Sector 3: Poster

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2. **Prof. Otakar Jiří Mika,** Department of Crisis Management, Faculty of Security Management, Police Academy, Czech Republic - "CBRNe prevention, preparedness & protection in the Czech Republic" (27)
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23. Developments in the field of Science and Technology related to the Biological Weapons Convention

Dr. Slavko Bokan, *MD, Croatia*

Abstract

Science and technology has been a long-standing topic for discussion among States Parties to the Biological Weapons Convention (BWC). To address changes in biology and biotechnology, BWC States Parties have established processes to review developments in science and technology (S&T), including annual expert meetings on this topic. Science and technology is also an area in which various scientific and academic institutions from around the world are very active.
Science and technology collaborations are critical to the full and effective implementation of the BWC's Article X provisions on economic cooperation and development. Ninth Review Conference of the BWC States Parties, which was held at the end of December last year, mandated that the intersessional process of meetings consider new developments in science and technology that have potential hostile applications.
The poster shows very plastically all the achievements in the development of science and technology (S&T) that can be used for the purposes of biological defense as well as for the development of new and even more dangerous biological weapons. In particular, trends in biotechnology are presented with a focus on systems and synthetic biology, whose achievements represent emerging threats, and which also include bioinformatics, biosensor detection, bioregulators or modulators, nanobiotechnology, advanced bioreactors and the so-called omics'-technologies.
Poster also presents all relevant requirements and characteristics, as well as advanced technologies and tools that lead to weaponization of possible biological and toxin warfare agents.

Keywords: Convention on the Prohibition of Biological Weapons, Systems Biology, Synthetic Biology, Weaponization of biological and toxin agents.

Biography – Slavko Bokan

Dr. Slavko Bokan is former expert and advisor in NBC Medical Defense of Croatian Armed Forces (CAF) and MOD. His major research experiences were in the field of toxicology, medical treatment, protection, detection, identification and decontamination against nuclear, radiological, chemical, biological, and toxin weapons and also in occupational health and industrial toxicology.
He was Chairman of the South Eastern Europe Defense Ministerial (SEDM) Working Group on Defense/Military Support to Counterproliferation, Border Security and Counter-terrorism (CBSC).
From 1995 to 2007, Dr. Bokan was official expert member of Croatian Delegation during the negotiations in Ad-hoc Group and in the intersessional process of States Parties of the Biological Weapons Convention (BWC) in Geneva.
He has participated and assisted the OPCW in many efforts in Croatia.
Dr. Bokan participated as the head of the health aspects and protection in the First OPCW Exercise on Assistance, ASSISTEX-I, that was held 2002 in Zadar, Croatia.
He helped to establish and serves as a Chair of the well-known CBMTS-Industry (Chemical and Biological Medical Treatment Symposia) series of scientific meetings, and "CSCM – World Congress on CBRNe Science and Consequence Management", which are held each two years in Croatia from 1996.

27. The CBRNe Prevention, Preparedness & Protection in the Czech Republic

Otakar Jiří Mika, Associate Professor

**Corresponding Author: Prof. Otakar Jiří Mika,* otakar_mika@email.cz

Abstract

A comprehensive concept of protection against CBRNe substances and materials must necessarily include the main components of the entire process: *Prevention, preparedness and protection*. Each individual area deserves independent and thorough analysis, evaluation and design of new or improved special security measures.
The expert contribution is focused on the analysis and evaluation of the readiness of the integrated rescue system to deal with events with the possible occurrence of CBRNe substances at the scene of the intervention, with a focus on the Fire and Rescue Service of the Czech Republic and providers of medical rescue services and the Police of the Czech Republic. These three basic components are the skeleton of the so-called integrated rescue system.
The main focus is on the professional discussion around the issue of the so-called typical activities of the Integrated Rescue System in relation to the so-called CBRNe events (accidents, attacks, terrorism). Do we need to prepare other Type activities, in addition to the ones we already have? And why? This expert contribution focuses on these questions.

Keywords: CBRNe Substances and Materials, CBRNe Prevention, CBRNe Preparedness, CBRNe Protection, Integrated Rescue System

Biography – Prof. Otakar Mika

Academic and associate professor (lecturer) with 33 years of university experience at several state and private universities in the Czech Republic. From October 1, 2020, he started to work at the Department of Crisis Management, Faculty of Security Management, Police Academy of the Czech Republic in Prague (Associate Professor), full time job. From July 1, 2021, he started to work at the Faculty of Health and Social Sciences, a part of South Bohemia University in České Budějovice (associate professor), part time job. Now, he works at both schools, meaning at the Academy and the University. During the period 2019-2022 he worked as a Project Manager for the national scientific and research CBRNe grant at the Police Academy of the Czech Republic in Prague.

4. The experience of the Polish Border Guard in the field of CBRN from Chernobyl to Zaporozhye

Mariusz Urban[1]
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Abstract

Every year, many dangerous goods radioactive are transported by Polish border. Awareness of the personnel who handles these materials is very important. There can happen incidents, not intential, f.e when parcel with radioactive material is destroyed and there is a leak of substance and contamination of the place. The invasion of Ukraine launched on February 24, 2022 by the Russian Federation has resulted in the intimidation of the public by disrupting the functioning of critical infrastructure, which is the nuclear power plant in Zaporhye. As a result of shelling from Russian troops, a fire broke out in the nuclear power plant. If the reactor had exploded, the consequences could have been worse than in Chernobyl.
Polish Border Guards is an uniformed and armed state law enforcement service responsible to the Ministry of the Interior and Administration, which is competent for matters of state border protection and border traffic control. The Polish Border Guard, through the implementation of its statutory tasks at the external border of the European Union, as a un informed formation, is the basic element of the security services, on whose shoulders rests the participation in ensuring the security of its borders.

Polish experience in radiometric control from 90's till now more than 30 years starting from Czarnobyl catastrophy. In order to ensure border protection and identification of threats, the Polish Border Guard uses, m.in. specialized equipment to conduct radiometric control, devices for identifying substances of unknown origin. In order to protect the border against radiological threats, the activities of the Polish Border Guard are based on internal procedures.

Keywords: Radiological threats, detection, border surveillance

Biography - Mariusz Urban

Cpt. BG Mariusz Urban graduated in history of Nicolaus Copernicus University in Toruń (2002). Postgraduated in CBRN Security Manager in Faculty of Biology and Environmental Protection of University of Lodz (2018). Cpt. BG Mariusz Urban received his PhD degree in War Studies University in Warsaw.
He has been working at Polish Border Guard since 2007 as a security oficer and since 2012 manager of security group as a Deputy of Commander Polish Border Post in Bydgoszcz, Nadwislanski BG Regional Unit in Warsaw. Currently, he is also employed as lecturer in National Security Department of War Studies University in Warsaw (since 2021).
Previously, he was, among other assistant in Faculty of Political Science and International Studies, University of Warsaw. He participated in research project EU-SENSE (European Sensor System for CBRN Applications). Member of the CBRN group in AIRPOL Agency. Member of the Committee I3M 2021-The 13th International Conference on Integrated Modeling and Analysis in Applied Control and Automation - IMAACA 2021. Member of the task force *for the analysis of threats related to the use of explosives precursors and the development of a procedure for neutralization or storage of explosive devices for the construction of which CBRN materials were used,* appointed by Decision No. 36 of the Chairman of the Interministerial Team for Terrorist Threats of February 20, 2018.
His scientific output includes about 20 original scientific papers. He published his scientific papers in international journals such as: Applied Sciences, International Defense and Homeland Security Simulation Workshop DHSS, WAT Bulletin, War Studies University in Warsaw.

31. Countering Foreign Threats in the United States Food Supply Chain

DeAnna Sutphin,

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Abstract

This research focuses upon unintentional outbreaks of Bovine Spongiform Encephalopathy (BSE) in the US. specifically addressing the economic impacts to the US dairy and beef industries during the outbreaks. The research then turns to the issue of food supply chain vulnerability to intentional contamination with a biological microorganism and the ability to identify and mitigate the economic and societal effects of such contamination. Key issues discussed are the adequacy of current definitions of what is a "biological weapon" or "threat", the cohesion of national defense and security strategies, and the integration of efforts amongst monitoring activities. Clarity and cohesion of efforts at the strategic level will provide a better framework to develop operational level systems to be implemented by government agencies and private sector organizations who can support threat assessments against foreign biological threats to the food supply chain. If this fails to occur, vulnerabilities to and destabilization of the economy and society through food insecurity and increased prices due to product scarcity will prevail. An additional, potentially destabilizing, factor considered are the implications of foreign owned companies operating within a nation's food supply and distribution systems.

Keywords: Biological Security; Food safety; Counterintelligence

Biography - DeAnna Sutphin

DeAnna Sutphin is a Captain in the United States Army and currently completing her Masters of Science in Strategic Intelligence at the National Intelligence University in Washington D.C. Captain Sutphin has served at the tactical, operational, and strategic levels with particular interests in security cooperation and international partnerships.
DeAnna also has Bachelor's degrees in Management and Bliology, respectively, as well as completed graduate coursework in Biological Security.
Her extensive background in the US agricultural community, particularly the dairy and equine industries, drives her interests in research involving Biological Security and defense applications to the US food supply chain and the agricultural industry. Captain Sutphin hopes to continue developing her research to include the global agricultural community and how international partnerships can support biological security.

18. Naturally Occurring Radioactive Materials - NORM waste in security of gas & oil industry

Ivica Prlić, L.Pavelić, S. Kobešćak

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Abstract

Republic of Croatia is the latest and one of the smaller members of the European Union in which the oil & gas were explored and gained since 1855. The first tar site in Croatia was mentioned 1391. Today, the national oil & gas company exploits some 54 oil & natural gas fields mostly in the geological region of Pannonian basin and from the northern Adriatic Sea bed (gas). Recently, Croatia started new investment cycles based on national energetic strategy and general plan and program of oil & gas exploration at land and sea. European Union environmental and radiation protection and oil & gas production Directives and new regulatory framework regarding NORM (production of residues) from oil & gas industry are implemented into research and production protocols. There is a need to investigate NORM originating from oil & gas production and to link the production sites once again with geological underground in order to establish the well documented map of sites were residues are to be expected as by-product of the production. This paper deals with the obvious technological need to work out the proper but cheap technology which can assure that NORM residues originating from Oil & Gas industry are reused and NOT stored as NORM LL RadWaste. Present geopolitical situation coused by the Russian invasion of Ukraine rises the need of energy sources security of EU MS. This means that the oil & gas are of enormous importance for the EU as a whole and production is to be encouraged. The NORM LL RadWaste will be produced while performing maintenance of the wells which, if not properly regulated, can contribute to a disturbance of environmental, mosty rural, sites with residues burden.
The radiological risk estimmation and shielding calculation simulation are to be performed in order to gain the possible construction which can be used as added value protecting environment from additional NORM LL RadWaste by using this byproducts to fight the new global climate change incidents, like flooding, fires, or else. In addition, the metrological relevance of crowd-sourced dose rate data originating from residues in scale and sludge inside tubing pipes, collected by professional at GPS mapped production sites is to be investigated. The pilot results will be presented.

Keywords: NORM residue, LL RadWaste, building material, reuse,

Emerging Domains of RP assignation - Research and Development (protection of people and environment)

Biography – Ivica Prlić

Ivica Prlić works for more than 40 years, from which 24 as a head of the Unit for Radiation Dosimetry and Radiobiology at the Institute for Medical Research and Occupational Health in Zagreb, Croatia in the field of radiation and medical physics, dosimetry, which includes human (occupational) and environmental monitoring and development of electronic dosemeters for radiation pulsed fields used in medicine. He collaborated in various project roles on considerable amount of projects and published a number of research and professional papers and studies. Currently he leads an EU supported project "Electromagnetic radiation dosimetry for implementation of the e-Schools pilot project: establishing a system for developing digitally mature schools" and is a dosimetry (QA) coordinator of the new Croatian health program – A campaign against the Lung cancer (introducing low dose screening programmes) - Appointed by Ministry of Health.
He was an EU CONCERT project PoM Project leader for Croatia (2014-2020)
He is a PIANOFORTE partnership project PoM Project leader for Croatia till 2025/27.

He is member of Croatian Medical Association, MELODI, ALLIANCE Radioecology & ENA_NORM Association Boards and several international/national academic societies and is an official representative of Republic of Croatia in the EURATOM Scientific committee. (Appointed by Ministry of science and education) Add i:

- Licensed professional Radiation Protection Expert
- Member of Scientific Exert Group ART 31. EURATOM Treaty – EC (2020-2025)
- Member of Scientific Exert Group ART 37. EURATOM Treaty – EC (2020-2025)
- Member of IRPA Task Group on Radioact Source Security (International Radiation Protection
- Association) nomination by RH 2019 – 2024.
- He is chair of the Medical physics section of the

Croatian Biomedical Engineering and Medical Physics Society (CROBEMPS)- NMO to EFOMP

- Member of EFOMP Project Committee

His main research interest is in medical physics, exposure of patients and general public to natural and man-made electromagnetic radiation, in particular in the research of the influence of pulsed x-ray and telecommunication fields on tissue, biota and general environment, reusing NORM residues including radioactive waste.

37. Non-destructive decontamination and modified methods to process CBRN-contaminated forensic evidence in the laboratory

Alessandro Previero*[1], B. Augustyns[1], K. De Meulenaere[1], I. Radgen-Morvant[2]

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Abstract

Following a chemical, biological, radiological and nuclear incident (CBRN), it is necessary to examine standard forensic evidence to assist in identifying individuals involved. However, presently, most forensic laboratories are hindered by a lack of suitable methods and protocols to safely analyse CBRN-contaminated items. To address this gap, the Belgian Defence Laboratories (DLD) are currently conducting a study aimed at identifying non-destructive CBRN decontamination methods and developing adapted forensic techniques for use in CBRN facilities. This endeavor aims to ensure the safe handling of contaminated objects as well as the preservation of the integrity of forensic traces. Fingerprints, DNA and digital traces are being investigated due to their particular usefulness in identifying both perpetrators and victims. The research on decontamination methods aims to identify a process that effectively removes contaminants from objects while preserving forensic traces. This would allow contaminated items to undergo safe processing in standard forensic laboratories following the decontamination step. On the other hand, the application of modified and adapted forensic techniques directly in specialized CBRN infrastructures ensures safe handling and eliminates the risk of trace degradation caused by the decontamination phase. The study is being conducted at the Federal Orientation Laboratory (FOL) of the DLD, which serves as the specialized Belgian facility responsible for receiving CBRN-related samples, screening for CBRN agents and transferring items to the appropriate reference laboratory.

Keywords: Forensic evidence; identification; warfare agents; non-destructive decontamination, forensic techniques adaptation

Biography - Alessandro Previero

Alessandro Previero is a researcher at the Federal Orientation Laboratory of the Belgian Defence Laboratories. He is currently conducting a study in CBRN Forensics, aimed at improving procedures for the examination of forensic traces contaminated by CBRN agents. From the School of Criminal Justice in Lausanne, Switzerland, he got his bachelor's degree in forensic science and master's degree in forensic science with a specialization in physical identification of persons. As a Swiss citizen, he served the military service in the rescue troops, undergoing training in CBRN risk management.

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6. Arsenic contamination in Georgia, phytoremediation of arsenic-contaminated environments

Dr. Mariam Tabatadze

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Abstract

Arsenic is introduced into the environment through both geological and anthropogenic processes and is considered a global contaminant. It is among the top carcinogens, and arsenic elevation in soil (and food) and drinking water has been reported to affect people around the globe.
In Georgia, arsenic pollution is especially high in the Racha-Lechkhumi and Kvemo Svaneti regions, where arsenic mine extraction, processing and manufacturing of arsenic-containing compounds took place for decades. Today both mines are closed down and no arsenic production exists, but soils remain contaminated. Large batches of toxic residuals are still kept at the territory of mining and chemical combines in the Uravi and Tsana villages. At the same time, this region is one of the most important tourist regions of Georgia.

We performed a scientific study to identify the level of arsenic contamination of the region's water, soils and food products. Analyzes were carried out using modern methods and equipment that meet and correspond to European standards.
Phytoremediation to clean up arsenic-contaminated environments methodology, as one of the environmentally friendly and cost-effective methods was first time tested in this region.
Successful phytoremediation depends largely on the bioavailability of arsenic in soil and on plant tolerance to and accumulation of arsenic. For the purpose of effective phytoremediation, various types of hyperaccumulator plants have been studied and tested the most adapted to local climatic conditions.

The study identifies that the arsenic hazard index in surface waters is less than 1 (HQ sw < 1) and is not at risk;
The arsenic hazard index in artesian and drinking waters is more than 1 (HQ dw >1), these waters are at risk;
30 at-risk soil sampling were identified, where the Arsenic hazard index is more than 1;
Cases of arsenic contamination of some food products were detected in both municipalities.

Keywords: pollution, arsenic, natural waters, soils, food products, phytoremediation

Biography – Dr. Mariam Tabatadze

Dr. Mariam Tabatadze is a senior scientist at the Georgian Technical University, with experience in environmental protection and chemical, biological, radiation, and nuclear (CBRN) security, as well as project elaboration management and implementation. Her professional background includes work in academic and scientific institutions as a researcher and lecturer in the field of Environmental Security. She was the principal investigator of several projects related to environmental and CBRN security. Dr. Tabatadze has authored 2 books and 30 scientific articles published in local and international scientific journals. In addition, she has organized international conferences and workshops.

In her 13 years at the Georgian MoD, she has managed security-related issues, concepts and policy paper development, and general strategic planning, including CBRN activities at the agency and national levels. Her experience is also associated with supervising the implementation of projects in the fields of policy and development, as well as the effective implementation of international principles and standards at the domestic level. Prior to her current position, she was involved in USAID and UN projects. Mariam Tabatadze received her PhD in geography from Georgia State University.

39. EDULAB: A New Generation CBRN Training Platform under the Innovative Digital Technologies

Neslihan Kulahlioglu, *University of Health Sciences, Department of Medical CBRN Defense, Ankara, Türkiye*
Corresponding Author: *Neslihan Kulahlioglu*, Email: cbrn.neslihan@gmail.com

Abstract

As the neighboring country of dangerous area of Middle East, mentioned threat has become a great concern in Turkey from the aspect of a possible use of CBRN agents. Therefore, as a preparedness, training provides an essential countermeasure for the on-site management.
Thus, it is aimed in this presentation, a new generation education concept has been developed and implemented within the Edulab Platform (ZEB Innovation Inc., Ankara, Türkiye), an alternative for current CBRN training. A new generation training approach was put forward within the scope of the CBRN concepts including user types (eg. civil society, security forces, military units, decision makers, academics, policy makers), technical user types (like first responders, health personnel, pharmacists, engineers), and Roles in CBRN events (such as consultants, decision makers, first responders) with CBRN mitigation periods (such as prevention, preparedness, response, remediation, policy making) in the EduLab Platform.
Within the scope of digitalization in education with the developing digital technologies, a classification was made as theoretical interactive training, theoretical VR training, applied interactive training, and applied VR and AR training for CBRN. If approved in the CBRN field, it provides an access to the globe for all types of training.
The two-stage security approval system assigned by the trainer for the trainings stands out as an important difference. In addition, the integration of education into the system is provided by trainers. As a result of the trainings, participants are supposed to be fulfilled with the improved techniques and methods aiming to raise the awareness of the issues related with CBRN incidents.

Keywords: CBRN; Training; Generation; Education; VR/AR

Biography – Dr. Neslihan Kulahlioglu

I am currently serving as an Assistant Professor at the Medical CBRN Defense Department within the Defense Health Sciences Institute at Health Sciences University. In 2021, I participated in a project at the Biological CBRN Defense Department of the Defense Health Sciences Institute, focusing on the development of a biosensor to detect anthrax spores, a biological warfare agent.
Within the Medical CBRN Defense Department, I offer lectures and lead research projects covering a range of topics including the identification and detection of chemical warfare agents, laboratory analyses, the health effects of radiation and protective measures, CBRN management of nuclear power plants, toxic industrial chemicals, and the use of medications and antidotes in CBRN exposure, catering to both master's and PhD students.
Concurrently, I hold responsibilities at the CBRN Education and Simulation Center, which is the only one of its kind in Turkiye and is based at Health Sciences University. This entails overseeing training programs, coordinating activities related to the CBRN casualty simulation mannequin, as well as supervising CBRN applications and exercises. My role includes the coordination of CBRN training for various professionals, such as healthcare providers, military personnel, EOD, forensic specialists, and first responders. I successfully completed the Chemical Weapons Analysis and Medical Management Training, organized by OPCW, a prominent aspect of CBRN training.
Additionally, I have been accepted into the "CBRN Master" program jointly supported by OPCW and NATO, held at Rome Tor Vergata University in Italy, where I continue to engage in ongoing training sessions.

62. Biological defense through the Civil Protection system: analysis and suggestions from the perspective of CBRN defense doctrine

COL. (ret) Prof. Dr. Zvonko Orehovec *et al*, *University of Zagreb, Croatia*

Abstract

Natural and anthropogenic biological threats very often cause mass casualties and destruction, with long-term repercussions to the economy, welfare, security and political stability, and ultimately, to the future progress of the state and its society. For these reasons, the EU Member States have developed national and joint doctrines and strategies that provide for defence systems against the above threats, based on mass mobilization and mass response of all available capacities. The joint military response resides within NATO's Joint CBRN Defence apparatus, while the civilian counterpart system is within the EU's Civil Protection Mechanism. At the national level, each country develops its own, yet compatible systems. In the Republic of Croatia, strategic documents and laws on the development of the Homeland Security System and the Civil Protection System have been adopted.
Biological threats, such as the current COVID-19 pandemic, are among such developments and require a systemic response. However, hardly anywhere in the world, not even in the EU and its Member States, have the relevant response systems worked. Even without special analysis, it can be stated that the Union's Civil Protection system is non-functional, that the military system of the NATO CBRN Defence is inactive, and that no EU Member State has managed to activate its homeland defence and civil protection systems.
Therefore, instead of having epidemiologists direct the national and the EU systems and the resources available to them, epidemiologists and healthcare systems work on their own, while the pre-existing contingency systems, doctrines, strategies, and plans remain unused. The result is devastating: individuals are trying to protect and save society, while the existing mass mobilization systems remain passive and unused. This stands in stark contrast to the single correct approach – one characterized by multi-disciplinarily, multi-capacity and mass social mobilization.
This analysis tries to understand why this is so and what needs to be done so that similar mistakes do not happen again in the future.

Keywords: pandemic, biological defence, civil protection system

Biography – Zvonko Orehovec

Zvonko Orehovec Military Academy of NBC Defense finished in Belgrade. Post-graduation, Master of Science study, and doctorate's degree study in physical and radio-chemistry finished in Faculty of Natural Science and Mathematics, University of Zagreb, Croatia. Military carrier finished as a full colonel. His current position is a professor at the University of Applied

Science Velika Gorica and Secures Pula. He is the author of more than 90 scientific and professional papers and books, lecturer of 12 scientific meeting proceedings, Co-director of the International ASSISTEX I Exercise, Executive director of 10 World congresses under the names CBMTS World Congress - Industry Series and CSCM World Congress of CBRNe Applied Science & Consequence Management. As an external associate-expert of Dok-Ing, he is the author of the concept of several special UGVs, such as UGV CBRNe, UGV AT, combat engineering solutions, etc.

63. UGV in the Protection of Critical Infrastructure and Facilities of Special Importance for Security and Defence

COL. (ret.) Prof. dr. Zvonko Orehovec *at al* *University of Zagreb, Croatia*

Abstract

Natural and technological accidents, terrorism, the existence of CBRN weapons, the selection of industries, warehouses, transport systems, communication and other critical infrastructures, as well as other objects of special importance that are the military and terrorist targets, are the source of potential contemporary threats with extreme conditions in which is action with human crews limited in time and space, even impossible. As one of the best responses to the protection and defence of critical infrastructure (CI) and objects of special importance (OSI) in extreme conditions, unmanned, multifunctional systems with remote control and autonomous features have been imposed. Based on its own experience from the Homeland War, the company Dok-Ing offered an efficient response to the identified gap in the form of the development of unmanned systems for operation in extreme conditions, together with doctrinal settings, standards, tactics and use procedures.

Keywords: critical infrastructure, UGV, protection, CBRN threats

5. The possibility of using special heavy cements in buildings for protection against to ionizing radiation

Prof. Olena Khrystych*, A. Korohodska

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Abstract

Radioactive substances and sources of ion radiation are used in almost all branches of industry, 10-12 thousand tons of waste from nuclear power plants, medical facilities, industrial enterprises, research centers are added to them annually institutions related to the use of radioactive materials, therefore the problem of disposal of radioactive waste, as well as the development of new materials that have high melting points, increased protective properties relative to ionizing radiation, provide corrosion resistance, has recently become extremely important. From that point of view, it is of interest to obtain radiation-shielding special-purpose materials based on compounds of the oxide system of chromites and barium aluminates. The study of chromium (III) compounds is of practical interest for the production technology of alumobarium chromium-containing cement for special purposes, as they have high melting points, resistance to the action of aggressive environments, and sudden temperature changes. The presence of a heavy element in its composition - barium - determines its increased protective properties against ionizing radiation, provides corrosion resistance, and the presence of chromium adds resistance to high temperatures. The possibility of synthesis was considered and samples of cements with high operational characteristics and a high mass absorption coefficient were produced. The developed cement can be recommended for use as a binder in the production of protective structures, screens and containers for the disposal and long-term storage of solid radioactive waste with a long thermal load, without the additional need for careful waste sorting.

Keywords: Radiation protection materials; barium-containing cement; special concretes

Biography – Prof. Olena Khrystych

Olena Khrystych, Senior Lecturer, Associate professor of the Department of special chemistry and chemical technology, National University of Civil Protection of Ukraine. In 1998 graduated from the National Technical University Kharkov Polytechnic Institute» for the Department of Ceramics, Refractories, Glass and Enamels Technology and received a specialty as a chemical engineer. From 2001 to 2008, she worked a chemical engineer then she worked as a junior researcher of the department of Ceramics, Refractories, Glass and Enamels Technology. In 2014, he received a Ph.D. diploma on the topic of special ceramic materials with nonlinear properties. From 2016 to the present, he works as a teacher at the Department of Special Chemistry and Chemical Technology at the National University of Civil Protection of Ukraine. At the moment, he is the scientific supervisor of students and cadets who perform work in the field of radiation and chemical protection. The main scientific interests are the special materials are protective against radiation and high temperatures based on oxide systems of refractory non-metallic and silicate materials, research of special cements and concretes, as well as training of specialists specializing in radiation and chemical protection.

14. CBRN Early Warning Systems for Critical Infrastructure (African Context)

Ms. Ngumi Morine, *Institute: National Crime Research Centre, 1st Ngong Avenue, Off Bishops Road, Nairobi, Kenya Department: Research Email:* morinengumi@gmail.com

Abstract

The threat of Chemical, Biological, Radiological, Nuclear and Explosives (CBRNe) incidents is a persistent concern globally, and Africa is not exempted. Africa has been grappling with the challenge of emergence of new technologies, tactics and materials being carried out with some of the deadliest terrorist groups like Al-Shabaab, Allied Democratic Force (ADF), Islamic State in the Greater Sahara (ISGS) and Jamaat Nasrat al-Islam Muslimeen (JNIM) on civilians, military officers, and critical infrastructure. In efforts to safeguard critical infrastructure from CBRN incidents, the African Union has established the Continental Early Warning System (CEWS) and the Committee of Intelligence and Security Services Africa (CISSA). While the African Union through the CEWS and CISSA have made significant efforts in providing timely and accurate early warning signs to critical operators through their intelligence sharing mechanisms, there are still significant obstacles that impede their effectiveness. Given the varying levels of development, infrastructure, and stability in Africa, establishing, and maintaining a wide network and sensors, surveillance systems and monitoring stations especially in the remote and war1stricken areas remains a big challenge. Addressing these challenges effectively and efficiently between African member states will require a combined effort not only from the relevant institutions and stakeholders but also through the civilians. Responding to the emergence of new technologies and tactics by terrorist groups in Africa requires a specialized, proactive, and multifaceted approach from the government level to the community level though public-private partnerships, investment in research and technological investments and advanced policy and legislative frameworks. This article aims to devise strategies for Africa to maintain its advantage in the face of evolving technologies and tactics employed by terrorists, particularly concerning early warning systems for safeguarding critical infrastructure.

Keywords: Africa, Critical Infrastructure, CBRNe

Biography - Ngumi Morine

Ms. Morine Ngumi is highly skilled in the field of research, with a strong focus in addressing critical challenges related to CBRNe incidents. She has made remarkable contributions as a young researcher at the National Crime Research Centre in Nairobi.

With a keen interest in understanding the complex dynamics of CBRNe and its impact on society, Ms. Ngumi has worked on numerous projects aimed at identifying patterns, trends, and potential solutions to combat CBRNe threats. Her expertise in international security, coupled with her unwavering commitment to public safety, led her to join the National Crime Research Centre where she has been instrumental in delivering their findings to the government for shaping impactful policies at a national scale in Kenya through research.

Passionate about making tangible impact, Ms. Ngumi has dedicated her expertise to Africa, particularly Kenya, where she actively contributes to strengthening CBRNe preparedness and response capabilities through research. Through her work, she has demonstrated a deep understanding of the unique challenges faced by the region, and she continually strives to bridge the gap between research and practical implementation.

Beyond her research endeavors, Ms. Ngumi actively engages with the local communities, leveraging her expertise to raise awareness about CBRNe threats and empower individuals to play an active role in their own safety.

43. Lessons learnt from chemical disasters during COVID 19 pandemic

Prof. Ashish Bhalla, V Suri, AK Pannu, D Dhibar

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Abstract

"Chemical Disasters" are dangerous as hazardous chemicals released have the capacity to result in morbidity and mortality. They could be man made or as a consequence of natural disasters. The aim of our study was to look at chemical disasters during COVID 19.

Methodology:

A literature search was made using MeSH terminology "industrial disasters, chemical disasters, toxic disasters, and COVID 19, SARS CoV2, pandemic", in Google and Pub-med. Two researchers filtered, read all the articles. These literature included government reports on incidents, media reports, incident reports in lay press and commentaries by experts.

Results:

1,24,000 articles hits were noted . After filtering for chemical disasters, India, COVID 19, 2020-21, 750 relevant articles remained. Duplicate records and news reports were filtered. 54 articles were read. During the year 2020; 258 patients died while during 2021; 162 patients died due to chemical disasters. The cause of death in industrial disasters could be categorized into two major catagories; equipment/ upkeep related and human errors related. The possible explanation could be, failure to keep the safety mechanism in check during lockdown, resulting in industrial accidents once the factories reopened. The second most important cause could be replacement of trained manpower by untrained personal and resultant error in execution. There were also chemical spills and toxic alcohol outbreaks noted.

Discussion:

Lockdown and migration of trained labor power possibly resulted in lack of upkeep of the storage facilities/tanks. Replacement of trained labor with untrained/ partially trained workers further compromised the functioning.

Keywords: Toxic disasters, chemical disasters, SARS CoV2, Pandemic

Biography - Prof. Ashish Bhalla

Ashish Bhalla is Professor Internal Medicine in Department of Internal medicine, Division of Clinical Infectious disease, PGIMER, Chandigarh, India.

I am working as full professor of Internal medicine at post Graduate institute of Medical education and Research at Chandigarh in North western India. I am a trained clinical oxicologist. I trained with Prof Paul Dargan at Guy's and St Thomas' hospital London as Commonwealth fellow (clinical toxicology) in the year 2014-15. I have been at the forefront for developing specialty of emergency medicine in India and have been working with Indo US collaborative for developing emergency medicine in India. I have worked with CDC and Emory University in India on chemical safety program for safe storage and handling of hazardous chemicals. I have worked and published extensively in clinical toxicology, emergency medicine and infectious diseases. I have 440 papers with an H index of 50. I have been awarded fellowships of various societies, namely Royal College of Physicians Edinburgh, Royal College of Physicians and Surgeons, Glasgow, American College of Medical Toxicology, Academic College of Emergency experts in India, Association of physicians of India and Indian society of critical Care Medicine.

45. Risk assessment of radiological weapons

Dr. Sabol Jozef

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Abstract

Out of individual CBRN components, a radiological dispersive device presents a very specific impact, which is characterized by very high doses to people close to its explosion. This is due to the release of vast amounts of radioactive material containing extremely high-activity radionuclides.

The consequent exposure of persons around may result in severe deterministic biological effects appearing almost immediately after the attack. In addition, many people receive lower exposure resulting in stochastic effects leading to the development of cancer and hereditary abnormalities.
For the risk assessment of each of these cases, different radiation quantities should be used, namely RBB-weighting dose and effective dose.
The paper discusses the use of these quantities in these special circumstances where wrongly often only one kind of quantity is used expressed in sievert (Sv) instead of Gy-Eq, which is a measure of the exposure of deterministic effects.
This may happen mainly because practically all radiation monitors are calibrated in such a way that their response is in terms of operational radiation protection quantities given only in Sv although for deterministic effects, this unit cannot be used.

Keywords: Radionuclide; Radiation; radiological bomb; consequences; Risk assessment

Biography - Jozef Sabol

Assoc. Prof., PhD., DSc., Head of the Department of Crisis Management**,** Police Academy of the Czech Republic in Prague

Dr. Jozef Sabol received his MSc. and Ph.D. in radiation physics and dosimetry at the Faculty of Nuclear Sciences and Physical Engineering of the Czech Technical University in Prague (FNSPE), where he was also assigned Associated Professor and at one time chaired the Department of Dosimetry and Application of Ionizing Radiation. The title DSc. (doctor of science) received from Charles University in Prague. Worked for more than 20 years at the FNSPE, and during the last four years (since 2019), has been head of the Department of Civil Protection at the Police Academy of the CR in Prague. Also worked for eight years at the IAEA in Vienna (1998-2006). Engaged in various areas related to the safety and security of using radiation and nuclear technologies, including CBRN, radiological terrorism, detection and identification of dangerous substances, exposure risk assessment and risk communication with the public. Published ten monographs and textbooks, author or co-author of about 250 scientific publications and author of 15 patents. Engaged as a project coordinator and principal researcher in more than 30 scientific projects, including those carried out under the EU and IAEA programme.

50. Proteomic Identification of Radiation Biomarkers in Blood Plasma of Total Body Irradiated Leukemia Patients

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Abstract

Functional radiation biomarkers are necessary for detection or monitoring the radiological or nuclear exposures. Because the molecular response of the organism to the radiation event is complex and appears on various levels, many techniques are applicable for monitoring the related changes. This work is focused on proteomic analysis of plasma proteins from the blood of total-body irradiated (TBI) leukaemia patients in order to identify and relatively quantify the changes of protein levels after irradiation.

The samples of peripheral blood were taken from a group of TBI patients prior (0h) and 24 h after irradiation event (2 x 2.0 Gy). The peptide mixtures obtained from digestion of plasma proteins were labeled with isobaric labeling chemicals (TMTpro16, Thermo) enabling parallel quantitation of 16 (8 control + 8 irradiated) samples using LC-MS/MS approach. Two data sets of TMTpro16 labeled samples were measured (16 patients, samples taken both in 0h and 24h). Aliquots of unlabeled peptide mixtures was also used for label-free quantitation analysis. The data were processed using Proteome Discoverer v.2.4 software (Thermo).
The results of proteomic analysis provided identification of several hundreds of plasma proteins. The statistically significant changes (t-test, $p<0.01$) greater than 1.2 or smaller than 0.83 as compared to non-irradiated state (0h) were filtered to obtain a group of protein candidates with a significant relation to gamma-radiation exposure. Most of the proteins are associated with the inflammatory response and lipid metabolism and some of them may have implications for practical biological dosimetry.

Acknowledgement
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Keywords: radiation; plasma; biomarker

Biography – Pavel Rehulka

Pavel Řehulka has received his master degree from Masaryk University and PhD degree from Mendel University of Agriculture and Forestry (both in Brno, Czech Republic). Currently he is working at the Faculty of Military Health Sciences of the University of Defence in Hradec Králové, Czech Republic. His main research interests are focused on bioanalytical chemistry, mass spectrometry and proteomics. He is involved in projects focused on analysis of post-translational modifications of proteins, separation and mass spectrometry analysis of biomolecules, host-pathogen interaction and targeted proteomic analysis.

49. Effect of antidotal therapy on sarin intoxication

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Abstract

The aim of the study was focused on monitoring the effect of cucurbit[7]uril on penetration of atropine, asoxime chloride and sarin into the mouse brain. The mice cohort was divided into four groups that were first intoxicated with sarin and treated with atropine. Subsequently, the first group was left as control, the second group was additionally treated with cucurbit[7]uril, third group with asoxime chloride and the fourth group was treated both with asoxime chloride and cucurbit[7]uril.
Effect of cucurbit[7]uril on sarin intoxication therapy was studied by monitoring the acetylcholinesterase activity and concentration of the compounds used. Activity of acetylcholinesterase was determined in blood and brain using Ellman method and the concentration of atropine, asoxime chloride and sarin was measured using LC-MS analysis. The acetylcholinesterase activity in mouse blood was not influenced in the second group treated with cucurbit[7]uril, but it was significantly increased in the case of asoxime chloride treatment (third group). The acetylcholinesterase activity in mouse brain was also increased in the case of asoxime chloride treatment (third group) and further activity enhancement was observed when simultaneous treatment of asoxime chloride and cucurbit[7]uril was applied. In conclusion, the application of cucurbit[7]uril increases the efficacy of the asoxime chloride reactivator and it does not influence the sarin intoxication.

Acknowledgement:
The work was supported by the Czech Science Foundation (project No. GA22-05318S).

Keywords: Sarin; Cucurbit[7]uril; Acetylcholinesterase; Asoxime chloride

Biography - Helena Řehulková

Helena Řehulková has received her master degree from Masaryk University and PhD degree from Mendel University of Agriculture and Forestry (both in Brno, Czech Republic). Currently she is working at the Department of Toxicology and Military Pharmacy of Faculty of Military Health Sciences of the University of Defence in Hradec Králové, Czech Republic.
Her main research interests are focused on bioanalytical chemistry, mass spectrometry, proteomics and toxicology. She is involved in projects focused on analysis of small molecules, separation and mass spectrometry analysis of biomolecules.

58. Automated CBRN Decontamination with a collaborative robotic arm

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Abstract

Within the German military, the thorough decontamination is currently carried out using the TEP 90 and MEP decontamination equipment with a low level of automation. The wet-chemical decontamination of large-scale equipment is carried out exclusively manually. To reduce risks and improve process safety, full or partial automation is hereby an explicit goal of future CBRN defense capabilities within the German military. With the realization of highly automated decontamination equipment, the operating personnel is sustainably relieved due to minimizing the time in the danger zone and wearing time under CBRN protection gear. This leads to better protection against contamination with hazardous substances. Automation also means significantly improved process control and safety as well as reproducibility of the decontamination process and thus decidedly increased process reliability.
The aim of this research project is to test and evaluate the usability of a collaborative robotic arm (Cobot) for automated decontamination processes and contamination/decontamination control with detection devices for possible long-term replacement of manually used decontamination equipment. The collaborative robotic arm is specifically designed for interaction/collaboration with humans. When putting the application into practice, one of the most important goals is to make the Cobot easy and intuitive to operate for soldiers in the field. Research with the Cobot will involve the establishment of technical specifications and motion profiles on specific test surfaces. Additionally, testing of connecting spraying systems and the application of decontaminants and usability within field deployment and later the decontamination of full vehicles will be evaluated for possible applications in the future.

Keywords: Automated Decontamination; Cobot; CBRN

Biography - Maria Hemme (will be added**)**