CHEMSEA Open Day: Invited Lectures

Global perspective on underwater munitions

Terrance Long (International Dialogue on Underwater Munitions, IDUM)

Abstract: Sea Dumped Chemical Weapons (SDW's) can be found in large volumes in our oceans, seas, lakes, rivers and streams. They can be found in in-land waterways where some waters are used for irrigation and drinking. They can be found in the Baltic, Mediterranean and Black Seas or off of Japan or the Hawaiian Islands or the east and west coasts of North America including the Great Lakes to name but a few areas. Mr. Long, Chairman of the International Dialogues on Underwater Munitions (IDUM), the Global Forum on Sea Dumped Munitions will provide a brief overview of the Global Impact of Sea Dumped Munitions on our environment and human health. Additionally, he will provide an update on the latest international activities on Sea Dumped Chemical Weapons. The IDUM is an internationally recognized body where all stakeholders (diplomats, government departments including external affairs, environmental protection and fishery departments, industry, fishermen, salvage divers, oil and gas, militaries and others) can come together in an open and transparent forum to discuss underwater munitions, seek solutions, and promote international teamwork on their issues related to underwater munitions. The IDUM promotes constructive engagement with all stakeholders rather than disengagement so that we may learn from one another's situation to determine how we can best respond in the future.

Germany's Program on Underwater Munitions

Tobias Knobloch (Federal Maritime Agency, Hamburg, Germany), Claus Böttcher and Jens Sternheim, Ministry of Energy, Agriculture, the Environment and Rural Areas Schleswig Holstein, Kiel, Germany)

Abstract: *missing so far*

Ecological risks of chemical warfare agents: CHEMSEA results on the health status of fish and bivalves at CWA dumpsites in the Baltic Sea

Kari Lehtonen and Raisa Turja (Finnish Environment Institute, Helsinki, Finland), Thomas Lang and Nicolai Fricke (Thünen Institute of Fisheries Ecology, Cuxhaven, Germany), Matthias Brenner (Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany)

Abstract: Results are presented on studies carried out in 2011-2012 addressing the health status of cod (*Gadus morhua*) in official and unofficial dumpsites of chemical warfare agents (CWA) in the Baltic Sea as well as effects of CWA on biomarker responses in blue mussels (*Mytilus edulis*) caged at the Bornholm dumpsite. A battery of measurements was performed in fish and mussels, including general fitness parameters, prevalence of gross diseases and parasites, liver and kidney pathology, lysosomal responses, blood cell counts, oxidative stress as well as neuro-, cyto- and genotoxicity biomarkers. The results are discussed in the light of hydrographic characteristics of the study sites as well as of data on CWA-related contaminants.

Preliminary CHEMSEA results of Contingency Planning in case of CWA accidents in the Baltic Sea

Bartłomiej Pączek and Jarosław Michalak (Polish Naval Academy, Gdynia, Poland)

Abstract: The lecture will focus on "Contingency Planning", i.e. the model of reaction of appropriate National Authorities and Agencies against the threat posed by contact with Chemical Warfare Agents. Two "life scenarios" will be described. The first refers to the contact with CWA at sea, and the second refers to the contact with CWA on land (e.g. at the beach). The goal is to introduce a coherent, unified "model of reaction processes" that may be implemented in all Baltic States. Our model is based primarily on Polish experiences, but we will also point to experiences of other states. We want to refer to the "VERORDNUNG (EG) Nr. 1224/2009 DES RATES vom 20. November 2009" and to the need of enhancing these regulations with CWA threat topic, particularly on the ground of information systems used to control fishery and caught fishes (i.e. the "vCatch" system).
Finally, we would like to introduce an idea of CWA Data Center, that would collect data on all CWA-related accidents in the Baltic Sea.

Poisoning by nerve agents and sulfur mustard: clinical appearance and therapeutic approaches

Horst Thiermann and Franz Worek (Bundeswehr Institute of Pharmacology and Toxicology, Munich, Germany)

Abstract: Recently, reports on stores on chemical warfare agents in Syria made the headlines. Nearly at the same time, media considered a potential threat due to sulfur mustard and nerve agents that were dumped in the North and Baltic Sea after Second World War. Therefore, it appears rational to review methods for adequate diagnosis, effective treatment as well as clear biomedical verification of an exposure towards such substances.

Nerve agents are compounds that cause death within very short time after absorption of only small quantities. It has to be distinguished between highly volatile substances, e.g. Sarin, which are primarily inhaled and persisting agents, e.g. VX, that enter the body primarily via the skin. In both cases, communication between cells of the nervous system and peripheral organs, e.g. secretory glands, muscles, is disturbed, leading finally to death due to respiratory arrest within very short time. Diagnosis is made on the basis of a clear clinical syndrome, the so called cholinergic crises. The clinical diagnosis can be confirmed by assessment of the inhibition of cholinesterases, laboratory parameters that can be determined with an on-site device within a few minutes. A clear biomedical verification of an exposure towards nerve agents, however, needs sophisticated laboratory methods, e.g. advanced GC-MS-MS or LC-MS-MS techniques, as cholinergic crises can also be elicited by other substances, e.g. organophosphorus compounds or carbamates that are used as pesticides. Therapy consists of the rapid administration of antidotes that can be administered by autoinjectors and in severe cases by ongoing antidote administration in combination with intensive care treatment. Unfortunately, not all nerve agents can be treated effectively with the available antidotes. In these cases, intensive care treatment including artificial ventilation may be necessary.

Sulfur mustard is an oily liquid that evaporates slowly. It can be inhaled, but enters the body via all routes possible, e.g. the skin, mucosal membranes and especially the eyes. Moisture and thin skin layers favor adsorption. Although the exact toxicological mechanism is not understood in detail until now, it is known that the interaction of sulfur mustard with the genetic substance, the DNA, plays the major role in toxicity. As a result of this interaction cell regeneration as well as cell homeostasis is disturbed leading to signs and symptoms in affected tissues. Due to this mechanism, development of signs and symptoms takes longer time, e.g. several hours in dependence on the amount absorbed. The earlier signs and symptoms appear the more serious is the exposure. Most frequently, the eyes are affected first followed by effects at the skin and the blood system. As regeneration of cells is disturbed healing may take several months thereby consuming many resources and extensive care. Long term effects are known at the lung, skin and eyes. Due to the very complex toxicological mechanisms, no causal antidote is available and treatment is directed to alleviate signs and symptoms. For the verification of poisoning,

metabolites can be determined in the urine and blood. More sophisticated methods are directed to identify DNA adducts .

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Water Abrasive Suspension Jet Cutting Technology in the UTM Reactor RETOS

Frank Bargmann and Michael Franck (UTM Umwelt-Technik-Metallrecycling GmbH, Lübeck, Germany)

Abstract: The innovative cutting technology is used with remotely controlled robot technology in recovery, deactivation and treatment of chemical and conventional ammunitions and its contents.