Mold in Military Bottled Water Supplies

(Technical)

FACT SHEET 31-018-0814

Introduction

The Department of Defense (DOD) is committed to providing all Service members safe water to drink, both in garrison and on the battlefield. Bottled water is often a part of the drinking water supplied to Service members during deployment. It is safe and palatable, and the convenience of bottled water is often perceived to be a quality of life item for troops. Production facilities are inspected and approved by Veterinary Services (VS) before bottled water is purchased to ensure it meets U.S. Food and Drug Administration (FDA)[1] and military standards[2]. Infrequently, mold is present in bottled water supplies. This is typically evident when mold cells multiply into large colonies that are visibly floating or attached to the sides of the bottle. Mold presence at any point in the bottled water production and supply system erodes Service member confidence in the quality of the water supply and disrupts their ability to accomplish the mission.

What is Mold?

Mold is a type of filamentous fungus that grows by recycling organic matter in the environment, commonly observed on decaying foodstuff. Molds are often used to produce commercial products such as antibiotics (Penicillin), organic acids, and in foods such as bread, beer, cheese, meats, and soy sauce.[3]

Mold can grow and accumulate in bottled water to the extent that it is visible, feeding on organic matter present in the source water or introduced during or after the bottling process. Studies indicate that certain types of molds produce toxins (mycotoxins) and other secondary metabolites in water[4]. The most studied toxin, T-2 mycotoxin, is produced by more than 350 species of fungi, has a reported lethal dosage 50 (LD50) of about 1 milligram/kilogram and has a 7-day, 5 liter/day military field drinking water standard of 8.7 micrograms/liter[5]. T-2 mycotoxin studies focus on intentional contamination. It is not likely to be introduced naturally into bottled water. In one bottled water study, the predominant mold species were Penicillium, Cladosporium, and Acremonium which do not produce mycotoxins[6].

There should be no mold in adequately treated and disinfected bottled water. The presence of mold may compromise the quality of the water. The Army does not routinely test for mold or toxins in bottled water; however, signs of mold growth may include, but are not limited to:

- Unusual color in the water
- Particles floating in the water
- Bad or unusual tastes or odors

Any of these conditions should alert Service members to avoid or stop drinking the water and report it to local medical or veterinary authorities.

Health Effects

Neither short nor long-term adverse health effects are expected from drinking bottled water with a presence of mold. Little research has focused on human health effects resulting from consumption of bottled water with a presence of mold, and there is no conclusive evidence that mold in bottled water presents a health risk. From what information is available, the potential health risk to Service members is considered low. Noticeable adverse health effects could occur if large quantities of bottled water with toxin-producing molds were consumed. Persons with weakened immune systems might be at relatively higher risk. One species of mold that can be found in bottled water is Penicillium. Under certain conditions, some sub-species of Penicillium may produce Penicillin. It is unlikely that a Service member who is allergic to Penicillium mold or Penicillin would have an allergic reaction by drinking bottled water with Penicillium mold present. It is unlikely that a sufficient amount of mold would be ingested from drinking bottled water to cause health effects. Service members who think they may have become ill after drinking bottled water for any reason should retain the bottle of water and consult a health care professional. Since it is unlikely a Soldier would be symptomatic from bottled water containing mold, medical and veterinary personnel should explore or rule out other etiologies that would cause or explain the Soldier's illness.

What Causes Mold in Bottled Water?

Mold can be introduced during the bottling process because of a breakdown in the control steps associated with water treatment, packaging, or distribution including:

- Contaminated Water Source
- Improper or Inadequately Maintained Treatment Systems
- Lack of Disinfection
- Unsanitary Conditions at Bottling Facility
- Contaminated Bottling Materials

Transportation in a forward environment and temperatures are important contributing factors to maintaining the shelf-life of bottled water. Extreme temperatures cause expansion and contraction of Polyethylene terephthalate

(PET) bottles which are not hermetically sealed. Transportation and handling can also affect package integrity so environmental contaminants can enter the bottle. Bottled water should always be stored off the ground in a shaded area, and preferably in a temperature controlled facility, even in a deployed environment to minimize the risk of contamination.

Bottled Water Regulations

The Food and Drug Administration (FDA) regulates, monitors, and inspects bottled water supplies in the United States, http://www.fda.gov [1]. Bottled water processing is regulated by the FDA under 21 Code of Federal Regulations (CFR) Part 129[7] and 21 CFR 165.110[8]. All bottled water producers water quality analyses must also meet U.S. Environmental Protection Agency (EPA) *National Primary Drinking Water Regulations*[9] in order for the establishment to be FDA listed.

In most other countries, bottled water is regulated as a food commodity with established criteria for physical, chemical, and biological quality generally at least as stringent as local drinking water guidelines or standards.

Current Military Action

USAPHC is responsible for matters of public health and consumer protection within the Army related to water and food safety, including bottled water. The VS Portfolio manages bottled water along with other food commodities. VS maintains close relations with Federal, State, and military agencies to ensure adequate consumer protection and product safety. Food and water products purchased and sold by DOD must meet all Federal, State, and military requirements. VS maintains a list of approved sources for procurement[10]. For our deployed forces, VS and PM personnel conduct routine bottled water surveillance according to MIL STD 3006[2] and TB MED 577[11]. Routine surveillance includes monitoring for the presence of indicator microbiological and select chemical contaminants.

Consumer Actions

Service members play an important role in the safety of the water supply as well. Soldiers should visually inspect bottled water for contamination prior to consumption. If the water is suspect, the recommended response is:

- Do not consume the suspected water.
- As practical, identify, set aside, and do not consume other bottles from the same batch/lot/package.
- Notify your immediate supervisor / chain of command about the incident.

For additional information, contact USAPHC at (410) 436-3919 or email usarmy.apg.medcom-phc.mbx.dehe-water-supply@mail.mil

Summary

Mold and mold-produced toxins are not expected to be found in bottled water, and their risk to Service members is considered low. Service members at all levels should protect their bottled water. Store bottled water under cover to minimize long term exposure to direct sunlight (which encourages biological growth) and use first-in-, first-out (FIFO) principles to minimize the opportunity for mold growth. Any evidence of the presence of mold in bottled water supplies should be reported immediately and investigated fully.

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References:

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5. Park, Chan W. (2014). *CBRNE - T-2 Mycotoxins. Medscape.* http://emedicine.medscape.com/article/830892-overview.

6. Fujikawa, Wauke, Kuunoki, Noguchi, Takahashi, Ohta, and Itoh. (1996). *Contamination of Microbial Foreign Bodies in Bottled Mineral Water in Tokyo, Japan*. 1997 Journal of Applied Microbiology 82, p. 289.

7. FDA. "Processing and Bottling of Bottled Drinking Water." *Code of Federal Regulations,* 21 CFR Part 129"

8. FDA. "Requirements for Specific Standardized Beverages: Bottled Water." *Code of Federal Regulations,* 21 CFR 165.110 "

9. EPA. "National Primary Drinking Water Regulations." *Code of Federal Regulations,* 40 CFR Part 141.

10. *Worldwide Directory of Sanitarily Approved Food Establishments for Armed Forces Procurement,* http://phc.amedd.army.mil/topics/foodwater/ca/Pages/DoDApprovedFoodSources.aspx.

11. Technical Bulletin Medical 577, *Sanitary Control and Surveillance of Field Water Supplies*, 1 May 2010.

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