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UNDER SECRETARY FOR HEALTH'S INFORMATION LETTER

EVALUATION OF VETERANS INVOLVED IN PROJECTS SHAD, AUTUMN GOLD, COPPERHEAD, AND OTHER RELATED TESTS FOR POSSIBLE OCCUPATIONAL HEALTH EXPOSURES

1. This Under Secretary for Health's Letter provides guidance to clinicians on evaluating veterans who may have participated in Project Shipboard Hazard and Defense (SHAD), Autumn Gold, Copperhead and related tests (including 68-50, 69-31, Eager Belle, Flower Drum, Fearless Johnny, Half Note, Purple Sage, Red Beva, Scarlet Sage, and Shady Grove) and are concerned about the relationship of their participation to their current health.

2. **Background**

a. During the 1960s, the Department of Defense (DoD) conducted tests involving animals to determine the effectiveness of shipboard detection and protective measures against chemical, biological, and possibly nuclear threats and to determine the potential risk to American forces posed by these agents. Recently, there has been increased Congressional and media attention to this issue.

b. Although the tests were originally classified, DoD has been actively pursuing declassification of relevant information for evaluation. Information is still limited, but at the present time, it is known that the following agents were used as part of the testing program:

(1) **Biological Warfare Agent Simulants:** Bacillus globigii, (since renamed B. licheniformis); E. coli, Serratia marcscens; and zinc cadmium sulfide (ZnCdS);

(2) **Chemical Warfare Agents:** GB (sarin) and VX;

(3) **Chemical Warfare Agent Simulants:** Methylacetoacetate and sulfur dioxide; and

(4) **Various Chemical Decontaminants:** Beta-propiolactone, ethyl alcohol, lysol, peracetic acid, potassium hydroxide, sodium hydroxide, and sodium hypochlorite.

NOTE: *Not every agent was used in every test. In addition, there are issues relating to possible exposures to other agents including at least "tracer" amounts of radioactivity and asbestos.*

c. Additional information currently available about some of the most hazardous of these selected agents is provided in the attached Fact Sheet. Currently, the Department of Veterans Affairs (VA) is working with DoD to obtain information on all of the agents utilized.

d. These projects involved at least Army and Navy personnel who are reported to have been required to use protective measures deemed appropriate at the time. Ships involved included LT-2080, LT-2081, LT-2085; LT-2086, LT-2087, USS Carpenter DD-825, USS George Eastman YAG-39, USS Granville S. Hall YAG-40, USS Hoel DDG-13, USS Navarro LPA-215, and USS Tioga County LST-1158. DoD is compiling information on individuals involved.

3. **Guidance**

a. VA medical centers need to provide evaluations to eligible veterans who may have been exposed to chemical and/or biological agents in Projects SHAD, Autumn Gold, Copperhead, and/or related tests and who request such evaluation. Since there are no markers for the agents known to have been involved in the tests, the evaluation needs to consist of a thorough military and medical history along with a basic medical examination including appropriate laboratory tests that relate to the veteran's complaints and medical findings.

(1) The military history needs to include the following:

(a) Project and ship name to which the patient is connected,

(b) Dates served aboard the ship,

(c) Involvement with the Project,

(d) Usual job description and responsibility,

(e) Details of experiments in which the patient believes the patient was involved,

(f) Perceived exposures, and

(g) Other relevant details.

(2) The medical history needs to include the following:

(a) Baseline health status or the usual state of health prior to the Project,

(b) Health status during the Project,

(c) Health status following the Project,

(d) Perceived association with any health condition and the Projects identified in the military history, and

(e) Other relevant details.

NOTE: *Additional specialized tests and consultations should be ordered if clinically indicated.*

b. Veterans need to be informed that the examination does not constitute a claim for compensation. ***NOTE:*** *Veterans who wish to file a compensation claim should be referred to a Veterans Benefits Counselor or advised to contact the appropriate VA Regional Office at 1-800-827-1000.*

c. It is encouraged that copies of this Information Letter be provided to the Primary Care Teams and or the staff responsible for ambulatory care and outpatient clinics, including community-based outpatient clinics, as well as Vet Centers.

4. **Follow-Up Responsibility.** Questions regarding this information letter may be addressed to the Environmental Agents Service (131) at (202) 273-8579.

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Attachment

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ATTACHMENT A

FACT SHEET

"PROJECT SHAD" HAZARDOUS ENVIRONMENTAL EXPOSURES

1. Project Shipboard Hazard and Defense (SHAD) was a series of tests conducted by the Department of Defense (DoD) from approximately 1962 to 1968. The tests were apparently intended to evaluate the effectiveness of shipboard detection and protective procedures against chemical, biological and possibly nuclear threats. Based on information available to the Department of Veterans Affairs (VA) today, we understand these tests involved possible exposures to the chemical warfare agents sarin and VX, a bacterium Bacillus globigii, and the chemical zinc cadmium sulfide. Although other chemicals and biological agents were also used, the four agents reviewed here represent the greatest health concern. This Fact Sheet will be updated as new information is obtained for other important exposures. DoD is actively investigating its records to determine the names of ships and crew members who participated in these tests, and additional information on the hazardous materials involved.

2. **Long-Term Health Effects from Sarin and VX**

a. Sarin and VX are highly toxic chemical warfare nerve agents. In 1998 VA requested the National Academy of Sciences (NAS) to review possible long-term health effects from exposure to sarin. Although NAS focused on sarin, their findings are applicable to related nerve agents including VX. Following is a summary of their findings appearing in their report "Gulf War and Health," published September 2000. ***NOTE:*** *The full text is available on-line at http://www.nap.edu/books/030907178X/html/.*

b. Sarin was synthesized in 1937 in Germany in a quest for improved insecticides. High level exposures to sarin can be fatal within minutes to hours. In vapor or liquid form, sarin can be inhaled or absorbed, respectively, across the skin, eyes, or mucous membranes. Because of its extreme potency, "high" sarin exposure for humans is quite low. Exposure to relatively small quantities of sarin can result in acute cholinergic signs and symptoms.

c. Sarin is a member of a class of chemicals known as organophosphorus esters (or organophosphates). A few highly toxic members of this large class are chemical warfare agents, but most are insecticides. Sarin exerts its effects by irreversibly binding to and inactivating the enzyme acetylcholinesterase (AChE). Inactivation of the enzyme that normally breaks down the neurotransmitter acetylcholine leads to the accumulation of acetylcholine at cholinergic synapses.

d. The NAS committee came to three conclusions about long-term effects of sarin exposure based on whether the exposure was high, medium, or low. They concluded that "there is 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." Thus, humans exposed to high doses of sarin show a well-characterized acute cholinergic syndrome as evidenced by acute cholinergic signs and symptoms.

Synaptic buildup of acetylcholine following sarin exposure results in widespread over-stimulation of muscles and nerves. Resulting cholinergic signs and symptoms are evident in seconds to hours after exposure and usually resolve in days to months. At high doses, convulsions and death can occur.

e. The Institute of Medicine (IOM) of the National Academy of Sciences committee further concluded that "there is limited and/or suggestive evidence of an association between exposure to sarin at doses sufficient to cause acute cholinergic signs and symptoms and subsequent long-term health effects." Subsequent to acute cholinergic poisoning, some individuals show persistent symptoms including fatigue; headache; visual disturbances such as asthenopia, blurred vision, and narrowing of the visual field; asthenia; shoulder stiffness; and symptoms of post-traumatic stress disorder; and abnormal test results, of unknown clinical significance, on the digit symbol test of psychomotor performance, electroencephalogram (EEG) records of sleep, event-related potential, visual evoked potential, and computerized post-urography.

f. The committee also concluded that "there is inadequate or insufficient evidence to determine whether an association does or does not exist between exposure to sarin at low doses insufficient to cause acute cholinergic signs and symptoms and subsequent long-term adverse health effects." In other words, there is not sufficient evidence to conclude that persistent symptoms will be observed in the absence of signs and symptoms of acute cholinergic poisoning. Unfortunately, there are no well-controlled studies of long-term health effects in humans exposed to sarin at doses that do not produce acute signs and symptoms.

g. **Summary.** The committee noted that exposure to high doses of sarin can result in widespread over-stimulation of muscles and nerves and convulsions and death can occur. The IOM also concluded that there is limited or suggestive evidence of an association between exposure to sarin at doses sufficient to cause acute cholinergic signs and symptoms and subsequent long-term health effects, including fatigue, headache, visual abnormalities, asthenia, shoulder stiffness, symptoms of post-traumatic stress disorder, and abnormalities on various psychomotor and EEG tests. This conclusion was based on the review of the reports of a group of industrial workers in the United States accidentally exposed to sarin and two groups of civilians exposed during terrorism episodes in Japan. VX, the other related chemical warfare agent involved with Project SHAD, is likely to have similar toxicological properties as sarin.

3. **Long-Term Health Effects from Bacillus globigii**

a. Bacillus globigii is referred to in older literature as a synonym for Bacillus licheniformis (BL). Members of the genus Bacillus are aerobic or facultatively anaerobic gram-positive or gram-variable spore-forming bacteria that are found ubiquitously in decaying organic matter, dust, soil, vegetables, and water. One species, Bacillus anthracis, is unusually pathogenic for humans, and is the basis of anthrax biological weapons (adapted from Principles and Practice of Infectious Diseases, 5th ed, GL Mandell, JE Bennett and R Dolin, eds, 2000).

b. BL is not normally considered to be pathogenic. DoD selected BL as a less infectious biological warfare agent simulant in the project SHAD experiments. However, BL is associated with a number of opportunistic infections, particularly in a hospital setting with debilitated, immune-suppressed or traumatized patients. Opportunistic infections would be expected to

occur shortly after an exposure event, and long-term health effects are not anticipated in individuals exposed to BL but who do not develop opportunistic infections.

c. Clinical manifestations from infection by some Bacillus species include food poisoning, localized infections related to trauma, e.g., ocular infections, deep-seated soft tissue infections, and systemic infections, e.g., meningitis, endocarditis, osteomyelitis, and recurrent bacteremia. Risk factors associated with Bacillus infections include intravenous drug use, sickle cell disease, foreign bodies including intravenous catheters, and immune-suppression from various causes including infection with human immunodeficiency virus (HIV). BL specifically has been clinically associated with intravenous catheter-acquired sepsis, and bacteremia can be a complication among patients with implanted intravenous catheters, usually requiring removal of the implanted device. BL has also been reported in food poisoning cases in which cooked meats and vegetables were most commonly implicated. The median period of incubation was about eight hours, and the predominant symptom was diarrhea with vomiting in about half the cases.

d. **Summary.** B. licheniformis is not generally considered to be pathogenic, but is recognized as a cause of such acute infections as intravascular catheter-acquired sepsis and food poisoning.

4. **Long-Term Health Effects from Zinc Cadmium Sulfide**

a. Zinc cadmium sulfide (ZCS) was used by DoD as a non-biological simulant for biological warfare agents. ZCS particles dispersed in air behave similarly to some biological agents, and they fluoresce under ultraviolet light and, therefore, can easily be detected. DoD has used ZCS as a simulant in Project SHAD and in other tests conducted in the 1950s and 1960s in several urban and rural locations in the United States and Canada.

b. In 1994, DoD asked the National Research Council (NRC) to review the potential human health risks of ZCS. In their 1997 report, the NRC committee reviewed the toxicokinetics, bioavailability and toxicity of ZCS, and the exposures related to use of this agent as a biological weapon agent simulant in studies conducted in the 1950s and 1960s in urban and rural U.S. and Canadian locations. ***NOTE:*** *The full report is available on-line at http://www.nap.edu/books/0309057833/html/index.html.*

c. The NRC committee reported that animal data indicate that ZCS is not acutely toxic when given orally, consistent with its low solubility and apparent lack of bioavailability. The committee found that the particle size used in these tests could have been inhaled and deposited in the deep lung. Given the lack of reports of toxicity of inhaled ZCS, the committee instead reviewed related toxicity data on cadmium as the most toxic component of ZCS.

d. The NRC Committee concluded that “inhaled cadmium has been shown in occupational studies and laboratory studies of animals to cause lung cancer, but not cancer at other body sites.” Further, “cadmium inhalation exposures associated with increased lung-cancer risk in animal studies involved higher concentrations (100 – 1,000 times higher), longer periods (lifetime exposures), and more-soluble compounds than the exposures to cadmium from ZCS in the Army’s testing program.” The estimated upper-bound, lung-cancer risks ranged from less than $0.01 X10^{-6}$ to $24.0 X 10^{-6}$ (0.4 to 24 per million).

e. **Summary.** The NRC previously concluded that the risks to civilian populations of non-cancer health effects and lung cancer from ZCS tests conducted by DoD appear to be low.

f. The committee commented that U.S. citizens living in areas affected by these tests were outraged at being exposed to chemicals by the government without their knowledge or consent. However, the committee did not address ethical and other policy issues involved.

5. **References.** Medical and toxicology texts may be consulted for more information on the agents. However, the following summarizes the currently accepted information on the risks of exposure for selected agents:

a. Gulf War and Health Volume 1, Depleted Uranium, Sarin, Pyridostigmine Bromide, Vaccines, Institute of Medicine, National Academy of Sciences, 2000.

b. Mandell et. al., Principles and Practice of Infectious Diseases, 5th edition, 2000 pages 2220-2226.

c. Toxicologic Assessment of the Army's Zinc Cadmium Sulfide Dispersion Tests, National Research Council, 1997.