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MEDICAL RESEARCH LABORATORY



U.S. Naval Submarine Base
New London

MEMORANDUM REPORT NO. 54-12

REPORT OF TESTS ON THE USE OF DRY IMITATION VINEGAR ON SUBMARINES

Bureau of Medicine and Surgery, Navy Department
Project NM 002 015.13.01

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Physiology Branch
7 December 1954

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ON SUBMARINES

U.S. NAVAL MEDICAL RESEARCH LABORATORY

MEMORANDUM REPORT NO. 54-12

Report No. 1
Bureau of Medicine and Surgery, Navy Department,
Project NM 002 015.13
Investigation of the Significance of Trace Substances
in the Submarine Environment

Physiology Branch
7 December 1954

REPORT OF TESTS ON
THE USE OF DRY IMITATION VINEGAR
ON SUBMARINES

Data Requested: An evaluation of the toxicity of dry imitation vinegar under conditions of increased atmospheric pressures, as are present in submarines.

Requested by: Chief, Bureau of Medicine and Surgery, by copy of his letter to CO, Provisions Supply Office, Naval Gun Factory, Washington, D.C., BUMED-7221-MES-nkc, L16-3 of 12 Aug 1954.

Materials Received for Testing: Two glass jars with plastic screw caps containing one pound dry imitation vinegar manufactured by Delaware Food Products, Inc., Wilmington, Del., in accordance with Quartermaster Corps purchase description No. 102, together with purchase description, including formula, (via CO, PSO, Nav-GunFac ltrs TEL, JJ56/EN10 of 23 Aug 1954 and 3 Sep 1954).

Tests Conducted: The following tests of the samples were carried out: the one pound jar of dry imitation vinegar was opened and placed in an autoclave. To imitate changing environmental conditions on operating submarines, pressure within the autoclave was increased up to 45 pounds (approximately three atmospheres) and maintained for 15 minutes. Then the pressure was released. After another 15 minutes, a vacuum of 12 inches of mercury was developed in the autoclave by using a Cenco Pressovac No. 4. At the end of 15 minutes the vacuum was released. The autoclave, which was placed in a climate chamber, was then opened. During this period the ventilation system of the climate chamber was turned off. Ten subjects were asked to write down their sensations and to note their opinions as to whether they would be able to perform normal activity for one hour or 24 hours under prevailing conditions.

During a second experimental period, the ventilation in the climate chamber was turned on and the subjects were asked to repeat their observations.

Results
Obtained:

As shown in Table 1 below, all subjects noted an irritation of nasal or pharyngeal membranes after five minutes had elapsed. As to the influences of these effects of vinegar, nine out of the ten found they could carry on for an hour, but only one subject felt he could go on for 24 hours. With the ventilation system on, symptoms increased. Nine out of ten subjects said that in addition to nasal irritation, the eyes were burning.

Table 1. -- Effects of Volatile Substances released from One Pound Dry Imitation Vinegar Exposed to Three Atmospheres and A Vacuum of 12 inches of Mercury for Periods of 15 Minutes on Ten Subjects in a Closed Space 10'x7'x7'.

A. Observations - Ventilation System OFF				
Number of Subjects	:	(1) Symptoms noted after 5 minutes	:	(2) Could work be carried out under prevailing conditions for 1 hour 24 hrs
10	:	Nasal membranes irritated - 10 subjects	:	Yes No Yes No
	:		:	9 1 1 9
B. Observations -- Ventilation System ON				
Number of Subjects	:	(1) Symptoms noted after 5 minutes	:	(2) Could work be carried out under prevailing conditions for 1 hour 24 hrs
10	:	Nasal membranes irritated - 10 subjects	:	Yes No Yes No
	:	Eyes burning - 9 subjects	:	9 1 0 10

General
Comments: From these results, it is concluded that the opening of a jar of this preparation of dry imitation vinegar on submarines for periods longer than 5 minutes produces definitely undesirable irritating effects on personnel. Such effects of this dry imitation vinegar could be anticipated during submarine operations during which breakage of the jars containing vinegar could occur. The effects of dry imitation vinegar on the observers was to evident that it was not considered necessary to enlarge tests, or to determine in a more elaborate way the concentration of volatile substances in the air.

Specific
Recommendations: THAT dry imitation vinegar be supplied to submarines in unbreakable containers, and of such a size that the contents when reconstituted will not make more than one quart of this liquid.

Tests
Conducted
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Branch

Report
Prepared
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Released
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