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Ser IH50/ 000016
06 JAN 2006

From: Commanding Officer, Navy Environmental Health Center
To: Commander, Naval Surface Warfare Center, Carderock Division (Code 635), 5001 S. Broad Street, Philadelphia PA 19112-1403

Subj: ADMINISTRATIVE HEALTH HAZARD ASSESSMENT: AQUEOUS FIRE-FIGHTING FOAMS (AFFF)

Ref: (a) Commander, Naval Surface Warfare Center Ltr 9593 Ser 635/215 1-6350-480 of 6 December 2005
(b) FC-206CF Light Water™ AFFF 6% manufactured by 3M Specialty Materials
(c) Buckeye 3% MIL SPEC AFFF (BFC-3MS) manufactured by Buckeye Fire Equipment Company
(d) OPNAVINST 5100.23F

Encl: (1) Toxicologic and Safety Evaluation of Aqueous Fire-Fighting Foams

1. Per reference (a), an administrative health hazard assessment for two aqueous fire-fighting foams (references (b) and (c)) has been conducted. Enclosure (1) outlines possible health effects arising from perfluoroctanoic acid (PFOA) as a AFFF metabolite and 35 years of Navy experience involving AFFF use in fire-fighting.

2. Aqueous Fire-Fighting Foam (AFFF) is an important chemical used for extinguishing fires on Navy ships and at shore facilities. AFFF is representative of more than 50 compounds that produce the metabolite, PFOA in exposed persons. This metabolite is present in the body and persists in tissues and fluids for months and years.

3. The United States Environmental Protection Agency (USEPA) is evaluating PFOA to determine if it is associated with adverse health outcomes. While current studies have not yielded consistent evidence of biological effects, such findings can be expected to fuel further regulatory interest, possibly further restricting use.

4. If a AFFF substitute becomes available, its toxicity should be compared against that of AFFF. Industrial hygiene and medical surveillance guidance should be relied upon to prevent adverse effects (reference (d)). Information on AFFF/PFOA toxicity will continue to be collected by this Command. The point of contact, Mr. Mike Swartout, can be reached via telephone at 757-953-0745, or by e-mail at swartoutm@nehc.med.navy.mil.

J.T. PIERCE
By direction

Copy to:
BUMED (M33)

Toxicologic Safety Evaluation of Aqueous Fire-Fighting Foams

(a) MEDLINE search conducted January 2006 (PFOA: 187 abstracts/13.4 million entries)
TOXLINE search conducted January 2006 (PFOA: 123 /50,000)
(b) Clinical Toxicology Awareness, a summary of 300 new developments (November 2005)
(c) C&E News, News Article on Perfluorinated Compounds, 30 Aug 04

1. The scientific literature reports over 300 research-grade references concerning toxic effects of perfluorinated compounds (reference (a)). These entries investigate the propensity for pregnancy loss and various liver and kidney effects in rodents. Reference (b), did not reveal any entries concerning toxicity of perfluorinated compounds in humans.

2. Perfluorinated compounds yield perfluorooctanic acid (PFOA) when metabolized and have been discovered in human biological materials, e.g., serum, mother's milk and sperm. Americans have detectable levels of PFOA's in their serum. PFOA in children have been found to range from 1.9 - 56.1 ppb with an average of 5.6 ppb (reference (c)) suggesting exposures occur very early in life. AFFF is similar to other perfluorinated molecules, all of which could contribute to serum levels of PFOA.

3. Rodent studies suggest minor effects corresponding to serum concentrations at 400 ppb PFOA. This is the lower bound risk estimate; an upper bound of 5000 ppb of PFOA has been noted. These values will be referred to in this risk assessment.

4. Thus, occupationally unexposed individuals typical of Navy and Marine Corps personnel would display serum levels below 10 ppb. This concentration is a reasonable guide for controlling PFOA exposures. As a comparison, workers manufacturing perfluorinated compounds have recorded serum levels of 1000-1500 ppb, thereby crossing the lower bound risk estimate. PFOA-relevant exposures will continue, even if AFFF use is discontinued, due to widespread nature of perfluorinated compounds.

5. From the standpoint of the firefighter health, elimination of the AFFF will not prevent further biological contamination with PFOA. Firefighter injuries include those associated with inhalation exposures (carbon monoxide and acid gases), along with thermal burns. Given the real chemical and physical risks associated with fire-fighting, the PFOA issue is of minor importance to this occupational group.

Enclosure (1)