

Letter Health Consultation

**ASSESSMENT OF PELAGIC FISH CONTAMINATION
AS A RESULT OF CHEMICALS ON FARALLON DE MENDINILLA
COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS**

NOVEMBER 5, 2008

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333**

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

You May Contact ATSDR TOLL FREE at
1-800-CDC-INFO

or

Visit our Home Page at: <http://www.atsdr.cdc.gov>

LETTER HEALTH CONSULTATION

ASSESSMENT OF PELAGIC FISH CONTAMINATION
AS A RESULT OF CHEMICALS ON FARALLON DE MENDINILLA
COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

Prepared By:

Site and Radiological Assessment Branch
Division of Health Assessment and Consultation
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry



SEP 24 2008

Senator Luis P. Crisostimo
P.O. Box 500129
Saipan, MP 96950

Dear Senator Crisostimo:

Thank you for your February 19, 2008, letter to the Agency for Toxic Substances and Disease Registry (ATSDR) regarding your concerns for potential exposure to chemicals released on the island of Farallon de Mendinilla in the Commonwealth of the Northern Mariana Islands. ATSDR worked closely with the U.S. Department of Defense and U.S. Environmental Protection Agency (EPA) to gather the available information related to your concerns. It is unfortunate, but ATSDR was not able to identify any fish sampling data that describes the concentration of military range-related contaminants in fish from open waters near the island of Farallon de Mendinilla. Additionally, ATSDR was not able to identify any planned future activities that would be expected to provide the necessary fish sampling data. As a result, ATSDR is not able to conduct any public health assessment activities to address your concern.

As mentioned in our previous letter dated March 24, 2008, ATSDR is authorized to conduct certain public health assessment activities following a request from a community member. ATSDR conducts these public health assessment activities to determine whether people have been, or are currently being exposed to hazardous substances released into the environment by the facility in question. The evaluation is based on the available environmental monitoring data typically gathered by the U.S. Environmental Protection Agency, the state environmental regulatory agency, or in the case of U.S. military facilities, the U.S. Department of Defense.

While we were not able to identify a source of fish sampling data for pelagic fish in the open waters near the island of Farallon de Mendinilla, we were able to identify a number of studies conducted by other researchers investigating the impact of their environmental exposure to explosive compounds. The attached consultation *Preliminary Assessment of Pelagic Fish Caught in the Open Pacific* is based both on the current scientific literature and our previous experience with analyzing the results of fish sampling data for other sites similar to the island of Farallon de Mendinilla. The consultation concludes that pelagic fish caught in open water are not likely to contain high levels of explosive residues from the neighboring Farallon de Mendinilla bombing range and will not pose a public hazard to people who eat them.

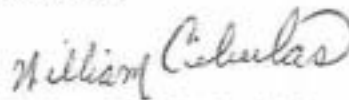
It is important to note that this conclusion applies only to contaminants released at the bombing range. We did not attempt to gather or evaluate information on other contaminants that may accumulate in fish. Additionally we can not comment on whether

Page 2 – Senator Crisostimo

the contaminant concentration in fish that remain near the bombing range would be similar to fish captured in open water. The Navy indicates that commercial fishing near the island of Farallon de Mendinilla is prohibited for safety and security reasons. As a result, the conclusions of the attached consultation are expected to be relevant for fish captured both by commercial fishing operations and local residents following the Navy's guidelines.

Thank you for forwarding your concerns to ATSDR. I hope that you find the information in this letter helpful. If you have additional questions, please contact CAPT Susan Neurath, ATSDR Petition Coordinator, at (770) 488-3368 or email SNeurath@cdc.gov.

Sincerely,



William Cibulas Jr., Ph.D.
CAPT, U.S. Public Health Service
Director
Division of Health Assessment and Consultation

Preliminary Assessment of Pelagic Fish Caught in the Open Pacific

Public Health Concern and Request of ATSDR:

Residents of the Marianas are concerned about eating pelagic fish caught in the open ocean waters. People have asked if the bombing activities on Farallon de Mendinilla (FDM) could have contaminated the fish that are caught in open waters.

Brief Answer:

Pelagic fish caught in open waters are not likely to contain high levels of explosive residues from FDM and will not pose an imminent public health hazard to people who eat them.

Summary:

ATSDR has examined fish, water, sediment and other media that was collected near bombing ranges and other marine environments where explosive chemicals were dropped or dumped. We also have reviewed numerous files on studies about the accumulation of chemicals in seafood. From this information, **we conclude that pelagic fish caught in open waters are not likely to contain high levels of explosive residues and do not pose a public health hazard to people who eat them.** We cannot draw any conclusions on the pollution that comes from many sources and accumulates in some fish. These contaminants, like metals, pesticides, and polychlorinated biphenyl (PCBs) are found in many areas in the Pacific Ocean and we cannot rule out pockets of higher contamination near the Marianas.

Discussion:

While the bombs and associated weaponry material are destructive to the terrestrial environment and the local habitat, the impact on the food chain beyond the site of the activity is limited. Because unicellular organisms and some shellfish are known to take up and be affected by explosive compounds, ecologists are concerned for local habitats where many bombs are dropped. However, fish and invertebrates are known to take up much less of the explosive compounds than those species, resulting in much less concern for the possibility of people becoming exposed to explosive-residues by eating fish.

FDM appears to have had very few direct marine detonations as the land is used for targeting and reports of surveys indicate that the sea floor is healthy and the fish stock robust (Navy dive reports 2003-2005). Therefore, the majority of chemical migration would occur by erosion of land, which would release explosive chemicals into the ocean water at a much slower rate than from a direct discharge.

The most common explosive chemicals (TNT, RDX, and HMX) rapidly decay in marine environments and do not travel far from where they were deposited. Some aquatic species have been shown to take up these chemicals and their breakdown products, but

they are rapidly metabolized and excreted. Picric acid does not break down quickly in the environment, but even picric acid is quickly metabolized in fish and other invertebrates. Since pelagic fish are caught in open waters or waters far from FDM, we do not expect that there will be sufficient explosive chemicals remaining in the tissue to pose a public health hazard. While this is true for the mobile pelagic fish, we cannot draw a conclusion on fish that remain near a contaminated area for long periods of time. However, because commercial fishing near the island is prohibited (for safety and security reasons), any potentially contaminated fish should not be harvested.

Chemicals such as PCBs, mercury, and arsenic do accumulate in fish. However, there are multiple sources of these chemicals. For this reason, the national and international organizations recommend a seafood monitoring program.

Summary of Supporting Studies:

The following bullets summarize studies that support the above conclusion:

- Pelagic fish are migratory and travel far; thus they eat from many locations, so their exposure to contaminated areas is low [UC Davis 2008];
- Uptake rates and toxicity of explosive compounds appear to be different for unicellular organisms and shellfish than for other species [Nipper and Carr 2005, Rosen and Lotufo 2005, Mukhi et al 2005, Mukhi and Patiño 2008].
- Uptake rates of most explosive chemicals are low in fish and decrease in fish with high oil content [Lotufo et al. 2005, Rosen and Lotufo 2007];
- Pelagic fish have high oil content, as much as 30% [FAO 2008];
- Bioaccumulation of explosive chemicals in fish is low, because fish quickly metabolize and excrete them [Ownby et al. 2005, Yoo et. al 2002, Helene et al. 2003, Lotufo et al. 2005, Lotufo and Lydy 2005, Houston and Lotufo 2005, Blackburn et al. 2004];
- Most explosive chemicals decay rapidly in the water and in the sediment of marine environments [Brannon et al. 2005, Yost et al. 2007];
- Picric acid, which is very stable underwater and in sediments, is metabolized and excreted within a few days [Yost et al. 2007, Nipper et al. 2001, Burton et al. 1983 and 1984, Cooper et al. 1984];
- The fillet tissue samples collected from fish caught in the waters close to the Vieques bombing range and near the Longhorn Army Depot did not contain explosive residues at concentrations that posed a public health hazard. Only trace levels were detected in very few fish in both studies [ATSDR 2000, ATSDR 2003, TCEQ and EPA 2004; USGS 2004];
- International and national organizations propose monitoring programs for fish [WHO 1987, WHO 1999, EPA 2000, EC 2002; FNB 1991];
- FDM and its neighboring waters are restricted (for 3 miles) [Navy 2005];
- FDM surveys indicate very little direct seafloor detonation with all planned bombing to occur on the island [Navy 2007, 2008].

Conclusions:

Pelagic fish caught in open waters will not contain high levels of explosive residues and will not pose an imminent public health hazard to people who eat them.

There are many sources of substances that are known to accumulate in pelagic fish. These sources are usually found near industrial operations. A seafood monitoring plan should protect people from ingesting these industrial chemicals that are known to accumulate.

Preparers

Gregory M. Zarus
Atmospheric Scientist/Geophysicist
Site and Radiologic Assessment Branch
Division of Health Assessment and Consultation

Reviewers

Carole Hossom
Senior Environmental Scientist
Site and Radiologic Assessment Branch
Division of Health Assessment and Consultation

Katherine Pugh
Environmental Scientist
Site and Radiologic Assessment Branch
Division of Health Assessment and Consultation

Sandra Isaacs
Chief
Site and Radiologic Assessment Branch
Division of Health Assessment and Consultation

References

Agency for Toxic Substances and Disease Registry (ATSDR). Exposure Investigation of fish and shellfish, Vieques, Puerto Rico. Atlanta: US Department of Health and Human Services; 2000.

ATSDR. Health assessment for Louisiana Army Ammunition Plant, Doyline, Webster Parish, Louisiana. Atlanta: US Department of Health and Human Services; 2003.

ATSDR. Health assessment on consumption of fish and shellfish, Vieques, Puerto Rico. Atlanta: US Department of Health and Human Services; 2003.

Blackburn W, Houston J, Lotufo GR. Dietary transfer of explosives in freshwater and marine systems: comparisons to DDT. Presented at: Society of Env Toxicology and Chemistry Conference; 2004.

Brannon J, Price CB, Yost SL, Hayes C, Porter B. 2005. Comparison of environmental fate and transport process descriptors in saline and freshwater. *Marine Pollution Bulletin* 50:247-251.

Burton DT, Cooper KR, Goodfellow WL. Bioconcentration, Elimination and Metabolism of Picric and Picramic Acid in Freshwater Fish and Estuarine Bivalves. [Arch Environ Contam Toxicol](#). 1983 Oct;41(3):308-18.

Burton DT, Goodfellow WL, Cooper KR Uptake, elimination, and metabolism of ¹⁴C-picric acid and ¹⁴C-picramic acid in the American oyster (*Crassostrea virginica*) *Arch Environ Contam Toxicol*. 1984 V 13, No 6, November, 1984.

Cooper KR, Burton DT, Goodfellow WL, Rosenblatt DH. 1984. Bioconcentration and metabolism of picric acid and picramic acid in rainbow trout. *J of Toxicology and Environmental Health* 14:731-747.

Environment Canada (EC). Examining fish consumption advisories related to mercury contamination in Canada. Environment Canada 2002.
<http://www.ec.gc.ca/MERCURY/EN/efca.cfm>

Food and Agriculture Organization (FAO), Fisheries and Aquaculture Department. 2008. Available from: URL: <http://www.fao.org/fishery/> .

Food and Nutrition Board (FNB). Committee on Evaluation of the Safety of Fishery Products. Institute of Medicine. Food Safety. National Academy Press, Washington DC, 1991.

Hélène DM, Augagneur S, Budzinski H, Mora P, Narbonne J, Garrigues P. 2003. Microcosm tributyltin bioaccumulation and multibiomarker assessment in the blue mussel, *Mytilus edulis*. *Environ Toxicology and Chemistry* 22:2679-2686.
Houston JG and Lotufo GR. 2005. Dietary exposure of fathead minnows to the explosives TNT and RDX and the pesticide DDT using contaminated invertebrates. *Int J of Environ Res Public Health* 2(2):286-292.

Lotufo GR and Lydy J. 2005. Comparative toxicokinetics of explosive compounds in sheepshead minnows. *Env Contam and Toxicology* 49:206-214.

Lotufo GR, Lydy J, Wild W. Toxicokinetics and toxicity of explosive compounds in fish. Presented at: Society of Env Toxicology and Chemistry Conference; 2005.

Mukhi S, Pan X, Cobb GP, Patiño R. 2005. Toxicity of hexahydro-1,3,5-trinitro-1,3,5-triazine to 3 larval zebrafish (*Danio rerio*). *Chemosphere* 2.

Mukhi S and Patiño R. 2008. Effects of hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) in zebrafish: General and reproductive toxicity. *Chemosphere* 72:726–732.

Nipper M, Carr RS, Biedenbach JM, Hooten RL, Miller K, Saepoff S. 2001. Development of marine toxicity data for ordinance compounds. *Environ Contam Toxicology* 41(3):308-313.

Nipper M and Carr RS. 2005. Ecological fate and transport of explosives and related compounds. Presented at: Society of Env Toxicology and Chemistry Conference; 2005.

Ownby DR, Belden JB, Lotufo GR, Lydy M. 2005. Accumulation of TNT in aquatic organisms: Part 1 –Bioconcentration and distribution in channel catfish (*Ictalurus punctatus*). *Chemosphere* 58(9):1153-1159.

Rosen G and Lotufo GR. 2007. Bioaccumulation of explosive compounds in the marine mussel, *Mytilus galloprovincialis*. *Ecotoxicology and Environmental Safety* 68:237-245.

Rosen G and Lotufo GR. 2005. Toxicity and fate of two munitions constituents in spiked sediment exposures with the marine amphipod, *Eohaustorius estuarius*. *Env Toxicology and Chemistry* 24(11):2887–2897.

Rosen G and Lotufo GR. 2007. Toxicity of explosive compounds to the marine mussel, *Mytilus galloprovincialis*, in aqueous exposures. *Ecotoxicology and Environmental Safety* 68:228–236.

Texas Commission on Environmental Quality (TCEQ) and US Environmental Protection Agency (EPA). Investigation of contaminants in fish tissue. Caddo Lake biological sampling and risk assessment for Longhorn Army Ammunition Depot. Nov 18, 2004.

US Environmental Protection Agency (EPA). Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories. EPA 823-B-00-007. November 2000.

US Geological Survey (USGS). Water quality, fish tissue, and bed sediment monitoring in water bodies of Fort Chaffee Maneuver Training Center, Arkansas. 2002-2004. US Department of the Interior, USGS Scientific Investigations. Arkansas Army National Guard.

University of California (UC) Davis. 2008. Pelagic Fish Research Group. Available from: URL: www.pelagicfish.ucdavis.edu .

Yoo L, Houston J, Gibson A, Faulkner A, Steevens J. Distribution and target tissues of TNT in fathead minnow. Presented at: Society of Env Toxicology and Chemistry Conference; 2002 Nov 16-20.

Yost SL, Pennington JC, Brannon JM, Hayes CA. 2007. Environmental process descriptors for TNT, TNT-related compounds and picric acid in marine sediment slurries. *Marine Pollution Bulletin* 54:1262-1266.

World Health Organization (WHO). Program Report 1986-1987, Joint FAO/WHO Food Contamination Monitoring Program. Document WHO/EHE/FOS/87.3. Geneva, 1987.

World Health Organization (WHO). Food Safety with Products from Aquaculture, Report of a Joint FAO/NACA/WHO Study Group, Technical Report Series No 883. ISBN 9789241208833. 1999.

Information Provided by the Navy:

COMNAV Mariana Instruction 3502.1: SOP and regulations for restricted area 7201 and Farallon De Medinilla Laser Bombing Range. 25 Apr 2005.

Air Space Usage Report from DE Marx CIV NFESC. 23 June 2008. (email -personal communication)

Dud Rate Report from L Jones NASF N44. 20 June 2008. (email -personal communication)

Eco Assessment from S Smith H Civ NFESC, 19 June 2008. (email -personal communication)

Quantitative HazMat Analysis from E Lynch J CTR COMPACFLT N01CE1EL 20 June 2008 (email -personal communication)

Island Miss Rate Low from J. VanName P CIV NAVFAC Lant, 20 June, 2008. (email -personal communication).