

14 January 2010

This supplement has been prepared to present scientific and technical news items that may be of more interest to technical personnel at RDT&E activities and the labs, or the medics rather than the broader readership of the basic CB Daily. Due to the nature of the material, the articles, if available online, are usually only available through subscription services thus making specific links generally unavailable. Thus, usually only the bibliographic citation is available for use by an activity's technical library.

Should you wish to be removed from this S&T Supplement address group, just send an email to one of the people listed at the bottom of this message. This will not affect your continued receipt of the CB Daily.

Chem-Bio News – S&T Edition

1. EFFECTS OF 4-PYRIDINE ALDOXIME ON NERVE AGENT-INHIBITED

ACETYLCHOLINESTERASE ACTIVITY IN GUINEA PIGS: *“Additionally, it did not modify the AChE activity in blood, brain, and peripheral tissues by itself or affect the AChE activity inhibited by a 1.0x LD50 dose of these three nerve agents in guinea pigs.”*

2. TMTI POST THIRD AMENDMENT TO RFP FOR HFV: *“TMTI has posted a third amendment to the Request for Proposal (RFP) for the Development of Medical Countermeasures (therapeutics) for the Treatment of Hemorrhagic Fever Viruses (HFV).”*

3. MRSA 'SPREAD BY PATIENTS MOVING BETWEEN HOSPITALS': *“The authors have called for more screening of people who are repeatedly admitted to different hospitals to try to break this transmission cycle.”*

4. A THEORETICAL STUDY OF SILICON-DOPED BORON NITRIDE NANOTUBES

SERVING AS A POTENTIAL CHEMICAL SENSOR FOR HYDROGEN CYANIDE: *“Based on calculated results, the Si-doped BNNT is expected to be a potential resource for detecting the presence of toxic HCN.”*

5. ION-MOLECULE REACTIONS OF O,S-DIMETHYL METHYLPHOSPHONOTHIOATE: EVIDENCE FOR INTRAMOLECULAR SULFUR OXIDATION DURING VX

PERHYDROLYSIS: *“Elimination of a sulfur moiety deactivates the nerve agent VX and thus the intramolecular sulfur oxidation process reported here is also able to explain the selective perhydrolysis of the nerve agent to relatively nontoxic products.”*

6. EVALUATION OF FIVE DECONTAMINATION METHODS FOR FILTERING

FACEPIECE RESPIRATORS: *“Concerns have been raised regarding the availability of National Institute for Occupational Safety and Health (NIOSH)-certified N95 filtering facepiece respirators (FFRs) during an influenza pandemic. One possible strategy to mitigate a respirator shortage is to reuse FFRs following a biological decontamination process to render infectious material on the FFR inactive.”*

CB Daily Report

EFFECTS OF 4-PYRIDINE ALDOXIME ON NERVE AGENT-INHIBITED ACETYLCHOLINESTERASE ACTIVITY IN GUINEA PIGS

Drug Week

January 22, 2010

"Methoxime (MMB-4) is a leading candidate oxime acetylcholinesterase (AChE) reactivator to replace pralidoxime (2-PAM) for therapeutic treatment of nerve agent intoxication. 4-Pyridine aldoxime (4-PA) is a synthetic starting material, a breakdown product, and a probable metabolite of MMB-4. There is a possibility that 4-PA may adversely interact with the nerve agent, thereby affecting nerve agent toxicity and biological AChE activity."

"This study evaluated the effects of 4-PA on sarin (GB)-, cyclosarin (GF)-, and VX-induced toxicity and AChE activity in blood, brain, and peripheral tissues of guinea pigs. Animals were pretreated with atropine methyl nitrate (1.0 mg/kg, im) 15 min prior to subcutaneous administration with 1.0x LD50 of GB, GF, or VX and then treated 15 min after the administration of nerve agents with 4-PA (3.5, 7.0, or 14.0 mg/kg, im). The dose-response effects of 4-PA alone were also examined. Toxic signs and lethality were monitored, blood and tissues were collected, and AChE activities were determined at 60 min after nerve agent administration. Under the condition of this study, all animals exposed to nerve agents exhibited some degree of toxic signs such as salivation, lacrimation, rhinorrhea, and convulsions. 4-PA at the three doses tested neither induced toxic signs nor altered the toxicity of GB, GF, or VX at the 1.0x LD50 exposure dose."

"Additionally, it did not modify the AChE activity in blood, brain, and peripheral tissues by itself or affect the AChE activity inhibited by a 1.0x LD50 dose of these three nerve agents in guinea pigs."

The full article can be found at: (T.M. Shih, et. al., "Effects of 4-pyridine aldoxime on nerve agent-inhibited acetylcholinesterase activity in guinea pigs". Archives of Toxicology, 2009; 83 (12):1083-1089). Link not available.

[Return to Top](#)

TMTI POST THIRD AMENDMENT TO RFP FOR HFV

CBRNIAC Email Notice

January 13, 2010

"TMTI has posted a third amendment to the Request for Proposal (RFP) for the Development of Medical Countermeasures (therapeutics) for the Treatment of Hemorrhagic Fever Viruses (HFV). This amendment clarifies and responds to questions received so far. The two previous amendments was posted to correct errors and omissions in the original posting and to answer any original questions. Click on the link above to obtain more information about the amendment. To learn more about the original RFP, visit FedBizOpps and enter

solicitation number W9113M-09-R-0008 in the "Keyword/Solicitation #" box in Yellow. On the next page click on the Opportunity that appears, "A-Development of Medical Countermeasure (Therapeutics) for the Treatment of Hemorrhagic Fever Viruses (HFV)."

The amendment can be found at: http://www.tmti-cbdefense.org/W9113M-09-R-0008_Amendment_0003.pdf

[Return to Top](#)

MRSA 'SPREAD BY PATIENTS MOVING BETWEEN HOSPITALS'

BBC

January 12, 2010

"MRSA is mainly spread by patients moving between hospitals, Dutch researchers have said.

The authors have called for more screening of people who are repeatedly admitted to different hospitals to try to break this transmission cycle.

They said this would eventually help to eradicate MRSA.

The conclusions were drawn from a large study of the geographical location of different strains of MRSA across 26 European countries."

.....

"The aim was to find out more about the distribution of the different strains so as to shed light on how the infection spreads.

Hajo Grundmann from the University Medical Centre in Groningen in the Netherlands, who was the lead author of the report, said: "To my utter surprise, we found that MRSA strains were geographically concentrated."

He concluded that the distribution of MRSA suggested it is transmitted by patients who frequent different hospitals, rather than being spread in the community.

"MRSA appears to be spread by patients who ping-pong around between hospitals. These are often frail or elderly people with on-going health problems."

The full article can be found at: <http://news.bbc.co.uk/2/hi/health/8445777.stm>

[Return to Top](#)

A THEORETICAL STUDY OF SILICON-DOPED BORON NITRIDE NANOTUBES SERVING AS A POTENTIAL CHEMICAL SENSOR FOR HYDROGEN CYANIDE

Journal of Technology & Science

January 10, 2010

"In order to search for a novel sensor to detect and control exposure to hydrogen cyanide (HCN) pollutant molecule in environments, the reactivities of pristine and silicon-doped (Si-doped) (8, 0) single-walled boron nitride nanotubes (BNNTs) towards the HCN molecule are investigated by performing density functional theory (DFT) calculations. The HCN molecule presents strong chemisorption on both the silicon-substituted boron defect site and the silicon-substituted nitrogen defect site of the BNNT, which is in sharp contrast to its weak physisorption on pristine BNNT."

"A remarkable charge transfer occurs between the HCN molecule and the Si-doped BNNT as proved by the electronic charge densities. The calculated data for the electronic density of states (DOSs) further indicate that the doping of the Si atom improves the electronic transport property of the BNNT, and increases its adsorption sensitivity towards the HCN molecule."

"Based on calculated results, the Si-doped BNNT is expected to be a potential resource for detecting the presence of toxic HCN."

The full article can be found at: (A theoretical study of silicon-doped boron nitride nanotubes serving as a potential chemical sensor for hydrogen cyanide. *Nanotechnology*, 2009; 20(50):5704). Link not available.

[Return to Top](#)

ION-MOLECULE REACTIONS OF O,S-DIMETHYL METHYLPHOSPHONOTHIOATE: EVIDENCE FOR INTRAMOLECULAR SULFUR OXIDATION DURING VX PERHYDROLYSIS

Journal of Technology & Science
January 17, 2010

"The alkaline perhydrolysis of the nerve agent O-ethyl S-[2-(diisopropylamino)ethyl] methylphosphonothioate (VX) was investigated by studying the ion-molecule reactions of HOO⁻ with O,S-dimethyl methylphosphonothioate in a modified linear ion-trap mass spectrometer. In addition to simple proton transfer, two other abundant product ions are observed at m/z 125 and 109 corresponding to the S-methyl methylphosphonothioate and methyl methylphosphonate anions, respectively."

"The structure of these product ions is demonstrated by a combination of collision-induced dissociation and isotope-labeling experiments that also provide evidence for their formation by nucleophilic reaction pathways, namely, (i) S(N)2 at carbon to yield the S-methyl methylphosphonothioate anion and (ii) nucleophilic addition at phosphorus affording a reactive pentavalent intermediate that readily undergoes internal sulfur oxidation and concomitant elimination of CH3SOH to yield the methyl methylphosphonate anion. Consistent with previous Solution phase observations of VX perhydrolysis, the toxic P-O cleavage product is not observed in this VX model system and theoretical calculations identify P-O cleavage to be energetically uncompetitive. Conversely, intramolecular sulfur

oxidation is calculated to be extremely exothermic and kinetically accessible explaining its competitiveness with the facile gas phase proton transfer process."

"Elimination of a sulfur moiety deactivates the nerve agent VX and thus the intramolecular sulfur oxidation process reported here is also able to explain the selective perhydrolysis of the nerve agent to relatively nontoxic products."

The full article can be found at: (A.M. Mcanoy, et. al., "Ion-Molecule Reactions of O,S-Dimethyl Methylphosphonothioate: Evidence for Intramolecular Sulfur Oxidation during VX Perhydrolysis" Journal of Organic Chemistry, 2009;74(24):9319-9327). Link not available.

[Return to Top](#)

EVALUATION OF FIVE DECONTAMINATION METHODS FOR FILTERING FACEPIECE RESPIRATORS

Health & Medicine Week

January 18, 2010

"Concerns have been raised regarding the availability of National Institute for Occupational Safety and Health (NIOSH)-certified N95 filtering facepiece respirators (FFRs) during an influenza pandemic. One possible strategy to mitigate a respirator shortage is to reuse FFRs following a biological decontamination process to render infectious material on the FFR inactive."

"However, little data exist on the effects of decontamination methods on respirator integrity and performance. This study evaluated five decontamination methods [ultraviolet germicidal irradiation (UVGI), ethylene oxide, vaporized hydrogen peroxide (VHP), microwave oven irradiation, and bleach] using nine models of NIOSH-certified respirators (three models each of N95 FFRs, surgical N95 respirators, and P100 FFRs) to determine which methods should be considered for future research studies. Following treatment by each decontamination method, the FFRs were evaluated for changes in physical appearance, odor, and laboratory performance (filter aerosol penetration and filter airflow resistance). Additional experiments (dry heat laboratory oven exposures, off-gassing, and FFR hydrophobicity) were subsequently conducted to better understand material properties and possible health risks to the respirator user following decontamination. However, this study did not assess the efficiency of the decontamination methods to inactivate viable microorganisms. Microwave oven irradiation melted samples from two FFR models. The remainder of the FFR samples that had been decontaminated had expected levels of filter aerosol penetration and filter airflow resistance. The scent of bleach remained noticeable following overnight drying and low levels of chlorine gas were found to off-gas from bleach-decontaminated FFRs when rehydrated with deionized water. UVGI, ethylene oxide (EtO), and VHP were found to be the most promising decontamination methods; however, concerns remain about the throughput capabilities for EtO and VHP."

"Further research is needed before any specific decontamination methods can be recommended."

The full article can be found at: (D.J. Viscusi, et. al., "Evaluation of Five Decontamination Methods for Filtering Facepiece Respirators". *Annals of Occupational Hygiene*, 2009;53 (8): 815-827). Link not available.

[Return to Top](#)

END of CB Daily Report.

Send subscription requests, unsubscribing requests, questions and comments to:

Steve Tesko: Steve.Tesko@anser.org

Copyright 2008. *Analytic Services Inc.*

[Analytic Services Inc. DMCA Copyright Notice: http://www.homelandsecurity.org/bulletin/Draft_ANSER_DCMA_Copyright_Notice.htm](http://www.homelandsecurity.org/bulletin/Draft_ANSER_DCMA_Copyright_Notice.htm)

Use of these news articles does not reflect official endorsement.

In accordance with Title 17 (USC), Section 107, this material is distributed without profit or payment and is intended for nonprofit research and educational purposes only.

Reproduction for private use or gain is subject to original copyright restrictions.

PRIVACY POLICY

Content provided in the *CB Daily Report* does not reflect the viewpoint(s) of Analytic Services Inc. Analytic Services Inc. does not share, publish, or in any way redistribute subscriber email addresses or any other personal information.