



FACT SHEET

Office of the
Assistant Secretary of Defense (Health Affairs)
Deployment Health Support Directorate

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Deseret Test Center Project SHAD

Half Note

Project Shipboard Hazard and Defense (SHAD) was part of the joint service chemical and biological warfare test program conducted during the 1960s. Project SHAD encompassed tests designed to identify US warships' vulnerabilities to attacks with chemical or biological warfare agents and to develop procedures to respond to such attacks while maintaining a war-fighting capability.

The purpose of the Half Note test was to determine biological decay rates of vegetative nonpathogens in a marine environment and to compare the field decay rates with chamber decay rates when conducted under similar conditions. Trials included the release of *Escherichia coli* or *Serratia marcescens* with *Bacillus globigii*.

In each trial, a slurry of *Bacillus globigii* and one of the two other organisms were released from Aero 14B spray tanks, wing-mounted on an A-4 aircraft. During each trial, the USS *George Eastman* (YAG-39) and five Army light tugs would traverse upwind attempting to remain in the aerosol cloud for several hours. Additional trials were conducted using a Navy fleet submarine, the USS *Carbonero* (SS-337). Using a submarine-biological-disseminator, the submarine released *Bacillus globigii* only. In addition, the USS *Granville S. Hall* (YAG-40) took complete surface observations, every half-hour during the trials.

The Department of Defense (DoD) is providing this information, at the request of the Department of Veterans Affairs (VA), to assist the VA in providing healthcare services to qualified veterans and to assist veterans in establishing service connection for disability claims. The Deployment Health Support Directorate (DHSD) collected this information from multiple sources and requested that the military services declassify it to allow its public distribution. The VA accepts this information provided on location, dates, units and/or ships, and substances involved in this exercise, which DHSD extracted from classified DoD records, and will provide it to individual veterans as necessary, but the VA cannot verify its accuracy.

Calcofluor, a fluorescent tracer, was used as a tool for determining cloud arrival and departure. For this test, a contractor released and sampled a stable inorganic tracer, zinc cadmium sulfide (FP), type 3206 green.

Half Note tests were conducted in the Pacific Ocean off the coast of Hawaii, approximately 80 nautical miles south-southwest of Oahu from August 18 - September 30, 1966.*

* This fact sheet was updated to include the participation of the USS *Carbonero* (SS-337).

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Test Name	Half Note (DTC Test 66-13)
Testing Organization	US Army Deseret Test Center
Test Dates	August 18 – September 30 1966
Test Location	In the Pacific Ocean off the coast of Hawaii, approximately 80 nautical miles south-southwest of Oahu.
Test Operations	To determine biological decay rates of <i>Escherichia coli</i> and <i>Serratia marcescens</i> in a marine environment.
Participating Services	US Navy, Deseret Test Center personnel
Units and Ships Involved	USS <i>George Eastman</i> (YAG-39) USS <i>Granville S. Hall</i> (YAG-40) USS <i>Carbonero</i> (SS 337) Army light tugs 2080, 2081, 2085, 2086, and 2087, all staffed by USN personnel
Dissemination Procedures	Sprayed from A-4 aircraft equipped with Aero 14B spray tanks and released from a fleet submarine specially equipped with a submarine-biological-disseminator.
Agents, Simulants, Tracers	<i>Bacillus globigii</i> <i>Serratia marcescens</i> <i>Escherichia coli</i> Calcofluor (fluorescent brightner 28) Zinc cadmium sulfide (FP)
Ancillary Testing	Not identified
Decontamination	Not identified
Potential Health Risks Associated with Agents, Simulants, Tracers	<u><i>Bacillus globigii</i></u> Now considered to be <i>Bacillus subtilis var. niger</i> , a close relative of <i>Bacillus subtilis</i> , this bacterial species was used as a simulant and considered harmless to

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	<p>healthy individuals. <i>Bacillus subtilis</i> and similar <i>Bacillus</i> species are common in the environment, and are uncommon causes of disease. They have been associated with acute infections of the ear, meninges (brain lining), urinary tract, lung, heart valve, bloodstream, and other body sites, but always or nearly always in individuals whose health has already been compromised. Long-term or late-developing health effects would be very unlikely (except perhaps as a complication of the acute infection). (Sources: Tuazon CU, <i>Other Bacillus Species</i> (chap. 197), in <i>Principles and Practice of Infectious Diseases</i>, 5th edition (vol. 2), ed., Mandell GL, Bennett JE, Dolin R, Churchill Livingstone, Philadelphia, 2000, p. 2220-6; US Environmental Protection Agency, <i>Bacillus subtilis</i> Final Risk Assessment, February 1997, available at http://www.epa.gov as of October 4, 2002.)</p> <p><u><i>Serratia marcescens</i></u> This bacterial species can cause acute infections of the urinary tract, lung, bloodstream, and other body sites. These infections commonly occur in individuals whose health has already been compromised, and often in patients who are already hospitalized. Long-term or late-developing health effects would be very unlikely. (Source: Eisenstein, Barry I., Zaleznik, Dori F., Enterobacteriaceae (chap. 206), in <i>Principles and Practice of Infectious Diseases</i>, 5th edition (vol. 2), ed., Mandell GL, Bennett JE, Dolin R, Churchill Livingstone, Philadelphia, 2000, p. 2303.)</p> <p><u><i>Escherichia coli</i>, or <i>E. Coli</i></u> This bacterial species is a common inhabitant of the digestive tract but can also cause acute infection, especially when it gains access to other body sites, like the urinary tract, lung, and bloodstream. Long-term or late-developing health effects of <i>E. coli</i> infection would be unlikely. (Source: Eisenstein, Barry I., Zaleznik, Dori F., Enterobacteriaceae (chap. 206), in</p>
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Principles and Practice of Infectious Diseases, 5th edition (vol. 2), ed., Mandell GL, Bennett JE, Dolin R, Churchill Livingstone, Philadelphia, 2000, p. 2299-301.)

Calcofluor (fluorescent brightener 28, Calcofluor White ST)

Used as a fluorescent tracer with *Bacillus globigii*. Chemical formula is $C_{40}H_{42}N_{12}Na_2O_{10}S_2$. This chemical has been used as a medical laboratory stain and as a whitening agent in detergents. It can cause eye irritation in animal testing, but there is limited evidence for or against human health effects.

(Source: <http://hazard.com/msds/tox/f/q127/q679.html> [as of April 30, 2002]NLM TOXNET, Cellufluor 4193-55-9, available at <http://toxnet.nlm.nih.gov>)

Zinc cadmium sulfide

This compound was aerosolized as a tracer material for the dispersion of biological warfare agents because it had similar properties. There has been little scientific study on the toxicity of this compound when inhaled. A National Research Council (NRC) committee focused on the cadmium component as potentially most toxic. While higher concentrations and more prolonged exposures to cadmium are associated with the development of lung cancer, the concentrations and durations of exposure in the Army's tests were substantially lower. The NRC committee concluded that the risk of adverse health effects to populations in the area was low. (Sources: National Research Council (National Academies), Toxicologic Assessment of the Army's Zinc Cadmium Sulfide Dispersion Tests, and Toxicologic Assessment of the Army's Zinc Cadmium Sulfide Dispersion Tests: Answers to Commonly Asked Questions, National Academy Press, Washington DC, 1997, both available at <http://www.nap.edu> as of October 1, 2002.)

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