EXHIBIT 1

CHEMICAL WARFARE AGENT EXPERIMENTS AMONG U.S. SERVICE MEMBERS

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Military experiments using service member as subjects have been an integral part of the U.S. chemical weapons program, producing tens of thousands of "soldier volunteers" experimentally exposed to a wide range of chemical agents from World War 1 to about 1975. By the end of World War 2, nearly 60,000 U.S. service members were experimentally exposed mainly to mustard agent and Lewisite (NAS 1993). From 1955 to 1975, thousands of U.S. service members were experimentally treated with a wide range of agents, primarily at U.S. Army Laboratories at Edgewood Arsenal, Maryland. Veteran and others have become increasingly concerned about long-term health effects potentially related to participation in these experiments. Even service members who were not experimental subjects but were involved only in carrying out military testing have expressed concerns about potentially related long-term health consequences, for example, tests evaluating ship vulnerability to attacks with chemical and biological agents conducted during the 1960s. Veterans and their supporters are also responding to a perception that participating veterans were the unwitting and unwilling subjects of secret military experimentation.

In response, VA with support from the U.S. Department of Defense (DoD) has made significant efforts to identify participants in the Edgewood/Aberdeen experiments conducted from 1955 to 1975 (as well as earlier testing), notify them of their involvement, offer them access to VA health care, and to evaluate potential long-term health consequences. Such efforts are significantly hampered by lack of military records on subject identity, and about the identity and magnitude of the agents they were exposed to. Many subjects were involved in multiple experiments with exposure to many different agents. These experiments were conducted decades in the past, further confounding modern efforts to piece together what happened. Today we appreciate that concerns about long-term health consequences among experimental subject are inevitable, earlier military researchers failed to anticipate this issue. During the height of the Cold War, researchers probably gave little thought of future interest in identifying and tracking down subjects to evaluate potential long-term health consequences and for outreach purposes. To address these problems in the future, study protocols and institutional review board approvals of human subjects research involving military personnel should require careful documentation of experimental exposures and of the identity of experimental subjects.

HISTORY OF U.S. CHEMICAL WARFARE AGENT HUMAN EXPERIMENTS.

The U.S. has had an active chemical warfare program since World War 1, with large-scale testing, manufacture and stockpiling of chemical agents and munitions. By the early 1990s, this stockpile included an estimated 25,000 tons of chemical warfare agents, including nerve agents such as sarin and VX, and vesicant (blister) agents including mustard and Lewisite. Today, this stockpile is considered obsolete, and federal law and international agreements require that it be destroyed.

A significant part of this program involved experimentation with U.S. service member "soldier volunteers," which ended only in 1975. Many experiments were intended to enhance defensive capabilities, such as improved protective clothing and respiratory masks. Others evaluated the impact on military personnel operational readiness, and the efficacy of new materials such as potential riot control agents. Other experiments evaluated the effectiveness of incapacitating and "brainwashing" agents such as cannabinoids and LSD. Human subjects were part of this program from the beginning, but the number of service members involved and the chemical warfare agents

tested has changed greatly over time. Although originally conducted in secret, today a great deal of information about them is available in the open literature.

Experiments Through World-War 2. The chemical warfare agent sulfur mustard (or just "mustard agent") caused nearly 400,000 casualties during World War 1 -- more than from any other chemical agent used during that conflict (NAS 1993). German use of mustard agent against Polish citizens in 1939 led U.S. military planners to respond in kind. U.S. military planners ultimately concluded that animal studies were not an adequate substitute for human studies, and in 1942, U.S. chemical weapons program managers were given authority to recruit and use volunteer subjects (NAS 1993). By the end of World War 2, over 60,000 U.S. service members had been used as human subjects in the U.S. chemical warfare defense research program (NAS 1993).

Research focused primarily on improving weapons and means of protection. "Soldier volunteers" were exposed commonly to acutely toxic levels (i.e., levels resulting in immediate signs and symptoms of poisoning) of agents via small drops applied to the arm or to clothing, or in gas chambers, sometimes without protective clothing (NAS 1993). In some experiments, subjects were repeatedly placed in gas chambers and exposed to mustard agent or Lewisite vapor sufficient to cause erythema (skin reddening) (NAS 1993). Field tests involved subjects passing through areas of land treated with sulfur mustard or Lewisite (NAS 1993). Gas chamber experiments evaluated the effectiveness of protective clothing including gas masks. Subjects exposed in chambers for 1 to 4 hours were evaluated twenty-four hours later for erythema as evidence of protective clothing failure (NAS 1993). Subjects often repeated this procedure every day or every other day until they developed moderate to intense erythema (NAS 1993). Most test subjects experienced intense, widespread erythema, especially in moist areas of skin folds, such as behind the knees and under the arms, in large areas of the chest and shoulders, and on their arms and legs (NAS 1993). Some experiments apparently involved less protected subjects who were reported to have experienced severe burns to the genital areas, including cases of crusted lesions to the scrotum (NAS 1993). Documented injuries among experimental subjects using various exposure routes was initially "quite high" -- one study of accidental injuries identified over 1,000 cases of acute mustard agent toxicity resulting in eye, ear, nose and throat symptoms occurred at Edgewood Arsenal over a 2-year period (NAS 1993).

By the end of the World War 2, the U.S. had produced more than 87,000 tons of sulfur mustard, 20,000 tons of Lewisite, and 100 tons of nitrogen mustard, at Edgewood Arsenal, MD, Huntsville Arsenal, AL, Pine Bluff Arsenal, AR, and Rocky Mountain Arsenal, CO (NAS 1993). Tens of thousands of military and civilian workers were involved in production of these agents, and some accidents were inevitable these individuals trained or otherwise came into contact with these materials. Similarly, a German bombing attack in December 1943 on U.S. ships loaded with mustard agent in the Italian harbor of Bari, Italy, released mustard agent into the air and water, which caused thousands of injuries and hundreds of deaths among U.S. service members and others in the area. Over 600 victims were treated from the harbor area alone, of which 83 died (NAS 1993). Close to 1,000 civilians from the town also died. Ironically, this was the only incident involving military use of mustard agent (or Lewisite) during World War 2 (NAS 1993).

Post World-War 2 – Edgewood/Aberdeen Experiments. The close of World War 2 led initially to reduced interest in human experimentation with mustard and Lewisite (NAS 1993). However, by the 1950s, DoD again saw a need for human experiments, although on a much

smaller scale, and with a focus on newer and potentially more effective chemical warfare agents, including the organophosphorus (OP) military nerve agents, nerve agent antidotes, incapacitating agents such as tear gas, and psychoactive agents such as LSD, PCP and synthetic cannabinoid (derived from marijuana) analogs (NAS 1993, NRC 1982).

From the 1955 to 1975, approximately 6,720 soldiers took part in experiments involving exposure to more than 250 different chemicals administered by various routes at U.S. Army Laboratories (formerly Army Chemical Center) at Edgewood Arsenal, Maryland (NRC 1982, NRC 1984, NAS 1993). Many of these experiments were designed to evaluate acute human toxic effects (NRC 1982). Some involved exposures to placebos or common agents such as caffeine and alcohol. Related testing also occurred at other military facilities during this period, and other agencies, including the CIA and the Special Operations Division of the Department of the Army, also reportedly were involved in these studies (NAS 1993). Congressional hearings about these experiments in 1974 and 1975 resulted in significant disclosures and the notification of some subjects about their participation, and compensation of a few families of subjects who had died during these experiments (NAS 1993).

The more than 250 agents tested represented about half a dozen pharmacological agent classes, including common approved pharmaceutical agents (Table 1), anticholinesterase nerve agents (e.g. sarin and common OP and carbamate pesticides), glycolate anticholinergic agents (e.g., nerve agent antidotes atropine, scopolamine, and BZ), nerve agent reactivators (e.g., the common OP antidote 2-PAM and related compounds), psychoactive compounds (e.g., LSD and PCP), cannabinoids (related to the active ingredient of marijuana), and irritants (e.g., tear gases) (Tables 2 - 4). Table 5 shows the agent class and median year for the Edgewood/Aberdeen experiments.

Anticholinesterase and anticholinergic agents were administered to approximately 3,200 subjects, or "almost half of some 6,700 subjects were exposed at Edgewood" (NRC 1984). Subsequent attempts to evaluate potential long-term health effects uncovered limited information on 750 subjects exposed to four cholinesterase reactivators (i.e., anticholinesterase antidotes such as 2-PAM), 260 subjects exposed to phencyclidine (PCP or "Angel Dust") or to 10 cannibinoid psychochemicals, and 1,500 subjects exposed to irritants and vesicants including CN, CS, other "tear gas" type irritants, and mustard agent. Anticholinesterases and anticholinergic agents were also purposefully tested in combination, since members of each are used as treatment for overexposure to the other (NRC 1982).

SHAD and Project 112 Tests. From 1963 through the early 1970s, DoD conducted tests known as "Project 112," with chemical and biological warfare agents as well as less hazardous simulants, to evaluate the effectiveness of various protective and detection measures on both land and at sea. The shipboard tests were called "Shipboard Hazard and Defense," or simply "SHAD." In 2000, responding to a request from Secretary of Veterans Affairs, DoD began declassifying and sharing what information was still available with VA about the medical aspects of these tests, and the identities of those involved. Unlike many such experiments before or since, Navy ship rosters have turned out to be an excellent source for determining who was actually involved in these tests, although data about individual exposures is more typically poor or non-existent. Since May 2002, using declassified information provided by DoD, VA has been notifying veterans who took part in these tests, and encouraging them to come to VA medical facilities if they have any related health concerns.

DoD has stated that the military personnel involved in these tests were not actually test subjects, but rather were only involved as test conductors Further, DoD offered the reassurance that procedures were taken during the tests to protect these test conductors from hazardous exposures, and that no veteran became ill during these experiments. Despite these assurances, there has been a perception by some that military personnel may have been in some cases the unwitting subjects of secret military experiments involving their deliberate exposure to hazardous agents.

Based on DoD's declassification efforts, today we know that a wide range of chemical and biological warfare agents, less hazardous simulants, and disinfectant agents were used in SHAD and Project 112. Tested biological warfare agents included *Coxiella burnetii, Francisella tularensis*, and Staphylococcal Enterotoxin B. Biological agent simulants were also tested as relatively non-toxic substitutes with similar physical properties as actual biowarfare agents. These included *Bacillus globigii* (BG), *E. coli*, *Serratia marcscens* and zinc cadmium sulfide. Although these biological agent simulants were considered to be safe at the time they were used, we understand today that they can be opportunistic pathogens under certain unusual circumstances – circumstances that are probably not relevant to most active duty personnel.

SHAD and Project 112 tests also involved most of the organophosphorus chemical warfare nerve agents in the U.S. arsenal at that time, including Sarin, VX, Tabun and Soman. The majority of tests involved chemical warfare agent simulants such as methylacetoacetate or sulfur dioxide, which had similar physical properties such as vapor pressure, but without the acute lethal toxicity of the actual chemical warfare agents. DoD also used a number of common agents for sterilizing surfaces, presumably following experiments with biological agents. These included β-propiolactone, ethyl alcohol, Lysol, peracetic acid, potassium and sodium hydroxide, and sodium hypochlorite (common bleach).

Literature on long-term health effects from biological agents used in Project 112 indicates such effects are unlikely in the absence of observable health problems at the time of exposure (VA 2002). These infectious agents are not associated with latent infections in the absence of acute and symptomatic illness. Similarly, in general, the chemical agents used in project SHAD are most likely to have produced long-term health effects only if they caused clinically significant effects during or shortly after exposure. However, there are few good, long-term studies of the health effects of exposure to low levels of the agents used in these tests. Consequently, VA has contracted with the Institute of Medicine to conduct a comprehensive study of potential long-term health effects among SHAD test conductors (VA 2002).

CALLS FOR INDEPENDENT EVALUATION

Public attention about these military human subjects experiments increased considerably when affected veterans began to seek compensation from VA for health problems they believed had been caused by their involvement. Veterans faced significant hurdles in establishing such claims because typically little or no supporting documentation was available. For example, generally the time spent as subjects in the World War 2 mustard agent and Lewisite experiments were unaccounted for in official service records (NAS 1993). Compounding veterans' difficulties, there was little scientific or medical information on long-term health effects from these exposures – existing literature focused nearly exclusively upon short-term effects.

Responding to mounting concerns about potential long-term health consequences from participation in military experiments, in 1980 DoD requested the National Research Council (NRC) to evaluate long-term health effects among the 6,720 servicemen subjects in the Edgewood/Aberdeen post-World War 2 experiments conducted in Army Laboratories from 1955 to 1975. This produced three reports titled "Possible Long-Term Health Effects of Short-Term Exposure to Chemical Agents" (NRC 1982, 1984, 1985), which reviewed the medical and scientific literature on the possible long-term health effects from exposure to the agents involved, and included an epidemiological study of experimental subjects. Overall, the NRC concluded that long-term health effects among subjects were probably minimal, but that gaps in scientific knowledge about such effects made conclusions necessarily tentative. Results of the epidemiological study were also generally negative.

Similarly, in 1991, increasing concerns among veterans, Congress and the media led VA's Secretary to announce new guidelines for compensation of veterans experimentally exposed to mustard and Lewisite agents. Those guidelines loosened the normal restrictions requiring documentation of exposure, and identified certain illnesses that VA would presume to be associated with exposure to mustard agent and Lewisite, including asthma, chronic laryngitis, chronic bronchitis, emphysema, corneal opacities, chronic conjunctivitis and keratitits of the eye. The Secretary also requested the National Academy of Sciences Institute of Medicine (IOM) to review relevant scientific literature on human health effects from exposure to these agents, which was published in 1993 (NAS 1993).

COMPARING PAST AND CURRENT HUMAN RESEARCH GUIDELINES.

Review of US military experiments conducted decades ago that involved exposure of human subjects to chemical warfare and other agents inevitably invites comparison with current standards regulating human subjects research. Many of the research protocols used during those earlier periods fall short of today's standards for protecting human subjects, a comparison leading in part to the outrage expressed by some affected veterans today – the sense that they were treated as no more than "human guinea pigs."

Nevertheless, according to the 1982 NRC report, experimental protocols used during the Edgewood, MD experiments from 1958 to 1975 ". . . emphasized that voluntary consent of each human subject was absolutely essential. It was also stated that, in all experiments involving volunteer subjects, the subjects would be thoroughly informed of all procedures and of what might be expected as a result of each test. Furthermore, each volunteer would be free to determine whether he desired to participate in a given experiment (NRC 1982)."

Furthermore, "the Nuremberg and Helsinki guidelines were regarded by the investigators and their supervisors as appropriate constraints in studies performed on volunteers, although this was not clearly articulated in official memoranda until the mid—1960s. The provision of accurate, informative explanations of what was planned and what might be expected was regarded as essential to the continuance of the program. Written consents, witnessed by medical staff members, were required from the outset and became more elaborate with time."

Nevertheless, the NRC report acknowledged that human subjects research standards have evolved over time; ". . .minutes of hearings conducted by the U.S. Senate Subcommittee on Health and Subcommittee on Administrative Practice and Procedure, September 10—12, 1975, stated that

the consent information was inadequate by current standards."

Finally, nearly all veterans who talk about their participation in these experiments express a strong sense of patriotism and the belief that they made an important sacrifice for the protection of their country. In return, VA has the obligation to provide equitable health care and benefits for any injuries these veterans sustained while on active duty.

EXPERIMENTAL PROTOCOLS – WHAT DO WE KNOW?

The secrecy under which these experiments took place had an enormous affect our current understanding about the identity of experimental subjects, the agent or agents they were exposed to, and the magnitude of their exposures. For example, during their investigations of World War 2 era mustard and Lewisite experiments, an IOM committee complained that an "atmosphere of secrecy still exists to some extent regarding the World War Two testing program." "As a result, the committee often had great difficulty obtaining information." "The committee is certain that other relevant information exists that was never obtained." "It is also clear that there may be many exposed veterans and workers who took an oath of secrecy . . . and remain true to that oath even today (NAS 1993)." The more recent Edgewood/Aberdeen studies (from 1955 to 1975) present similar difficulties for evaluating long-term health issues, due to poor contemporary records and the passage of time (NRC 1984).

However, many of these early experimental protocols were probably reasonably consistent with contemporaneous standards, and may have been crude only in comparison with modern pharmacological research. "Not until the mid-1960s was there a general consensus in a minimally acceptable design for studying psychochemicals, and even now there may be disagreement. The experimental design used in the experiments at Edgewood compares favorably with the pharmacologic research at other [contemporary] research centers" (NRC 1984). Military Edgewood/Aberdeen experiments commonly began with low "range finding" doses among "a few" volunteers, followed by more subjects being tested with doses subsequently estimated as safe but pharmacologically active (NRC 1984). Additional studies apparently followed up interesting effects, worrisome side effects, or tested potential interventions using experimental antidotes (NRC 1984).

Common Pharmaceutical Agents and Placebos. Available records indicate that many Edgewood/Aberdeen subjects were exposed to a wide range of common placebos and pharmaceutical agents (or their close analogs). However, placebo controls were not always used, possibly consistent with the research goals of military planners (NRC 1984). Table 1 lists many of the common pharmaceutical agents, their close relatives, and harmless agents used apparently as control exposures in the Edgewood/Aberdeen experiments.

Anticholinesterases. Table 2 lists 16 anticholinesterase agents including OP, carbamate and other cholinesterase inhibiting compounds, tested on about 1,400 subjects in the Edgewood/Aberdeen experiments. Subjects were exposed via intravenous, vapor, oral percutaneous, intramuscular routes, and some were treated simultaneously with reactivating and antidote agents (NRC 1982). Contemporary case summaries were "brief and anecdotal," with no reports of neurologic or psychologic examinations (NRC 1982). Subjects reportedly showed a wide range of symptoms consistent with acute cholinergic toxicity, including dizziness, frontal headache, blurred vision, lethargy, nausea, stomach pain, vomiting, rhinorrhea, chest tightness,

wheezing, fasciculations, sweating on hands and feet, and significantly decreased red blood cell cholinesterase levels (NRC 1982). Many showed no signs or symptoms of toxicity. Some were treated simultaneously with protective or reactivating agents, while others reportedly required standard antidotes including atropine as a medical response to severe poisoning symptoms (NRC 1982).

Anticholinergics. Table 3 lists 24 anticholinergic "glycolate" agents related to atropine, tested on about 1,800 subjects in the Edgewood/Aberdeen experiments, via intravenous, vapor, oral percutaneous, intramuscular routes (NRC 1982). Some subjects were treated simultaneously with other agent, and available case summaries were reportedly "brief and anecdotal" (NRC 1982). Although some laboratory results were available, reports of neurologic or psychologic examinations were absent (NRC 1982).

Cholinesterase Reactivators, Cannabinoids, Irritants and Blister Agents, Phencyclidine and LSD. Table 4 lists 4 cholinesterase reactivators, 11 cannabinoids, 9 irritants and vesicants and phencyclidine (PCP or "Angel Dust"), tested on about 3,500 Edgewood/Aberdeen subjects. Antidote cholinesterase reactivator such as 2-PAM were tested on about 750 subjects. Irritants (i.e., lachrymatory "riot control" agents) and vesicants were tested on about 1,500 subjects, and included riot control agents CN, CS, chloropicrin (PS), Diphenylaminochlorarsine (DM, Adamsite), other ocular and respiratory irritants, and mustard agent (NRC 1984). For example, from 1958 to 1973 at least 1,366 human subjects underwent experimental exposure to CS at Edgewood (NRC 1984) including via aerosol (1,073 subjects), dermal (180 subjects), aerosol and dermal (82 subjects), and ocular (31 subjects). Most experiments evaluated protective equipment and impact on performance of military tasks. In contrast to the earlier World War 2 era experiments that involved about 60,000 subjects, only 147 subjects were exposed to mustard or Lewisite during these more recent experiments (NRC 1982). Some experiments only involved one or two subjects. For example, the period 1962 to 1972 saw 123 irritant chemicals (based upon preliminary animal studies) tested using only two subjects each exposed in a wind tunnel (NRC 1984). Various psychochemicals including phencyclidine ("angel dust," PCP) and 11 related synthetic cannabinoids were tested on about 260 subjects (NRC 1984). Other experiments involved LSD with about 741 soldiers (NRC 1984).

ACUTE EFFECTS AMONG EDGEWOOD/ABERDEEN SUBJECTS.

Some of our best information about the dose experienced by subjects of the Edgewood/Aberdeen experiments comes from contemporary records of acute poisoning signs and symptoms among subjects (Brown and Brix 1999).

Anticholinergics. Anticholinergics, including military OP nerve agents such as sarin and VX, and their closely related OP pesticides act by inhibiting acetylcholinesterases, leading to a well-characterized toxic accumulation of the neurotransmitter acetylcholine. Subjects exposed to anticholinergics reportedly exhibited a wide range of classic symptoms consistent with acute cholinergic toxicity, including dizziness, frontal headache, blurred vision, lethargy, nausea, stomach pain, vomiting, rhinorrhea, chest tightness, wheezing, fasciculations, sweating on hands and feet, and significantly decreased red blood cell cholinesterase levels (NRC 1982). Many subjects showed no evidence of acute toxicity, presumably because of the low dose they received. Others experienced severe clinical acute cholinergic poisoning that required treatment with conventional antidotes such as atropine (NRC 1982). A 1982 NRC review reported no clear

evidence that the anticholinergic agents tested produced any long-term adverse human health effects in the doses used at Edgewood Arsenal: "On the basis of available data, in the judgment of the panel, it is unlikely that administration of these anticholinergic compounds will have long-term toxicity effects or delayed sequellae" (NRC 1982). However, the committee cautioned that "more intensive study is required to confirm this conclusion" (NRC 1982).

Reactivators. Reactivators such as 2-PAM are intended to "reactivate" cholinesterases that have been inhibited by an OP nerve agent such as sarin or common OP pesticides. Not surprisingly, reactivators were often given following treatment with anticholinergics. The medical records of subjects treated at Edgewood/Aberdeen apparently included test protocols, physicians' orders, nursing notes, clinical observations, symptom checklist, and laboratory and performance test results, but not reports of physicians' examinations (NRC 1984). Commonly reported effects included dizziness, eye discomfort, blurred vision, diplopia, muscle pain (with intramuscular exposure), tingling sensations (with intravenous exposure), voiding difficulty, diarrhea, dry mouth, and lethargy (NRC 1984). Clinical responses to conventional reactivators have been well characterized, and according to the 1984 review, "the manifestations experienced by subjects in these tests . . . were the moderate clinical effects that have been reported in the literature [and] in all but two instances, moderate effects disappeared within 24 hours" (NRC 1984).

More severe acute effects were also noted, including one subject (treated with P2S and soman) with significant chronic psychological effects, and a second (treated with 2-PAM alone) experiencing a grand mal seizure (NRC 1984). The NRC committee concluded that "with the possible exception of those two cases, the records contained no evidence of delayed or persistent effects after administration of the cholinesterase reactivators. Such data cannot, however, address the issue of long-term effects or delayed sequelae" (NRC 1984).

PCP. PCP "phencyclidine," is an illicit drug with a somewhat sinister reputation as the recreational hallucinogen "Angel Dust." According to the 1984 NRC review, charts in the clinical files of Edgewood/Aberdeen subjects treated with PCP varied from sketchy and incomplete notes and line-line summaries, to records that could "serve as models for research documents" (NRC 1984). Effects reported among Edgewood/Aberdeen subjects were similar to those reported in clinical research from pharmaceutical companies who had evaluated PCP as an anesthetic agent, that is, the military tests "did not involve extraordinary doses" compared to contemporary civilian experiments (although inhalation exposure was unique to the military trials) (NRC 1984).

Edgewood/Aberdeen subjects treated with PCP reported "feelings of unreality – dream-like states with perceptual size changes," with variable affect and mood changes (NRC 1984). Some became talkative and uninhibited, while others became passive and withdrawn (NRC 1984). At higher doses, symptoms intensified and were accompanied by "visual disturbance, blurred vision, ataxia, limb paresthesias, and memory impairment," and becoming non-communicative (NRC 1984). Strikingly, amnesia was reported among some subjects. At the largest doses tested, subjects experienced analgesia, nausea and vomiting, and four experienced collapse and prostration or incapacitation without convulsions, with recovery over the next few hours (NRC 1984). In general, signs and symptoms disappeared within 6 to 8 hours, although at the largest doses symptoms persisted for 24 or 48 hours (NRC 1984). No clinically abnormal effects, including renal or hepatic toxicity, were noted in available records. Strikingly, despite the negative "street reputation" of this agent for causing aggression, no subjects were reported to have become overly assertive, hostile or unmanageable (NRC 1984).

Cannabinoids. Edgewood/Aberdeen subjects were exposed to the active ingredient of marijuana and a series of related synthetic "cannabinoids," by oral, intramuscular, and intravenous routes. Reported signs and symptoms were "very similar to those later described over the last 15 years by many research laboratories working with cannabis and THC," and included fatigue, weakness, drowsiness, ataxia, feeling of giddiness, mild headache, occasional increased thirst, general slowing of motor activity, and postural hypotension especially at higher doses, occasionally with fainting on standing (NRC 1984). At the largest doses, subjects often showed marked psychomotor retardation, sluggishness, difficulty in concentrating, and blurred vision for up to 48 hours after a single dose (NRC 1984). Cardiovascular effects included tachycardia and orthostatic hypotension in some subjects and at almost all doses tested (NRC 1984). Importantly, these effects disappeared in most subjects after 24 hours, although they persisted for several days in a few (NRC 1984). Finally, the 1984 NRC review reported a "lack of evidence of severe mental or emotional disturbances" even among subjects experiencing intense and persistent cardiovascular effects (NRC 1984).

LSD. According to a 1980 report by the US Army Medical Department, the US Army Chemical Corps and the US Army Intelligence Corps conducted human experiments with LSD from 1955 through 1967, involving at least 741 individuals (US Army 1980). These experiments were intended to test LSD as a chemical warfare agent, and were a response to "the rumored use of LSD or some similar agent by certain Soviet block nations, for the purpose of interrogation and behavioral control (brain washing)" (US Army 1980). They reported that "with rare exceptions, all LSD-exposed subjects voluntarily participated in the chemical warfare testing and were informed ahead of time that they would be receiving a psychoactive agent." Moreover, "strict medical supervision was provided during the testing, and prior to the actual receipt of drugs, almost all subjects received some degree of psychological screening" (US Army 1980). However, the Army report contained little information about the acute (immediate) effects experienced by subjects of this study, except to document that most received pharmacologically relevant exposures.

Irritants and Vesicants (Mustard Agents, Lewisite, CS, CN, CR, DM, CA, Chloropicrin, Nonanoyl Morpholide, CHT, and 123 Other Miscellaneous Irritants). Many of the Edgewood/Aberdeen experiments involved exposure to irritants such as riot control agents that produce intense lacrimation (tears) and respiratory distress, and to vesicants that produce reddening and blistering of the skin. Subjects involved in experimental exposures to irritants and vesicants at Edgewood from 1955 to 1965 were exposed to hundreds of different test compounds, via aerosol chamber and droplets applied directly to the skin. Some subjects sustained dermal injuries (NRC 1984). According to the 1984 NRC committee, subjects were generally at least partially protected with clothing and masks.

Mustard Agents, and Lewisite (chlorovinyldichloroarsine). Signs and symptoms of acute mustard agent poisoning, which are usually delayed for some hours following exposure, include severe irritation and tissue damage to eyes, skin, and respiratory and gastrointestinal (GI) tracts. Although the vast majority of military human experiments with mustard agents and Lewisite agents occurred before the end of World War 2, experiments with mustard agents were also conducted at Edgewood/Aberdeen from 1955 to 1965. In those experiments, subjects were reportedly removed from exposure typically after evidencing dermal erythema, noted on trunks, extremities, and backs of subjects (NRC 1984). Droplet exposure on skin also reportedly led to

erythma and occasionally blisters at the application site. Some subjects experienced blistering that required hospitalization with injuries that "might have been severe enough to cause permanent scarring" (NRC 1984). No subject was reported to have sustained ocular or respiratory tract injuries, perhaps because of protection used by subjects during experimentation (NRC 1984).

Effects reported among Edgewood/Aberdeen subjects echo more recent reports of military exposure to mustard agents. Probably the largest actual military use of mustard agent was during the 1980s Iran-Iraq war (NAS 1993). A report of Iraqi use of mustard agent against Iranian troops in 1984 documented health effects among more than 5,000 Iranian casualties, including first to third degree burns over 20 to 70 percent of the total skin surface, in a pattern similar to that reported for mustard agent casualties in World War 1. Eye exposure caused tearing, severe conjunctivitis, and temporary loss of vision. Corneal abrasion was nearly always present, and photophobia and blurred vision developed in some cases. Upper airway involvement due to chemical burning of the throat led to pharyngitis and tracheobronchitis. These effects were quite severe, and this group suffered approximately 15 percent mortality. Those who survived the initial symptoms later experienced various GI complaints, including nausea, vomiting, and diarrhea. After five to seven days, hematologic problems were the greatest health threat to survivors (Kadivar & Adams 1991).

CS (o-chlorobenzylidene malononitrile). The "tear gas" and riot control agent CS causes burning sensations of the eyes, intense lacrimation, coughing, conjunctivitis, erythemic eyelids and other symptoms of irritation of the eyes, skin and mucous membranes. From 1958 to 1973, at least 1,366 human subjects underwent experimental exposure to CS at Edgewood/Aberdeen, and 1,073 subjects were exposed to aerosol CS, 180 with dermal applications, 82 both dermal and aerosol, and 31 to the eye. Subjects were exposed via a gasmask or more often, in large wind tunnels (NRC 1984). Exposed subjects typically experienced short-term tears, nasal secretions and copious saliva flow that required "towels rather than handkerchiefs" (NRC 1984). Physical effects were reported to subside 5 to fifteen minutes after exposure stopped. CS applied to skin directly or as an aerosol produced erythma, vesicles and in some cases burns. "Hepatic dysfunction and urinary abnormalities" were seen in some subjects (NRC 1984). "A high percentage of subjects" reportedly developed allergic contact dermatitis after repeated exposure (NRC 1984). Thus, follow-up evaluations suggested that repeat CS exposure may cause allergic contact dermatitis in many subjects, and possibly idiosyncratic hepatitis or allergic pneumonitis in some persons (NRC 1984).

CN (chloroacetophenone). Subjects at Edgewood/Aberdeen were experimentally exposed to another "tear gas" agent CN from 1958 to 1972 as aerosols in chambers or skin application (NRC 1984). Aerosol exposed subjects showed transient effects that reportedly included lacrimation, blepharospasm, conjunctivitis, and rarely, palpebral edema, noropharyngeal irritation, rhinorrhea, and rarely dyspnea, headaches and dizziness (NRC 1984). Skin exposure produced local irritation and occasionally erythema at the exposure site, which lasted for 7 hours (NRC 1984). Laboratory tests for skin exposed individuals were normal, including urinalysis, complete blood count, blood urea nitrogen, alkaline phosphatase and serum glutamic oxalotransferase, 7 days after exposure (NRC 1984).

CR (dibenz[b,f][1,4]oxazepine. CR is another "tear gas" agent tested from 1963 to 1972 on subjects at Edgwood/Aberdeen, using aerosol (chamber) and dermal (patch) exposures. As with other "tear gas" type agents, transitory effects were reported as primarily respiratory and ocular

(NRC 1984). Aerosol exposure universally lead to upper respiratory tract irritation among subjects with choking, and sometimes dyspnea. Dermal exposure produced stinging and erythmea at the exposure site, which resolved within 24 hours (NRC 1984). Laboratory analyses 7 days after exposure showed no abnormalities from the exposure (NRC 1984).

DM (diphenylaminochlorarsine). DM (Adamsite), another "tear gas" agent tested in 1958 and from 1966 to 1968 at Edgewood/Aberdeen, using aerosols in chambers. Predominant symptoms included burning sensations of respiratory tract, choking, dysphonia, dyspnea, coughing, sneezing, and nausea (NRC 1984). Less frequent effects included retching, anorexia, headache, dizziness, lacrimation, salivation, and increased urinary frequency. Laboratory results 7 days after the exposure showed no abnormalities due to the exposure (NRC 1984). "Although DM has greater acute toxicity to the respiratory tract than CS and CN, Edgewood subjects appeared to recover shortly after exposure" (NRC 1984).

CA (bromobenzyl cyanide). In 1966, Edgwood/Aberdeen subjects were experimentally treated with the "tear gas" agent CA in aerosol chambers. Reported effects were transient, and included ocular irritation, often accompanied by conjunctivitis, and upper respiratory tract irritation with rhinorrhea (NRC 1984). Blood and urine laboratory analysis 7 days after exposure for 12 subjects showed minimal leukocytosis (WBC 12,800) not seen prior to exposure (NRC 1984).

PS (chloropicrin). Chloropicrin, another "tear gas" agent, was tested from 1955 to 1971 at Edgewood/Aberdeen in chambers experiments. Subjects reportedly wore gas masks to test their function. Although records were incomplete, no acute effects were documented (NRC 1984).

Nonanoyl morpholide. Nonanoyl morpholide was another experimental "riot control" agent to which Edgewood/Aberdeen subjects were experimentally exposed in 1958 in chamber experiments (NRC 1984). Effects were reported as transient, mainly causing respiratory tract irritation, including rhinorrea, cough, substernal pain, and dyspnea (NRC 1984). Nausea was also commonly reported, and vomiting occurred if the subject had eaten before the test. Headaches sometimes occurred one hour after exposure, and for one subject the headache persisted for a week (NRC 1984). No laboratory analyses were available.

CHT (1-methyl-1,3,5-cycloheptatriene). Another experimental "riot control" agent CHT was tested on Edgewood/Aberdeen subjects in aerosol chambers during 1969 and 1970. Physical effects were described as transient, with "complete resolution by 15 minutes after leaving the chamber" (NRC 1984). The main effects were lacrimation leading to incapacitation from eye closure and blurred vision "lasting several minutes after the exposure" (NRC 1984). Dermal irritation and rhinorrhea also were reported among exposed subjects. Laboratory analysis 9 days later reported two subjects with slight increases in SGOT (31.5 and 44.5) – slightly less than double pre-exposure values (NRC 1984). However, SGOT was normal 1 month later. Other minor effects on laboratory results were also noted (NRC 1984).

123 Other Miscellaneous Irritant Chemicals. From 1962 to 1972, 123 other irritant "tear gas" like compounds were tested at Edgewood/Aberdeen, generally only on two subjects per compound (NRC 1984). Tested substances had been classified as irritants based on preliminary animal studies. Human experiments took place primarily in aerosol chambers, with exposures lasting a minute or less, with subjects exposed only once (NRC 1984). Of the 123 tested chemicals, 64 caused slight or no effects, while 42 caused mainly ocular effects including eye irritation, lacrimation and conjunctivitis, and of those, 34 caused very mild effects (NRC 1984).

Eight of these 42 compounds produced relatively more severe effects, including prolonged incapacitation associated with lacrimation and eye closing (NRC 1984). "The discomfort associated with the exposures was marked, but exposures were short and recovery appeared complete" (NRC 1984).

LONG-TERM HEALTH EFFECTS AMONG EXPERIMENTAL SUBJECTS

Although military researchers were primarily interested in short-term acute effects, today, many veterans are concerned more with possible long-term health effects from these experimental exposures. Review of the significant amount of literature on long-term health effects from tested agents can help predict what health affects may be anticipated. Much of this literature is based on studies of the veterans involve. Many studies are also available based on other exposed groups including civilians exposed in accidents or via terrorist incidents. However, the lack of good exposure data significantly limits our ability to predict long-term health effects for individual veterans involved in these experiments.

Mustard Agent and Lewisite. The 1993 NAS committee concluded that some veterans experimentally exposed to mustard and Lewisite had clearly suffered serious and debilitating diseases as a consequence, lasting in some cases for decades (NAS 1993). Many subjects of earlier World War 2 era experiments with these agents also sustained dermal injuries severe enough to cause permanent scarring (NRC 1984). However, the absence of follow-up health assessments such as epidemiological studies of chemical weapons production workers, of chemical warfare munitions handlers and trainers, or of chemical weapon combat casualties, has limited any systematic assessment of long-term health consequences (IOM 1993).

In their broad review of all relevant medical and scientific literature on health effects related to mustard agent exposure the 1993 NAS committee identified a range of related chronic diseases, including (NAS 1993):

1. a *causal relationship* between exposure to mustard and Lewisite chemical warfare agents and the following health conditions:

- Respiratory cancers including;
  - Nasopharyngeal
  - Laryngeal
  - Lung
- Skin cancer
- Pigmentation abnormalities of the skin
- Chronic skin ulceration and scar formation
- Leukemia (typically acute non-lymphocytic type, nitrogen mustard)
- Chronic respiratory diseases
  - Asthma
  - Chronic bronchitis
  - Emphysema
  - Chronic obstructive pulmonary disease
  - Chronic laryngitis

- Recurrent corneal ulcerative disease (includes corneal opacities; acute severe injuries to eye from Lewisite will also persist)
- Delayed recurrent keratitis of the eye
- Chronic conjunctivitis
- Bone marrow depression and resulting immuno-suppression (an acute effect that may result in greater susceptibility to serious infections with secondary permanent damage to vital organ systems)
- Psychological disorders
  - Mood disorders
  - Anxiety disorders (including post-traumatic stress disorder)
  - Other traumatic stress disorder responses (These may result from traumatic or stressful features of the exposure experience, not a toxic effect of the agents themselves)
- Sexual dysfunction (scrotal and penile scarring may prevent ort inhibit normal sexual performance or activity)

2. a *suggested a causal relationship* between exposure and the following health conditions:

- Leukemia (acute non-lymphocytic type, sulfur mustard)
- Reproductive dysfunction (genotoxicity, mutagenicity, etc.; mustard agents)

3. *insufficient evidence found to demonstrate a causal relationship* between exposure and the following health conditions:

- Gastrointestinal diseases
- Hematologic diseases
- Neurological diseases
- Reproductive dysfunction (Lewisite)
- Cardiovascular diseases (except for those that may result from serious infections shortly following exposure – heart disease resulting from rheumatic fever, for example)

Studies of World War 2 Mustard and Lewisite Military Human Subjects. A 2000 study by VA researchers compared mortality among 1,545 World War 2 Navy veterans exposed to mustard agent in World War 2 era experiments to mortality among 2,663 similar Navy veterans not part of these experiments (Bullman & Kang 2000). Long-term health issues had not been evaluated previously for this group. The study found no increased risk of any cause of death associated with mustard agent exposure, and no increased risk in cause-specific mortality associated with the level of mustard agent exposure among exposed veterans (Bullman & Kang 2000). The large sample size produced substantial statistical power, with a 95% power to detect a 2-fold or greater increase of risk of deaths due to respiratory cancers (Bullman & Kang 2000). Moreover, since exposures occurred over 40 years before this study was conducted, a long latency of effect should not have been missed. In contrast, earlier studies of World War 1 veterans with combat exposure to mustard agent had reported an increased risk of death from lung cancers and respiratory related diseases. Ten years after their combat exposure soldiers

exhibited residual disabilities including chronic bronchitis (usually associated with emphysema), bronchial asthma, chronic conjunctivitis, blepharitis, keratitis, and corneal opacities (NRC 1984). VA researchers speculated that the different findings might be because the World War 2 veterans, in contrast to many World War I veterans, wore protective clothing and were exposed for relatively short periods to probably lower levels of agents (Bullman & Kang 2000).

Studies of Post World War 2 Edgewood/Aberdeen Subjects. NRC studies in the 1980s reported finding little evidence of any health consequences among participants in the post-World War 2 Edgewood/Aberdeen military experiments. They evaluated long-term morbidity and mortality among the 6,720 subjects exposed from 1955 to 1975 to more than 250 different chemicals, including common approved pharmaceutical agents, anticholinesterase nerve agents, glycolate incapacitating agents, atropine-related anticholinergic agents, LSD and related compounds, cannabinoids, and irritants (NRC 1985). Perhaps surprisingly, they reported that these subjects were generally healthier in comparison to era controls, while both subjects and controls were healthier than the general population (NRC 1984). However, the NRC committee pointed out that a range of methodological problems limited their ability to evaluate potential long-term health effects (NRC 1984).

Morbidity was evaluated through mailing a health survey sent to all living and locatable experimental subjects, and from information gleaned from VA and Army hospitalization admissions data (NRC 1984). Eighty-two percent of subjects receiving a mailed health survey responded. VA hospital admissions data was examined for malignant neoplasms, mental disorders and diseases of the nervous system and sense organs. Researchers focused in particular on evaluation of cancer risks, adverse mental, neurologic, hepatic and reproductive effects that might be associated with participation in the post-World War 2 Edgewood/Aberdeen tests.

Devising an appropriate control group for this study was complicated because the exclusively military subjects were apparently also subjected to further significant physical and psychological screening for inclusion in these studies (NRC 1985). Moreover, experiments involving hazardous chemical warfare agents selectively used more fit subjects, leaving less fit subjects as controls or tests with placebos (NRC 1985). Finally, experimental subjects were commonly used in multiple tests with exposure to a range of different agents (NRC 1985). In practice, NRC researchers developed two internal comparison groups:

1) Subjects not exposed to any chemical warfare agents (1,058 subjects, including 907 apparently exposed to no agents, 93 exposed to 58-different FDA approved drugs, 17 exposed to common agents including caffeine and alcohol, 39 exposed to control substances such as water, saline, and sodium bicarbonate, and two subjects exposed to two of the above).

2) Subjects exposed to chemical warfare agents *other* than the agent being evaluated in a particular comparison. That is, a subject exposed only to LSD might be compared to subjects exposed to nerve agents.

A 2003 study provided follow-up health evaluations of 4,022 out of the 6,720 soldiers involved in the1955 to 1975 Edgewood/Aberdeen experiments (Page 2003). Of these, 256 had been exposed to sarin, 740 to VX, 571 to various psychochemicals including LSD, 1,366 to irritants including CS, and 147 to vesicants including mustard agent. As always, identifying comparable controls were a problem -- this study also relied upon internal controls including subjects exposed to none, one or multiple agents *other* than the agent under evaluation (Page 2003).

Conclusions. NRC researchers were careful to document the significant study limitations they faced: "The experimental methods and the available comparison groups were such that only large effects were likely to be uncovered. The large standard errors, the initial differences between the exposed and the non-exposed groups, the possibility that more than one exposure might have led to the same adverse effect, and the self-reporting nature of the questionnaire study all would tend to obscure small differences" (NRC 1985).

Nevertheless, the study reported that Edgewood/Aberdeen subjects experimentally exposed to anticholinesterase and anticholinergic agents, cholinesterase reactivators or psychochemicals did not differ significantly from the two comparison groups in their mailed health survey responses (NRC 1985). Almost ninety percent reported no health problems related experimental exposures, and seventy-nine percent reported "good to excellent" health. Subjects tested with LSD at Edgewood reported an increased use of LSD compared to controls subsequent to the experiments, but there "was no evidence of adverse health effects among these subjects" (NRC 1985). Subjects tested with irritants and vesicants, including those who had developed skin lesions from exposure to mustard agent, reported no increased risk of "significant skin cancer" or other adverse health effects (NRC 1985). An apparent decrease in fertility among subjects exposed to anticholinergic agents in comparison with subjects tested with other agents disappeared after adjusting for age of subjects when tested such that "there was no difference between the observed fertility pattern of the men exposed to anticholinergic chemicals and that expected on the basis of men who were exposed to other chemicals" (NRC 1985).

Review of hospital admissions records for Army from 1958 to 1983, and VA from 1963 to 1981, showed a "barely statistically significant increase in admissions to VA hospitals for malignant neoplasms among men exposed to anticholinesterases and a statistically significant increase in admissions to VA hospitals and Army hospitals for nervous system and sense organ disorders among men exposed to LSD" (NRC 1985). However, the report noted that admission numbers were small, no dose relationships were detected, and, for subjects exposed to anticholinesterases, neoplasms occurred at a range of sites with no consistent pattern or correlation with exposure to a specific chemical (NRC 1985). In general, anticholinesterase compounds, including common pesticides and military nerve agents, are not considered carcinogens. Cardiovascular effects have been reported among individuals with acute, immediate anticholinergic poisoning, including poisoning from pesticides. However, such effects were not detected among the Edgewood/Aberdeen subjects (NRC 1985). Finally, admissions by experimental subjects to Army or VA hospitals for mental disorders did not appear to be significantly increased (NRC 1985).

The more recent follow up studies of Edgewood/Aberdeen subjects reported only two statistically significant effects (Page 2003). Subjects exposed *only* to OP nerve agents reported 1) *fewer* attention problems compared to subjects exposed to *other* agents, and 2) *greater* sleep disturbances compared to subjects exposed to *no* active agents. Strikingly, in this study, neurological diseases including Parkinson's, and chronic multisymptom illnesses such as CFS and FM, were not significantly different from controls, and were generally very low among all groups (Page 2003). Interestingly, subjects reporting exposure to chemicals in civilian or military activities *other* than from the Edgewood/Aberdeen testing reported many statistically significant adverse neurological and psychological effects, regardless of their experimental exposure.

LSD Effects. In the 1985 NRC evaluation, 317 out of 571 soldiers involved with LSD experiments at Edgewood/Aberdeen returned completed health survey questionnaires (NRC

1985). LSD exposed subjects did not differ from the comparison groups in total hospital admissions, admissions for malignant neoplasms, mental disorders, or current health status (NRC 1985). However, they did show an increased number of first admissions for nervous system and sense organ disorders (NRC 1985). No increase in suicide or epilepsy was found, although interestingly, subjects reported an increase in the use of controlled substances subsequent to these experiments (NRC 1985).

According to an earlier 1980 report by the US Army Medical Department, the US Army Chemical Corps and the US Army Intelligence Corps conducted human experiments with LSD from 1955 through 1967 with at least 741 individuals (US Army 1980). In 1978, the US Army Health Services Command initiated a follow-up health evaluation of subjects, although their evaluation was complicated because the experiments had occurred on average 19 years earlier. Researchers had access to a "comprehensive" computerized roster of individuals "believed to have received LSD in Army chemical warfare projects between 1955 and 1967," with names of 741 individuals involved in LSD experiments between 1955 to 1967 (US Army 1980). Most experiments took place at Edgewood arsenal, but many took place (in decreasing frequency) at Ft. McClellan, Ft. Benning, Ft. Bragg, and Dugway Proving Ground (US Army 1980).

Long term health effects were evaluated by inpatient health evaluations (220 subjects) at military facilities, including Walter Reed Army Medical Center, Letterman Army Medical Center, Presidio of San Francisco, and Dwight David Eisenhower Army Medical Center), or by a mailed brief "Health History Questionnaire" (100 subjects) for those declining medical examination, yielding an overall response rate of 43% among 320 subjects (US Army 1980). Age of subjects when surveyed ranged from 30 to 72 years (average 45 years). All were male with at least two years military service, and most (261 or 81%) were married. Of the remaining 421 subjects, 55 US Air Force personnel were excluded from evaluation, 24 (3.2%) were deceased, 193 (26%) could not be located, and 149 (20%) were located but declined to respond. Cause-of-death data were obtained for 21 of the 24 deceased subjects (US Army 1980).

Typically, establishing a useful comparison group was problematic because the LSD subjects were clearly not a random sample of the Army population. Many (117) were apparently involved in experiments with other agents, including glycolates such as Ditran and BZ, riot control agents, and alcohol (US Army 1980). Moreover, poor records made it impossible to verify that all 741 subjects had actually been exposed to LSD. Records for 119 subjects listed "unknown" under administered agent, and 10 were listed as "controls" without any actual exposure data. US Army researchers decided that since all 741 subjects had been assigned to LSD experiments, "it was assumed that they probably received LSD." Because of these limitations, matched controls were not used for this health follow up study, and formal statistical epidemiological analysis was not attempted because "such methodology is inappropriate and potentially misleading" (US Army 1980).

Conclusions. Seventy-six LSD subjects (24% of 320) reported one or more long-term adverse reactions to LSD exposure (Table 6) (US Army 1980) (all complaints from subjects were reported as "adverse effects" even though these events had occurred on average 19 years earlier). Fifty subjects reported symptoms that met criteria commonly associated with LSD effects, including flashbacks, or spontaneous transient occurrences of experiences reminiscent of the symptoms originally evoked by LSD. Forty one (13%) stated that the adverse effects continued to the time of the survey. Nine reported post LSD depression. Some subjects also reported

"possible" LSD effects including memory loss, blackouts, alcohol abuse, etc. Hearing loss was the most frequent medical finding among study participants (88 subjects, 28%), but was of a type most commonly associated with chronic noise exposure and LSD "is not known to be ototoxic" (US Army 1980). Alcohol abuse was reported in 27 subjects (8%) and attributed to LSD exposure by four. Twenty-seven subjects reported "flashbacks," with 11 stating their flashbacks persisted to the present time of the study (Table 6). Twelve subjects reported depression from their LSD exposure (Table 6) lasting from a few days to several years, with psychiatric intervention or hospitalization apparently required half those cases. Subjects also reported a range of negative personality and other changes attributed to LSD exposure (Table 6), including social withdrawal, loss of interest in work, irritability and aggressiveness, anxiety, increased nightmares, paranoid ideation, non-specific memory loss, dissociative episodes, and use of other illicit drugs. Forty-one subjects reported "present problems," from LSD, in particular somatic complaints.

Overall and consistent with the 1985 NRC evaluation, this group was reported to have "remarkably little disability," and to show "marital stability, exceptional levels of education and employment, and no more medical or psychiatric illness than might have been expected for a random sample of the population" (US Army 1980). Nevertheless, some subjects reportedly suffered significant "socioeconomic difficulty," including marital and family disruption resulting from reported personality changes, depression, alcohol abuse, etc, reported by seven subjects. At least five reported work-related difficulties and job instabilities that they attributed to LSD exposure. A total of 23 subjects "felt that symptoms related to prior LSD exposure had significantly compromised, at least temporarily, their socioeconomic adjustment."

Evaluating Project SHAD Veterans. An unpublished January 2006 review of Project SHAD veterans examined VA health care utilization among 5,032 identified Project SHAD veterans (about 90% of DoD's estimated total for SHAD veterans). Of these, 37.2% had been seen at least once at a VA medical facility between 1970 and 2005, which is comparable to other veteran groups over the same period of time. The most common diagnoses cover a wide range of health problems that are similar to those found in the general, middle to older aged U.S. population, and no particular health care problem stands out among SHAD veterans in this descriptive survey. Importantly, since May 1, 2002, when the Veterans Benefits Administration (VBA) began mailing letters to SHAD participants notifying them of potential chemical and biological exposures during these Cold War tests, 449 Project SHAD veterans have newly enrolled for the first time for VA health care. While this review was not a substitute for a well-designed epidemiological study, it does summarize the clinical experience of a group of SHAD veterans who have received medical care from VA.

The medical data obtained for just those SHAD veterans who receive health care from VA does not allow for meaningful comparisons with other SHAD veterans who have not utilized VA health care or to military veterans who did not participate in Project SHAD. To obtain valid scientific data, VA contracted in October 2002, with the IOM to conduct a study to evaluate health risks among all Project SHAD veterans. That scientific study is scheduled for completion in early 2007.

Today, decades after the SHAD tests, no diagnostic test can accurately tell us which agents veterans were exposed to and if any health problems might be associated with such an exposure. The pending IOM study will evaluate whether SHAD veterans are experiencing greater morbidity

or mortality than similar veterans who served during the same period. For today, accurate diagnoses are possible based on a patient's symptoms and pathologic findings, and treatment is the same regardless of etiology. That means high quality health care is available now for any SHAD veteran with a health problem who seeks care from the VA, even before the IOM study is completed.

PSYCHOLOGICAL IMPACT OF TEST PARTICIPATION.

A significant body of literature suggests that the mere act of participating in military experiments can lead to long-term psychological effects. For example, a study of veteran subjects of U.S. military experiments involving mustard agent exposure reported significant increased risk of Post-traumatic Stress Disorder (PTSD) compared to controls who did not participate (Schnurr et al., 2000). Researchers at VA's National Center for PTSD used structured interviews to assess PTSD and other psychosocial outcomes among twenty-four subjects of World War 2 mustard agent experiments (Schnurr et al., 2000). Ninety-six percent had participated in gas chamber experiments with mustard agent, and 92 percent reported they had volunteered. Twenty-two percent of the subjects reported that they understood the dangers involved, and 67 percent were ordered to not discuss their participation. Most subjects (83 percent) reported experiencing physical symptoms at the time of mustard agent exposure.

Nearly 5 decades after participating in these experiments, subjects were found to be less psychologically and physically healthy in comparison to men of similar age (Schnurr 1996). Significantly, they exhibited a high PTSD prevalence of 17 percent, with lifetime estimates for full and sub-diagnostic PTSD of 17 and 33 percent, respectively (Schnurr 1996). Only the number of individual exposures to mustard gas during these experiments predicted lifetime full or sub-diagnostic PTSD rates (Schnurr 1996).

A related study evaluated PTSD among 363 veterans randomly selected from a VA list of veteran-subjects from military World War 2 mustard agent experiments. Investigators reported that 32 percent of these veterans suffered from full-PTSD, and 10 percent for partial-PTSD (Schnurr et al., 2000). Veterans with full PTSD reported poorer physical health and a higher likelihood of several chronic illnesses (Schnurr et al., 2000). Similar mental health effects have also been reported among survivors of the 1995 terrorist attack with the chemical warfare agent sarin against civilians in the Tokyo subway system (Ohbu et al., 1997; Okumura et al., 1996).

LONG-TERM HEALTH EFFECTS IN OTHER POPULATIONS

From Military and Insecticide OP Nerve Agents. Four distinct health effects have been described for military and related pesticide organophosphorus (OP) nerve agents, including 1) acute cholinergic toxicity, 2) organophosphate-induced delayed neuropathy (OPIDN), 3) subtle long-term neuropsychological and neurophysiological effects; and 4) a reversible muscular weakness known as "intermediate syndrome" (Brown and Brix, 1998). . Because all OP related health effects have threshold exposure levels below which they are clinically not detectable, meaningful predictions of clinical short- and long-term human health effects require information about exposure magnitude (Brown and Brix, 1998, IOM 2000). Moreover, long-term health effects reported among survivors of acutely toxic and even life threatening OP agent poisoning are often subtle, sometimes difficult to differentiate from health effects caused by other diseases or occupational exposures, more readily detectable in exposed populations than in individual cases,

and not reported among individuals experiencing only subclinical exposure (Brown 2006).

In 1998, VA requested the National Academy of Sciences Institute of Medicine (IOM) to review all medical and scientific literature on long-term health effects from exposure to the military OP nerve agent sarin. Two IOM committees (IOM 2000 and IOM 2004) established for this evaluation examined thousands of scientific publications spanning over five decades, including results from human experiments, occupational and accidental exposures, laboratory animals, and from terrorist attacks. They focused on studies of human populations exposed to sarin, including 1) U.S. military volunteers who had been experimentally exposed decades ago to non-lethal doses of sarin and other chemical warfare agents; 2) industrial workers with documented acute exposure to sarin; and 3) victims of the sarin terrorist attacks in Matsumoto City in 1994 and Tokyo in 1995 (IOM 2000; IOM 2004).

The two committees confirmed that all long-term health effects from sarin exposure required an initial threshold exposure level sufficient to cause acute, immediate signs and symptoms of cholinergic poisoning. Both IOM committees reached essentially identical conclusions about long-term health effects from sarin at various exposure levels as defined by the magnitude of initial acute poisoning signs and symptoms. The 2000 IOM committee also reviewed the hypothesis that exposure to sub-clinical traces of sarin might produce a new, previously undescribed disease – a "Gulf War syndrome." They did not endorse this hypothesis, and in fact, their most important conclusion relative to Gulf War health effects was that there was "inadequate/insufficient evidence of an association" between exposure to sub-clinical levels of sarin and any subsequent long-term health effects.

Not surprisingly, considering the fact that these chemical agents are designed to kill or incapacitate, the committee also found "sufficient evidence of a causal relationship" between exposure to sarin and a dose-dependent acute cholinergic syndrome that is evident seconds to hours subsequent to sarin exposure and resolves in days to months (IOM 2000).

They also reported "limited/suggestive evidence of an association" between exposure to sarin at doses sufficient to cause acute (that is, immediate) cholinergic signs and symptoms and subsequent long-term health effects, based primarily on studies of three groups of people exposed to sarin – 1) workers occupationally exposed to sarin in the 1950s and 1960s; 2) a terrorist attack on civilians in Matsumoto, Japan in 1994; and 3) a terrorist attack on civilians in Tokyo, Japan in 1995. No veteran of the 1991 Gulf War has been reported to have experienced an acute exposure to an OP agent, that is, showing immediate cholinergic poisoning signs and symptoms (Brown 2006).

Any terrorist attack upon civilians might be expected to exact some psychological toll. Some of the 1995 Tokyo terrorist victims reported experienced severe cholinergic poisoning that required hospitalization or even resulted in death, some showed milder signs and symptoms, and some were exposed at levels leading to no acute effects (IOM 2000). One common long-term health consequences included increased risk of PTSD and reports of "fear of subways," are likely to have derived from the psychological stress of the terrorist attack rather than directly from cholinergic poisoning (IOM 2000).

As an indicator of the extensive scientific literature available on this topic, the 2004 IOM sarin health effects update was able to add about 250 peer-reviewed articles published *after* the earlier 2000 review, including 19 epidemiological studies of sarin health effects among the same

experimentally exposed veterans, industrial workers and terrorist attack survivors that had been previously evaluated, as well as a wide range of new animal studies. The update reiterated the findings of the earlier IOM analysis, and added that there is inadequate/insufficient evidence to determine whether an association does or does not exist between exposure to sarin and subsequent long-term cardiovascular effects (IOM 2004).

From Cannabinoids. A 1999 National Academy of Sciences (NAS) committee review of medical and scientific literature on marijuana health effects addressed potential long-term health effects from exposure to cannabinoids (NAS 1999). They identified a significant body of scientific literature on cannabinoid health effects based on research conducted during the 1980s and 1990s. The committee concluded that cannabinoids have a "natural role in pain modulation, control of movement, and memory" (NAS 1999). They also found that animal research suggested a potential for cannabinoid dependence and withdrawal symptoms, although milder than that seen for benzodiazepines, opiates, cocaine or nicotine. A distinctive but mild and short-lived marijuana withdrawal syndrome includes restlessness, irritability, mild agitation, insomnia, sleep EEG disturbances, nausea, and cramping (NAS 1999).

Euphoria is the commonly the sought-for acute reaction to smoking marijuana, however other acute effects include transient (resolving in hours) adverse mood reactions including anxiety and paranoia and less often panic, depression, dysphoria, depersonalization, delusions, illusions and hallucinations can also occur (NAS 1999).

Evidence is much less clear for any long-term health effects from smoking marijuana. Immunological effects have been reported, but their clinical significance remain uncertain (NAS 1999). Addressing the suggestion that marijuana use might produce lasting mood disorders or psychotic disorders, such as schizophrenia, the committee found that very high doses of marijuana have been reported to be associated with a gradual waning of the positive mood and social facilitating effects of the drug and an increase in irritability, social isolation, and paranoid thinking (NAS 1999). Other reports describe development of apathy, lowered motivation, and impaired education performance in heavy marijuana users who do not appear to be behaviorally impaired in other ways (NAS 1999). Similarly, there are clinical reports of marijuana-induced psychosis-like states lasting for a week or more, apparently through triggering a latent psychopathology. Thus, although heavy marijuana use can precipitate schizophrenic episodes, there is less evidence that it can cause the underlying psychotic disorder. Individuals with schizophrenia or with a family history of schizophrenia are likely to be at greater risk for adverse psychiatric effects from cannabinoid use (NAS 1999). There was little evidence that marijuana alone produces a psychosis that persists after the period of intoxication. Other studies have also shown subtle effects on cognitive tasks and psychomotor performance, but these studies are difficult to interpret, and it remains unclear if repeated use of marijuana at therapeutic doses produces any irreversible cognitive effects (NAS 1999).

Smoked or ingested marijuana can also cause cardiovascular effects including tachycardia, which can last three to five hours (NAS 1999). Cases have been reported of blood pressure increase while a subject is in a reclining position but decreases inordinately upon standing, resulting in postural hypotension (decreased blood pressure due to changing posture from a lying or sitting position to a standing position, which can cause dizziness and faintness. These cardiovascular changes "have not posed a health problem for young healthy users of marijuana," but they could present problems for older patients with coronary arterial or cerebrovascular diseases (NAS

1999).

The committee reported that there was "no conclusive evidence that marijuana causes cancer in humans, including cancers usually related to tobacco use." However, a range of studies suggest that the smoke of a marijuana cigarette may be an important risk factor for respiratory cancers (NAS 1999).

Finally, the committee concluded that although marijuana is not a completely benign substance, "except for the harm associated with smoking, the adverse effects of marijuana use are within the range of effects tolerated for other medications" (NAS 1999).

CONCLUSIONS

The US military personnel who participated in these Cold War experiments took great health risks in the service of their country. They deserve our respect and assistance for any health problems that were the result of toxic exposures during these military tests. Some of these exposures had the potential to cause substantial harm to the veterans' health, whereas some participants may not have been exposed to any toxic substance because they were used as controls in these experiments. Regardless, long-term psychological effects could have resulted just from participating in these experiments.

Unfortunately, the records are not complete enough to determine the exact nature of the exposure in many of these veterans. Each veteran therefore has to be cared for as an individual and given a thorough clinical evaluation to identify all outstanding health problems. Fortunately, high quality health care does not depend on identification of etiologic factors. This is true for much of modern health care. For example, cancer diagnosis and effective therapy does not depend on the identification of a specific etiology.

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US Department of Veterans Affairs, Under Secretary for Health Information Letter, IL 10-2005-004, "Health Effects Among Veterans Exposed to Mustard and Lewisite Chemical Warfare Agents," March 14, 2005. Available at www.va.gov/environagents/docs/USHInfoLetterIL10-2005-004_March_14_2005.pdf.

TABLES

Table 1. Common Pharmaceutical Agents, Close Analogs, and Simulant or Control Agents Used in the Edgwood/Aberdeen Experiments.[1]

Agent/Simulant Name	*Agent Class*
Antipyrine	Analgesic (PDR[2], Auralgan)
Atropine (methylnitrate, sulfate salts)	Anticholinergic (PDR, Lomotil)
Banthi (Banthine bromide, Methantheline bromide)	Anticholinergic (drug not available in the US)
Benzetimide	Anticholinergic
Dibutoline	Anticholinergic
Methscopolamine (bromide salt)	Anticholinergic (PDR)
Methylatropine	Anticholinergic
Scopolamine (hydrobromide)	Anticholinergic (PDR)
THA (Tetra Hydro Amino Acrodim) (Tacrine)	Anticholinergic (PDR)
5-HTP (5-Hydroxytryptophane)	Antidepressant
Regitine (Phentolamine)	Antihypertensive
Prolixin	Antipsychotic (PDR, as Fluphenazine)
Thorazine	Antipsychotic (PDR)
Adrenaline (epinephrine)	Bronchodilator (PDR)
Methacholine (mecholyl)	Cholinergic
Mylaxen (Hexafluronium bromide)	*Cholinergic*
Pilocarpine	Cholinergic (PDR)
Prostigmine (Neostigmine)	Cholinergic (PDR)
Succinylcholine	Cholinergic (PDR)
Urecholine	Cholinergic (PDR)
2-PAM Chloride	Cholinesterase Reactivator
Amyl Nitrate	Cyanide Antidote
Fluorescein	Dye
Indo-Cardio-Green Dye (Indocyanine Green)	Dye
Ammonium Chloride	Salt
Saline	Salt
Sodium Bicarbonate (NaHCO3)	Salt
Alcohol (ethanol)	Sedative
Amobarbital (Amytal)	Sedative
Chloral Hydrate	Sedative
Meprobamate	Sedative (PDR)
Nembutal	Sedative (PDR)
Secobarbital Sodium	*Sedative*
Seconal	Sedative

Table 1. Common Pharmaceutical Agents, Close Analogs, and Simulant or Control Agents Used in the Edgwood/Aberdeen Experiments.[1]	
Agent/Simulant Name	*Agent Class*
Valium (Diazepam)	Sedative (PDR)
Caffeine	Stimulant
Dexedrine	Stimulant (PDR)
Ritalin	Stimulant (PDR)
MDA (methylenedioxyamphetamine)	Stimulant, incapacitating agent
Niacinamide (Niacin, Vitamin B3)	Vitamin
Thiamine (HCl) (Vitamin B12)	Vitamin
[1]Data provided by Department of Defense, Health Affairs, Deployment Health Directorate, 2006. [2]PDR = listed in the Physicians Desk Reference, Medical Economics Company, Inc.	

Table 2. Anticholinesterase chemicals tested on 1,406 subjects at Edgwood/Aberdeen (NRC 1982). Common examples of this class include common OP and carbamate pesticides, and Pyridostigmine Bromide, commonly prescribed for myasthenia gravis patients.

Compond Tested	*CAS No.*[1]	*Class*	*No. Subjects Tested*
Sarin (GB)	107-44-8	OP	246
VX	5-782-69-9	OP	740
Tabun (GA)	77-81-6	OP	26
Cyclosarin (GF)	329-99-7	OP	21
Soman (GD)	96-64-0	OP	83
DFP	55-91-4	OP	11
EA 3148[2] (cyclopentyl S-2-diethylaminoethyl methylphosphonothiolate VX analog)		OP	32
Malathion (a common household OP insecticide)	121-75-5	OP	10
THA (Tacrine)	321-64-2	Anticholinesterase	15
Eserine (Physostigmine)	57-47-6 (free base)	Carbamate	138
Prostigmine (Neostigmine)	59-99-4	Carbamate	22
Hexafluorenium (Mylaxen)	317-52-2	Quat. ammonium AChE inhibitor	11
Pyridostigmine (salt)	155-97-5	Carbamate	27
Methacholine (Mecholyl chloride)	62-51-1	Cholinergic agonist	9
Urecholine	590-63-6	Cholinergic agonist	15

[1]CAS = Chemical Abstract Service numbers, which are unique unambiguous numerical designations for a specific compound. Not all compounds tested had CAS numbers.
[2]EA numbers are Edgewood Arsenal designations.

Table 3. Anticholinergic Glycolic Acid Esters tested on 1,752 subjects at Edgewood/Aberdeen (NRC 1982). Common examples of this class include atropine, a common antidote for poisoning with OP and other anticholinesterases, and scopolamine, prescribed as a mild sedative and anti motion sickness drug.

Compound Tested	*CAS No.*[1]	*No Subjects Tested*
BZ	13004-56-3 (hydrochloride)	292
EA 3443[2] (N-methyl-4-piperidyl cyclopentylphenylglycolate)	37830-21-0	101
EA 3580 (N-methyl-4-piperidyl cyclobutylphenylglycolate)	54390-94-2	130
Scopolamine	55-16-3 (hydrochloride)	534
Atropine	33952-38-4 (hydrochloride)	444
EA 3167 (3-Quinuclidinyl phenylcyclopentyldlycolate)	29125-55-1 (hydrochloride)	2
Ditran	8015-54-1	9
EA 4929 (benzetimide, dl-2-(1-benzyl-4-piperidyl)-2-phenylglutarimide)	14051-33-3	18
27349 (L-2-α-Tropinyl · benzilate)	64520-33-8	50
226,086 (L-2-α-Tropinyl L-cyclopentylphenylglycolate)	64471-85-8	21
302,196 (N-Methyl-4-piperidyl cyclopentyl-(1-propynyl)-glycolate)	53034-67-6	52
301,060 (cis-2-Methyl-3-quinuclidinyl cyclopentaylphenylglycolate)	*	29
302,282 (1-Methyl-4-piperidyl phenyl-(3-methylbut-1-yn-3-enyl)-glycolate)	*	8
302,368 (3-Quinuclidinyl (1-hydroxycyclopentyl) phenylacetate)	*	5
302,537 (3-Quinuclidinyl cyclopentyl-(2-propenyl)-glycolate)	*	18
302,668 (4-(1-Methyl-1,2,3,6-tetrahydropyridyl)-Methyl-isolpropylphenyl glycolate)	*	39
Benactyzine	57-37-4	16
Methyl-Scopolamine	155-41-9	72

Atropine methyl nitrate	52-88-0	18
EA 3834 (N-Methyl-4-piperidyl isopropylphenyl-glycolate	*	144
TAB, BAT (Tropine benzilate)	3736-36-5	24
[1]CAS = Chemical Abstract Service numbers, which are unique unambiguous numerical designations for a specific compound. Not all compounds tested had CAS numbers. [2]EA numbers are Edgewood Arsenal designations. 6-Digit numbers are contractor's designations.		

Table 4. Reactivators, Cannabinoids, Phencyclidine, and Irritants and Vesicants Tested on 3,500 Subjects at Edgewood/Aberdeen (NRC 1984). Common examples of reactivators include 2-PAM, commonly prescribed for OP poisoning. The irritants include commonly used "tear gas" and "riot control" agents.

Compound	*CAS No.*[1]	*No Subjects Tested*
Reactivators		
2-PAM	51-15-0	607
P2S (methyl methanesulfonate salt of 2-PAM)	154-92-2	95
Toxogonin	114-90-9	41
TMB-4	3613-81-9 (hydrochloride)	32
Cannabinoids (11 analogs)	(various)	259
Phencylidine (PCP or "Angel Dust"	956-90-1	29
Irritants and Vesicants		
H Mustard	505-60-2	152
DM (Adamsite)	578-94-9	67
CS (o-Chlorobenzylidene malononitrile)	2698-41-1	1,372
CN (Chloroacetophenone)	532-27-4	99
CR (Dibenz [b,f][1,4]oxazepine)	257-07-8	97
CHT (1-Methoxy-1,3,5-cycloheptatriene)	1728-32-1	16
PS (Chloropicrin)	76-06-2	138
CA (Bromobenzyl cyanide)	5798-79-8	13
Nonanoyl Morpholide	5299-64-9	32

[1]CAS = Chemical Abstract Service numbers, which are unique unambiguous numerical designations for a specific compound.

Table 5. Chemical Class and Median Year of Tests on 6,720 Subjects at Edgwood/Aberdeen (NRC 1982).

Chemical Class	*Median Year Tested*
Approved Drugs	1971
Innocuous Chemicals and Controls	1971
Anticholinergics	1968
Cholinergic Reactivators	1968
Irritants	1967
Cannabinoids	1965
Anticholinesterases	1962
LSD Derivatives	1959

Table 6. Adverse effects reported by 320 LSD subjects (US Army 1980).

Reported Effect	**Frequency**
Flashbacks	27
Somatic complaints	18
Depression	12
Personality change	7
Anxiety	6
Nightmares	5
Dissociative episodes	5
Alcohol abuse	4
Paranoid ideation	4
Memory loss	4
Phobia	2
Episodic withdrawal	2
Drug abuse	2
Seizure disorder	1
Miscellaneous	1

EXHIBIT 2

From: david.abbot@vba.va.gov [david.abbot@vba.va.gov]
Sent: Friday, October 07, 2005 11:13 AM
To: Dee.Morris@deploymenthealth.osd.mil
Subject: RE: Testing at Ft McClellan?

Thank you. We will not both you with the case.

Dave

-----Original Message-----
From: Dee Morris/OSAGWI [mailto:Dee.Morris@deploymenthealth.osd.mil]
Sent: Friday, October 07, 2005 11:06 AM
To: david.abbot@vba.va.gov
Cc: Roy S. Finno/CTR/OSAGWI; Lionel West/CTR/OSAGWI
Subject: Re: Testing at Ft McClellan?

The military ceased the use of soldiers in chemical and biological agent testing in 1975. That said, the school at FT McClellan sent students to Redstone Arsenal (Huntsville, AL) for live agent TRAINING until it brought its Chemical Decontamination Training Facility (CDTF) online in the mid 1980s. Training at Redstone and the CDTF was tightly controlled and pre and post training blood cholineasterase tests were performed on the students. My view of this training would be that soldiers were not exposed to anything harmful because they were wearing full protective gear for the training.

There is a CDTF at FT Leonard Wood where the Chemical School moved in 1998-9. There has been no documented case of a student being exposed during the history of CDTF training at either FT McClellan or FT Wood.

Dee Dodson Morris, JD, MPH, LLM
Director, CBRN Assessments
Deployment Health Support Directorate
(703) 845-8339, FAX: (703) 578-8501
SIPR: dmorris@gwillness.osd.smil.mil

david.abbot@vba.va.gov	To	Dee.Morris@deploymenthealth.osd.mil
10/07/2005 10:47 AM	cc	
	Subject	Testing at Ft McClellan?

Dee,

1. Should I assuming that you are now the source (the only source) for verification of any chem-bio exposure a service member may have experienced regardless of type or location while on active or inactive duty? If so...

2. We have a application from a veteran who claims residual disabilities from exposures resulting from tests/experiments at Ft. McClellan during the 1980s. We know that the Army Chemical School relocated there in 1979 from Aberdeen, Maryland, but were any testing or experiments conducted there? I assume they were. Can you describe the tests in any way, type of possible exposures, etc?

Pardon my prodding. I am trying to learn if I have a legitimate exposure.

David Abbot
Compensation & Pension Service (212B)
VACO
(202) 273-8947

EXHIBIT 3

REDACTED

From: Dee Morris [Dee.Morris@deploymenthealth.osd.mil]
Sent: Friday, May 05, 2006 9:52:38 AM
To: Roy S. Finno
Subject: Fw: Release of Records on Chemical/Biological Testing on Service Members

Attachments: 1986 DA form 3286-19.pdf; 1993 MRVS Recruitment forms1993.pdf; 1993 01-25 MRVS - site rpt.pdf; 1993 01-25 MRVS-Recruitment itinerary.pdf; 1993 MRVS-Ackn.pdf; 1993 MRVS-Acknowledgment.pdf

This seems to substantiate that volunteers were being recruited into 1993.

Dee Dodson Morris, JD, MPH, LLM
Program Director, CBRN Assessments
Deployment Health Support Directorate
(703) 845-8339, FAX: (703) 824-4216
SIPR: dee.morris@fhp.smil.mil
----- Forwarded by Dee Morris/OSAGWI on 05/05/2006 09:51 AM -----

"Anderson, Arthur O COL USAMRIID" <art.anderson@us.army.mil>
04/20/2006 04:45 PM

To
"Dee Morris/OSAGWI" <Dee.Morris@deploymenthealth.osd.mil>
cc

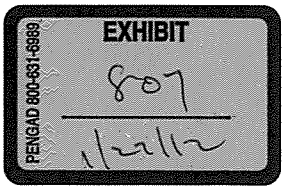
Subject
RE: Release of Records on Chemical/Biological Testing on Service Members

Art Anderson MD COL MC
Office of Human Use and Ethics, USAMRIID
Phone: 301 619 4723 FAX: 301 619 1250
Mobile: 240 215 7556
E-Mail: arthur.anderson2@amedd.army.mil
https://riid-vision.detrick.army.mil/human/index.cfm

-----Original Message-----
From: Dee Morris/OSAGWI [mailto:Dee.Morris@deploymenthealth.osd.mil]
Sent: Thursday, April 20, 2006 3:46 PM
To: Anderson, Arthur O COL USAMRIID
Cc: michael.okeefe@osd.mil; Michael.Kilpatrick; blackbua@battelle.org
Subject: Release of Records on Chemical/Biological Testing on Service Members

Dr. Anderson,

With the assistance of a research team contracted by the Special Assistant for Chemical/Biological Defense and Chemical Demilitarization Programs (SA(CBD & CDP)), my office is compiling a database of military personnel involved in chemical and biological testing. The compilation of a consolidated database is required by P.L. 107-314 and the National Defense Authorization Act for 2005. The database is being provided to the Department of Veterans Affairs (VA) as it is compiled for the purpose of notifying the veterans that they were involved in testing and offering a medical examination if the veterans believe that their testing experience has impacted their health. This effort is a continuation of the work done over ten years ago to compile a Mustard Participants Database and the more recent effort to identify those



veterans involved in Projects 112 and SHAD.

I therefore need access to records held at Fort Detrick that document the participation of former service members. The scope of our current work is from 1942 to the present and includes actual agents, other chemicals or biologicals and simulants. I want to review both still classified and unclassified records to extract participant identifying data and if available, dosages. If we encounter medically relevant data that is still classified, I have established a process with Army G-8, the declassification authority, to obtain declassification of selected CB testing information. In addition to providing participant data, my office also provides the VA with fact sheets on the various testing programs. I therefore also need access to the associated Medical Division test protocols.

Specific documents that I know I need are:

HU Protocol Participants FY45 thru FY79.2 HU Protocol Participants FY79.2 thru FY 92.8 The associated Medical Division test protocols.

My contact information is below should you need clarification on the records needed. Thank you for your assistance.

Dee Dodson Morris, JD, MPH, LLM
Program Director, CBRN Assessments
Deployment Health Support Directorate
(703) 845-8339, FAX: (703) 824-4216
SIPR: dee.morris@fhp.smil.mil

PAGES FROM DEPO EX. 807

BATES NUMBERED

VET125-047492 & VET125-047493 ARE

REDACTED IN THEIR ENTIRETY

FROM THE PUBLIC VERSION

SGRD-UIZ-H (70-1n) 25 January 1993

MEMORANDUM FOR RECORD

SUBJECT: Recruitment of Medical Research Volunteer Subjects

1. The Chairman, USAMRIID Human Use Committee accompanied the MRVS recruitment team and observed the process.

2. After setting up for the presentation in a AIT training classroom, SFC Crosby addressed the trainees during a formation outside. He invited the trainees to hear our presentation in a charismatic and non-coercive manner.

3. The classroom was filled to capacity. Those who knew they were not interested were encouraged to leave and the remaining individuals were told they could leave at any time if they decided they were not interested.

4. CPT Makuch and COL Anderson were introduced and CPT Makuch discussed research protocols and the process of research involving humans at USAMRIID. He indicated that the studies would eventually benefit the soldier in the field by providing information needed for development of new vaccines and drugs. In some studies a direct benefit may be immunity to the respective agent while in others there would be no benefit other than new information. Additional benefits of volunteering were monetary reimbursement for blood drawn for lab tests and convalescent leave awarded according to the conditions of the study.

5. There were questions regarding "additional pays" for research volunteers. COL Anderson clarified this point by indicating that no "additional pays" will be given. Reimbursement for blood donated is not a pay, it is compensation for donated blood used in research and is comparable to payments from commercial blood banks, etc. Since the volume of blood one may donate during any 8 week period is limited, it is unlikely that the amount of reimbursement for donated blood would constitute coercion. COL Anderson pointed out that convalescent leave would be granted by a disinterested physician according to the practices of AR 630-05 and is based on inconvenience, morbidity, and extent of limitation of freedom (i.e. lock up or inpatient on project ward).

SGRD-UIZ-H
SUBJECT: Recruitment of Medical Research Volunteer Subjects

6. COL Anderson discussed the process of review and approval of human use protocols and emphasized that this should not be taken as an indication that approved protocols are free of risk. Risk is minimized but the remaining real and predictable risks must be completely and accurately communicated to the MRVS in writing and in verbal presentations. It is incumbent on the MRVS to completely understand what these risks are before he volunteers.

7. There was great interest and numerous questions were asked by the 91B trainees. A sample of the questions includes: Will I get a disease with long-term effects? Will I be vaccinated without my knowledge? What kind of diseases will be studied? Will convalescent leave count against regular leave time? How much additional pay will I receive? Is there a real risk that I might die?

8. SGT Beavers described the environment of USAMRIID, the facilities for activities associated with the project ward, the Frederick area and local colleges and scenery. He also described the kinds jobs that were available for MRVS at USAMRIID. SPC Green answered questions about what it was like serving as a MRVS.

9. At the end of the presentation 37 individuals left their names and social security numbers indicating interest in the program.

10. On Wednesday morning, SFC Crosby, CPT Harrington, and SGT Beavers reviewed the 201 Files on the listed individual and CPT Makuch reviewed the medical records. A number of individuals had entries in their medical and/or personnel records which disqualified them from our program.

11. After the evening formation the listed 91Bs returned to the classroom for interviews with CPT Makuch and two teams comprised of CPT Harrington and SGM Alston and SFC Crosby and SGT Beavers. COL Anderson observed the interview process. Every candidate was asked why he wanted to be a MRVS and how they felt about an assignment where it was not likely that they would be performing

duties directly applicable to their MOS. All were informed that they would be expected to perform as soldiers and maintain their skills, physical fitness, and discipline. In situations where there were entries in the medical or 201 File, that flagged the individual according to our criteria, additional questions were asked in order to clarify the circumstances. On two occasions, the candidate denied the event despite the entry in the record. This resulted in complete disqualification. The interviews commenced at 1800 hours and continued until 2230 hours.

12. On Thursday a.m., SFC Crosby and SGT Beavers returned to review the records on the candidates that showed up Wednesday, pm, but were not on the list, and they re-reviewed the records on candidates where there was discrepancies between their statements and the records.

13. The team met and reviewed the list and determined which candidates would be chosen. Any encumbrance would be the basis of disqualification regardless of how well the individual scored in any part of the recruitment process. Seventeen were selected.

14. Conclusions: The recruitment process was thoroughly and professionally carried out. Each member made a major contribution and ethical principles were adhered to throughout the process. SFC Crosby and SGT Beavers displayed excellent leadership in planning, organizing, and executing this recruitment effort. Throughout the process there were spontaneously initiated self evaluations aimed at identifying ways of improving the next presentation. I felt that the present recruitment was very successful and high quality MRVS were identified who will be mature, well-informed volunteers and valuable contributors to the USAMRIID work place.

15. Recommendations:

a. The privacy act statement could be given out to those who recorded their interest before the 201 Files and medical records are reviewed. Time constraints did not permit distribution and receipt of these documents the night of the presentation.

SGRD-UIZ-H
SUBJECT: Recruitment of Medical Research Volunteer Subjects

b. I recommend that a copy of the signed "statement of acknowledgement" be given to each volunteer to keep after they are signed. The wording of this document is clear and answers many of the questions that were asked.

Arthur O Anderson MD

ARTHUR O. ANDERSON, M.D.
COL, MC
Chairman USAMRIID Human Use
Committee, USAMRIID

Approved:

ERNEST T. TAKAFUJI
Colonel, MC
Commanding

RECRUITMENT PROCESS

1. Medical Research Volunteer Recruitment Team 19 - 22 JAN93.

   a. COL Anderson - Represents the Human Use Committee
   b. CPT Makuch - Medical Physician
   c. CPT Harrington - Medical Company Commander
   d. SGM Alston - USAMRIID SGM
   e. SFC Crosby - Medical Division NCOIC
   f. SGT Beavers - MRV NCOIC
   g. SPC Geen - MRV

ITINERARY

DAY ONE (19 JAN 93)

STEP 1: LEAVING FROM USAMRIID AND ARRIVING AT SAN ANTONIO

a. Depart from the front of USAMRIID at 0630, the vehicle will be there NLT 0600. Depart BWI at 0835 and arriving San Antonio at 1245.

b. Pick up the rental cars at the airport and proceed to hotel. We will be staying at the Airport Holiday Inn.

STEP 2: BEFORE GOING TO FT SAM

a. After lunch myself, SFC Crosby and SPC Green will go to FT SAM to pick up the audio visual equipment.

c. We will be in uniform and meet in the main lobby of the hotel at ____ to leave for FT SAM.

STEP 3: THE RECRUITMENT(BEFORE GOING TO THE CLASSROOM)

a. We will be recruiting from Echo Company 232nd Medical Battalion. There will be approximately 190 Active Duty Regular Army soldiers that we can recruit from.

b. They will have a Company formation at 1800 after the cadre conducts their business we will be introduced.

c. At this time I will address the soldiers. I will give a brief statement(10-Minutes) about what MRVS are and what their mission will be at USAMRIID.

d. After the I finish the cadre will take over the formation and release all soldiers who are either unable to be recruited(ie. Reserve, National Guard, GMO, or any precommitted soldiers). The cadre will also release those individuals who decide that they have no interest in the program and do not want to hear the rest of the recruitment.

NOTE: THE PURPOSE OF THIS IS TO REDUCE THE NUMBER SO THAT WE CAN FIT IN THE CLASSROOM.

STEP 6: THE RECRUITMENT(INSIDE THE CLASSROOM)

a. After everyone is seated and we are ready to begin I will start by introducing myself and the rest of the staff. I will tell them who you are and your job at USAMRIID and how it pertains to MRVS.(3-5 MIN)

b. I will then give the floor to CPT Makuch to discuss USAMRIID' mission, the medical aspects of being a MRV and what happens on an inpatient protocol.(15-20 MIN)

c. CPT Makuch will then bring up COL Anderson to discuss the process and safety of how a protocol becomes a protocol and what the Human Use Committee is about.(15-20 MIN)

d. At this point we will open the floor for any further questions to CPT Makuch or Col Anderson on the material that has been discussed.

e. I will now take over and discuss the responsibilities of MRVS when they are working on a day to day basis and are not involved in a protocol. I will discuss the jobs available to them at USAMRIID, FT Detrick, and the surrounding community.(15-20 MIN)

f. At this time the slide portion of the recruitment will be complete. We will answer any questions that they might have to us as a group. I will take each question they have and direct it to the person that covers that particular area.

g. We all leave when this is complete with the exception of SPC Green. She will be by herself to answer any questions that they may have for a "REAL" MRV.

h. After she is finished we will return to the classroom and release anyone that is not interested in continuing with the recruitment.

NOTE: AT THIS TIME WE WILL DISCUSS HOW MANY 91B' WE WILL INTERVIEW THIS EVENING

STEP 7: THE INTERVIEW

a. Whoever is left will be given an interview sheet this interview, sheet contains a privacy act statement, statement of acknowledgement, and questionnaire form.

b. While they're filling out their interview sheets we will break down into two interview groups. The groups will be set up as follows:

GROUP I	GROUP II
CPT MAKUCH	CPT HARRINGTON
SFC CROSBY	SGM ALSTON
COL ANDERSON	SGT BEAVERS

c. There are some general questions that we will ask all of the candidates, after these questions are asked it is up to the persons conducting the interview to ask the questions needed to determine if that individual is a reasonable candidate.

NOTE: IF WE ARE NOT ABLE TO FINISH THE INTERVIEWS BECAUSE OF TIME CONSTRAINTS I WILL CONTACT THE OPS NCO AND COORDINATE A TIME THAT WE CAN INTERVIEW THE REST OF CANDIDATES THE NEXT DAY.

NOTE: AT THIS TIME OUR FIRST DAY IS COMPLETE.

DAY 2 (20 JAN 93)

STEP 1: REVIEWING RECORDS

a. We will begin reviewing records at approximately ____. We have to review both the medical and personnel records.

b. We will break down into two groups; group I will review medical records and group II will review personnel records. The following will be the two groups.

GROUP I(PERSONNEL RECORDS)	GROUP II(MEDICAL RECORDS)
SGM ALSTON	COL ANDERSON
SFC CROSBY	CPT MAKUCH
SGT BEAVERS	SPC GREEN
CPT HARRINGTON	

c. How much time this will take will based on how many records we have to review.

d. If we have no further candidates to interview and we do not need to recruit from another class then we are through for the day.

STATEMENT OF ACKNOWLEDGEMENT

In connection with my assignment at the United States Army Medical Research Institute of Infectious Diseases (USAMRIID), Fort Detrick, Maryland. I hereby acknowledge that:

a. My assignment is for the Medical Research Volunteer Subject Program.

b. By volunteering for the Medical Research Volunteer Subject Program, I understand that I shall be expected to take part in studies which are aimed at developing medical preventive measures against infectious disease producing organisms, and that I shall be expected to participate as a volunteer subject in such studies.

c. I understand that my participation as a volunteer subject may mean that I will be requested to receive inoculations of new, experimental vaccines, and participate in other similar studies.

d. I further understand that by volunteering for the Medical Research Volunteer Subject Program, I am not agreeing in advance to participate in my research study until I have received a full and comprehensive briefing as to the purpose and nature of the study, the risk involved, and exactly what will be expected of me. After such briefing, I will not be asked to sign a consent form to participate in any particular study unless and until I have freely and voluntarily agreed to do so and have so consented in writing.

e. I also understand that, when not actually participating as a volunteer under a particular study, I shall be required to perform noncombatant type duties commensurate with my training, background, and the needs of the unit to which I am assigned.

f. If the Commander, U.S. Army Medical Research and Development Command determines that I am no longer qualified for continuation as a Medical Research Volunteer Subject, I understand that I will be reassigned for duty within my military occupational specialty, will remain at the U.S. Army Medical Research Institute if Infectious Diseases for my guaranteed period of stabilization, and will be required to complete my term of service obligation.

_____

(Signature/SSAN/Date)

STATEMENT OF ACKNOWLEDGEMENT

In connection with my assignment at the United States Army Medical Research Institute of Infectious Diseases (USAMRIID), Fort Detrick, Maryland. I hereby acknowledge that:

a. My assignment is for the Medical Research Volunteer Subject Program.

b. By volunteering for the Medical Research Volunteer Subject Program, I understand that I shall be expected to take part in studies which are aimed at developing medical preventive measures against infectious disease producing organisms, and that I shall be expected to participate as a volunteer subject in such studies.

c. I understand that my participation as a volunteer subject may mean that I will be requested to receive inoculations of new, experimental vaccines, and participate in other similar studies.

d. I further understand that by volunteering for the Medical Research Volunteer Subject Program, I am not agreeing in advance to participate in any research study until I have received a full and comprehensive briefing as to the purpose and nature of the study, the risk involved, and exactly what will be expected of me. After such briefing, I will not be asked to sign a consent form to participate in any particular study unless and until I have freely and voluntarily agreed to do so and have so consented in writing.

e. I also understand that, when not actually participating as a volunteer under a particular study, I shall be required to perform noncombatant type duties commensurate with my training, background, and the needs of the unit to which I am assigned.

f. If the Commander, U.S. Army Medical Research and Development Command determines that I am no longer qualified for continuation as a Medical Research Volunteer Subject, I understand that I will be reassigned for duty within my military occupational specialty, will remain at the U.S. Army Medical Research Institute if Infectious Diseases for my guaranteed period of stabilization, and will be required to complete my term of service obligation.

_____

(Signature/SSAN/Date)

PRIVACY ACT STATEMENT

VOLUNTEER AGREEMENT QUESTIONNAIRE FORM

AUTHORITY:
Section 301 or Title, U.S. Code: Section or Title 44, U.S. Code: Sections 1071-1087 or Title 10, U.S. Code: and Executive Order 9397.

PRINCIPLE PURPOSE(S):
The purpose for requesting personal information is to provide the various types of data needed to determine if you are interested and eligible to volunteer as a Medical Research Volunteer Subject for research studies conducted at the U.S. Army Medical Research Institute of Infectious Diseases and to determine what kind of duty assignment you are most interested in, or so that steps can be taken to contact you should it later be learned in your best interest to do so.

ROUTINE USES:
This information will be used for administrative records to indicate in appropriate files that you are to be assigned to the U.S. Army Medical Research Institute of Infectious Diseases as a Medical Research Volunteer.

MANDATORY OR VOLUNTARY DISCLOSURE AND EFFECT ON INDIVIDUAL NOT PROVIDING INFORMATION:
The disclosure of requested information is voluntary. If the information is not furnished, and/or not available from other resources, your voluntary participation in investigational studies may be precluded.

I understand that a copy of the Volunteer Agreement and questionnaire, together with a copy of this form, may be placed in my health records as evidence of this notification, and that additional copies may be retained, received or have declined to accept a copy of the Volunteer Agreement Questionnaire and a copy of this form which I may keep.

_____
(Signature)

STATEMENT OF ACKNOWLEDGEMENT

In connection with my assignment at the United States Army Medical Research Institute of Infectious Diseases (USAMRIID), Fort Detrick, Maryland. I hereby acknowledge that:

a. My assignment is for the Medical Research Volunteer Subject Program.

b. By volunteering for the Medical Research Volunteer Subject Program, I understand that I shall be expected to take part in studies which are aimed at developing medical preventive measures against infectious disease producing organisms, and that I shall be expected to participate as a volunteer subject in such studies.

c. I understand that my participation as a volunteer subject may mean that I will be requested to receive inoculations of new, experimental vaccines, and participate in other similar studies.

d. I further understand that by volunteering for the Medical Research Volunteer Subject Program, I am not agreeing in advance to participate in my research study until I have received a full and comprehensive briefing as to the purpose and nature of the study, the risk involved, and exactly what will be expected of me. After such briefing, I will not be asked to sign a consent form to participate in any particular study unless and until I have freely and voluntarily agreed to do so and have so consented in writing.

e. I also understand that, when not actually participating as a volunteer under a particular study, I shall be required to perform noncombatant type duties commensurate with my training, background, and the needs of the unit to which I am assigned.

f. If the Commander, U.S. Army Medical Research and Development Command determines that I am no longer qualified for continuation as a Medical Research Volunteer Subject, I understand that I will be reassigned for duty within my military occupational specialty, will remain at the U.S. Army Medical Research Institute if Infectious Diseases for my guaranteed period of stabilization, and will be required to complete my term of service obligation.

_____

(Signature/SSAN/Date)

MEDICAL RESEARCH VOLUNTEER (MRV) QUESTIONNAIRE

1. Name: _____ 2. SSN: _____

3. Unit: _____ 4. Rank: ____ 5. Age: ____

6. Sex: _____ 7a. Marital Status: _____ 7b. Spouse's Age: ____

7c. Spouse's Occupation: _____

8. Education: High School Diploma ____ GED ____ College Diploma ____

College Credits ____ Major: _____

9. Work Experience Before Enlisting in the U.S. Army: _____

_____

10. Have you ever been arrested? ____ If yes, explain: _____

_____

ANSWER THE FOLLOWING BY CHECKING "YES" OR "NO":

DO YOU HAVE ANY OF THE FOLLOWING MEDICAL CONDITIONS?	YES	NO
11. Physical or health problems	____	____
12. Allergies	____	____
13. Asthma	____	____
14. Profiles	____	____
15. Bad reaction to shot or vaccine	____	____
16. Take medication regularly	____	____
17. Been refused as a blood donor	____	____
18. Have difficulty/complications when your blood is drawn	____	____

19. EXPLAIN ANY YES ANSWERS HERE: _____

_____

_____

_____

_____

_____

_____

PAGE 1

EXHIBIT 4

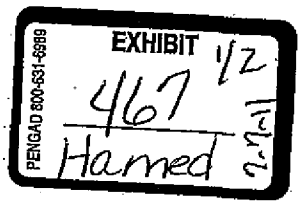


EXHIBIT VOL. 1 OF 2

DEPARTMENT OF DEFENSE

OFFICE OF THE UNDER SECRETARY OF DEFENSE PERSONNEL & READINESS

DEPUTY UNDER SECRETARY FOR PROGRAM INTEGRATION

INFORMATION MANAGEMENT OFFICE

CHEMICAL WEAPONS EXPOSURE PROJECT

SUMMARY OF ACTIONS AND PROJECTS

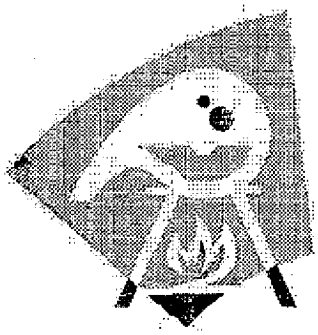
1993 – 2007

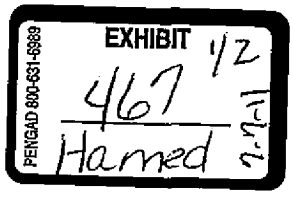
EXECUTIVE SUMMARY

FULL TABLE OF CONTENTS
&

SUMMARY FOR 1993

BINDER I





This report was prepared at the request of the Office of the Under Secretary of Defense for Personnel and Readiness, Information Management Office. It summarizes the efforts of the Department of Defense to identify, collect, archive, and forward to the Department of Veterans Affairs the names of DoD personnel exposed to chemical, biological, or nuclear agents during research, testing, and transportation of subject agents.

Information was extracted from current and archived files containing official letters, memoranda, technical and administrative reports, task force and work group reports, Congressional briefings, news paper articles, and from the corporate memory of the preparer. Major source documents that define the efforts undertaken from 1993 to 2004 are included at tabs to the report. Submitted September 26, 2007. Addendum added May 2008.

Prepared By: Martha E. Hamed
Independent Consultant to
BOOZ ALLEN HAMILTON INC.
G-SOOT-99-ALD0202
ICA#91458DG

TABLE OF CONTENTS

Executive Summary

This report was requested by the Director, Personnel & Readiness Information Management (IM) as a result of the continuing interest in, and need for, information collected during the 1990's concerning the use of human test subjects in Department of Defense(DoD) chemical weapons research during and following World War II.

It is a summarized history of the participation of the P&R IM Office in the recurring requests for information from Congress, the Public, Military Veterans and their survivors; as well as other Federal Agencies, particularly the Department of Veterans Affairs(VA) and the National Institutes of Health (NIH). The summary covers the years from 1993 through the current month of September, 2007. During this period the P&R IM Office went through several name changes, which are noted in the report to provide clarity and the continuity of actions and projects managed by this office.

The DoD Chemical Weapons Exposure Study was initiated in 1993 as the DoD response to direction from President Clinton, Congress, and the Secretary of Defense. The impetus for their concern and aggressive response was the publishing of a scientific study by the NIH Institute of Medicine. This study was *VETERANS AT RISK The Health Effects of Mustard Gas and Lewisite*, edited by Constance M. Pechura and David P. Rall, and released in January, 1993. This report started a line of inquiry into Government conducted research using human test subjects that is still a contemporary topic of concern, research, and interest today. At the time of this writing the P&R IM Office had recently been contacted again by the Government Accountability Office (GAO) concerning programs, funding, and promises from the original 1993 effort.

Although the original program impetus from January 1993 was targeted at veterans that had been the subject of experiments and tests using mustard gas and lewisite, by January of 1994 there was significant information that indicated biological agents had also been tested. Also, the specter of human subjects having been used for radiological experiments had surfaced in records recovered, in newspaper stories, and in Congressional inquiries. Although this specific kind of exposure was researched, and records collected, under the cognizance of the then Assistant Secretary of Defense for Atomic Energy, there is mention of, and documentation from, the program in this summary because the two programs were often the topic of the same Congressional hearings, and the staff of both studies worked together and exchanged information and assistance to each other whenever needed. Personnel from this effort were full participants in several of the projects and meetings undertaken by the P&R IM Office back in the 90's.

The major effort of the Chemical Weapons Exposure Study to locate and identify WWII chemical weapons test sites and human test subjects was carried out

during the period between 1993 and 1995. *Section A, Summary for 1993*, lent itself to more of a chronological presentation than Sections B and C, because as the issue unfolded over the year and projects were developed, they flowed with the course of Executive direction from the White House, Cabinet levels, and to meet continuing Congressional inquiry and requests for accountability. *Section B, Summary for 1994*, is arranged more by major issue or project, and contains summary descriptions of actions, studies, and Congressional Hearings—which were particularly active that year. One of the major documents located for this section was an entire Briefing Book for a 1994 *Hearing on Experiments With Human Test Subjects*. This book includes an alphabetical index of topics and is invaluable in documenting the efforts on the Chemical Weapons Exposure Study up through September, 1994. The entire book has been reproduced and added to *Section B* as an addendum. Notes on its importance are bolded in the Table of Contents, as it should be fully reviewed when examining *Section B, Summary for 1994*, in order to get the full scope of the efforts taken to recover names of test subjects.

The P&R IM Office continued to have full oversight for the project until sometime in 1995 when it was transferred to the Defense Manpower Data Center. Even then P&R IM continued to be very active with Congressional, SECDEF, and VA issues concerning the collection and sharing of names and information on the chemical and biological test subjects. Although there were continued data collection efforts into 1995 and 1996, most of the activity on the files was and continued to be to respond to requests from veterans or VA to provide information to assist with compensation claims, and to locate surviving test subjects and send them Certificates of Commendation. However, in 1996 the P&R IM Office initiated a project to improve and streamline passing of human exposure information to the VA. The *Exposure Records Locator Project Final Report*, including radiation and nuclear test records, was published in 1997. These efforts are summarized and documented, along with examples of the DoD Certificate of Commendation, in *Section C, Binder III, Summary for 1995 Through 2007. Section C*, like *Section B*, is arranged by major issue areas.

Not until 2003 was there another major interest in the Chemical Weapons Exposure Study. That year the DoD Public Affairs Office was contacted by the *Detroit Free Press* concerning a story being written about the WWII mustard gas and lewisite human test subjects. In 2004 the newspaper printed a three part expose' on these veterans and the actions of DoD and VA to recognize and assist them. The full expose', with a transcript of the interview with the P&R IM Director and Project Lead, is in *Section C*. Also in that section are notes on the most current request from GAO made to the Director, P&R Information Management in August, 2007.

This *Executive Summary*, and the narrative summary included in each section, is based on review of the available records on the program, paper and electronic, and the memory and recollections of the author spanning a fourteen year

period. Information to compile this summary history was collected from the following sources:

- **files and stored records of the P&R IM Office**
- **files and electronic records of the retired Project Lead (author)**
- **files from the Defense Manpower Data Center**
- **files from the office of the Program Director for CBRN (Chemical, Biological, Radiation) Assessments, Deployment Health Directorate**

The CBRN Office is located in the TRICARE Management Activity, under the Office of the Assistant Secretary of Defense for Health Affairs. They currently hold the major portion of the Chemical Weapons Exposure Study files which were transferred to CBRN in 2005. This includes the original files of the P&R IM Office from 1993 through 1995.

Finally, since some of the information in the narratives was gleaned from the author's memory, and from her re-interpretation of files and records from ten to fourteen years ago, if they are in conflict with any reader's personal recollection or other records not reviewed at the time of this report, she apologizes for any error or omission, misinterpretation, or her poor recollection. She would welcome feedback so the record can more accurately reflect those events.

Martha E. Hamed *26 September 2007*

Addendum May 2008:

Alphabetical Index for Total Report, Sections A, B, C with copy of index inserted into each binder (I, II, III) following Table of Contents.

GAO Report: CHEMICAL AND BIOLOGICAL DEFENSE DoD and VA Need to Improve Efforts to Identify and Notify Individuals Potentially Exposed during Chemical and Biological Tests GAO-08-366 dated February 2008 added to Section C Binder III.

SECTION A

1993

SUMMARY FOR 1993

I *VETERANS AT RISK*

On January 1, 1993 the Institute of Medicine(IOM) released *Veterans at Risk: The Health Effects of Mustard Gas and Lewisite*. This report was initiated by a request from the Department of Veterans Affairs, and was the result of a committee convened to investigate a nexus between specific medical conditions and exposure to mustard gas and/or lewisite. Mustard gas and Lewisite are blister producing (vesicant) agents. There are two types of mustard agents, sulphur mustard and nitrogen mustard. Lewisite is an organic, arsenic containing, compound sharing some of the properties of mustard agents. The major finding of the report was that there were about 60,000 U. S servicemen that had been used as human test subjects at various sites during WWII, including tests in the tropical climate of Panama. Those participants were sworn to secrecy, describing verbal oaths of secrecy often being administered. This oath of secrecy inhibited the test subjects from coming forth and seeking compensation and benefits from the Department of Veterans Affairs (VA) for exposure related conditions.

The following were the general conclusions of the committee:

- The lack of follow-up health assessments of the human test subjects, by their researchers or medical personnel severely limited the amount of information that could be used to determine long term health effects.
- Levels of exposure to agents may have been higher than implied by reports
- There were no studies done on occupational health risks to workers in production, handling (storage and transportation), and chemical weapons training facilities, nor for combat exposures from WWII.
- There were several medical conditions the VA identified as being presumptive of exposure to mustard gas: laryngitis, bronchitis, emphysema, asthma, conjunctivitis, keratitis, and corneal opacities.

An extract from the report is at Tab A1 with a copy of the Table of Contents and the Executive Summary, along with a 1993 article from the Washington Post titled *Getting Burned* written by Tracy Thompson.

II EXECUTIVE AND CONGRESSIONAL REACTIONS TO THE REPORT

Department of Veterans Affairs

On January 5, 1993 the Acting Secretary of Veterans Affairs, Anthony Principi, signed a letter to Secretary of Defense (SECDEF) Dick Cheney citing *Veterans at Risk* and requesting information on the types of tests conducted (patch, chamber or field), the

agent used, and the names, units, and service numbers of personnel who participated in the tests so that VA could attempt to notify them of possible health risks and evaluate them. They also asked for specific information on test participants at Edgewood Arsenal, on exposures that may have been occupational such as storage and handling, and for information on exposures as a result of the Bari Harbor disaster in Italy during December of 1943. In addition he requested that personnel who participated in these secret tests be released from their oaths and expressed a desire for coordination on communicating the release to veterans. A copy of this letter is at Tab A2.

House Committee on Veterans Affairs

On January 22, 1993, Representative G. V. (Sonny) Montgomery, Chairman of the Committee, signed a letter to the new SECDEF, Les Aspin, also citing *Veterans at Risk*. Representative Montgomery's main concerns were the detrimental impact of the oaths of secrecy on the treatment and compensation of veterans who were test subjects, and the noted absence of records that would corroborate veterans' claims of participation in tests or other service related exposures to chemical warfare agents. He requested that information be made available to the VA concerning test sites, units assigned, individual names and service numbers if possible, and dates testing was conducted. He also requested information on facilities that would have led to occupational exposures through production, transportation and storage. In addition, Representative Montgomery directly cited the allegation in the report that a lingering atmosphere of secrecy inhibited the full collection of information for the report. He went as far as describing a letter he, Secretary Aspin (then in Congress) and Representatives Stump and Dickenson sent to SECDEF Cheney requesting information on experiments on service members using LSD, mustard gas, other dangerous chemicals. He characterized the response they received as inadequate, as it did not report any of the information that was reported by the IOM report. A copy of the letter from Representative Montgomery is at Tab A3.

General Accounting Office (GAO)

On February 18, 1993 a GAO Report was released with the title *VETERANS DISABILITY Information From Military May Help VA Assess Claims Related to Secret Tests*. This report not only cited the mustard gas and lewisite tests, but discussed the tests using human subjects that involved the use of nerve agents, nerve agent antidotes, and lysergic acid diethylamide (LSD). The report mentions hearings held in 1991 and actions taken by VA to adjust the criteria for claims for chemical agent test subjects, and mentions the detrimental impact of the gaps in information and documentation in DoD. Recommendations were for collection of necessary information to make compensation determinations and naming points of contact at Army and Navy. A copy of this report is at Tab A4.

The White House

On February 19, 1993, President Clinton signed a letter in response to correspondence from Representative Glen Browder. In his letter President Clinton stated that the VA and DoD were diligently working to identify the affected veterans, and that VA had "relaxed requirements for evaluating mustard gas claims" and had requested DoD release former members from the oath of secrecy. He also stated that he had directed the Secretaries of both Departments to expedite the required actions to deliver benefits and compensation to the affected veterans. A copy of President Clinton's letter to Representative Browder is at Tab A5.

The Office of the Secretary of Defense

On March 9, 1993 Deputy Secretary of Defense (DEPSECDEF) William J. Perry signed a departmental memorandum on Chemical Weapons Research Programs Using Human Test Subjects. The first statement of this memorandum released persons from oaths of secrecy or non-disclosure restrictions, either written or oral, if they had participated in any testing, production, transportation or storage associated with any chemical research that happened prior to 1968. He also stated he was declassifying documents for chemical weapons research studies conducted prior to 1968 to include the locations of the programs, the kind of tests conducted, and the start and finish dates of each test. He also included identification of units stationed at research sites during testing periods down to name, service or social security numbers, and names of those known to have been test subjects. Declassification was also extended to documents concerning production, transportation and storage of these agents. Secretaries of the Military Departments were directed to fully cooperate in these directed actions and to initiate procedures to carry out the declassification of the specified documents. Information on locations of chemical test sites, agents used, test dates, and any personnel involved were to be collected immediately and provided to OSD by July 31, 1993. Also on March 9, Deputy Secretary Perry signed a letter back to Representative Sonny Montgomery thanking him for his letter about *Veterans at Risk* and forwarding a copy of his 9 March internal memorandum directing the actions cited above. A copy of the March 9, 1993 internal memorandum and the letter back to Representative Montgomery are at Tab A6. A copy of the Department of the Army internal memorandum requiring a comprehensive search for the information requested in the 9 March memorandum is at Tab A7. Since the primary concern was former Service members who were now veterans, oversight for carrying out the DEPSECDEF's mandates was assigned to the Office of the Assistant Secretary of Defense for Force Management and Policy (OASD(FM&P)). That office is now the Office of the Under Secretary of Defense for Personnel and Readiness (OUSD (P&R)).

On March 17, 1993 the Deputy Director of Defense Research and Engineering (DDR&E) signed a letter to Secretary of Veterans Affairs Jesse Brown. It stated that DoD would make every effort to assist VA and that areas of assistance would include compilation of the names of personnel, test protocols, and available data for mustard gas

testing for WWII and Edgewood Arsenal in particular. The same would be provided for Lewisite and mustard production and handling, as well as names of personnel exposed during the Bari Harbor disaster. The letter also stated that points of contact for each Military Department would be provided, and referenced the March 9 DEPSECDEF memo in regard to release of former personnel from oaths of secrecy and non-disclosure restrictions. The letter closed with a stated "hope" to provide the information to the VA within that current fiscal year which would have been a target date of September 30, 1993. A copy of this letter is at Tab A8.

III OASD (FM&P) ACTIONS AND REPORTS

OUSD (P&R) Information Management Office

The office in OSD with primary oversight of the Chemical Weapons Exposure Study from 1993 to 1995 was the Information Resources Management Office under the Deputy Assistant Secretary of Defense for Requirements and Resources under the Personnel secretariat. The Office is still under the Personnel secretariat and is the current Deputy Under Secretary for Program Integration (DUSD(PI)). The Information Resources Management (IRM) Office has had several name changes, but is currently the Personnel & Readiness Information Management Office. This office assigned senior personnel to chair task forces and working groups, carry out reviews and analysis of chemical weapons test sites and records repositories, and to be the primary point of contact for inquiries from the office of the Secretary of Veterans Affairs, the Veterans Health Administration, the VA Compensation and Pension Service, Congressional staff, the National Archives and Records Administration, National Personnel Records Center (NPRC) in St. Louis, Missouri, and many of the individual veterans. At any given time there was a GS-15, GS-14 and GS-12 actively working on the project—conducting site reviews and records analysis, collecting names, responding to the VA and to individual veterans, and preparing status reports and compiling the database of names of verified test subjects. In addition to responding to and verifying veterans' exposures, verification was also done on several civilian exposures since documentation was found that civilian personnel had also been exposed to these agents via occupational activities. One of the major issues that negatively impacted the ability of the VA and DoD to corroborate veteran's claims was the unavailability of military personnel records that had been destroyed in a major fire at NPRC in 1971. Because of this the IRM Office commenced an immediate review of test sites and records repositories within DoD, particularly the Army and the Navy. Tab A9 contains a list of sites visited in 1993.

Chemical Weapons Exposure Study Task Force

To help respond to the need to locate appropriate information to assist WWII veterans to file compensation and benefit claims for injury and illness resulting from chem/bio exposures, OASD (FM&P) created the Chemical Weapons Study Task Group

(CWEST). This group was comprised of senior personnel from OSD personnel, health and medical, environmental, atomic energy and research communities, as well as the Military Services. The CWEST initiated an interagency task group that met to recommend a specific plan of action to respond to the information needs of the VA to assist veterans, and to the specific directives from the March 9 DEPSECDEF memo. This group was the CWEST members augmented with senior officials from both the Veterans Health Administration (Epidemiology) and the Compensation and Pension Service. The group met on April 19 to develop a plan of action and program of work. The group used as a model the process used by the Defense Nuclear Agency (DNA) to respond to similar issues with personnel affected by the nuclear testing carried out by the U. S. in the Pacific Islands and in Nevada. The group recommended appointment of an Executive Agent and specific tasks for identifying locations and content, declassification actions and issues, compilation of databases on sites and personnel tested. They further recommended actions to halt any destruction of records pertaining to testing, storage, transportation, and handling, and the collection of descriptions of the records collections by the Executive Agent. The work group also recommended that a complete history regarding chemical weapons testing be developed for each site, and listed specific data elements that should be included in both a site level database and a name level data base. A list of CWEST members and a copy of the April 22, 1993 interagency group report, with members, is at Tab A10.

As a result of this April 22 report a Request for Approval of Information Collection was initiated in May, 1993. The request was approved in June 1993, and information collection began shortly thereafter. The request for approval and back up information is at Tab A11, along with the Supporting Statement and draft Federal Register Notice. Since the Department of the Army had oversight of the chemical weapons testing and develop programs, senior leadership proactively went out with a data call in May and early June. A copy of the consolidated Army response, with records collections and cost data, is at Tab A12.

Chemical Weapons Exposure Study Update July 1993

By July 1993 DoD had initiated several working groups and projects to try to locate test sites and records repositories in order to identify test subjects and to find documentation the VA would deem sufficient and reliable in adjudicating veterans compensation claims related to chemical weapons activities. The IRM Office had identified five major sites of chemical testing that used human subjects, for example Edgewood Arsenal in Maryland, and Dugway Proving Ground in Utah. They had also identified seven major sites where field testing was conducted, some of which were no longer in existence, such as Bushnell Field, Florida and Camp Sibert, Alabama where tests were held to determine effects of the chemicals in tropical conditions. The IRM Office had also contracted with the Chemical Warfare/Chemical and Biological Defense Information Analysis Center (CBIAC) in Edgewood, Maryland, to compile a site location database. By July there was a preliminary run with 117 entries. They had also collected a large sample of the various kinds of documentation that was found to contain names of

test subjects and volunteers. Some were morning reports, duty rosters, orders of special commendation, and some military personnel medical records that documented treatment for burns and injuries resulting from the tests. Also by July, DoD had been able to start a preliminary Chemical Weapons Exposure Database and had found almost 4,000 names. These names were forwarded to the VA as they were found, the first large list was the test subjects from the Naval Research Laboratory. Also during July a study update was prepared and a briefing was given to staff and members of the House Committee on Veterans Affairs (mostly staff members). A copy of an initial draft of the Chemical Weapons Exposure Study Update is at Tab A13, and the original cover sheet that notes preparation for Congressional briefing was left for integrity of the source material. The report provides samples of the Chemical Weapons Site Location Database being prepared by CBIAC at Tab One. Tab Two is lists of the repositories identified up to that time with samples of the kind of documentation used to identify the repositories such as field reports, a medical report of injury, and excerpts from technical and historical books. Tab Three has information on the preliminary Personnel Database with samples of medical records documenting exposures, temporary duty rosters of officers assigned to a field test site in Panama; and other kinds of personnel and operational paperwork that helped document test participation. Tab Four was a summary of major issues/problems that had arisen during the first six month of the project. A copy of the pared down brief given to Congressional staffers is at Tab A14.

Personal Interface and Response to Affected Veterans

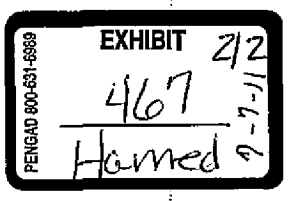
The senior lead for the IRM Office had personal contact with many of the affected veterans and some former DoD civilian employees affected by chemical exposures. This exchange was not only to assist the individuals in obtaining appropriate compensation, it also was an additional source of information on other sites where tests were conducted, or agents were stored or handled. Communication with these individuals assisted in locating an additional test site at Harts Island in New York; a specific example of a Navy commendation given to individual test participants; location of records archived at a major university library; and verification of official record keeping for occupational exposures of civilian employees (only two contacted OSD during the 1993 time frame). Tab A15 contains short anecdotal summaries of some of the direct veteran and former employee contacts with the IRM Office.

IV Inter-Agency Actions

DoD/VA Non-Medical Benefits Task Force

Secretariat, Executive and other senior level management in both the VA and DoD were kept fully apprised of the activities to respond to the information requirements of the VA set forth in Acting Secretary Principi's letter of January 5 and in the actions directed by the memorandum from Deputy Secretary Perry dated March 9, 1993. This

ADDENDUM TO SECTION B BRIEFING BOOK FOR SEPTEMBER 28, 1994 CONGRESSIONAL HEARING



Chemical Weapons Testing Sites Using Human Subjects

Naval Research Laboratory, Washington, D. C.
Naval Training Center, Great Lakes, IL
Camp LeJeune, NC
Edgewood Arsenal, MD
Bushnell Field, FL
Fort Pierce, FL.
San Jose Island, Panama Canal Zone
Camp Sibert, AL
Dugway Proving Ground, UT
Camp Polk, LA
Gulfport, MS
El Centro, CA
Fort Richardson, AK
Fort Detrick, MD
Fort Benning, GA
U. S. Navy, Harts Island, NY

Harts Island Letter 1944
Volunteers from Navy Brig

11 April 1944

MEMORANDUM FOR CHIEF, MEDICAL DIVISION:

Subject: Procurement of Enlisted Volunteers.

1. A meeting was held at Cornell Medical Center on 10 April 1944 at 1400. Those present were:

Comdr. Marion B. Sulzberger (MC) USNR
Lt. A. Kanof, USN
Major Richard C. Carlisle, MC
Dr. Rudolph L. Baird
Capt. William H. Shervin, Jr., CWS

Comdr. Sulzberger produced a letter dated 7 April 1942 to the Secretary of the Navy requesting that the study of the effect of toxic agents be permitted on volunteers from the U. S. Navy.

2. Approval of this project was obtained from the Secretary of the Navy as per attached letter. The N.D.R.C. and C.M.R. have in progress tests on volunteer Navy personnel at the Naval Disciplinary Barracks, U.S. Navy Receiving Station, Harts Island, New York. The volunteers for this project are obtained by addressing groups of [illegible] Navy personnel being held for disciplinary measures and asking that they volunteer for necessary tests. Comdr. Sulzberger states that the procurement of these men is very satisfactory.

3. Comdr. Sulzberger suggested that we confer with Mr. Austin McCormick, advisor to the Secretary of War on rehabilitation of enlisted personnel. Mr. McCormick was Commissioner in New York State for the rehabilitation of prisoners and would no doubt be in a position to aid this Service in the procurement of enlisted Army personnel. Comdr. Sulzberger requested that this information be conveyed to Colonel Rhoads for his consideration and further action.

4. Comdr. Sulzberger suggested that, in the event the approval of the Secretary of War is obtained to use volunteer enlisted personnel from the rehabilitation center at Camp Upton, New York, suitable laboratory equipment be installed at this post and also the construction of a gas chamber if necessary. The finding of such tests under the direction of Comdr. Sulzberger and the Army could then be readily correlated in New York City.

Mr. Austin MacCormick,
114 East 30th Street,
New York City - phone Regent 7-0814.
Caledonia 5-9720.

WILLIAM H. SHERVIN, JR.
Captain, CWS

6

COPY

D E P A R T M E N T O F T H E N A V Y

Office of the Secretary

Washington

May 8, 1942.

My dear Doctor Richards:

This will acknowledge your letter of April 7, 1942 with reference to scientific investigation of war gases.

As Secretary of the Navy I authorize the proposed investigation which shall be carried out in a manner subject to the approval of the Surgeon General.

Sincerely yours,

s/James Forrestal
Acting Secretary of the Navy

Dr. Alfred N. Richards
Chairman, Committee on Medical Research
Office of Scientific Research and Development
1850 P Street N.W.
Washington, D. C.

Certified a true copy
E. H. Cushing
Commander MC-V(S) USNR

Copy

April 7, 1942.

The Honorable Frank Knox
Secretary of the Navy
Washington, D. C.

My dear Mr. Secretary:

Among the problems of war medicine, vitally important both for the armed forces and the civilian population, are those connected with war gases. Investigations in this field are the subjects of contract between the Office of Scientific Research and Development and several University groups in Chicago, New York, Philadelphia and Baltimore. These studies include means of both prevention and treatment.

In the study of vesicant gases, investigators are confronted with one major obstacle, namely, that the skin of man is so different anatomically from that of laboratory animals that the latter are relatively useless as subjects for experimentation. It becomes necessary, therefore, to consider means by which human subjects may be made available for this type of research.

In the hands of competent experimenters much can be learned concerning the prevention and treatment of gas burns in men without subjecting them to more than relatively trivial annoyance or disability. A system is successfully in force under the auspices of the Canadian National Research Council which provides experimenters in this field with volunteers for these experiments. I have in my files a full description of their arrangements.

In or adjacent to the cities in which the investigators alluded to above are located are numbers of military establishments. It is our belief that a plan could be designed in accordance with which volunteers in limited numbers (not more than 50 in a group) for limited periods of time (10 days) would submit themselves to carefully supervised tests which would yield highly significant information. Such a plan should require the approval of the Surgeon General of the Service from which volunteers might be drawn; should be subject to arrangements approved by the officer in command of the unit of that Service and the tests themselves should be performed under the supervision of a medical officer of the unit.

In addition to the scientific and practical information which might emerge from such studies, another very practical advantage might accrue; that is, an educational familiarity with these gas weapons and consequent lessening of fear of their unknown qualities.

It is the purpose of this letter to request your approval of this general plan and perhaps to obtain your suggestions as to the most appropriate steps to be taken in its initiation should you choose to make them.

Yours very respectfully,
s/Alfred N. Richards, Chairman
Committee on Medical Research

Certified a true copy
E.H. Cushing
Commander MC-V(S) USNR

VET017-000696

EXHIBIT 5

UNCLASSIFIED

[redacted]

Initials.....Rank.....

Ex/GJBF/bml

CWS 400.112/126 Conf. 2nd Ind.
War Dept., C.C. C.W.S., August 16, 1937. To: Commanding Officer, Edgewood Arsenal, Md.

1. The remark of General Baker, as referred to in basic letter, was to the effect that no objection was seen by him to the use of certain selected enlisted men for tests of protective clothing if the commanding officer, Edgewood Arsenal considered such action necessary and desirable. The commandant, being responsible for the completion of these field tests during the present test season, is best able to coordinate the various means available to him for this purpose. In any event, it is desirable to avoid utilizing the services of enlisted men who are not mature soldiers and who do not volunteer for this duty.

By order of the Chief of the Chemical Warfare Service:

AUG 17 1937

GEO. J. B. FISHER
Major, Chemical Warfare Service
Acting Executive.

UNCLASSIFIED

Command Historian's Office, CBDCOM
Edgewood Arsenal, MD
Row 2; File cabinet A, Drawer #4

OFFICE OF THE TECHNICAL DIRECTOR

EDGEWOOD ARSENAL

August 12, 1937.

SUBJECT: Physiological Tests.

TO: Commanding Officer, Edgewood Arsenal, Md.

1. During the first four tests of protective clothing conducted during July and the first part of August a great many volunteers for physiological tests received slight HS burns. Although these burns are not serious, they make the subject increasingly sensitive to mustard for quite a period of time. Therefore, it is desirable, if possible, to avoid using these same volunteers during that period of increased sensitivity.

2. It is suggested, therefore, that all the enlisted men in the Second Separate Chemical Battalion be permitted to volunteer for this work. The Chief, Chemical Warfare Service, has given verbal approval of the projected use of the enlisted men.

3. If approval of the above is granted, it is requested that the Technical Divisions be given data on the prior service of the volunteers.

CHARLES E. LOUCKS,
Major, C.W.S.,
Technical Director.

E.A.

1st Ind.

HEADQUARTERS [illegible] August 13, 1937 To: Chief, Chemical Warfare Service, Washington, D.C.

1. Request verification of second sentence, Paragraph 2, as one.

A. M. HERITAGE
Lt.Colonel,C.W.S.
Commanding

Command Historian's Office, CBDCOM
Edgewood Arsenal, MD
Row 2; File cabinet A, Drawer #4

Jan. 3 1.m

UNCLASSIFIED

[redacted],

CWS 400.112/126 Conf. 2nd Ind. FTG/tech/ers
War Dept., O-C of CWS, June 10, 1937. To: Commanding Officer, Edgewood Arsenal, Md.

1. The use of volunteers from the first three grades of enlisted men as suggested in the basic letter is approved.

By order of the Chief of Chemical Warfare Service:

MAIG SERKEN JIAN
Lieutenant Colonel, Chemical Warfare Service
Executive.

JUN 11 1937

UNCLASSIFIED

Command Historian's Office, CBDCOM
Edgewood Arsenal, MD
Row 2; File cabinet A, Drawer #4

Herd 7126 Corr

1st Ind.

HEADQUARTERS, EDGEWOOD ARSENAL, Maryland, June 4, 1937.
To: Chief, Chemical Warfare Service, Washington, D. C.

1. It is desired to use volunteers from the first three grades of enlisted men, as suggested in the basic letter, if this is approved by the Chief, Chemical Warfare Service. Even if a number of enlisted volunteers are obtained, the extensive tests contemplated will seriously interfere with all activities at Edgewood Arsenal.

CHARLES R. ALLEY, JUN 8 1937
Colonel, C.W.S.,
Commanding.

Command Historian's Office, CBDCOM
Edgewood Arsenal, MD
Row 2; File Cabinet A, Drawer #4

WAR DEPARTMENT
CHEMICAL WARFARE SERVICE
Edgewood Arsenal
Edgewood, Maryland

June 3, 1937.

Subject: Physiological Tests.

To: Commanding Officer, Edgewood Arsenal, Md.

1. In order to assure a sufficient number of subjects for physiological tests during July, August and the first two weeks in September, to complete the work planned, an additional source besides the Officers of the Arsenal and the technical employees will be desirable. As it is contemplated that two or three tests requiring about twenty subjects each will be held every week, the total number of tests is greater than the subjects available, at present.

2. It is suggested that enlisted men of the first three grades be made available for this purpose. Since they are frequently called upon to instruct and explain chemical warfare in the training of the civilian components of the Army, as well as the Regular Army, practical experience with the chemical agents would give them a better background. Therefore, the suggested tests would be the means of making them better qualified instructors. The physiological tests would be the means whereby many other phases of chemical warfare would be made clearer to them, such as the proper respect for the chemical agents how the agents are disseminated (particularly by airplane) and other information of a very practical nature affecting chemical warfare.

3. It is, therefore, recommended that as many Chemical Warfare Service Enlisted Men of the first three grades as can be spared be given an opportunity to volunteer for the same tests as the Chemical Warfare Service Officers and Technical Employees who have recently volunteered for this work.

CHARLES E. LOUCKS,
Major, C.W.S.,
Technical Director.

EXHIBIT 6

UNCLASSIFIED

U.S. ARMY ACTIVITY

IN THE U.S.

BIOLOGICAL WARFARE PROGRAMS

VOLUME I

24 FEBRUARY 1977

UNCLASSIFIED

CONTENTS

Volume 1

Purpose and Definition

This report provides a comprehensive review of the U.S. Army's role in the Biological Warfare (BW) program so that Congress and other government officials can assess accurately BW issues which are being raised continually. The report is limited to the BW technical program and the policies and governmental controls which guided the program.

The acronym BW will be used throughout to connote biological weapons and defense programs. It also encompasses the terms "bacteriological" and "bacterial" which were used interchangeably in the early periods. BW is defined as the use of microorganisms ("germs"), such as bacteria, fungi, viruses, rickettsiae, and substances (toxins) derived from living organisms (as distinguished from synthetic chemicals used as gases or poisons) to produce death or disease in humans, animals, or plants. For BW purposes, the most effective and efficient route of entry of disease microorganisms into the human and animal body is normally by breathing into the lungs. For plants deposition on external surfaces is usually sufficient to cause infection.

Preface

In preparing a comprehensive review of the Army BW programs, it is crucial that the activities be portrayed in the context of the times and circumstances in which they occurred. For this reason, the events have been related to the appropriate period of national security activity. It has been difficult, at times, to provide finite data as some of the detailed working papers have since been destroyed; however, much data is available and every attempt has been made to use primary documents or the most credible derivative data.

The policy of the United States regarding biological warfare between 1941 and 1969 was to first deter its use against the United States and its forces, and secondly to retaliate if deterrence failed. Fundamental to the development of a deterrent strategy was the need for a thorough study and analysis of our vulnerability to both an overt and covert attack while concomitantly examining the full range of retaliatory options. Recognition by American scientists of the potential of BW and concern about the United States lack of preparedness prompted the start of the U.S. program in World War II. From its inception, the program was characterized by continuing in-depth review and participation by the most eminent scientists, medical consultants, industrial experts, and government officials.

As a result of President Nixon's ban on BW weapons in November 1969 we have destroyed our limited BW weapon stocks. Because a potential BW threat still exists, the U.S. still maintains a defensive BW program in accordance with the 1969 Presidential policy statement. This program seeks to develop effective warning and detection devices, protective clothing and equipment and continues to assess the vulnerability of the U.S. and its forces to enemy BW attack. The problems of biological defense are greater today than at any time in the past because of the technological advances in the biological sciences.

Chapter 1

Introductory Survey of United States Army Biological Warfare Programs (U)

World War II

In the fall of 1941, opinions differed on the potential effectiveness of BW. Sufficient doubt existed so that reasonable prudence required that a serious evaluation be made as to the dangers of a possible attack. Secretary of War Henry L. Stimson therefore requested the National Academy of Sciences to appoint a committee to make a complete survey of the BW situation (two months prior to the attack on Pearl Harbor). After careful study, the committee concluded in February 1942 that BW was feasible and urged that appropriate steps be taken to reduce U.S. vulnerability to BW attack. Secretary Stimson then recommended to President Roosevelt the establishment of a civilian agency for this purpose. With approval by the President, the War Reserve Service (WRS) was formed in August of 1942 with George W. Merck of the Merck Company, a pharmaceutical firm, as Director. WRS was attached to the Federal Security Agency and served as a coordinating agency using the resources of existing government and private institutions to carry out the BW program. Scientific advice was received from a committee of prominent scientists set up by the National Academy of Sciences and the National Research Council. An exchange of information was also inaugurated with the United Kingdom and Canada.

The first task undertaken by WRS was the development of defensive measures against possible BW attack. Its major achievement was the organization of a research and development program (R&D now referred to in the Department of Defense as research, development, test and evaluation, RDTE) to extend the paucity of knowledge about BW. It was concluded that significant knowledge could not be gotten without larger scale developmental operations.

Therefore, in November 1942, WRS requested the Chemical Warfare Service (CWS) of the Army (redesignated the Chemical Corps in 1946) to prepare to assume responsibility for a larger scale research and development program, including construction and operation of laboratories and pilot plants. Up until this time the Army had only been involved in the coordinating Committee activities of the WRS. The Army chose Camp Detrick, Frederick, Maryland, a small National Guard Airfield, as the site for new facilities and construction started in April 1943. WRS turned over to the Army CWS all operational projects but continued to exercise general supervision over the entire BW program.

The Office of Strategic Services alerted the Joint Chiefs of Staff in December 1943 to indications that the Germans might be planning to use BW. The BW program was accordingly stepped up and, in June 1944, the complete program was transferred by direction of the President to the War Department. At the direction of the Secretary of War, the Chemical Warfare Service was made responsible for work on BW agents, for BW intelligence, and for BW defense. The Army Surgeon General was directed to cooperate with the CWS on matters of BW defense. The program continued as a joint effort with Navy and other Federal department participation. The R&D program was greatly accelerated with the addition of field testing facilities and a production plant. When the War Department assumed full responsibility, Secretary Stimson appointed Mr. Merck as a special consultant on BW. He also established the United States BW Committee in October 1944 with Mr. Merck as Chairman and with senior representatives from the military services.

At its peak, the Special Projects Division of the Army CWS, which was the main element for carrying out the program, had 3,900 personnel, of which 2,800 were Army, nearly 1,000 Navy, and the remaining 100 civilian. The work was carried out at four installations: Camp Detrick was the parent research and pilot plant center; field testing facilities were set up in the summer of 1943 in Mississippi, another field testing area was established in Utah in 1944; and a production plant was constructed in Indiana in 1944. All work was conducted under the strictest secrecy. In addition to the coordination with the United Kingdom and Canada, a joint program was undertaken by an American-Canadian team to develop defenses against rinderpest disease of cattle.

During World War II, the policy of BW use implicity paralleled the policy for Chemical Warfare (CW); that is, retaliation only. While the United States had not ratified the Geneva Gas Protocol of 1925 which prohibited CW and BW, President Roosevelt and Prime Minister Churchill announced this policy in unilateral statements in the spring of 1942.

End of World War II

At the end of World War II, the construction activities and the testing programs were terminated and the remainder of the activities gradually phased down to a research status. The production plant, Vigo Ordnance Works, constructed at Terre Haute, Indiana to provide a retaliatory capability using aerial bombs, ceased operation before infectious BW agents production began. Only a harmless simulant biological agent (Bacillus globigii or BG) was produced. The project was terminated and the plant was subsequently sold to

the Charles A. Pfizer and Company for commercial use.

By the end of World War II, a wide variety of disease agents effective against man, animals, and plants had been studied and limited field testing conducted. Extensive work on safety measures to perform BW research and development had been necessary as no comprehensive procedures, methodologies or equipment had been available at the start. Even so, infections occurred. These were later reported publicly in the extensive War Department press release on BW in January 1946. The release was the first notification to the nation and the world of United States work in BW. It reported, in part, that:

> "In all work on biological warfare carried on in the United States, extreme care was taken to protect the participating personnel from infection. Many new techniques were devised to prevent infection and proved highly successful. Hospitals and dispensaries were maintained at all installations, staffed with both Army and Navy personnel and were equipped to treat accidental infections. As the result of the extraordinary precautions taken, there occurred only sixty cases of proven infection caused by accidental exposure to virulent biological warfare agents which required treatment. Fifty-two of these recovered completely; of the eight cases remaining, all are recovering satisfactorily. There were, in addition to the sixty proven cases, 159 accidental exposures to agents of unknown concentrations. All but one of these received prompt treatment and did not develop any infection. In one instance, the individual did not report exposure, developed the disease, but recovered after treatment."

Although remarkable achievements were made, the potential of BW had by no means been completely measured; and Mr. Merck in his final report to the Secretary of War recommended that the program be continued on a sufficient scale to provide an adequate defense. A summary of accomplishments stated in the report are shown at Annex A.

Chapter 2

Research and Planning Years After World War II (1946-49) (U)

Responsibility and Authority

When World War II ended, the CWS had as its major mission preparedness for CW and BW in the context of a policy of retaliation only. The BW program of the Chemical Corps was justified annually to Congress along with other Army programs. During the hearings in 1946 before the Subcommittee of the Committee on Appropriations, House of Representatives, on the Military Establishment Appropriations Bill for 1947, the Chief Chemical Officer discussed the BW program including the accomplishments applicable to public health and welfare and the potential effects of biological warfare. In the 1947 hearings to the same subcommittee, a question was raised as to why the Chemical Corps should be retained as a separate branch of the Army. General Waitt defended its retention on the basis of its past contributions and the future need for its technical military expertise. This issue was seriously debated in the Army at that time and was resolved in favor of continuing the separate Army Chemical Corps. A summary of the extent to which Congress was aware of the BW program is at Annex B.

With the establishment of the Office of the Secretary of Defense (OSD) in 1947, overall technical direction of the BW R&D program was vested in the "Research and Development Board" of OSD which was constituted at the same time. The Board had a Committee on Chemical and Biological Warfare which carried out this responsibility. The Committee consisted of a full-time three man executive staff and eminent consultant members from science, industry and government.

The authority channel of management control was from the Secretary of Defense through the War Department (renamed the Department of the Army) to the Chief Chemical Officer and on to Camp Detrick. Military command at Camp Detrick was limited to administration of the installation service and support activities; direction of the technical program in the laboratories was the assigned responsibility of the Technical Director. Both the Commanding Officer and Technical Director were under the Chief Chemical Officer.

Scope of BW Program

The BW work was primarily confined to Camp Detrick with a small number of contracts in universities and industry. Activities were concentrated on BW agent research and defensive aspects; some applied research on dissemination devices; the collation and digestion of the large scale R&D effort carried out during World War II; and the formation of sound research and development program frameworks. The research and development program is discussed in more detail in Annex C.

In response to concerns about the vulnerability of the United States to covert attack, the Research and Development Board, OSD, requested its Committee on BW to consider the implications of BW in sabotage in extension of a study by a Special "Ad Hoc Panel on Sabotage." In October 1948, the Committee submitted a "Report on Special BW Operations" concluding that: BW was well adapted to subversive use; U.S. was particularly susceptible to attack by BW operations which presented a grave danger, and the current BW R&D program did not meet the requirements to defend against subversive BW operations. The Committee provided a blueprint on goals, objectives, organization, and examples of projects. One of their defensive project examples was conduct of vulnerability tests on " . . . test ventilating systems, subway systems,

and water supply systems with innocuous organisms . . .". Their recommendations were subsequently approved and became the genesis of open air vulnerability tests and covert R&D programs conducted by the Army, some of which were in support of the Central Intelligence Agency (CIA). As a result of the study recommendation a Special Operations (SO) Division was established at Camp Detrick, MD in May 1949.

While most of the BW R&D program concentrated on the antipersonnel aspects of BW, there are also smaller programs in antianimal and anticrop BW as outgrowths of the World War II effort. The antianimal program was closely linked to the antipersonnel program since certain diseases produced effects in humans and animals, and the scientific disciplines involved are identical or very similar. The anticrop R&D program differed significantly in that agricultural sceintific disciplines were required. Additionally, the anticrop program at Camp Detrick also included R&D on chemical substances which could be used against plants for either defoliation or crop destruction. The latter was considered CW but was performed at Camp Detrick as a matter of scientific economy. As with the antipersonnel R&D programs, the antianimal and anticrop activities were heavily research oriented during this period.

From the end of World War II until 1950, no production was carried out for purpose of operational readiness and no facilities were available for such work. Laboratory scale research and pilot plant development proceeded as a natural extension of the research programs. New facilities for pathogenic BW agent pilot plant production were also planned during this period. (Annex C and D).

Testing

At the end of World War II, all the field test sites with the exception of Dugway Proving Ground, were abandoned and the primitive Granite Peak BW

test site at Dugway Proving Ground, Utah was inactivated. Pathogenic agent testing at Camp Detrick was confined to closed laboratory size chambers and was directly related to agent evaluation and medical defensive aspects. In this period, no control experimentation on humans had yet been conducted at Camp Detrick even though such experimentation was an acceptable practice in the development of vaccines within the U.S. medical community. Small scale outdoor testing with two biological simulants (BG, a spore forming microorganism; Serratia marcescens, a vegetative organism commonly referred to as SM) and inert material such as talc, were conducted at Camp Detrick. These materials were considered to be totally harmless by scientific and medical experts. In 1949, construction of an enclosed one million liter test sphere (the largest in the world) was built at Camp Detrick and BW explosive munition tests with pathogens were started.

The first open air sea tests with biological simulants were conducted in 1950 aboard U.S. naval ships in the Atlantic Ocean off Norfolk, VA. Simulant clouds were released to envelop ships so as to assess their vulnerability and to test prototype BW electronic detection devices. Annex E provides a chronological listing of the open air tests conducted and Annex F discusses some of the tests which have appeared in the news recently.

Open air testing of infectious biological agents was considered essential to an ultimate understanding of BW potentialities because of the many unknown factors affecting the degradation of microorganisms in the atmosphere. However, the primitive test experience in World War II, revealed that too little was known on how to assure absolute control of infectious organisms in the open air from a safety and environmental

standpoint. Safety and medical aspects in BW R&D as well as testing were always of overwhelming concern; and adequate safety procedures and controls had to be operative prior to the initiation of any new R&D BW projects. Annex G summarizes the BW safety program.

Support to Other Government Agencies

In addition to its internal BW technical work, the Army provided what was tantamount to "contract services," to other military services and government agencies since it had the most comprehensive and largest BW program. From its formation, the mission of SO Division was to carry out research on potential methods of enemy covert BW attack and also to assess the BW implications of the growing concern about sabotage in the cold war. Activities of SO Division in support of CIA were investigated and recorded in the 1975 Report of the Hearings in September 1975 before the Senate Select Committee, chaired by Senator Church, to study Governmental Operations with Respect to Intelligence Activities and, therefore, will not be discussed in detail in this report.

Program and Policy Reviews

The military significance of BW and the need for a BW program were constantly reviewed at the highest levels of OSD between 1948 and 1950. In July 1948, a comparative study of BW, CW and radiological warfare (RW), was made by the Research and Development Board at the request of the Joint Chiefs of Staff (JCS). Subsequent studies were made periodically to evaluate comparative military aspects, time to accomplish R&D, system costs and technical feasibility. In March 1949, the Secretary of Defense

established a committee to report on the status of the BW program. The committee report in July 1949 indicated that the U.S. BW defense posture needed improvement.

The general United States policy for use of CBR warfare, i.e., only in retaliation against its use by an enemy, was reevaluated at the highest military and civilian levels in 1949. This culminated in February 1950 when the President approved continuation of the retaliation only policy.

In October 1949, at the direction of the Secretary of Defense, the Research and Development Board established an Ad Hoc Committee on CBR Warfare to investigate all the technical and strategic aspects of the subject.

In June 1950, after extensive research, the Committee submitted a report recommending changes in CBR weapons policy, establishment of a BW production facility, that field tests of BW agents and munitions be conducted, and all aspects of BW research programs be expanded.

Chapter 3

Expansion of the BW Program During the Korean War (1950-53)

Attainment of BW Retaliatory Capability

At the onset of the Korean War on 25 June 1950, the report of the Ad Hoc Committee on CBR Warfare was under review by the Secretary of Defense. The Korean War spurred efforts to again develop a BW retaliatory capability based on the ominous threat of USSR involvement but there was reluctance to publicize the program.

On 27 October 1950, the Secretary of Defense formally approved all of the Ad Hoc Committee on CBR Warfare recommendations except one relative to changing U.S. BW retaliatory policy, and directed their implementation. The U.S. Army Chemical Corps assumed prime responsibility for carrying out the Committee recommendations. The Army was authorized to construct a BW production facility at Pine Bluff Arsenal (PBA, near Pine Bluff Arkansas). Design of the facility was accelerated and ground was broken in February 1951.

The first limited BW retaliatory capability was achieved in 1951 when an anticrop bomb was developed, tested and placed in production for the Air Force. Anticrop Agent production sites were carefully selected for safety with the coordination and approval of the U.S. Department of Agriculture.

Expanded Program

The BW test program was also accelerated in this period. (Annex E). In late 1949, vulnerability tests with simulants were started in response to the Report on Special BW Operations which pointed out the U.S. susceptibility to covert BW attack. The first large area vulnerability test

was conducted in San Francisco Bay in September 1950 using the simulants BG, SM and fluorescent particles. (Annex E). Small scale pathogenic field testing at Dugway Proving Ground was resumed in 1950 after a five year lapse and expanded in 1951. (Annexes H and I). The first antianimal BW test was conducted in July 1951 at Eglin Air Force Base, Florida. In 1954, the antianimal BW program was discontinued because it was concluded that it lacked military worth. This is covered in more detail in Annex C.

In September 1951, the JCS assigned priorities to the Army for the development of specific BW agents. Also, the state of CBR readiness was reviewed by the Secretary of Defense in November 1951 with the conclusion that a higher degree of readiness and more manpower was required in the development of CW and BW munitions. A directive to improve CBR readiness was issued to all elements of the Defense Department on 21 December 1951.

In early 1952, the Pine Bluff Arsenal BW antipersonnel agent plant was 40 percent complete (Annex D) and the total cost was estimated at $69 million. Production was scheduled for October 1952 but did not begin until December 1953. Production readiness to meet estimated requirements was achieved in the spring of 1954. The final total cost of the plant was $90 million.

Major research facilities to support the expanded BW R&D program were constructed at Camp Detrick and in 1953 over $10 million worth of laboratory and pilot plant facilities were completed.

With the expansion of the BW retaliatory program, there was also an increase in the defensive work, e.g., the research program in protection against BW was almost doubled in 1952. Much data were developed in

personnel protection, decontamination, and immunization. Early detection research was started but progress was also because of the complexity of the technical problem.

The preceding acceleration actions during the Korean War were, in part, caused by the concerns of the field commanders. They became very apprehensive over the possibility of the enemy initiating CW and/or BW because of the intensive propaganda campaign accusing the U.S. of using BW. It was recommended that the United Nations Forces should maintain retaliatory capabilities and defensive preparedness in CW and BW.

Readiness

In response to the December 1951 DOD Directive to improve CBR readiness, the Secretary of the Army established a committee to evaluate Army efforts in CW and BW. The resulting report indicated a need to improve management of the CW and BW effort by reorganizing to separate BW and CW elements on a vertical basis. The report was reviewed by a panel of General Officers. The panel supported the basic thrust of the Committee and proposed "Contractor operation" of the BW program with a small government management staff for supervision, paralleling the AEC management approach. As a result, an Assistant Chief Chemical Officer for BW was appointed in the early fall of 1953 and the BW elements of the Chemical Corps were consolidated under him in October 1953. This action was a preparatory measure prior to signing a contract with a large commercial chemical firm. In late December 1953, while final negotiations were in progress with representatives of the contractor, the firm advised that they no longer wanted to contract operate the program and withdrew from further participation. The BW program was then continued, as reorganized, with government personnel.

In June 1953, a month before the Korean War ended, The Secretary of Defense, expressed concern over the state of CBR readiness and stated that each Service, singly or in combination, should be prepared to employ CBR weapons when directed. After a review of the Services' capabilities, it was concluded that BW capabilities were, indeed, limited for a variety of reasons but primarily by knowledge gaps in the biological sciences.

Chapter 4

Cold War Years - Reorganization of Weapons and Defense Programs

(1954-1958) (U)

Continuation of Technical Programs

As previously described, by the end of the Korean War in July 1953, construction of the BW production plant at Pine Bluff Arsenal (PBA), was nearing completion. Production of hardware for antipersonnel BW agent cluster bombs began early in 1953 and by the end of the year had been delivered to PBA for filling to support Air Force requirements. In December, the plant entered the shakedown test phase with pathogenic organisms. It became operational in the spring of 1954 with the first production of Brucella suis (the causative agent of undulant fever). Large scale production of the lethal agent Pastuerella tularensis (tularemia) began a year later.

The growth of BW R&D capabilities continued at Fort Detrick. Between August 1954 and July 1958, an additional $15.6 million worth of laboratory construction was completed. Safety continued to be of major concern, particularly where shipment of larger quantities of BW agent were contemplated. (Annex J). In January 1955, and continuing until December 1958, the vaccine research program at Fort Detrick was supplemented by a major contractual effort at Ohio State University Research Foundation. The program included the use of human volunteers. (Annex K).

Policy Revision

A thorough review of the basic U.S. policy of "retaliation-only" with CBR warfare was precipitated in May 1954 by the Chief of Staff of the Army. The question of CBR policy was ultimately referred to high level

national security advisors. Based on Soviet military doctrine expressed by Marshal Zhukov in a speech to the 20th CPSU Congress on 20 February 1956, and repeated three days later by the Commander-in-Chief of the Soviet Navy, our national policy was realigned. The Soviet pronouncements clearly stated the tenet that CW and BW weapons would be used for mass destruction in future wars. In 1956, a revised BW/CW policy was formulated to the effect that the U.S. would be prepared to use BW or CW in a general war to enhance military effectiveness. The decision to use BW or CW would be reserved for the President.

Special Studies

In May 1958, the JCS again reviewed the BW and CW situation at the request of the Secretary of Defense and concluded that progress on offensive BW and CW was slow because of budget limitations. While the Air Force has some capability, Army offensive BW systems were still under development. Although there was a firm military requirement for CW and BW defense materiel, defensive capabilities were not effective because of technical difficulties.

In December 1958, a BW/CW Symposium was convened by the Defense Science Board at the Headquarters of the Rand Corporation. This symposium examined the military and political impact of BW and resulted in recommendations that the Secretary of Defense acquaint the JCS of the results of the symposium, develop weapons requirements, increase the CW and BW research effort, develop weapons systems use doctrines, and attempt to gain public acceptance and support for BW and CW weapons systems.

The Defense Science Board approved the conclusions and recommendations resulting from the symposium and forwarded them to the Director of Defense Research and Engineering (DDR&E). The recommendations were sent to the JCS with the report, and an Ad Hoc Committee on Biological and Chemical Warfare was established to prepare a research, development, test and evaluation program based on the recommendations.

Chapter 5

The Limited War Period - Expanded Research Development, Testing and Operational Readiness (1959-1962) (U)

Program Definition and Expansion

In mid-1959, the DDR&E briefed the Secretary of Defense on the potentialities of CW and BW and recommended a 5-fold expansion of the RDTE effort over a five year period. The Secretary of Defense sought advice on expanding the CW/BW weapons program and asked that employment doctrine be identified. He was advised that present retaliatory capabilities were out of date and needed modernization; a U.S. operational capability should be maintained as a deterrent; U.S. forces must be capable of operating in a toxic environment; an increased RDTE program directed to qualitative operational requirements was needed, and the Service Chiefs should be requested to identify qualitative operational requirements.

In late October 1959, the Chief Chemical Officer was directed by the Chief of Army Research and Development to prepare an expanded five year program. The DDR&E also revived the Army's anticrop program which had been phased out in 1957 because of the decreased interest of the Air Force, the prime user.

By the end of 1959, the Chemical Corps mission reached a height of emphasis unprecedented since WWII. The military Services were submitting requirements for BW munitions, which included dissemination means for artillery, missiles, drones, and other lesser weapon systems. (See Annex

C, Research and Development). To further the emphasis the Secretary of Defense set up a Biological and Chemical Defense Planning Board, to establish program priorities and objectives. The Board had eminent scientists, engineers, and R&D managers from industry, academia, and government. In the report of June 1960, the board recommended, inter alia, major emphasis in the BW retaliatory and defensive programs. The DDR&E approved the recommendations in August 1960 and the Services were directed to increase their funding to attain identified BW/CW objectives. The cold war years of possible direct nuclear confrontation (U.S. vs USSR) had been ameliorated by the Korean War which had been fought with conventional weapons. In about the same period, the Soviet Union was beginning limited harassment tactics, e.g., the closing off of highway access to Berlin, resulting in the Berlin airlift. The advent of limited war and small scale conflict evoked a need for weapons which could assist in controlling conflict with minimum casualties. Controlled temporary incapacitation, therefore, became an RDTE weapons objective, and CW and BW weapons offered the most promising technical possibilities. The BW program was then shifted to emphasize incapacitation.

In the summer of 1960, the CW/BW national policy of "preparedness for use at the discretion of President" which had been revised from "retaliation only" in March 1958 was revalidated. Congress became interested in CBR disarmament at about the same time and the Senate Subcommittee on Disarmament held hearings and published a report (See Annex B). Stimulated by this initiative, the Department of Defense conducted extensive studies through 1961, concluding that for the "time periods 1962-65 and 1965-70 no single

inspection procedure or combination of procedures were available that would offer a high level of assurance against militarily significant violation of BW arms limitations;" and that "there was no inspection procedure that would insure against clandestine use of these weapons."

An immediate major Defense thrust of the Kennedy Administration was a reassessment of BW/CW. In May 1961, the Secretary of Defense asked that the JCS: evaluate the potentialities of BW/CW, considering all possible applications; prepare a costed plan for development of an adequate BW/CW deterrent capability. This project was Number 112 of about 150 which the new Defense leaders were emphasizing. The JCS, using primarily the August 1960 report of the Defense Biological Planning Board and an Army Chemical Corps special submission, sent their study to Secretary of Defense McNamara in early June, accepting the Board's basic findings and generally supported additional emphasis. The JCS estimated that the cost for obtaining Secretary of Defense McNamara's complete spectrum BW/CW capability was about 4 billion dollars.

The Acceleration Plans

Within OSD, the JCS study was referred to the Director of Defense Research and Engineering for review prior to submission to the Secretary of Defense. The DDRE made a finite review of the JCS recommendations. Overall, he strongly concurred in the JCS view that these weapons had great potential; however, he felt that they could be considered operational only in the most limited sense and that the task of measuring their impact accurately still had to be done. The DDR&E recommended that his office, in cooperation with the JCS, come up with a phased approach for achieving the required capabilities.

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The Secretary of Defense accepted the JCS recommendations as modified by the DDRE and in July 1961; a DOD task group titled, "Project 112 Working Group" was set up by the DDRE, with Joint Staff and Service representatives. They then prepared a comprehensive plan for execution which was submitted in September 1961 to DDRE. The plan laid out precise tasks, target dates and assigned action. The lack of adequate field testing was also highlighted with the recommendation that a Joint Task Force (similar to the nuclear testing Joint Task Force) be established under JCS control, which would conduct service tests. Overall, the project resulted in large increases in U.S. Army BW programs, since the Army Chemical Corps was responsible for conducting BW agent research for all military Services.

Reorganization of Chemical Corps Functions

The Army Chief Chemical Officer was notified by the Office of the Deputy Chief of Staff for Logistics (DCSLOG) on 14 November 1961, that he was responsible for carrying out the major portion of Army Project 112 actions. At this juncture, the Chief Chemical Officer was under the direct jurisdiction of the DCSLOG with technical channels to other General and Special Staff elements of the Army, notably the Army Chief of Research and Development where the primary Army focal point for Project 112 was located. The Assistant Chief Chemical Officer for BW (established in 1953) was shortlived and had been abolished in 1954 when the new Chief Chemical Officer realigned the Chemical Corps to the traditional functional approach. With modest changes, it remained that way through 1961.

In 1962, the Army had a major reorganization which abolished the Chiefs of Technical Services to include the Chief Chemical Officer. His technical operating functions were integrated into the newly formed Munitions Command of the Army Materiel Command. Selected non-technical staff functions were assigned to a new office within the Office of the Deputy Chief of Staff for Operations (DCSOPS), with the Chief Chemical Officer as its Director, initially with a staff of 70. Within the Munitions Command, the BW program subsequently was centered at Fort Detrick which had operational control of BW production activities at Pine Bluff Arsenal. In 1962, BW testing was assigned to a separate Testing and Evaluation Command.

Program Accomplishments

The BW program in 1962 reflected the objectives established by Project 112. An anticrop weapons system for the Air Force resumed in 1962 with the production of agent. Within the increased program, $20.1 million was approved for modification and expansion of the production facilities at Pine Bluff Arsenal. The development of vaccines for Q fever and Tularemia enabled development work on Q fever and tularemia to proceed to standardization as BW agents. $2.3 million was authorized for procurement of broad spectrum antibiotics for BW casualties.

Deseret Test Center

As a result of Project 112, the Army activated a BW/CW testing organization in May 1962. Deseret Test Center (DTC) was established at Fort Douglas in Salt Lake City, Utah. It was authorized 227 military and civilian personnel and was jointly staffed and supported by the Army, Navy, Air Force, and Marine Corps. Liaison was maintained with the US Public Health

Service. Its mission, organization, and functions were approved by the Secretary of Defense. DTC was to coordinate the requirements for, plan, conduct, and evaluate testing of biological (and chemical) weapons and defense systems. While reporting through the Army Chief Chemical Officer and Army Chief of Staff, DTC had to obtain approval of the JCS for conduct of tests, to include materiel, personnel, and funds. In addition, review and approval by OSD (DDR&E) and the President (President's Scientific Advisory Committee (PSAC)) were required. The Secretary of the Army also participated since he submitted the proposed test programs to the Secretary of Defense on a parallel basis with the Army Chief of Staff submissions to the JCS. For example, on 21 August 1962, the Secretary of the Army provided recommendations with supporting detailed rationale for the DTC tests. Coupled with the Deputy Secretary of Defense approval of only part of the tests, these documents demonstrate the extreme care taken to assure the ultimate in safety, the highest level of review and approval, and appropriate government coordination. These reviews of proposed BW/CW tests focused on the need to place governmental controls on any experiment that could have adverse effects onthe environment; and precipitated a statement on national policy on 17 April 1963. This statement required that the President give prior approval for any scientific or technological experiments which might have protracted effects on the physical or biological environment. OSD implemented this policy on 30 April 1963 by issuing a DOD Instruction titled, "Large Scale Scientific or Technological Experiments," which spelled out precise controlling procedures.

Chapter 6

Adaptation of the BW Program to Counterinsurgencies -

The Vietnam War Years (1963-68) (U)

Technical Programs

Throughout the Vietnam War, the BW program was guided essentially by the requirements delineated in Project 112.

The overall emphasis in Defense programs during this period was on supporting the Vietnam War and the BW program was limited accordingly. The primary retaliatory BW efforts were directed toward meeting production requirements of antipersonnel and anticrop agents. Production facilities at Pine Bluff Arsenal were completed and between 1964 and 1967, the plant produced several different BW agents. Various types of BW munition hardware were delivered to Pine Bluff Arsenal, filled, and stored there. These munitions were never shipped anywhere, except for test purposes. Production of anticrop agent was accelerated in 1963 and continued until August 1969. Anticrop agent cultivating methods, originally developed at Fort Detrick, were subsequently refined under a contract beginning in 1963. The agent was subsequently produced and delivered to Fort Detrick at the termination of the contract in June 1966.

Chemical Herbicides

Based on the special scientific advisory efforts of the OSD Advanced Research Projects Agency to South Vietnam and supported by special funds provided by them, the United States Army and Air Force were requested to conduct chemical herbicide spray experiments in South Vietnam. The purpose was to determine their operational suitability for defoliation of jungle vegetation to prevent ambush along key travel routes, and for destruction of field crops grown by the insurgents in remote areas. The technical work

on the herbicides and dissemination devices was done by Fort Detrick personnel and the US Air Force provided aircraft and pilot support. These actions were not BW but some confusion resulted because Fort Detrick carried out the RDTE activities as a part of their overall scientific program. Subsequent U.S. introduction of herbicides operationally in 1963 and rapid increase in their use until termination in 1970, resulted in North Vietnamese accusations that the U.S. was using CW and Even BW. The impact of these actions on the U.S. ban of BW in 1969 are treated in detail in Chapter 7.

Incapacitating BW Agents

In 1964 RDTE on enterotoxins from bacteria of the Staphylococcus group, which causes severe short term incapacitation (known as food or ptomaine poisoning), had progressed to the point where development of weapon systems appeared feasible. As a result, work on this potential agent was accelerated. Enterotoxins are not living microorganisms and are not contagious in any way. They are complex chemical substances produced by microorganisms which can not be readily synthesized chemically; and were included in the Fort Detrick BW program as a matter of scientific economy, much like the chemical herbicides were part of the BW anticrop program. Staphylococcal enterotoxins were particularly attractive as agents because much less enterotoxin is required to produce incapacitation as compared to standard CW agents. President Nixon's statement in November 1969 did not specifically ban biological toxins and extensive discussion ensued on whether to include toxins in the U.S. declaration. The inclusion of toxins in the ban occurred in February 1970 and all Staphylococcal enterotoxin work stopped. The details of R&D, production, human volunteer testing, and field testing are in Annexes C, D, E and K.

Some living microorganisms, such as Q fever and VEE, were also considered but were not as desirable as toxins because of the concern about possible

spread, the predictability of effects on the target population, and available knowledge about their long term effects on the environment. Other associated programs were also carried out and are described in the annexes listed above. No serious consideration was given to their use in the Vietnam War although hypothetical analyses were made to assess their potential.

Defensive Programs

Defensive BW developments in this period emphasized rapid detection systems, extension of available vaccines and improved therapy and prophylaxis. Also, a test was conducted to determine the vulnerability of personnel in an urban subway system to covert BW attack. A series of trials were conducted in three major north-south subway lines in mid-Manhattan, New York City, in June 1966. A harmless simulant biological agent (BG) was disseminated within the subway tubes and from the street into the subway stations. The simulant data when translated into equivalent covert attacks with pathogenic agents during peak traffic periods indicated that large numbers of people could be exposed to infectious doses. With the need for increasing money to support the U.S. Army's increased involvement in the Vietnam War and the mounting efforts in the United Nations (UN) to achieve some type of disarmament agreement in CW/BW, the funding support of Army BW programs gradually dropped from $38 million in FY 66 to $31 million in FY 69 when President Nixon banned U.S. BW weapons. In FY 73, when the Army biological defense program had stabilized, the amount had dropped to $11.8 million.

Chapter 7

Disarmament and Phase Down (1969-72) (U)

Presidential Ban of BW

On 25 November 1969, President Nixon announced a major policy decision on the United States chemical and biological warfare program. With respect to CW, he renounced the first use of lethal and incapacitating chemicals and he stated that he would resubmit the Geneva Protocol to the U.S. Senate for ratification. With regard to the BW program, President Nixon renounced the use of lethal bacteriological (biological) agents and weapons and all other methods of biological warfare, and he directed the Defense Department to make recommendations for the disposal of existing BW weapons. He further stated that the U.S. would confine its biological research to defensive measures such as immunization and safety measures. Questions remained, however, on whether the policy applied to biological toxins. On 14 February 1970, a White House announcement extended the policy to biological toxins regardless of their means of production.

The Presidential announcement was culminated by several major reviews of U.S. policy concerning chemical and biological warfare by national security experts. However, as indicated in Chapter 6, the origin of the policy change dates from criticism of U.S. application of chemical herbicides and riot control agents in the Vietnam War beginning in the mid-60's. In addition, studies of a coordinated U.S. policy on BW and CW were initiated by the Defense Department and the State Department in October 1963. These studies continued into 1965. On 5 December 1966, the General Assembly of the United Nations passed a resolution for all States to observe the principles of the Geneva

Protocol of 1925. In December 1966, a recommendation was made that the United States should announce a policy of "no first use" of biological weapons but no action was taken.

United Nations Disarmament Efforts

International attention on chemical warfare was heightened in January 1967 by the reported use of toxic material in the Yemen Civil War. The effectiveness of the Geneva Protocol was questioned and there was considerable debate at the United Nations on the necessity to develop new instruments to extend the Geneva Protocol. A case was made by the United Kingdom to separate BW and CW to facilitate disarmament progress in this area. In 1968, the Eighteen-Nation Committee on Disarmament (ENCD) recommended that the Secretary General appoint a group of experts to examine the dangers to mankind represented by employment of CW and BW. The group was subsequently appointed following a UN General Assembly resolution to this effect on 20 December 1968. They met in February, April and June and submitted their report to the Secretary General of the UN in late June 1969. In July 1969, the Secretary General accepted the report and urged a halt to the development, production and stockpiling of all CW and BW agents and proposed elimination from the stockpile. He also appealed to all States to accede to the Geneva Protocol and to apply its provisions to all chemical and biological warfare agents. In November 1969, the World Health Organization submitted a separate report to the UN on the health aspects of chemical and biological weapons. Both reports emphasized the unpredictability, risk in, and lack of control of BW in a major military employment. At the UN, there was general agreement that no new instrument other than the Geneva Protocol was needed to preclude the use of CB weapons

but that a new agreement would be needed to prohibit their development, production, and stockpiling.

The UK continued to push for a separation of CW and BW and on 10 July 1969, they submitted to the Conference of the Committee on Disarmament (CCD)* a draft Convention for the prohibition of the development, production and stockpiling of bacteriological (biological) and toxin weapons. (The UK draft was revised to include toxins at the suggestion of the U.S. and was resubmitted on 18 August 1970.) The USSR submitted a competing disarmament Convention encompassing CW and BW to the UN General Assembly in September 1969. It was in this framework of international debate that President Nixon made his preemptive announcement of unilateral BW disarmament by the United States.

United States Demilitarization Program

In preparation for the President's announcement, the Department of the Army in August 1969, was directed to immediately cease all production of toxins and biological agents and filling of dissemination devices. Guidelines for BW demilitarization plans were formulated and plans were initiated for disposal of all antipersonnel agents and munitions at Pine Bluff Arsenal and all anti-crop material at Fort Detrick, Rocky Mountain Arsenal and Beale Air Force Base. The plans emphasized operational safety and control, total accountability for all materiel, and absolute verification of destruction in the form of incontrovertible data. The plans were reviewed extensively by Army experts and by U.S. Departments of Health, Education and Welfare; Interior; Agriculture; the Environmental Protection Agency; and appropriate state and local officials. Accompanying environmental impact statements were filed with the President's Council on Environmental Quality.

*On 26 Aug 1969, the Eighteen Nation Committee on Disarmament was renamed "The Committee on Disarmament (CD)" to reflect expansion of its membership. The name of the conference was changed accordingly.

Total destruction of DOD antipersonnel BW stocks and munitions was accomplished between 10 May 1971 and 1 May 1972. The facilities at Pine Bluff Arsenal were completely decontaminated and turned over to the Food and Drug Administration to become the National Center for Toxicological Research. Total destruction of DOD anticrop agents and decontamination of facilities at the three storage points was accomplished between 19 April 1971 and 15 February 1973.

The offensive BW experimental program was also terminated in 1969 with a complete inventory of all BW materiel at Fort Detrick and Dugway Proving Ground and destruction of all items except those essential to defensive BW research. The BW production facilities were decontaminated and assigned to the Army Health Services Command pending formal transfer to the National Cancer Institute (NCI). The NCI has performed work through a contractor at the former biological laboratories since 1972 under an interim agreement; final transfer should be completed in 1977. Finally, BW defense program management and operations were transferred to Edgewood Arsenal. Details of the BW demilitarization program are contained in Annex L.

Biological Warfare Convention and Geneva Protocol

In March 1971, while the U.S. BW demilitarization program was in progress, the East and West stalemate regarding separation of BW and CW weapons was broken and a mutually acceptable draft convention applied to BW alone was submitted to the General Assembly. The convention was approved by the Assembly in December, signed in Washington, London, and Moscow on 10 April 1972. Ratification by the U.S. Senate was delayed by their consideration of the Geneva Protocol and the question of adding herbicides and riot control agents to the definition of CW agents.

The question was resolved by President Ford in the latter part of 1974 when the Administration renounced as a matter of policy the first use of

of riot control agents and herbicides in war except under specific conditions of defense to save lives. The Senate approved both the Protocol and the Convention on 16 December 1974 and President Ford signed documents of ratification on 22 January 1975.

Chapter 8

The Biological Defense Research Program (1973-77)

Program Realignment

Since the President's ban on offensive BW in November 1969 (extended by the ban on biological toxins in February 1970), the Army has confined its BW technical program to demilitarization and to defensive development involving physical protection and medical procedures. The demilitarization programs have been discussed in the previous chapter and elaborated in Annex L.

On 1 April 1972, Fort Detrick was transferred from the U.S. Army Materiel Command (AMC) to the Office of The Surgeon General. As a result of the shift in ownership of Fort Detrick, the Analytical Science Office and the Biological Defense Materiel Division were transferred from Fort Detrick to Edgewood Arsenal, Maryland. On 1 July 1973, Fort Detrick and the U.S. Army Garrison was reassigned to the U.S. Army Health Services Command also under The Surgeon General. Civilian personnel, equipment and facilities of the Plant Sciences Directorate of Ft Detrick were transferred to the U.S. Department of Agriculture to continue the work on defense technology against crop disease in accordance with a PSAC recommendation.

The U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID)* located at Fort Detrick is the center of the Army's program on the medical aspects of BW defense. The physical defense program is conducted by the Biological Defense Group, with approximately forty personnel, assigned to the Directorate of Development and Engineering at Edgewood Arsenal. Field test support of the Edgewood Arsenal effort is provided by Dugway Proving Ground. Under an RDTE Project (Technical Assessment of Foreign Biological Threat), Dugway Proving Ground has the mission of examining the U.S. and its Armed Forces' vulnerability to biological attack. This function is

*Approximately 461 assigned personnel.

assigned to a total of seven analysts in the Studies Division who examine available intelligence reports, current laboratory research, and results of vulnerability testing with an overall assessment of these activities. Vulnerability assessments normally involve study and evaluation rather than laboratory R&D; however, simulant tests may be conducted when additional basic data is required.

Funding for the total RDTE effort has varied from $10.2 million in FY 73 to $14.4 million in FY 76. Most of the funds (approximately 65% of $14.1 million in FY 77) have been applied to The Surgeon General's medical defense programs.

Physical Defense Program

The Biological Defense Group has responsibility for basic research and development of biological detection and alarm devices, development of high volume aerosol sampling and collection equipment, as well as development and evaluation of devices, systems, methods, and protocols for physical protection and decontamination. The major thrust of the physical defense program during the 1972 to 1976 time frame has been towards the end item development of a Biological Detection and Warning System for the field Army.

The current program for basic research on biological detection has emphasized studies on remote detection concepts. This research has consisted of theoretical analyses of the feasibility for detecting micro-biological aerosol clouds in the atmosphere area scanning methods. No experimental studies have yet been conducted.

The hardware development program was accompanied and supported by an active program of system analysis to provide a logical basis for the

establishment of performance characteristics for the proposed systems. Studies included threat analysis, target analysis, field alarm array studies and the impact of detector arrays on casualty reduction, system logic studies, and related concept of use studies leading to a better definition of system requirements. Coupled with the detector development was the parallel development of a large volume field sampler which would be triggered by an alarm to collect a sample.

Exploratory development of biological agent decontamination continued throughout the 1972-77 period. A contract package was prepared for the exploratory development of a decontamination system for biological contaminated personnel, equipment, and enclosures. This would be a four year technical effort planned for FY77 through FY80.

Basic research in this area is directed at evaluating the concept of decontaminating microbiological aerosols with a counter-aerosol of a chemical disinfectant such as lactic acid.

In the area of physical protection, peripheral leakage tests on two new mask prototypes will be completed, and evaluation of the leakage characteristics and performance of individual and collective protection equipment under development for the Army will be continued.

Medical Research Program

The objective of the medical research program is the development of an effective, integrated medical defense against biological weapons and highly infectious agents. New and classical techniques in virology, immunology, and pathology are employed to develop methods for the early diagnosis, prevention and/or treatment of biological agent casualties, and rapid laboratory identification of BW agents as well as other extremely infectious diseases of importance in military operations. A major effort of research

is the development, production and stockpiling of vaccines that can be used by US military troops deployed anywhere in the world against known and potential BW agents. The only national resource for vaccine development of any magnitude for the US Armed Services, Merrill National Laboratories, is utilized for mass production of candidate vaccines. This multifaceted program utilizes the most efficient methods and technology for prevention and treatment, aerosol immunization, diagnosis, and vaccine production for BW agents and other militarily important highly infectious diseases.

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IN THE

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FOR RELEASE AT 7:30 P.M., EST. JANUARY 3, 1946

BIOLOGICAL WARFARE

REPORT TO THE SECRETARY OF WAR BY MR. GEORGE W. MERCK, SPECIAL CONSULTANT FOR BIOLOGICAL WARFARE

Note to the Editors: Intelligence reports of investigation conducted by Military Intelligence agencies in Japan after the occupation and received there after Mr. Merck had prepared his report to the Secretary of War show that Japan had made definite progress in biological warfare. From these investigations it is known that the Japanese Army fostered offensive developments in this field from 1936 until as late as 1945.

Intensive efforts were expanded by Japanese military men toward forging biological agents into practical weapons of offensive warfare. Modifications of various weapons developed through research in their laboratories were fieldtested at Army proving grounds where field experiments were also conducted in the use of bacteria for purposes of sabotage. These efforts were pursued with energy and ingenuity. While definite progress was made, the Japanese had not at the time the war ended reached a position whereby these offensive projects could have been placed in operational use.

There is no evidence that the enemy ever resorted to this means of warfare. Whether the Japanese Army could have perfected these weapons in time and would have eventually used them had the war continued is of course not known. However, defenses against biological warfare were the subject of an active research and development program in this country.

This report sets forth the combined efforts of American scientists and industry working with the armed forces and in cooperation with similar agencies in the United Kingdom and Canada to develop defenses to enemy attacks by biological warfare.

While the military developments cannot be disclosed in the interest of national security the research contributed significant knowledge to what was already known concerning the control of diseases affecting humans, animals and plants. Arrangements have been made whereby this information of value to humanity as a whole will be made available to the public from those sources responsible for the work. This will be accomplished through reports before scientific bodies, publication in scientific journals and other means by which advances in science and medicine are disseminated in peacetime.

Dear Mr. Secretary:

The military strength of a nation in war depends not only on the weapons which it actually brings to bear on the enemy but also on the thoroughness with which the nation prepares for all eventualities. This basic military doctrine was followed by the United States in waging war against the Axis.

A type of warfare that might have been employed in World War II - a potential avenue of attack by our enemies - was biological warfare. Biological warfare may be defined as the use of bacteria, fungi, viruses, rickettsies, and toxic agents from living organisms (as distinguished from synthetic chemicals used as gases or poison) to produce death or disease in men, animals, or plants. This type of warfare was not unknown in World War I, although it was employed only on a very limited scale. There is incontrovertible evidence, for example, that in 1915 German agents inoculated horses and cattle leaving United States ports for shipment to the Allies with disease-producing bacteria.

In the years between World War I and World War II a general interest in the possibilities of biological warfare was maintained by scientists and military men in many countries, and many came to believe that this type of warfare was possible or even probable in the future. As the inter-war period drew to a close, opinion in the United States as to the possibility of biological warfare was by no means united, but common prudence dictated to those responsible for the nation's defense that they give serious consideration to the possible dangers in this field. The counsel of those alert to the possible danger was formally brought to the attention of the War Department in the fall of 1941, whereupon Secretary Stimson promptly requested the National Academy of Sciences to appoint a committee to make a complete survey of the current situation and of future possibilities.

After careful study, this committee - known as the WBC committee - drew the conclusion in its report of February 1942 that biological warfare was distinctly feasible and urged that appropriate steps be taken for defense against its use. The report stated in part:

> "The value of biological warfare will be a debatable question until it has been clearly proven or disproven by experience. The wide assumption is that any method which appears to offer advantages to a nation at war will be vigorously employed by that nation. There is but one logical course to pursue, namely, to study the possibilities of such warfare from every angle, make every preparation for reducing its effectiveness, and thereby reduce the likelihood of its use."

With these conclusions before him, Secretary Stimson recommended to President Roosevelt the establishment of a civilian agency to take full charge of all aspects of biological warfare. Upon the approval of the President, the War Research Service with Dr. George W. Merck as Director was organized in the summer of 1942 and was attached to the Federal Security Agency. In the interests of efficiency, economy, and secrecy, War Research Service remained a small organization. It served primarily as a coordinating agency and drew on the facilities, personnel, and experience already existing in the Government and private institutions. Its recommendations were implemented by orders and directives issued by the various branches of the Armed Services, particularly the Medical Services of the Army and the Navy and the Chemical Warfare Service of the Army. Appropriate liaison was maintained with the Armed Services, the U.S. Public Health Service, the Department of Agriculture, and the Department of the Interior. Intelligence was obtained from the Army, the Office of Naval Intelligence; and public relations matters were handled in cooperation with the Bureau of Public Relations of the War Department, the Office of War Information, and the Office of Censorship. A Committee of prominent scientists -- known as the ABC Committee -- was set up by the National Academy of Sciences and the National Research Council to advise War Research Service on its special research problems.

The exchange of information on this subject which had been inaugurated some months before with the United Kingdom and Canada was continued and provision was made for the interchange of biological warfare personnel between the three countries.

The first major task undertaken by War Research Service was the development of defensive measures against possible biological warfare attack. Measures were taken in cooperation with the Armed Services to protect the supply of water, food, and milk on the mainland; in Hawaii, the Caribbean Area, particularly the Canal Zone; and finally all overseas theaters.

An extensive program for the collection of intelligence on biological warfare was established, making use of the intelligence collection agencies of the Armed Forces, the OSS, and the FBI, and arrangements were made to send specially trained intelligence officers into operational areas to stimulate the collection of intelligence on biological warfare.

The major achievement of War Research Service, however, was the organization of a program of research and development to extend the boundaries of knowledge concerning the use of pathogenic agents as a weapon of war and the means of protection against possible enemy use of these agents. All known pathogenic agents were subjected to thorough study and screening by scientists of the highest competence in their respective fields to determine the possibilities of such agents being used by the enemy. Those disease-producing agents which seemed to offer some promise were assigned to various university and private research laboratories for

intensive experimentation to determine their lethal properties, means of production, and methods of protection against their use. As the program progressed, however, it soon became clear that exhaustive investigations of biological warfare agents, their use as weapons, and means of protection against them could not be achieved without larger scale developmental operations.

In November 1942 War Research Service requested the Chemical Warfare Service of the Army to prepare to assume responsibility for a larger scale research and development program involving the construction and operation of specially designed laboratories and pilot plants. The site chosen for these facilities was at Camp Detrick, Frederick, Maryland, where construction was begun in April 1943. When these facilities were put into operation, research projects which had been developed under sponsorship of War Research Service were turned over the Chemical Warfare Service for further development at Camp Detrick. War Research Service continued to exercise general supervision over the entire field and continued to sponsor fundamental research studies in universities and private institutions and to help secure scientific personnel and equipment for the Camp Detrick operations.

In December 1943, the Office of Strategic Service reported to the Joint Chiefs of Staff that there were some indications that the Germans might be planning to use biological warfare agents. While the evidence that the Germans might use such agents was inconclusive, there was considerable concrete information available from work which had been carried on in the United States, the United Kingdom and Canada that attack by biological agents was feasible. Accordingly, it was decided in January 1944 to step up all work in this field, particularly in terms of the protection of troops against possible enemy use of these weapons, and to transfer a large part of the responsibility for the biological warfare program to the War Department. The complete transfer was accomplished by direction of the President in June 1944 when the Chemical Warfare Service was made responsible for the program in the War Department with the cooperation of the Office of the Surgeon General on certain important defensive phases. The Navy Department continued to make important contributions to the program and continued to work in close collaboration with the War Department in this field. The research and development program was greatly accelerated, although it was directed that no biological warfare agents should be produced in quantity without specific approval of the Secretary of War. In fact, no large stocks of these agents have ever been accumulated.

Upon assumption of the War Department of full responsibility in this field, the Secretary of War appointed the Director of War Research Service as his Special Consultant on Biological Warfare and established the United States Biological Warfare Committee, with Mr. Merck as chairman, to advise him on policy matters and to maintain close liaison with the British and Canadian groups concerned with biological warfare. This Committee was composed of representatives of the Chemical Warfare Service, the Office of the Surgeon

General, U.S. Army; Bureau of Medicine, U.S. Navy; Bureau of Ordnance, U.S. Navy; Army Service Forces; New Development Division, War Department Special Staff; G-2; and the Office of Strategic Services. A new Committee -- designated the BDF Committee -- was formed by the National Academy of Sciences and the National Research Council to advise the War Department on the scientific aspects of the subject.

At the height of its development, the Special Projects Division of the Chemical Warfare Service of the Army, which carried the main responsibility for the program after June 1944, had a total personnel, nearly 3900, of which some 2800 were Army personnel, nearly 1000 Navy, and nearly 100 civilian. The projects carried on by the Special Projects Division at its four installations were combined operations -- with Army, Navy, and civilian personnel working together in the closest cooperation. They worked under high pressure and the strictest secrecy. Their achievements have been most remarkable.

The first installation, established by the Special Projects Division in April 1943 was the parent research and pilot plant center in Maryland; the second, Field testing facilities established in the summer of 1943 in Mississippi; the third a plant designed for the investigation of larger scale production acquired early in 1944 in Indiana; and the fourth field testing facilities established in the summer of 1944 in Utah. Those installations were unique in many respects requiring, as they did, special designing to meet the completely new problems under investigation. The need for great precision and rigid safety requirements created many complex engineering problems. Special equipment had to be designed, constructed, and installed to handle processes never before exploited and on a scale of operation never before undertaken.

While it is not possible to reveal at this time the specific agents on which intensive work was done at those installations, the general nature of the problem and the type of information that was obtained in this field can now be told. It should be emphasized that while the main objective in all these endeavors was to develop methods for defending ourselves against possible enemy use of biological warfare agents, it was necessary to investigate offensive possibilities in order to learn what measures could be used for defense. It was equally clear that the possibility of retaliation in kind could not be disregarded in the event such agents were used against us. Accordingly, the problems of offense and defense were closely interlinked in all the investigations conducted. This is implicit in the discussion which follows.

A wide variety of agents pathogenic for man, animals, and plants was considered. Agents selected for exhaustive investigation were made as virulent as possible, produced in specially selected culture media and under optimum conditions for growth, and tested for disease producing power on animals or plants. Intensive investigations were conducted on many aspects of this field, including studies of how well various organisms of high disease-producing power would retain their virulence and how long they would remain alive under different storage conditions; biological, physical, and

chemical protective measures; the number of organisms required to produce infection; the effectiveness of antibiotics and chemo-therapeutic agents; the incubation period of various diseases; and the effectiveness of certain chemicals (or coagents) when used with pathogenic agents or toxins in influencing their disease producing powers. From these and other studies has come much new information which, when published in scientific journals, will make significant contributions to the advancement of knowledge. Extensive studies of biological and chemical agents which might have been used in attacking out-crops resulted in certain discoveries which will undoubtedly prove of great value to agriculture.

Studies were made of methods and means by which biological warfare agents might be employed against us. This involved not only the perfection of antisabotage measures -- information on which was made available to appropriate civilian and military authorities -- but also studies of the various types of munitions that might be employed for the dissemination of biological warfare agents. A strong intelligence program was instituted which operated very effectively in all theaters of operation with the result that a thorough knowledge of German activities in this field was also obtained. Similar investigations of Japanese activities (are now being) were conducted. When these investigations are completed it will be possible to evaluate fully the work carried on in this field by our enemies. All evidence to date indicates that the Axis powers were behind the United States, the United Kingdom and Canada in their work on biological warfare. It is also known that after early 1942 Germany obtained no information concerning United States activity in biological warfare, and that no serious leaks of information on this subject occured in this country. The intelligent and whole-hearted cooperation of the press and radio of the nation, working in conjunction with the Office of Censorship, helped very materially in this regard.

In all work on biological warfare carried on in the United States, extreme care was taken to protect the participating personnel from infection. Many new techniques were devised to prevent infection and proved highly successful. Hospitals and dispensaries were maintained at all installations, staffed with both Army and Navy personnel and well equipped to treat accidental infections. As the result of the extraordinary precautions taken, there occured only sixty cases of proven infection caused by accidental exposure to virulent biological warfare agents which required treatment. Fifty-two of these recovered completely; of the eight cases remaining, all are recovering satisfactorily. There were, in addition to the sixty proven cases, 159 accidental exposures to agents of unknown concentrations. All but one of these received prompt treatment and did not develop any infection. In one instance, the individual did not report exposure, developed the disease, but recovered after treatment.

Obviously none of these cases were brought about intentionally, and were not, therefore, "controlled" experiments, but in any event certain valuable information was obtained from their treatment, particularly with

regard to new antibiotics, chemotherapeutic agents, and immunizing procedures, which, but for those cases of accidental infection, could otherwise have been tested only on animals. Considering the variety of highly pathogenic agents handled, the scale of operations employed, and the relatively large number of people involved, the safety record of our biological warfare program is truly remarkable.

The activities of the United States in the field of biological warfare, undertaken under the good of necessity and aimed primarily toward securing for this nation and its troops in the field adequate protection against the possible use by our enemies of biological warfare agents, were carried on with that teamwork which has characterized so many of our efforts in wartime. The branches of the Army and Navy, many civilian scientists, university and private research institutions, and several Departments of the Government all worked together to the common end. This was a matter of great urgency, and many of the problems were unique and most complex. The objective was attained; adequate defenses against a potentially dangerous method of warfare were devised, the possibility of surprise from this quarter was forestalled. Apart from the military objectives attained, however, much information of great lasting value for human welfare was obtained. Unique facilities were established for research and experimentation on pathogenic agents on a scale never before possible. These facilities will be of inestimable value to future military and civilian biological investigations. In general terms, these were some of the more important accomplishments of the program:

1. Development of methods and facilities for the mass production of microorganisms and their products.

2. Development of methods for the rapid and accurate detection of minute quantities of disease-producing agents.

3. Significant contributions to knowledge of the control of airborne disease-producing agents.

4. Production and isolation, for the first time, of a crystalline bacterial toxin, which has opened the way for the preparation of a more highly purified immunizing toxoid.

5. Development and production of an effective toxoid in sufficient quantities to protect large scale operations should this be necessary.

6. Significant contributions to knowledge concerning the development of immunity in human beings and animals against certain infectious diseases.

7. Important advances in the treatment of certain infectious diseases of human beings and animals, and in the development of effective protective clothing and equipment.

8. Development of laboratory animal propagation and maintenance facilities to supply the tremendous number of approved strains of experimental animals required for investigations.

9. Applications of special photographic techniques to the study of airborne microorganisms and the safety of laboratory procedures.

10. Information on the effects of more than 1000 different chemical agents on living plants.

11. Studies of the production and control of certain diseases of plants.

Steps are being taken to permit the release of such technical papers and reports by those who have been engaged in this field as may be published without endangering the national security. It is important that this be done, for much of the information developed in the course of this undertaking will be of great value to public health, agriculture, industry, and the fundamental sciences.

III

While it is true that biological warfare is still in the realm of theory rather than fact, in the sense that it has not actually been used in military operations, the findings of the United States in this field along with the findings of groups engaged in similar work in the United Kingdom and Canada have shown that this type of warfare cannot be discounted by those of this nation who are concerned with the national security. Our endeavors during the war provided means of defending the nation against biological warfare in terms of its presently known potentialities, and explored means of retaliation which might have been used, had such a course been necessary. Although remarkable achievements can be recorded, the metes and bounds of this type of warfare have by no means been completely measured. Work in this field, born of the necessity of war, cannot be ignored in time of peace; it must be continued on a sufficient scale to provide an adequate defense.

It is important to note that, unlike the development of the atomic bomb and other secret weapons during the war, the development of agents for biological warfare is possible in many countries, large and small, without vast expenditures of money or the construction of huge production facilities. It is clear that the development of biological warfare could very well proceed in many countries, perhaps under the guise of legitimate medical or bacteriological research.

In whatever deliberations that take place concerning the implementation of a lasting peace in the world, the potentialities of biological warfare cannot safely be ignored.

Respectfully yours,

GEORGE W. MERCK
Consultant

Annex B

Congressional Awareness

World War II. The strict secrecy and urgency imposed during World War II (WWII) on the BW program prohibited public knowledge and resulted in only cursory Congressional review. However, key Congresaional leaders were kept generally aware of the program through Secretary of War Stimson and his consultant for BW, George W. Merck. At the end of WWII, an official report (an unclassified version of Mr. Merck's secret report to the Secretary of War) was released and published. This report, entitled "Implications of Biological Warfare," was included in a volume of U. S. Scientific Atomic Energy Information transmitted to the United Nations Atomic Energy Commission in June 1946 by Bernard M. Baruch, the United States Representative. Concomitantly, selective BW work was authorized for publication in scientific journals. During the period 1946 to 1972 over 1,600 scientific papers by Fort Detrick scientists were published in the open literature.

Post World War II. During the period 1946 to 1952, information on the BW program was provided to members of the House Armed Services Committee and the Defense Subcommittee of the House Committee on Appropriations. Because of the classified nature of the discussions, a number of the portions of the hearings are not reflected in the Congressional records. In the 1946 hearings the Chief Chemical Officer discussed the BW program in detail including accomplishments applicable to public health. In the hearings before the Defense Subcommittee of the House Committee on Appropriations for 1951, Mr. George M. Mahon, Texas, Chairman, reflected the view expressed at times by other Congressional members when he decried the "Change of our

policy last year in making public the work in field of biological warfare which we are undertaking. ... I regret that the Department of Defense is now making public the amounts of money which we are spending for biological warfare or that we spend money for such purposes ... I do not see that any useful purpose has been served." ...

Post Korean War. In hearings before the Defense Subcommittee of the House Committee on Appropriations for 1953, the record shows the need for an increased funding level to pay for new biological laboratories that were scheduled to begin operations in 1953.

With these actions and the need to justify funds for a continuing Army BW program, Congressional oversight was expanded to the level of scrutiny afforded other military programs having security implications and gradually extended to the point where special Congressional Committee comprehensive reviews were conducted starting in 1959. The House Committee on Science and Astronautics held a two-day hearing in June 1959 on Chemical, Biological and Radiological Warfare Agents, chaired by Congressman Overton Brooks and included, among others, Congressmen John W. McCormack, Joseph W. Martin, and Olin E. Teague. A study on CBR Warfare and Its Disarmament Aspects was prepared in August 1960 by the Subcommittee on Disarmament of the Committee on Foreign Relations of the United States Senate. The Chairman was Senator Hubert H. Humphrey and includes, among others, Senator John F. Kennedy and Senator Frank Church.

These special reviews augmented the annual Army budget justification submissions and testimony to the Congress in which the Army BW programs were specifically identified and were, at times, the subject of extensive discussion. In hearings before the Defense Subcommittee of the House Appropriations Committee in 1959, Congressman Robert L. F. Sikes, Florida, asked Secretary

n. Defense McElroy for a review of the chemical and BW programs because "they are both operating now on a meager basis." On 26 March 1958, Major General William M. Creasy appeared as a witness before the aforementioned subcommittee. General Creasy's testimony totals 20 pages in the Congressional Record and covers an extensive number of areas relating to the overall chemical and BW programs including the testing program and the necessity to use human volunteers. Budgetary requirements, public information needs, security aspects, offensive and defensive BW, and other areas of Congressional interest are reflected in hearings before the Subcommittee of the House and Senate Committees on Appropriations for 1959, 1960 (H.R. 7454), (Part 6), and 1961 (Part 6) (H.R. 11998, Part 2). Certain congressmen also maintain a continuing awareness as a result of regional and personal interest. For example, Senator Charles M. Mathias has had general knowledge of the Fort Detrick BW programs at Frederick, Maryland because of its location in his home town and his past participation in its U. S. Naval Reserve Unit as well as his constituency interests as the past District Congressman and subsequently as U.S. Senator. Key committee members also visited the installations involved in the BW program. In 1959, Representatives Norrel, Teague and Mahler toured the production facility at Pine Bluff Arsenal and received a classified briefing on its mission and operations.

Biological Ban. In early November 1969, the BW program again became the focus of Congressional scrutiny as 108 Members of Congress called upon the President to take actions to review chemical and biological warfare. On 18 November 1969, the House Subcommittee on National Security Policy and Scientific Developments of the Committee on Foreign Affairs started extensive hearings on United States policy with respect to chemical and

biological warfare. On 25 November 1969, President Nixon's statement banned U. S. use of BW and made a statement supporting a universal outlawing of BW. Since then Congressional review has been constant and at times intense. The policy reviews continued in 1971 with the Senate Committee on Foreign Relations hearings on the Geneva protocol.

In retorspect, all aspects of U. S. Army funded activities in the U.S. BW Program have been either reviewed or made known to the appropriate and designated elements of Congress. The only aspect which could be viewed as an exception was the technical work done by the U. S. Army for the Central Intelligence Agency (CIA). Under the authoritative "ground rules" enforced by CIA, this was their responsibility since they provided the funds. The same arrangement obtained with the other military Services and Federal agencies when they requested technical assistance from the Army in BW activities pertaining to their responsibilities.

In September 1975 the CIA connection with the BW program at Fort Detrick was thoroughly reviewed by the Senate Select Committee to Study Government Operations with Respect to Intelligence Activities. It was during these hearings that the question of BW vulnerability testing, including the New York subway tests, was raised by Senator Hart. Details of this aspect of the program are covered in the Senate Select Committee report.

Annex 6

Biological Warfare Research and Development

Introduction. Research and development of offensive and defensive aspects of BW was initiated shortly after the entry of the United States into WWII as a result of intelligence reports indicating an offensive capability by the Axis powers. As discussed in Chapter 1, responsibility for implementation of the R&D program was assigned to the Chemical Warfare Service (CWS) in November 1942 and construction of Camp Detrick, the principal BW R&D center, was initiated in April 1943. The research effort at Fort Detrick began eight months later under the Special Projects Division of the CWS. Fort Detrick remained the center of BW research and development and was aided by many academic and industrial agencies, until termination of the BW offensive program in 1969. (Appendix I) Scientists working at Fort Detrick published 1616 articles in scientific and technical journals.

BW Offensive Research and Development. The BW offensive program was concerned principally with antipersonnel and anticrop agents and associated delivery capabilities and to a much lesser degree with antianimal agents. Antipersonnel agent research covered a wide range of highly infectious pathogenic bacteria, rickettsial, viruses and fungi and extremely toxic products of biological origin (toxins). Research efforts were directed toward selection and preservation of the most virulent strains, establishing human dosages, enhancing storageability, and survival when released as an aerosol. Technology for large scale production of the most promising agents was developed. To assist production, development, and testing efforts, harmless simulant agents were selected and efforts expended to obtain improved simulants. During the twenty-six years of BW offensive

research, only eight antipersonnel agents were standardized.

Anticrop research at Fort Detrick concerned BW agents as well as CW agents, i.e., chemical herbicides and defoliants. The latter will not be discussed further as they were not part of the BW microbial program. Research on BW agents included strain selection, evaluation of nutritional requirements, development of optimal growth conditions and harvesting techniques and preparation in a form suitable for dissemination. Extensive field testing was done to assess the effectiveness of agents on crops. Many candidate anticrop BW agents were screened resulting in five standardized BW anticrop agents.

Research and development on BW munitions started by adaptation of burster type bombs available from the British and was extended to improved burster type munitions, submunitions, gas explusion bombs, various types of line source spray tanks and highly specialized projectiles and generators as well as insect vectors. In the early years, the research and development essentially paralleled the experience gained in the development of CW munitions during WWII. Research activities included optimizing configurations, testing performance and developing hardware production and filling technology.

Antianimal research began in 1942 and was initially concerned with developing methods for portecting our large livestock population against BW attack. This research resulted in the development of vaccines to protect against rinderpest, a deadly cattle disease and Newcastle disease, a serious poultry affliction. Research was carried out at Camp Detrick initially but when there was a need for larger scale research, a facility was established at Camp Terry on Plum Island, New York. Two field tests of potential antianimal agents were conducted using hog cholera virus and Newcastle

virus. The program at Camp Detrick was terminated in 1954. By agreement between the Secretary of Defense and the Secretary of Agriculture, the Department of Agriculture assumed responsibility for the defense of our livestock against BW attack, and the Plum Island facilities were transferred to that agency.

Defensive BW Research and Development. The biological defense program included safety, physical and medical protection. The safety program pervaded the entire BW research and development effort to provide protection of both employees and the surrounding community. The program included personnel and laboratory safety practices commensurate with the extremely hazardous agents involved, design criteria for site operating equipment and facilities, facility monitoring devices, and assessment of handling procedures for BW munitions.

The physical protection program was directed toward detection identification and warning systems, protective devices and decontamination methods. Detection and warning efforts started in 1948 have led to engineering development of a fast-response antipersonnel BW detector system which has not been standardized. At the present time, there is no field BW detector, and only conventional biological identification techniques are available. Research on protective masks, particulate filters, protective clothing and shelters was closely integrated with the chemical defense programs. Many compounds were screened for use as decontaminants and decontaminant dispensers were developed for field use. However, some chemicals which are the most effective decontaminants are also toxic and/or carcinogenic. Research in this area is continuing to find safer decontaminants.

R&D efforts on medical aspects of protection related to BW have been extensive throughout the history of the program and have involved close cooperative efforts between Army, USPHS, and other HEW agencies. Major accomplishments in this program include development of vaccines, rapid identification procedures and treatment methods which have been responsible for the excellent safety records.

Biological Defense Research Today. The current biological defense technology program is divided into two major areas: Detection and Warning Investigations and Decontamination and Protection. Effort in detection and warning is of an exploratory nature and is directed toward concepts, principles and approaches for rapid detection of biological aerosols and evaluation of candidate devices. Concepts under consideration include group specific immunological methodology, remote and/or area alarms, background interference elimination methodology and computerized pattern recognition techniques.

Decontamination and protection research is directed toward concepts, principles and approaches for the decontamination of biological materials, personnel protection and biological evaluation of other materiel under development. Concepts under consideration include anti-aerosol and protective cloud technology, decontamination agent generators, individual and group collective protectors, and a continuing chemical screening program for new less toxic vapor-phase decontaminants for closed spaces.

Throughout the research and development process, there is a requirement to test hypothesis and developmental equipment items. In the BW program, this necessitated the use of BW simulants and agents in a wide variety of tests.

Appendix I to Appendix C

FORT DETRICK RDTE TYPE CONTRACTS

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
Aerojet-General Corp.	29	Oct 1956	Jun 1958
		Apr 1958	May 1965
		May 1963	Aug 1963
		Jun 1963	Feb 1964
		Jun 1964	Sep 1966
		Sep 1964	Jan 1966
		Sep 1964	Oct 1965
		Jun 1959	Jun 1960
		Jul 1959	Jan 1960
		Feb 1966	Apr 1967
		Jun 1966	Aug 1967
		Mar 1962	Apr 1962
		Oct 1969	Nov 1969
		Nov 1965	Mar 1967
		May 1963	Dec 1965
		Jun 1964	Dec 1967
		May 1965	Apr 1968
		Apr 1967	Aug 1968
		Apr 1967	Sep 1969
		Nov 1967	Jul 1969
		Apr 1968	Feb 1969
		Apr 1968	Aug 1969
		May 1968	Jun 1969
		Nov 1968	Mar 1970
		Jan 1969	Oct 1969
		Jan 1969	Dec 1969
		Jan 1969	Mar 1969
		Mar 1969	Oct 1970
		Jun 1969	May 1970
Aeroprojects Inc.	9	Sep 1950	May 1951
		May 1951	Feb 1952
		Mar 1952	Aug 1953
		Jun 1955	Jul 1956
		Jul 1956	Apr 1957
		May 1957	Jun 1958
		Sep 1951	Feb 1953
		Nov 1952	Feb 1954
		Apr 1968	Jan 1970
Aerotec Corp	1	Jun 1955	Oct 1956
Agricultural Aviation Engr Corp	1	Mar 1963	Oct 1963
Agricultural Specialty Co	1	Jun 1963	Mar 1965

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
Aircraft Armaments, Inc	4	Oct 1951	Feb 1954
		May 1962	Feb 1963
		Jun 1963	Mar 1965
		Nov 1964	Mar 1965
AAI Corp	2	Jun 1966	May 1968
		Jan 1967	Apr 1968
AiResearch Mfg. Co.	2	Apr 1964	Sep 1964
		May 1965	Apr 1967
Allied Research Associates Inc.	1	Aug 1957	Jun 1958
Allied Chem. Corp.	3	Apr 1967	Jun 1968
		Apr 1964	Apr 1967
		Dec 1958	Jun 1959
Allied Helicopter Service, Inc.	1	Apr 1967	Sep 1967
Amchem Products, Inc.	1	Aug 1959	Jan 1961
American Cyanamid Co.	2	Apr 1964	Nov 1965
		Jul 1957	Jul 1958
American Institute of Crop Ecology	2	Jun 1963	Jun 1965
		Apr 1955	Dec 1957
American Type Culture Collection, Inc.	1	Jun 1964	May 1967
Ansul Chemical Co.	2	Mar 1967	Aug 1969
		Jun 1962	Dec 1963
American Type Culture Collection	1	Jun 1952	Jun 1953
Anstice Co., Inc	1	Jun 1951	Aug 1951
Applied Science Laboratories Inc.	1	Jun 1961	Jul 1962

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
Univ. of Arizona	2	Jun 1961 Jun 1963	Jul 1970 Dec 1965
Univ. of Arkansas	3	Sep 1954 Nov 1955 Nov 1956	Nov 1955 Nov 1956 Nov 1957
Armour Research Foundation of IIT	5	Nov 1951 Jun 1952 May 1953 Jun 1955 Jul 1955	Sep 1953 May 1954 Apr 1955 Dec 1955 Jun 1956
Arthur D. Little, Inc.	4	Apr 1950 Aug 1950 Jan 1951 Dec 1952	Mar 1951 Jun 1952 Sep 1952 Oct 1955
Associated Nucleonics, Inc.	3	Feb 1960 May 1961 Jun 1961	Dec 1960 Apr 1962 Aug 1962
Atlas Powder Co.	1	Nov 1966	Jul 1956
Auburn Research Fndn.	1	Mar 1953	Dec 1957
AVCO Corp.	5	Sep 1958 Jun 1961 Sep 1964 Jun 1968 Apr 1969	Sep 1959 Jun 1963 Jun 1967 Oct 1970 Jun 1970
Baltimore Biological Laboratory	1	Apr 1963	May 1966
Battele Memorial Institute	11	Apr 1952 Apr 1952 Mar 1953 Apr 1953 Jul 1954 Oct 1954 Jun 1956 Apr 1957 Dec 1962 Sep 1964 Jun 1965	Oct 1952 Mar 1954 Mar 1954 Mar 1954 Aug 1955 Feb 1956 Sep 1958 Jul 1958 Jan 1966 Feb 1966 Aug 1965
Baylor College of Medicine	1	Aug 1966	Jun 1972
Ben Venue Labs, Inc.	2	Sep 1953 Oct 1954	Jun 1954 Oct 1955

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
Beckman Instruments, Inc.	3	Feb 1966 Jun 1968 Nov 1968	Apr 1968 Nov 1969 Mar 1970
Bete Fog Nozzle, Inc.	1	Jun 1951	Jun 1952
Bendix Corp.	2	Jun 1962 Sep 1964	Jun 1964 Jul 1965
Bionetics Research Laboratories	2	Mar 1966 Jun 1967	May 1967 Sep 1968
Biosearch Co.	1	Feb 1962	Mar 1963
Bio-Search & Development Co.	1	Apr 1962	Sep 1963
Bjorksten Research Laboratories	1	Jan 1964	Jul 1965
Black Mfg. Co.	1	Jun 1951	Jun 1952
Booz-Allen Applied Research, Inc.	5	Feb 1957 Jul 1962 Apr 1963 Oct 1964 Oct 1965	May 1962 Sep 1962 Jun 1964 Oct 1965 Mar 1968
Boyce-Thompson Inst.	3	Jun 1963 Jun 1964 Oct 1968	Jun 1964 Aug 1965 Nov 1969
Brooklyn College	1	Mar 1960	Sep 1961
Bucknell Univ.	2	Apr 1952 Jul 1953	Jun 1953 Aug 1954
Buffalo Electro-Chemical Co., Inc.	1	Feb 1951	Dec 1951
State of California	2	Jul 1951 Jan 1953	Sep 1952 Dec 1953
Univ. of California	12	Apr 1950 Sep 1950 Mar 1951 Aug 1951 Aug 1952 Oct 1954 Jul 1962	Sep 1953 Aug 1951 Jul 1953 Aug 1952 Oct 1954 Oct 1955 Dec 1965

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
cont'd		Mar 1963	Dec 1963
		Mar 1964	Feb 1965
		Jun 1965	May 1966
		Jun 1966	Nov 1967
		Dec 1967	Nov 1968
Cambridge Technology, Inc.	2	Jun 1967	May 1968
		Jun 1967	Jun 1968
C-E-I-R, Inc.	1	Aug 1958	Mar 1959
Univ. Of Chicago	13	Jul 1955	Mar 1957
		May 1956	Sep 1963
		Oct 1950	Feb 1953
		Jun 1951	Jun 1953
		Dec 1951	Dec 1953
		Jun 1952	Jul 1954
		Jun 1952	Mar 1954
		Dec 1953	Dec 1956
		Aug 1962	Aug 1965
		Oct 1963	Oct 1964
		Nov 1964	Oct 1965
		Apr 1960	Apr 1963
		Mar 1966	Jul 1966
University of Cincinnati	5	Sep 1950	Sep 1951
		Sep 1951	Aug 1953
		Sep 1951	Sep 1953
		Apr 1953	Apr 1955
		Jun 1955	Jun 1956
Columbia University	1	Dec 1952	Jun 1954
Commercial Solvets Corp.	1	Apr 1963	Dec 1965
Continental Oil Co.	1	Sep 1962	Dec 1964
Control Data Corp. (Formerly C-E-I-R, Inc.)	2	Jun 1964	Feb 1968
		Jan 1968	Mar 1970
Cordis Corp.	1	Oct 1964	Oct 1965
Cornell Aeronautical Lab., Inc.	1	Oct 1960	Dec 1962
Cornell Univ.	2	Apr 1951	Mar 1953
		Apr 1953	Mar 1955
Cyclo Chemical Corp.	2	Jun 1964	May 1969
		Jun 1969	Dec 1970

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
Danielson Manuf. Co.	1	Mar 1953	Jun 1968
Daniel, Mann, Johnson & Mendenhall	1	Jun 1967	Jul 1968
Day & Zimmerman	1	May 1955	Oct 1955
DeBell & Richardson Inc.	1	Jun 1955	Dec 1957
Dorr-Oliver, Inc.	1	Aug 1962	Jul 1964
Doughnut Corp. of America	1	Dec 1952	Jan 1953
Dow Chemical Co.	5	May 1963	Aug 1964
		Jun 1967	Jun 1970
		Feb 1964	Jan 1966
		Nov 1958	May 1959
		Apr 1967	Dec 1967
Dry-Freeze Corp.	2	Feb 1951	Sep 1951
		Mar 1952	May 1952
Duke Univ.	5	May 1951	May 1954
		May 1951	May 1953
		May 1954	Jun 1956
		Jun 1956	Feb 1964
		Feb 1964	Dec 1968
Allen B. DuMont Labs, Inc.	2	Jun 1953	Mar 1956
		Mar 1954	Mar 1956
Edo Corp.	1	Jun 1964	Sep 1965
Emory Univ.	1	Dec 1954	Jun 1957
Everedy Co.	1	Mar 1951	Feb 1952
Environmental Rsch. Corp.	2	Jun 1967	Sep 1968
		Jun 1967	Jan 1971
Ethyl Corp.	1	Jun 1962	Jun 1966
Fairchild Engine & Airplane Corp.	1	Aug 1959	Jan 1960
Fairchild Stratos Corp.	4	Aug 1962	Apr 1964
		Jan 1964	Apr 1964

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
cont'd		Apr 1960	Jun 1961
		Jul 1961	Sep 1961
Falcon Plastics	1	Dec 1958	Jun 1959
Farrand Optical Co.	2	Jun 1956	Apr 1958
		Dec 1957	Sep 1958
Fawn Plastics Co., Inc	1	Mar 1961	Aug 1962
Fletcher Enamel Co.	1	Dec 1950	Dec 1951
Univ. of Fla.	6	Jun 1956	Jun 1957
		Jun 1955	May 1956
		Jun 1963	Jun 1965
		Jun 1968	May 1970
		Apr 1952	May 1954
		Jan 1953	Sep 1953
Florida State Univ.	3	Mar 1951	Sep 1951
		Sep 1951	Jun 1953
		Jul 1953	Jun 1956
FMC Corp.	4	Jun 1964	Dec 1965
		Jan 1965	Jun 1967
		Jun 1966	Mar 1967
		Sep 1969	Feb 1970
Fordham Univ.	2	Mar 1966	Feb 1967
		Jan 1965	Feb 1966
Fostoria Presses Steel Corp.	1	Jul 1966	Mar 1956
Foundation for Research on the Nervous System	2	Dec 1963	Apr 1968
		Apr 1968	Oct 1969
Franklin Electronics, Inc.	1	May 1966	Jun 1966
Franklin Inst.	2	Jun 1968	Jan 1970
		Apr 1969	Oct 1970
Gelman Instrument Co.	1	Apr 1964	Apr 1969
General American Transp. Co.	2	Oct 1961	Jun 1966
		Jun 1962	Jan 1963
General Aniline & Film Co.	1	Jun 1963	Oct 1964
General Dynamics Corp.	1	May 1955	Apr 1956
General Electric Co.	5	Nov 1960	May 1961

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
cont'd		May 1963	Jul 1963
		Jun 1963	Dec 1964
		Sep 1963	May 1964
		Feb 1966	Dec 1967
General Mills, Inc.	7	Apr 1950	Jan 1951
		Jul 1950	Dec 1950
		May 1952	Jun 1954
		Dec 1952	Nov 1955
		Dec 1955	Dec 1957
		Aug 1956	May 1957
		Nov 1956	Nov 1957
George Washington Univ.	2	Nov 1952	Apr 1956
		May 1956	Mar 1959
Georgia Tech Rsch Inst.	5	Jun 1950	Jun 1951
		Jun 1951	Jun 1953
		Mar 1953	Jun 1954
		Jun 1954	Jun 1955
		Jun 1956	Jun 1957
B. F. Goodrich Co.	2	Jul 1953	Aug 1954
		Jan 1955	Jan 1956
Grinnell Co., Inc.	1	Jan 1954	Nov 1958
Hahn E. Mann Medical College & Hospital	2	Oct 1953	Jan 1954
		Nov 1954	Apr 1956
Harvard College	5	Jul 1951	Sep 1952
		Jul 1949	Aug 1961
		Aug 1951	Jun 1955
		Sep 1955	Aug 1956
		Jun 1963	Sep 1968
Hawaii, Univ. of	2	May 1967	Jun 1968
		Jun 1968	Jun 1970
Henry Ford Hospital	2	Jul 1951	Jul 1952
		Oct 1952	Jul 1953
Hills-McCanna Co.	1	Jan 1957	Jan 1958
Holmes & Narver, Inc.	1	Jun 1968	Nov 1969
Honeywell Regulator Co.	5	Jan 1955	Dec 1956
		Jun 1955	Apr 1957
		Feb 1957	Apr 1958
		Jun 1961	Nov 1962
		Dec 1961	Apr 1962

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
Hooker Chemical Corp.	1	May 1964	Aug 1965
Hyland Labs, Inc.	1	Jun 1964	Feb 1966
IIT Research Inst.	10	Sep 1962	Jan 1963
		Nov 1962	Jul 1966
		Jun 1955	Dec 1956
		May 1963	Jun 1964
		May 1964	Feb 1967
		May 1965	Feb 1965
		Feb 1958	Sep 1962
		Feb 1963	Apr 1965
		May 1965	Sep 1966
		Jan 1966	Aug 1970
Illinois, Univ. of	7	Oct 1950	Dec 1951
		Jun 1951	Jun 1954
		Sep 1952	Jun 1956
		Apr 1956	Dec 1957
		Jun 1959	May 1960
		Oct 1963	Jan 1967
		Jun 1966	May 1968
Indiana, Univ. of	4	Mar 1953	Apr 1955
		May 1951	Apr 1953
		Apr 1963	Mar 1966
		Sep 1964	Mar 1966
Industrial Corp.	1	Jun 1962	Apr 1963
Insect Control & Rsch, Inc.	3	Jun 1964	Jun 1966
		Oct 1963	Jun 1964
		Dec 1960	Sep 1963
International Business Machines	1	Jun 1968	Mar 1969
Internation Minerals & Chemical Corp.	2	Sep 1966	Jun 1968
		May 1964	Jun 1965
Bioferm, Inc.	3	Dec 1962	Nov 1963
		Mar 1963	Apr 1963
		Nov 1963	Nov 1963
Iowa State College of Agric.	6	Jan 1949	Jan 1951
		Jun 1950	May 1952
		Jul 1951	Jul 1953
		Dec 1951	Jun 1953
		Sep 1954	Jun 1956
		Jun 1952	May 1954

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
John Hopkins Univ.	12	Jul 1955	Feb 1963
		Mar 1956	Sep 1958
		Jun 1950	Jul 1951
		Mar 1951	Aug 1953
		Apr 1951	Oct 1952
		Aug 1951	Oct 1952
		Oct 1952	Oct 1954
		Nov 1952	Oct 1953
		Mar 1953	Mar 1955
		Apr 1955	Mar 1956
		Apr 1963	May 1971
		Jun 1965	Jun 1970
S. C. Johnson & Son, Inc.	1	Sep 1960	Nov 1962
Kansas State Univ. of Agric. & Applied Science	5	May 1956	Jun 1958
		Dec 1962	Jul 1963
		Oct 1959	Aug 1960
		Aug 1960	Aug 1961
		Sep 1961	Sep 1962
Univ. of Kansas	4	Apr 1949	Jun 1951
		Jul 1951	Jun 1952
		Jun 1952	Jun 1953
		Jul 1953	Jun 1954
Duane Kennedy Co.	1	Jul 1959	Jul 1960
Kent Manuf. Corp.	1	Apr 1950	Mar 1951
Kentucky Research Fdn.	1	May 1954	Jun 1956
Walter Kidde & Co., Inc.	1	Jan 1955	Apr 1958
Knapp-Monarch Co.	1	Sep 1952	Aug 1953
Kuljian Corp.	1	Nov 1954	Mar 1956
Lambert Pharmaceutical Co.	1	Jun 1950	Jun 1951
Lehigh Univ.	1	Jan 1953	Dec 1953
Litton Systems, Inc.	14	Jun 1960	Sep 1965
		Nov 1962	Feb 1964
		Mar 1964	Nov 1965
		Sep 1964	Jan 1966
		May 1965	Oct 1965
		May 1965	Jan 1966
		Jun 1965	Sep 1965
		Mar 1966	Apr 1966
		Apr 1966	Jul 1966

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
cont'd		Jun 1962	Jun 1964
		Aug 1966	Dec 1966
		Nov 1966	Jan 1968
		Mar 1967	Mar 1967
		Nov 1967	Nov 1967
Lockheed Aircraft Corp.	3	Jan 1965	Dec 1965
		Aug 1966	Sep 1967
		Mar 1968	Dec 1969
Long Island Biological Association	6	Oct 1950	Sep 1951
		Oct 1951	Sep 1952
		Oct 1952	Sep 1953
		Oct 1952	Sep 1953
		Sep 1953	Sep 1954
		Sep 1954	Sep 1955
Lovell Chemical Co.	3	Oct 1950	Sep 1951
		Feb 1952	Apr 1952
		May 1953	May 1954
Lux Clock Manuf. Co.	1	Jul 1953	Dec 1953
Machine & Tool Design Co.	1	Jun 1954	Nov 1954
Magna Corp.	1	Jun 1962	Aug 1963
Glenn L. Martin Co.	1	Aug 1950	Nov 1950
Martin Marietta Corp.	1	Mar 1953	Jul 1955
Md., Univ of	8	Mar 1953	Jul 1955
		Jun 1955	Jul 1956
		Oct 1956	Oct 1959
		Jun 1951	May 1952
		Jun 1952	May 1953
		Mar 1953	Feb 1954
		Mar 1954	Mar 1955
		Mar 1969	Dec 1969
Mass., Univ of	1	Nov 1954	Nov 1955
Mathieson Cml Corp.	2	Mar 1953	Jun 1954
		Jun 1952	Apr 1953
Maxon Electronics Corp.	1	Jun 1961	Aug 1963
Marquette School of Medcine	1	Jun 1969	Aug 1970

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
MB Associates	5	Jun 1964	Oct 1966
		Jun 1966	Aug 1967
		Jan 1967	Sep 1967
		Jun 1967	Jul 1969
		Mar 1969	Nov 1969
Mellon Inst. of Ind. Rsch	4	Aug 1950	Aug 1951
		Aug 1951	Aug 1952
		Aug 1952	Feb 1954
		Jun 1954	Aug 1955
Melpar, Inc.	6	Jun 1961	Jul 1963
		Jun 1962	Jun 1963
		May 1963	Oct 1965
		May 1964	Nov 1964
		Jun 1964	Aug 1965
		Jun 1964	Jul 1965
American Std., Inc. (Melpar Div)	2	Oct 1965	Jan 1967
		Feb 1966	Jul 1967
Merck & Co., Inc.	2	May 1955	Dec 1956
		Apr 1960	Jun 1961
Meteorology Rsch, Inc.	1	Jun 1965	Feb 1967
Metronics Associates, Inc.	2	Apr 1966	May 1966
		May 1968	Jun 1970
Metal Matic, Inc.	1	Aug 1954	Oct 1954
Michigan, State of (Dept of Health)	1	Jun 1965	Jul 1967
Michigan State College	5	Jun 1954	May 1956
		Oct 1950	Sep 1952
		May 1951	Oct 1951
		May 1952	Jan 1953
		Oct 1952	Sep 1954
Michigan State Univ.	3	May 1956	Sep 1967
		Dec 1965	Nov 1968
		May 1960	May 1961
Michigan, Univ. of	7	Jul 1951	Jun 1952
		Apr 1953	Sep 1955
		Aug 1959	Jun 1964
		Aug 1962	Jun 1964
		Jun 1964	Nov 1965
		Mar 1967	Jun 1969
		Jun 1969	Jul 1961
Midwest Rsch Inst.	4	Jun 1961	Jul 1963
		Jul 1961	Apr 1964

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
cont'd			
		Jun 1965	Jun 1971
Metronics Associates, Inc.	2	Mar 1965	Oct 1968
		Jun 1968	May 1970
Univ. of Miami	1	Apr 1969	Sep 1970
Millipore Filter Corp.	1	Jun 1954	Dec 1955
Mine Safety Appliances Co.	5	Jun 1955	Jan 1957
		Jun 1957	Apr 1959
		Sep 1959	Oct 1960
		Mar 1961	Nov 1963
		Jun 1963	Jun 1964
Minneapolis-Honeywell Regulator Co.	3	Feb 1953	Dec 1954
		Feb 1953	Sep 1955
		Dec 1952	Feb 1956
Univ. of Minnesota	18	Jun 1950	May 1952
		Jul 1953	Sep 1956
		Jul 1951	Jun 1952
		Jun 1952	May 1954
		Jun 1952	Jun 1954
		Jun 1952	Jun 1953
		Oct 1952	Dec 1953
		Apr 1953	Mar 1955
		Apr 1953	Sep 1953
		Jul 1953	Jun 1955
		May 1953	Jun 1954
		May 1954	Jan 1955
		Sep 1956	Sep 1957
		Jun 1964	Dec 1965
		Jun 1962	Dec 1965
		Jun 1959	May 1964
		Feb 1965	Apr 1966
		Mar 1967	Jun 1970
Mississippi State College	2	May 1951	Apr 1953
		May 1953	Apr 1955
Univ. of Mississippi	3	Jul 1951	Sep 1952
		Nov 1951	Jun 1953
		Sep 1952	May 1955
Univ. of Missouri	1	May 1950	Apr 1952

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
Molded-Resin Fiber Co.	1	Dec 1951	Feb 1953
Monomer-Poylmer, Inc.	1	Nov 1951	Mar 1952
Monsanto Chemical Co.	1	Dec 1958	Jun 1959
Monsanto Research Corp.	4	Jan 1963	Dec 1965
		Jun 1966	Apr 1968
		Apr 1967	Dec 1967
		Jun 1968	Feb 1969
Montana State Univ.	1	Jun 1967	Nov 1970
MID Research & Development	1	Jul 1960	Aug 1961
Douglas M. McBean, Inc.	1	Jun 1953	Jul 1957
McDonnell Douglas Corp.	1	Jun 1960	Mar 1965
National Academy of Sciences	1	Dec 1957	Dec 1962
Nation Research Corp.	1	Feb 1961	Mar 1961
Univ. of Nebraska	2	Sep 1951	Apr 1954
		Nov 1948	Aug 1951
New Mexico College of Agriculture & Mechanic Arts	1	Jun 1960	Dec 1962
New Mexico State Univ.	1	Jun 1964	Dec 1968
New York Univ.	1	Jan 1954	Jun 1956
Research Fndn. of State Univ. of New York	3	Oct 1952	Mar 1965
		Jun 1963	Jun 1967
		Jun 1969	Jul 1969
North American Avaiation, Inc.	2	Dec 1957	May 1959
		Jan 1962	Apr 1962
North Carolina State of Univ. of N.C.	2	Aug 1963	Sep 1963
		May 1964	Jun 1964
North Dakota Agricultural College	2	Apr 1960	Sep 1960
		Apr 1961	Sep 1961
Northrop Corp.	1	Jan 1966	May 1967
Univ. of North Carolina	1	Oct 1951	Jan 1954

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
Northwestern Univ.	3	Sep 1950	Oct 1951
		Nov 1951	Oct 1952
		Dec 1952	Jun 1954
Univ. of Notre Dame	1	Dec 1951	Mar 1954
New York Univ.	1	Nov 1951	Nov 1953
Univ. of Notre Dame	6	Jun 1953	Jul 1954
		Jan 1950	Mar 1951
		Mar 1951	Jul 1954
		Sep 1954	Sep 1955
		Sep 1959	Aug 1960
		Nov 1962	Jan 1965
G. O. Noville & Associates Inc.	1	Aug 1953	Jul 1957
Ohio University	2	Feb 1955	Jan 1957
		Jan 1957	Jan 1958
Ohio State Univ. Research FNDN.	8	Oct 1952	Oct 1955
		Jan 1955	Dec 1958
		May 1955	May 1957
		Oct 1959	Sep 1960
		Oct 1962	Oct 1965
		Mar 1963	Dec 1965
		Jun 1963	Sep 1965
		Jun 1969	Jul 1969
Okanagan Copter Sprays Ltd.	1	Jun 1967	Jun 1967
Oklahoma Agric. & Mechanical	1	Sep 1951	Feb 1953
Oklahoma State Univ.	2	Mar 1963	Jun 1963
		Feb 1968	Aug 1969
Olin Mathieson Chem. Corp.	2	Sep 1955	Feb 1958
		Sep 1955	Feb 1958
Optics Technology, Inc.	2	May 1963	Nov 1964
		Jun 1965	Jun 1966
Ordnance Engrg. Corp.	1	May 1955	May 1956
Oregon State Univ.	2	Jan 1964	Dec 1968
		Jan 1969	Apr 1970
T. G. Owe Berg, Inc.	1	Jun 1966	Aug 1967
Parke, Davis & Co.	7	Jun 1951	Nov 1954

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
cont'd		Jan 1953	Apr 1955
		May 1953	Feb 1958
		May 1955	Feb 1958
		Dec 1954	Oct 1955
		Oct 1955	Oct 1956
		Apr 1957	Oct 1958
Park Thompson	1	Dec 1950	Aug 1951
Ralph M. Parsons Co.	10	Oct 1951	Oct 1951
		Dec 1951	Mar 1952
		Jun 1952	Feb 1954
		Jun 1952	Aug 1955
		Apr 1952	Jul 1963
		Jun 1952	May 1956
		Sep 1954	Nov 1955
		Jun 1951	Nov 1951
		Aug 1951	Dec 1953
		Sep 1953	Jan 1954
Pennsalt Chem. Corp.	3	Jun 1962	Dec 1965
		Jan 1969	Sep 1970
		Jan 1969	Sep 1970
Pennsylvania State College	3	Jul 1951	Aug 1953
		Sep 1953	May 1970
		Mar 1969	Apr 1971
Pennsylvania, Univ. of	4	May 1955	Nov 1957
		Feb 1958	Jun 1958
		Jun 1958	Sep 1961
		Jul 1961	Aug 1967
Pfizer, Charles & Co., Inc.	3	May 1963	May 1964
		Mar 1965	Jan 1967
		Jun 1963	Jun 1964
Philco Corp.	1	Jun 1961	Nov 1964
Photomechanisms, Inc.	2	Sep 1958	Feb 1962
		Oct 1961	May 1962
Pittsburgh, Univ. of	1	Apr 1951	Jun 1953
Planning Research Corp.	1	Apr 1960	Dec 1961
Plax Corporation	1	Mar 1952	Sep 1952

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
Pneumo-Dynamics Corp.	1	Jun 1963	Jan 1964
Polaroid Corp.	6	Feb 1951	Jun 1952
		Jun 1952	Jun 1953
		Jun 1953	Aug 1954
		Sep 1954	Dec 1955
		Jan 1956	Apr 1957
		Apr 1958	Apr 1960
Prengle, Dukler & Crump	1	May 1961	Mar 1964
Prime, Inc.	3	Jul 1950	Oct 1950
		May 1953	Apr 1954
		Aug 1953	May 1955
Princeton Univ.	1	Jun 1967	Oct 1969
Puerto Rico, Univ. of	1	Jan 1952	Jun 1952
Purdue Research Fndn.	6	Jun 1952	Nov 1954
		Jan 1955	Mar 1956
		Jul 1963	Jan 1966
		Jun 1966	Aug 1968
		Feb 1969	Aug 1970
		Jun 1963	Dec 1969
Rheem Manufacturing Co.	1	Mar 1952	Apr 1954
Rhode Island State College	1	Jan 1951	Mar 1952
Rhode Island, Univ. of	1	Mar 1953	Mar 1955
Rutgers College	1	Oct 1950	Sep 1951
Rutgers Univ.	1	Oct 1951	Sep 1953
Rutgers, The State Univ.	2	Jun 1957	Aug 1960
		Sep 1962	Aug 1965
Ryan Aeronautical Co.	1	May 1963	Jul 1963
Sharpley Laboratories, Inc.	1	Mar 1963	Mar 1966
Shell Chemical Corp.	1	Nov 1958	May 1959
Sierra Engrg. Co.	1	Jun 1964	Jul 1965
Smithsonian Inst.	4	Apr 1951	Apr 1953
		Apr 1953	Apr 1955
		Jul 1955	Apr 1956
		Oct 1962	Jun 1969
Southern Calif., Univ of	2	Oct 1952	Jan 1955
		Jan 1955	Sep 1957

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
cont'd		Jan 1955	Sep 1957
Southern Research Inst.	16	Apr 1951	Jan 1952
		Jun 1951	Jun 1952
		May 1952	Dec 1952
		May 1952	Sep 1953
		Jun 1952	Jun 1953
		Jun 1953	Jul 1954
		Oct 1953	Sep 1954
		Feb 1953	Nov 1955
		Jun 1954	Dec 1955
		Oct 1954	Jan 1956
		Aug 1954	Sep 1955
		Jan 1956	Mar 1958
		Jul 1956	Aug 1957
		Feb 1960	Apr 1961
		May 1960	Sep 1963
		Dec 1961	Jun 1962
Southwest Research Inst.	1	Apr 1957	Jul 1957
Sperry Piedmont Co.	1	Jan 1965	Aug 1965
Sperry Utah Co.	2	Apr 1963	May 1965
		Jun 1964	Mar 1965
Specialized Instruments Corp.	2	May 1952	Aug 1952
		Jan 1954	Jul 1954
Spraying Sys Co.	1	Jul 1951	Aug 1952
Squibb, E. R. & Sons	1	Jun 1952	Apr 1953
Stanford Research Inst.	2	Aug 1957	Aug 1958
		Jun 1954	Jun 1955
Stanford, Leland Jr. Univ.	4	Jun 1954	Jun 1955
		Jul 1955	Aug 1956
		Oct 1951	Apr 1954
		Aug 1956	Sep 1959
Stanford Research Inst.	1	Mar 1964	Jan 1966
Syracuse Univ.	2	Nov 1967	Jan 1969
		Jan 1969	Apr 1970
Taller Y Cooper, Inc.	1	Jun 1955	May 1957
Tennessee, Univ. of	2	Jun 1951	Oct 1952
		Nov 1962	Oct 1965
Texas Agric. Mechanical Col.	5	Jul 1953	Dec 1954

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
cont d		Jun 1954	Jun 1955
		Jun 1955	Aug 1956
		Aug 1956	Aug 1957
		Jun 1968	Dec 1970
Texas, Univ. of	8	Oct 1951	Oct 1954
		Oct 1952	Jul 1955
		Sep 1955	Jul 1958
		Jun 1957	Aug 1958
		Feb 1951	Feb 1953
		Aug 1958	Aug 1960
		May 1963	Oct 1965
		Jun 1968	Jun 1970
Tex. Rice Improvement Assoc.	1	Mar 1958	Nov 1958
Thompson Helicopters, Inc.	1	May 1964	May 1964
Townsend Engineered Products Inc.	1	Aug 1963	Jul 1957
Tracerlab, Inc.	6	Dec 1951	Dec 1952
		Jan 1953	Dec 1953
		Sep 1949	Dec 1951
		Jan 1954	Mar 1955
		Jun 1955	Feb 1957
		Apr 1957	Dec 1958
Travelers Research Corp.	1	Jun 1966	Jan 1968
Trident Eng'g Assoc. Inc.	1	Mar 1965	Aug 1965
Trio-Cml Works Inc	4	Sep 1967	Oct 1967
		Aug 1967	Sep 1967
		Mar 1969	Mar 1969
		Jul 1969	Dec 1969
Edward L. Trudeau Foundation	1	Jun 1952	Sep 1953
U.S. Industrial Corp	1	Apr 1965	Jun 1965
U.S. Rubber Co.	1	Jun 1964	Jul 1965
U.S. Steel Co.	1	Mar 1958	Mar 1959
Univ. Match Corp.	3	Feb 1954	May 1955
		Sep 1955	Jun 1956
		Nov 1956	Nov 1957
Utah,Univ of	6	Jan 1951	Feb 1953
		Mar 1953	Feb 1954
		Mar 1954	May 1955

CONTRACTOR	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
cont d		Nov 1953	Nov 1954
		Nov 1954	Jun 1956
		Jul 1955	Jul 1959
Virginia, Univ. of	2	Jun 1965	Apr 1967
		May 1967	Feb 1969
Vitro Eng'g Co	1	Dec 1961	Mar 1962
Wahl-Henius Inst	2	Jun 1952	Oct 1952
		Jun 1953	Jun 1954
Warner Lambert Pharmaceutical CO.	1	Jun 1953	Jun 1955
Wash. St. Univ.	4	May 1967	Sep 1968
		Aug 1959	Nov 1964
		Dec 1964	Nov 1968
		Jan 1969	Jun 1970
Wesleyan Univ.	2	Feb 1953	Apr 1955
		Apr 1951	Apr 1953
West Va. Univ	14	Jun 1949	Sep 1951
		Jun 1952	Jun 1953
		Dec 1952	Feb 1955
		Jun 1953	Jun 1954
		Jun 1953	Jun 1954
		Jun 1954	Jun 1955
		Oct 1954	Sep 1955
		Feb 1955	Jan 1957
		Jul 1955	Jun 1956
		Jul 1956	Jul 1959
		Feb 1957	Jan 1958
		Jan 1963	Sep 1964
		Feb 1963	Apr 1966
		Sep 1964	Mar 1966
Western Reserve Univ.	3	Mar 1951	Feb 1952
		Jun 1951	May 1952
		May 1952	May 1953
Wiegand, Edwin L. Co.	1	Aug 1955	Apr 1956
Wisconsin, Univ. of	21	May 1950	May 1952
		Jun 1950	May 1952
		Jun 1950	Jan 1952
		Jun 1952	Jan 1954
		Sep 1952	Sep 1953
		Mar 1953	May 1955
		Apr 1951	Aug 1956
		Feb 1954	Sep 1956
		Dec 1954	Oct 1963

CONTRACTORS	NUMBER OF CONTRACTS	CONTRACT DATE	TERMINATION DATE
cont'd		Jul 1956	Jul 1957
		Nov 1956	Jun 1961
		Jun 1966	Oct 1969
		Sep 1950	Sep 1951
		Oct 1950	Oct 1951
		May 1951	May 1953
		Jun 1951	Jun 1952
		Sep 1951	Sep 1952
		Oct 1951	Feb 1953
		Feb 1952	Sep 1953
		Jun 1952	Jan 1954
		Jun 1952	May 1953
Wistar Inst. Of Anatomy	3	Jun 1963	Oct 1965
		May 1966	Jan 1968
		May 1960	Apr 1962
Worchester Fndn. for Experimental Biology	1	Dec 1962	Nov 1963
Yale Univ.	2	Jun 1963	Aug 1965
		Jun 1966	Oct 1967
H.L. Yoh & Co., Inc.	2	Jun 1955	Feb 1956
		Jun 1955	Mar 1956

Annex B

Production of Antipersonnel Warfare Agents and Munitions

Background. Production of all BW agents including antipersonnel and anticrop material, was based on technology developed in laboratory and pilot plant facilities at Fort Detrick. The first pilot plant, intended for the production of botulinum toxin, was completed in October 1943. A second plant was built in March 1944 to produce anthrax spores and the anthrax simulant. From these beginnings until cessation of offensive BW operations in 1969, Fort Detrick produced test quantities of a large number of antipersonnel and anticrop BW agents and developed the production process eventually employed at the Vigo and Pine Bluff Arsenal production facilities. A wide variety of process equipment, some of which was developed for the first time to support the unique requirements of BW production, constituted the numerous pilot plant facilities at Fort Detrick.

Antipersonnel agent and munition production. The first large scale BW munition production facility was constructed at the Vigo Ordnance Plant, near Terre Haute, Indiana, beginning in May 1944. The Vigo Plant was intended to produce biological agents and vaccines and to fill and assemble biological munitions beginning with anthrax-filled bombs. The Vigo Plant was in a test operation phase producing BG, a harmless simulant of anthrax, when the end of WWII terminated plant operations. The plant was deactivated and eventually excessed by the Army in 1946.

The only facility operated for large scale production of antipersonnel BW agents was located at Pine Bluff Arsenal with construction completed in November 1953. The plant later became permanently identified as the Directorate of Biological Operations (DBO). The initial capability of producing bacterial agents was later expanded to include capabilities for producing

toxins in addition to viral and rickettsial agents and the unique capacity for growing and infecting mosquitoes with viral agents. The complex of buildings included those designed for agent fermentation, munitions filling/production and laboratory support operations. The entire facility was designed and constructed to provide both absolute safety to operating personnel and absolute containment of the highly toxic and infectious materials produced there. Between 1954 and 1967, the facility produced the following biological agents and toxins: Brucella suis, Pasteurella tularensis, Q fever rickettsia, Venezuelan Equine Encephalomyelitis, Bacillus anthracis, botulinum toxin and staphylococcal enterotoxin. Bulk agents and antipersonnel munitions filled with these various agents and toxins were produced and stored at DBO as a deterrent capability. DBO operations were terminated in November 1969, and all stocks of anti-personnel biological munitions, agents and toxins were subsequently destroyed in accordance with approved demilitarization plans. The facility was then decontaminated and deactivated, and on 15 May 1972, the complex (including land, buildings, and equipment) was turned over to the Food and Drug Administration, an agency of the Department of Health, Education and Welfare, who operate it as the National Center for Toxicological Research (NCTR).

Anticrop Biological Agent Production. Three anticrop biological agents were produced between 1951 and 1969. These included both stem rust of wheat and rye, and rice blast. Between 1951 and 1957, wheat stem rust spores and rye stem rust spores were produced from innoculated crops at planting sites located on Government installations.

The harvested spores were shipped to Edgewood Arsenal, Maryland for classification, drying and storage. This operation was terminated in 1959 by the Air Force. Between 1962 and 1969, wheat stem rust spores were grown at Government sites. The crude material was transferred to Rocky Mountain Arsenal where it was cleaned, classified and placed in cold storage. All wheat rust spores were destroyed by February 1973.

Rice blast was produced by a submerged culture process under a contract. The production contract was awarded in March 1965. Agent production was terminated in June 1966 after initial delivery of acceptable material. The final agent was packaged and stored at Fort Detrick. The total rice blast stock was destroyed between 17 January and 18 May 1972.

ANNEX E

Testing

General. Testing is an integral part of research and development. It is primarily concerned with the acquisition of data to evaluate and confirm or negate postulates and theories devised in the laboratory, instrumentation design parameters, and mathematical modes.

Rationale for biological testing. BW testing, like all elements of the BW program, was at its inception, unique. The artificial study of biological material disseminated into the atmosphere, now known as aerobiology, was not a practiced or organized scientific discipline at the start of the BW program. Little or no knowledge was available regarding the biological and/or physical decay factors of micro-organisms in normal weather fluctuations, the amount necessary to cause infections, nor the methodology or hardware to effect dissemination. It was, therefore, essential to conduct testing to acquire the necessary scientific and technical information to substantiate theories and fill knowledge gaps and to determine vulnerability to attack.

Categorization of biological testing. Biological testing can be divided into three categories, laboratory (small scale), closed chambers (medium scale), and open air field (large scale). Each of these categories can be further divided into testing with simulants and pathogens. The open air field testing can be further categorized into continental and extra continental and that performed on public and non-public domain (military installations). Within this realm further

characterization can be delineated into the target of the test, i.e., mechanical devices such as detectors or biological samplers, and living targets such as humans, animals or crops.

In addition to the above testing another form may be categorized under the general heading of immunological testing in humans and animals which was done to evaluate vaccines, toxoids and skin tests.

Appendix I is a pictorial representation of biological testing.

Liaison. The US Public Health Service closely followed the progress of BW research and development from the very start of the program because of its civil defense responsibilities. In 1950 a USPHS liaison officer was assigned to Ft. Detrick on a permanent basis to maintain even closer contact for emergency health planning, and awareness and mutual exchange of information on new detection methodology, epidemiology, disease control, safety, and vulnerability of the US to hostile BW attack.

In 1951, the Department of Agriculture assigned a permanent liaison officer to closely follow the BW program as related to crops and animals.

Active liaison was also maintained from the very beginning of the program with the other military services. The Surgeon General of the Army maintained his close liaison with medical personnel right on the scene working within the research and development laboratories. In 1956, as a result of a Joint Medical Service and Chemical Corp Agreement, the Army Medical Unit was established at Ft. Detrick with the mission to conduct defensive R&D including prophylactic and therapeutic measures, more rapid and effective diagnostic and identification procedures and to evaluate the threat of BW to the military from a medical point of view.

The US Naval Unit, Ft. Detrick was established on 8 February 1944 with the mission to promote modern medical research in public health concerns, vapor phase disinfectants control of airborne diseases, and to provide the Naval Establishment with information for its defense.

Naval personnel were integrated into all aspects of the laboratories, and operational elements of the past.

The US Air Force began to station liaison officers at Ft. Detrick in the late 1940's. The mission was to coordinate BW munition development, supply support for field testing, and to maintain and operate a meterological station.

General Safety and Medical Considerations. The safety and medical aspects of testing with biological material were of overwhelming concern to management from inception of the BW program, primarily because of the many unknown factors, and the potential severe danger to employees as well as the local community. A major safety organization was always established along with the operational organizations and its importance can be attested to by the fact that the Safety Director reported directly to the Commanding Officer and Technical Director. Since many of the early aspects of the Safety/medical program were of necessity experimental, it was necessary to confer with and have the approval of the Surgeons General of the military services for much of its operations. U.S. Public Health Service maintained cognizance of the program and provided advice on public health.

To this end, the Safety/medical program developed specialized operating features for laboratories to include negative pressure isolation cabinets, glove ports and gloves for working within the cabinets, and exhaust ventilation system incorporating air incineration chambers,

water and water decontamination systems and protective clothing and masks to ensure that no contaminated material contacted the workers or was discharged to the environment.

These pioneering efforts subsequently became the foundation for infectious disease safety procedures, techniques and equipment throughout the scientific and industrial communities in the world.

The concern for safety/medical aspects is further noted by the deliberations of various external/advisory committees such as "The US Biological Warfare Committee" (Merck Committee) in 1942, and the Committee on Biological Warfare of The National Military Establishment Research and Development Board (Baldwin) in 1948. With advent of the requirement to determine the field environment effects such as varying temperature, humidity, terrain, to include structures, sunlight, winds, etc., on BW agents, independent external advisory committees were formed to review, comment upon, and make recommendations concerning test protocols. These committees were "The *Ad Hoc* Committee on BW Testing" (Scheele Committee) 1953, and "The Interagency Survey Committee on BW Testing" (Price Committee) 1959. The members of these committees were eminent authorities in their fields of biological and medical sciences and were drawn from various universities, and Federal and state agencies. It is to be noted that these committees did in fact make strong recommendations for safety/medical requirements and specified certain pathogenic microorganisms which should be utilized for open-air testing. The Army considered these latter recommendations binding.

The increased testing program which arose from DOD Project 112 generated a detailed safety review procedure for each test. "The Deseret Test Center (DTC) Medical Advisory Committee" (Davis Committee) 1962-1969 provided the first level of review. Since DTC was a joint organization the proposed test programs were reviewed and approved by the Joint Chiefs of Staff and the Office of the Secretary of Defense. A national policy directive was issued by the President on 17 April 1963 requiring Presidential approval of all tests which might have significant or protracted effects on the physical or biological environment. The Department of Defense issued an instruction in April 1963 on Large Scale Scientific or Technological Experiements which outlined the procedure to be used for obtaining Presidential approval. DTC test plans and the Medical Advisory Committee recommendations were forwarded to the President's Science Advisory Committee for approval.

Conduct of testing. In the conduct of testing, specialized sampling and analysis aspects were employed to determine the various parameters of the test requirements as well as the downwind travel distances. These were supplemented by rather complete meteorological data gathering systems to define meteorological conditions. Meterological conditions were an absolute control factor in whether or not a test was permitted to start or continue.

Simulant Testing. Every effort expended in open-air testing was first directed towards the utilization of simulants to obtain the necessary data for evaluation. Biological simulants are defined as living micro-organisms, not normally capable of causing infection, representing the physical and biological characteristics of potential microbiological agents and considered medically safe to operating personnel and surrounding communities. In addition, certain selected inorganic materials such as flourescent particles, were also utilized to obtain aerosol dissemination data.

The two most commonly used biological simulants were Serratia marcescens (SM) and Bacillus subtillis variant niger, normally referred to as Bacillus globigii (BG). The most commonly used flourescent particle was an inorganic complex, zinc cadmium sulfide (Zn CdS).

Bacillus globigii (BG). BG is considered ubiquitous in nature. It can be readily cultured from hay, dust, milk and water. It was and is still considered by medical authorities to be harmless (nonpathogenic) to man. The utilization of BG in aerosol testing in open-air tests were reaffirmed as recently as 1970 by The Surgeon General of the US Public Health Service who indicated as a result of his directed literature search and consultation with health experts, that there is no evidence of infection in man or experimental animals following exposure to BG spores, even in massive doses.

Serratia marcescens (SM) is a motile, nonsporulating, grammegative bacillus which may produce a red pigment especially when grown at room temperature. It is commonly found in water, food and sewage and sometimes can be isolated from feces and sputum of apparently healthy people. It was used as a bacterial marker with little risk up to 1969 because of its avirulant nature. In 1969, it was recognized as having

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limited pathogenic capability and should not be used for study of experimental infections in man because of the assumed role as an opportunist, producing disease if man is exposed to large doses and/or when the body defenses are weakened by age, debilitatory disease, drug abuse or antibiotics. A summary report on SM is at Appendix II.

Aspergillus fumigatus (AF) was a fungus simulant used on four occasions from 1950-1953 and abandoned when antifungal agents were removed from the BW program. It is ubiquitous in nature and can be cultured from soil, water, air, food stuffs, animals waste products and most human body orifices. AF is considered an opportunist causing aspergillosis in debilitated persons.

Rationale for Vulnerability Testing. In the beginning and continuing throughout the BW Program, there was a paucity of scientific and engineering knowledge and principles related to the vulnerability of the US and/or its personnel to BW attacks both covert and overt. Vulnerability testing was required to provide information on the agents likely to be used, means of disseminating agents, sizes of areas that could be attacked, environmental effects on agents, obstructive effects of buildings and terrain on agents, ability to detect and identify agents areas of the US and for its forces most likely to be attacked, the extent of damage possible, and data to devise physical and mathematical models to be used as substitutes for live, open air testing.

The examination of the threat of vulnerability of the US and/or its personnel to BW attack, overt or covert, was under active consideration as early as 1939. "Bacteriological Warfare Possibilities", Technical Study No. 10, 28 August 1939, Office of the Chief, Chemical Warfare Service, concluded "...that attack by airplane dissemination of infected insects and other bacteriological materials, is a possibility not to be ignored, especially when parachute troop landing can be expected." Intelligence information from WWI indicated that Axis powers had resorted to the use of BW in the form of anthrax and glanders.

Concern about the vulnerability of the US to BW attack at the highest levels in the government has been noted in previous chapters especially chapter 1. However, immediate concern was expressed by the Chairman of the Committee on BW, of the Research and Development Board of the National Military Establishment (NME) in a special report on BW activities, 5 August 1948. He concluded that: (1) Biological agents would appear to be well adapted to subversive use: (2) The US is particularly susceptible to attack by "special BW operations" (meaning subversive or covert actions involving the use of biological agents); (3) The subversive use of biological agents by a potential enemy prior to a declaration of war presents a grave danger to the US; and (4) The BW R&D program is not now authorized to meet the requirements necessary to prepare defensive measures against special BW operations. The memo recommended that the Secretary of

Defense authorize the NME to engage in the required R&D to counter the threat in the field of special BW operations and suggested that a unit be set up as an integral part of Ft. Detrick. Illustrative examples of projects to be undertaken described in the memo were testing of ventilating systems, subways, water supply systems, etc., with innocuous organisms.

House Report No. 815 entitled "Research in CBR," a Report of the Committee on Science and Astronautics, the House of Representatives, 86th Congress, First Session 1960, recommended that "more positive and imaginative attention should be given to the problems of detecting and guarding against use of CBR by saboteurs aimed at disrupting key activities in time of emergency." (Appendix III)

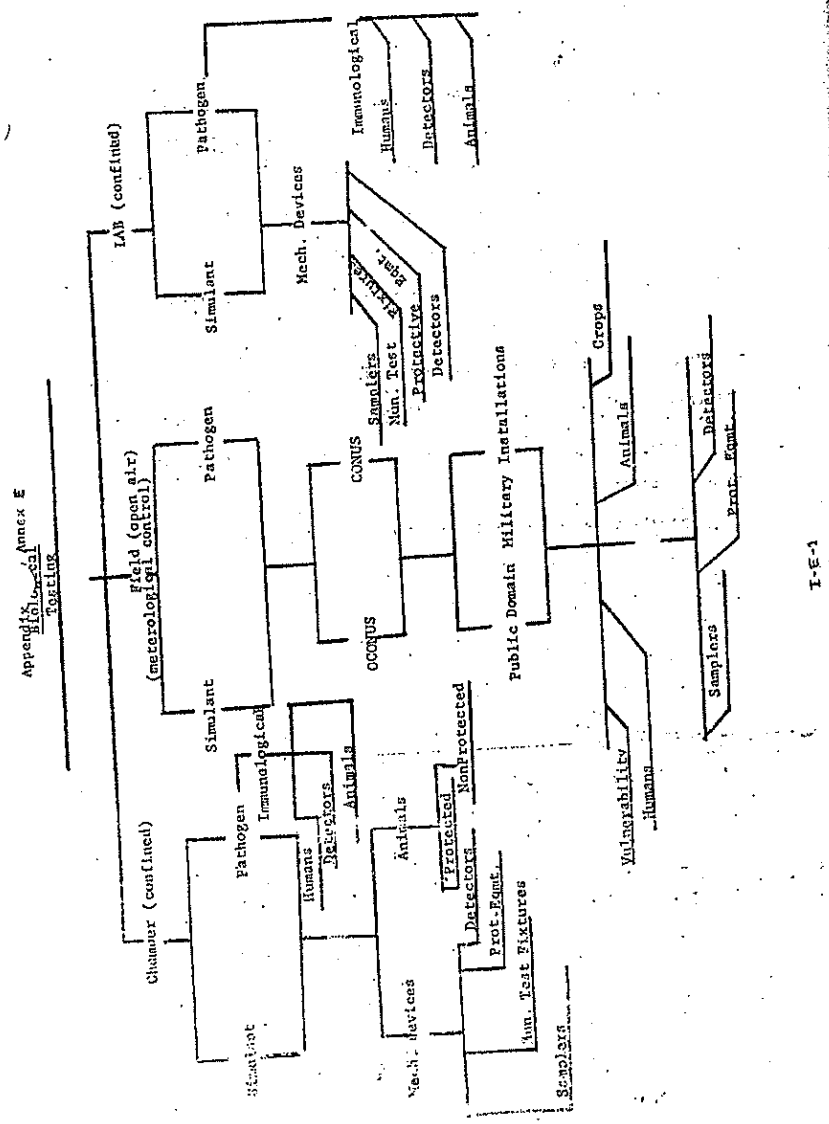
Concern regarding vulnerability of the US continued even after the Presidential ban on offensive BW in 1969. The Chairman of the President's Science Advisory Committee, BW/CW Panel, submitted a report on 16 December 1970 "Requirements for BW Defense" to the Deputy Secretary of Defense. The report stated a recognition of the need to continue many aspects of the BW defensive program to include the resolution of problems relating to US preparedness against covert attack on the civilian population.

The report of the NSC Under Secretaries Committee, 5 August 1972, entitled "Annual Review of the US CW and Biological Research Program" Appendix B, entitled "Biological and Toxin Research Program" contains a recommended 5-phase program which it states is in consonance with the PSAC report (15 December 1970 noted above). The vulnerability

Analysis phase of the NSC report states "this portion of the program will examine the US and its Armed Forces vulnerability to biological attack. It will include an active examination of ....results of vulnerability testing.... This will be a continuing program. The "Testing" phase of the recommended program states "simulated tests will be required for testing defense equipment and for vulnerability analysis." The report further states that studies indicating vulnerability of the United States and its Armed Forces must remain classified.

Thus vulnerability testing provided essential data to permit the military and civil defense authorities to assess the dangers to which the US and its allies might be exposed and to plan appropriate responses by enemy actions in the BW area.

Appendix IV summarizes BW field testing chronologically.



APPENDIX II to ANNEX E

SERRATIA MARCESCENS INFECTION

CONTENTS

I. Definition.

S. marcescens is a motile, non-sporulating, gram negative bacillus of the family Enterobacteriace, which may produce a red pigment especially when grown at room temperature. It is commonly found in water, food and sewage and can be sometimes isolated from the feces and sputum of apparently healthy people.(1)

II. Disease associated with S. marcescens.

a. Pre antibiotic era (prior to 1946).

S. marcescens, originally named Chromobacterium prodigiosum, was first recognized in 1823 as a cause of "bleeding polanta," a red discoloration of cornmeal mush(2), and has subsequently received great historical notoriety as a masquerader of blood (i.e., blood stained communion wafers). A low degree of pathogenicity was assumed because reports of serious infection in humans were rare isolated events. In 1913(3) Woodward and Clark reported a case of "pseudo-hemoptysis" in a young man. Aside from a chronic cough and the psychological aspects of producing red (appearing bloody) sputum, he was apparently quite healthy. Thompson (4) and Aronson (5) reported the same case of meningitis. The patient apparently recovered spontaneously and there was some question as to whether the organism was a contaminant. Other reports were not available for this review suggested a pulmonary(6) and a wound (7) infection.

b. Post antibiotic era.

The post antibiotic era ushered in a period during which an increasing

number of incidences of serious infections caused by S. marcescens were reported. They began with scattered reports on series of small numbers of cases(8,9), but which have steadily increased until the present time (over 10 reports since 1970). The common threads running throughout the reports are hospitalization, intravenous and urinary tract catheterization, serious underlying disease, a debilitated state, broad spectrum antibiotics and steroid treatment(10, 11, 12, 13, 14). All these conditions predispose patients to infection with organisms of low intrinsic virulence. The largest number of reports have emphasized the acquisition of the organisms(15, 16, 17, 18, 19), and the urinary tract as a principle infected organ. (Bibliography incomplete).

III. The use of S. marcescens as a bacterial marker.

The non-virulent aspects of S. marcescens during the pre antibiotic era and its red coloration allowing ease of identification led to its selection as a bacterial marker. In 1937, Burket and Burn(20), and in 1949, McEntegart and Porterfield(21), painted S. marcescens on gums to determine the source of bacteriemia following dental extraction. No ill effects were seen in spite of documented bacteriemia in 18 patients. Kass and Schneiderman(22), planted Serratia marcescens to demonstrate bladder colonization from the urethral meatus after catheterization. Laurenzi, Porter, Kass(23) demonstrated the bacterial clearing effect of the tracheobronchial tree after planting S. marcescens

in the oropharynx. Paine[24] demonstrated the relatively harmless effects on healthy young volunteers of aerolization of large amounts of S. marcescens (2.5 hrs exposure, 2×10^6 org. per cubic feet of air). In fact, until the early 1960's S. marcescens was routinely used to demonstrate aerolization and air sampling techniques in college bacteriology courses[25].

IV. Use of S. marcescens by the U.S. Army relative to reports of disease at that time.

The only incidence of S. marcescens aerolization by the military referred to in the published literature occurred in the San Francisco Bay area, September 1950[26].

In 1957, Wheat, et al[8] reported on 11 cases seen in a San Francisco Hospital from September 1950 - February 1951. However, the association with the above mentioned aerolization appears to be coincidental, since (1) no other hospitals reported similar findings; (2) and all the patients had urinary tract infections (2 subsequently developed septicemia, a well recognized complication of urinary catheterization). Thus, considering the evolution of disease caused by S. marcescens, it is likely that this report was the forebearer of what was to come.

Intravenous drug abuse, which is frequently associated with an increased incidence of infections, was the underlying condition associated with 19 cases of endocarditis caused by S. marcescens in the San Francisco Bay area reported

by Mills, et al in 1976[26]. Similar clustering of cases of endocarditis among addicts due to unusual organisms have been reported, (i.e., Pseudomones in Detroit, enterococci in Cleveland).

Recent reports of infections involved principally non-pigmented strains. The relationship of pigment production to the ability to infect man is unclear at the present time.

V. Summary.

The increase in infections caused by S. marcescens appears to be an illness related to medical progress and has assumed a prominent role as an opportunist, producing disease in man only in large doses (i.e., contaminated nebulizer), and/or when the body defenses are weakened by age, debilitating disease, drug abuse, or antibiotics. Its early use as a bacterial marker entailed little risk, attested to be the fact that highly reputable medical journals (i.e., 22, 23, 24), published the data, and an editorial in the Lancet[28] published as late as February 1969, emphasized the avirulent nature of the organism. Not until 1969 did recognition of limited pathogenic capability lead to the advice that the organism should not be used for the study of experimental infections in man.

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Annex E

Extract from Appendix III

RESEARCH IN CBR

A Report of

THE COMMITTEE ON SCIENCE

AND ASTRONAUTICS

The House of Representatives
The Congress of the United States

EIGHTY-SIXTH CONGRESS

FIRST SESSION

(No. 23)

House Report No. 815

Pages 15-16

As a result of its hearings and further study on the problems of research in CBR, this committee offers the following recommendations:

(1) There must be a strong and continuous intelligence effort conducted by the United States as a protective measure to keep abreast of foreign developments in the fields of CBR if this country is to have time to develop adequate passive defense and other countermeasures.

(2) Surveillance of foreign activities might also give this Nation its only inkling of imminent use of CBR against the United States, and therefore is important for this reason, too.

(3) There is an urgent need for greater public understanding of the dangers and uses of CBR if proper support is to be given to our defenses and countermeasures.

(4) In any consideration of international disarmament, a special effort must be made not to overlook the great potential of CBR and the ease of evading detection of CBR activities.

(5) There is an urgent need for a higher level of support on a continuing, longrun basis in order to develop better detection and protection measures against possible employment of CBR against this country.

(6) Civil defense plans of this country should include a more positive effort at providing shelters which are proof against CBR attack, at providing more masks and protective clothing, and in public instruction in defensive measures.

(7) More positive and imaginative attention should be given to the problems of detecting and guarding against use of CBR by saboteurs aimed at disrupting key activities in time of emergency.

(8) The committee views CBR as a weapon which is not competitive with nuclear weapons, but complementary to them, designed to do a different job.

(9) The committee cannot bring itself to describe any weapon of war as "humane," and makes no moral judgement on the possible use of CBR in warfare. It does recognize that ignoring CBR will not remove the problem of its existence or its possible employment against the United States.

(10) It is granted that some forms of CBR offer the prospect and the hope of winning battles without taking human life or destroying homes and factories. If force must be used, this is better than many of the alternatives. But it must also be recognized that even if the United States is attacked with the new "gentle" weapons, the consequences of any defeat for our Nation would be just as dangerous to our national goals and life.

(11) It is also recognized that in the present world situation with other countries pursuing vigorous programs of CBR development, the best immediate guarantee the United States can possess to insure that CBR is not used anywhere against the free world is to have a strong capability in this field, too. This will only come with a stronger program of research.

(12) At the present time, CBR research is supported at a level equivalent to only one one-thousandth of our total defense budget. In light of its potentialities, this committee recommends that serious consideration be given to the request of Defense officials that this support be at least trebled. Only an increase of such size is likely to speed research to a level of attainment compatible with the efforts of the Communist nations.

(13) If CBR is to be considered a deterrent force in the U.S. arsenal of weapons, the program of research advocated here will have to be accompanied by an adequate program of manufacture and deployment of CBR munitions.

(14) CBR warfare is not particularly expensive as compared with many other modern forms of warfare, particularly when considered as an incremental cost added to already necessary delivery techniques employed for nuclear weapons. This is a further reason why this investment must be given careful consideration.

(15) The research being done in CBR has already yielded a variety of peacetime benefits, including antidotes for poisons, new serums to prevent disease, greater understanding of how diseases are spread, new insecticides, and fundamental knowledge of life processes. (See appendix.) There is no real separation possible between potential military application of chemical and biological knowledge and peaceful applications. These peaceful applications are required in any case, and deserve added support for the national welfare.

(16) The United States is in a research and development race, particularly with the Soviet Union, whether it be for peaceful or military purposes. The study by this committee of CBR reinforces our general view of the urgency of the overall race and the necessity of full public understanding and support of science and technology everywhere in our Nation.

Appendix IV to Annex E

Biological Field Testing
(Chronological Listing)

Table 1 - Antipersonnel with biological simulants involving public domain.

Table 2 - Antipersonnel with biological simulants not involving public domain.

Table 3 - Nonbiological simulants/air diffusion involving public domain.

Table 4 - Antipersonnel with pathogenic agents.

Table 5 - Anticrop with pathogenic agent involving public domain.

Table 6 - Anticrop with pathogenic agent not involving public domain.

Abbreviations

UA	Unavailable.
BG	Bacillus globigii (Bacillus subtilis var niger).
SM	Serratia marcescens.
AF	Aspergillus fumigatus.
EC	Escherichia coli.
FP	Fluorescent particle.
LP	Lycopodium Spores.
SO_2	Sulfur Dioxide.

TABLE 1

BIOLOGICAL FIELD TESTING
ANTI-PERSONNEL
BIOLOGICAL SIMULANTS
INVOLVING PUBLIC DOMAIN

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
Washington, DC	18 Aug 1949 26 Aug 1949 12-13 Dec 1949 11 Mar 1950	SM
USS Coral Sea anchored in Hamptom Rds, & USS K.D. Bailey at sea off entrance to Hampton Roads Hampton Roads, VA 1 trial at anchor, 16 trials at sea off the entrance	1-21 Apr 1950	BG SM
San Francisco, CA	Sep 1950	SM BG
Port Hueneme, CA	10 Sep - 24 Oct 1952	BG
Panama City, FL	Mar-May 1953	SM BG
Off-shore, between Port Hueneme and Point Mugu, CA, near Santa Barbara	17-27 Aug 1954	BG
Pennsylvania State Highway #16 westward for one mile from Benchmark #193	7 Jan 1955	BG
Kittakinny and Tuscarora Tunnels, Pennsylvania Turnpike	Aug 1955	BG
Offshore Hawaii	Jan-June 1963	BG

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
Vicinity Ft. Greeley, Alaska	Dec 1963 - Jan 1964	BG
Central Alaska	Jan - Feb 1965	BG FP
National Airport & Greyhound Terminal, Wash, DC	May 1965	BG
Oahu, Hawaii	May - Jun 1965	BG
Off California Coast (San Diego)	Feb - Mar 1966	BG
Hawaii, Hawaii	Apr - May 1966	BG
New York, NY	7-10 Jun 1966	BG
Hawaii, Hawaii	Jan - Mar 1968	BG SM
Oahu, Hawaii	Apr - May 1968	BG
Dugway Proving Ground Utah	1945 Jul-Nov 1949	BG BG
Camp Cooke, California	1955	BG FP
Edgewood Arsenal, MD	1959	BG
Key West, FL	1952	SM
Off California Coast (San Clemente)	Aug-Sep 1968	BG

TABLE 2

BIOLOGICAL FIELD TESTING
ANTI-PERSONNEL
BIOLOGICAL SIMULANTS
NOT INVOLVING PUBLIC DOMAIN

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
Marine Corps Schools Quantico, VA	24-25 May 1949	BG
Port Huemene, CA	Jul and Sep 1949	BG
US Naval Advance Base Proving Ground Port Hueneme, CA	22 Jul 1949	BG
NAB, Little Creek, VA	Dec 1950	SM BG AF
Carswell AFB, Ft Worth, TX	11-21 Feb 1951	BG SM AF
Fort Detrick, MD Limited Area	15 May 1951	SM BG
Navy Supply, Mechanicsburg, PA and Norfolk, VA	7 May - 4 Jun 1951	BG SM AF
Fort Detrick, MD	Aug - Sep 1951	SM
Fort McClellan, AL	1 - 30 Jul 1952	SM BG
Fort McClellan, AL	15-28 Sep 1952	SM BG
Camp Detrick, MD	14 Feb 1953 to 24 Feb 1953	SM BG
Dugway Proving Ground, UT	May - Jun 1953	BG SM FP AF
Eglin AFB	1 Jun - 1 Jul 1953	BG

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
Dugway Proving Ground, UT	17 Jun 1953 and 25 Jun 1953	BG SM
Camp Detrick, MD Fort Ritchie, MD	Jun 1953	SM BG
Dugway Proving Ground, UT	13 Jul 1953 to 14 Oct 1953	BG
Dugway Proving Ground, UT	13 Jul 1953 14 Jul 1953 6 Aug 1953 12 Aug 1953	BG BG BG BG
Morrisville Maneuver Area, Pelham Range, McClellan, AL	15 Sep 1953 21 Sep 1953	BG BG
Dugway Proving Ground, UT	15 Oct 1953 21 Jan 1954 27 Jan 1954 12 Feb 1954 17 Feb 1954 14 Mar 1954 7 Apr 1954	BG BG, FP BG BG BG, FP BG, FP BG, FP
Ft Belvoir, VA	1953	BG
Eglin AFB, FL and Kirtland AFB, NM	Apr - May 1954 (Eglin) and Jul 1954 (Kirtland) Apr - May 1954, Jul 1954	BG BG
Dugway Proving Ground, UT	13 May 1954 24 May 1954	BG BG
Fort Ritchie, MD	Sep 1954	BG
Dugway Proving Ground, UT	Oct 1954 15 Nov 1954 - 6 Jun 1955 1954	BG, FP BG NA
Engineer Proving Ground, Ft Belvoir, VA	1954	BG
Port Hueneme, CA	24 Jan 1955	BG

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
Dugway Proving Ground, UT	May 1955 May - Jun 1955 27 Jul 1955 Aug 1955	BG, FP BG BG, FP SM
Wright Patterson AFB, OHIO	Aug 1955	BG SM
Dugway Proving Ground UT	1 Dec 55 - 3 Feb 56	BG
Loring AFB, Maine	Jan - Feb 1956	BG SM
Army Chemical Center, MD	21 Mar 1956 23-24 Apr 1956	BG BG
Dugway Proving Ground, UT	Spring - Fall 1956	SM
Camp Cooke, CA	Summer 1956	BG, SM
Dugway Proving Ground, UT	Aug - Sep 1956 1956	BG BG, FP
Army Chemical Center, MD	Oct - Nov 1956	BG
Fort Detrick, MD Area B	20 May - 25 Jun 1957	SM
Dugway Proving Ground, UT	20 - 24 Jun 1957 Jul - Aug 1957	BG, SM BG
Explosive Ordnance Disposal Technical Center, Indianhead, MD	Sep, Oct 1957	BG
Range 75C, Eglin Air Force Base, FL	Sep, Oct, Dec 1956 and Jan, Apr, Sep, Oct 1957	SM BG
Dugway Proving Ground, UT and Hamilton AFB, CA	7 Oct 57 and 18-21 Jan 1958	BG
McGuire AFB	15-18 Oct 1957	BG
Dugway Proving Ground, UT	1957	BG SM

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
Eglin AFB, FL	May - Jun 1958	BG SM
Dugway Proving Ground, UT	Aug - Sep 1958	BG, SM
	Aug 1958	SM, BG
	24 Sep 1958	BG, SM
	Jul 1959	BG
	Jul 1959 to Dec 1960	BG, SM
	Sep 1960	BG
	27 Mar 61 and 16 May 61	BG
	Jun 1961	BG
	Aug - Sep 1961	BG
Ft Eustis, VA	9-16 Feb 1959	BG
Fort Detrick, MD	12 Oct - 6 Nov 1959	BG
Ft McClellan, AL	Mar - Jun 1962	BG
	19 Mar - 13 Apr 1962	BG
	June 1962	BG
Dugway Proving Ground, UT	Aug 1962 - Feb 1963	BG
	Oct 1962 to Mar 1963	BG
Fort Detrick, MD Eglin AFB, FL	Sep 1962 May 1966	BG
Dugway Proving Ground, UT, Ft Bragg, NC Yuma Test Sta, AZ Ft Detrick, MD	Nov 1962 - Mar 1963 Jan - Apr 1963	Talc SM, BG
DPG, UT	Nov 1962 - Mar 1963	BG
Ft Bragg, NC Yuma Test Sta, AZ	Nov 1962 - Mar 1963	BG
Ft Detrick, MD	1962 - 1963	BG
Dugway Proving Ground, UT	16 Jan 1963 - 29 Jan 1963	BG
Yuma Test Sta, AZ	Mar - May 1963	Lipstick
Ft Bragg, NC	Mar - May 1963	Lipstick
Dugway Proving Ground, UT	Oct 1963 - Mar 1964	BG
	7 Nov - 14 Nov 1963	BG
	24 Jan - 3 Feb 1964	NA

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
"M" Field, Edgewood Arsenal, MD	19 - 26 Feb 1964	BG
DPG, UT	Aug - Sep 1964	Uraine Dye
Fort Bragg, NC		BG
Carroll Island, Edgewood Arsenal, MD	10 - 25 Aug 1965	BG
Fort Detrick, MD	Nov 1965	BG
Camp Pendleton, Edwards AFB, Rosamond Dry Lakebed, CA	Oct 1966 - Mar 1967	BG SM
Dugway Proving Ground, UT	Feb 1967	BG
	Jul 1968 - Mar 1969	Lipstick
Rosamond Dry Lake Edwards AFB, CA	26 Sep 1967 - 13 Jul 1968	SM BG
Edwards AFB, CA	15 Jul - 16 Oct 1968	SM BG
Ft Bragg, NC	Aug - Sep 1968	Lipstick
Edwards AFB, CA	Nov 1968	BG
Pacific Missile Range Point Mugu, CA	Jul 1969	
Eglin AFB, FL	2 Nov 1969 to 6 Nov 1969	BG

TABLE 3

FIELD TESTING
NON-BIOLOGICAL SIMULANTS/AIR DIFFUSION
INVOLVING PUBLIC DOMAIN

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
Harpers Lake, CA (Mojave Desert)	18 - 19 Aug 1949	Soap Bubbles
South Carolina, Georgia Coast	Mar - Apr 1952	FP
Minneapolis, MN St. Louis, MO	15 Jan - 24 Mar 1953	FP
Rosemont, MN	Sep - Oct 1953	FP and Lycopodium spores
San Francisco Bay, Redwood City, CA	21 and 26 Mar 1956	FP SO_2
Continental U. S. East of Rocky	30 Nov 1957 6 Feb 1958 25 Apr 1958 20 Mar 1958	FP
North Central Texas	1959 - 1960 Test No. Date A-1 13 Aug A-2 15 Aug A-3 18 Aug A-4 2 Oct A-5 5 Oct A-6 7 Oct A-7 9 Oct A-8 12 Oct A-9 10 Feb A-10 12 Feb A-11 15 Feb A-12 19 Feb A-13 22 Feb	FP FP
Vanderburg AFB, CA	Jun - Aug 1961 Feb, Mar, and Jun 1962	FP
Cape Kennedy, FL	May, Jun 1961, Jan - Mar 1962	FP
NE Oklahoma, Corpus Christi, TX, E Washington and SW Nevada	Summer 1962	FP

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
St. Louis, MO	May - Sep 1963 Apr - Oct 1964 Mar 1965	FP
Dugway Proving Ground, UT	17 - 21 May and 15 Aug 1963 4 Sep 1963	FP FP
Chippewa National Forest, MN	Jan - Aug 1964	FP
San Francisco, CA	Mar 64 - Mar 1968	FP
Wambaw Swamp Francis Marion National Forest, SC	Jun - Aug 1964	FP
Fort Wayne, IN	29 Jul 1964 - 5 Feb 1966	FP
Victoria, TX	Jul - Aug 1965 Jul - Aug 1965 9 - 29 Jul 1966	LP, FP LP, FP Glass beads & fluorescent tagged cork
Oceanside, CA	Jun - Jul 1967	FP
Searcy, AR	Sep 1967 - May 1968	FP
East Central Texas	1967	Glass beads, fluorescent tagged ground cork
Charles Lathrop Pack Demonstration Forest of the University of WA	Nov 1968	FP
Cambridge, MD	Aug - Nov 1969	FP

TABLE 3B

BIOLOGICAL FIELD TESTING
ANTI-ANIMAL
NON-BIOLOGICAL SIMULANTS
INVOLVING PUBLIC DOMAIN

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
Fort Worth, Texas Stockyards	30 Nov - 1 Dec 1964	Aerosol Deodorant
Kansas City, MO Stockyards	3-4 Dec 1964	"
South St. Paul, Minn Stockyards	11 Jan 1965	"
Sioux Falls, SD Stockyards	13 Jan 1965	"
Sioux City, Iowa Stockyards	14 Jan 1965	"
South Omaha, Neb	15 Jan 1965	"

TABLE 4

BIOLOGICAL FIELD TESTING
ANTI-PERSONNEL
PATHOGENIC AGENTS

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
Dugway Proving Ground, UT	1 Jun 1951 - 26 Aug 1951	Coxiella burnetti
		Psittacosis virus
	27 Mar 1952	Pasteurella pestis (avirulent Strain A-1122)
	12 May 1952	Brucella suis
(Horizontal Grid)	9 Apr 52 & 9 Jul 52	Pasteurella tularensis
	Jun & Sep 1952	Brucella suis B. melitensis
	Jul - Aug 1952	Brucella suis
	Aug - Oct 1952	Brucella suis
	21 Aug 1952	Coxiella burnetii
	Sep - Nov 1952	Coxiella burnetii
	9 Oct 1952	Pasteurella
	19 Nov 1952	Clostridium botulinum toxin
	Dec 1952	Brucella melitensis
	24 Mar & 21 Apr 1953	Pasteurella tularensis
	18 Mar -12 Jul 1955	Coxiella burnetii
	20, 28 Dec 1954 & 6 Jan 1955	Brucella suis
	Jan - Apr 1954	Bacillus anthracis
	12 & 18 Nov 1954	Pasteurella tularensis
(Horizontal Grid)	27, 29 Oct 1954 3 Nov 1954	Brucella suis
	4 Sep 54 - 21 Feb 56	Bacillus anthracis
	12 Jan 1955	Brucella suis
	6, 15 Apr & 4 May 55	Brucella suis
	Mar 55 - Feb 56	Bacillus anthracis
	Jun 54 - Jun 55	Brucella suis
Animal Exposure Chamber	Aug - Oct 1957	Bacillus anthracis
	May - Jul 1958	
	Aug 57 - Apr 1959	Pasteurella tularensis
	23 Oct & 14 Nov 1957	Pasteurella tularensis
	Apr 1958	Pasteurella tularensis
	Jul 1959	Bacillus anthracis Pasteurella tularensis Coxiella burnetii
	Apr 1960 - Feb 1962	Pasteurella tularensis
	Apr 1960 - May 1960	Pasteurella tularensis
	Sep 1960	Botulinum toxin Bacillus anthracis Coccidioides
	30 Jan 1961 - 27 Sep 1962	Coxiella burnetii
	Aug 62 - Feb 63	Pasteurella tularensis
	Nov 62 - Mar 63	Pasteurella tularensis Coccidioides

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
Dugway Proving Ground, UT (Continued)	Nov 62 - Mar 63	Coccidioides uranine Coxiella burnetii
	30 Jan 63 - 11 Apr 63	Pasteurella tularensis
	28 Mar - 11 Apr 1963	Pasteurella tularensis
	Oct 63 - Mar 64	Coccidioides
	14 Oct - 17 Nov 1965	Pasteurella tularensis
	25 Apr 66 - 6 Jun 66	Pasteurella tularensis
	9 Jul 66 - 25 Aug 66	Pasteurella tularensis
	15 Feb - 4 Apr 1967	Pasteurella tularensis Coxiella burnetii
Eglin AFB	14 Jul 1951	Hog Cholera
Farm owned by Univ of Wisconsin	Oct 1951	Newcastle Disease
Ft Detrick & DPG	Mar - May 1961	Pasteurella tularensis Brucella suis

TABLE 4A

(UNSUBSTANTIATED)
BIOLOGICAL FIELD TESTING
ANTI-PERSONNEL PATHOGENS
NOT INVOLVING PUBLIC DOMAIN

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
Dugway Proving Ground, UT	Jun - Nov 1950	Pathogens

TABLE 5

BIOLOGICAL FIELD TESTING
ANTI-CROP
PATHOGENIC AGENT
INVOLVING PUBLIC DOMAIN

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
South Carolina - Georgia Coast	Nov & Dec 1952	Dyed Lycopodium Spores Seed-dyed Cereal Rust Spores
Morris, Waseca, Le Sueur, Crookston, Duluth, & Rosemount, MN	May 1953	
Crookston, MN; Rosemount, MN; Rapid City, MN	Rosemount - 5,7 Jun 1955; Rapid City - 3 Jun 1956; Crookston 19 Jun 1956	Wheat Stem Rust
Intersection of US Highways 60 and 441, Yeehaw Junction, Florida	15, 18, 19, 20, 24, 27 Nov & 1 Dec 1956	Wheat Stem Rust
Hays, Kansas	7 May 1960	Wheat Stem Rust
Experimental Station, Beaumont, TX	Summer 1959	Rice blast
Langdon, North Dakota	12 Jun 1960	Wheat Stem Rust
Yeehaw Junction, FL	Nov, Dec 1968	Wheat Stem Rust

TABLE 5A

(UNSUBSTANTIATED)
BIOLOGICAL FIELD TESTING
ANTI-CROP
BIOLOGICAL AGENTS
INVOLVING PUBLIC DOMAIN

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
Edgewood Arsenal, MD	1949-50	TX or TX simulant
Crookston, MN	1964	TX
Avon Park AFB, FL	1954-1957 1960 1964	Cereal Stem rust spores None LX Helminthosporium oryzae
Casselton, ND	1964	TX
Crookston, MN	1956-57	
Stillwater, OK	1963-67	TX
Hayes, KS	1960, 64, 65	TX
Lincoln, NEB	1964-65	TX
Rosemount, MN	1955, 57, 64	TX
Langdon, ND	1960, 64	TX
Crowley, LA	1963, 64, 68, 69	LX and Helminthosporium oryzae
Avon Park AFB, FL	1 Apr 1965 - 31 Oct 1965	LX

TABLE 6

BIOLOGICAL FIELD TESTING
ANTI-CROP
PATHOGENIC AGENT
NOT INVOLVING PUBLIC DOMAIN

LOCATION OF TEST	DATE(s) OF TEST	SIMULANT/AGENT USED
Dugway Proving Ground, UT	18 Feb - 27 May 1952	Wheat Rust Spores
	12 Sep 52 - 26 May 53	Stem Rust of Wheat
	21 Jul - 24 Sep 53	Wheat Stem Rust
(Crop Grd #5)	12 Nov 53 - 16 Dec 53	Stem Rust Wheat
	Apr - Aug 1954	Wheat Rust
	14 Oct 54	Wheat Stem Rust
Avon Park AFB, Avon Park, Florida Bombing Range	Nov - Dec 1954	Wheat & Rye Stem Rust
ACmlC Rosemount Research Lab, Rosemount, MN	12 Jul 1955	Wheat stem rust (killed spores)
Belleglade & Ft Pierce, FL	Apr 1, May 1, Jun 1, & Jul 1, 1956 & 1957	Rice blast

Mid-Atlantic Tests

Background. On 21 November 1976, the Long Island Newspaper Newsday reported that the Army had "conducted an experiment to test San Francisco's (SF) vulnerability to a germ warfare attack. A little more than a month later one man was dead and five other patients were infected at a local hospital by the same kind of bacterium used in the test. ... The Army conducted similar experiments for as long as 10 years, including ... a test in the New York City subway system."

On 22 December 1976, the Washington Post reported under the New York Newsday byline that the Army had released information confirming the tests conducted in Key West and Panama City, Fla., New York City and S. F. over a 16-year period. The Washington Post also stated that the Army said that similar tests were conducted in Army installations at Point Mugu and Port Hueneme, CA., Fort McClellan, AL, a Navy facility in Mechanicsburg, PA, and at the Pentagon. The Washington Post article (22 December 1976) inferred that the Serratia marcescens (SM) used in the S. F. tests caused the death in S. F. (1950) and that the incidence of pneumonia cases increased sharply in Calhoun County, AL (1952), and in Key West (1952). The Newsday article in the Washington Post (22 December 1976) article reported that SM was used at eight of the test locations, Bacillus globigii (BG), at seven of the eight sites, and a fungus, Aspergillus fumigatus (AF), at one of the eight test sites.

The Newsday article was apparently based on a 15 December 1976 Army acknowledgement that field testing with SM had been conducted in eight tests in the U.S. up to 1966 to determine vulnerability to enemy biological attacks.

Subsequent to the two Newsday reports, articles appeared in various newspapers throughout the country. On 23 December 1976, the Atlanta Constitution reported tests were run at the following locations:

Pentagon, Washington, D.C.	(1950)
S. F., CA	(1950)
Mechanicsburg, PA	(1951)
Key West, FL	(1952)
Fort McClellan, AL	(1952)
Panama City, FL	(1953)
Point Mugu-Port Hueneme, CA	(1956)
New York City, NY	(1966)

Analysis of Allegations. The reports of the tests are essentially correct except for attributing a direct relationship of increased incidence of disease to the Army vulnerability tests in the S. F. area in 1950. In 1951, Dr. Richard P. Wheat, M. D., et al, in article "Infection Due to Chromobacteria," published in the Archives of Internal Medicine (Vol 88, 1950) reported on eleven cases seen in a San Francisco hospital from September 1950 to February 1951. The following is extracted from the "Comment" section of the referenced article:

> . . . Instrumentation of the urinary tract had been performed in every case, and the Chromobacterium probably was introduced by these procedures. An epidemiological study failed to reveal the route of infection in detail.
>
> That so many cases of urinary-tract infection by this unusual organism should have been observed was not surprising, since the obstructed and instrumented urinary passages are fertile soil for the multiplication of bacteria that are not commonly the cause of disease elsewhere. A contributing factor was the use of multiple antibiotics, which eliminated all the usual organisms that are responsible for infection of these organs and permitted the ready implantation of the highly antibiotic- and sulfonamide-resistant Chromobacterium.
>
> Similar invasion of various organs by bacteria resistant to one or more antibiotics, and not usually the cause of disease in the involved system, has become commonplace in patients treated with these agents. Such invasion has been most frequently observed in cases of superinfection of the urinary tract by members of the Pseudomonas and Proteus group. It is evident that the ever-widening use of antimicrobial agents will be associated with the discovery of infectious disease caused by a wide variety of unusual micro-organisms.

Therefore, the association with the above mentioned tests appears to be coincidental, since (1) no other hospitals reported similar findings; and (2) all the patients had urinary tract infections (two subsequently developed septicemia, a well recognized complication of urinary catheterization). All available evidence continues to indicate that SM is an opportunistic organism which infects those individuals who are debilitated or have a reduced immune response. To avoid exposing such populations to SM, the Fort Detrick Safety Director established a policy whereby the use of SM was not authorized if the simulant could enter a hospital or a sanitarium. The suspicion of attributing the cause of the one death in S. F. vulnerability tests has been refuted repeatedly and was also considered unlikely by Dr. Mills and a team from the S. F. General Hospital who had studied the relationship between SM infections and drug addiction in the S. F. area.

Because of apparent concern over a possible link between its San Francisco test in 1950 and the incidence of SM infections in the Stanford Hospital in 1952, the Army requested a group of eminent scientists to review the available information and provide recommendations on the future use of SM. The four civilian consultants from the Communicalbe Disease Center, USPHS; Department of Health, City of New York, Ohio State University; and Microbiological Institutes, National Institutes of Health, USPHS. Analysis and recommendations of the group were:

1. Experimental work in BW outside of the laboratory is impossible without the use of simulants. Simulants must be organisms having biological characteristics, other than pathogenicity, as nearly identical as possible to BW agents under study. An ideal simulant has not yet been found. Avirulent strains of

recognized pathogenic organisms should not be used in routine field trials if the necessary information can be obtained in any other possible way. Ideally a simulant should be an organism that has never been associated with a human disease and is not capable of growth in the human body. It must also be readily recognizable and recoverable by simple means.

2. Since the early days of bacteriology, SM has been the most commonly used organism for studying the dissemination of bacteria in air. Until recent years, there have been no reports of human illness associated with this organism in spite of its extensive use. In 1946 at Camp Detrick, four cases of minor illness of short duration were discovered in association with heavy exposures to SM. Reference is made to "Illness in Man Following Inhalation of Serratia Marcescens;" Paine, Tom F.; Journal of Infectious Diseases; Nov-Dec 1946; Vol. 79. A current survey among Camp Detrick personnel reveals only two cases of similarly insignificant illnesses among all those exposed while working with the organism.

3. The data in the referenced article describing the experience in San Francisco are incomplete as to the primary relation of the SM isolated from the patients and their illnesses, except in the case of one patient who died from bacterial endocarditis and SM bacteremia. With this single exception, the finding of SM in these cases was not shown to have influenced the clinical course of the patients' illnesses.

4. On the basis of our study, we conclude that SM is so rarely a cause of illness and the illness resulting is predominantly so trivial, that its use as a simulant should be continued, even over populated areas, when such studies are necessary to the advancement of the BW program.

5. The program at Camp Detrick in the search for better simulants should be then actively pursued. If a more desirable simulant is discovered, it should then replace SM.

6. In future tests over populated areas, it would be desirable to institute prior and subsequent studies in a few hospitals to determine whether the report previously referred to was purely coincidental or whether the recovery of SM from patients was related to BW field tests.

Health data for Monroe County (Key West) and Bay County (Panama City) do not support the Newsday allegations of pneumonia cases according to Dr. C. Prather, Florida's Health Officer, as given to the National Observer Weekend Edition (26 December 1976). A state-wide influenza epidemic hit Florida in 1952 and 1953 with a corresponding increase in pneumonia. According to Dr. Prather, the incidence of pneumonia in Bay County (Panama City) was relatively constant in 1951, 1952, and 1953. The Army disseminated what were believed to be innocuous biological substances, namely, SM, BG, and AF. SM, BG, and fluorescent particles were used in the S. F. test and BG mixed with charcoal in the New York subway test.

Additionally, SM has been used medically as a bacterial tracer from 1937 to 1969 with the results having been published in highly reputable medical journals as late as February 1969. The following are examples:

1. SM painted on gums to determine the source of bacteremia following dental extraction. No ill effects were seen in spite of documented bacteremia in 18 patients.

2. SM implanted to demonstrate bladder colonization from the unethral meatus after catheterization.

3. SM planted in the oropharynx to demonstrate the bacterial clearing effect of the tracheobronchial tree.

Not until 1969 did recognition of limited pathogenic capability lead to the advice that SM should not be used for the study of experimental infections in man.

In connection with open air testing, competent medical authority such as the USPHS stated no objection to the aerosolization of SM as a simulant test organism under stated test conditions.

Appendix I from Dr. David J. Sencer, Assistant Surgeon General, Center for Division Control in Atlanta, GA , provides additional data regarding the incidence of pneumonia and influenza deaths near cities where the vulnerability tests were conducted. The report substantiates the lack of evidence associating the reported deaths with the organisms used in the various tests.

Appendix F to Annex F

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333
TELEPHONE [illegible]

Your Reference: DASG-HCH-D

FEB 3 1977

Richard R. Taylor, M.D.
Lieutenant General
The Surgeon General
Department of the Army
Washington, D. C. 20310

Dear Dr. Taylor:

In regard to your request for information on pneumonia cases and deaths in the counties where simulated biological warfare tests were conducted, we have been able to obtain for you the following preliminary data which are attached to this letter. You will note that we have provided you pneumonia and influenza deaths by year, by county and/or city in question for the years 1943-61 and also indicating those years in which influenza outbreaks occurred. These outbreaks, you know, can increase the number of pneumonia and influenza deaths. For San Francisco we have reports of the number of cases of pneumonia and influenza by week for 1950 and 1951, which we will send under separate cover. We have contacted the four State Health Departments yesterday and requested that they determine whether cases and deaths due to pneumonia by county by month for the years in question are also available.

We do not know of any evidence that would indicate an association between the deaths reported in the press articles you included and the organisms reported to have been used in the atmospheric tests. Our surveillance of hospital-acquired infections over approximately the past 10 years does show an increase in the incidence of infections due to Serratia marcescens; however, this may reflect better country-wide surveillance, improved laboratory identifications, and the increasing susceptibility of the hospitalized patient due to increasing age, presence of chronic disease, increasing use of antibiotics, and increased use of various diagnostic and therapeutic procedures that increase the opportunities for infections to be acquired in the hospital. We have no data suggesting that Bacillus globigii is causing human disease.

Page 2 - Richard R. Taylor, M.D.

I hope this initial analysis is useful. We should know the availability of the other material by the end of this week.

Sincerely yours,

David J. Sencer, M.D.
Assistant Surgeon General
Director

Attachment

cc:
S. Paul Ehrlich, Jr., M.D.
Acting Surgeon General, PHS

PNEUMONIA AND INFLUENZA DEATHS BY YEAR FOR SELECTED CITIES AND COUNTIES *

	1943	A 1944	B 1945	1946	A 1947	1948	1949	A 1950	A 1951	1952	A 1953	1954	1955	1956	A 1957	1958	A 1959	A 1960	B 1961
[illegible] Ga.	682	492	447	418	358	402	311	268	261	297	324	266	256	268	330	283	287	305	283
[illegible] Ga.	3	2	9	2	6	7	2	5	NA**	NA**	5	6	7	4	7	8	9	11	11
[illegible]	NA	NA	68	66	59	79	26	18	29	31	19	13	14	19	23	25	27	38	17
[illegible]	2	3	6	8	1	2	2	6	NA	NA	3	3	7	8	3	7	3	8	2
[illegible]	NA	NA	34	25	16	13	15	23	21	24	22	7	22	22	29	17	22	25	19
[illegible] Fla.	25	30	20	8	5	11	7	4	NA	NA	6	9	3	5	7	9	10	8	2
[illegible] County,	NA	NA	11	12	0	1	2	4	15	6	6	1	3	8	2	4	6	6	3
[illegible] Fla.	12	9	12	20	11	14	4	10	NA	NA	11	13	9	5	5	10	10	7	5
[illegible]	NA	NA	1	0	0	0	1	0	11	15	0	1	0	0	3	1	0	2	3
[illegible], Ala.	35	28	18	19	18	7	7	11	NA	NA	10	13	12	11	13	11	12	15	10
[illegible] County, Ala.	NA	NA	22	15	14	20	9	16	27	29	14	17	9	7	8	11	11	18	8

* Vital Statistics of the United States, Dept. of Commerce - Bureau of Census, 1943-1944; Federal Security Agency - Vital Statistics, 1945-1949; Dept. of Health, Education, & Welfare - Vital Statistics, 1950-1961.

** Asterisk represents a reporting change for 1951 and 1952 for the entire country.

A Represents years when influenza A or B was epidemic for the country.

Annex G

BW PROGRAM SAFETY

Background. The safety and medical aspects of RDT&E in BW were recognized, formalized, implemented, emphasized and policed from the very onset of the program. The concern was primarily for the health of the operating personnel but encompassed the surrounding communities as well.

A safety organization was established in 1943, along with operation organizations reporting directly to the Commanding Officer. One of the functions was to develop, implement and police safety policies, procedures and practices for the protection of personnel and another was to conduct research, development, testing and evaluation of safety devices, procedures and practices to include immunization. In addition, a meticulous records keeping procedure was established, and maintained to assure individual immunizations, etc., were kept up-to-date. The liaison officers from USPHS and USDA were involved in several aspects of the safety program.

Accomplishments. The emphasis on safety continued throughout the lifetime of the BW Program resulting in the development of special equipment such as negative pressure isolate cabinets with specialized gloves and glove parts for handling materials; decontamination systems such as exhaust air ventilation system incorporating air incineration chambers, water and waste decontamination systems, effective filtration systems for air and fluids, and specialized personnel protective clothing and masks such as clean air supplied garments.

The specialized equipment, testing devices, techniques and practices developed and perfected by the Safety organization, some of which were wholly new and others on a scale never attempted before, have been adopted by academia, industry and private research institutions. Safety engineering

standards and practices have been embodied in a two volume document "Design Criteria for Microbiological Facilities, Fort Detrick" which to the present is referred to and followed in the design of laboratory facilities for conducting microbiological research.

Safety Record. That safety efforts were effective is attested to by the remarkably fine safety record achieved as noted in attached table and the fact that 27 vaccines, 5 toxoids and 5 skin tests were developed, perfected and effectively utilized for workers in the BW program (See Tables I and II.).

In conformation with the National Safety Council standards, the rate of infection at Fort Detrick during its lifetime was less than 10 infections per million manhours worked. This rate was better than any industrial average and 10 to 14 times better than all Civil Service and 20 to 50 times better than most industry averages during the same time frame. The three deaths represented a lower mortality rate than was found in any other survey of laboratory infections.

During the years 1950-1967, Dugway Proving Ground had only 10 infections Pine Bluff Arsenal had 34 infections from 1950-1969, and the Deseret Test Activity had only 4 from 1962-1973. These infections resulted in no fatalities or permanent disabilities.

TABLE I

Fort Detrick Laboratory acquired infections
(Includes civilian and military personnel)

Number of Infections 20 April 1943 to Termination	456
Deaths. (anthrax 1951, 1958; viral encephalitis 1964)	3
Number of Infections 1943 to 1947	93
Number of Infections 1948 - 1958.	277
Number of Infections 1959 - 1969.	86

TABLE II

Safety Program
1943 to 1969

Agent Vaccines Developed	Toxoids	Skin Tests
1. Psittacosis virus	1. Clostridobotulinum A	1. Brucella suis
2. Bacillus anthracis	2. Clostridobotulinum B	2. Pasteurella tularensis
3. Pasteurella tularensis (attenuated)	3. Clostridobotulinum C	3. Mycobacterium tuberculosis
4. Pasteurella tularensis (irradiated)	4. Clostridobotulinum D	4. Clostridium tetani
5. Rift Valley virus	5. Clostridobotulinum E	5. Bacillus anthracis
6. Rio Bravo virus		
7. Rocky Mountain Spotted Fever Rickettsia		
8. Blastomyces dermatiditis		
9. *Pneumococcus pneumoniai*		
10. Eastern Equine Encephalomyelitis virus		
11. Brucella suis		
12. Pasteurella pestis		
13. Japanese B Encephalitis virus		
14. Salmonella typhii		
15. Venezuelan Equine Encephalomyelitis virus		
16. Q Fever Rickettsia		
17. Q Fever & Rocky Mountain Spotted Fever (combined)		
18. Germiston virus		
19. Vibrio comma		
20. Coccidioides immitis		
21. Influenza virus		
22. Typhus Rickettsia		
23. Pasteurella tularensis (425)		
24. Yellow Fever virus		
25. Mycobacterium tuberculosis		
26. Malleomyes mallei		
27. Bolivian Hemorragic Fever Virus		

Annex H

Medical/Safety Considerations for Conduct of Open-Air Tests with Pathogens

Background:

Medical/safety aspects of open-air tests with pathogenic microorganisms conducted by the DOD were guided by the recommendations and observations of independent advisory committees. Three committees were assembled to advise the Army on test conduct. These were: the Ad Hoc Committee on BW Testing (Scheele Committee) at Dugway Proving Ground (DPG)-1953, the Inter-Agency Survey Committee on BW Testing at DPG (Price Committee)-1959, and the Deseret Test Center Medical Advisory Committee (Davis Committee)-1962. A summary of committee composition, purposes, recommendations and findings follows.

Ad Hoc Committee on BW Testing at Dugway Proving Ground (Scheele Committee).

The "Scheele Committee" was convened at the request of Robert T. Stevens, Secretary of the Army, in 1953 for the purpose of advising the Department of the Army on the advisability and safety of testing prototype hardware containing animal and plant pathogens at Dugway Proving Ground. The Committee was chaired by Dr. Leonard Scheele, Surgeon General of the US Public Health Service. Members of the Committee were eminent authorities in their fields of biological specialization and were drawn from various universities and federal and state (Utah) agencies. Incorporated is a list of the Committee membership. The Committee assembled for two series of meetings: One series was held at Ft. Detrick and DPG during July of 1953 to consider agents which could or could not be safely tested at DPG; a second series of meetings at DPG was held during October of 1953, at the request of MG Egbert Bullene, Chief Chemical Officer, to consider the specific subject of the safety of conducting field trials on the Salt Flats at DPG using Bacillus anthracis.

Although review of the minutes and comments of Scheele Committee actions provides some insight into a deep concern for, and deliberation on, medical and safety considerations with respect to testing by the technical staff and/or consultants at Ft. Detrick prior to establishment of the committee, no definitive correspondence or memoranda related to the subject could be retrieved from the files.

(July 1953 meetings.) During this series of meetings, various agents were considered safe for testing within limits prescribed by the committee. Basically, those agents which were present in the United States in animal reservoirs and which were relatively widespread were deemed safe for testing at Dugway. "Human infections acquired in nature are of public health

interest but do not constitute major problems . . . ." "To reduce even such a small hazard as might develop, continuous surveillance of the rodent and ectoparasite populations should be continued . . . ." These statements were the prime precepts which delineated the Dugway test orientation and which laid the foundation for pursuit of the expanded Ecology and Epidemiology (E&E) program in the Dugway and surrounding areas.

The Committee considered other agents, as well, which were deemed to be, at that time, unsafe for testing because of lack of evidence for endemicity in western wildlife.

The Committee emphasized the importance of continuing and expanding meteorological investigations on and adjacent to DPG before conduct of tests of persistent agents, such as B. anthracis. In this regard, they recommended that numerous small and large scale tests be done with viable biological simulants (specifically with B. globigii (BG) and inert particulates (FP) to determine cloud travel and deposition. Persistence studies of organisms in both aerosols and soil should also be completed. They recommended a continuing and increased effort on disease surveillance in both wildlife and domestic animals in the area for those agents under consideration for open-air testing. They further recommended that "appropriate state officials" be continually informed of tests to be conducted with pathogenic agents in order that their cooperation may be obtained in maintaining human, animal and crop epidemiological intelligence in areas adjacent to Dugway. Finally, to keep the Surgeon General informed of testing activities on a continuing basis, the committee recommended permanent on-site Public Health personnel be assigned to both Ft. Detrick and DPG. All of these recommendations were immediately and fully implemented.

(October 1953 meetings.) A review of work done at DPG on agent spread and persistence from Salt Flat release of biological simulants (BG) and FP, and work at Ft. Detrick "on the lethal end point of N/anthrax)" indicated that small stepwise releases may be made "provided adequate precautions for safety and for handling of emergency situations" were available in advance. The Committee recommended that precautions should include "assurance of an adequate supply of specific chemotherapeutic agents for prophylactic treatment, availability of personnel for administration of such materials, and plans for appropriate cooperation with health and agricultural officials at state and federal levels." All of these recommendations were fully implemented. The Committee established levels of agent release beginning with small and proceeding to larger releases.

Tests could be conducted under meteorological conditions which, in the opinion of the test staff, would be unlikely to provide for travel of clouds in dangerous concentrations to areas known to be inhabited or occupied by humans or livestock. On the basis of this meeting, two successful series of B. anthracis tests were conducted over an 18 month period in stepwise fashion under the parameters established by the Committee. No untoward effects of these tests were ever reported. Extended surveillance of wildlife in the areas surrounding the test site was maintained for many years as a component of the E&E effort. No epizootic or evidence of elevated serological antibody levels in the wildlife were detectable.

MEMBERS OF SECRETARY OF DEFENSE
AD HOC COMMITTEE FOR DUGWAY PROVING GROUND
OR SCHEELE COMMITTEE - 1953

Leonard A. Scheele, M.D., Chairman
Surgeon General
Public Health Service
Department of Health, Education, and Welfare
Washington 25, D.C.

Members:
Assistant to the Secretary of Defense
(Health and Medical)
Washington 25, D.C.

Chief, Bureau of Animal Industry
US Department of Agriculture
Washington 25, D.C.

Professor of Bacteriology
College of Agriculture
University of Wisconsin
Madison 6, Wisconsin

State Director of Public Health
Utah State Department of Health
Salt Lake City, Utah

Health & Special Weapons Defense Office
Federal Civil Defense Administration
Washington 25, D.C.

Operations Research Office
The Johns Hopkins University
6410 Connecticut Avenue
Chevy Chase, Maryland

President, Armed Forces Epidemiological Board
Professor of Microbiology
College of Medicine
New York University
477 - 1st Avenue
New York 16, New York

Chief, Biological Warfare Branch
Research and Development Division
Office of the Chief Chemical Officer
Washington 25, D.C.

ADVISORS TO THE COMMITTEE

Chief, Office of Health Emergency Planning
Public Health Service
Department of Health, Education and Welfare
Washington 25, D.C.

Director, Microbiological Institute
National Institutes of Health
Public Health Service
Department of Health, Education and Welfare
Bethesda, Maryland

Interagency Survey Committee (Price Committee): This Committee was organized in 1959 by David E. Price, Chief, Bureau of State Services, U.S. Public Health Service, at the request of MG Marshall Stubbs, U.S. Army Chief Chemical Officer. Meetings again were held at both Ft. Detrick and DPG. As with the Scheele Committee, the purpose of this Committee was to make recommendations on pathogenic agents which could or could not be considered in open-air tests at DPG. Membership of this Committee was again drawn from universities and various federal and state agencies (Utah and Nevada). All were eminent authorities in their fields of biological specialization. A list of the membership of this Committee is incorporated.

The Price Committee reaffirmed the basic precepts defined by the Scheele Committee, lauded the extensive detailed epidemiological, wildlife dynamics, and ecological material resulting from the expanded E&E program and review in detail the open-air biological test activities which had been completed during the 1953-1959 time frame. Essentially the same list of agents approved by the Scheele Committee was approved.

Where agents had not been previously tested at Dugway, the Committee recommended that ecological, laboratory safety and soil persistence studies be initiated at least one year prior to consideration for use in open-air tests. Detailed studies were recommended for initiation to permit estimation of concentrations of organism simulants and patterns of aerosol travel between the biological sampling grids and highway U.S. 40 (35 miles to the north). These studies were later completed with no evidence of agent having reached U.S. 40. The Committee repeatedly commended the progress of work in the ecology and epidemiology area and strongly recommended support for continuation of these studies. Likewise, it was pleased with the working

agreement with Utah State officials and recommended a similar agreement with officials from the State of Nevada.

Consideration was given by the Committee to the subject of tests with "infected" (sic) mosquitoes and "uninfected" (sic) arthropods but recommended against same because of a concern for the potential for establishment of permanent foci for infection and arthropod colonies.

Finally, the Committee recommended that it be retained in a permanent status, subject to call by the U.S. Army Chief Chemical Officer. The Committee was not subsequently reconvened because the U.S. Public Health Service Liaison Officers, resident at both Ft. Detrick and Dugway (mentioned under the section on the Schaele Committee), served as the intermediaries in relations with USPHS medical authorities and consultants.

All Price Committee recommendations were fully implemented.

INTERAGENCY SURVEY COMMITTEE - 1959

David E. Price, M.D., Chairman
Chief, Bureau of State Services
U.S. Public Health Service
Department of Health, Education and Welfare
Washington, D.C.

Members:
Chairman, Utah State Board of Health
Utah State Department of Health
Salt Lake City, Utah

Associate Director
National Institute of Health
U.S. Public Health Service
Bethesda, Maryland

Chairman, Department of Epidemiology
School of Public Health
University of Michigan
Ann Arbor, Michigan

Chief Staff Officer, Laboratory Services
Animal Disease Eradication Service
Agriculture Research Office
Department of Agriculture
Washington, D.C.

Acting State Health Officer
Nevada State Health Department
Carson City, Nevada

Department of Bacteriology
College of Agriculture
The University of Wisconsin
Madison, Wisconsin

Professor of Research Medicine
Hospital of the University of Pennsylvania
Philadelphia, Pennsylvania

Program Coordinator, Research Division
U.S. Army Chemical Corps Research and Development Command
Washington, D.C.

National Institute of Allergy and Infectious Diseases
Rocky Mountain Laboratory
Hamilton, Montana

CONSULTANTS TO INTERAGENCY SURVEY COMMITTEE

Chief, Virus and Rickettsia Section
Communicable Disease Center
U.S. Public Health Service
Montgomery, Alabama

Chief, Epidemiology Branch
Communicable Disease Center
U.S. Public Health Service
Atlanta, Georgia

The Johns Hopkins Hospital
Baltimore, Maryland

Agriculture Research Office
Department of Agriculture
Washington, D.C.

Deputy Commander
U.S. Army Medical Research and
Development Command
Washington, D.C.

Deseret Test Center Medical Advisory Committee (Davis Committee):

This Committee was organized under the auspices of the Secretary of the Army. The Committee was chaired by Dr. Dorland G. Davis, Director of the National Institute of Allergy & Infectious Disease. Incorporated is a list of the other members of the Committee. All members of this Committee were eminent public health authorities. They were assembled to advise the Secretary of the Army and the Commanding General, Deseret Test Center, on ecology, epidemiology and safety of conducting field tests with pathogenic microorganisms at remote extra-continental test sites. Their guidance was in consonance with precepts established by the predecessor Committees (Scheele and Price). Several experts had been members of those Committees, as well. Specifically, they made recommendations on the use of specific agents at specific test sites. They met in six series of meetings between 1962 and 1969. These meetings, some of which were held at test sites, were generally held at Dugway and Deseret Test Center, Ft. Douglas, Utah. All of the Committee members visited various test sites to observe, firsthand, that their recommendations were implemented. Their observations and recommendations included: (a) ecology and epidemiology considerations, which served as the basis for initiation of extensive E&E studies in all test areas for which agent tests were being planned; (b) meteorological considerations, to minimize the possibility of exposure of human, domestic animals and wildlife populations to agent; and (c) safety considerations for participating military and civilian personnel, to minimize hazards associated with possible exposure to agent. The majority of their effort was devoted to E&E studies because of their importance in evaluating immediate and residual effects in the specific remote site environment. They recommended both pre-test

baseline studies and post-test residual studies. In every case, they found the test teams in a high state of readiness prior to test conduct. No impact on the environment was ever detected nor were any other untoward effects.

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Annex I

Environmental and Ecology Programs

Background. Emphasis on ecology and the impact of effluents on the environment came into national focus within the last decade. However, this problem was highlighted in the BW program as far back as 1951. Based upon guidance from the Chief Chemical Officer in 1951, a program was initiated to study and analyze the plants and animals of Dugway Proving Ground, Utah, and the adjacent areas. A broad spectrum of detailed studies was designed to provide baseline data on plant and wildlife distributions, population dynamics, ecology, etc. The same requirement was also imposed on the Deseret Test Center when it was established in 1962.

Dugway Proving Ground. Under the guidance and recommendations of the Scheele and Price Committees (described in the foregoing), Dugway Proving Ground has been intimately involved in the conduct and management of a variety of ecological surveys, surveillances, analyses, and evaluations for 25 years (1952). The basic directive for these specific studies was to collect baseline data required to assure that testing activities would not create an immediate and residual hazard to wildlife, livestock, domestic animals and humans.

Based upon guidance from the Chief Chemical Officer in 1951, a program was initiated to study and analyze the plants and animals of Dugway Proving Ground and the adjacent areas. A broad spectrum of detailed studies was designed to provide baseline data on plant and wildlife distributions, population dynamics, ecology, etc. In November 1952, a contract was entered into with the University of Utah to initiate the program.

The investigative areas were:

1. Identification of the plants and animals in the vicinity and the development of adequate reference collections for the ready identification of species being studied;

2. Study of the potential for transmission of the candidate agents contemplated for test at Dugway by vectors naturally resident on the wildlife of the Proving Ground and surrounding areas;

3. Study of ecological relationships of possible vectors, hosts, and predators in relation to the physical environment and to other members of the biota, including foods, ranges, distribution, density, reproduction and life histories;

4. Study of the daily and seasonal activities or migrations of animals and the long time trends in the fluctuations of their population numbers as they influence the possible spread or control of vectors; and

5. Establishment of sample areas for study of econological fluctuations.

This scheme was diligently pursued by the contractor and the following facilities were established at Dugway:

1. A field operations laboratory to support field teams for the trapping, processing, tagging, identifying, packaging, storing and recording of morbid and live field samples for further study and analysis;

2. A faunal colony and ecology laboratory used for the rearing of wild animals and insect vectors necessary in experimental infection work;

3. An animal quarantine and holding facility to receive and hold wild animal specimens procured from the field; and

4. Laboratories and associated animal rooms for work with pathogenic material.

In 1953, the Environmental and Ecology (E&E) program was expanded in

scope to encompass the recommendations made by the Scheele Committee. Federal agencies such as the USPHS cooperated in this program. Pursuant to the request of the Army, A USPHS Commissioned Officer was assigned to Dugway, as the Director of E&E Division, to serve on the commanders staff. In this capacity he served as the contracting officer's representative and project coordinator. Every effort was made to follow Committee recommendations. Six years later the Price Committee strongly supported the existing ecological and epidemiological effort at Dugway.

In April 1955, a symposium on the "Ecology of Disease-Transmission in Native Animals" was held at Dugway, sponsored by the University of Utah. Advisors and participants were invited from educational institutions and from various agencies such as the U.S. Public Health Service and other governmental agencies. Presentations and discussions were published. In 1956, the annual International Northwestern Conference on Disease in Nature Communicable to Man (INCDINC) was sponsored by the University of Utah with presentations by E&E program personnel.

Periodically, reports were issued to fulfill the contract requirement. These reports culminated in "Ecological Check Lists" edited by A. M. Woodbury in 1965. This and other reports, dealing with surveys for pathogens and their hosts, present a wealth of information on the biota of the Great Salt Lake Desert and are the most extensive ever attempted in the Bonneville Basin. Production of numerous special reports continued. Some, such as Vest, 1962, "Biotic Communities of the Great Salt Lake Desert," became landmark contributions in the study of the environment and were well received by the scientific community. Other reports reviewed the status of information on such pathogens as tularemia, plague, Venezuelan Equine Encephalitis, etc. Starting in 1959, a series of 12 annual reports were issued with the title, "A Study of the Ecology and Epizoology of the

Native Fauna of the Great Salt Lake Desert."

In 1968, methodology was established to test for chemical toxicological effects on the biota and by 1971 acetylcholinesterase levels in wildlife and livestock were being examined routinely as indicators for exposure to organophosphorus chemicals as part of the chemical safety program. Meanwhile, surveillance continued on disease levels, population interactions and related factors of disease and epidemiological safety interest.

In 1970, the contract with the University of Utah was terminated, and studies were continued for three years by Ecodynamics, Inc., of Salt Lake City at approximately the same level of effort. These studies are now being conducted in-house on a much diminished scale. Requirements have been reduced in consonance with the elimination of biological warfare by the United States in 1969.

Since 1966, arthropod-borne viruses have been studies in detail. The 1971 VEE epidemic in horses in the southern United States prompted a 1972 expansion in surveillance of domestic and wild mammals as well as mosquitoes for detection of possible incursion of the VEE virus into Utah.

The Dugway E&E program investigations have resulted in original isolation of Utah in the causative organisms of Plague, Q-Fever and arboviruses for California Encephalitis, Hart Park, trivittatus, Main Drain, Jamestown Canyon, St. Louis Encephalitis, and Lokern.

Throughout the program, data concerning disease incidence, native populations and parasites, etc., have been correlated to examine trends between five zones of comparison; these zones range from close to Dugway to distant control areas of Utah and points in Nevada and Idaho. In the 25 years of study, no change has been observed in animal population distributions or dynamics attributable to the testing program nor has any

evidence been developed indicative of epidemiological involvement of resident wildlife resultant from the extensive biological test program completed in years past. Contractor and domestic reports support this conclusion. Cyclic changes can be explained as natural phenomena.

Deseret Test Center. Acting on the recommendations of the Deseret Test Center Medical Advisory Committee, Deseret Test Center, from its establishment in 1962 to its merger with Dugway Proving Ground in 1968, sponsored a contractual E&E effort with the Smithsonian Institute and the University of Oklahoma. These programs provided required E&E surveys in those areas outside the continental United States which had been designated for possible open-air BW testing.

The purpose of these studies was to determine potential reservoirs of specific infectious agents, if any, and possible routes of dissemination.

Studies were conducted during 1963 through 1969 on selected islands in the Central Pacific Ocean from latitudes 35° N to 20° S and longitudes 145° E to 145° W (approximately from the Hawaiian Islands west to Guam and south to Samoa). Other investigations were conducted in Alaska and the Bering Sea (i.e. Pribilof Islands), and off the Pacific Coast.

Specific objectives of this ecological program were: to identify and determine the distribution of birds and mammals and their ectoparasite; to conduct biological studies on their breeding and feeding habits and migratory routes; and to ascertain the breeding and host preferences of mosquitoes and biting flies.

Pelagic birds were studied more intensely in the Pacific, while in Alaska mammals were emphasized because of differences in relative abundance in the respective areas. As at Dugway, no immediate or residual environment effects were observed during or subsequent to completion of test activities

as the test sites.

Pine Bluff Arsenal: Prior to the formal establishment of the production laboratories in October 1953, a research contract was negotiated with the University of Arkansas to assure that the planned biological mission would pose no ecological or environmental hazards.

Contractural provisions included studies of both plant and animal life (study activities) but primarily addressed surveys, analysis and evaluations of community animal life in relation to potential transmission of candidate agents to local animal populations. Collection of baseline data for the various surveillance categories was accomplished (for on-going studies, tests and experiments). Support facilities including a field operations laboratory for use in all phases of wildlife entrapment, and a faunal colony for experimental infection work, were extensively used in a broad spectrum study effort. Periodic reports prepared in accordance with contract requirements, summarized and evaluated results of the various ecological surveys, studies and surveillances indicated no immediate or residual environmental effects.

As the biological operations mission progressed, an in-house capability for performing required ecological studies was gradually established with concurrent reductions in the scope of the contractural effort. The contract studies were halted in 1957. In-house studies to verify environmental safety were continued until termination of the mission in 1969.

Annex J

Transportation of Biological and Etiologic Materials (U)

Introduction. The history of military shipping experience relative to biological and etiologic agents and materials cannot accurately be reconstructed from inception due to non-availability of supporting documentation. In addition to complying with the earliest of regulations issued by the U.S. Post Office, U.S. Public Health Service and commercial airlines, however, military shipments were subjected to more restricted packaging standards to maximize transportation safety. During the intervening years, standards issued by both the military and non-military departments became progressively more restrictive with emphasis upon packaging reliability rather than design criteria. As a result, military shipments have continually been performed under optimum safety conditions, and without accident.

Background. The earliest packaging regulations for etiologic agents were those of the U.S. Post Office in 1951 which applied to "specimens of diseased tissues, blood, serum and cultures of pathogenic microorganisms." Military operating procedures for shipping biological materials were first known to have been published by Fort Detrick in 1950-1951, and by the Department of the Army in Technical Bulletin 237 dated 6 June 1952; these source documents have not been located. It is important to note, however, that the earlier non-military regulations and standards primarily addressed packaging design criteria rather than reliability factors in event of an in-transit accident or incident. Accordingly, in 1954, Fort Detrick initiated a review of procedures and regulations issued specifically for transport of infectious materials in the biological warfare program.

This review reported the results of repeated performance-type tests (rough handling) using prototype packages. The favorable results obtained from these tests--no package leakage--supported the elimination of two currently employed safety precautions: (1) nonstop military aircraft flights, and (2) use of a military escort vehicle and an accompanying decontamination truck during land transport.

Due to discovery of a leakage of experimental living poliomyelitis virus in a commercial shipment on 24 May 1956 (at Washington National Airport), the U.S. Public Health Service on 15 March 1957 issued a Federal Regulation specifying packaging standards for shipment of infectious microorganisms exclusive of Postal Mail. This regulation is code of Federal Regulations Title 42, Public Health, identified as 42 CFR 72.25, Interstate Quarantine, Shipment of Certain Things, Etiologic Agents, which specified a maximum volume of 1 U.S. gallon of etiologic agent. Subsequently, as noted in the Federal Register of 13 May 1958, the Civil Aeronautics Board (CAB) adopted the packaging provisions of 42 CFR 72.25, with certain amendments, effective 25 June 1958. On 19 September 1958, the commercial airlines followed the Civil Aeronautics Board by accepting 3 gallons of etiologic agent in any of the aircraft with the requirement for decontaminating material between the separating containers; however, both the quantity and decontaminant requirement were deleted some time prior to 1966 for they do not appear in the current official air transport restricted articles tariff No. 6-D. The first military directive on the subject published in January 1959, was Chemical Corps Safety Directive 385-9, "Shipping Criteria for Etiologic Agents and Material." This regulation summarized existing regulations, formalized the packaging specifications previously developed and accepted under 42 CFR 72.25,

and except for diagnostic specimens (laboratory samples), made technical escort mandatory for all Army shipments of etiological agents, although not required by 42 CFR 72.25.

The first severe testing of etiologic agent packaging occurred in May 1961 and resulted from inquiries by the Federal Aviation Agency and commercial airlines into the validity of packaging reliability standards described in Chemical Corps Safety Directive 385-9. A variety of drop tests including high altitude drops ranging to 4,000 feet at the Army's Dugway Proving Ground, Utah, and other actual/simulated drop tests utilizing packages prescribed in the Chemical Corps Safety Directive were conducted with extremely favorable results--only one container sustained breakage and no leakage occurred through the secondary container. Revised packaging standards resulting from these tests were subsequently standardized at Fort Detrick and in 1962 recorded in Technical Memorandum 12. In January 1964, U. S. Army Materiel Command issued AMCR 384-101, "Safe Shipping Criteria for Etiologic Agents and Biological Materials." Subsequently, on 7 June 1965, Department of Agriculture (USDA) and approved by HEW with formal agreements between those Departments and the Department of Defense (DOD). The regulation approved the packages described in Technical 12 and authorized use of the same principles to package amounts of 1 gallon or less. In addition it removed the requirement for a technical escort for shipment of etiological agent with 500 ml. or less in the primary container, but continued the requirement for escort if the total quantity in any one vehicle, aircraft, or other conveyance exceeded 3 gallons--a requirement in effect since 14 February 1963 when authorized by the next higher Army command. The military requirement of a decontaminant (calcium hypochlorite) between the primary and secondary containers

was removed 12 November 1969 in U.S. Army Materiel Command Supplement 1 to AR 55-8. Analysis indicated this decontaminant caused deterioration of the tin container and could cause explosion under certain conditions during disposal of opened packages. This supplement also eliminated the use of particulate absorbent material, such as vermiculate, which when contaminated could be easily spread outside a broken package. Use by the military of larger gallonage containers received attention as early as 1959 when a 13 gallon seed tank adapted for use during production was modified for packaging agent in quantities up to 16 gallons. Other type containers such as a 15-gallon stainless steel keg, within a protective configuration, were developed and subjected to performance testing--50 foot air drops to hard surfaces. Such containers were always shipped under military technical escort in military trucks and planes (or Logair) due to the 1-gallon perpackage limitation in the commercial airlines restricted articles tariff. Logair was a scheduled domestic cargo aircraft service provided by commercial air carriers under contract to the U.S. Air Force and controlled by that service through Air Force Logistics Command (AFLAC) - except for technical escort personnel, no passengers were permitted on these flights. Commercial trucks were not used for transport of Army shipments of etiologic agents. Authority for more than 1-gallon shipments was obtained from the Public Health Service, after individual review, in accordance with a 1954 agreement concerning the shipment of potential biological warfare agents. Such shipments were approved after thorough evaluation of the containers, mode of shipment and provisions for decontamination and containment in the event of an accident, satisfying the USPHS that the overall hazard was less than that of commercial shipments in full compliance with 42CFR 72.25.

The development of more sophisticated biological munitions and their large area coverage potential, prompted development of improved packaging to insure safe transport by land or air. On 17 November 1964, the Chemical-Biological Joint Technical Coordinating Group (JTCG-CB) established a tri-service Ad Hoc etiologic agent shipping and handling safety committee to resolve attendant problems. Extensive research and study into developing "aircraft crash-equivalent standards" was accomplished including the design and designation of adequate containers for shipment of etiologic agent by air or land without technical escort. These and other containers that met prescribed velocity impact standards were later approved by The Surgeon General and the Public Health Service.

An agreement between the Department of Health, Education and Welfare and the Department of Defense for shipment of etiological agents was formalized on 13 December 1965. This agreement, in addition to the other Federal requirements, assured that etiologic agents/potential biological warfare agents were shipped only in accordance with standards approved by the U.S. Public Health Service and the Administrator of the Agricultural Research Service. Except for the possible use of packaging used to transport radioactive materials, only military packaging of biological/etiological material was designed and tested to meet extraordinary standards used by the military services for transportable containers of etiologic agents. The combination of these regulations and packaging standards was directly responsible for the successful accomplishment of military shipments without incident. No known leakage of infectious or toxic biological material, or instance of a personnel infection occurred during a military shipment.

Annex K

Human Volunteer Testing

Authorization and Establishment. Since World War I and the introduction of mustard gas into military inventories, the use of chemical and biological agents in open warfare has been addressed as a moral, social and tactical issue at military conferences as well as a matter for open public concern. Although the use of biological agents in the military armamentarium was not a universally accepted proposal, the requirement to investigate the effects of such a weapon if applied against the United States received attention at the highest levels of the executive branch of the Federal government, the civilian scientific community and the military establishment. In the post-World War II years addressing this requirement remained the responsibility of the U.S. Army Chemical Corps with the collaboration of the U.S. Army Surgeon General. A report of the Armed Forces Medical Policy Council in 1952 noted that while tests with simulants had demonstrated the vulnerability of the United States to biological attack, no scientific data were available to assess human vulnerability to biological agents.

This concern led to intensive consultation between the Chief Chemical Officer and the Army Surgeon General. Simultaneously, the Secretary of Defense, Secretary of the Army, Army Chief of Staff and the Chemical and Medical elements of the Army addressed the subject of research in defense against biological warfare utilizing human volunteers. The responsibility to provide a defense against biological warfare was assigned to Army Medical Services under the purview of the Army Surgeon General. Although the origin of the term "Whitecoat" is not documented here, its use to describe proposed research involving

volunteers is found in correspondence dating back to October 1954. "Operation Whitecoat" was the code name for the plan to use human volunteers in field experiments concerning the effects of certain biological pathogens upon humans. Thorough legal investigation and ethical review yielded a group of conditions under which volunteers could be used in research.

a. Voluntary consent is required. Written consent must be witnessed, and signed by the individual concerned.

b. No experimentation which could predictably lead to death or permanent disabling injury will be investigated with the use of human volunteers.

c. Proper medical supervision and treatment capability will be immediately available to the subjects.

d. Experimentation must be expected to yield fruitful results for the good of society, not available by other means.

e. Experimentation should avoid all unnecessary physical and mental suffering.

f. The degree of risk taken should never exceed the importance of the experiment or the expectable benefits from it.

g. The volunteer may remove himself from the experiment at any stage if he feels that he has reached the limits of his physical or mental endurance.

The above elements were incorporated in the policies and procedures for the use of human volunteers in biological warfare research published by the Army Chief of Staff (CS 385-30, June 1952) with approval of the Secretary of the Army. Further consultation between the Chief Chemical Officer and the Army Surgeon General led to the development of a plan for a project which would involve human volunteers in the first attempt to obtain dose-response data on Q fever. After extensive legal review and coordination with civilian advisory groups of both the Chief Chemical Officer and the Army Surgeon General

authority for this project was granted by the Acting Secretary of the Army on 14 January 1955. This authorization added a new dimension to the biological (BW) research then being conducted by the Chemical Corps at Camp Detrick, Maryland. For the first time, effective research leading to the development fo a defense against the use of microbiological agents could be scientifically conducted and evaluated without relying solely upon data extrapolated from animal studies.

This project, known as the CD-22 program, terminated its initial research effort in 1956 after yielding the first scientific data of its kind, gathered by U.S. military investigators from experiments conducted on human volunteer subjects. Areas of interest concerning the project were: the vulnerability of man to biological agents; prevention and treatment of BW casualties; and identification of biological agents. Information such as the minimum infectious dose, effectiveness of prophylactic and therapeutic measure, serologic responses to infection and the effects of various doses of inoculum, eventually provided answers to the questions contained within the research objectives. The entire program was monitored by the Commission on Epidemiological Survey (CES) of the Armed Forces Epidemiological Board (AFEB) which provided technical consultation, reviewed protocols, and attended some tests.

The authorization to use volunteers, success of the two-year research project CD-22, the definition of responsibilities concerning research into BW defense and the legal requirements essential to Operation WHITECOAT culminated in the organization of the United States Army Medical Unit (USAMU) and its activation at Camp Detrick, Frederick, Maryland on 20 June 1956. USAMU was assigned the research responsibilities of the Army Medical Department's requirement to provide a defense against BW.

Between 1956 and 1961 the ground work for an effective, on-going recruiting program aimed at continuing the supply of volunteer personnel for Project Whitecoat.

Unit Expansion and Progress. The first significant action to have a direct bearing on USAMU was a revised Agreement on Responsibilities for the Conduct of Research and Development for Defense Against Biological Warfare, signed by the Army Surgeon General and the Chief Chemical Officer on 21 February 1956. This document in conjunction with the policies of the Secretary of the Army, governed the research responsibilities of the Commander, USAMU until 1963; when revised agreements were signed. The revised agreements did not change the status of BW medical defense research but added chemical warfare (CW) defence to the Army Medical Departments' tasked responsibilities. CW defense work was never assigned to USAMU or its successor, USAMRIID.

During the CD-22 project, personnel concerned with research at Fort Detrick were assigned to WRAMC. Even though personnel were assigned to USAMU after its establishment, WRAMC remained as the next higher headquarters until 1958, when USAMU was assigned to the United States Army Medical Research and Development Command (USAMRDC). In 1963, USAMU was internally reorganized to reflect the unit divisional structure which remains essentially the same today.

In August 1957, Ward 200, WRAMC, was established at USAMU to provide a medical treatment facility for all military personnel and to satisfy the requirement for an inpatient facility for conducting research studies in Project Whitecoat volunteers. By December 1957, 110 Project Whitecoat volunteers were available for participation in research programs. The CES of the AFEB continued to monitor the overall effort and reported directly to the Army Surgeon General. A research project, designed to identify the infectious dosages of P. tularensis organisms, began in FY 58 and was recorded

as the first research project involving human volunteers (WHITECOAT) performed at USAMU.

Venezuelan Equine Encephalitis (VEE), the second major project was conducted by USAMU in conjunction with the Allied Sciences Division, Biological Warfare Laboratories. Animals infected intraperitoneally showed no symptoms of disease except a diphasic fever curve which was detected 24-72 hours subsequent to onset in 75% of the animals tested. Although attenuation of the Trinidad strain was achieved in tissue culture, potentially hazardous reactions occurred, precluding definitive prophylaxis achievement. VEE research continued until 1962, when responsible investigators published a research paper on the comparative pathology of the disease as experimentally introduced into various animals. This project did not initially involve the use of WHITECOAT designated volunteers. However, several professional members of the USAMU staff actively participated as volunteers in the studies. During 1964, the immunization requirements were reasonably established for VEE and tularemia. The research findings pertaining to VEE and tularemia were followed with the preparation of industrial sized lots of immunizing vaccines against these diseases. Since that time, several publications have been prepared demonstrating significant findings such as the effects of aerosol age on the infectivity of airborne P. tularensis, effects of respiratory acquired P. tularensis on blood chemistry, and the effects of live attenuated VEE vaccine on immune status. The use of this vaccine with at risk laboratory personnel proved to be completely successful in preventing laboratory acquired VEE infections of symptomatic nature.

In 1969, USAMU was redesignated the United States Army Medical Research Institute of Infectious Diseases (USAMRIID) and although the mission was generally the same, the motivating purpose was altered to reflect current

DA policies and strategic plans. The continuing search for chemoprophylactics vaccines and improved methods for their utilization was no longer structured to meet the requirements for BW defense, but was directed toward the control of communicable diseases in man. In November 1969, President Nixon announced several major decisions concerning the use of biological weaponry, research and stockpiles. BW defense (the mission of USAMRIID *immunization and protective measures*) research is still authorized. This decision came approximately at the time of the USAMRIID redesignation. USAMRIID research objectives and ultimate goals are oriented and planned with the reasonable expectations, therefore, that they will benefit the civilian community as well as fulfill a military objective.

Project WHITECOAT. The authorization to allow human volunteers to participate actively as research test subjects provided the basis for a meeting between Army and Seventh Day Adventist Church Officials. Preliminary plans were made to establish the Seventh Day Adventist (SDA) Church membership as a potential resource for Project Whitecoat volunteers. This meeting in October 1954 initiated the project that has afforded some 2200 Seventh Day Adventists the opportunity to participate in continuing research at USAMRIID, and an additional 800 to function as laboratory technicians, ward attendants, and at several other significant positions. An official statement of attitude was rendered by the SDA Church indicating offical approval of the project as planned. The SDA General Conference as well as the Army Surgeon General regarded the services rendered by the volunteers in such a light that a commendatory article, published in the official church newspaper on 3 November 1955, openly indorsed the program by both parties. The article colorfully described the contribution of each "WHITECOAT" with particular reference to service to the country and individual standards of fortitude. This article,

as much as any single action, influenced the theme of the conscientious objector volunteer mission as it relates to USAMRIID. The SDA Project Whitecoat volunteers have provided the Army Medical Department with an extremely valuable and irreplaceable resource and have performed, without question, "Beyond the Call of Duty".

Project Whitecoat volunteers were selected from personnel classified as noncombatants (formerly identified by a I-A-O draft status) during their training at Fort Sam Houston. Twice annually, the Commander and Executive Officer, USAMRIID, along with the Director, National Service Organization for the SDA Church, interviewed potential Project Whitecoat volunteers at Fort Sam Houston to select from those interested to volunteer a group of men to be assigned to the unit. Personnel were oriented as a group in order that a common understanding of the general provisions of the program was insured. Potential participants were then interviewed individually to determine the compatibility of their needs of conscience and the requirements of Project Whitecoat. If an individual was selected, his reassignment orders were annotated as "earmarked for W/C Project TSC" and personnel reports were similarly modified. Coordination between the Commander, USAMRIID, and the Commander, Medical Training Center (MTC) advised the latter of the impending visit and requested permission for group presentation and personal interviews.

The above procedure proved effective as long as selective service classification (1-A-O) was prominent data in military records and the special provisions of conscientious objector status remained in effect. Coincident with the termination of the draft was the absence of the requirement to provide identification of conscientious objectors, since the theory attendant to a volunteer military force presumed unrestricted assignment policies. The position of the SDA Church concerning the volunteer Army is consistent with past statements of attitude: A noncombatant status must be guaranteed their personnel prior to

entry into military service. To date, a three-year enlistment program as a "volunteer" has been approved by the Department of the Army. This program is now being implemented by the Selective Service System and includes provisions for classifying all interested candidates as 1-A-Os. No Project Whitecoat recruiting has been effected since the discontinuance of the draft.

During the early stages of Project Whitecoat (circa 1959) volunteers participated in several projects, and for the purpose of command and control the volunteers were assigned to the units enlisted detachment. Two hundred spaces were authorized by the Army Surgeon General to perpetuate Project Whitecoat. This authorization does appear on the TDA. In that all Project Whitecoat personnel are required to complete 91A-AIT Training, the spaces appear as three line items on the TDA: E-5, E-4, E-3 91As. The number of volunteers required was reduced to 172 during 1964. Volunteer projects generally required about two months/year of of Whitecoat's time. During non-project intervals the volunteers performed mission work as laboratory technicians, ward attendants, building systems monitors, and administrative assistants in such a manner that the Institute relied upon their resources for continuity and perpetuation of functions.

The Department of the Army officially set forth the specific regulations for the conduct of research studies in subject volunteers with the publication of AR 70-25 in 1962: Use of Volunteers as Subject of Research. Withdrawal from any particular project and, if the individual so desires, from the entire program, is guaranteed upon request. Desired projects are reviewed thoroughly by the Commander and his staff and forwarded to the Commander, USAMRDC, for final approval as appropriate. The required involvement of high-level personnel insures the proper conduct of experiments administered to human research test subjects.

Of all agencies concerned about the welfare of Project Whitecoat volunteers, it would be reasonable to assume that the Seventh Day Adventist Church would head the list, since the overwhelming majority of Project Whitecoat volunteers are members of the SDA Church. Since the initial attitude statement rendered by the Secretary, General Conference of Seventh Day Adventists, the position of the SDA Church has remained in favor of Project Whitecoat and the voluntary participation of Adventist inductees. Several papers and items of official correspondence have originated from various levels in the SDA hierarchy unequivocally supporting the research conducted at USAMRIID. In light of the Adventist doctrine that prescribes the strict manner in which the human body should be maintained, the absence of derogatory correspondence from the SDA Church indicates that few complaints have been forwarded to church officials. Occurrences such as those reported in some periodicals would certainly have had a deleterious effect on the strength of Whitecoat volunteers assigned to USAMRIID if any credence were given those reports.

Sample Project Synopsis. The procedures used to initiate and control the experiments involving human volunteers are organized and disseminated by the Secretary, Medical Division and ultimately become the Standing Operating Procedures which the Commander, USAMRIID will administer throughout the course of an experiment. The objective, scope, anticipated risk, and special circumstances surrounding a project are prepared by the originating division and Medical Division secretary and are collectively referred to as the protocol of the project. A master bleeding schedule is included as a record of hematological data accumulated during the experiment since variations in blood chemistry are important in final evaluations. The protocol is reviewed and analyzed at a conference attended by the Commander, Scientific Advisor, and Research Division Chiefs to refine procedure and determine the potential, foreseeable benefits expected from the research. Once a protocol is accepted by the conference

members and signed by the Commander, it is forwarded to higher headquarters for final approval. A comprehensive distribution list insures maximum utilization of research data and prompt implementation of the findings by the responsible divisions. After the approved protocol is distributed, individual volunteers are selected, notified and interviewed. The multipurpose interview provides the volunteers with pertinent and required protocol information, obtains his consent, completes the administration necessary for admission, and consolidates health historical records for review. A final selection process based upon scrutiny of individual medical histories results in the identification of primary and alternate test subjects. This information is provided the Adjutant. Once the health records are screened by the interviewers, they are returned to the Ward Secretary for filing. Master laboratory slips are prepared in duplicate for primary and alternate test subjects and forwarded to the Clinical Laboratory, Pathology Division for record administration.

On the day of admission, admission sheets are forwarded to Walter Reed Army Medical Center, Registrar Division. Telephonic notification of each primary and alternate test subject is provided, as the WRAMC Registrar in exchange for the Registrar numbers pertaining to the test subjects. Registrar numbers are then forwarded to the Ward Secretary. As the admission sheets are returned by WRAMC, they are incorporated into the patient Clinical Record folder along with the admission card, consent statement, and other pertinent project data.

As the project is completed, narrative summaries are prepared, signed and returned, along with the project charts, to the Medical Division Secretary who transmits a copy of the cover sheet to the Medical Records Library, Registrar Division, WRAMC. Project charts, when completed, are filed in a records area. Master folders containing all project information,

are prepared and reflect the names of participating volunteers, a copy of the protocol, publications referenced, summaries of findings by all investigators, narrative summaries pertaining to each individual and copies of information included in the USAMRIID Annual Report. All project information is ultimately summarized by the Chief, Medical Division. The Secretary, Medical Division extracts descriptive project information from the cover sheets and transcribes it into the permanent, continuing list of USAMRIID research projects involving human volunteers.

Summaries and Source Documents. A list of all studies involving human volunteers conducted by the US Army Medical Research Institute of Infectious Diseases (USAMRIID) and its antecedents, USAMU and WRAMU is found at Table 1. The individual medical records of all volunteer subjects who participated in these studies are on file at USAMRIID as are the records of the individual projects.

An attempt has been made to identify all extra-mural contracts associate with the USAMRIID program since its inception, Table 2. The participation of volunteers is indicated as known. Regulations governing routine retirement and destruction of extra-mural contract records preclude a definitive statement on this aspect.

All publications in the open scientific literature relating to human volunteer studies conducted by USAMRIID through 1972 have been listed, Table 3. Since the inception of this type of research efforts have been made to insure that information of value to the general scientific community be published in appropriate journals.

Vaccines studies developed or under study have been included in a separate list, Table 4.

Source materials relating to each of the summaries described above are on file at USAMRIID, Fort Detrick, Maryland.

ADDENDUM

Human Volunteer Recruiting Since Termination of the White Coat Program

Since the end of the draft in 1973, no White Coat Volunteers have been recruited. Under the original provisions of the volunteer Army recruiting regulations conscientious objectors could not enlist in the US Army, thus making it impossible for Seventh Day Adventist/conscientious objectors to participate in the White Coat Program.

In 1975 the provisions of AR 601-210 were changed to permit persons to enlist as Medical Research Volunteer Subject (MRVS). This program implemented by US Army Recruiting command produced six enlistees in 1975. During 1976 this program and direct recruitment among 91B Medical Advanced Individual Training Students at Fort Sam Houston, Texas attracted 76 persons for the MRVS program. Two additional volunteers have elected this program during January and February 1977.

ANNEX K

TABLE 1

U. S. ARMY MEDICAL RESEARCH INSTITUTE OF INFECTIOUS DISEASES

RESEARCH PROJECTS INVOLVING VOLUNTEERS 1954-1976

87-857 O - 77 - 13

YEAR AND PROJ. NO.	TITLE	NUMBER OF VOLUNTEERS
1954-1956	Vulnerability of Man to Biologic Agents/Project CD-22/Laboratory and Field Assessment of Infectivity of Q Fever (Coxiella burnetti); Efficacy of Vaccine; Efficacy of Antibiotic Therapy	91
1956-1957	Analysis of 42 Cases of Laboratory-Acquired Tularemia. Objectives were (1) To evaluate clinical and laboratory manifestations of the disease and to attempt to establish criteria for earlier diagnosis. (2) To assess the efficacy of phenolized and/or acetone-extracted tularemia vaccine in the prevention or modification of the disease. (3) To determine the therapeutic efficacy of tetracycline.	42*

*This is a study of patients conducted during the course of providing medical care. The subjects were not volunteers but had acquired their illness as a consequence of occupational exposure. The vaccines had been given for accupational health protection before the patients came under medical care.

FISCAL YEAR AND PROJ. NO.	TITLE	NO. OF VOLUNTEERS (NON-SDA)	HOSPITAL DAYS	CONVL LEAVE
1958				
58-1	Evaluation of a Living Vaccine for Tularemia (LVS)	21		
58-2	Evaluation of Rift Valley Fever Vaccine	3	17	0
1959	None			
1960				
60-1	Evaluation of Attenuated VEE Virus Vaccine (TC-50)	(16)		
60-2	Evaluation of Attenuated VEE Virus Vaccine (TC-80)	(13)		
1961				
61-1	Assessment of Respiratory Immunization with Tularemia Vaccine (LVS)	17 (7)		
61-2	Evaluation of WEE and VEE Titers in Men Immunized with Attenuated VEE Virus Vaccine (TC-80) with Subsequent IM Challenge of 5 with Virulent VEE	(20)		
61-3	Evaluation of Serological Responses to Attenuated VEE Virus Vaccine (TC-80) and WEE and EEE Vaccines	(5)		
61-4	Evaluation of Attenuated VEE Virus Vaccine (TC-80) as Therapy for Various Malignancies and Lymphomas	(12)		
61-5	Evaluation of Attenuated VEE Virus Vaccine (TC-80)	5 (13)		

YEAR AND PROJ. NO.	TITLE	NUMBER OF VOLUNTEERS (NON-SDA)	HOSP DAYS	CONVL LEAVE
1961 (Continued)				
61-6 (was 61-A)	Evaluation of Attenuated VEE Virus Vaccine (TC-80)	8	13	0
61-7 (was 61-1	Respiratory Virulence of Aged Aerosols of Pasteurella tularensis, SCHU-S4, for Man (30-min) (61-TE-1462)	6	15	0
61-8	Evaluation of Attenuated VEE Virus Vaccine (TC-80)	6 (5)		
1962				
62-1A	Evaluation of Attenuated VEE Virus Vaccine (TC-80)	(6)		
62-1	Respiratory Virulence of Aged Aerosols of Pasteurella tularensis, SCHU-S4, for Man (60-min) (61-TE-1519)	8	20	0
62-2	Respiratory Virulence of Aged Aerosols of Pasteurella tularensis, SCHU-S4, for Man (180-min) (61-TE-1519)	8	14	0
62-3	Assessment of Respiratory Immunization with Living Tularemia Vaccine (LVS) Against Challenge with Pasteurella tularensis, SCHU-S4	20	17	4
62-4	Evaluation of Attenuated VEE Virus Vaccine (TC-81)	(7)		
62-5	Evaluation of Attenuated VEE Virus Vaccine (TC-81)	(13)		
62-7	Respiratory Virulence of Aged Aerosols of Pasteurella tularensis, SCHU-S4, for Man (120-min) (62-TE-1564)	8	15	0
62-8	Evaluation of Reimmunization with Attenuated VEE Virus Vaccine (TC-81)	(4)		
62-9 (was 9B)	Estimation of Human Immunizing Dose of Attenuated VEE Virus Vaccine (TC-81, 10^{-4}, 10^{-5}, 10^{-6})	6		

YEAR AND PROJ. NO.	TITLE	NUMBER OF VOLUNTEERS (NON-SDA)	HOSP DAYS	CONVL LEAVE
1962 (Continued)				
62-10	Evaluation of Interference of Response to Attenuated VEE Virus Vaccine (TC-81) by Yellow Fever Vaccine (17-D)	36		
1963				
63-1	Respiratory Virulence of Aged Aerosols of Pasteurella tularensis, SCHU-S4, for Man (180-min) (62-TE-1629)	8	14	0
63-1A	Evaluation of Attenuated VEE Vaccine (TC-93), ND-4	(13)		
63-2	Evaluation of Attenuated Tularemia Vaccine (LVS), NDBR-101, Lot 2	17		
63-2A	Evaluation of Attenuated Tularemia Vaccine (LVS), NDBR-101, Lots 1-4, 6	33 (6)		
63-3	Evaluation of Metabolic Changes in Immunized and Nonimmunized Man Exposed to an Infectious Dose of Pasteurella tularensis, SCHU-S4 (62-TC-1684)	20	17	0
63-4	Respiratory Virulence of Aged Aerosols of Pasteurella tularensis, SCHU-S4, for Man (120-min) (62-TE-1713)	8	18	5
63-5	Evaluation of Attenuated Tularemia Vaccine (LVS), NDBR-101, Lot 1	(8)		
63-6	Evaluation of 1-year Storage Stability of Tularemia Vaccine (LVS), NDBR-101, Lots 2 and 4	20	21	0
63-7	Evaluation of Attenuated VEE Virus Vaccine NDBR-102, Lot 4	2 (7)		
63-8	Determination of Human ID_{50} of Attenuated VEE Virus Vaccine (TC-93) ND-4 from National Drug Co.	42		

YEAR AND PROJ NO.	TITLE	NUMBER OF VOLUNTEERS (NON-SDA)	HOSP DAYS	CONVL LEAVE
1963 (Continued)				
63-9	Evaluation of Attenuated *Tularemia* Vaccine (LVS), NDBR 101-2	(11)		
63-10	Evaluation of Susceptibility of Volunteers Previously Infected with Tularemia (Respiratory) to Reinfection by Aerosolized Pasteurella tularensis	23	23	12
63-11	Evaluation of Attenuated Tularemia Vaccin (LVS), NDBR-101, Lot 3	(9)		
1964				
64-1	Evaluation of Metabolic Changes in Normal Humans with Hyperthermia Induced to Mimic the First Day of Fever in Acute Tularemia	8	23	13
64-2	Evaluation of Attenuated Tularemia Vaccine (LVS), NDBR-101, Lot 4	(5)		
64-2A	Evaluation of Attenuated VEE Virus Vaccine (TC-83), Lot 3-2	1 (6)		
64-3	Classified Project	(4)		
64-4	Classified Project	(4)		
64-5	Classified Project	(4)		
64-6	Evaluation of Intermittent and Continuous Tetracycline Prophylaxis in Respiratory Tularemia, SCHU-S4	22	56	14
64-7	Evaluation of Attenuated Tularemia Vaccine (LVS), NDBR-101, Lot 6	(11)		
64-8	Evaluation of Metabolic Changes in Normal Humans with Fever Induced by Bacterial Endotoxin	8	30	13
64-9	Evaluation of Personnel Exposed to a Patient with Bolivian Hemorrhagic Fever	1 (12)		

YEAR AND PROJ. NO.	TITLE	NUMBER OF VOLUNTEERS (NON-SDA)	HOSP DAYS	CONVL LEAVE
1964 (Continued)				
64-10	Evaluation of Metabolic Changes in Humans during Induced Q Fever (63-TE-1823)	8	42	19
64-11	Evaluation of Metabolic Changes in Humans during Antibiotic Therapy	8	27	13
64-12	Evaluation of Intermittent Therapy and a 28-Day Prophylactic Course of Tetracycline in Respiratory Tularemia	24	41	12
64-13	Evaluation of Attenuated Tularemia Vaccine (LVS), NDBR-101, Lot 1	(7)		
64-14	Evaluation of Metabolic Changes in Nonimmunized Man Exposed to an Infectious Dose of *Pasteurella tularensis* while on an Animal Protein (as opposed to a vegetable protein) Diet	7	34	16
64-15	Evaluation of Two Courses of Tetracycline Therapy and a 14-Day Course of Tetracycline Prophylaxis in Respiratory Tularemia	12	42	13
64-16	Evaluation of Metabolic Changes in Humans during Induced Sandfly Fever	8	34	16
64-17	Respiratory Virulence of Aged Aerosols of Pasteurella tularensis, SCHU-S4, for Man (180-min) (64-TE-1907)	8	16	3
64-18	Evaluation of Attenuated Tularemia Vaccine (LVS), NDBR-101, Lot 2	(3)		
1965				
65-1	Respiratory Virulence of Aged Aerosols of Pasteurella tularensis, SCHU-S4, for Man (180-min) (64-TE-1907)	8	17	5
65-2	Evaluation of Clinical and Serological Responses of Volunteers to Phase I Q Fever Vaccine	6		
65-3	Evaluation of Clinical and Serological Responses of Volunteers to Phase I Q Fever Vaccine			

YEAR AND PROJ. NO.	TITLE	NUMBER OF VOLUNTEERS (NON-SDA)	HOSP DAYS	CONVL LEAVE
1965 (Continued)				
65-4	Evaluation of Attenuated Tularemia Vaccine (LVS), NDBR-101, Lot 3	(7)		
65-5	Evaluation of Tetracycline Therapy and Prophylaxis in Respiratory Tularemia	22	36	14
65-6	Evaluation of Individuals Following Accidental Respiratory Exposure to SEB	(15)		
65-7	Evaluation of Attenuated Tularemia Vaccine (LVS), NDBR-101, Lot 4	(12)		
65-8	Evaluation of Attenuated Tularemia Vaccine (LVS), NDBR-101, Lots 2 and 4	20		
65-9	Evaluation of Attenuated VEE Virus Vaccine (TC-83/3-2L3)	(19)		
65-10	Evaluation of Metabolic Changes in Humans during Graded Reduction of Dietary Intake or during Low Dose Cortisol Administration	8	33	13
65-11	Evaluation of Tetracycline Therapy in Respiratory Tularemia Due to SCHU-S5 Strain	8	34	15
65-12	Evaluation of Clinical and Serological Responses of Volunteers to Phase I and Phase II Q Fever Vaccine	16		
65-13	Evaluation of 3-year Storage Stability of Tularemia Vaccine (LVS), NDBR-101, Lots 2 and 4	14	27	14
65-13A	Evaluation of Metabolic Changes in Immunized Subjects Exposed to Infectious Doses of Pasteurella tularensis	8	34	15
65-14	Viremia determinations in Humans Vaccinated with the Recommended Immunizing Dose of VEE Virus Vaccine, Live, Attenuated (TC-83/3-2)	3		
65-15	Classified Project	(4)		

YEAR AND PROJ. NO.	TITLE	NUMBER OF VOLUNTEERS (NON-SDA)	HOSP DAYS	CONVL LEAVE
1965 (Continued)				
65-16	Evaluation and Comparison of Efficacy of Phase I and Phase II Henzerling Strain Q Fever Vaccines Against Challenge with the AD Strain (Phase II) Q Fever (65-TE-2033)	18	28	1
65-17	Classified Project	(1)		
65-18	Classified Project	10		
1966				
66-1	Evaluation of Tetracycline Prophylaxis and Therapy of Respiratory Tularemia in Volunteers	16	35	1
66-2	Classified Project	10	3	
66-3	Classified Project	3 (1)	2	
66-4	Classified Project	2	2	
66-5	Classified Project	2	2	
66-6	Classified Project	2	3	
66-7	Classified Project	3	4	
66-8	Classified Project	4	5	
66-9	Classified Project	4	5	
66-10	Classified Project	4	5	
66-11	Classified Project	3	4	
66-11A	Classified Project	4	4	
66-12	Classified Project	4	4	

YEAR AND PROJ. NO.	TITLE	NUMBER OF VOLUNTEERS (NON-SDA)	HOSP DAYS	CONVL LEAVE
1966 (Continued)				
66-13	Evaluation of Effects of Respiratory Tularemia on Task Performance of Volunteers (BEID-2) and Tetracycline Therapy of Respiratory Tularemia in Volunteers	18	29	15
66-14	Investigation of Clinical Effects of Attenuated VEE Virus Vaccine in Volunteers (TC-83/3-2L3)	20	9	
66-14A	Investigation of Clinical Effects of Attenuated VEE Virus Vaccine in Volunteers (TC-83/3-2L3)	20	13	5
66-15	Determination of the Effect of Diet Upon Normal Periodicity of Whole Blood Amino Acids in Humans	6	8	
66-16	Classified Project	10	5	
66-17	Classified Project	8	4	
66-18	Classified Project	10	4	
1967				
67-1	Evaluation by Task Performance of Respiratory Tularemia in Man (BEID-3)	10	23	15
67-2	Study of Whole Blood Amino Acids in Normal Adult Male Subjects			
	2A	6	6	4
	2B	24		
	2C	6	22	11
	2D	10	10	6

YEAR AND PROJ. NO.	TITLE	NUMBER OF VOLUNTEERS (NON-SDA)	HOSP DAYS	CONVL LEAVE
1967 (Continued)				
67-3	Preliminary Evaluation of Plague Vaccine, Live, Attenuated (Strain EV-76-WR, Freeze-Dried, Lot 7)			
	(1A) 5×10^3	6	13	13
	(1B) 5×10^4	8	10	7
	(1C) 5×10^5	6	9	7
	(1D) 5×10^6	6	9	3
	(1E) 5×10^7	6	9	11
	(2A) 5×10^5	10	8	9
	(2B) 5×10^7 Reimmunization of 5×10^5 and 5×10^6	10	8	9
67-4	Evaluation of Metabolic and Biochemical Responses to Immunization with 17-D Strain Yellow Fever	10	15	7
67-5	Evaluation of Metabolic and Biochemical Responses to Immunication with 17-D Strain Yellow Fever	12	15	10
67-6	Acceptability Study of Eastern Equine Encephalitis (EEE) Vaccine, Tissue Culture Origin, Lot 1-1966	6		
1968				
68-1	Evaluation of Metabolic and Biochemical Responses to Immunization with 17-D Strain Yellow Fever	12		
68-2	Evaluation of Metabolic, Biochemical and Serological Responses to EEE Vaccine Inactivated, Tissue Culture Origin, Lot 1-1966	20 GroupI GroupII	17 15	
68-3	Evaluation of Behavioral, Metabolic and Serological Responses to Infection with Sandfly Fever Virus, Sicilian Strain (Task Performance BEID-4 and 5)	20 GroupI GroupII	17 18	
68-4	Evaluation of 5-year Storage Stability of Tularemia Vaccine, Live, Attenuated, NDBR-101, Lot 4. Part I: Immunization. Part II: Aerosol Challenge	20	21	15
68-5	Evaluation of Response to Immunization with 17-D Strain Yellow Fever	14	16	6
68-6	Evaluation of Circadian Variation in Tyrosine Metabolism in the Human	13	12	10

YEAR AND PROJ. NO.	TITLE	NUMBER OF VOLUNTEERS (NON-SDA)	HOSP DAYS	CONVL LEAVE
1968 (Continued)				
68-7	Comparison of Blood Levels and Urinary Excretion of Chloromycetin® and a Generic Preparation of Chloramphenicol	22	5	3
68-8	Evaluation of Clinical and Biochemical Responses to Attenuated VEE Vaccine (TC-83/3-2L6)	20	20	13
68-9	Evaluation of Response of Volunteers to Adenovirus Vaccine, Live, Oral, Type 7, Lot 16CV-0100 (L-AV-7)	24	28	11
1969				
69-1	Evaluation of Clinical and Biochemical Responses to Attenuated VEE Virus Vaccine (TC-83/3-2L9)	24	19	12
69-2	Acceptability Study of WEE Vaccine, Inactivated, Tissue Culture Origin, Lot 1-1967	(6)		
69-3	Evaluation of WEE Vaccine, Inactivated, Tissue Culture Origin, Lot 1-1967	19	13	8
69-4	Evaluation of WEE Vaccine, Inactivated, Tissue Culture Origin, Lot 1-1967	6		
69-5	Evaluation of VEE Immune Globulin (Human) in Volunteers	30		
69-6	Evaluation of Combined EEE (Lot 1-1966) and WEE (Lot 1-1967) Vaccines, Inactivated, Tissue Culture Origin	20	12	9
69-7	Evaluation of Factors Affecting Serum and Plasma to be Used in Quantitative Electrophoretic Studies of Lipoproteins and Glycoproteins	16		
69-8	Evaluation of Human Response to Simultaneous Administration of Live VEE Vaccine (NDBR-102) and Combined, Inactivated EEE (Lot 1-1966) and WEE (Lot 1-1967) Vaccines	20	12	7
69-9	Acceptability Study of Rift Valley Fever Vaccine, Formalin-Inactivated, Tissue Culture Origin, NDBR-103, Lot 6	(3)		

YEAR AND PROJ. NO.	TITLE	NUMBER OF VOLUNTEERS (NON-SDA)	HOSP DAYS	CONVL LEAVE
1969 (Continued)				
69-10	Evaluation of Human Response to Rift Valley Fever Vaccine, Formalin-Inactivated, Tissue Culture Origin, NDBR-103, Lot 6	20	9	8
1970				
70-1	Evaluation of Influence of Sandfly Fever on Work Performance (BEID-6), Muscular Function and Selected Laboratory Measurements	10	18	12
70-2	Selected Clinical Laboratory Measurements in Humans Infected with Sandfly Fever Virus	8	12	9
70-3	Evaluation of Lipid-Vitamin Changes During Sandfly Fever Infection	5	20	10
70-4	Acceptability Study of Chikungunya Vaccine, Inactivated, Dried, Tissue Culture Origin, Lot E-20	(6)		
70-5	Evaluation of Chikungunya Vaccine, Inactivated, Dried, Tissue Culture Origin, Lot E-20	20	11	10
70-6	Evaluation of the Serological Response in Volunteers to the Administration of Combined Eastern and Western Equine Encephalitis Vaccine	16		
70-7	Evaluation of the Serological Responses of Volunteers to the Administration of Plague Vaccine U.S.P. (E Medium)	29		
70-8	Multiple Task Performances in Humans Infected with Sandfly Fever Virus and Administered Symptomatic Treatment BEID-7	14	19	13
1971				
71-1	Evaluation of Lipid Metabolism during Sandfly Fever Infection	5	29	16

YEAR AND PROJ. NO.	TITLE	NUMBER OF VOLUNTEERS (NON-SDA)	HC DAYS	CONVL LEAVE
1971 (Continued)				
71-2	Evaluation of Volunteers of Adenovirus Vaccine, Live, Oral, Type 21, Lot 16C1X-01201	15	34	14
71-3	Evaluation of Human Metabolic Responses to the 17-D Strain of Yellow Fever Vaccine	14	14	7
71-4	Acceptability Study of Eastern Equine Encephalitis Vaccine, Inactivated, Dried, NDBR 104, Lot 1, Run 1	(4)	-	-
71-5	Evaluation of Eastern Equine Encephalitis Vaccine, Inactivated, Tissue Culture Origin, NDBR 104, Lot 1, Run 1	16	-	-
1972				
72-1	Infectivity of Human Plasma Presumed to Contain Sandfly Fever Virus	1	10	9
72-2	Chemical Analysis of Blood and Urine Collected Under Standard Conditions	21	7	3
72-3	Median Infective Titer of Sandfly Fever Virus in a Pool of Human Plasma	20	9½	9½
72-4	Associated Administration to Volunteers of Venezuelan Equine Encephalitis Vaccine, Live, Attenuated and Yellow Fever Vaccine, 17-D Strain	32	-	-
72-5	Responses of Host Carbohydrate Metabolism During Sandfly Fever	10	13½	13½
1973				
73-1	Prophylaxis of Sandfly Fever	18	15½	16½
1974				
NONE				
1975				
75-1	Acceptability Study of Western Equine Encephalomyelitis Virus Vaccine, Inactivated, Dried, MNLBR 106, Lot 3	(6)	-	-

YEAR AND PROJ. NO.	TITLE	NUMBER OF VOLUNTEERS (NON-SDA)	HOSP DAYS	CONVL LEAVE
1975 (Continued)				
75-2	Evaluation in Volunteers of the Active-Rosette-Forming Lymphocyte Test as an Assay for Previous Immunization to Tularemia	(9)	-	-
75-3	Persistence of Venezuelan Equine Encephalitis Antibodies Following Vaccination with the Live, Attenuated, TC-83/3-2 VEE Vaccine	23 Former SDAs	-	-
75-4	Tuberculin Skin Test Antigen in Man and its Effect on the Active-Rosett-Forming Lymphocyte Test	(9)		
1976				
76-1	Proposed Clinical Evaluation of Rocky Mountain Spotted Fever Vaccine, Formalin-Inactivated SS Strain, Chick Embryo Cell Origin, Lot 1	12		
76-2	Acceptability Study of Venezuelan Equine Encephalomyelitis Vaccine, Inactivated, Dried, MNLBR 109, Lot No. C-84-1	(6)		
76-3	Rejuvenation and Preservation of P. Vivax (Chesson Strain) and Assessment of Blood Schizontocidal Activity of Mefloquine HCl (WR 142,490)	(1)	22	20
76-4	Immunization of At Risk USAMRDC (Fort Detrick) Laboratory Workers with Monovalent Influenza A/Swine (A/New Jersey/8/76) Virus Vaccine	169	-	-
76-5	Reactogenicity and Antigenicity of Influenza Virus Vaccines: Bivalent A/Victoria/75 and A/New Jersey/76 and Monovalent B/Hong Kong/72	174	-	-
76-6	Reactogenicity of Western Equine Encephalomyelitis Vaccine, Inactivated, Dried Lot 2-1974	6	-	-

ANNEX K

TABLE 2

EXTRA-MURAL MEDICAL RESEARCH CONTRACTS

U.S. Army Medical Research Institute

Of Infectious Diseases

Ft. Detrick, MD

DA-18064-404-CML 474	*Ohio State Univ. (V)	Early diagnosis of infectious diseases	Jan 55- Dec 58
DA-49-007-MD751 (V)	Univ of Maryland	Studies of Rift Valley fever, related viruses and tularemia	Jul 56 - Dec 65
DA-49-193-MD-2867 (V)		Pathogenesis, detection, prevention and treatment of infectious diseases of military importance	Jan 66 - Nov 75
DA-49-193-MD-2125	National Drug Co.	Establish and perform a research program on a series of biologicals	Jul 60 - Jun 70
DADA17-70-C-0107		Development of special biological products	Jul 70 - Current
DA-49-193-MD-2398	Johns Hopkins U.	Investigation of immunological aspects of group B arboviruses	Feb 63 - May 74
DA-49-193-MD-2428	Chas Pfizer & Co.	Preparation and evaluation of staphylococcal enterotoxoids	May 63 - Apr 67
DA-49-193-MD-2528	Tufts University	Biochemical studies on bacteria and on latent agents	Nov 63 - Oct 67
DA-49-193-MD-2533	MIT	Studies of biologically active agents	Jan 64 - Jan 67
DADA17-68-C-8060	Northeastern		Jan 68 - Feb 72
DA-49-193-MD-2534	MIT	Effect of diet on the relative levels of protein synthesis in various tissues	Feb 64 - Jan 66

*While specific contract documentation could not be found, it appears from review of associated correspondence that a contract did exist at least as early as 1955 with Ohio State University. Additional details at Appendix 1.

DA-49-193-MD-2553	Brandeis Univ	Viral and bacterial induced alterations of cellular and enzymic components during the early phases of infection	Feb 64 - Jan 67
DA-49-193-MD-2560	MIT	Infection and nutrition; mechanisms of interaction	Jun 64 - Jun 70
DA-49-193-MD-2567	U. Louisville (V)	Behavioral effects of infectious diseases	Mar 64 - Jun 72
DA-49-193-MD-2588	IIT Research Inst.	Research in aerosol immunization	Jun 64 - Jul 67
DA-49-193-MD-2829	Cordis Corp	Virus detection by fluorescence polarization	Oct 65 - Sep 67
DA-49-193-MD-2823	U. Cincinnati	Host parasite interactions in experimental systems	Oct 65 - Sep 68
DA-49-193-MD-2882	U. of Tennessee	Metabolic changes in animals following specific bacterial infection	Feb 66 - Mar 71
DA-49-193-MD-2589	Wistar Inst.	Influence of deuterium oxide on biological systems	Jun 65 - May 66 ?
DA-49-193-MD-2597	Harvard School of Medicine	Separation and characterization of antigens of Rickettsia tsutsugamushi	Aug 64 - Aug 66 ?
DA-49-193-MD-2598	Georgetown Univ	The metabolic effects of fever and infection	Jul 64 - Jul 67
DA-49-193-MD-2599	Johns Hopkins Univ	Studies of cellular defense against infection	Jul 64 - Jun 67
DA-49-193-MD-2604	Hood College	The structure of bacterial cell walls as affected by antibiotics	Jun 64 - May 65
DA-49-193-MD-2630	IIT Research Inst.	Susceptibility to infection in irradiated animals	Jul 64 - Oct 67

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DA-49-193-MD-2670	Loma Linda Univ	Virus-host relationships in gnotobiotes	Sep 64 - Aug 66
DA-49-193-MD-2674	Wadsworth Vet. Hosp Los Angeles, Calif	Rapid diagnosis of bacteremia	Oct 64 - Sep 66
DA-49-193-MD-2679	Collaborative Res. Inc	Studies of inhibition of viral multiplication	Jan 65 - Sep 69
DA-49-193-MD-2694	Rutgers Univ	Biochemical changes in avian tissues during the bioenergetics of infection and the incubation period of disease	Jan 65 - Current
DA-49-193-MD-2724	U. of Tennessee	Studies on intracellular bacterial parasites	Apr 65 - Mar 69
DADA-17-67-C-7073	Univ of Michigan	Management of animal cell cultures for fermentor production of virus vaccines	Jan 67 - Aug 69
DADA17-67-C-7102	Univ. California	Mode of action of staphylococcal enterotoxin B	May 67 - Nov 67
DADA17-68-C-8073	Univ. Vermont		Jan 68 - Jul 72
DADA17-67-C-7145	IIT Research Inst	Research in immunization with soluble Viral antigens	Aug 67 - Jul 69
DADA17-68-C-8079	Chas. Pfizer Inc	Large scale production and evaluation of staphylococcal enterotoxoid B	Feb 68 - Feb 70
DADA17-68-C-8125	Univ. Florida	Pathology of experimental enterotoxemis	Sep 68 - May 71
DADA17-67-C-7109	EG&E Inc	Rapid identification of microorganisms using light- scattering techniques	Apr 67 - Apr 68
DADA17-68-C-8131	Science Spectrum		Apr 68 - Oct 71

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DADA17-68-C-8080	Ohio State Univ	Early diagnosis of infectious diseases	Sep 68 - Jul 72
DADA17-72-C-2151	W. Va. Univ Med Ctr		Jul 72 - Mar 75
DADA17-73-C-3098	Yale Univ.	Sequential immunization of spider monkeys with three group B arboviruses: Yellow fever, Langat, and Dengue-2	May 73 - May 75
Project Order 4604	Veterans Admin. Hosp., Pittsburgh	Role of cyclic nucleotides in the regulation of lymphocyte transformation	Jun 74 - May 76
DADA17-72-C-2161	Medical College of VA	Investigation of attenuated strains of group A arboviruses	Jul 72 Dec 75
DAMD17-74-C-4079	Baylor College of Medicine	Muscle composition in infection	Jun 74 - Dec 74
DAMD17-74-C-4095	Johns Hopkins U	Adjuvant effects on immune responses to biological agents	Jul 74 - Current
DADA17-73-C-3090	Washington State U	Studies of the antigenic composition of Coxiella burnetii	Apr 73 - Current
DAMD17-74-C-4007	Wyeth Laboratories	An investigation of E. coli enterotoxins	Aug 73 - Current
DAMD17-74-C-4012	Pan American Health Organization	Program for preparation of immune globulin against Bolivian hemorrhagic fever	Jul 73 - Jun 74
DAMD17-74-C-4112	Northwestern Univ. Medical School	Viral vaccine immunogenicity to host cell-mediated and humoral immune responses	Jun 74 - Current
DAMD17-74-C-4025	Univ of Notre Dame	Development of a colony of germ free hamsters as a biomedical response	Oct 73 - Jul 74

DAMD17-74-C-4047	Stanford Res. Inst.	Field ionization mass spectrometric rapid diagnosis in infectious diseases	Dec 73 - Current
DAMD-17-74-C-4057	Johns Hopkins Univ.	Radiometric methods for rapid diagnosis of viral infection	Jun 74 - Dec 74
DAMD17-75-C-5041	Johns Hopkins Univ.		Feb 75- Current

TABLE 3

REPRINTS

U. S. ARMY MEDICAL RESEARCH INSTITUTE OF INFECTIOUS DISEASES

"Involving Whitecoat Volunteers as Human Subjects"

BIBLIOGRAPHY

1956

A Tigertt, W.D.; A.S. Benenson: STUDIES ON Q FEVER IN MAN
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B Tigertt, W.D.: STUDIES ON Q FEVER IN MAN
Med. Sci. Pub. 6 (Symp. on Q Fever) WRAIR 1959 p. 89

C *Beneson, A.S.: Q FEVER VACCINE: EFFICACY AND PRESENT STATUS*
Ibid. p. 47

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D Benenson, A.S.: IMMUNOLOGICAL COUNTERMEASURES
Military Med. Vol. 123 p. 119, 1963

E McKinney, R. W.; T.O. Berge; W.D. Sawyer; W.D. Tigertt; D. Crozier
Am. J. Trop. Med & Hyg. Vol. 12 No. 4 p. 597, 1963

1964

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TABLE I

VACCINES UNDER STUDY AT

U.S. ARMY MEDICAL RESEARCH INSTITUTE OF INFECTIOUS DISEASES
FORT DETRICK, FREDERICK, MARYLAND 21701

VACCINE	RESEARCH YEARS	STATUS OF VACCINE
Anthrax	1959-1968	Development completed
Venezuelan equine encephalomyelitis	1960-1974	Development completed
Tularemia	1960-1969	Development completed
Plague	1965-1974	Development completed
Q fever	1960-1974	Development completed
Rocky Mountain spotted fever	1972-1974	Final development
Chikungunya	1969-1974	Final development
Rift Valley fever	1963-1974	Final development
Western equine encephalitis	1968-1974	Intermediate development
Eastern equine encephalitis	1967-1974	Intermediate development
Staphylococcal enterotoxin B	1964-1974	Intermediate toxoid
California encephalitis	1969-1974	Early development
St. Louis encephalitis	1969-1974	Early development
O'Nong-Nyong	1969-1974	Early development
Mayaro	1970-1974	Early development
Sindbis	1971-1974	Early development
Langat	1972-1974	Early development

Appendix I to Annex K

CHRONOLOGICAL SUMMARY OF THE U.S. ARMY CHEMICAL CORPS -

OHIO STATE CONTRACT VOLUNTEER STUDIES

1. Significant opposition existed to the extrapolation of data from animals to man and it was deemed necessary to obtain data by direct challenge of man. Therefore, by 31 July 1952, the Chemical Corps had issued the directive CMLRE-B-2.729.3, subject: "Use of Human Subjects in Hazardous Tests."

2. The first formal action regarding microbial challenge of volunteers was 26 March 1953.

3. A plan, apparently prepared as of 9 October 1953, for the respiratory challenge of man with Francisella (Pasteurella) tularensis was forwarded to the Secretary of the Army on 21 January 1954 and approved by him 30 March 1954.

4. Contract negotiations were then initiated and culminated on 21 January 1955 in a signed contract (DA-18-064-CML-2655) with the Ohio State Research Foundation and Dr. Samuel Saslaw as the responsible physician.

5. On 31 January 1955, Dr. A. G. Wedum was appointed Project Officer by the Ass't Secretary of the Army.

6. Based on evidence from respiratory challenges of monkeys and guinea pigs, the planned respiratory exposure of volunteers was reassessed and it was elected to perform aerosol challenges only if the results from intradermal inoculation were not prohibitive. A revised plan and contract entitled "Plan for Assessment of an Agent" was sent to the Secretary of the Army on 1 April 1955 and approved by him 24 June 1955.

7. Intradermal testing was completed in January 1957.

8. To accomplish the respiratory phase of the contract, it was necessary, based on joint agreement between TSGO and the Chief Chemical Officer, dated 21 February 1956, to appoint a new contract officer; on 27 September 1957, COL Wm. D. Tigertt was designated Project Officer in relief of Dr. Wedum.

9. The results of the intracutaneous and respiratory challenges were reported in the open literature in 1961 and 1962. Six publications resulted and a copy of each is attached (References 1-6).

Reprinted from the Archives of Internal Medicine
May 1961, Vol. 107, pp. 689-701

Tularemia Vaccine Study

I. Intracutaneous Challenge

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HENRY T. EIGELSBACH, Ph.D.
HENRY E. WILSON, M.D.
JOHN A. PRIOR, M.D.
AND
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COLUMBUS, OHIO

The frequency with which Pasteurella tularensis infects hunters of rabbits and laboratory workers studying this microorganism makes vaccination of these persons desirable. However, the protective value of available nonviable vaccines is not certain. Studies on this point have been conducted by Foshay et al.[1] and Kadull et al.[2]

The ideal method of evaluating a vaccine intended for protection of humans is to challenge volunteers, both vaccinated and nonvaccinated, with a reproducible known infective dose of the disease-producing agent. A study in a small vaccinated group challenged by a known infective dose can provide more specific information in a shorter time than by assembling a much larger number in a study in which vaccinated persons are "exposed" accidentally in varying degree or not at all.

Pasteurella tularensis offers certain advantages in such a critical study employing human challenge with viable microorganisms. A broad base of preliminary experience is provided by accumulated data and literature on experimental animal and accidental human infections. The specific detailed studies in monkeys performed in these laboratories preliminary to the human studies described below are the subject of a separate report.[3] The highly infectious nature of P. tularensis and the excellent therapeutic effect of streptomycin in terminating infection is ideal for study of experimental infection in volunteers.

The purpose of this study was to compare the response of nonvaccinated and vaccinated men challenged with a carefully controlled known small number of P. tularensis organisms, administered intracutaneously.

Materials and Methods

Volunteers were inmates of the Ohio State Penitentiary, 21 to 35 years of age. Those accepted for the project were required to pass a rigid

Submitted for publication May 28, 1960.
From the Department of Medicine, College of Medicine, Ohio State University, Columbus. This study was supported under contract with the U.S. Army CmlC, Fort Detrick, Frederick, Md.

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May 1961, Vol. 107, pp. 702-711

Tularemia Vaccine Study

II. Respiratory Challenge

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HENRY T. EIGELSBACH, Ph.D.
JOHN A. PRIOR, M.D.
HENRY E. WILSON, M.D.
AND
SALLY CARHART, M.S.
COLUMBUS, OHIO

Previous studies from these laboratories demonstrated that man can readily be infected by intracutaneous inoculation with approximately 10 Pasteurella tularensis organisms (SCHU S4 strain).[1] Prior vaccination with killed Foshay vaccine did not prevent local lesions, but did reduce the incidence of systemic manifestations of infection. Review of accidental laboratory infection indicates that the respiratory route may serve as a portal of entry.[2] Experimental respiratory infections can easily be induced in both vaccinated and nonvaccinated monkeys, and response to therapy is good.[3] This present report describes the response to respiratory challenge with P. tularensis of nonvaccinated volunteers and of volunteers who received either killed vaccine or a viable attenuated vaccine.

Materials and Methods

Volunteers were inmates of the Ohio State Penitentiary, 21 to 35 years of age. Criteria for selection and conditions of volunteering have been described.[4]

Vaccination with Foshay killed tularemia vaccine was conducted as previously described.[1] The viable vaccine was administered by the multiple puncture technique (150) through a drop of rehydrated lyophilized vaccine in a 3 to 10 mm. area on the outer aspect of the ether-cleansed upper arm. The vaccine contained 1×10^9 viable organisms per milliliter and was prepared by one of us (H. T. E.) from the more immunogenic of 2 variants isolated at Fort Detrick in 1956 from a Soviet preparation.[5]

Submitted for publication Aug. 9, 1960.
From the Department of Medicine, College of Medicine, Ohio State University, Columbus, Ohio. This study was supported under Contract with the U.S. Army CmlC, Fort Detrick, Frederick, Md.

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STUDIES WITH TULAREMIA VACCINES IN VOLUNTEERS*

III. SEROLOGIC ASPECTS FOLLOWING INTRACUTANEOUS OR RESPIRATORY CHALLENGE IN BOTH VACCINATED AND NONVACCINATED VOLUNTEERS

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AND

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Previous reports from this laboratory have described the clinical aspects of tularemia infection in both vaccinated and nonvaccinated volunteers following intracutaneous[4] and respiratory[5] challenge. These studies offered an excellent opportunity to compare the serial antibody responses following vaccination with killed or viable attenuated vaccine as well as the serologic picture in nonvaccinated and vaccinated volunteers challenged by either the cutaneous or respiratory route. It is the purpose of this report to describe the serologic aspects of experimental tularemia in man.

Materials and Methods. Foshay killed (phenolized) vaccine and the viable attenuated vaccine were administered as previously described (Saslaw *et al.*[4,5]). Challenge with *P. tularensis* (Schu S4 strain) by both the cutaneous[4] and respiratory[5] route in both nonvaccinated and vaccinated volunteers has also been described.

SERUM. Blood was collected in sterile tubes from volunteers at weekly intervals following vaccination and at biweekly intervals after challenge. Serum obtained from these specimens was stored at −20° C.

BACTERIAL AGGLUTINATION TEST. To each 0.5 ml. of serum dilutions, 0.5 ml. of formalin-killed bacterial suspension (approximately 3×10^8 organisms) was added, and the tests incubated overnight in a 37° C. water bath before reading. Titers were recorded as the highest dilution showing at least 2+ agglutination.

HEMAGGLUTINATION TEST. These tests were performed as described by Alexander, Wright and Baldwin[1] and Wright and Feinberg[2]. In brief, washed human type "O" red blood cells were sensitized by incubation with *P. tularensis* polysaccharide†, washed and then 0.5 ml. added to 0.5 ml. of serum dilutions

*This study was supported under Contract with the U.S. Army CmlC, Fort Detrick, Frederick, Maryland.
†Kindly supplied by Dr. P. S. Nicholes, Utah University.

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STUDIES WITH TULAREMIA VACCINES IN VOLUNTEERS*

IV. BRUCELLA AGGLUTININS IN VACCINATED AND NONVACCINATED VOLUNTEERS CHALLENGED WITH PASTEURELLA TULARENSIS

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(From the Department of Medicine, Ohio State University College of Medicine, Columbus, Ohio)

Previous studies from this laboratory have been concerned with the clinical[9,10] and serologic[11] aspects of experimental tularemia in vaccinated and nonvaccinated volunteers following intracutaneous or respiratory challenge. These studies provided a unique opportunity to investigate the occurrence of brucella agglutinins in tularemia under controlled conditions. Various workers (Eisele[1], Feinberg and Wright[2], Foshay[3], Francis[5], Francis and Evans[6], Poston and Smith[8], Stanfield, Taylor and Morgan[13]) have shown that patients with naturally acquired tularemia can exhibit agglutinins for brucella species, but there is not general agreement as to the frequency with which this serologic cross reaction occurs and its importance from the diagnostic standpoint. The present report is concerned with brucella agglutinin formation in 98 vaccinated and nonvaccinated subjects challenged by the intracutaneous or respiratory route with virulent *P. tularensis*. Ancillary studies in rabbits immunized with killed *P. tularensis* also will be presented.

Materials and Methods. Volunteers received either Foshay killed (phenolized) vaccine *or viable attenuated* vaccine by methods described previously[9,10]. Procedures used for intracutaneous and respiratory challenge have also been discussed in our earlier reports[9,10]. Brucella tube agglutination tests were carried out by standard methods (Spink *et al.*[12]). Tube antigen was obtained from the Bureau of Animal Industry, Beltsville, Maryland.

Formalin-killed suspension of *P. tularensis*, Strains 38, Schu S-4, 425, 503 and the viable vaccine strain† were used to immunize 3, 3, 3, 2 and 4 rabbits, respectively. All strains were grown on GCBA medium (BBL) for 72 hours, harvested in physiologic saline containing 0.5% formalin, and allowed to remain at 4° C. for 24 hours. After appropriate sterility tests had been completed, the suspensions were washed 3 times with sterile saline and resuspended in a concentration which, when diluted 1:10, was equivalent in opacity to MacFarland tube No. 2. Each rabbit was injected intravenously with 0.5, 1.0, 1.0 and 1.0 ml. on 4 consecutive days, respectively. Blood samples were obtained from the marginal ear vein before immunization and at weekly intervals thereafter. At 7 and 11 weeks after the first immunization, each rabbit received an intravenous booster injection of 0.5 ml. of the same suspension used originally. Curves of antibody production and decline were established in each rabbit by three serologic tests: *P. tularensis* bacterial agglutination and polysaccharide hemagglutination, and *Brucella abortus* bacterial agglutination. Procedures used in per-

*This study was supported under Contract with the U.S. Army CmlC, Fort Detrick, Frederick, Maryland.
†Kindly supplied by Dr. Henry T. Eigelsbach.

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Reference 5

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STUDIES WITH TULAREMIA VACCINES IN VOLUNTEERS.* V. IMMUNODIFFUSION STUDIES WITH *PASTEURELLA TULARENSIS* ANTIGEN-HUMAN ANTIBODY SYSTEMS

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and

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(From the Department of Medicine, Ohio State University College of Medicine, Columbus, Ohio)

Previous reports[6-8] from this laboratory described the clinical and serologic aspects of tularemia in vaccinated and nonvaccinated volunteers following intracutaneous or respiratory challenge with *Pasteurella tularensis*. It was impossible to predict, from bacterial agglutination or hemagglutination tests, whether or not an individual would become ill after challenge. The possibility was considered that qualitative characterization of pre-challenge sera with immunodiffusion tests might relate a particular antibody component to immunity. The present report describes application of the Ouchterlony[4] double diffusion technique in experimental tularemia in volunteers. Preliminary studies of *P. tularensis* antigen-rabbit antibody systems are described separately (Carlisle, Hinchliffe and Saslaw[1]).

Materials and Methods. Volunteers received either Foshay killed (phenolized) or viable attenuated vaccine by methods described previously (Saslaw *et al.*[6-7]). Challenge with *P. tularensis* (SCHU S4 strain) by both the cutaneous[6] and respiratory[7] route in both vaccinated and nonvaccinated volunteers has also been described. Immunodiffusion test antigens were prepared by sonic vibration (Carlisle, Hinchliffe and Saslaw[1]) of suspensions of *P. tularensis*, strains 38, SCHU S4, and the viable vaccine strain (LV).† Since preliminary studies (Carlisle, Hinchliffe and Saslaw[1]) showed no significant qualitative or quantitative differences in these antigens, strain 38 was used except where indicated. Details of preparation of sonic-vibrated antigens and performance of agar diffusion tests have been described (Carlisle, Hinchliffe and Saslaw[1]).

Results. PRECIPITIN LINE RESPONSE AFTER VACCINATION. After Foshay vaccination, precipitins were detected in sera of only 11 of 40 (27.5%) volunteers. As shown in Table 1, precipitins appeared far less frequently and later (mean, 15 days) than significantly elevated titer rises in either bacterial agglutination (mean, 9 days) or hemagglutination (mean, 8 days) tests.

Some degree of correlation was observed between precipitin line response and *peak* bacterial agglutination titers (Table 2). For example, no precipitins were detected in 10 sera

*This study was supported under Contract with the U.S. Army CmlC, Fort Detrick, Frederick, Maryland.

†Cultures kindly supplied by Dr. Henry T. Eigelsbach.

(81/176)

Reference 6

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Studies with Tularemia Vaccines in Volunteers.* VI. Assessment of Role of Properdin in Resistance. (27592)

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Recently there has been resurgence of interest in nonspecific resistance to infection (1). The role of properdin in resistance to infectious disease is not clear(2). Previous studies from this laboratory(3-7) have been concerned with clinical and serologic aspects of experimental tularemia in vaccinated and non-vaccinated volunteers after intracutaneous or respiratory challenge. Both Foshay killed (phenolized) and viable attenuated vaccine stimulated production of antibodies, but there was no correlation between inci-

*Supported under contract with U. S. Army CmlC, Fort Detrick, Md.

ANNEX L

Demilitarization

Policy Directives. Beginning in March 1969, at the President's direction, the National Security Council conducted a major review of United States policy concerning biological warfare. Government agencies participating in the review were: Department of State, Department of Defense, Arms Control and Disarmament Agency and the Office of Science and Technology. Comments were also received from the scientific community and evaluated by the President's Scientific Advisory Committee.

Pending the outcome of this study, Department of Army directed immediate cessation of all production of toxins and biological agents and filling of dissemination devices with these agents on 15 August 1969.1/ On 25 November 1969, the President issued an announcement of US policy regarding biological warfare which included the following:

(1) The US shall renounce the use of lethal biological agents and weapons and other methods of biological warfare.

(2) The US will confine its biological research to defensive measures such as immunization and safety measures.

(3) The Department of Defense will prepare recommendations for the disposal of existing stocks of bacteriological weapons.

On 14 February 1970, a White House announcement extended the policy to military programs involving toxins whether produced by biological

means or chemical synthesis and directed the destruction of toxin weapons and stocks which were not required for defensive research program.

Planning and Project Approval. General guidelines for preparation of demilitarization plans were provided to Ft. Detrick by Headquarters US Army Munitions Command on 12 November 1969. The guidelines involved:

(1) Absolute adherence to safety and control procedures with no tradeoff for time or cost.

(2) Verification of the efficacy of the detoxification procedures.

(3) Strict accountability procedures for demilitarized items.

(4) Preparation of a risk analysis defining degree of risk for each step and for the total operation.

(5) Preparation of detailed step-by-step operation procedures, production plans, security plans, reporting procedures, inspection, and managerial control programs for the entire operation..

(6) Maximum protection provided to operating personnel and absolute assurance that agent released from any possible accident during the demilitarization will be totally contained.

(7) All aspects of the operation to be justifiable from a personnel safety, security and community safeguard standpoint, with sufficient hard data to be incontrovertible in the event the procedures, facilities and concepts of operation are challenged in an objective evaluation of the program.

Demilitarization plans were prepared for all BW stockpiles of antipersonnel and anticrop agents at four locations: Pine Bluff Arsenal, AR, (antipersonnel materiel); and Rocky Mountain Arsenal, CO,

Beale Air Force Base, CA, and Ft. Detrick, MD (anticrop materiel). Test quantities of BW agents and munitions were also destroyed at Ft. Detrick and at Dugway Proving Ground according to procedures approved by the Army Materiel Command. Enough material was retained to support approved defensive R&D programs.

The four major demilitarization plans were evaluated first by an Ad Hoc Committee of Army experts including representatives of the Armed Services Explosives Safety Board and the Air Force Armament Laboratory. The plans and accompanying environmental impact statements (EIS) were reviewed by officials of the US Department of Health, Education and Welfare, US Department of Interior, US Department of Agriculture, Environmental Protection Agency and appropriate state and local officials. The EIS were filed with the President's Council on Environmental Quality

Demilitarization of Antipersonnel Materiel. Between 10 May 1971 and 1 May 1972, the stockpile of antipersonnel BW agents and munitions was destroyed at the Directorate of Biological Operations (DBO) located at Pine Bluff Arsenal.

The disposal operation was preceded by a complete, replicated inventory and a series of special experimental and engineering studies necessary to establish or verify plant procedures. A separate verification office was established to provide overall accountability of each item or material as it proceeded through the destruction process. Independent observers were appointed from HEW and USDA to follow the

entire program to advise on matters relating to their areas of responsibility. The Center for Disease Control (CDC) was employed to independently test all samples submitted (of destroyed agent material residues from DBO) to certify as to the non-pathogenicity of these samples. Extensive press coverage was provided through a constant series of briefings, news releases, closed circuit TV, and tours of non-contaminated areas throughout the operation. Detailed SOPs were prepared and approved by the Army Ad Hoc Committee; and prior to starting any operation, all personnel were thoroughly trained in the job to be done.

Demilitarization operations began on 10 May 1971. The procedures used for destruction varies with the item. Munitions containing either botulinum toxin or shellfish poison were smelted in a deactivation furnace at 2000°F. Agent materials such as dry Bacillus anthracis spores were removed from munitions, mixed with 2 percent caustic solution and heated for three hours at 280°F. The components of these munitions were also smelted at 2000°F. Larger munitions, were emptied and their agent fill were slurried in caustic solution and sterilized at 280°F for three hours. Bulk agents were handled in a similar manner.

Residues from the agent destruction operations were neutralized, innoculated with a non-pathogenic culture derived from soil, river water, and sewage and allowed to biodegrade to reduce BOD. After biodegradation, the solutions were sterilized again at 280°F for three hours, verified sterile by independent observers, pasteurized at 210 to 250°F and discharged to a package sewage unit for a second biodegradation.

Discharge from this unit was collected in an evaporation bed for drying and eventual disking into the soil.

Cans, containers, munition components and packaging were destroyed by various means including cutting and crushing, incineration and smelting at 2000°F. All metallic residues were collected, accounted for, verified free of agent after sterilization and placed in a sanitary land fill at Pine Bluff Arsenal. Unused hardware, munitions, components and packaging materials were destroyed and disposed of by the same procedures.

Following the complete disposal and certification of the BW stockpile, all facilities in the biological complex were thoroughly cleaned and decontaminated using procedures, controls and certification necessary to provide incontrovertible data that non-immunized personnel could utilize any and all parts of the complex for any purpose. All agent contaminated areas were washed; equipment and apparatus were disassembled; ductwork and piping galleries were opened and the entire area was subjected to gaseous formaldehyde for 16 hours. Process systems throughout the plant and laboratory areas were sterilized by steam at 250°F for three hours. Biological test tabs of heat resistant spores, distributed throughout the system prior to the start of decontamination, were examined afterwards for viable spores as a positive check on the completeness of decontamination.

On 1 May 1972, the DBO facility was turned over to the Food and Drug Administration, Department of Health, Education and Welfare as the National Center for Toxicological Research. All biological material

had been completely destroyed and the production facilities decontaminated without a single biological agent infection exposure of the staff at a total cost of $10,830,600.

Demilitarization of Anti-Crop Materiel. At the time of the President's ban on BW, two anticrop biological agents existed in the stockpile: urediospores of agent TX, the casual agent of wheat stem rust, and spores of agent LX, the causal agent of rice blast. The TX stockpile was stored at Beale Air Force Base, and at Rocky Mountain Arsenal. LX was stored only at Ft. Detrick. The planning, approval and execution of the disposal operations for all three sites as well as the processes employed were practically identical.

Beale Air Force Base Operations. Destruction of TX at Beale Air Force Base, California, was planned and accomplished by the Special Projects Division of Rocky Mountain Arsenal assisted by Ft. Detrick personnel. Project planning, operational procedures and review by the Ad Hoc Committee and the staffing and approval of the final plan and EIS were comparable to those involved in the Pine Bluff Arsenal demilitarization program.

Disposal operations at BAFB required modification of an existing building on land leased by the Army to ensure total containment of the agent during operations. Process equipment was designed, installed and thoroughly tested.

Preceding the operation was an extensive series of laboratory and engineering studies to verify techniques for destroying the agent and decontaminating the facility. As in the case with Pine Bluff Arsenal operation, a control and verification system was developed to record the entire operation including movement of material, laboratory assays and disposal operations to assure credibility of the program. Independent observers, with free access to all disposal activities and records at BAFB were appointed from the US Department of Agriculture and the State of California.

The demilitarization operation was a six step process:

(1) Verification of the viability of the TX stock by incubation of random samples to determine percent germination.

(2) Inactivation of the material by exposure to carboxide gas (10% ethylene oxide - 90% CO_2) once a day for five successive days.

(3) Certification of inactivation to the minimum level of 99.964% by incubating random samples.

(4) Incineration of the inactivated spores in a 4 stage hearth incinerator at 1600° - 2000°F followed by fumigation of the residual ash with paraformaldehyde.

(5) Verification of destruction by microscopic examination of the ash for the presence of spores and by chemical analysis.

(6) Disposal of the ash in an approved area by disking into the soil to a depth of six inches and planting the area with a cover crop of millet.

Following the TX disposal operation, all equipment, trash, air filters, empty drums and ash residue were decontaminated by fumigation with paraformaldehyde. Effectiveness of facility decontamination was verified with BG strip indicators. The land and buildings were returned to the Air Force. Some equipment items were disposed of by the BAFB Property Officer and non-reuseable materials were placed in a BAFB sanitary landfill. Remaining equipment, trash and empty drums were shipped to Rocky Mountain Arsenal for disposal.

The demil operation at BAFB was completed on 10 March 1972 at a cost of $498,153.

Rocky Mountain Arsenal Operation. Rocky Mountain Arsenal was nearly identical to the BAFB demilitarization project. The RMA Special Projects Division, aided by Ft. Detrick personnel, was responsible for planning and conducting the operation. Detailed plans and procedures were reviewed by the Army Ad Hoc Committee, and the final plan and EIS were staffed through the same Federal agencies and the State of Colorado. Preliminary technical studies used to support BAFB operations also supported the RMA project. Safety and security precautions, independent observation from the Department of Agriculture and State of Colorado, and verification procedures were essentially identical to the BAFB project.

The RMA demilitarization facility was housed in an existing two story brick and tile building modified to provide total containment of TX spores. The RMA TX stock was about 25 times the size of the BAFB stock;

therefore the process equipment was larger although practically identical in design, and the operation was longer and more costly. The demilitarization process was identical at that used at RAFB.

TX demilitarization at RMA began on 2 August 1971 with an assay of agent viability. Operations were suspended shortly thereafter for equipment and building alterations. Operations were resumed on 18 January 1972 and disking of residual ash into the soil at RMA was completed on 11 January 1973. The facility and equipment were decontaminated and certified by 4 November 1972. Equipment was turned over to the RMA property officer or discarded. Drums, filters and trash were incinerated at 1000°F then buried in an RMA landfill. The total TX disposal operation at RMA was completed by 15 February 1973 at a total cost of $2.41 million.

Ft. Detrick Operations. Planning, approval and execution of the LX demilitarization project at Ft. Detrick was accomplished similarly to the TX operation under the direction of the Ft. Detrick staff. Detailed plans, based on approved SOPs, were prepared and reviewed by the Army Ad Hoc Committee. The final plan and the EIS were reviewed by Federal, State and local officials as in previous cases. Independent observation and certification of the operation was provided by US Department of Agriculture and State of Maryland officials.

The demilitarization was accomplished in existing total containment facilities at Ft. Detrick, so the operation enjoyed the exceptional effluent treatment measures and safety and security controls employed for BW agent research and development. Incineration equipment was procured and installed and some modifications of the building were required to provide personnel change facilities.

The LX demilitarization program was based on extensive laboratory and pilot testing and engineering analysis to establish design and operating parameters, to verify analysis and control procedures, and to check plant decontamination and agent containment methods. Prior to initiating demilitarization operations, the LX stock was carefully recorded and analyzed as in the other BW demilitarization operations.

The destruction operation was a six-step process similar to the TX demilitarization:

(1) LX lots were sampled and assayed to establish viability.

(2) Containers of LX spores were inactivated with carboxide gas (10% ethylene oxide and 90% carbon chloride) in a pressurized gas chamber at 18 psig for twenty hours followed by a second exposure for 24 hours. Initial attempts to deactivate with a single 20 hour treatment did not produce the desired destruction level of 99.943% at the 99.5% confidence level. In fact, four lots required additional treatment for as long as 71 hours.

(3) Inactivation was certified by sampling and assay to measure the residual viability.

(4) Inactive spores were incinerated in a dual chamber, gas fired furnace operating at 1200-1500°F.

(5) The resulting ash was crushed, sampled and analyzed microscopically and chemically to verify the absence of spores.

(6) Certified ash was then disced into the soil at an approved disposal site at Fort Detrick and the area was seeded with a cover crop of orchard grass.

The residual storage drums were incinerated in the furnace for 10 minutes, removed and sterilized at 250°F for 2 hours, crushed and buried in an approved landfill. All combustible material was incinerated at 1000°F. The biological safety cabinets were chemically decontaminated and the entire building was decontaminated with paraformaldehyde and certified using biological test strips. The building was vacated on 31 March 1973.

The total LX stock was destroyed between 17 January and 18 May 1972 at a cost of $990,000. Ash disposal was completed on 16 March 1973 signifying the end of the program.

Mr. MILLER. Dr. Augerson will now present a short statement concerning use of humans in testing.

Senator KENNEDY. General Augerson.

General AUGERSON. I am Assistant Surgeon General for Research and Development. I replaced General Dirks who testified before you in late 1975. We welcome the opportunity to assist your subcommittee.

My prepared remarks address two principal areas of interest.

First, I would like to summarize the efforts made since the hearing in the fall of 1975, to guarantee the protection of human research subjects within the Army, and to improve the process by which these guarantees are assured.

Second, I want to review briefly human experimentation in the biological warfare program since World War II.

The Army wholeheartedly supports the aims and emerging conclusions of the National Commission for the Protection of Human Subjects in Biomedical and Behavioral Research.

Senator KENNEDY. You will support the expansion of the jurisdiction to include——

General AUGERSON. DOD.

Senator KENNEDY [continuing]. The witness nodded his head affirmatively, let the record show.

Mr. MILLER. We may have to answer on the basis that we individually and personally support it. The position of the Defense Department has not yet been finalized.

[The biographical sketch of General Augerson follows:]

EXHIBIT 7

The Edgewood Arsenal Database
[Also Known As the Chemical, Biological, Radiological, Nuclear, Explosive (CBRNE) Database]

On December 5, 2005, the Department of Defense (DoD) sent VBA a new database listing the names of 1,012 service members who were exposed to as many as 144 different agents at Edgewood Arsenal.

On March 30, 2006, the Compensation and Pension (C&P) Service, with members of VA's Office of Policy, Planning, and Preparedness (008) and the Veterans Health Administration, met with the Deployment Health Support Directorate (DHSD) of DoD. DHSD discussed its on-going efforts to catalogue the biological and chemical tests performed at Edgewood Arsenal. Highlights of the meeting included:

- DoD has nearly completed decoding and describing the agents listed in the database.

- The types of agents and chemicals used at Edgewood Arsenal varied considerably in complexity as well as familiarity to the layperson. Therefore, all meeting participants agreed that DoD would handle any public inquiries about these substances. Examples of them included:

  1. LSD
  2. XV Nerve gas
  3. 2-PAM Chloride
  4. Chloropicrin (Trichloronitromethane)
  5. Compound 302,668 [(1-methyl)-1,2,3,6-tetrahydro-4-piperidyl) methyl-alpha-I
  6. EA 3580 (N-methyl-4-piperidyl cyclobutylphenylglycolate)

- DoD handed out a draft of Edgewood Arsenal Chemical Agent Exposure Studies: 1955-1975. This fact sheet contains basic information about the test program.

- C&P Service has drafted notification, which will include the DoD fact sheet, that it will send to test participants for whom it can find addresses. The goal of the Service is to have this draft in concurrence by April 14, 2006. C&P Service plans to begin sending letters to Edgewood Arsenal volunteers initially identified by DoD by July 2006.

- DoD anticipates adding between 3,500 and 5,000 names to the database by the end of August 2006, so that it might finally total 7,000 names.

- Additional data concerning chemical and biological tests will come from tests at Ft. Detrick, Maryland, and Dugway Proving Grounds, Utah. DoD estimated that as many as 100,000 service members might have been involved in such testing. However, DoD also estimated that it might be able to identify only 30,000 of those individuals. DoD expects that the total participants in Project SHAD, mustard gas, and Edgewood Arsenal tests alone would be half of that total.

Prepared by: Compensation and Pension Service (21)
Procedures Staff (212B), David Abbot
April 3, 2006

EXHIBIT 8

VBA Outreach Efforts to Veterans Exposed to Chemical and Biological Substances at Edgewood Arsenal

Since December 2005, the Department of Veterans Affairs has maintained an outreach effort for those veterans exposed the chemical and biological agents at Edgewood Arsenal, MD. Of the 4,446 records received, VA issued letters to 41 percent (1,818) of those records with a matching names and social security numbers. As addresses arenames and

On December 1, 2005, Veterans Benefits Administration (VBA) received a list of names of 1,012 participants used in tests conducted at Edgewood Arsenal. The tests consisted of 140 agents. This was the beginning of the Chemical, Biological, Radiological, Nuclear and Explosives (CBRNE) database. The Department of Defense (DoD) met with VBA on February 2, 2006, to share a draft copy of a DoD fact sheet entitled "Edgewood Arsenal Chemical Agent Exposure Studies: 1955-1975." On April 25, 2006, VBA's Compensation and Pension Service (C&P) staff received an updated CBRNE database with an additional 3,434 names for a total database of 4,446 names.

On May 26, 2006, C&P Service received from the Office of Performance Analysis & Integrity (PA&I), the results of a data match between the CBRNE database, BIRLS and the C&P master record. This match provided social security numbers and addresses of a limited number of test participants (1,818 were a match). Whenever data such as current mailing addresses are not provided from DoD or PA&I, the next option is to contact Choice Point, which associates the data with their batch run, that is sent to IRS monthly.

On June 27, 2006, C&P Service began mailing notification letter to veterans from the CBRNE database. By July 31, 2006, C&P Service had mailed out 1,818 notification letters to test participants in the CBRNE database (4,446) with current addresses. On July 11, 2006, C&P Service sent a list of CBRNE test participants to Veterans Health Administration's (VHA) Eligibility Center in order to help them to determine those veterans who were eligible for medical treatment.

On September 7, 2006, C&P Service received an additional 2,261 names from DoD to add to the CBRNE database, for a total of 6,707 participants. CBRNE Training Letter 06-04 was released to the field (VA Regional Offices) on September 12, 2006.

Letters for the remaining 4,889 veterans whose data initially could not be located, were mailed on September 18, 2007. As of June 2008, C&P Service had received 3,821 new names to be added to the CBRNE database, bringing the total to 10,528 names. Notification letters have not been sent out because VA was waiting for clarification from DoD on an updated version of the CBRNE Fact

Sheet. There was also a number of inquiries to DoD on whether or not women veterans participated in these chemical testing. On August 5, 2008, Mr. Roy Finno from DoD sent C&P Service an updated Fact Sheet to be included in our notification letters. Mr. Finno also sent a list of all chemical agents and non-agents that were used for CBRNE testing for a total of 427 agents.

VA will send notification letters to the new list of veterans identified by DoD,.

A copy of the latest CBRNE notification letter is attached.

EXHIBIT 9

Chemical Compounds Used in Human Testing at EDGEWOOD ARSENAL (1955 to 1975) *

APPROVED DRUGS/CHEMICALS

I. Anticholinesterase

Diisopropyl fluorophosphate (DFP)
Hexa fluorenium (Mylaxen)
Physo stigmine salicylate (Eserine)
Prostigmine (Neostigmine)

II. Anticholinergic

Atropine sulfate
Atropine methylnitrate
Benztropine mesylate (Cogentin)
Homatropine
Methscopolamine bromide (Pamine)
Scopolamine hydrobromide
Trihexyphenidyl HCl (Artane)
Benactyzine HCl

III. C.N.S. Active Drugs

Caffeine
Chlorpromazine (Thorazine)
Diazepam (Valium)
Ethyl alcohol
Fluphenazine (Prolixin)
Ipremazid (Marsilid)
Meprobamate
Methylphenidate (Ritalin)
Prochlorperazine (Compazine)
Reserpine

IV. Adrenergic Agonist/Antagonist

Dextroamphetamine (Dexedrine)
Epinephrine (Adrenalin)
Isoproterenol HCl (Isuprel)
Methoxamine hydrochloride (Vasoxyl)
Phenoxybenzamine HCl (Dibenzyline)
Propranolol HCl (Inderal)

V. Cholinomimetic

Bethanechol Chloride (Urecholine)
Methacholine chloride (Mecholyl Chloride)

VI. Antihistamine

Diphenhydramine (Benadryl)
Tripelennamine (Pyribenzamine)

VII. Oxime

Pralidoxime Chloride (Protopam)

VIII. Barbiturates

Amobarbital (Amytal)
Pentobarbital (Nembutal)
Phenobarbital
Secobarbital (Seconal)

IX. Vasodilater

Amyl Nitrite
Sodium Nitrite

X. Miscellaneous (Others)

Adrenocorticotropic Hormone (ACTH)
Ammonium chloride
Curare (Tubocurarine)
Dapsone (U.S.P.)
Digoxin (Lanoxin)
Heparin
Lidocaine
Nitrogen Mustard (Mustard)
Phenytoin Sodium (Dilantin)
Propylene glycol
Sodium Bicarbonate
Thiamine (U.S.P.)

*Information retrieved from Biomedical Laboratory records - February 1977

Chemical Compounds Used in Human Testing at EDGEWOOD ARSENAL (1955 to 1975) *

EXPERIMENTAL COMPOUNDS

I. Anticholinesterase

EA 3148
Diisopropyl phosphorofluoridate (DFP)
GF
G-V
Malathion
Sarin (BG)
Soman (GD)
Tabun (GA)
Tetrahydrominoacridine (THA)
VX

II. Anticholinergic

EA 2277 CS4030 (BZ)
EA 3167
EA 3443
EA 3580
EA 3834
R 4929
27349
226086
301060
302196
302282
302368
302537
302668
Benactyzine Toxogonin Atropine (TAB) (BTA)
Ditran

III. LSD Analogs

EA 1729, EA 1653, EA 3528 (LSD)
Acetyl lysergic acid diethylamide (ALD)
Brom-lysergic acid diethylamide (BOL)

IV. Oximes

Pralidoxime methane sulfonate (P2S)
Toxogonin
TMB4

V. Irritants

EA 1778
EA 1779
EA 2097
EA 2542
EA 3547
EA 4923
CA
CN
CS
T792
T792DM
Other Irritants

VI. Miscellaneous (Incaps)

EA 1476
EA 2233
218437
219362
220548
302034
302089
302582
Phenylcyclohexyl Piperidene Monohydrobromide (Sernyl)

VII. Simulants

DEP
DMHP

VIII. Miscellaneous (Others)

5-hydroxy tryptamine (5HTP)
N-Octylamine
Nitrogen dioxide
Para-amino benzoic acid (PABA)

*Information retrieved from Biomedical Laboratory records - February 1977

VVA026293

EXHIBIT 10

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

OAKLAND DIVISION

VIETNAM VETERANS OF AMERICA, et al.,

Plaintiffs,

vs.

CENTRAL INTELLIGENCE AGENCY, et al.,

Defendants.

No. CV 09-0037-CW

Deposition of MARTHA HAMED, taken at 2000 Pennsylvania Avenue Northwest, Suite 6000, Washington, DC, commencing at 9:03 a.m., Thursday, July 7, 2011, before Carmen Smith, Notary Public.

PAGES 1 - 266

PAGES 85-237; 244-251 ARE CONFIDENTIAL SUBJECT TO THE PROTECTIVE ORDER AND BOUND UNDER SEPARATE COVER

Q And roughly what time period were they tested with those substances?

A The people that I spoke with?

Q Yes.

A The people that I spoke with were World War II veterans. They were tested probably anywhere between 1939 and 1945.

Q Did some of those veterans tell you that they had been administered secrecy oaths?

A Yes, they did.

Q Did any other veterans outside of that time period tell you that they had been administered secrecy oaths?

A I don't recall discussing that with any -- I don't recall talking to veterans outside of that time period, unless it was mustard gas or lewisite. But I don't remember -- I don't recall talking to veterans after the World War II era. These were people that were specifically in the service in the war.

Q What was your primary goal in engaging in the collection efforts and having conversations with veterans during this time period from '92 to '95?

MR. PATTERSON: Objection; vague.

BY MR. LITTLETON:

I declare under penalty of perjury under the laws that the foregoing is true and correct.

Executed on _____ , 20___, at _____, _____.

_____

SIGNATURE OF WITNESS

CERTIFICATE OF NOTARY PUBLIC & REPORTER

I, CARMEN SMITH, the officer before whom the foregoing deposition was taken, do hereby certify that the witness whose testimony appears in the foregoing deposition was duly sworn; that the testimony of said witness was taken in shorthand and thereafter reduced to typewriting by me or under my direction; that said deposition is a true record of the testimony given by said witness; that I am neither counsel for, related to, nor employed by any of the parties to the action in which this deposition was taken; and, further, that I am not a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

Notary Public in and for the
District of Columbia

Commission Expires: MARCH 14, 2013

EXHIBIT 11

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

OAKLAND DIVISION

VIETNAM VETERANS OF AMERICA, et al.,

Plaintiffs,

v.

CENTRAL INTELLIGENCE AGENCY, et al.,

Defendants.

No. CV 09-0037-CW

Washington, D.C.

Friday, June 3, 2011

Deposition of WILLIAM F. BLAZINSKI, a witness herein, called for examination by counsel for Defendants in the above-entitled matter, pursuant to notice, the witness being duly sworn by ANDREA P. HUSTON, a Notary Public in and for the District of Columbia, taken at the offices of the Department of Justice Federal Programs Branch, 20 Massachusetts Avenue, N.W., Washington, D.C. at 8:26 a.m., Friday,

June 3, 2011, and the proceedings being taken down in Stenotype by ANDREA P. HUSTON, RPR, CRR, and transcribed under her direction.

A. No.
Q. Okay. Where did it take place?
A. It was a laboratory.
Q. What do you recall, if anything, about that day of the first test?
A. Well, they called us in, and they explained to us why they were doing the test. And the reason they told us at the time is that they were putting tear gas in the tunnels in Vietnam knowing there were people down there, and nobody was coming out.

We were told that our test -- what they would be doing is be mixing different dosages of gas to air, and they wanted to see how long we could stand it. They said stay in there as long as you can. After ten minutes, if you're still in there, we're going to come in there and get you out anyway. And then a team of doctors and psychiatrists would ask us different questions and give us a physical, I guess, whatever they did, took our blood pressure, pulse and things.

Q. So, you recall there being doctors on site

A. Yes.
Q. And when was the last time you've seen this document?
A. Yesterday.
Q. Okay. Is there anything to your knowledge that is untrue with respect to any of the information contained in Exhibit 163?
A. There was never -- never any time that anybody told us about any possible lasting effects. It was only about what would happen while we were taking certain substances, the likely effects of it.
Q. Uh-huh. And just so I'm clear, where in this participation agreement do you see it says that you would be informed of the lasting health effects?
A. I don't see anything in here about it.
Q. Okay. My question to you was just -- was there anything that was inaccurate that is contained in Exhibit 163?
A. Yeah, I don't recall receiving a document.
Q. The Medical Research Volunteer Program?
A. Right. Yeah, I don't recall. I know I signed a lot of documents, and -- but I don't recall

Q. Got it. It's fair to say that everyone's experience at Edgewood would necessarily be unique, correct?

A. Yes.

Q. Okay. Now, Mr. Blazinski, at any time while you were at Edgewood, did anyone administer to you what I'll call a secrecy oath?

A. We were told right up front that this was top secret. We weren't to discuss this with anyone, any tests that were taken there, anything about the program.

Q. And that was told to you before you began your participation in the experiments?

A. Yes.

Q. I see. And do you recall by any chance who told you that?

A. I think it was part of the presentation at Fort Sill.

Q. I see. So, during that initial presentation at Fort Sill, you were instructed that the testing program at Edgewood was top secret?

A. I believe so.

sort of secrecy agreement?

A. Again, I may have. As you can see, they had us signing everything. Normally, when the Army has you sign something, it's sign it all, you can read it later or whatever, like that, you know.

Q. I mean I will represent to you I have not been able to find any sort of secrecy document in your files. And I take it your testimony is you just don't recall one way or the other --

A. Right.

Q. Okay. So, it's possible you did, and it's possible that you didn't?

A. Right. I don't recall.

Q. Just don't know. Okay. Fair enough.

Did there come a time when you ultimately felt comfortable discussing your time at Edgewood after you had left?

A. Yeah, I guess I did.

Q. And what changed? What happened, just the course of time?

A. Well, something -- the National Institute of Health or whatever, Medicine, whatever like that,

when I did those surveys with them like that --

Q. Yeah.

A. -- and got copies of the results --

Q. Sure.

A. -- I mean somebody was looking into something there. And, again, all those findings didn't mean anything to me.

Q. Yeah.

A. I had no idea what they were talking about.

Q. Yeah. I take it today, you don't feel inhibited in any way from sharing what you know about Edgewood, correct?

A. Correct.

Q. Okay.

I'm trying to actually cut through a few things.

A. Good. Yes.

Q. I do have one question for you: Have you ever seen the Department of the Army or the Department of Defense's chemical and biological exposure web site?

notice and follow-up medical care to test subjects. Do you see that? That's in your initial disclosures.

A. Yes.

Q. What knowledge do you have about the provision of notice? If any? Maybe you don't.

A. I don't.

Q. Okay. Fair enough. Do you have any knowledge about follow-up medical care to test subjects?

A. No.

Q. Okay.

(Exhibit No. 166 was marked for identification.)

BY MR. GARDNER:

Q. Mr. Blazinski, I have handed you a document that's marked as Exhibit 166 to your deposition. It's a document Bates-labeled PLTF 002214 from the Department of Army, United States Army Medical Research Institute of Chemical Defense, dated March 31, 1992, addressed to you from Robert E. Foster, Chief Research Operation Division.

Mr. Blazinski, do you recognize this

Exhibit 167?

A. No.

Q. Okay. And just so I have a clear record, you don't even know exactly if you in fact received Exhibit 167?

A. I don't recall.

Q. Okay. When you looked at it yesterday, did it refresh your recollection that you had seen these two documents before?

A. No.

Q. Okay. Mr. Blazinski, have you ever made a claim for benefits with the VA?

A. Yes.

Q. Okay. Can you describe those circumstances?

A. When I got my two diagnoses of leukemia and colitis, I went to the VA, and I guess you have to sign up and register, and I was refused because I make too much money, like that. And then I filled out forms for disability, which was subsequently turned down because I couldn't prove that I've had it since 1968.

reasons for your disability on 5521 is that you were a medical volunteer at Edgewood Arsenal in 1968 --

A. Correct.

Q. -- Project 112. Do you see that?

A. Yes.

Q. What's Project 112?

A. I come to find out I wasn't on Project 112.

Q. Oh, okay.

A. I was in something else.

Q. Okay.

A. I was under the impression I was. Both of them had testing at Edgewood Arsenal --

Q. Okay.

A. -- and other places.

Q. I see. I see. Mr. Blazinski, have you ever made a claim for medical care to the Department of Defense?

A. No.

Q. Why not?

A. Didn't know you could.

Q. Okay. Have you ever made a claim for

CERTIFICATE OF DEPONENT

I hereby certify that I have read and examined the foregoing transcript, and the same is a true and accurate record of the testimony given by me. Any additions or corrections that I feel are necessary, I will attach on a separate piece of paper to the original transcript.

_____

Signature of the Witness

CERTIFICATE OF NOTARY PUBLIC

I hereby certify that the individual representing himself/herself to be the above-named individual, appeared before me this _____ day of _____, 2011, and executed the above certificate in my presence.

_____

Notary Public

In and for the County of _____

MY COMMISSION EXPIRES:_____

EXHIBIT 12

REDACTED VERSION

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

VIETNAM VETERANS OF AMERICA, et al.,

Plaintiffs,

v.

No. CV 09-0037-CW

CENTRAL INTELLIGENCE AGENCY, et al.,

Defendants.

Washington, D.C.

Wednesday, June 1, 2011

Deposition of

TIM M. JOSEPHS, called for examination by counsel for Defendants, pursuant to notice, at the United States Department of Justice, 20 Massachusetts Avenue, Northwest, Washington, D.C., commencing at 8:56 a.m., before Barbara A. Huber, CSR and Notary Public in and for the District of Columbia, when were present on behalf of the respective parties:

Q Have you ever spoken to your doctors or physicians about your time at Edgewood?

A Not till recently.

Q Okay. But you have spoken to your doctors recently about your time at Edgewood?

A Yes.

Q Okay. How recently?

A Within the last five years.

Q Okay. Have you ever had any communications with the Department of the Army or the Department of Defense about your time at Edgewood?

A Yes, I received some survey type information.

Q Okay. When was that?

A In the 70s.

Q 70s. Okay.

Is there anyone else who you can recall you've spoken with about your time at Edgewood other than Mr. Muth, Mr. Dufrane, Mr. Blazinski, your wife, your immediate family, your physicians, and the Department of the Army?

that was back when you typed with carbon paper, so that type of stuff.

Q Okay. Anything else you can recall? You delivered documents, what else?

A That's primarily what I did.

Q Okay. And did you do your service in Thailand/Vietnam at the end of your service?

A Yes.

Q I see. How long were you there for, in Thailand and Vietnam?

A A year.

Q One year? Okay.

A Give or take.

Q So one year of your approximately two and a half in the service was spent in Thailand and Vietnam?

A May have been a little more than a year, but somewhere in that general --

Q Okay. Now, Mr. Josephs, are you a member of any organizations?

A The VVA.

Q That's Vietnam Veterans of America.

A Yes.
Q When did you become a member of Vietnam Veterans of America?
A Oh, several years ago.
Q Can you give me more specifics?
A I had a friend that was a member and suggested that I join.
Q And when I said more specifics, I'm sorry, I should be more clear with my questions.
Do you remember specifically when you became a member of the Vietnam Veterans of America?
A No, I don't. Less than five years ago.
Q Okay. Less than five years ago.
After your diagnosis with Parkinson's?
A Yes.
Q Okay. Is Vietnam Veterans of America an organization which you have to pay dues?
A Yes.
Q Are the dues annual?
A Annual, or they give you a lifetime option.
Q In other words, you pay a larger sum of

A I don't recall. Maybe a matter of weeks.
Q Uh-huh. Okay. And when did you actually participate in testing at Edgewood Arsenal?
A January and February of 1967.
Q 1967 or 1968?
A '68, rather.
Q Okay. So you were a test participant at Edgewood Arsenal for --
A Two months.
Q Two months, January and February 1968, correct?
A Yes.
Q Okay. Now, can you describe to me, with as much recollection as you have, what happened once you arrived at Edgewood Arsenal?
A I think some battery of tests or questionnaires and background information and that type of thing.
Q Now, as I understood it, you had filled out a questionnaire and taken some tests before you arrived at Edgewood to see if you --
A I don't know if it was a test or

Q Okay. But I take it your testimony is you don't recall what specific medical care they were providing either before or after the tests?
A No.
Q Okay. How long did each test last?
A Everything was -- there was no -- it was different things, so different time periods.
Q Okay. Was there an average?
A No.
Q Okay.
A I mean, I'm sure -- I assume there probably would have been, but I have know idea what it was.
Q Did anyone talk to you during the testing?
A I don't recall.
Q Okay. How were each of the test substances administered to you?
A Mostly by injections. Some pills.
Q Okay. Now would probably be as good a time as any.
What do you know about what substances

you were tested with?

A Nerve agents, antidotes to nerve agents.

Q Anything else?

A I have a list, that I'm sure you have too, that the Army identified as this is what you were exposed to during your period at Edgewood. So, again, I'm -- I don't have a medical background. I don't know if --

Q Okay. And we'll take a look at that and maybe we'll revisit those questions in the context of the specific agents.

Do you recall anyone asking you during the tests being administered how you felt?

A Yes.

Q Okay. And were those doctors that were asking you those questions?

A I don't know who they were.

Q Do you know why they were asking you how you felt during the tests?

A Well, I imagine -- they were testing me, so they might have been interested in how it affected me.

or would you say I don't recall?

A I'm not positive.

Q Okay. Fair enough.

Anything else that you believe to be inaccurate with respect to Exhibit 152?

A As they tried to influence me to stay there, they emphasized nothing would be involved in the testing that would be in any way harmful to your health.

Q Uh-huh.

A Would you agree -- I can't see where anyone would want to participate, knowing that this was going to lead to a serious health issue over the -- why would you do that, you know. I was not crazy.

Q Just so I'm clear, is it your belief that back in 1968, the Department of Defense believed that the tests that they exposed you to would result in Parkinson's?

A I don't know what they believed one way or another, but they wanted to see what would happen.

even need to do that. We can keep on plugging away on the third amended complaint for now. So sorry.

Mr. Josephs, did anyone, at any time while you were at Edgewood, administer a secrecy oath to you in connection with your participation at Edgewood?

A I remember discussions that I was not to discuss this with anyone. I -- I think maybe your immediate family was permitted, but, of course, they had to know where you were.

Q Okay.

A But I don't know if a secrecy oath was involved. If --

Q Okay. So beyond you being told not to discuss this with anyone other than possibly your immediate family, is there any other specific recollection you have of being prevented from disclosing your involvement in the Edgewood tests?

A I remember that if -- I was instructed that if I had an adverse reaction, that I was given a number to call at Edgewood and not to seek medical attention in the general community. To --

recall who now.

Q You mean other service members?

A I'd say readings, inquiries into -- maybe Internet stuff.

Q Okay. So --

A You know, any government that would treat me like that, I don't trust.

Q Uh-huh. So -- okay. As I understand it then, you have a concern based upon some book you've read, sorry -- some book you've read which you can't identify, some conversations with individuals who you cannot identify, and Internet searches that lead you to conclude that you may have been tested with things that are not on your service member test file?

A That's correct.

Q Okay. Now, when you submitted your claim for VA benefits, Mr. Josephs, you made a claim related to Parkinson's disease, correct?

A Correct.

REDACTED

Q What's the status of that claim?
A Receiving disability, social security.
Q Okay. And how much are you receiving in social security benefits based upon your Parkinson's disease, if you know?
A I really don't.
Q Okay.
A I'm not sure.
Q Have you made any claim to any state entities --
A No.
Q -- for any claims due to your Parkinson's disease?
A No.
Q Okay.
A I'm not aware that there are any.
Q Okay. Have you ever made a claim for service related healthcare to the Department of Defense as opposed to the VA?
A I don't believe so.
Q Why not?
A I didn't know that avenue existed.

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Signature of Deponent

I hereby certify that the individual representing himself/herself to be the above-named individual, appeared before me this _____ day of _____, 2011, and executed the above certificate in my presence.

_____

NOTARY PUBLIC IN AND FOR

_____

County Name

MY COMMISSION EXPIRES:

CERTIFICATE OF NOTARY PUBLIC

I, BARBARA A. HUBER, CSR, the officer before whom the foregoing deposition was taken, do hereby certify that the witness whose testimony appears in the foregoing deposition was duly sworn by me; that the testimony of said witness was taken by me in stenotypy and thereafter reduced to print under my direction; that said deposition is a true record of the testimony given by said witness; that I am neither counsel for, related to, nor employed by any of the parties to the action in which this deposition was taken; and, furthermore, that I am not a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

_____

BARBARA A. HUBER, CSR
Notary Public, in and for the District of Columbia
My Commission Expires: March 14, 2012