

# **Book of Abstracts**

# **CSCM**

## 25<sup>th</sup> Annual World Congress on CBRNe Science & Consequence Management

Dubrovnik - Cavtat, Croatia, 23-27 October 2023



Radiological Response - TRAINING WORKSHOP 22-24 October 2023

## New Technologies for Critical Infrastructure Protection against CBRNe and TIMs Threats - WORKSHOP

22 October 2023 Workshop 25 October 2023 Live Field Exercise

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## CSCM – World Congress on CBRNe Science & Consequence Management

## 23-27 October 2023

CSCM World Congress on CBRNe Science & Consequence Management will be held under the auspices of the Government of the Republic of Croatia

## **Congress Organizers**

CSCM International Organizing Committee CBRNe Science and Consequence Management Education Fondation, US Ministry of Interior – Civil Protection Directorate, Croatia RACVIAC - Regional Arms Control Verification and Implementation Assistance Centre, Zagreb, Croatia DTRA – Defense Threat Reduction Agency, USA US EUCOM - US European Command, USA OSDIFE, Observatory on Security and CBRNe Defence, Roma, Italy Idaho National Laboratory, USA, TOR VERGATA Universita Degli Studi di Roma, Italy, University of the Republic of San Marino, Italy European Centre for Disaster Medicine

## Ministries of the Government of the Republic of Croatia and Institutions as Supporters to the Congress organization

Ministry of Interior - Civil Protection Directorate Ministry of Foreign and European Affairs Ministry of Defense and Croatian Armed Forces Ministry of Health Ministry of Science and Education Ministry of Economy and Sustainable Development

### **International Organizations**

**OPCW** – Organization for Prohibition of the Chemical Weapons, Den Haag, **European Centre for Disaster Medicine** 

## **Technical Congress Co-organizer**

URKA, d.o.o./PerfectMeetings, Zagreb, Croatia

## **Congress Management**

## International Organizing Committee (IOC)

Dr.sc. Damir Trut, CSCM Honorary director LTC (ret.) Jeffrey Allen, USA Prof. Roberto Mugavero, Italy Mr. Mason Soule, USA COL (ret.) Prof. Dr. Zvonko Orehovec, Croatia Cdr (ret.) Dr. Stef Stienstra, The Netherlands LTC (ret.) Dr. Slavko Bokan, Croatia Dr. Mzia Kutateladze, Republic of Georgia Mr. Bryon Marsh, MPH, MHS, USA Mr. Nick Mann, USA Dr. Peter M. Leitner, USA Ms. Nina Dumančić, Croatia Dr. Stela Popović, Croatia Dr. Željka Kristic, PhD, Croatia Mr. Mario Mustapić, Croatia Mr. Hrvoje Meštrić, PhD, Croatia Mr. Robert Blažinović, Croatia Mr. Ivica Škrinjarić, Croatia LTC. Dragutin Tušek, PhD, Croatia

#### **Croatian Local Organizing Committee**

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Marijana Klanac Zdravka Tečić Stela Popović Željka Kristić Robert Blažinović Mario Starčević Vesna Pehar Ivan Babić

### International Scientific Committee (ISC)

Dr. Peter M. Leitner, CSCM Congress Chair, USA Prof. Roberto Mugavero, Italy LTC (ret.) Dr. Slavko Bokan, Croatia Cdr (ret.) Dr. Stef Stienstra, The Netherlands LTC (ret.) Jeffrey Allen, USA COL (ret.) Prof. Dr. Zvonko Orehovec, Croatia Mr. Mason Soule, USA Dr. Mzia Kutateladze, Republic of Georgia Mr. Bryon Marsh, MPH, MHS, USA Mr. Nick Mann, USA Mr. Asish Mohapatra, Canada Dr. Krunoslav Capak, PhD, Croatia Dr. Pavle Jeličić, PhD, Croatia Dr. Marija Bubaš, PhD, Croatia Dr. Barbara Bekavac, PhD, Croatia Dr. Marinko Artuković, PhD, Croatia COL. Valentina Ključarić, PhD, Croatia

## CSCM – World Congress on CBRNe Science & Consequence Management

## Cavtat, Croatia 23 - 27 October 2023

## Saturday 21 October 2023 Workshops (only) Registration

## **Hotel Croatia Lobby**

 13:00 – 18:00 Congress Registration including workshops - New Technologies for Critical Infrastructure Protection against CBRNe Threats Workshop and INL/NNSA Workshop

## Sunday 22 October 2023 & Wednesday 25 October 2023 Live Exercise

## New Technologies for Critical Infrastructure Protection against CBRNe Threats Workshop

 O9:00-13.20 Workshop - New Technologies for Critical Infrastructure Protection against CBRNe Threats - Part I – Chairman: Prof. Roberto Mugavero

## Keynote Speech

1. **09:00-09:20 Prof. Roberto Mugavero,** European Centre for Disaster Medicine, Unirsm, Osdife, Unitov, Italy

## Speakers

- 2. 09:20-09:40 Dr. Mark Foster, New Technologies, Protecting Critical Infrastructure from CBRN Threats, Symetrica
- 3. **09:40-10:00 Mr. Torkom Pailevanian**, Use of Robotics and Autonomy in CBRNe Detection and Disposal, RedaraLabs
- 4. **10:00-10:20 Mr. Gordan Pešić,** UGV CBRNe as a new technology to protect critical infrastructure against CBRNe threats, Dok-Ing
- 5. 10:20-10:40 Willy Kaye, Ph.D. High fidelity visualization of radiation, H3D
- 10:40-11:00 Coffee Break
  - 1. 11:00-11:20 Dr. Ante Bakić, Robotics in crisis management, Faculty of Mes
  - 2. **11:20-11:40 Dr. Rafael Arruga, Mr. Jakov Mihaljević,** *Technological solutions for remote control with a decontamination device on the example of UGV MVFD-5, HispanoVema*
  - 3. **11:40-12:00 Mr. Chris Carpita**, Area Monitoring for Next-Generation Chemical Warfare and Pharmaceutical-Based Agents, 908 Devices
  - 4. **12:00-12:20 Mr. David Brandtner**, Handheld Raman spectroscopy for identification of hazardous material, Rigaku

- 5. **12:20-12.40 Mr. Heino Teifel**, *Cutting edge handheld Threat Assessment Tools, DetectaChem*
- 6. **12:40-13:00 Mr. Schauer Harald, Mr. Andreas Zeller,** *CBRN RSS Chemical, Biological, Radiological and Nuclear Reconnaissance and Surveillance System, Rosenbauer*
- 7. 13:00-13:20 Prof. Roberto Mugavero, Closing remarks Session I
- 13:30-14:30 Lunch
- 14:30-17.10 Workshop New Technologies for Critical Infrastructure Protection against CBRNe Threats - Part I – Chairman: Prof. Roberto Mugavero

#### Speakers

- 8. **14:30-14:50 Mr. Giacomo Mangiagalli**, *RadHawk:* a smart UAV for radioactivity hunting, CAEN S.p.A
- 9. **14:50-15:10 Mr. Sinisa Klecar**, "Croatian civil protection intervention unit the first unit in the EU with UGV for technical and CBRNe disasters: preparedness and experiences," CPD of the Republic of Croatia
- 10. **15:10-15:30 Mr. Pavel Bělohradský,** Use and methods of protection by ibipc safety elements in CBRN incidents against the background of the Ukrainian conflict, Trusted Alliance
- 11. 15:30-15:50 Mr. Thomas Xu, CONFOAM, FEVDI Nuclear Decontamination
- 12. **15:50-16:10 Dr. Peter Kaiser**, *Mitigating Emergency Response Disruption Triggered by Disinformation Produced by Generative Artificial Intelligence, IAEA*
- 13. **16:10-16:30 Dr Sophie Allain Ioos**, *Biosecurity and Health Security Protection* (*BSP*) Unit, EPP-WHE, WHO
- 14. **16:30-16:50 Mr. João Simões,** CBRN & Explosives EUROPOL Activities, EUROPOL - European Counter Terrorism Centre
- 15. **16:50-17:10 Dr. Zvonko Orehovec, Prof. Roberto Mugavero**, Discussion and Workshop Conclusion

## Sunday 22 October 2023 – Tuesday 24 October & 25 October 2023 Live Exercise

## INL/NNSA Workshop

## Sunday 22 October 2023 Main Conference Agenda

### Hotel Croatia Lobby

13:00-19:00 Congress Registration

## Monday 23 October 2023

Hotel Croatia - Ragusa Conference Hall

07:30-10:00 Congress Registration

## <u>Congress Opening</u>

 08:45-13:00 Introduction, Official Welcome and Congress Opening, Keynote Address and First Session

Congress Chair: Dr. Peter Leitner, USA; Co-chair Ms. Jennifer Turnage, USA

• 08:45-10:45

## Introduction

- 1. Dr. Peter Leitner, Congress Chair, CSCM Congress Official Welcome
- 2. Dr. Krunoslav Capak, Director General Croatian Institute of Public Health, Croatia
- 3. Amb. Constantin-Mihail Grigorie, Director, RACVIAC Centre for Security Cooperation
- 4. Dr. Damir Trut, CSCM 2023 Congress Honorary Director, Directorate of Civil Protection, Ministry of Internal Affairs, Croatia Congress Opening

Keynote Address - I

- 5. Gen. Mirko Sundov (ret) Former Chief of Staff Croatian Army
- 6. Amb. Sergio Piazzi, Secretary General, Parliamentary Assembly of the Mediterranean
- 7. Brig. Gen. Chris McKinney, Deputy J5, European Command, USA
- 8. COL John Sandefur, CST Program Chief, National Guard Bureau, USA
- 9. Dr. Edward P. Locke, Combatant Command Representative to US European Command for Defense Threat Reduction Agency (DTRA), USA
- 10:45-11:15 Coffee Break
- 11:15-13:00

Keynote Address – II

- 12. Dr. Sophie Allain Ioos, Biosecurity and Health Security Protection Unit, Epidemic and Pandemic Preparedness and Prevention Department, WHO Health Emergencies Programme
- 13. Mr. Krzysztof Zyman, EUR-OPA Executive Secretary, Council of Europe
- 14. **Dr. Antonella Cavallo**, Lead, rescEU CBRN, Directorate-General for European Civil Protection and Humanitarian Aid Operations, **European Commission**
- 15. Mr. Peter Kaiser, Crisis Communication Adviser, Incident and Emergency Centre (IEC), Department of Nuclear Safety and Security, International Atomic Energy Agency (IAEA)
- 16. **Mr. Matija Matokovic,** Acting Head of Unit, Innovation Unit Emerging Security Callenghes Division, **NATO HQ (online)**
- 13:00-14:00 Lunch

## Hotel Croatia - Ragusa Conference Hall

- 14:00-17:30 Opening Session
- 14:00-15:30 State of the Art and Future of Asymmetric Threats Session I
  - Common, Comprehensive, Integrated and Multidimensional Approach for Non-Conventional Events Management
  - 16. Mr. Talgat Toleubayev, Regional Coordinator South East and Eastern Europe, CBRN Risk Mitigation and Security Governance Programme, United Nations Interregional Crime and Justice Research Institute (UNICRI)
  - 17. Dr. Daniel Donachie, Programme Manager, Preparedness and Resilience Department, World Organisation for Animal Health (WOAH-OIE)
  - 18. Mr. João Simões, Acting Head of CBRN & Explosives, EUROPOL European Counter Terrorism Centre
  - 19. Mr. Kenneth L. Deal Jr, Chief, CBRN Operational Response Division, US Department of State – "Foreign Consequence Management challenges and programs" (66)
- **15:30-16:00** Coffee Break
- 16:00-17:30 State of the Art and Future of Asymmetric Threats Session II
  - Conflicts and Consequence Mitigation: Cooperative Action and Initiatives
  - Civil and Military Cooperation in Protecting People and Critical Infrastructures
  - Research and Innovation: Strategies, Tactics, Methodologies, Technologies and Resources to Prevent, Manage, and Mitigate Infrastructural, Territorial, Social and Economic Impacts and Consequences of Crisis Emergencies, Disasters and Terrorism

- 20. Mgr. Pavel Belohradsky, CEO, Institute of Blast & Impact Proof Concrete, Czech Republic "Perspective on the blast protection industry on the backdrop of the Ukranian conflict"
- Capt. (ret. USPHS) Kenneth F. Martinez, Idaho National Laboratory, Infrastructure Security, PO Box 1625, MS 3545, Idaho Falls, ID |83415, USA -"Convergence of Deliberate Threats and Emerging Infectious Diseases Advancing Biosurveillance Awareness" (72)
- 22. LTC Giancarlo Romana (OF-4), ITA-A, PROT Course Director & Instructor Protection Department Director - NATO School
- 18:00-19:00 Welcome and Networking Reception

## **Tuesday 24 October 2023**

## Hotel Croatia - Ragusa Conference Hall

### 09:00-17:30 Congress Sessions

## 09:00-10:45 Sector 1: CBRNe Emerging Threats and Critical Infrastructure Protection: Innovation and Technology for Preparedness, Response and Consequence Mitigation

## Chair: Doc. dr. sci. Marinko Artuković MD

## Co-Chair: Asish Mohapatra

**Introduction:** This session will explore the next generation of threats that have not been presented as plausible because of the lack of technology as we know it today to bring them to fruition. What will possibly be the threat from Artificial Intelligence (AI) in all sectors of society? How will it be used for nefarious purposes? How will government's, military, companies, and public works protect critical infrastructure and if they fail how will they respond?

- a) Trends in science and technology
- b) Nanotechnology (Promises/Risks)
- c) Countering CBRNe IED threat
- d) Research and Industry
- e) CBRNe Protection
- f) Artificial Intelligence

## Sector 1 CBRNe Emerging Threats and Critical Infrastructure Protection: Innovation and Technology for Preparedness, Response and Consequence Mitigation - Session I

**Chair: Doc. dr. sci. Marinko Artuković MD**; Co-Chair: Capt. (ret. USPHS) Kenneth F. Martinez

### Speakers

- 1. Mr. Sinisa Klecar, CPD of the Republic of Croatia "Croatian Civil protection intervention unit the first unit in the EU with UGV for technical and CBRNe disasters: preparedness and experiences"
- 2. **Dr. Marinko Artuković MD**, Director of the Special Hospital for Lung Diseases Zagreb "New technologies in public health challenges" (51)

- Mr. Steven Buntman, Program Manager, International Operations, Office of Nuclear Incident Policy and Cooperation, Department of Energy, National Nuclear Security Administration, USA – "US DOE's Office of Counterterrorism and Counterproliferation (CTCP)" (69)
- 4. Dr. Arkandiusz Trzos, Jagiellonian University Medical College, Faculty of Medicine, Chair of Anaesthesiology and Intensive Care, Department of Disaster Medicine and Emergency Care, Poland - "Specialist CBRNe medicine training for medical personnel - Polish experience" (42)
- 5. Dr. Zorica Topić Omaljev, LL.M., Faculty of Law, University of Zagreb, Croatia -"The AI ACT awaiting" (59)
- 6. **Mr. Asish Mohapatra**, Regional Health Risk Assessment and Toxicology Specialist, Environmental Health Program, Health Canada, Calgary, Alberta – "Human Health Risk Assessments (HHRAs) and Climate Change Considerations in Contaminated Sites" (60)
- 10:45-11:15 Coffee Break

## 11:15-17:00 Sector 2: Chemical Threats Chair: Dr. Shahriar Khateri; Co-**Chair: Dr. Zdravko Lovrić**

Introduction: Chemical warfare is the use of toxic properties of chemicals substances to kill, injure or incapacitate an enemy in warfare and associated military operation. This sessions will focus on the four types of chemical warfare agents but also will explore Toxic Industrial Chemicals (TICs) and Toxic Industrial Materials (TIMs) hazard and how they have become the weapon of choice to attack civilian populace and critical infrastructure.

- a) Threats, Doctrine & Policy
- b) Consequence Management and Countermeasures
- c) Detection and identification
- d) Protection and Decontamination
- e) Medical (health risk assessments)

## 11:15-13:00 Sector 2: Chemical Threats - Session I Chair: Dr. Todd Myers; Co-Chair: Dr. Maja Knepr Šegina

## Speakers

- 1. **Dr. Zdravko Lovrić**, Head of the Risk Assessment Department, Croatian Institute of Public Health, Croatia "Legislation on Chemical Safety Management" (64)
- Maja Knepr Šegina mag. edu. biol. et mag. biol., Head of Section, Division for Toxicology at Croatian Institute of Public Health, Croatia - "Education on protection and decontamination of the general population in cases of CBRN Mass Casualties Events" (32)
- 3. **Dr. Todd Myers**, United States Army Medical Research Institute of Chemical Defense, USA "The Göttingen Minipig for Medical Countermeasure Development: Benefits and Capabilities" (29)
- Dr. Laura Cochrane, Vice President Global Government Procurement, Emergent BioSolutions - "Evaluation of Decontamination Efficacy of the RSDL<sup>®</sup> Kit against Incapacitating Agents [Pepper Spray (OC), MACE<sup>™</sup> (CN), And CS]" (40)
- Prof. Ashish Bhalla, Department of Internal Medicine, Post Graduate Institute of Medical Education and Research, India - "Lessons learnt from chemical disasters during COVID-19 pandemic" (43)
- **13:00-14:00** Lunch

## 14:00-17:00 Sector 2: Chemical Threats - Session II Chair: Dr. Shahriar Khateri; Co-Chair: Mr. Robert Malone

## Speakers

- 1. **Dr. Faraidoun Moradi**, School of Public Health and Community Medicine, Institute of Medicine, Sahlgrenska Academy, University of Gothenburg, Sweden "Respiratory function 34 years after sulfur mustard exposure in survivors in Sweden" (16)
- Dr. Shahriar Khateri, MD, Ph.D, Medical Toxicologist, W. Nikan Hospital, Tehran-Iran - "Are we prepared? Medical response to incidents involving toxic chemicals; The OPCW and strengthening preparedness and response capacity of its member states" (12)
- 3. **Dr. Laura Cochrane**, Vice President Global Government Procurement, Emergent BioSolutions - "Analytical Estimation of Novichok Exposure Risk and Economic Consequences Using an SCR Vertex Mathematical Model" (41)
- 4. **Dr. Ondrej Soukup**, University of Defence, Faculty of Military Health Sciences, Department of Toxicology and Military Pharmacy, Czech Republic - "The cytotoxicity and reactivation efficacy of oxime reactivators against Novichok inhibited acetylcholinesterase" (21)

## 15:30-16:00 – Coffee Break

- 5. **Prof. Jaroslav Pejcha**, University of Defence, Faculty of Military Health Sciences, Department of Toxicology and Military Pharmacy, Czech Republic - "Evaluation of new modified bisquarternary pyridinium oximes K1651–K1654" (44)
- Mr. Robert J. Malone, US Army Futures Command DEVCOM Chemical Biological Center, Aberdeen Proving Ground, MD, USA - "Compact Rapid Chemical Agent Neutralization System: A Rapidly Deployable Method for Large Scale Chemical Agent Destruction" (28)
- 7. **Ms. Donna Vadlja**, Ministry of Defense, Battalion for nuclear-biologicalchemical defense, Croatia - "Remote controlled systems for first responds" (48)
- Mr. Matevž Ferjančič, CEO Mil Sistemika, Slovenia "Low Cost Smart Sensor Networks" (70)

## 09:00-17:00 Sector 3: Poster

### Chair: LTC. (ret) Dr. Slavko Bokan, MD; Co-Chair: Mr. Mason Soule

**Introduction:** The poster session allows participants to present their work on any of the sessions that will be discussed during the Congress.

- a) Chemical Session
- b) Biological Session
- c) Radiological Session
- d) Asymmetric Threats Session
- e) Emerging Threats Session
- f) Consequence Management Session
- 1. LTC. (ret) Dr. Slavko Bokan, MD, Croatia "Developments in the field of science and technology related to the Biological Weapons Convention" (23)
- Prof. Zvonko Orehovec, University of Zagreb, Croatia "UGV in the Protection of Critical Infrastructure and Facilities of Special Importance for Security and Defence" (63)
- Ms. Aleksandra Nakonieczna, Military Institute of Hygiene and Epidemiology, Biological Threats Identification and Countermeasure Center, Bacteriophage Laboratory Poland – "New bacteriophage lysins, LysJ and LysF, effective in killing anthrax bacteria in vitro" (57)

- 4. Ms. DeAnna Sutphin, National Intelligence University, School of Strategic Intelligence, Roberdeau Hall, Washington, USA "Countering foreign threats in the United States food supply chain" (31)
- 5. Dr. Alessandro Previero, Belgian Defence Laboratories, DLD "Non-destructive decontamination and modified methods to process CBRN-contaminated forensic evidence in the laboratory" (37)
- 6. **Prof. Neslihan Kulahlioglu,** University of Health Sciences, Department of Medical CBRN Defense, Ankara, Türkiye "EDULAB: A New Generation CBRN Training Platform under the Innovative Digital Technologies" (39)
- 7. Ms. Morine Ngumi, Institute: National Crime Research Centre, 1st Ngong Avenue, Off Bishops Road, Nairobi, Kenya Department: Research - "CBRN Early Warning Systems for Critical Infrastructure (African Context)" (14)
- 8. Dr. Pavel Rehulka, Faculty of Military Health Sciences, University of Defence, Department of Molecular Biology and Pathology, Czech Republic - "Proteomic Identification of Radiation Biomarkers in Blood Plasma of Total Body Irradiated Leukemia Patients" (50)
- 9. Dr. Helena Rehulkova, Faculty of Military Health Sciences, Department of Toxicology and Military Pharmacy, Czech Republic "Effect of antidotal therapy on sarin intoxication" (49)
- 10. Dr. Matthias Berger, Bundeswehr Research Institute for Protective Technologies and CBRN Protection, Chemistry Department, Germany - "Analysis of VX and its degradation products in conjunction with plasma decontamination" (54)
- 11. **Ms. Maria Hemme**, *Bundeswehr* Research Institute for Protective Technologies and CBRN Protection, Department: CBRN Decontamination, Germany – "Automated CBRN Decontamination with a collaborative robotic arm" (58)
- 12. Ms. Bela Mihalik, IDEAS Science Ltd. Oroszvár street 5, Budapest H-1172 Hungary "Towards Comprehensive Biological Agent Detection: Introducing the HoloZcan Multi-Modular System" (74)
- 13. **Dr. Jozef Sabol**, Police Academy, Czech Republic "Risk assessment of radiological weapon"
- 19:00-21:30 Official Congress Dinner

## Wednesday 25 October 2023

## Hotel Croatia - Ragusa Conference Hall

## Consequence Management, Rad-Nuke Threats and

## **Critical Infrastructure Protection Day**

## 08:00-18:00 Congress Sessions followed by Live Demo and Exercise

## 08.00-09:30 Sector 4: Radiological-Nuclear Threats

## Chair: COL. Lien Senchak MD; Co-Chair: Dr. Stela Popovic MD

**Introduction:** This session will explore the Radiological/Nuclear material safety and security state-of-the-art and future scenarios. The use of Tactical Nuclear Weapons (TNW) versus the ease of deployment of a Radiological Dispersal Devices (RDD) (Weapon of Mass Chaos). The use of an RDD will achieve the same effects: Lose of Critical Infrastructure, Area denial although much smaller than a TNW, Psychological effects on the populace and economic impact, RDD potential use and the Tactics, Techniques and Procedures (TTPs) to mitigate this threat and recover:

- a) Threats, Doctrine & Policy
- b) Detection, Identification & Dosimeter
- c) Active Interrogation Technologies
- d) Protection and Decontamination
- e) Medical (health risk assessments)

### 08:00-09:30 Sector 4: Radiological-Nuclear Threats - Session I Chair: Mr. Nick Mann; Co-Chair: **Dr. Marija Surić Mihić**

## Speakers

- Mr. Nick Mann, Emergency Response & Readiness, National and Homeland Security

   Defense Systems, Idaho National Laboratory, USA "Radiological contamination: historical uses and novel isotope development for emergency response training and testing" (20)
- 2. Mr. John Giles, Idaho National Laboratory, 2525 N. Fremont Ave., Idaho Falls, ID, USA "Consequence Management Training in a "Live" Radiological Environment" (69)
- 3. **Dr. Marija Surić Mihić,** *N*histry of the Interior, Civil Protection Directorate, Radiological and Nuclear Safety Sector, Zagreb, Croatia - "Radiological protection education and training in Croatia" (19)
- 4. COL Lien Senchak MD, AFRRI US, Armed Forces Radiobiology Research Institute Uniformed Services University of the Health Sciences - "Testing Technologies for Personnel Dry Decontamination of Radiological Contaminant in Extreme Cold Environments to Increase Human Survivability" (13)
- Dr. Ivica Prlić, Institute for Medical Research and Occupational Health, Croatia - "Naturally Occurring Radioactive Materials - NORM waste in security of gas in oil industry" (18)
- 09:30-10:00 Coffee Break

## 10.00-11:30 Sector 5: Crisis - Consequence Management Chair: Dr. Ed Locke; Co-Chair: COL. Valentina Kljucaric

**Introduction:** If crisis management measures fail, then you be prepared to respond to the consequences of an incident or terrorist attack involving CBRN agents. Consequence management includes activities to contain the damage, treat victims, restore essential services, initiate clean-up, and provide relief.

- a) Doctrine of CBRNe Defense (Civil Defense, Defense Support to Civil Authorities)
- b) CBRN Teams and HAZMAT Technologies
- c) Crisis Communications and Evacuation
- d) Incident response (including emergency, disaster and crisis management)
- e) The Threat Spectrum to Consequence Management
- f) Safety and Security (Civil safety and security companies and CBRN threat, education of civil population)

## 10:00-11:30 Sector 5: Crisis - Consequence Management - Session I Chair: Dr. Ed Locke; Co-Chair: Dr. Isabel Radgen-Morvant

### Speakers

1. LTC Samuel Roberts, National Guard Bureau, USA - "WMD Civil Support Team"

- Dr. Isabel Radgen-Morvant, School of Criminal Justice, University of Lausanne, Lausanne, Switzerland - "Impact of Chemical and Biological agent decontamination on traces recovery" (30)
- 3. **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)
- Dr. Yannick Saintigny, CEA, Institut de Biologie François Jacob, Fontenay aux Roses, France – "RESILIENCE: European strategic alliance for research, development and innovation on medical countermeasures against CBRN threats" (71)
- CPT Kevin Caspary, MPH, Georgia National Guard 4<sup>th</sup> Weapons of Mass Destruction Civil Support Team, USA – "Connecting the dots: Concept of operation for fielddeployed sequencing and data analysis" (73)
- 11:30-12:30 Lunch
- **13:00** Departure to Live Exercise Venue

## • 13:30-18:00 Joint Multinational Exercise Responding to CBRNe Threats

The live exercise will be conducted as a joint operation between the United States Idaho National Laboratory, National Nuclear Security Administration, Armed Forces Radiobiology Research Institute, Bundeswehr Special Operations Command CBRN Defense Platoon, Croatian Anti-Terrorism Team, Croatian military NBC team, Multiple NATO NBC military members and the Croatian Civil Protection Directorate. During the Congress, attendees will receive daily intelligence updates on the possibility of an imminent attack on the Croatian territory of Dubrovnik. The intelligence updates are to help you understand crisis management by governments and intelligence agencies. This information will allow participants to get an understanding of how first responders, police and military units coordinate their efforts to respond to such a threat and attack.

The exercise will be multi-dimensional with the use of radiological dispersive device (RDD), chemical and biological agents. We are using this scenario of multiple WMD weapon threats in order to demonstrate the ability to detect, identify and mitigate such threats. This exercise is intended to show how the efforts of academia, scientists, engineers, and industry have been instrumental in the development of the technology that will be demonstrated during this event.

At the conclusion of the exercise, participants will have the opportunity to interact with and view the equipment that was utilized during the exercise. This will allow you to have a better understanding of the tactics, techniques and procedures you saw being performed during the exercise. You will also receive a capabilities brief by each participating agency. We also will have an opportunity to receive briefing and demonstrations from companies that are participating in Congress activities and displaying equipment. We will also integrate into the exercise new technology that was presented during the Congress, (Robotics, UGV, UAV, sensor and mapping technology, detectors, sampling, analyzers, new building materials for critical infrastructure, communications equipment that provides redundancies, and decontamination both dry and wet methods).

Idaho National Laboratory (INL) is one of the U.S. Department of Energy's 17 national laboratories. With roughly 4,000 scientists, engineers and support personnel, the lab also stands as one of Idaho's largest employers. At INL's three primary facility areas – the Advanced Test Reactor Complex, Materials and Fuels Complex, and Research and Education Campus – researchers perform work in support of DOE's mission to "discover the solutions to power and

secure America's future." More specifically, INL is the nation's leading center of nuclear energy research and development. Day-to-day management and operation of the laboratory is the responsibility of Battelle Energy Alliance.

The NNSA's Office of Counterterrorism and Counterproliferation (CTCP) is integral to the U.S. Government's layered defense against nuclear terrorism and nuclear proliferation. CTCP's scientific capabilities help provide early threat indications and inform the security of nuclear materials worldwide. Its operational assets are used to locate and defeat terrorist nuclear devices and mitigate the effects of radiological incidents around the globe. This **"defense-in-depth"** strategy requires adversaries to defeat multiple layers of security to obtain and detonate a nuclear device.

NNSA's nuclear counterterrorism, counterproliferation, and incident response missions harness the Department's unparalleled command of nuclear science to understand and contend with nuclear threats. CTCP performs three core functions:

- Preparing for nuclear and radiological incidents and accidents through planning, training, and exercises
- Countering adversary efforts to acquire and use nuclear capabilities
- Responding to nuclear and radiological incidents and accidents worldwide.

The Civil Protection Directorate of the Republic of Croatia is in the process of establishing robotic RescEU units for the needs of the Union Civil Protection Mechanism, the first such unit in the world. The unit will be composed of remotely controlled ground and air systems (UGV and UAV) for defense against CBRN threats, capable of operating in extreme CBRN conditions where operating with manned assets and equipment is impossible. The congress exercise will demonstrate the capabilities and advantages of UGV and UAV systems in CBRNe defense, as well as other modern technologies that enable CBRNe and TIM detection, sampling, data collection, and processing, C-IED/EOD tasks, the fight against terrorism, and more.

Sessions include a live demonstration of tactics, techniques and procedures for RDD response. Commentary will be by Mr. Bryon Marsh-USA , Mr. Nick Mann-USA , and COL. (ret) Dr. Zvonko Orehovec-Croatia

### Exercise participants:

- Croatian RescEU unit for CBRNe defense
- Croatian Anti-Terrorist Police Unit
- Idaho National Laboratory, USA National Nuclear Security Administration, Armed Forces Radiobiology Research Institute, US and NATO military members
- Radiological and nuclear safety sector of the Civil Protection of the Republic of Croatia
- US military CBRNe experts, and multiple NATO military CBRNe experts
- Institute for Medical Research and Occupational Health
- Explosive Ordnance Disposal team
- Industries
- 17:00-18:00 Lectures
  - 1. Senior Representative, Croatian Anti-Terrorist Police Unit
  - 2. Senior Representative, Idaho National Laboratory, USA
  - 3. Senior Representative, Croatian Civil Protection

**18:00** Departure to Hotel Croatia

## Thursday 26 October 2023

## Hotel Croatia - Ragusa Conference Hall

## 08:00-17:00 Congress Sessions

## 08:00-09:15 Sector 4: Radiological-Nuclear Threats - Session II

## Chair: Chair: Dr. Giacomo Mangiagalli; Co-Chair: Dr. Ivica Prlić

## Speakers

- 1. **Dr. Giacomo Mangiagalli**, CAEN SpA, Spectroscopy Division, Italy "Fast detection of Nuclear threats and weapon grade material with realtime identification of Gamma and (n,alpha) radiological emission in realistic scenarios" (33)
- 2. **Dr. Ivica Prlić,** Institute for Medical Research and Occupational Health, Croatia "A citizen monitoring network a pilot project proposal and subject for discussion" (17)
- Dr. Stela Popovic MD, Ministry of the Interior, Civil Protection Directorate, Civil Protection Operations Centre, Unit for Radiological and Nuclear Emergency, Zagreb, Croatia – "Illicit trafficking attempt at Croatian border crossing" (25)
- Dr. sci. Valentina Ključarić, CBRN Defense Colonel, Ministry of Defense of the Republic of Croatia – "Radiation-Enhanced Nuclear Missiles (Tactical Nuclear Weapons)" (56)
- 9:15-09:45 Coffee Break

## 09:45-11:15 Sector 5: Crisis - Consequence Management - Session II Chair: Prof. Otakar Jiří Mika; Co-Chair: Mr. Yannick Saintigny

## Speakers

- 1. Ms. Mari Lursmanashvili, State Security Service of Georgia, Head of CBRN Regional Secretariat for SEEE Region "Georgia's experience in national coordination and building resilience towards emerging CBRN threats" (10)
- Prof. Otakar Jiří Mika, @partment of Crisis Management, Faculty of Security Management, Police Academy, Czech Republic - "Missing National CBRNe Strategy and National CBRNe Action Plan" (26)
- 3. Dr. Yannick Saintigny, CEA, Institut de Biologie François Jacob, Fontenay aux Roses, France - "COUNTERACT: European agile network for medical countermeasures against CBRN treats" (72)
- 4. **Dr. Jozef Sabol**, Police Academy, Czech Republic "Communication of CBRN risk to the public with special emphasis on radiation exposure and radioactive contamination"

## 11:15-15:00 Sector 6: Biological Threats

### Chair: Dr. Krunoslav Capak, MD; Co-Chair: Dr. Stef Stienstra

**Introduction:** Senior policy makers globally are in agreement that within the next 5-10 years we will experience a new pandemic and/or a major biological attack due to the continued proliferation of dual-use technologies and the lack of biosafety/biosecurity measures. The biological session will explore present day biological threats and what will be future threats on the horizon:

- a) Biosafety and Biosecurity globally
- b) Management of biosafety and biosecurity risks
- c) Codes of conduct and responsibilities of scientists
- d) Legal and ethical relevance of dual-use science and biosecurity
- e) Dual-use biosecurity dilemma in life science
- f) Medical (health risk assessments)

### 11:15-12:30 Sector 6: Biological Threats - Session I Chair: Dr. Mzia Kutateladze; Co-**Chair: Dr. Pavle Jeličić**

## Speakers

- 1. **Dr. Krunoslav Capak, MD**, Director for the Croatian Institute for Public Health, Croatia "Infodemic in the COVID-19 pandemic" (52)
- 2. **Dr. Pavle Jeličić,** MD, MHM, PhD, Epidemiology and environmental health specialist, Croatian Institute for Public Health, Croatia - "Croatian experience in health crisis management (47)
- 3. Cdr. (ret.) Dr. Stef Stienstra, Active Technology Transfer Europe, Beek-Ubbergen, The Netherlands - "Emerging biological threats disrupt both society and military operations" (24)
- 4. **Dr. Mzia Kutateladze**, Director, G. Eliava Institute of Bacteriophages, Microbiology and Virology, Republic of Georgia "Future Biological Threats Re-examining the role of Bacteriophages in Modern Biological Event Response" (11)
- 12:30-13:30 Lunch

## 13:30-15:00 Sector 6: Biological Threats - Session II Chair: Mr. Dave Trudil; Co-Chair: Prof. CPT Kenneth Martinez, INL

## Speakers

- 1. COL. (ret) Dr. Zvonko Orehovec et al, University of Zagreb, Croatia "Biological defense through the Civil Protection system: analysis and suggestions from the perspective of CBRN defense doctrine" (62)
- Mr. Bryon Marsh, MPH, Idaho National Laboratory, USA "Reducing Biological Risk in the Built Environment: Biodefense Research Capability and Testbed Development" (67)
- 3. Capt. (ret. USPHS) Kenneth F. Martinez, Senior Critical Infrastructure Analyst, Infrastructure Security - "Amerithrax 22 Years Later – The Case for Environmental Surveillance for Intentional Releases of Infectious Agents and Emerging Infectious Diseases" (55)
- 4. Dr. János Pálhalmi, DataSenseLabs Ltd., Budapest, Hungary "Cross-validation based approach to develop and evaluate an AI-supported microscopy platform to detect and classify airborne biothreat" (53)
- Mr. David Trudil, New Horizons Diagnostics Corp., Baltimore, MD. USA "Determination of Immune Status by Detection of Mucosal Immune Antibodies in Saliva" (61)
- 15:00-15:15 Break

## 15:15-16:30 Sector 7: Asymmetric Threats - Intelligence - Counter-Terrorism Chair: Mr. Mason Soule; Co-Chair Mr. Bobby R. Baker

**Introduction:** The proliferation of weapons of mass destruction, terrorism, financial crime, and cyber-attacks are examples of asymmetric warfare, and some of the leading global security

challenges of the 21<sup>st</sup> century. In this session we will explore the consequences inflicted on governments, personnel, and critical infrastructure. How will Intelligence agencies adapt and respond to the new threats and what role will counterterrorism assets play?

- a) CBRNe and WMD Indications & Warning
- b) CBRNe and WMD Scientific & Technical Intelligence (CBRNe S&T)
- c) CBRNe and WMD Threat Assessment
- d) CBRNe and WMD Target Intelligence

### Speakers

- 1. **Prof. Roberto Mugavero,** European Centre for Disaster Medicine, Unirsm, Osdife, Unitov, Italy "AI, CBRNe Intel and Info sharing" (35)
- Prof. Peter Leitner, National Intelligence University, USA "Strategic dispersal of CBRN Defense materials for the protection of civilian populations: reviving Civil Defense thinking" (38)
- 3. **Mr. Mason Soule,** Senior Fellow, Civil Council for Defense and Security, Tblisi, Republic of Georgia - "Introduction to PISCES-INTL, A Cybersecurity Partnership Among Academic Institutions and Under-Served Community Organizations" (36)
- Mr. Bobby R. Baker, Jr B.A.Sc., M.P.S. Principal Training Specialist, Counter-Terrorism Division, Mission Support and Test Services – "Technology and Talent: The Synergistic Combination needed to Protect Critical Infrastructure" (65)

### 16:30-17:00 Congress Closing Remarks

## Friday 27 October 2023

• From 05:00 - Transfers to Dubrovnik Airport

**CSCM Congress** 

Abstracts

**Speaker Listing** 

### 1. Terrorism and the Pandemic: Weaponizing of COVID-19

#### **Dr. Katalin Petho-Kiss**

Senior Fellow at the Global Peace Institute and a Senior Analyst at the Counter Terrorism Information and Criminal Analysis Centre in Hungary, E-mail: <u>pethokk@gmail.com</u>

#### Abstract

The global pandemic has offered extraordinary opportunities for extremists and terrorists to mobilize themselves and revive as more powerful actors in the security landscape. But could these threat groups actually capitalize on the coronavirus crisis and advance their malevolent agendas? To answer these questions, it should be assessed whether Islamist terrorists as well as far-right entities have been able to exploit novel vulnerabilities COVID-19 has established. It may be yet too early to identify the pandemic's medium and long-term effects on terrorism; there is, however, a significant number of information available to draw implications on detected changes in terrorists' operational circumstances. The largest COVID-19-related terrorism database provides the basis for the research. The analysis is built upon a quantitative and qualitative comparison between the nature of both the jihadist and the far-right-related threat in 2018 and 2020. The ultimate goal is to provide a true picture of novel trends since the outbreak. This established snapshot view could serve as the basis for amendments to be made in countering terrorism strategies both in the conflict and in the non-conflict zones. With this in mind, implications on future counter policy actions have been put forward.

#### Will not be presented

#### **Biography - Katalin Petho-Kiss**



Katalin Petho-Kiss is a Senior Fellow at the Global Peace Institute and a Senior Analyst at the Counter Terrorism Information and Criminal Analysis Centre in Hungary. She is the former deputy head of the Central European CBRNE Training Centre in Budapest. Responsible for counter terrorism and violent extremism, she covered explosives and CBRN at the law desk of the Hungarian Europol National Unit. She holds a Juris Doctorate Degree and as a recipient of an Endeavour Scholarship, she graduated from the Master of Research Program in Policing, nd Counter Terrorism at Macquarie University. Australia, While in Sydney, she assessed CBRN

Intelligence and Counter Terrorism at Macquarie University, Australia. While in Sydney, she assessed CBRN terrorism risks and compared Australian and EU terrorism legislation. Her research was published in Perspectives on Terrorism and in the Journal of Applied Security Research.

#### 2. An evaluation of the medical measures taken against COVID-19 in Turkey

#### Dr. Levent Kenar<sup>1</sup>, M. Ortatatli<sup>1</sup>

<sup>1</sup>University of Health Sciences, Medical CBRN Department, Institute of Health Defense, Ankara, Turkey Corresponding Author: Levent Kenar, <u>lkenarmd@gmail.com</u>

#### Abstract

The new type of coronavirus pandemics, which started with pneumonia cases of unknown etiology in the city of Wuhan, China at the end of 2019, has been officially seen in our country for the first time on March 11, 2020. Since then, many precautions have been taken to prevent the disease in our country and to prevent the transmission of the infection. Health system was managed from a single center. In addition, state institutions quickly started to implement the decisions taken by the scientific committee. As of 13rd May 2023, the number of COVID-19 cases in Turkiye had reached more than 17 million with 102174 deaths, as reported by the Ministry of Health. During the pandemics, public and private hospitals spent a great effort to reduce the effects of COVID-19 under the management of the Ministry of Health, in addition, epidemiological studies and clinical filation investigations were started simultaneously in the society. The MoH started to implement a program under the COVID-19 Vaccine National Implementation Strategy as the first vaccination with the Sinovac which started on 13 January 2021. Turkovac, an inactivated vaccine, was approved by MoH as "Emergency Use Approval " after November 2021. The recommendations and decisions of the scientific committee established by the MoH were carried out by the relevant institutions of the State without the need for military support. In this presentation, the details of the measures taken by the Turkish MoH will be discussed from the health perspective.

Keywords: COVID-19; Turkey; Pandemics

#### Will not be presented

#### **Biography – Levent Kenar**



Prof. Dr. Kenar has been working for more than 20 years in the CBRN Department in Ankara, Turkey and is currently the Professor of CBRN in this department. He has completed a PhD program about CBRN defense. He has been assigned in various international organisations/ meetings and has represented Turkey in CBRN- NATO related groups like CBRN Working Group, CBRN Defense Working Group, NBC Initiatives in NATO Assessment Team. He was also certified as the inspector of UNMOVIC organized by the UN. He worked as a visiting scholar in the University of Minnesota, USA between Sept

2010-Sept 2011. He has papers published in peer-reviewed international journals, oral and poster presentations in international scientific meetings. He has been tasked in various assignments in developing CBRN strategy, plans and training at some related organizations like MoD, MoH, Ministry of Foreign Affairs, AFAD (Disaster and Emergency Management Authority). As the Chief of the CBRN Department, he has supervised and trained about 20 instructors and provided CBRN training for about 2500 national staff students until August 2022. He has also participated in higher level Decision Making Process in support of CBRN response in Turkey. From that perspective, he has been involved in planning and executing CBRN meetings, panels and symposia. On the other hand, he's also been organizing, attending, and speaking in congresses, seminars, conferences or workshops along with the supervising project or study groups. He has also been designing CBRN courses and updating the curriculum requirements for various degrees.

## 3. Minimization of the harmful effect from emergency situations with the pollution of chemical and radioactive substances into the atmosphere

#### Dr. Maksym Kustov\*, V. Kalugin, A. Melnychenko

National University of Civil Defence of Ukraine, Scientific Department of Civil Protection and Environmental, 94 Chernyshevska str., Kharkiv, Ukraine \*Corresponding Author: Maksym Kustov, kustov, m@nuczu.edu.ua

#### Abstract

A comprehensive system for minimizing the harmful effect from natural and man-made emergency situations for the atmosphere has been developed. This system is based on the fact that the management decision support subsystem has a complex of mathematical tools for forecasting changes in the state of the pollution zone and implementing the process of influencing it and the decision implementation subsystem has effective methods of precipitation from the atmosphere of dangerous gaseous and dispersed substances by artificial rainscavenging.

The pollution zone is monitored with the establishment of its dimensions, geographical coordinates, the height of the lower and upper limits, the chemical composition and the quantitative composition of pollutants, the dispersion of the polluting aerosol and meteorological parameters in the pollution zone.

Space satellites, manned and unmanned aerial vehicles, ground mobile and stationary vehicles can be used as means of monitoring. The prepared monitoring results are sent to the management decision-making support system, where, based on the received data, using a developed set of calculation tools, precipitation intensity is predicted, which determines the rate of pollution removal from the lower atmosphere.

The head of the pollution elimination process decides on the methods of impact and delivery of droplet formation activators to the impact zone. There is a possibility of integrating new and promising both chemical and physical methods of artificial influence on atmospheric processes into the developed method of minimizing the harmful effect from an emergency situation for atmospheric air.

#### Will not be presented

Keywords: Pollution zone; man-made emergency situations; artificial rainscavenging

#### Biography - Maksym Kustov



Col. Dr. Kustov Maksym, Head of Scientific Department on Problem of Civil Protection and Technogenic-Environmental Safety, National University of Civil Protection of Ukraine. In 2006 graduated from the National University of Civil Protection of Ukraine and received a master's degree in fire safety. He worked as a fire brigade commander. In 2010, he received a Ph.D. in fire safety for the development of new fire extinguishing compositions. From 2010 to 2021, he was involved in the organization and training of command personnel for the CBRN teams. In 2019, he received the degree of Doctor of Technical Sciences, specializing in Civil Protection

for the development of a system for the deposition of hazardous chemical and radioactive substances from the atmosphere. At the moment, he is the scientific supervisor of several scientific programs and international grants, which are carried out at the university as well as Ph.D. students. The main scientific interests are the liquidation of major CBRN accidents, crisis management, and training of rescuers.

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

#### Mariusz Urban<sup>1</sup>

<sup>1</sup>Polish Border Guard, Nadwislanski BG Regional Unit, Warsaw, Poland \*Corresponding Author: Mariusz Urban, mariusz.urban@strazgraniczna.pl or murban7476@gmail.com

#### Abstract

Every year, many radioactive dangerous goods are transported through the Polish border. Awareness of the personnel who handle these materials is very important. There can happen incidents, not intentional, f.e when a 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 Zaporozhye. 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 uniformed 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 the 90's is now more than 30 years starting from the Czarnobyl catastrophe. 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

#### Will not be presented

#### **Biography - Mariusz Urban**



Cpt. BG Mariusz Urban graduated in history from Nicolaus Copernicus University in Toruń (2002). Postgraduate in CBRN Security Manager in the 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 officer 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 the

National Security Department of War Studies University in Warsaw (since 2021).

Previously, he was, among other positions, assistant in the Faculty of Political Science and International Studies, University of Warsaw. He participated in the research project EU-SENSE (European Sensor System for CBRN Applications) as a member of the CBRN group AIRPOL Agency. Member of the Committee I3M 2021-The 13<sup>th</sup> 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.

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

#### Prof. Olena Khrystych\*, A. Korohodska

 \* National University of Civil Protection of Ukraine, Department of special chemistry and chemical technology, 94 Chernyshevska str., Kharkiv, Ukraine
 National Technical University «Kharkov Polytechnic Institute», Department of general and inorganic chemistry, 2 Kyrpychova str. Kharkov, Ukraine
 \*Corresponding Author: Olena Khrystych, Email: <u>el-green@ukr.net</u>

#### 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.

#### Will not be presented

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 in the Department of Ceramics, Refractories, Glass and Enamels Technology and received a specialty as a chemical engineer. From 2001 to 2008, she worked as 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. Her main scientific interests are the special materials for protection 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.

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

#### Dr. Mariam Tabatadze

*Hydrometeorological Institute of Technical University of Georgia, Tbilisi, Georgia, E-Mail:* dr.m.tabatadze@gmail.com

#### 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  $HQ_{dw} > 1$ ), 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

#### Will not be presented

#### 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.

## 7. Academic and Nongovernmental education and research activities in the field of the nuclear security and nonproliferation in Georgia (on the example of the CCDS)

#### Irakli Mchedlishvili

Board Member, Civil Council on Defense and Security (CCDS), Tbilisi, Georgia E-mail: <u>e.mchedlishvili@gmail.com</u>

#### Abstract

The purpose of this presentation is to review academic and non-governmental (NGO) education and research efforts in the field of nuclear security and nonproliferation in Georgia; outline prospects of future developments of this sector and introduce possible options for further international cooperation.

To begin, the presentation will examine the regional context and recent advancements in nuclear security and nonproliferation from Georgia's perspective. Additionally, it will delve into the government's efforts and policy developments in this field. The presentation will highlight the contributions made by Georgian academic and non-governmental organizations in this domain.

A particular focus will be given to the education and awareness programs on nuclear security and nonproliferation conducted by the CCDS. This will include an in-depth look at their tools, such as STATIONARY and MOBILE interactive maps used to monitor background radiation. The presentation will also review CCDS's publications and highlight their conference and network activities, specifically the Tbilisi Regional Stability Forum. This forum

brings together governmental representatives and experts from regional countries, primarily from the Caucasus and Black Sea regions, as well as the EU and the US.

At the conclusion emphasis will be placed on the significance of academic and non-governmental initiatives in nuclear security and nonproliferation. These efforts are integral to a country's national and international security objectives. The presentation will underscore the role of international cooperation among academic and nongovernmental organizations as a means of empowerment of their capabilities.

#### Will not be presented

#### Biography - Irakli Mchedlishvili



Since 2005 Irakli Mchedlishvili is a co-founder and executive board member of the Civil Council on Defense and Security (CCDS), Tbilisi, Georgia. In the frames of CCDS he is involved in Research and education programs in the field of Nuclear Security, Radiation Safety and Nonproliferation. Before Irakli Mchedlishvili was working for different Georgian NGOs and Think Tanks on Defense and Security Sector democratic reformation, NATO integration, issues of regional cooperation and stability. For a short period, he also worked for the Committee on Foreign Relations of the Parliament of Georgia. Irakli Mchedlishvili graduated from the Faculty of Physics of the Tbilisi State University. In 2009-2016 He was also involved in the work of the

Combating Terrorism Working Group of the NATO Partnership for Peace (PfP) Consortium of Defense Academies and Security Studies Institutes based in the Marshall Center, Garmisch-Partenkirchen, Germany, while in 2001 -2003 he was a Co-Chairman of the Southern Caucasus Regional Stability Study Group and the member of the Secretariat Working Group of the PfP Consortium. Irakli Mchedlishvili is an author of various articles on international relations and national security issues. He is an editorial board member of the books: "Evaluation of Parliamentary Powers Related to Oversight of the Defense Sector in Georgia" and "Georgia's Nuclear Odyssey: The Path from Soviet Atomic Legacy to Global Nonproliferation Regime".

#### 8. Remote Detection of CBRNE Threats with use of Unmanned Vehicles

Bartłomiej Jankiewicz<sup>1\*</sup>, Bartosz Bartosewicz,<sup>1</sup> Bogusław Budner,<sup>1</sup> Miron Kaliszewski,<sup>1</sup> Krzysztof Kopczyński,<sup>1</sup> Malwina Liszewska,<sup>1</sup> Jarosław Młyńczak,<sup>1</sup> Maksymilian Włodarski,<sup>1</sup> Martin Sabo,<sup>2,3</sup> Mateusz Szala<sup>4</sup> <sup>1</sup>Institute of Optoelectronics, Military University of Technology; gen. S. Kaliskiego 2, Warsaw, Poland <sup>2</sup>Slovak University of Technology in Bratislava, Ilkovicova 2, Bratislava, Slovakia <sup>3</sup>MaSa Tech, s.r.o.; Ilkovičova 2, Karlova Ves, Bratislava, Slovakia <sup>4</sup>Faculty of Advanced Technologies and Chemistry, Military University of Technology; gen. S. Kaliskiego 2, Warsaw, Poland

\*Corresponding Author: Bartłomiej Jankiewicz, bartlomiej.jankiewicz@wat.edu.pl

#### Abstract

Military personnel and first responders widely use unmanned Ground and Aerial Vehicles (UGV and UAV) in various missions. The main advantages of using UGV and UAV include reduced risk for personnel, small size, lower cost of acquisition and operation than existing manned platforms, and flexible and reconfigurable payloads, which can be adjusted to specific mission types. The use of UGV and UAV in missions focusing on detecting CBRNE threats is a subject of many activities worldwide, including EU and EDA R&D projects. In this presentation, we report the results of our studies and tests carried out within national and international projects on developing CBE sensors for unmanned platforms.

The remote detection and identification of IEDs components during route clearance operations with the use of unmanned vehicles were one of the main goals of the project "CONFIDENT - Confirmation, Identification and

Airborne Early Warning of (CBRN) IEDs carried out in the frame of EDA Programme on IED Detection (IEDDET). The IOE MUT team's focus in the project was the development of chemical and explosives detection systems allowing for the remote detection of explosives used for preparing IEDs and potential chemical payloads. The bioaerosol point detection system for UGV was developed in the project "SFORA - Mobile laboratory for environmental sampling and identification of biological threats funded by the National R&D Centre. Finally, the potential of CBRNE detection on unmanned platforms is further explored within the project "Strengthening CBRNE safety and security - Coordination and Standardization" implemented under the Norwegian Financial Mechanism.

Acknowledgements: The project "Strengthening CBRNE safety and security - Coordination and Standardization" is financed by the Programme "Home Affairs" implemented under the Norwegian Financial Mechanism for 2014-2021.

Keywords: CBRNE Detection; Remote Detection; Unmanned Vehicles

#### Will not be presented

#### Biography – Bartłomiej Jankiewicz



Bartłomiej Jankiewicz is a scientist at the Institute of Optoelectronics at the Military University of Technology (MUT) in Warsaw, Poland. He gained his MSc in chemistry, specialty CBRN protection, in 2004 (MUT) and PhD in chemistry in 2008 (Purdue University). His research focuses on fabrication of plasmonic nanostructures for various applications including CBE-sensing by using surface enhanced spectroscopies. He is and was involved in various

national and international projects and activities related to DIM of CBE agents. He represented Poland as a CapTech National Coordinator (CNC) and CapTech Governmental Expert in Capability and Technology group of the European Defence Agency focusing on CBRNE Protection & Human Factor topics.

#### 9. Civil Society and Volunteer Organizations' Response to Nuclear Accidents in Ukraine

#### Natalia Klos

*Nuclear security expert in State Nuclear Regulatory Inspectorate of Ukraine* Email: <u>klosnataliia@gmail.com</u>

#### Abstract

Over the past 100 years, Ukraine has been almost the only country with a developed industry and one of the leading countries in the world, ranking 7th in terms of electricity production by nuclear power plants. The conventional war unleashed by the Russian Federation has brought new threats. Russia attacked and occupied Zaporizhzhya NPP. The principles of nuclear and radiation safety and physical protection were violated. The facility is being operated with violations, including with an insufficient number of personnel. Ukraine and international observers have recorded the presence of a significant amount of military equipment and explosives on the territory of the facility. The area around the facility has been confirmed to be mined. Ukrainian intelligence notes that critical facilities at the nuclear power plant and the cooling pond are mined. In this vein, the explosion of the Novo-Kakhovka HPP by Russian troops has increased the risks of safe operation of the NPP and raised the risk of ZNPP explosion.

There are many prerequisites that confirm the development of such a scenario, based on the previous experience of observing Russia's actions. For example, Rosatom personnel were withdrawn from Enerhodar, the satellite city of ZNPP, and the personnel who had suspended their contracts with the Russians. In the information space of the Russian Federation, the main media channels spread information that the Ukrainian authorities are preparing a terrorist attack on the ZNPP.

This is a common, proven tactic of Russia when they want to shift the blame for some actions to the Ukrainian side. About a month before, the Russian population began to prepare to find the guilty party. These and other events, together with intelligence from the Ukrainian side, led to active preparations by the Ukrainian authorities for a possible nuclear accident.

The only consolation is that at least 5 units are in cold shutdown, and the consequences of a nuclear explosion will not be as catastrophic as in the case of the Chernobyl accident. At the same time, without access to the facility, it is difficult to predict what exactly might happen. The explosion, including of the dry spent fuel storage facility, will also not bring anything good.

The authorities have announced training exercises in the region to eliminate the consequences of the accident, and the media are disseminating information about a possible terrorist attack and recommendations to the public on how to behave in the event of a radioactive accident. Also, in the event of a ZNPP explosion, a 50-km exclusion zone and mandatory resettlement have been announced. This zone includes, for example, the town of Zaporizhzhia and other smaller towns, which is somewhere around a little over a million people, not including the military.

The cities of Dnipro, Kryvyi Rih, and Melitopol are also affected, which is up to another three million people. With so many people in need of assistance, self-organization of the population and volunteer movements are gaining significant importance, playing a significant role in meeting the needs of people at this time. The existence of a highly motivated self-organization of the population is not taken into account in the existing response systems. Volunteer organizations have been actively created since 2014, and since 2022 they have expanded and become a significant driving force in assisting the state in responding to and eliminating the consequences of emergencies. The nuclear sphere is specific and requires knowledge of how to deal with them. Ukraine already has the experience of the Chornobyl disaster, so the reaction of an average citizen is tied to past experience and causes a lot of fear, belief in myths and retold stories.

It's not so much radiation that kills, but the fear of it and the panic it causes. In my presentation, I will talk about the experience of conducting training and awareness courses for volunteer organizations on how to behave in the event of a radiological accident and how to cooperate with the authorities. Explaining to the public why these

other events are taking place, and how to behave and what to expect. Against the backdrop of hostilities and constant rocket attacks from Russia, this is many times more difficult. At the same time, the Ukrainian population is quite resilient to all kinds of emergencies and is ready to help each other at the highest organizational level.

#### Will not be presented

#### Biography – Natalia Klos



Natalia Klos is a Coordinator of the Black Sea Women in Nuclear Network.

She is a nuclear security expert with 19 years of experience in the field of physical protection, including at the IAEA, the State Nuclear Regulatory Inspectorate of Ukraine, the Ministry of Energy of Ukraine and the Ministry of Internal Affairs of Ukraine. Nataliia holds a Master's degree in Nuclear Security and Public Administration, and fellowship program at the James Martin Center for Nonproliferation Studies, Monterey, California, USA, Co-Chair of the Initiative

Sharing Initiative on Assistance to Ukraine in Radiation and Nuclear Security within the Global Partnership Against Spread of Weapon and Material of Mass Destruction in 2017-2022.

Permanent Representative of Ukraine on the Global Partnership meetings in 2015-2022. Chairwoman of Working Group No. III Promoting the Development of Nuclear Security in IAEA International Nuclear Security Education Network (INSEN).

IAEA IPPAS mission, nuclear security culture expert. Founder of the Nuclear Security master's degree program in NTUU "Igor Sikorsky Kyiv Polytechnic Institute" in 2019. IAEA expert on security culture. Research area: SMR, security culture, countering insider threats, cybersecurity and illicit trafficking of radioactive materials.

## **10.** Georgia's experience in national coordination and building resilience towards emerging CBRN threats

#### Ms. Mari Lursmanashvili

State Security Service of Georgia, Head of CBRN Regional Secretariat for SEEE Region, Georgia

#### Abstract

This presentation reviews the author's long experience in building national and regional coordination and partnerships across governments and CBRN national teams, and discusses the accomplishments and issues encountered in this process. The presenter will showcase Georgia's experience in developing national CBRN Threat Reduction Strategies and action plans as well as country's effort in building national resilience towards emerging CBRN threats (incl. consequences of Covid-19 and the war in Ukraine).

The author will highlight the work of the Georgian government's Interagency Coordinating Council for Combating CBRN Threats that is regarded as a successful model for interagency coordination in Eastern Europe and beyond.

She will also present examples on what comes next after developing national CBRN security plans and share valuable lessons for other countries on implementation tools.

The presentation will also review the recent work of regional stakeholders in the Balkans and Black Sea region on CBRN Regional Action Plan and common priorities, and how these countries work together through joint projects and initiatives to achieve goals outlined for CBRN safety and security.

The author will also discuss success stories and regional cooperation of Black Sea countries on strengthening capabilities of intelligence officers to counter RN smuggling.

Keywords: Georgia, CBRN, National Action Plans

#### Biography - Ms. Mari Lursmanashvili



Ms. Lursmanashvili has a 25+ year career, most of which she worked in WMD nonproliferation and security-related industries. Currently, she represents the State Security Service of Georgia (SSSG) and is a primary focal point for the government of Georgia's Interagency Coordinating Council for Combating CBRN Threats, leading the interagency coordination of CBRN programs and supporting bi-lateral and multilateral cooperations for Georgia. In 2019 Ms. Lursmanashvili was nominated by the government of Georgia as a Head of Regional Secretariat of the South East and Eastern Europe (SEEE) for the European

Union's CBRN Risk Mitigation Centres of Excellence (CoE) initiative. In this capacity, she supports planning and implementation of regional initiatives, projects and exercises among 10 partner countries of the SEEE region and is a well-recognized professional across the regional and international CBRN communities. She is also a lead on the CBRN Initiative under the Substantial NATO-Georgia Package.

Before joining the SSSG, for almost a decade, Ms. Lursmanashvili worked on the US DTRA-funded Cooperative Threat Reduction (CTR) programs in Georgia and other former Soviet Union countries. In 2014 she supported the organization of the CSCM Congress in Tbilisi, Georgia, when the agreement on transition of the Collaborative Biological Engagement Program (CBEP) was signed between Georgia and the US.

## **11.** Future Biological Threats – Re-examining the role of Bacteriophages in Modern Biological Event Response

#### Dr. Mzia Kutateladze, PhD

Director, G. Eliava Institute of Bacteriophages, Microbiology and Virology, Tbilisi, Georgia

#### Abstract

The origins of the COVID-19 pandemic remain unclear. Did the SARS-CoV-2 virus emanate from a zoonotic source in a Wuhan animal market, or did it escape from a laboratory?

Was the strain deliberately engineered as a threat agent?

Or was it released inadvertently - or deliberately - by a lone rogue actor?

Origins aside, the world must address the consequences, and plan to improve its collective response to the next pandemic. In addition to viruses, the CBRN community is facing perhaps its most dangerous threats in the evolution and spread of infectious diseases caused by multidrug resistant bacteria. The wide, uncontrolled use of antibacterials (including antibiotics) is principally responsible for a worsening situation. The search for effective alternatives for treatment is broadening, and the health community is re-examining the role that could be played by bacteriophages, or phages.

Bacteriophages – viruses that specifically kill only host bacteria can be effective remedies against multi-drug resistant pathogens. Phage application and treatment has a long history in the FSU, and even received renewed interest by the Western defense community which are working in parallel with health authorities to develop phage-based approaches to fight bacterial infections. Phages can be used for animal and plant protection, as well, and thus are quite compatible with the current One-Health concept. The presentation examines coming changes in phage use in the global health environment.

Keywords: Bacteriophages, antibacterial agent, antimicrobial resistance

#### Biography – Dr. Mzia Kutateladze



Dr. Mzia Kutateladze Dr. Mzia Kutateladze represents the world-renowned G. Eliava Institute of Bacteriophages, Microbiology and Virology, headquartered in Tbilisi, Georgia. Currently, she is the Director of the Eliava Institute, as well as the President of the Eliava Foundation, a collection of commercial spinoffs.

She oversees, coordinates and manages the research directions and programs of the Institute. She is the author or co-author of more than 80 scientific papers. Her scientific background is in microbiology and molecular biology, bacteriophage research and

application. Dr. Kutateladze was a manager and a leading scientist of a number of scientific research projects. She is serving as a project and papers reviewer for national and international funding agencies and scientific journals.

## **12.** Are we prepared? Medical response to incidents involving toxic chemicals; The OPCW and strengthening preparedness and response capacity of its member states

#### Dr. Shahriar Khateri, MD, PhD

Medical Toxicologist, Chemical Emergency Response Expert, Nikan Hospital, Tehran-Iran

#### Abstract

As long as there is a possibility of the use or threat of use of chemical weapons, deliberate release or incidents involving toxic chemicals, there will be a need to maintain and improve the protective capabilities of all countries in

terms of their domestic preparedness and response and their ability to assist other countries. Such enhanced capabilities exert an important deterrent effect. Medical response as an integrated part of chemical emergency response has to be included in any capacity building program to ensure preparedness of medical responders and medical facilities to deal with chemical emergencies particularly in mass casualty incidents. Even though medical responders are expected to be able to provide care for patients during chemical incidents however; they should also know how to protect themselves as the first priority to prevent their own exposure as well as secondary contamination, this would require sufficient training and equipment.

Medical facilities and emergency departments should also be prepared for dealing with chemical casualties including decontamination stations and a comprehensive disaster plan to include a CBRN component. Once these tasks are taken care of, in the higher level of preparedness, the key questions are: have responsibilities for the chemical emergency tasks including medical care of casualties been assigned through legislation or other binding policy, are the institutions having such responsibility aware of their role? Have the institutions with responsibility for medical response practiced their role? And if so, have they identified any capacity gaps or unresolved challenges to carrying out their legal mandate? If so, what are they?

The Organisation for the Prohibition of chemical weapons provides support to its member states to enhance their capability on chemical emergency response through capacity building programs as well as providing expert and technical advice. The organisation also works closely with several regional and sub-regional organisations to enhance their capacity to respond effectively to chemical emergencies. This presentation is going to provide an overview on the role of the OPCW as an international organization in strengthening the capacity of its member states in preparedness and responding to incidents involving chemical warfare agents and other toxic chemicals.

#### Biography - Dr. Shahriar Khateri



Dr. Shahriar Khateri is a physician and "Chemical Emergency Response" specialist currently based in Tehran-Iran. He has extensive experience in clinical aspects of long term health effects of exposure to CW agents, medical management of CW casualties as well as rehabilitation of the CW victims. Dr. Khateri received his MD degree from Beheshti University of medical sciences in Tehran-Iran and his PhD in Medical Toxicology from Institute of Cellular Medicine, Newcastle University, United Kingdom. He worked for the Organization for the Prohibition of Chemical

Weapons (OPCW) in the Hague as Senior Program Officer, International Cooperation and Assistance Division from 2014 to 2021. Currently he is in charge of organizing national and international training courses on medical management of chemical casualties as well as providing expert advice on CBRN emergency response. Before joining the OPCW, he worked in the field of "war and Public health" for over 15 years dealing with the war related injuries among the survivors of Iran-Iraq war with focus on chemical warfare survivors. As senior researcher and head of a research unit on CW health impacts at JMERC<sup>1</sup>, he was involved in various clinical and epidemiological research projects addressing the long-term health impacts of chemical warfare agents as well as victims assistance programs, He has also been involved in local and international NGO activities including on CW victims' support, peace and disarmament. He is co-founder and head of International relations of the Tehran Peace Museum, a non-governmental organization with the aim of raising public awareness about the effect of chemical weapons as well as providing support for victims of chemical warfare. Dr. Khateri has several publications on health and environmental impacts of war with focus on chemical weapons and landmines.

## **13. Testing Technologies for Personnel Dry Decontamination of Radiological Contaminant in Extreme Cold Environments to Increase Human Survivability**

#### COL. Lien Senchak MD

AFRRI US, Armed Forces Radiobiology Research Institute Uniformed Services University of the Health Sciences, USA

#### Abstract

#### Summary:

An incident where radiological agents are released into the air is a serious threat and hazard for military forces and civilians in the operational environment. The events can range from an industrial accident or accidental release of radiological particulate into the environment from an intentional terrorist attack or adversary use of a nuclear or radiological weapon. Casualties may present with conventional traumatic injuries, burns and/or radiological contamination on skin and clothing. Decontamination should be performed immediately if there are no life-threatening injuries. Standard decontamination procedures use a water-based solution which poses logistical challenges of transportation of water tanks, equipment and a water source readily available. However, in extreme cold weather environments snow and ice create additional logistical challenges as well as risk of lowering core body temperatures causing casualties to experience cold shock or hypothermia. Various dry technologies such as a wipe, spray or vacuum have been developed to expand the operational temperatures that can be used to safely and adequately decontaminate casualties in extreme cold weather, especially when water-based systems are not a viable option for use in humans due to the high risk of hypothermia. Our objective was to test the various dry technologies for efficacy and ease of use in removing dusty radiological contamination in extreme cold temperatures.

#### Methods-Results:

Our purpose was to collect independent performance data of dry decontamination technologies in a range of low temperatures as an alternative to water-based systems. We performed the experiments using dead pig skin as simulant to human flesh and an adherent non-radioactive simulant to represent radiological fallout. A key performance data point was adequate reduction of contaminate on the pig skin (1 x 1"and 3 x 7" samples) and time to complete decontamination within a set time frame. This time limit for self-decontamination of ambulatory casualties is 3 minutes and non-ambulatory casualties is 9 minutes. The technologies were tested at 3 prescribed temperatures of (65F, 35F and 5F) using the radiological simulant at concentrations of (10g/m2, 5 g/m2, and 2 g/m2) and measuring residual contaminate by utilizing several detection sensors (laser particle, microscope, X-ray fluorescence, and high-speed camera analysis). The technologies tested included an alcohol-based wipe, carbon embedded fiber wipe, spray, and HEPA vacuum. Initial testing showed that there is no significant impact of temperature on the efficacy of the technologies. Temperature only drives the decision to use dry decontamination instead of water-based systems when the temperature is below 35 degrees F. The results utilizing 60 data points showed the most effective technology was the carbon embedded fiber wipe and the HEPA vacuum, with efficacy of 82% and 79% respectively. The less effective technologies include the spray which showed no significant change between the samples and alcohol-based wipe with efficacy of 61%.

#### Conclusions:

The carbon embedded fiber wipe showed no significant difference in efficacy when compared to the HEPA vacuum. The performance of the two technologies is identical in the full range of temperatures and concentrations. The technology proved robust with changing temperatures and demonstrated consistent performance and efficacy. Final phase of testing involving large scale operations in the field performed in Alaska. Points of measure included rate of processing contaminated casualties in both an ambulatory and non-ambulatory setting, ease of training and use, durability, and waste management.

#### **Biography - COL. Lien Senchak MD**



COL Lien Senchak is a Medical Doctor specializing in Diagnostic Radiology. She graduated with a medical degree from the State University of New York at Buffalo in 2004. She subsequently completed her residency in 2009 at Tripler Army Medical Center in Honolulu, HI. Her tours included serving as Officer in Chief at Joint Readiness Training Center Fort Polk, LA in 2010 followed by head of the ultrasound department at Joint Base San Antonio in Texas in 2011. During which time she deployed to Afghanistan and served as Officer in Chief of Diagnostic Radiology at a Role 3 Combat Support Hospital at Camp Dwyer in

Helmand Province Afghanistan in 2012. She completed a fellowship in Musculoskeletal Imaging at the American Institute of Radiologic Pathology at Washington Hospital Center in 2013 followed by serving as Department Head of Musculoskeletal Radiology at Walter Reed National Military Medical Center from 2013-2019. She then served as the department head of Military Medical Operations at the Armed Forces Radiobiology Research Institute (AFRRI) for 4 years before transitioning to her current role as Director of the Office of Strategic Operations at AFRRI in Bethesda, MD. The primary functions of her office include developing relationships, establishing a connection in order to exchange scientific knowledge to prepare global partners and allies to better respond to a nuclear radiological threat.

#### 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:* <u>morinengumi@gmail.com</u>

#### 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 war stricken 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 through 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 a 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.

## **15.** Development of amperometric and impedimetric based biosensors for the detection of *Bacillus anthracis* spores

Zahir Kilic<sup>1</sup>, Ebru Saatci<sup>2</sup>, Levent Kenar<sup>\*1</sup>, Mesut Ortatatli<sup>1</sup>

<sup>1</sup>University of Health Sciences, Medical CBRN Department, Institute of Health Defense Sciences, Ankara, Turkey <sup>2</sup>Erciyes University, Faculty of Science, Department of Biology, 38039, Kayseri, Turkey Corresponding Author: Mesut Ortatatli, mortatatli@gmail.com

#### Abstract

Due to the importance of *Bacillus anthracis* in biological warfare agents, the fast and sensitive detection of its spores is crucial in all ways. Several biosensor methods are currently being developed to detect *B. anthracis* spores. Especially electrochemical immunosensors take the most significant part of this area. In our study, a newly developed amperometric immunosensor was designed to develop *B. anthracis* spores with a combination of magnetic beads and multiplex screen printed electrodes.

In this method, changes in current intensity resulting from oxidation and reduction in the working electrode are measured directly to the spore concentrations. In addition, signals from amperogram curves were used to draw standard graphics in inactive and live spore concentrations. Besides, another highly sensitive impedimetric

immunosensor was developed. For amperometric immunosensor, a standard curve was formed in the method by testing the number of live spores between  $2x10^2 - 2x10^4$  spores/ml concentrations.

Current changes were taken under an applied potential and, LOD and LOQ values were found to be 92 and 272 spores/ml, respectively. For an impedimetric immunosensor, the measurement range was found to be  $1x10^2 - 1x10^4$  spore/ml. LOD and LOQ values were 55 and 154 spores/ml, respectively. It was shown as CV% =2.59. No cross-reactions were seen for *Bacillus subtilis, Bacillus cereus* and *Bacillus thuringiensis* spores.

As a result, it is shown that the designed CBRN agent Anthrax immunosensor has high sensitivity and selectivity with fast results. Furthermore, the immunosensor can also be miniaturized to detect live spores in the field with high accuracy.

Keywords: Bacillus anthracis, Amperometry, Impedance, Immunosensor

#### Will not be presented

#### Biography – Dr. Mesut Ortatatli



He was born in Konya-Turkiye on 24 February, 1970. In 1994, he was awarded an MD degree upon graduation from Gulhane Military Medical Faculty, Ankara. He worked as a general practitioner in Antalya between 1995-1997.

He became Specialist MD in Infectious Diseases and Clinical Microbiology in 2002. Thereafter, he earned a PhD degree in Medical CBRN Defense in 2006. He worked as

Specialist MD in Infectious Diseases and Clinical Microbiology in Antalya between 2007 and 2009. Since 2009 he has been working as Assistant Professor at department of CBRN defense in University of

Health Sciences, Ankara Turkey.

His research interests have broadened recently beyond microbiologic diagnostic techniques applications to molecular biology and biosensor related projects for detection of biological and chemical warfare agents. He is married and has two sons.

#### 16. Respiratory function 34 years after sulphur mustard exposure in survivors in Sweden

Dr. Faraidoun Moradi<sup>1\*</sup>, Sanna Kjellberg<sup>1</sup>, Ying Li<sup>1</sup>, Bledar Daka<sup>1</sup>, and Anna-Carin Olin<sup>1</sup>

<sup>1</sup>School of Public Health and Community Medicine, Institute of Medicine, Sahlgrenska Academy, University of Gothenburg, Sweden

\* Correspondence: Faraidoun Moradi, faraidoun.moradi@gmail.com, E-mail: moradi.faraidoun@gu.se

#### Abstract

#### Background:

Sulfur mustard (SM) exposure causes acute and chronic respiratory diseases. The extent of small airway dysfunction (SAD) in individuals exposed to SM is unclear. This study evaluated and compared SAD in SM-exposed versus SM-unexposed participants using non-invasive lung function tests assessing small airway function.

#### Methods:

This retrospective cohort study involved SM-exposed (n=15, mean age:  $53\pm8$  years) and SM-unexposed (n=15, mean age:  $53\pm7$  years) Kurdish-Swedish individuals in Sweden. Small airway resistance and reactance were assessed using impulse oscillometry (IOS). Nitrogen (N<sub>2</sub>) multiple breath washout (MBW) was used to assess lung ventilation inhomogeneity. The gas-exchanging capacity of the lung was assessed using the diffusing capacity of the lungs for carbon monoxide test. Lung function outcomes were reported as absolute values and z-scores. Group comparisons were performed using the Mann-Whitney U test. **Results**:

No statistically significant differences in age, height, or body mass index were observed between the two groups. IOS identified significantly increased small airway resistance, while N<sub>2</sub> MBW identified significantly increased global and small airway ventilation inhomogeneity in SM-exposed compared to non-exposed individuals. SAD was identified in 13/15 SM-exposed individuals, defined as at least one abnormal IOS (FDR and/or AX) or N<sub>2</sub> MBW (S<sub>acin</sub>) outcome. Out of these 13 individuals, only four individuals demonstrated concordant findings across the IOS and N<sub>2</sub> MBW tests.

#### Conclusions:

Exposure to SM was associated with long-term impairment of respiratory tract function in the small airways in the majority of previously SM-exposed individuals in the present study. Whether they are at risk of further deterioration and lung disease is unknown, but to explore this would be of great interest. IOS and N2 MBW seem to give complementary information hence both should be employed to detect SAD in SM-exposed survivors. To identify and characterize the remaining pathology of the small airways in SM survivors is a first step towards improved treatment and follow up.

**Keywords**: Small airways, Oscillometry, Multiple Breath washout, Pulmonary Disease, Sulfur Mustard, Halabja

#### Biography – Dr. Faraidoun Moradi



I am a clinician-researcher at the Institute of Medicine and is also connected to a Centre for disaster medicine, Kunskapscentrum katastrofmedicin väst, based at the Institute of Clinical Sciences, Sahlgrenska Academy at the University of Gothenburg. I obtained my medical degree from the prestigious University of Gothenburg in 2012, specializing in Family Medicine.

I also hold a license as a pharmacist from the renowned University of Uppsala in 2006. With a passion for research, I embarked on a Ph.D. journey investigating sulfur mustard's long-term effects. My research involves conducting interviews, surveys, and medical examinations to gather comprehensive data on the survivors' experiences and health outcomes.

Using a combination of qualitative and quantitative approaches, my research aims to shed light on the long-term consequences of exposure to sulfur mustard. Specifically, I am dedicated to examining the firsthand experiences, mental well-being, quality of life, and respiratory function of individuals exposed to sulfur mustard in Kurdistan-Iraq and Sweden.

#### 17. A citizen monitoring network - a pilot project proposal and subject for discussion

#### Ivica Prlić

Mladen Hajdinjak<sup>2</sup>, Zdravko Cerovac<sup>3</sup>, Luka Pavelić<sup>1</sup>, Mihovil Jurdana<sup>1</sup>, Jerko Šiško<sup>1</sup> <sup>1</sup> Institute for Medical Research and Occupational Health, 10001 Zagreb, Croatia, iprlic@imi.hr <sup>2</sup> Haj-Kom LtD, 10000 Zagreb, Croatia, <sup>3</sup> Alara instruments LtD, 10000 Zagreb, Croatia

#### Abstract

Public interest in policy decisions of a complex, technical nature, in particular in the field of technologies which use ionizing radiation, has grown in recent years. Formal provisions for disseminating information to the public about proposed policies regarding the use of radioactive technologies are now commonplace. The proposed project should support further development of risk assessment and risk management approaches supported by technology, in particular telecommunication technologies, to cope with various accident scenarios arising from new and future nuclear radiological technologies and, especially, from new threats arising from war situations like in Ukraine. The further development of monitoring and dosimetry techniques is supported and above all, modern social, ethical and legal issues are to be taken into consideration. We are using state of the art project results of the ongoing "e-Schools pilot project <u>https://pilot.e-skole.hr/en/e-schools/project-description/</u> project performed in Croatia building up fast internet educational network of the country with the purpose of establishing a system for the development of digitally mature schools and to evaluate the application of ICT (information and communications technologies) in the educational and operational processes of 10% of schools in the Republic of Croatia.

Picked up schools will build the base of AI and big data technologies in radiological impact assessments compiling the databases that are required by AI technologies, with historic scenario information - including besides nuclear/radiological accidents, scenarios of new threats, such as war situations. Monitoring strategies with newly developed or upgraded mobile and advanced monitors, connected to an e-Schools fast internet networks relying also on citizen science approach and providing early detection of threats together with educational purpose in understanding radiation as a whole. The AED (Area electronic dosimeters) ionizing radiation monitoring devices together with the devices monitoring the nonionizing telecommunication electromagnetic spectrum are to be operational throughout all Croatian schools building up educational and independent emergency network and filling up big-data database enabling the development of indicators for resilience strategies solving social and psychological challenges for emergency actors and citizens and their impacts on the effectiveness of protective measures, legal basis and practical arrangements for emergency response and recovery.

The citizens in our pilot project proposal are children, pupils up to 18 years of age, the ones who need to be educated and prepared for future technological challenges to cope with societal resilience and novel ethical

considerations. In addition, discussion should help to point out the number of factors that determine whether information exchange between policy makers and the public is effective or ineffective. In the action research pilot project that is proposed, an attempt is made to improve a situation in which a serious deficiency in the information exchange process had developed and was revealed during the war in Ukraine.

Keywords: citizen monitoring, radioactivity, electronic dosimeters, network dosimeters, e-Schools, EMF

#### 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 dosimeters for radiation pulsed fields used in medicine. He collaborated in various project roles on a 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 the 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 Radioactive 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.

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

#### Ivica Prlić, L.Pavelić, S. Kobešćak

Institute for Medical research and Occupational Health, Unit for Radiation Dosimetry and radiobiology, 10000, Zagreb, Republic of Croatia, e-mail: <u>iprlic@imi.hr</u>

#### 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. The present geopolitical situation caused by the Russian invasion of Ukraine raises the need for energy source 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, mostly rural, sites with residue burden. The radiological risk estimation and shielding calculation simulation are to be performed in order to gain the possible construction which can be used as added value protecting the environment from additional NORM LL RadWaste by using these 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 professionals 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)

## **19.** Radiological protection education and training in Croatia

### Marija Surić Mihić\*, Zdravka Tečić and Antonia Bilić

Ministry of the Interior, Civil Protection Directorate, Radiological and Nuclear Safety Sector, Nehajska 5, Zagreb, Croatia

\*Corresponding author: <u>msuricmihic@mup.hr</u>

#### Abstract

As of 2014, the radiological protection education for radiation workers and radiation protection officers (RPOs) has been performed via e-learning system only. A practical training on implementation of radiation protection measures is not provided. The education, training and retraining for radiation protection experts (RPEs) is not available in Croatia as a formal systematic education so RPEs build their competences graduating PhD courses in Medical physics, attending available courses provided by the EU/EURATOM, IAEA or professional/scientific associations. In order to improve the radiological and nuclear safety in the country the Ministry of the Interior, Civil protection directorate, as a regulatory body in radiological and nuclear safety, within the framework of the IAEA Technical cooperation programme, participates in projects aimed to strengthen national capacities in radiological protection and safety.

In 2019, a curriculum for education and training of RPEs and RPOs was prepared in cooperation with the IAEA experts. In 2022, a national project proposal for establishing a national strategy for education and training in radiological protection, nuclear safety and nuclear security was submitted to IAEA for Technical cooperation Programme Cycle 2024-2025.

The current situation, needs and planned measures to improve the Radiation protection education and training in Croatia would be presented and discussed.

#### Biography – Dr. Marija Surić Mihić, PhD



Marija Surić Mihić was born in Zagreb. After completing her elementary and secondary education in Zadar, she studied experimental medical physics at the Faculty of Science, University of Zagreb where she received her BSc degree in experimental physics and earned her PhD degree in medical physics. From 2001 to 2005, she worked as a junior researcher at the School of medicine, University of Zagreb, and from 2005 to 2021 as a scientist at the Institute for Medical Research and Occupational Health in Zagreb.

In 2021, she earned the title of senior research associate in the field of public health and healthcare. Her major scientific interests were issues of human exposure to ionizing radiation in all aspects: occupational exposure during work with radiation sources, patient exposure in radiodiagnostic procedures as well as exposure of the population and biota from radionuclides in the environment. In 2018 she gained the status of radiation protection expert.

Since 2021, she has worked as a head of the Radiological safety department in the Civil protection directorate of the Ministry of the interior.

She is an author or co-author of 88 scientific and professional publications in scientific journals and proceedings of scientific and professional conferences, and she mentored graduate theses and doctoral dissertations.

As a member of the organizing or scientific committee, she participated in the organization of three national and two international congresses, where she was the editor of a book of abstracts of an international congress. She is an active member of several Croatian professional societies.

# 20. Radiological Contamination: Historical Uses and Novel Isotope Development for Emergency Response Training and Testing

Nick Mann\*1, Z. Heiden<sup>2</sup>, C. Hines<sup>2</sup>, S. Buntman<sup>3</sup>

<sup>1</sup>Idaho National Laboratory, National & Homeland Security, 1955 North Fremont Avenue, Idaho Falls, Idaho, USA. <sup>2</sup>Washington State University, Nuclear Science Center, 50 Round Top Drive, Pullman, Washington, USA. <sup>3</sup>Department of Energy/National Nuclear Security Administration, Independence Ave, SW, Washington D.C., USA. \*Corresponding Author: Nick Mann, nick.mann@inl.gov

## Abstract

The use of radioactive materials in training has a rich historical background dating back to the development of nuclear weapons during World War II. The potential dangers of radioactive materials (sealed and unsealed) necessitate that first responders are adequately trained in the event of a nuclear incident or radiological accident. The dispersion of actual radioactive materials for training is problematic due to their radiotoxicity. Radioactive materials exist in a wide variety of chemical forms with varying physical properties that prohibit their use other than as industrial sealed sources.

The successful adoption of useful surrogate radioactive materials for training depends on several characteristics. Surrogate materials must decay to stable or short-lived daughter isotopes that decay to stable, non-toxic isotopes.

The target matrices must be relatively inexpensive yet have a high enough purity to minimize the production of deleterious radioactive isotopes that are considered environmentally and biologically persistent.

To be useful as a training resource, surrogate radioactive materials should mimic radioactive particle and photon emission properties of known industrial radioisotopes that mesh well with first responder detection equipment. Idaho National Laboratory (INL) has been training U.S. first responders since 2009. Bromine-82, K-42 (Potassium Bromide) and Cu-64 have been successfully adopted as radioactive surrogates for outdoor large area contamination training. INL is currently evaluating additional isotopes for use in a national **indoor testbed**.

Keywords: Isotopes; Responders; Training

## Biography – Nick Mann



Mr. Nick Mann – Idaho National Laboratory

Mr. Mann began his career at the Idaho National Laboratory (INL) in 1997 as a separations researcher.

He has over 25 years of technical experience in the areas of chemical separations, solid-liquid separations and Radioactive Dispersal Device (RDD) research. He is credited with the development of live RDD dispersals for training and testing at the INL.

Mr. Mann currently serves as a RDD SME and instructor for the Emergency Response and Readiness program. Mr. Mann has authored or co-authored over 19 peer reviewed journal publications and conference proceedings. Authored 10 INL external reports and awarded 13 U.S. patents.

# 21. The cytotoxicity and reactivation efficacy of oxime reactivators against novichok inhibited acetylcholinesterase

## **Ondrej Soukup**<sup>2</sup>,

V. Hepnarova<sup>1</sup>, M. Hrabinova<sup>1</sup>, L. Pulkrabkova<sup>2</sup>, L. Muckova<sup>2</sup>, J. Korabecny<sup>1,2,</sup> Daniel Jun<sup>1</sup>

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#### Abstract

In recent years, so-called Novichoks receive worldwide attention. There are several types of novichok agent (e.g. A-234, A-232 etc). One type of Novichok was evaluated in our laboratory and its physical-chemical and biological properties were compared to well-known nerve agents such as sarin or VX.

Inhibition kinetics of human acetylcholinesterase and butyrylcholinesterase was determined. Further, the ability of standard oxime reactivators like HI-6, obiodoxime, methoxime etc. to restore the activity of both acetylcholinesterase and butyrylcholinesterase was assessed.

The results showed that low capability of currently available oximes to reactivate novichok-inhibited cholinesterase in vitro and some effect in vivo. Such results highlight the necessity of further development of effective antidotes or alternative approaches for post exposure therapy against novichok.

Considering the cytotoxic effect of organophosphates, the mechanism of cytotoxicity of the NAs, including Aagents, was confirmed to be ascribed rather to non-specific effects of OPs than to AChE-mediated effects and must be addressed in further research.

**Keywords**: Organophosphates, novichoks, oxime reactivators

## Biography - Ondrej Soukup



Ondrej obtained his PhD in 2011 at the University of Defence in Hradec Kralove. He became Assoc prof. and Professor in Toxicology in 2018 and 2023 respectively with the special focused on the military toxicology and fore mostly on nerve agent poisoning ant its treatment. Currently, he is the head of Biomedical Research Center (BRC), University Hospital Hradec Kralove, solving many research projects on various clinical topics as well as in the field of drug-development.

In particular, his research is focused on the evaluation of new therapeutics for Alzheimer's disease and organophosphorus poisoning, where biological properties of the new compounds, pharmacological and toxicological profile both *in vitro* and *in vivo* are determined.

He is author or co-author of 180+ research articles with over 2700 citations up-to-date.

# 22. Thermal burden of PPE and Non-invasive monitoring of core body temperature for responders

Dr. Pavel Castulik, Czech Republic, pavel.castulik@dekonta.cz

# Abstract

Thermal insulation properties of PPEs were evaluated on thermal manikin and microclimate conditions in PPE and physiology status were evaluated by the volunteers with purposely elevated core body temperature (CBT) for +38, 5 °C. Volunteers were monitored with a rectal probe and with a new non-invasive sensor; including skin temperature and heart rate wearing different PPE (air permeable, perspiration, isolation, ventilation) with define work-load and elevated environmental temperature (+5 to +35°C) and humidity.

It was concluded, that for a long-term and repeated use of PPE by the first receivers and responders the improvement of microclimate conditions inside of PPE is essential for sustainable protection of their health. In parallel also monitoring of the health status of end-users wearing PPE (heart rate and CBT) with non-invasive means will be beneficial.

## Will not be presented

## Biography - Dr. Pavel Castulik



Graduate in chemical technology engineering with specialisation on protection and decontamination against WMD/CBRNE from University of Defence in Czech Republic. He holds PhD in NBC defence & protection with specialization on decontamination. He has over 50 years working in the CBRNE community and has had multiple CBRNE commands and senior R&D positions, including at OPCW and EU CBRN CoE Initiative. He is lecturing at academic institutions, JCBRN CoE, Police School, and NATO School in Oberammergau and for courses abroad. He regularly contributes to national and international conferences. Currently he is R&D

Manager of DEKONTA, JSC responsible for R&D projects for physical protection means, decontamination technologies and training of responders. He is co-inventor of the patents on PPEs.

# **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 Adhoc 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.

# 24. Emerging biological threats disrupt both society and military operations

## Dr. Stef Stienstra

*Joint NATO CBRN-defense-Centre of Excellence, Vyskov, Czech Republic* Cdr(ret) Dr Stef Stienstra, <u>Stef@Stienstra.de</u>, Postbus 110, 6573 ZK Beek-Ubbergen, The Netherlands

## Abstract

Amongst all CBRN threats the bio-threat is the most invisible and neglected multi source threat. Originally the biological threats were from nature only, but the bio-threat emerges with travelling, climate change and human (criminal) activities.

Officially the BWTC (Biological Weapon & Toxin Convention) prohibits the use of biological agents in warfare, but it has a long history, starting with arrows impregnated with toxins. Both natural- and man-made biological threats are emerging. Both the monitoring of potential threats as the legislation about what to consider as illegal use of biological organisms or toxins as weapons are running behind.

In addition to the illicit use of biological substances, the hoaxes around possible biological attacks are increasing. As biological threats are invisible, the use of it in PSYOPS with fake news and behavioral influence, is a rising threat, which has a dangerous disruptive effect on the society as well. Not necessary directed against the population, but also towards cattle, agriculture, food industry and environment. To get better insight it is required to develop a bio-watch program to be able to monitor with high reliability potential biological threats. With innovative equipment and new analytical techniques this is feasible, but monitoring the trigger (base) level is still a challenge like the detection of unknown pathogens. The combination of gene analysis together with several spectrometric pre-screening techniques and lab-on-a-chip technologies enable to construct a bio-surveillance system, which protects society against disruptive biological incidents, natural or man-made, which we never can exclude in the world.

Keywords: Bio-surveillance; bio-detection; public health; communication

## Biography – Stef Stienstra



Stoffer (Stef) Stienstra Has a doctorate in both (bio)chemistry and medicine and just finished a 40-year career as officer of the Dutch Armed Forces as SME (Subject Matter Expert) CBRN in the end-rank of Cdr with the Royal Dutch Navy Reserve Special Forces. He is still lecturer at the NATO School in Oberammergau (Germany) and the Joint NATO CBRN-defense Centre of Excellence in Vyskov, Czech Republic on CBRN-related topics. Gives as visiting professor of the University of Rome Tor Vergata lectures for the University of Rome tor Vergata CBRN-MSc curriculum as well. He is also a specialist in Civil-Military Cooperation and has fulfilled several

(military) deployments in Asia and Africa. He has a diploma in 'Organization of IO's, UN structures and NGO's at the Harvard University, Cambridge MA, USA and many other post-doc courses. For the MoD he completed strategic special projects, like developing 'mission safety' and was co-author of the Dutch DefenseIndustry-Strategy. In 2014 he was member of the NKS (Nuclear Knowledge Summit) team at the NSS (Nuclear Security Summit) in The Hague. He continues working with this knowledge (and network) internationally for several medical-, biotech- and high-tech companies as a scientific advisory board member. He is senior advisor on public health and biodefense for the EU-financed ReSEMBiD project executed by Expertise France and other EU and/or UN supported projects including OSCE. He has 41 peer reviewed scientific publications, over 400 publications in professional literature and is the key inventor for three different patents (related to dermatology and blood cells).

# 25. Illicit Trafficking Attempt at Croatian Border Crossing

## Dr. Stela Popović

Ministry of the Interior, Civil Protection Directorate, Civil Protection Operations Centre, Unit for Radiological and Nuclear Emergency, Nehajska 5, Zagreb, Republic of Croatia <a href="mailto:spopovic5@mup.hr">spopovic5@mup.hr</a>; <a href="mailto:stela.popovic5@mup.hr">stela.popovic5@mup.hr</a>; <a href="mailto:stela.popovic5@mup.hr">stela.popovic6@mup.hr</a>; <a href="mailto:stela.popovic5@mup.hr">stela.popovic6@mup.hr</a>; <a href="mailto:stela.popovic5@mup.hr">stela.popovic6@mup.hr</a>; <a href="mailto:stela.popovic5@mup.hr">stela.popovic6@mup.hr</a>; <a href="mailto:stela.popovic5@mup.hr">stela.popovic6@mup.hr</a>; <a href="mailto:stela.pop">stela.pop</a>; <a href="mailto:stela.pop">stela.pop<

## Abstract

Illicit trafficking of radioactive materials is a potential threat to the security of the states and international security. The loss or unauthorized possession of nuclear material or nuclear waste can lead to serious economic and environmental consequences.

In the hands of terrorists or other criminals, radioactive sources could be used for malicious purposes. In EU neighboring former-Soviet Union countries, nuclear and radioactive materials have continued to appear on the black market since the early 1990s. As part of the effort to prevent smuggling of nuclear and radioactive materials, the US Department of Energy National Nuclear Security Administration through Second Line of Defense Program donated to the Croatian Customs Administration several Radiation Portal Monitors (RPMs) which were deployed on four Croatian border crossings.

On 12 September 2016, when trying to leave the Croatian territory, a vehicle with foreign license plates caused RPMs to trigger an alarm procedure at the border crossing Karasovici. Since Croatia is a tourist country where tourism revenues represent a significant portion of the state budget, the possibility that radioactive material was detected caused a great deal of attention of the professionals and the media.

The driver was sentenced to one year in prison, suspended over four years. This case is an example of successful cooperation and coordination of all response participants. The scenario at the Karasovici border crossing was used as the basis for the preparation of the National Preparedness and Response Plan of the Republic of Croatia.

Keywords: Illicit Trafficking; Response; Coordination

## Biography – Stela Popović



Ms. Stela Popović is currently the Head of Unite for Radiological and Nuclear Emergency, in Civil Protection Directorate Ministry of the Interior in the Republic of Croatia. Her education and vocational background is a medical doctor with a long national and international experience in public health activities, including surveillance over use and transport of radioactive material, emergency preparedness and response, inspection and international cooperation. As an external expert, she has contributed extensively to the IAEA publications, training courses and Missions.

# 26. Missing National CBRNe Strategy and National CBRNe Action Plan

Ivan Mašek, Prof. Otakar Jiří Mika, Jozef Sabol

Department of Crisis Management, Faculty of Security Management, Police Academy of the Czech Republic in Prague (Associate Professor), \*Corresponding Author: Prof. Otakar Jiří Mika, otakar mika@email.cz

Abstract

Current CBRNe security threats are also very important in the Czech Republic. It must be emphasized that the Czech Republic adequately deals with these serious security issues, it has prepared not only the necessary documentation, but also the forces and resources to quickly and reliably overcome such adverse events.

This paper provides expert discussion on the lack of a National Strategy and National Action Plan for protection against chemical, biological, radiological, nuclear and explosive (CBRNe) threats aimed at protecting the population and general preparedness for CBRNe issues.

Necessary improvement of the integrated chain of preventive, protective, rescue, mitigation, reaction, and recovery measures under the conditions of the Czech Republic. Academic reflections, professional discussions dealing with the above-mentioned areas in the Czech Republic with a presentation of important technical areas focused on CBRNe terrorism.

Conclusions and recommendations on how to improve the current situation, including proposals for basic methodological procedures of first responders. Basic information about a professional project at the Police Academy of the Czech Republic in Prague, which dealt with issues of CBRN preparedness and protection, with a focus on new progressive modern detection methods. Among other things, the output of the aforementioned security project was two certified methodologies. All three listed authors of this professional contribution worked on this project.

**Keywords**: CBRNe Threats, CBRNe Preparedness, CBRNe Protection, Integrated Rescue System, Typical Activities of Components of the 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.

# 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

# 28. Compact Rapid Chemical Agent Neutralization System: A Rapidly Deployable Method for Large Scale Chemical Agent Destruction

### T. Blades<sup>1</sup>, Robert J. Malone\*<sup>1</sup>, M. Marinelli<sup>1</sup>

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Corresponding Author: Robert J. Malone, robert.j.malone50.civ@army.mil

## Abstract

The Compact Rapid Chemical Agent Neutralization System (CRaCANS) is a patent-pending chemical agent neutralization technology under development at the US Army Chemical Biological Center since 2021. Modeled after the Field Deployable Hydrolysis System (FDHS) neutralization process that was used to destroy the Syrian Chemical Agent Stockpile in 2014, the CRaCANS is designed to be a chemical agent destruction technology that is more rapid and flexible than those historically used for large stockpiles. The CRaCANS deploys on a single 463L NATO pallet (108″x88″x80″) and is designed to destroy more than two tons of bulk or 48 projectiles/mortars (when paired with an access system) of chemical agent in 24 hours. With minimal logistical support requirements due to its onboard power source, heaters, air compressor and waste containers, the CRaCANS is fabricated to effectively destroy agent whilst maximizing the ease of operation, transportability, and ruggedness of the equipment. The US Army Chemical Biological Center is currently live agent testing the CRaCANS at Aberdeen Proving Ground to prove its capability to deploy and destroy chemical agents, including H, GB, VX, HD/L, and L. Approved for public release: distribution unlimited

Keywords: Chemical Weapon; Chemical Agent; Destruction; Disposal; Mobile; Portable

## **Biography - Robert J. Malone**



## Plans and Assessments Chief

Robert Malone is a subject matter expert in chemical agent operations, secondary waste processing, treatment technology selection, facility closure planning / implementation, field sampling and site remediation. His career includes leadership roles as both a government civilian for the U.S. Army and as a contractor for Science Applications International Corporation. Rob currently serves as a Program Manager and Chief of the Plans and Assessments Team for Chemical Biological Applications and Risk Reduction (CBARR). His work

has led to the technology selection, fabrication and delivery of the Field Deployable Hydrolysis System (FDHS) a first-of-akind deployable chemical agent destruction system developed under a rapid acquisition process to satisfy

the first Joint Emergent Operational Needs Statement (JEONS) issued. Mr. Malone has worked the project planning for both land-based and ship-board FDHS operations. He served aboard the Cape Ray throughout the construction, operation and demobilization phase of the Syrian chemical weapons destruction mission. Rob previously served as the Associate Site Project Manager for the Tooele Chemical Agent Disposal Facility (TOCDF), responsible for both technical and contractual management. TOCDF, in Tooele Utah has destroyed the largest and most diverse stockpile of chemical agent munitions in the world. Rob chaired the Integrated Risk and Schedule Management IPT for the Deseret Chemical Depot utilizing his knowledge of acquisition lifecycle management, demilitarization, chemical operations, and closure to lead the integrated team of government and contractor personnel through a first-ofa-kind process that guantifies risks to project schedule execution, calculates milestone confidence and identifies solutions for risk avoidance or mitigation to the Project Managers. Prior to TOCDF, Rob was the Closure and Remediation Department Manager and the Johnston Atoll Chemical Agent Disposal System (JACADS) Project Manager for SAIC. JACADS was the first full-scale chemical agent demilitarization plant in the U.S. Mr. Malone holds a Masters of Science degree from The Johns Hopkins University in Environmental Science and Policy and a Bachelors of Science degree from the University of Maryland at College Park in Natural Resources Management. He is a PMI certified Project Management Professional since 2007 and is a Registered Environmental Manager with the NREP. Rob was awarded the Superior Civilian Service Award in 2013 and 2014 for his work at TOCDF and the Syria Cape Ray mission respectively. He received the Commanders Award in 2011 and 2012 for his work at JACADS and TOCDF.

# 29. The Göttingen Minipig for Medical Countermeasure Development: Benefits and Capabilities

## Todd M. Myers

United States Army Medical Research Institute of Chemical Defense (USAMRICD)

Despite efforts to reduce reliance upon the use of animals, animal research continues to serve a critical role in the testing and development of medical countermeasures. The continued use of non-human primate models is unsustainable due to ethical concerns, reduced availability, and skyrocketing costs.

The Göttingen minipig was developed for laboratory research and could be capable of providing comparable or possibly superior attributes for many research questions within medical chemical defense. Targeted development of the Göttingen minipig model could improve study design, statistical power, and throughput to advance medical countermeasures for regulatory approval and fielding. Of course, studies must be designed, funded, and completed to meet this goal.

In this vein, we completed foundational studies regarding the pharmacokinetics and physiological safety of intramuscularly administered atropine sulfate, pralidoxime chloride (2-PAM), and diazepam across a broad range of doses using adult male Göttingen minipigs surgically implanted with vascular access ports and telemetric devices to monitor cardiovascular, respiratory, arterial pressure, and temperature signals.

Pharmacokinetic data were orderly and largely mirrored available human data at comparably scaled doses. Atropine sulfate dose-dependently increased the magnitude and duration of tachycardia and decreased the PR and ST intervals (consistent with findings obtained from other species).

To further advance our safety assessment capabilities, two behavioral tests from the FDA's Operant Test Battery commonly used in primates were adapted to swine using a custom-built apparatus. Göttingen minipigs were capable of learning and performing both tests at high levels of proficiency and consistency, setting the stage for behavioral drug safety testing.

This work was supported by the Defense Threat Reduction Agency, Medical S&T Division.

The views expressed in this abstract are those of the author(s) and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.

The experimental protocol was approved by the Animal Care and Use Committee at the United States Army Medical Research Institute of Chemical Defense, and all procedures were conducted in accordance with the principles stated in the Guide for the Care and Use of Laboratory Animals (National Research Council, 2011) and the Animal Welfare Act of 1966 (P.L. 89-544), as amended.

## Biography – Dr. Todd M. Myers



Dr. Todd Myers is a Research Toxicologist who has dedicated his professional career to furthering medical chemical defense. As a scientist, he has elaborated methods for assessing the safety and efficacy of medical countermeasures against the most potent poisons in the world, from toxic industrial chemicals to nerve agents, pesticides, and synthetic opioids. His work has enabled scientists within his institute to evaluate behavioral perturbation ranging from subtle to profound, in species including mice, rats, guinea pigs, ferrets, swine, and monkeys. He has advanced the African green monkey and the Göttingen minipig as alternative large animal models for pharmacological and behavioral assessment.

In addition to understanding threat agent toxicity, he has also explored and elaborated improved acetylcholinesterase reactivators, anticholinergic drugs, first-line and adjunct anticonvulsants, as well as novel scavengers capable of detoxifying threat agents in vivo.

As a subject matter expert, Dr. Myers serves on domestic and international working groups to guide animal model selection, the design of laboratory studies, product development decisions, and regulatory approval, with an eye toward optimizing human emergency use and clinical practice guidelines for fielded medical countermeasures.

His recent body of work has focused on countering the threat posed by synthetic opioid poisoning by utilizing non-human primate models of physiology, pharmacokinetics, and behavior to study existing and evolving medical countermeasures.

# 30. Impact of Chemical and Biological Agent Decontamination on Traces Recovery

Isabelle Radgen-Morvant\*1, N. Kummer<sup>1,2</sup>, C. Curty<sup>3</sup>, O. Delémont<sup>1</sup>

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## Abstract

Ensuring safety and minimizing risks takes precedence in the event of biological or chemical incidents. Decontamination processes are employed to neutralise or remove toxic substances from individuals, objects, and locations. From a forensic standpoint, it is essential to understand the effects of these decontamination procedures on the relevant traces in order to determine the most effective strategies for recovering these traces and securing complete and reliable evidence.

This study explores the impact of 16 different decontaminants targeting biological and chemical agents on fingermarks, DNA, and digital media. In terms of fingermarks, paper and glass substrates were investigated. Various techniques were employed to develop fingermarks and identify the most compatible combination of decontaminant and revelation technique.

Cyanoacrylate, small particle reagent, ninhydrin, indanedionezinc, and physical developer were among the fingermark enhancement techniques tested.

In the case of DNA, the quantity and quality of DNA profiles collected from traces of blood and saliva were assessed, and degradation analysed. Additionally, the data integrity of digital media was assessed after exposure to decontaminants, using SHA1 and MD5 hashes.

By examining these aspects, valuable insights can be gained regarding the effects of decontamination on various types of evidence, enabling the formulation of recommendations on compatible decontamination strategies with traces recovery.

Keywords: Fingermarks; DNA; Digital Media; Toxic substances; Decontamination

## **Biography - Isabelle Radgen-Morvant**



**Biography – Dr. Isabelle Radgen-Morvant**Isabelle Radgen-Morvant is a graduate assistant and a PhD student at the school of criminal justice at the University of Lausanne. She holds a BSc degree in forensic science and a MSc degree in forensic science with emphasis on chemical criminalistics both from the University of Lausanne. She concluded her master in august 2018 after an exchange semester at the University of Technology Sydney (UTS). Her current research is in the field of CBRN forensic and focuses on the possibility to handle forensic relevant items and traces contaminated with chemical and biological agents.

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

## DeAnna Sutphin,

National Intelligence University, School of Strategic Intelligence, Roberdeau Hall, Washington, DC 20511, United States of America, <u>de.sutphin310@gmail.com</u>

## 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.

# **32. Education on protection and decontamination of the general population in cases of CBRN Mass Casualties Events**

#### Maja Knepr Šegina, mag. educ. biol. et mag. biol.

*Croatian Institute for Public Health, Toxicology Service, Head of the chemicals documentation department, Craoatia, maja.knepr-seqina@hzjz.hr* 

#### Abstract

The risk of chemical, biological, radiological and nuclear (CBRN) incidents has increased in recent years and because of that we need to provide good and secure protection and decontamination to mass population in case of mass CBRN event. The risk of Mass Casualties Events comes from technological advance and increased possibility of unconventional weapons usage. All basic actions that first emergency responders are able to use in such events must be in some way introduced to mass public as well.

There are two basic ways to inform public about actions that should be taken: pre-incident information or ad hoc during the event. Pre-incident information will enhance the reaction speed in case of emergency and can save more lives. In this case public can take action to reduce their own risk before any of emergency responders arrive on scene.

Certain research papers suggest that pre-incident information provision will not be very effective since people are not usually willing to engage in that type of education. However, there is a difference between population that have been involved in some kind of CBRN event and population with really low CBRN risk.

Main methods of providing pre-incident information could be various: television, commercial billboards in wellpopulated areas, online adverts or even implemented in school curriculum.

On the other hand, ad hoc information (e.g early warning system) would be useful in the moment and more people would be interested, but reaction time would be much longer. Nevertheless, any information given is better than nothing.

Croatia is, for now, low risk country, but we do provide basic information about chemical danger implemented in school curriculum, and all workers that handle chemicals must take courses on how to safely work with chemicals and how to properly protect themselves.

Each year, approximately 8000 individuals complete the courses.

## Biography - Maja Knepr Šegina



Maja Knepr Šegina, mag. educ. biol et mag. biol., born on November 1, 1980 in Bjelovar. She graduated from the Faculty of Science and Mathematics, Biology Department, University of Zagreb in 2005 as a professor then at the beginning of 2006 as an engineer, and obtained the diplomas of then graduate professor of biology and engineer of biology - majoring in ecology.

After completing her education, she worked as an expert consultant in the sale and marketing of laboratory materials, and then as an environmental protection specialist, an occupational safety specialist and a person responsible for hazardous chemicals.

In 2017, she came to the then Croatian Institute for Toxicology and Anti-Doping (CITA) as an expert associate, and in 2019 she became the Head of the Chemicals Documentation Department, after CITA joined the Croatian Institute for Public Health as the Department of Toxicology.

Since 2018, she has been involved in the work of the Anti-Explosion Service of the Administration for Public Order and Security, as an external collaborator for the chemical part of CBRN issues. She participated in various meetings, workshops and congresses that include the issue of chemicals as part of the REACH and CPL Regulations, chemical risk assessment and CBRN.

During the SARS-CoV-2 pandemic, she coordinated the work of the 113 call centre, and since 2020 she has been leading the JA TERROR project as an expert coordinator and collaborator on several work packages. She also participated as a collaborator on some of the SHARP JA work packages.

# 33. Fast Detection of Nuclear Threats and Weapon Grade Material with realtime identification of Gamma and (n,alpha) Radiological Emission in realistic scenarios

**Giacomo Mangiagalli**\* <sup>1</sup>, M. Morichi<sup>1</sup>, F. Pepe<sup>1</sup>, P. Garosi<sup>1</sup>, I. Bonesso<sup>2</sup>, L. Stevanato<sup>2</sup> <sup>1</sup>*CAEN SpA, Spectroscopy Division, Via della Vetraia 11, Viareggio (LU) 55049, Italy* <sup>2</sup>*Università degli studi di Padova, Dipartimento di Fisica G. Galilei, Via F. Marzolo 8, Padova (PD) 35121, Italy* 

\*Corresponding Author: Giacomo, Mangiagalli, Email: <u>g.mangiagalli@caen.it</u>

## Abstract

Nuclear Emergencies and Nuclear Security actions require abilities to quickly understand the specific scenario and rapidly execute a complete assessment of the radiological risk. A near real-time understanding of the situation together with the ability to implement immediate operations is essential to mitigate the infrastructures, operators and population risks.

The current dramatic situation obliges to consider scenarios where the ability to detect and alarm in seconds and identify within one minute a nuclear threat by identifying the Special Nuclear Material with a high level of efficiency is highly required.

For this reason, CAEN developed and patented an innovative algorithm capable to identify, in only 1 minute, through the neutron measurement, Special Nuclear Material even when it's shielded, moderated or masked. Thanks to the extensive experience acquired by CAEN in Nuclear Safeguards and advanced digital electronics we realized a novel isotope identifier that can be effectively deployed to enhance operations.

Its validation is proven by the NATO stock number availability.

The identification capability exceeds any standard currently available. To give an idea, to perform the same measurement with current technique a set of three systems (more than  $300.000 \in \text{cost}$ ), more than one hour of measurement and analysis performed by highly experienced nuclear physicists are needed.

In this article we present the results of extensive test conducted for more than 4 years in the main international laboratories (IAEA, ENEA, INFN) with real Reactor Grade Plutonium sources.

The tests were performed in compliance with international standards and by simulating real use case scenarios of contaminations, smuggling and nuclear threats.

Keywords: Nuclear Threats; Dirty bomb; Special Nuclear Material ; Radiological Counterterrorism Device

## Biography - Giacomo, Mangiagalli



Giacomo Mangiagalli is a technical salesperson with a master degree in Physics obtained at the University of Milano Bicocca and 5 years of experience in civil nuclear industry and CRBNe security.

He Joined CAEN in 2017 as a junior scientist and he started with laboratory measurement for characterization and calibration of equipment used to detect ionizing radiations with a focus on neutron measurements.

In 2018 he was in charge of the product development of a Special Nuclear Material portable identifier called SNIPER-GN, a backpack radiation device with a novel algorithm capable to identify the SNM by means of the only neutron detection.

He followed the development of the prototype and the measurement campaign in recognized international laboratories in IAEA, Ispra JRC and ENEA sites to validate the instrument.

In 2019 he became the product manager of the SNIPER-GN delivering the first prototype and starting the production phase.

He is now responsible of the security product line and Sales Specialist for the Italian, French and German market. Currently he is head of marketing for the CAEN SyS division.

# 34. Connecting the dots: Concept of operation for field-deployed sequencing and data analysis

## **CPT Kevin Caspary, MPH**

Georgia National Guard

4<sup>th</sup> Weapons of Mass Destruction Civil Support Team, USA, Email: <u>kevin.m.caspary2.mil@army.mil</u>

## Abstract

Nanopore sequencing devices offer low-cost, easy-to-use, field-deployable detection platforms for traditional biological threat agents and emerging infectious diseases. While these devices can be used for qualitative detection, their true strength lies in the abundance of data produced during analysis. This information can be used to characterize the genome of specific agents of interest.

Characteristics such as antibiotic resistance or genetic alteration can drastically alter clinical interventions for individual casualties and protective actions for large populations.

This presentation will outline a concept of operation for the flow of sequencing data from field detection through expert analysis, and it will discuss the positive impact on threat evaluation and subsequent emergency response decision making.

## Biography - CPT Kevin Caspary, MPH



CPT Caspary has over 15 years of experience working in the field of CBRN planning, training, and response. During that time, he developed emergency response plans for the Georgia Department of Public Health and training and educational products for the Centers for Disease Control and Prevention's Radiation Studies Branch. He currently serves as the Nuclear Medical Science Officer for the Georgia National Guard 4<sup>th</sup> Weapons of Mass Destruction Civil Support Team (4<sup>th</sup> WMD-CST). In this role, he manages and operates the team's mobile analytical laboratory and provides technical oversight for domestic CBRN response operations. He holds an MPH from the University of Georgia College of Public Health.

# **35. AI, CBRNe Intel and info sharing: leveraging Open-Source Intelligence with innovative applications**

#### Roberto Mugavero,

<sup>1</sup>University of Rome "Tor Vergata", Department of Electronic Engineering - DIE, <sup>2</sup>University of the Republic of San Marino, Centre for Security Studies - CUFS, <sup>3</sup>Observatory on Security and CBRNe Defense - OSDIFE, <sup>4</sup>European Centre for Disaster Medicine - CEMEC Email: mugavero@ing.uniroma2.it

### Abstract

This paper delves into the underlying concepts and features of the OSDIFE Intelligence Platform in the context of its utilization by national and international public organizations dealing with CBRNe threats (Chemical, Biological, Radiological, Nuclear, and explosive materials) and the proliferation of Weapons of Mass Destruction (WMDs). The platform, developed by the Observatory on Security and Defence CBRNe - OSDIFE in cooperation with the

University of Rome "Tor Vergata", Department of Electronic Engineering - DIE, and the University of the Republic of San Marino, Centre for Security Studies - CUFS through international research funding, leverages Artificial Intelligence (AI) and semantic web technologies to enable realtime analysis of unstructured data streams.

Its advanced natural language understanding capabilities facilitate the identification of weak signals and emerging trends associated with the intentional use of radioactive materials.

The study explores the fundamental concepts behind the implemented technology and provides a comprehensive overview of the platform's key features. It highlights the platform's potential applications within public organizations tasked with combating CBRNe threats and WMD proliferation. By automating intelligence processes, enhancing text analysis, and overcoming the limitations of traditional keyword-based search engines, the platform equips organizations with powerful tools for proactive monitoring, risk assessment, and early detection of potential security risks.

The paper emphasizes the relevance and significance of the OSDIFE Intelligence Platform for public organizations at the national and international levels. By harnessing the platform's capabilities, these organizations can enhance their situational awareness, information sharing, and decision-making processes to effectively address CBRNe threats and mitigate the risks associated with WMD proliferation. Overall, this research contributes to the growing field of Open-Source Intelligence (OSINT) and demonstrates how the OSDIFE Intelligence Platform empowers public organizations in their crucial mission to safeguard national and international security.

**Keywords**: OSINT, OSDIFE, environment, hazardous materials, semantic interoperability, asymmetric threats, artificial intelligence, CBRNe, WMD, crime, terrorism, chemical, biological, radiological nuclear, cyber-crime.

#### Biography – Roberto Mugavero



Degree in Environmental Engineering, Director and Professor at the "Centre for Security Studies" - CUFS, Director and Professor at the Second Level Master Degree "International Security Studies", Professor of "Environmental Risk Management" - Degree Course in Civil and Environmental Engineering/IASA, Member of the Academic Senate - University of the Republic of San Marino. Professor of "Action Planning for Homeland Security" - Degree Course in Energy Engineering, Scientific Director and Professor at the Second Level Master Degree "Electronic Systems and Technologies for Security, Defence and Intelligence", Head of the

Research Area "Security" at the Department of Electronic Engineering - University of Rome "Tor Vergata" - Italy. Professor of "Intelligence Analysis" at the Second Level Master Degree "Forensic Sciences" - University of Rome "Sapienza" - Italy. Professor of "Systems and Technologies for Security" at the First Level Master Degree "Urban Manager for Security, Safety and Violence Management" - University of Padova - Italy. Lecturer at the NATO School - Oberammergau - Germany. Visiting Scholar at the Flinders University - Torrens Resilience Institute -Australia. Supervisor and Assistant Supervisor of more than 120 Master Thesis.

Lecturer in many National and International Public/University Courses and Masters. Chairman and Speaker in National and International Conferences, Workshops and Seminars in the Fields of Safety, Security, Defence, Intelligence, Terrorism/Crime Prevention, Territorial Security, CBRNe Risk, WMD Counter-Proliferation, Emergency and Risk Management. Scientific Director and lecturer in more than 120 national and international Advanced Training Courses. Chairman and Speaker in National and International Conferences, Workshops and Seminars in

the fields of Security, Defence, Intelligence, Terrorism/Crime Prevention, Territorial Risk, Chemical-Biological-Radiological/Nuclear and explosive (CBRNe) Risk, Weapons of Mass Destruction (WMD) Counter-proliferation.

Author of more than 180 papers/articles/technical and scientific publications in magazines, newspapers, books and presentations at national and international conferences and working groups. Editor and Coauthor of books on Security and Defence. President of the "European Centre for Disaster Medicine" Research Institute - Council of Europe's Major Hazard Agreement. President of the "Observatory on Security and CBRNe Defence" - Italy. Volunteer Firefighter Technical Officer at the Italian Ministry of Interior - National Fire Brigade. President Emeritus of the Italian National Association of Volunteer Firefighters.

Expert of the "CBRN Centres of Excellence" programme promoted by the European Union in cooperation with the United Nations Interregional Crime and Justice Research Institute - UNICRI. CBRNe Defence Expert and Member, as "CBRN Coordination Expert", of the European Civil Protection Task Force.

Expert in charge for Project Evaluation at the European Commission - REA. Project Manager and Expert in many Security & Defence National and International Projects. He collaborates with various Security and Defence Organizations, Associations, Magazines and Research Institutes.

Holder of International Patents related to Electronic Systems and Technologies. He took part in many International Exercises, Operations and Emergency Activities.

# **36. Introduction to PISCES-INTL, A Cybersecurity Partnership Among Academic Institutions and Under-Served Community Organizations**

### Mr. Mason Soule<sup>1</sup>, S. Stein<sup>2</sup>

<sup>1</sup>Senior Fellow, Civil Council for Defense and Security, Tblisi, Republic of Georgia

### Abstract

The US Government is strengthening its efforts to reduce cyber-security vulnerabilities at public health, chemical and radiological facilities by hardening such CBRN targets by introducing minimal level cyber and information security measures - including introducing awareness trainings and sharing best practices.

This presentation introduces PISCES (Public Infrastructure Security Cyber Education System) and illustrates its potential relevance to the international CBRNe defense and related security communities. PISCES is funded by the US Department of Homeland Security (DHS) to help qualified students with curricula and supervised experiences to act as entry-level cyber analysts.

Students are empowered to analyze streaming data for small communities, municipalities and small businesses which might not otherwise be able to secure and protect their data and networks to the extent needed. Under the supervision of a senior analyst the students gain hands-on experience to identify cyber threats. PISCES' academic partners, which range from universities to community colleges, are currently serving communities in six US States.

Based largely on those ongoing relationships, additional interest is being shown by potential international partners, and so this introduction is being made by Intersect Insight LLC to CSCM participants who may be aware of similar needs in the organizations and communities they represent, especially as it may pertain to training of entry-level analysts.

Engaging such a cadre of students also could indirectly help authorities follow obscure or dark social media sites where possible CBRNe threats could be in planning stages. This coverage also is critical as it occurs at the local level where national security authorities have less of a presence.

This paper describes the program in detail, including case studies and the experiences of participants to date. Key statistics regarding the benefits to students and served community organizations are presented.

**Keywords**: <sup>1</sup>Cybersecurity Training, <sup>2</sup>Cyber Threat Identification

#### **Biography – Mason Soule**



Mr. Soule had a 30+ year career with Battelle Memorial Institute (Columbus, Ohio) managing programs and assessing technologies associated with counterproliferation and national security-related industries, primarily in the CBRN arena. His last assignment with Battelle was as an expat on a Defense Threat Reduction Agency (DTRA)-funded program in Tbilisi, Georgia, where he led collaborative team building, commercialization and sustainability, and training activities aimed at identifying international business and scientific collaborators for the Georgian bio-laboratory network. For the past 15 years, he also has been a key organizer of

the CSCM Congresses and helped bring two of the events to Georgia. Still residing in Georgia, he is employed at

the International School of Economics, Tbilisi State University as a business developer. He also is a Senior Fellow supporting the Tbilisi-based Civil Council on Defense and Security which has held four forums on regional stability associated with nuclear and radiological threats in the Black Sea region.

# **37.** Non-destructive decontamination and modified methods to process CBRNcontaminated forensic evidence in the laboratory

Alessandro Previero<sup>\*1</sup>, B. Augustyns<sup>1</sup>, K. De Meulenaere<sup>1</sup>, I. Radgen-Morvant<sup>2</sup>

<sup>1</sup>Belgian Defence Laboratories (DLD), Kwartier Majoor Housiau, Peutie, Belgium <sup>2</sup>Ecole des Sciences Criminelles (School of Criminal Justice), University of Lausanne, Switzerland \*Corresponding Author: Alessandro, Previero, alessandro.previero@mil.be

## 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.

# **38. Strategic Dispersal of CBRN Defense Materials for the Protection of Civilian Populations: Reviving Civil Defense Thinking**

Prof. Peter M. Leitner, National Intelligence University, School of Science and Technology Intelligence, USA

## Abstract

While the COVID-19 pandemic revealed a general lack of preparation for the onset of a novel and extraordinarily virulent pathogen, it also reminded us of the endless cycle of learning, unlearning, and relearning the lessons from tragic losses of innocent civilians. The actual number of human lives lost that may be attributed to the failure of public institutions to prepare has yet to be counted.

The pandemic gave rise to heroic individual acts and remarkable examples of leadership on the part of certain national figures against a background of poor and myopic planning by their predecessors.

Perhaps the most disappointing outcome has been the rapid resumption of business as usual as the pandemic recedes from view in the rush to return to normalcy. In the headlong race to get past the over

767,500,000 confirmed cases of COVID-19, including 6,900,000 deaths (<u>WHO Coronavirus Dashboard</u>), the framework of disaster preparedness is in danger of being ignored—setting the stage for the next mass-casualty event. Mitigating predictable but unexpected tragedy comes at a cost, and it is highly uncertain that governmental and institutional leaders are even willing to consider, let alone invest in, the preparation and structural changes necessary to effectively meet the next challenge.

This presentation addresses many of the lessons previously learned but not implemented from recent disasters and suggests a general course of action to minimize unnecessary casualties from future threats.

## Biography – Dr. Peter M. Leitner



Dr. Peter Leitner who holds a Doctorate from the University of Southern California, and four master's degrees, is a Professor with the National Intelligence University, School of Science and Technology Intelligence. He was one of the founders of the National Center for Biodefense and Infectious Diseases at George Mason University. Dr. Leitner, former President of Maxwell USA, a multinational pharmaceutical firm, has also served as a Senior Fellow with George Washington University's Center for Advanced Defense Studies, and as an Advisor on Terrorism with New York University'sLaw School, and as a Consultant and

Expert Witness to the Connecticut Attorney General and Department of Corrections. He was the co-Editor and founder of the Journal of Power and Ethics. Dr. Leitner has provided intelligence and anti-terrorism training to thousands of state and local investigators, law enforcement personnel, the CIA, FBI, Marine Corps and other national agencies through the Higgins Counterterrorism Research Center that he founded. His 43-year government career also includes 21 years within the Office of the Secretary of Defense as a Senior Strategic Trade Advisor, 13 years with the Defense Intelligence Agency, and 7 years as an International Relations Specialist with the International Division of the US General Accounting Office. Dr. Leitner has authored seven books, over 20 articles, testified seven times before both houses of the US Congress, and testified before the Michigan State Senate. In addition, he has been a presenter, keynote speaker, and/or organizer at over 25 international conferences. His fields of expertise include:

- Weapons of Mass Destruction,
- The Biological Threat,
- Counter/Non-Proliferation,
- Biological Warfare,
- Counterterrorism,
- Technology Transfer,
- Law of the Sea Treaty,
- Ocean Mining,
- Arctic Issues,
- Advanced Computing,
- Research Methods and Infrastructure Vulnerability Assessment.

# **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: <u>cbrn.neslihan@gmail.com</u>

## 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.

# 40. Evaluation of Decontamination Efficacy of the RSDL<sup>®</sup> Kit against Incapacitating Agents [Pepper Spray (OC), MACE<sup>™</sup> (CN), AND CS]

M. Fentabil<sup>1</sup>, M. Gebremedhin<sup>1</sup>, Laura Cochrane<sup>\*2</sup>, and D. Toth<sup>1</sup>

<sup>1</sup>Emergent BioSolutions Canada Inc., Winnipeg, MB, Canada <sup>2</sup>Emergent BioSolutions UK, Chiswick, UK \*Corresponding Author: Laura Cochrane, cochranel@ebsi.com

## Abstract

## **Objective:**

To evaluate the efficacy of RSDL® (Reactive Skin Decontamination Lotion Kit) in decontaminating the incapacitating agents capsaicin (OC), commonly referred to as Pepper Spray; 2-chloroacetophenone (CN), commonly referred to as MaceTM; and 2-chlorobenzalmalononitrile (CS), typically used in military training exercises.

## Methods:

The current study was designed to specifically investigate the reactivity component of the RSDL lotion with OC, CN, and CS in vitro. The RSDL lotion was mixed with each incapacitating agent at different molar ratios of the lotion's active ingredient. The reactivity of the lotion with the incapacitating agent was observed for one hour, while 10  $\mu$ L samples were quenched and analyzed for residual incapacitating agent using liquid chromatographymass spectrometry.

## **Results:**

CN was effectively degraded at 90% within 2 minutes at a molar ratio of 2:1 (active lotion:compound),. Degradation of more than 68% of CS was achieved at a 20:1 molar ratio within 1 hour reaction time. No degradation of OC was observed with the lotion, irrespective of the relatively higher molar ratios of up to 20:1 and longer reaction time of up to one hour.

#### Conclusion:

This study evaluated the direct effect of the liquid phase reaction of the incapacitating agents with the RSDL lotion in the absence of any physical removal action by the sponge. The lotion was highly effective in degrading CN and moderately effective in degrading CS. The lack of reactivity of OC by the lotion alone suggests that physical removal by the sponge plays a significant role in achieving decontamination.

Keywords: RSDL; Incapacitating Agents; Decontamination

## **Biography - Laura Cochrane**



Laura is supporting activities in Biological and Chemical Threat medical preparedness as Vice President of Medical affairs for the health protection and medical countermeasures across partnerships with industry, government, research and academia. Her early background was in Chemical and Materials engineering from the Royal Military College of Canada, furthered education at St. Andrews University, has an extensive background in Defence Research, and a specialized career in support of medical clinical operations for government agencies around the globe.

She has focused her area of expertise for the last 20+ years in medical applications to support CBRN and Health research programs, published across peer review publications, with primary focus on the development of medical countermeasures to high impact events, such as pandemics, intentional events or epidemics.

# 41. Analytical Estimation of Novichok Exposure Risk and Economic Consequences Using an SCR Vertex Mathematical Model

Tristan Learoyd\*1, Laura Cochrane1

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### Abstract

The low volatile nerve agent Novichok (Nx) represents a significant health risk combining rapid onset of symptoms and the potential to purposefully expose civilian, first responder, and health care professional populations. An intentional use mathematical SCR (Susceptible-Contaminated-Removed) scenario, with parameters based on 11 existing Nx reports (e.g., case fatality ratio, time to death, first response and hospital treatment variations), was adapted to a vertex model with causal linear time event decision trees, which factored for actor competency when applied to an at-risk civilian population (n=750).

A further itemized direct, indirect, and productive cost analysis was formed using the scenario's parameters. Direct treatments were taken from case studies, and respective best prices and/or national formulary price. Indirect costs for administration, decontamination, equipment loss, and loss to host enterprise turnover were computed. Local economy losses of 10% reduced visitor loss in the annum to a metropole of size 1.25M were additionally factored.

Productive costs were expressed as a function of half national life expectancy and median hourly GDP per capita, with assumed injury duration of three months and 10% carer accumulation cost.

The model forecasted an event of 356.25 civilian casualties, 48.66 responder casualties, and total deaths of 114.73. Direct costs of \$75.15M, and total incident including indirect and productive costs of \$828.17M were calculated. The adaptable vertex model with underlying cost analysis offers a template to identify positive preparatory measures and forecast human loss and economic values.

Keywords: Low Volatile Chemical Agents, Exposure, Patient Populations

# 42. Specialist CBRNEmedicine training for medical personnel – Polish experience

## Arkandiusz Trzos<sup>1</sup>, K. Łyziński<sup>1</sup>

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## Abstract

The increased risk of incidents involving CBRNe agents as a consequence of the war in Ukraine and possible terrorist activities requires proper preparation of medical personnel in Poland to provide specialist medical care. The research conducted in 2021-2022 uncovered inadequate readiness of the Emergency Medical Services (EMS) and the Health Care System in Poland for CBRNe threats. The urgent need to address this grave problem inspired a specialist educational programme for medical personnel, CBRNemedicine Training Project, conducted as part of the Strengthening CBRNe Safety and Security – Coordination and Standardization project financed by the Norwegian Financial Mechanism 2014-2021.

The programme, focusing on the three key areas: pre-hospital care, medical decontamination (biological, chemical and radiation) and in-hospital treatment, offered comprehensive training in emergency and disaster management, CBRNe triage, rapid detection and identification of CBRNe agents, the use of personal protective equipment, and advanced life support. Between 2022-2023, twenty one specialist training courses were conducted for the benefit of selected EMS and hospital personnel, paramedics from a CBRNe fire brigade and the Polish armed forces. Additionally, we trained a medical team from Kiev (Ukraine).

Overall, the CBRNemedicine Training Project shaped a new perception of CBRNe threats by the medical staff, set a new direction in the education of medical and military professionals, as well as proved invaluable in the preparation of specialized CBRNe medical procedures.

Keywords: CBRNe training, medical simulation

## Biography - Lt. Col. (ret.) Arkadiusz Trzos, MD, PhD



Acting Head of Department of Disaster Medicine and Emergency Care. Lider of the Project 'Strengthening CBRNE Safety and Security – Coordination and Standardization' at the Jagiellonian University Collegium Medicum. Author of a innovative training programme 'CBRNEmedicine for emergency and medical personel'.

Editor and Co-author of the CBRNE medical procedures for Emergency Medical Services and Emergency Departments in Poland.

# 43. Lessons learnt from chemical disasters during COVID 19 pandemic

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

Department of Internal Medicine, Post Graduate Institute of Medical Education and Research, Chandigarh. India, bhallachd@gmail.com

#### 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.

## 44. Evaluation of new modified bisquarternary pyridinium oximes K1651–K1654

Jaroslav Pejchal<sup>1\*</sup>, K. Musilek<sup>2</sup>, M. Hrabinova<sup>1</sup>, E. Prchalova<sup>2</sup>, D. Malinak<sup>2</sup>, R. Andrys<sup>2</sup>, and J. Zdarova Karasova<sup>1</sup>

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## Abstract

Oxime reactivators are causal antidotes for organophosphate (OP) poisoning, restoring acetylcholinesterase (AChE) physiological functions. These compounds are more or less effective. However, none has proved the ability to sufficiently reactivate AChE inhibited by various OPs regardless of their chemical structure.

Research of new oximes is therefore still ongoing. Our study aimed to assess new modified bisquarternary pyridinium oximes K1651, K1652, K1653, and K1654. Firstly, we conducted reactivation screening and determined the reactivation kinetics of K1651, K1652, K1653, and K1654 using human recombinant AChE (*hr*AChE) inhibited by nerve agent surrogates and paraoxon. Based on *in vitro* results, the maximum tolerated dose (MTD) for rats was established only for K1653 and K1654.

Subsequently, we conducted reactivation experiments *in vivo* against sarin and VX and established protective indices against VX. K1654 showed the highest reactivation ability, while both K1653 and K1654 exhibited superior reactivation kinetics against nitrophenyl isopropyl methylphosphonate- (sarin surrogate) and nitrophenyl ethyl methylphosphonate (VX surrogate)-inhibited *hr*AChE. MTD of K1653 and K1654 was established at 150 and 50 mg/kg, respectively. K1653 significantly reactivated blood and brain cholinesterases in VX-poisoned rats, while K1654 significantly reactivated blood cholinesterases in sarin-poisoned animals and brain cholinesterases in VX-intoxicated rats. Oxime K1653 provided higher protection against VX in rats than asoxime or obidoxime. K1653 seems promising for further testing.

This work was supported by the Czech Science Foundation (no. 21-03000S).

Keywords: oxime; organophosphate; therapy

## **Biography - Jaroslav Pejchal**

Assoc. Prof., M.D., Ph.D. et Ph.D.



**Jaroslav Pejchal** is a researcher in the field of toxicology. His background also covers medicine and military radiobiology. He has published as an author and co-author of over 80 papers in highly regarded, peer-reviewed journals. He has been twice assigned to the NATO CBRN Joint Assessment Team, was twice a member of NATO working groups, and once served as a medical manager on a half-year mission abroad.

# 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

#### Will not be presented

## **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.

# 46. Communication of CBRN risk to the public with special emphasis on radiation exposure and radioactive contamination

## Jozef Sabol

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## Abstract

In order to prevent severe effects and consequences of the use of CBRN weapons and minimize their impact on the health of affected persons, it is vital to prepare members of the public for such emergencies. Therefore, it is essential to inform the population about basic CBRN effects using simple and well-understandable language so that all persons can perceive the potential impact of individual agents of the CBRN family. People, who are familiar with potential CBRN risk and understand the basic principles of protection against such dangerous substances, usually cooperate with professional rescue teams more effectively than persons who are not aware of such threats.

This is why it is very important to communicate CBRN risk to the public in order to prepare the population for the potential future use of CBRN agents for terrorist attacks. Special attention should be paid to the possible radiological or nuclear assaults, which usually result in high radiation exposure. Any appropriate countermeasures may substantially reduce the impact of such attacks. The more the public is aware of the radiological danger, the better and more efficiently they can be protected against radiation exposure and thus minimize consequences and health hazards associated with such dangerous situations.

Keywords: Communication; CBRN; risk; public; radiation exposure; radioactive contamination

#### Will not be presented

## 47. Croatian experience in health crisis management

**Dr. Pavle Jeličić**, MD, PhD, Nataša Janev Holcer, PhD, Krunoslav Capak, MD, PhD *Croatian Institute of Public Health, Environmental Health Department* \**Corresponding Author: Pavle Jeličić, Tel.:* +385 1 4864 376, E-mail, pavle.jelicic@hzjz.hr

#### Abstract

The Republic of Croatia has seen a number of crisis situations over the past 10 years that, from an epidemiological perspective, may have endangered people's lives. The Homeland War broke out in Croatia at the start of the 1990s, followed by a devastating flood in eastern Slavonia in 2014, the passage of migrants through Croatia from September 2014 to December 2015, two extremely destructive earthquakes in the northwest of Croatia in 2020, and the coronavirus pandemic that reached our nation. The Crisis Headquarters of the Ministry of Health, operating under the National Headquarters for Protection and Rescue, is responsible for managing the health-related aspects of crisis situations. This includes organizing the initial response of health services, providing medical aid for the recovery of injured communities, and undertaking initiatives for a rapid return to normal for individuals and communities in affected areas. The Deputy Minister of Health serves as the Crisis Headquarters' Chief in order to connect and coordinate actions at all levels of the healthcare system during a crisis.

The Croatian Institute of Public Health (CIPH) creates a public health strategy after the Minister of Health declares a risk of communicable disease epidemic. These measures include monitoring the supply of safe drinking water, maintaining sanitary conditions, preparing and distributing food, and engaging in activities to control infectious diseases in the most affected areas, such as disinfection, pest and rodent control. In all previous crisis situations, the Ministry of Health's Crisis Headquarter was able to ensure all health conditions for citizens' safe returns to their homes because of coordinated efforts and measures.

**Keywords**: crisis response, crisis management, health effects, sanitation, disinfection

## Biography - Dr. Pavle Jeličić



Pavle Jeličić was born in 1978. He graduated in 2004 at the Medical School, University of Zagreb. In 2010, he completed his specialization in epidemiology and in 2014 his specialization in environmental health after which he works as a specialist in epidemiology and environmental health.

Since 2016 he acts as a head of the environmental health division at Croatian Institute of Public Health. He completed the postgraduate study "Leadership and Management in Healthcare Service" at the Medical school, University of Zagreb in 2014 and obtained the title of Master in Healthcare Management. In 2023 he ended successfully his post-graduate doctoral studies in

Biomedicine and healthcare at the Faculty of Medicine of the University of Zagreb and obtained the title of Doctor of Philosophy.

Since 2019, he is holding the position of first vice-president of the Croatian Society for Environmental Health at the Croatian Medical Association.

He is member of several interdisciplinary working bodies within several ministries in matters of One Health, Vector Borne diseases, Vector Control, Disaster Risk Assessment, Climate Change, Terror Threats etc.

He has published several scientific and professional papers and participated in conferences in the country and abroad. He speaks English and German.

# 48. Remote controlled systems for first responds

## **Donna Vadlja**\*<sup>1</sup>, D. Tušek<sup>2</sup>, Z. Orehovec<sup>3</sup>

<sup>1</sup> Ministry of Defense, Battalion for nuclear-biological-chemical defense, Republic of Croatia <sup>2</sup>Ministry of Defense, Battalion for nuclear-biological-chemical defense, Republic of Croatia <sup>3</sup> Universitiy of Applied Sciences Velika Gorica, Department of Physics, Republic of Croatia \*Corresponding Author: Donna, Vadlja, donna.vadlja@gmail.com

### Abstract

With the development of new technologies, unmanned air and ground vehicles (UGV, UAV) have found their irreplaceable purpose in the daily performance of military and civilian activities. The synergy of system and man is visible in the design and use od UGV and UAV. These systems are still not fully automated and depend on human management, and cannot perform complex, autonomous tasks without operator supervision. In order to better develop algorithms for the cognitive mode of operation of the system, cognitive task analysis (CTA) was used. UGV/UAV systems must replace the human role in responding to threats, where they can be life- threatening.

Natural disasters, CBRN threats are just some f the challenges for designing an optima system. The main tasks in which such systems would be used are; removal of obstacles in the way of intervention, research, disposal of dangerous objects during and after incident itself, transport of necessary substances and equipment to the CBRN dangerous area and assessment and medical evacuation of the injured. Operating in highly contaminated area presents a special kind of challenge.

Reconnaissance detection and identification require a number of specialized detectors, containers and compartments to be located on the system. The communication network, as all components that systems to the operator, can be potential targets of cyberattacks.

The systems are most vulnerable precisely in this area because the information that can be obtained from these systems can be very valuable.

Keywords: UAV/UGV; CBRN; Cognitive Tasks Analysis - CTA; Cyber protection

## Biography - Donna Vadlja



Donna Vadlja was born in Osijek in 1993, where she completed undergraduate and graduate studies in medical laboratory diagnostics at the Faculty of Medicine in Osijek in 2017. The Armed Forces of the Republic of Croatia joined in 2018. as a soldier in the Nuclear-Biological-Chemical Defense Battalion. He will complete his basic officer training in 2020. at the Croatian Military Academy, after which he assumed the duties of platoon commander.

In 2023, he assumed the position of commander of the 1st company in the NBC Defense Battalion.

In parallel with his work in the Armed Forces, he enrolled in postgraduate studies at the University of J.J. Strossmayer in Osijek - Molecular biosciences, majoring in biomedicine, where he is still at today as part of the CellToxTargets project. In the past two years, he and his collaborators have published international reviews on the topic of N-alkyl quaternary quinuclidinium compounds.

## 49. Effect of antidotal therapy on sarin intoxication

Helena Řehulková\*1, A. Dlabková1, J. Pejchal1, J. Žďárová Karasová1

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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.

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

**Pavel Rehulka**<sup>\*1</sup>, A. Tichy<sup>2</sup>, G. Rydlova<sup>2,3</sup>, V. Vozandychova<sup>1</sup>, H. Rehulkova<sup>4</sup>, I. Sirak<sup>5</sup>, M. Davidkova<sup>6</sup>, M. Stastna Markova<sup>7</sup>, A. Myslivcova Fucikova<sup>3</sup>

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<sup>2</sup>Faculty of Military Health Sciences, University of Defence, Department of Radiobiology, Třebešská 1575, 50001 Hradec Králové, Czech Republic <sup>3</sup>Faculty of Natural Sciences, University of Hradec Králové, Department of Biology, Rokitanského 62, 50003 Hradec Králové, Czech Republic

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<sup>5</sup>University Hospital, Department of Oncology and Radiotherapy and 4th Department of Internal Medicine -Hematology, Sokolská 581, 500 05 Hradec Králové, Czech Republic

<sup>6</sup>Nuclear Physics Institute of the Czech Academy of Sciences, Department of Radiation Dosimetry, Na Truhlářce 39/64, 18000 Praha, Czech Republic

<sup>7</sup>University Hospital Na Bulovce, Department of Hematology and Blood Transfusion, Budínova 67/2, 18081 Praha, Czech Republic

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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

This work was supported by a long-term organisation development plan from the Faculty of Military Health Sciences, University of Defence, Czech Republic (DZRO FVZ ZHN II).

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.

# 51. New technologies in public health challenges

Marinko Artuković<sup>\*1</sup>, M. Bubaš<sup>1</sup>, K. Capak<sup>1</sup>

<sup>1</sup>Croatian Institute of Public Health, Zagreb, Croatia \*Corresponding Author: *Marinko, Artuković,* <u>marinko.artukovic@gmail.com</u>

## Abstract

Among the wide range of fields with possible applications of AI medicine stands out as one in which there is tremendous potential along with equally substantial challenges. There is virtually no area in medicine and care delivery that is not already being touched by AI. For example, AI-driven applications are available to capture the dictation of medical notes; many such applications are attempting to synthesize patient interviews and laboratory test results to write notes directly, without clinician intervention.

Medicine is much different from other areas where AI is being applied. AI enables new discoveries and improved processes in the entire health care continuum; ethical, governance, and regulatory considerations are critical in the design, implementation, and integration of every component of the AI applications and systems. Because of concerns about both utility and safety, new applications will generally have to adhere to the same standards applied to other medical technologies.

AI and machine learning can transform medicine. Health professionals will figure out how to work with AI and machine learning as we grow along with the technology. AI and machine learning will not put health professionals out of business; rather, they will make it possible for health professionals to do their tasks better and leave time for the human–human interactions that make medicine the rewarding profession we all value.

Keywords: Artificial intelligence; health care transformation; health decisions

## Biography - Marinko Artuković



Marinko Artuković, MD, PhD, is a specialist in internal medicine, subspecialist in allergology and clinical immunology and rheumatology. Since 1997, he has been working at the Sveti Duh Clinical Hospital, Zagreb, Croatia. 2016-2023. he was the director of the Special Hospital for Pulmonary Diseases in Zagreb which was declared the best-managed healthcare institution during his tenure.

He is an assistant professor at the North University, Croatia. Since 2023., he has been working as the head of the Service for Strategic Planning, Innovation and Coordination of EU Projects at the Croatian Institute for Public Health.

# **52. Infodemic in COVID-19 pandemic**

## Prof. Dr. Krunoslav Capak, MD, PhD

*Epidemiology and env. health specialist, Croatian Institute of Public Health address for contact; Rockefellerova 7, Croatia. telephone:+385 14863221, e-mail:* <a href="https://kcapak@hzjz.hr">kcapak@hzjz.hr</a>

## Abstract

The term "infodemic" refers to an overwhelming amount of information and disinformation about a particular issue, which hinders the search for solutions. The public discourse about it intensified when Dr. Tedros Ghebreyesus, the Director-General of the World Health Organization (WHO), stated that the world was not only battling an epidemic during the COVID-19 crisis but also an infodemic. The media was flooded with both genuine information and misinformation, setting this epidemic apart from previous virus outbreaks. Previously, especially on internet platforms and other social media, there were circulating "information" suggesting the virus was a biological weapon accidentally released from a lab, or that it emerged from consuming raw bats. Other myths posited that consuming garlic could treat the disease or that bleach could effectively kill the virus. However, even the United Nations warned that there has been an unprecedented spread of global panic, prejudices, and intolerance, particularly on social media platforms. Besides combating the coronavirus outbreak, the WHO, in collaboration with popular social media platforms like Twitter, Facebook, TikTok, and Tencent, engaged in countering misinformation.

Vaccine skeptics, or "anti-vaxxers", became an even greater threat than the coronavirus itself. According to them, the coronavirus either did not exist at all or, if it did, it was not as dangerous as portrayed. They propagated theories that the virus was created using 5G technology, with the ultimate aim of mandating global vaccination. They believed that vaccines would implant malicious microchips in individuals.

Bill Gates was painted as the mastermind behind this, intending to control the population, including executing a controlled depopulation. According to this narrative, the shadowy global elites would reshape the world according to their desires, with the rest of us becoming their subservient slaves. If we proved unuseful, they would simply eliminate us. Such a narrative is factually incorrect. Nonetheless, it garnered significant attention among social media users. Media outlets capitalized on this, providing a platform for purveyors of false news (fake news). It was found that such news retains attention eight times longer than positive news, leading to greater advertising revenue.

In response to these challenges, the healthcare system can effectively counteract them only by enhancing the health literacy of citizens. This involves providing a higher level of information on all health-related topics and policies. It's incumbent upon us in the system to modify our communication approach with the public, using clear language and modern communication techniques to provide timely and accurate information, resisting the spread of toxic propaganda.

## **Biography - Assoc. Prof. Krunoslav Capak**



## MD, PhD, Primarius Specialist epidemiology

Subspecialist in environmental health Croatian Institute of Public Health Rockefellerova 7, HR-10000 Zagreb

Krunoslav Capak, born in 1962, director of the Croatian Institute of Public Health. Associate professor at the Department of Environmental Health, School of Medicine, University of Mostar. Teaches at Medical School in Rijeka and Zagreb, and the Faculty of Law in Split. President of the Croatian Society for Health Ecology and member of the Society of Epidemiology at the Croatian Medical Association. From 2010 to 2013 he was a member of the Standing Committee of the Regional Council on behalf of the WHO European Regional Office, and from 2011 to 2013 he was chair of the European Environment and Health Task Force and member of the European Environment and Health Ministerial Board. In 2016 he was elected a member of the Academy of Medical Sciences. He has been awarded the Homeland War Memorial Medal 1990-1991, the medal of Danica Hrvatska Order, and the medal of the Hrvatski trolist order. During pandemic of COVID-19 he was member of National Headqurters.

# 53. Cross-validation based approach to develop and evaluate an AI-supported microscopy platform to detect and classify airborne biothreat.

## János Pálhalmi\*1, Anna Mező1.

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## Abstract

An extensive amount of effort has been put into the development of different optical sensor solutions to detect, identify and monitor airborne biological agents. One of the reasons why there is no existing standard and interoperable bioagent monitoring solution is the lack of platforms capable of comparative data monitoring and archiving for traceable inter-method comparison. Since the resilience of disease control authorities is very intensive regarding the environmental presence of the most dangerous and unfortunately well-known member of the Bacillus cereus group, and it is very easy to access all the necessary components to create a virulent Bacillus anthracis strain, our AI supported platform is currently being finetuned for the detection of bacillus form objects sampled from the air. Our platform supports the quantitative phase imaging sensor-based data input for analysis and algorithm training. Our algorithm system can detect suspicious bacillus form objects sampled from the air with higher than 90% accuracy (precision: 88.9%; recall: 94.1 %) in the case of differential interference contrast (DIC) microscopic images and also in the case of digital holographic (DHM) microscopic images (precision: 67.7%; recall: 98.5 %). The platform contains the possibility of inter-sensor comparison, since it has been optimized and finetuned for different datatypes of quantitative phase imaging methods. The integration of the platform into CBRN related further research, decision-making and pre-standardization will be presented based on the quantitative results.

The project was supported by Horizon 2020 program: HoloZcan (GA: 101021723). (<u>https://datasenselabs.net/</u> <u>https://datasenselabs.net/horizon2020/</u>) Keywords: artificial intelligence, object detection, air sampling, bio-detection, bacterial classification.

## Biography – Dr. János Pálhalmi



Dr. János Pálhalmi is a cell-biologist, neuroscientist, metrologist, specializing in bioinformatics and computational sciences. He holds a PhD degree in health sciences as well. Inventor of the term 'BioSignal Metrology' (patent ID: P1900302), with the aim to improve the standards of quality assurance in the field of industrial level bio-medical research and development. He is scientific coordinator, work package leader and participant in several EU projects in the field of sensor integration, AI software development, testing, validation, and use case specific fine

tuning.

Dr. János Pálhalmi is invited speaker and consultant in different Medical CBRN and NATO supported projects and conferences, and participates in miniaturized biosensor and implemented algorithm development workflows to improve anomaly detection and health monitoring systems.

# **54.** Analysis of VX and its degradation products in conjunction with plasma decontamination

## **Dr. Matthias Berger**\*1, A. Ficks<sup>1</sup>

<sup>1</sup>Bundeswehr Research Institute for Protective Technologies and CBRN Protection, Chemistry Department, Humboldtstrasse 100, 29633 Munster, Germany \*Corresponding Author: Dr. Berger, Matthias, <u>matthias2berger@bundeswehr.org</u>

## Abstract

VX (S-{2-[Di(propan-2-yl)amino]ethyl} O-ethyl methylphosphonothioate) is one of the deadliest and most persistent nerve agent known. Furthermore, it is one of the most challenging chemical warfare agents to decontaminate using vacuum technology due to its low vapour pressure and high boiling point. A relatively novel approach in decontamination of sensitive equipment is the application of plasma. Reasonable priced vacuum plasma chambers, originally designed for the microchip industry, have become commercially available in recent years. By utilising such a plasma chamber, we have investigated the reaction of VX with different types of plasma (air, oxygen) and ozone. The principle idea is that the reactive plasma species/ozone breaks up the chemical bonds in the structure of VX to yield smaller and, thus, more volatile and less toxic substances.

The presented investigation was carried out utilising GC-HRMS (High Resolution Mass Spectrometry) and LC-HRMS analytical techniques. We were able to identify the structures of multiple toxic and non-toxic degradation products after plasma decontamination of a VX contaminated model surface. The investigation has led to multiple benefits; on the one hand, various chemical substances with relation to VX were registered and subsequently added to our in-house databases, which may facilitate future analysis of environmental samples of our OPCWdesignated laboratory. On the other hand, compounds like EA 2192 were identified, which represent very toxic stable degradation products of VX and highlights the need for investigating reaction processes with modern analytical instrumentals in order to decide whether a decontamination process was successful or not.

Keywords: Plasma, Decontamination, VX

#### **Biography - Dr. Matthias Berger**

2010 Diploma in chemistry at the Institute of Inorganic and Analytical Chemistry, Goethe University Frankfurt, Germany

2010 - 2015 Ph.D. in chemistry at the Institute of Inorganic and Analytical Chemistry Goethe University Frankfurt, Germany

2016 - 2021 Bundeswehr Research Institute for Protective Technologies and CBRN Protection (WIS), Munster, Germany Decontamination Branch

2021-present - Bundeswehr Research Institute for Protective Technologies and CBRN Protection (WIS), Munster, Germany Chemistry Laboratory

# 55. Amerithrax 22 Years Later – The Case for Environmental Surveillance for Intentional Releases of Infectious Agents and Emerging Infectious Diseases

#### Kenneth F. Martinez<sup>1</sup>

<sup>1</sup>Idaho National Laboratory, Infrastructure Security, PO Box 1625, MS 3545, Idaho Falls, ID |83415, USA

\*Corresponding Author: Kenneth F. Martinez, kenneth.martinez@inl.gov

### Abstract

In October of 2001, a letter was mailed to the American Media, Inc. (AMI) building in Boca Raton, Florida that contained *Bacillus anthracis* (*Ba*) spores. This resulted in two cases of anthrax including one death. Subsequently, letters with *Ba* spores were sent to various media outlets in New York City and to Capital Hill. It was estimated that each letter contained 2 grams of spores. In total, the release of spores resulted in 23 anthrax cases, 12 cutaneous, 11 inhalation, and 5 deaths. Over 10,000 environmental samples were collected at anthrax-contaminated facilities to understand the degree of contamination, the exposure pathways, and to drive medical treatment strategies and remediation plans.

Concentrations on surfaces ranged up to 10^8 colony forming units per gram of dust. In addition to the health impacts, there was a significant economic burden incurred for the cleanup of contaminated buildings. Fumigation of the United States Postal Service (USPS) of contaminated Processing and Distribution Centers cost \$200M, which does not include business continuity costs (i.e., costs associated with facility closure, renovation, and security upgrades).

Two years later, a national airborne biosurveillance system was created to detect and shorten the time frame for response to such events. Fast forward to today, environmental microbiology played a critical role in understanding the persistence and transmission pathways of SARS-CoV-2 during the pandemic that resulted in a shift of fomite transmission to primarily airborne. Novel airborne sensor technologies have evolved that include immunoassays, genetic testing, Raman spectroscopy, and mass spectroscopy (MALDI-TOF).

Keywords: Emerging Infectious Diseases, Bacillus anthracis (Ba) spores, environmental microbiology

#### Biography - Kenneth F. Martinez



Certified Industrial Hygienist and Environmental Engineer with experience in leading and conducting large-scale research; managing programs in occupational safety and health, and emergency response; and creating and teaching professional development courses. Brings 33 years of CDC expertise in the area of hazardous agent exposure characterization and mitigation control practices in the manufacturing and healthcare industry. Recognized subject matter expert in biological agents including infectious disease and bioterrorism agents.

Over a nine-year period for CDC, served in numerous emergency response field leadership roles including the World Trade Center collapse, anthrax, SARS, multi-drug resistant TB, hurricane emergency responses (Katrina and Wilma) and the Deep-Water Horizon oil spill. As a subject matter expert on biological threat agents, provided counsel and leadership to senior management of other federal agencies including providing testimony before a congressional sub-committee on Capitol Hill, presenting before senior leaders of the OSTP, GAO, USPS, DHS, EPA, and FBI and serving on a CDC team tasked to provide responses and a strategic plan to the Pandemic and All-Hazards Preparedness Act (PAHPA). During 2009, the H1N1 pandemic, coordinated and directed education through media communication to over 600 Cincinnati NIOSH staff.

Research efforts in bioaerosols have resulted in 38 peer-reviewed journal articles and book chapters; 32 NIOSH technical reports; over 100 technical presentations at scientific meetings; and courses on bioaerosols targeted at the local, state, and national level. From 2013 to 2020, he supported DHS as a contractor for a national airborne biodetection system serving as a Jurisdictional Coordinator for two jurisdictions, as an Environmental Assessment (EA) team lead and as a Field Operations team lead.

Subsequently, he provided contract support to FEMA CBRN and FDA. He currently serves as a Senior Critical Infrastructure Analyst for Idaho National Laboratory and concurrently operates as the Chief Science Officer for a non-profit (Integrated Bioscience and the Built Environment Consortium – IBEC) created to provide support of COVID-19 pandemic response efforts nationally. He also serves as an Adjunct Professor at the Edith Cowan University, School of Medical and Health Sciences in Australia.

# 56. Radiation-Enhanced Nuclear Missiles (Tactical Nuclear Weapons)

Z. Orehovec<sup>1</sup>, **Dr. sci. Valentina Ključarić** \* <sup>21</sup> Retired CBRN Defense Colonel, Zagreb, Republic of Croatia <sup>2</sup> CBRN Defense Colonel, Ministry of Defense of the Republic of Croatia, Trg Kralja Petra Krešimira IV br. 1, Zagreb, Republic of Croatia \*Corresponding Author: Col Valentina Ključarić, PhD, valentina.kljucaric@morh.hr

## Abstract

The preferred type of contribution: ORAL Keyword: nuclear missiles, tactical nuclear weapons, enhanced radiation, protection, defense. Recently, we have witnessed significant changes in the geopolitical situation in the world caused by a series of conflicts that are being waged, among other things, on European soil, and the frequent mention of nuclear weapons. This necessarily results in changes in the understanding of war, both in its conduct and in the development of defense in a strategic and tactical sense. With the development of science and technology, the introduction of new types of nuclear weapons that differ in construction, mode of action, power and launch method, the world's nuclear potential is becoming more complex and diverse. In the current development of nuclear weapons, two directions can be distinguished, one of which goes in the direction of producing missiles for operational-strategic purposes and developing and perfecting the means for their transfer and launch, and the other represents the research, development and improvement of tactical nuclear weapons of small and very low power on the fission and fusion principle of energy release. In principle, a tactical nuclear weapon is considered to be a weapon with a power of less than 10 kT, which has a pronounced radiation effect, and the shock and thermal effects are reduced to a minimum, so we also call them weapons with increased radiation (radiation weapons), in which the dominant effect of the destruction of the living force comes from the initial pulse of neutron radiation. All previous agreements (SALT and START) limit the amount of strategic nuclear weapons, but do not limit the research and development of tactical nuclear weapons. It is necessary to monitor the development of these weapons, the development and improvement of ways, methods and principles of protection. The potential application of these weapons can be diverse, which imposes the obligation to establish an anti-neutron defense, covering all structures of society as well as considering the problems of military skill and defense in general.

## Biography - Dr. sc. Valentina Ključarić

Valentina Ključarić is an employee of the Center for Defense and Strategic Studies "Janko Bobetko" at the Croatian Defense Academy "Dr. Franjo Tuđman" in Zagreb. She is the Head of the NBK laboratory. She is a lecturer, supervisor and associate at several courses at Military Studies at CDA. The areas of research work she is focused on include the field of chemistry - organic synthetic chemistry, as well as the development of methods of detection and identification of precursors and toxic industrial substances that are important in the field of CBRN defense. She is the manager of several national projects from the functional field of CBRN and one international project. She is a member of the National Commission for the Implementation of the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction.

# 57. New bacteriophage lysins, LysJ and LysF, effective in killing anthrax bacteria in vitro

## Aleksandra Nakonieczna\*, M. Kwiatek

Military Institute of Hygiene and Epidemiology, Biological Threats Identification and Countermeasure Center, Bacteriophage Laboratory, Lubelska 4, Puławy, Poland

\*Corresponding Author: Aleksandra Nakonieczna, aleksandra.nakonieczna@wihe.pl

## Abstract

Endolysins (lysins) are lytic proteins encoded by bacteriophages, i.e. bacterial viruses. They are directly responsible for damaging the bacterial cell wall and releasing phage progeny from the infected bacterium. Endolysins, like phages, have a potential therapeutic value (as an alternative or supplement to antibiotic therapy) in the treatment of infections caused by *Bacillus anthracis*, an etiological agent of anthrax. Also, they could be used to identify and detect this pathogen.

The sequences of endolysins encoded by two new anthrax phages, J5a and F16Ba, differ from the best-known *B. anthracis*-infecting phage lysin, PlyG from Gamma phage, by the presence of a signal peptide at the N-terminus and by the length. The genes encoding the lysins of the phages J5a and F16Ba were thus cloned and expressed in *E. coli*. The activity of the purified lysins, LysJ and LysF, was evaluated against strains of *B. anthracis* and other

bacterial species of the genus *Bacillus* using the plate method and by assessing the optical density (OD) reduction of bacterial cultures.

Dropping different concentrations of both lysins on the cell layers of the tested bacteria showed their specificity towards the anthrax bacilli. In the OD reduction assay, LysJ and LysF proved their lytic activity against live cells of all tested *B. anthracis* strains (incl. virulent strains) but also other *Bacillus* species. LysJ showed better antimicrobial activity in all performed experiments and could constitute a potential candidate for further studies in terms of future applications in treating human or animal infections.

The studies have been conducted within a project "Comparative analysis of endolysins encoded by bacteriophages lytic against *Bacillus anthracis*" 2016/23/N/NZ7/01992, funded by a National Science Centre.

Keywords: anthrax; bacteriophages; endolysins; lytic activity

### Biography - Aleksandra Nakonieczna



I am a biotechnologist working as a Research Assistant in the Bacteriophage Laboratory in Biological Threats Identification and Countermeasure Center of MIHE, Pulawy, Poland. I have been working in this lab for the past 12 years. I'm experienced in the isolation and characterization of phages (bacterial viruses) and their lytic enzymes (endolysins), focusing especially on phages infecting Bacillus anthracis as a biowarfare agent.

I have worked with various pathogens, including virulent anthrax strains in the BSL-3 laboratory, and I'm familiar with a range of molecular biology techniques. During my career,

I have been involved in national and international research projects within the microbiology or diagnostics field, for instance: "Isolation, selection, and characteristics of bacteriophages lytic against enterohemorrhagic Escherichia coli strains (EHEC)", "Anthrax Environmental Decontamination Network", "New diagnostic technologies on the modern battlefield - nanobiodetectors for the detection of Bacillus anthracis".

I had two abroad internships within Marie Curie Actions program. Recently I defended my Ph.D. on new anthrax phages that I have isolated and their endolysins, based on the grant I led ("Comparative analysis of endolysins encoded by bacteriophages lytic against Bacillus anthracis").

# 58. Automated CBRN Decontamination with a collaborative robotic arm

## **Maria Hemme**<sup>\*1</sup>, Dr. N. Schneider<sup>1</sup>

<sup>1</sup>Bundeswehr Research Institute for Protective Technologies and CBRN Protection, Department: CBRN Decontamination, Humboldtstraße 100, 29633 Munster, Germany \*Corresponding Author: Hemme, Maria, E-mail: <u>mariahemme@bundeswehr.org</u>

#### 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**

Professional Experience (selected): OCTOBER 2020 - PRESENT BUNDESWEHR RESEARCH INSTITUTE FOR PROTECTIVE TECHNOLOGIES AND CBRN PROTECTION (WIS), Munster, Germany Department: CBRN Decontamination (since Oct '22) - Head of the Chemical Decontamination Laborator - Trainings and Consultations within the German Military and NATO - R&D in the field of CBRN Decontamination Department: Chemical Detection (Oct '20 - Sep '22) DECEMBER 2019 - JULY 2020 NETHERLANDS ORGANISATION FOR APPLIED SCIENTIFIC RESEARCH (TNO), Rijswijk, The Netherlands Department: CBRN Protection - Chemical attribution of sulfur mustard analogues in blood plasma by means of mass spectrometric analysis (Master Thesis Project) OCTOBER 2018 - APRIL 2019 ORGANISATION FOR THE PROHIBITION OF CHEMICAL WEAPONS (OPCW), The Hague, The Netherlands Department: Office of Strategy and Policy - Supporting science and technology monitoring activities and scientific literacy/ engagement for effective science advice to policymakers Education: - APRIL 2017 - JULY 2020: Master of Science in Chemistry at the University of Hamburg - OCTOBER 2013 - APRIL 2017: Bachelor of Science in Chemistry at the University of Hamburg - SEPTEMBER 2009 – JUNE 2012: Vocational Training as Chemical Laboratory Technician at E.ON Kernkraft GmbH (Nuclear Power Plant Brokdorf, Germany) Publications: DOI: HTTPS://DOI.ORG/10.1007/S00216-021-03354-Z APRIL 2021 ANAL BIOANAL CHEM DOI: 10.1039/C9RA05078G AUGUST 2019, RSC ADVANCES

# 59. The AI ACT awaiting

Zorica Topić Omaljev<sup>1</sup>, <u>M. Artuković</u>\*<sup>2</sup>, M. Bubaš<sup>2</sup>, K. Capak<sup>2</sup>

<sup>1</sup>Special Hospital for Pulmonary Diseases, Legal Department, Rockefeller St. 3, Zagreb, Croatia <sup>2</sup>Croatian Institute of Public Health, Rockefeller St. 7, Zagreb, Croatia

## Abstract

Artificial intelligence improves forecasting accuracy, optimization of operations and allocation of resources and while personalizing the provision of services. Healthcare is an area in which artificial intelligence may significantly contribute to the achievement of results that are in the interest of society, but it may also give rise to new risks or negative consequences for individuals or society as a whole. The Artificial Intelligence Act defines healthcare as a high-risk system in the context of artificial intelligence application for it is unambiguously clear that healthcare is increasingly exposed to risks of human rights violations. The vulnerability of health system users due to their poor health, potential discrimination and possibility of misdiagnoses are just few of the challenges to be faced in the application of artificial intelligence in the healthcare system.

Croatia must swiftly and efficiently become involved in the creation of legal framework for the application of artificial intelligence that will prevent possible abuses and enable all areas, including healthcare, to benefit from artificial intelligence, while also taking steps to educate all stakeholders of the healthcare system. Artificial intelligence should not be resisted or feared, but rather regulated by establishing legal frameworks.

The author gives a brief review of the European Union regulatory framework for artificial intelligence based on the principle of fairness and demonstrates key challenges in the creation of legal framework for application of artificial intelligence in the healthcare system of the Republic of Croatia.

Keywords: Artificial Intelligence; Health care; Legal framework

## Biography – Zorica Topić Omaljev



Zorica Topić Omaljev (April 3, 1988.) is the head of the Department for Legal & Amp; General Affairs, Human Resources and the Assistant Director for Legal Affairs at the Special Hospital for Pulmonary Diseases in Zagreb.

She graduated from the Faculty of Law in Zagreb, and gained experience in a law firm and private companies in the country and abroad, working from intern to head of the legal affairs department.

Currently, she is a doctoral student at the Doctoral Study in Media and Communication of the University North in Croatia. Passionate about law in general, interested in the field of human rights protection, bussines inteligence and health policies.

# 60. Human Health Risk Assessments (HHRAs) and Climate Change Considerations in Contaminated Sites

### Asish Mohapatra

Regional Health Risk Assessment and Toxicology Specialist, Environmental Health Program, Health Canada, Calgary, Alberta, e-mail: <u>asish.mohapatra@hc-sc.gc.ca</u>

## Abstract

Within the scope of our Contaminated Sites Program and requirements to address chemical stressors exposure and climate change considerations, two projects were completed; 1) Scoping Review of Climate Change Human Health Risk Assessment (HHRA); 2) Cumulative Risk Assessment (CRA) modelling tools, methodological frameworks review and applications. The broad goal and objective of these studies were to evaluate exposure and health risks and their interconnectedness to various stressors and how those were likely to be influenced by climate change considerations. Human receptor sensitivity frameworks for HHRAs were also identified.

The CRA project was based on the initial scoping review project that focussed on contaminated sites HHRAs and some chemicals of potential concern such as arsenic, cadmium, mercury, per-fluorinated chemicals, and petroleum hydrocarbons. Based on the updated literature reviews, findings from northern environments (e.g., permafrost affected areas) will be shared in the presentation. Further evaluation of climate change considerations affecting chemical fate, transport and toxicity will be included. Furthermore, analyses and understanding of the heterogeneity and variability in characteristics traits of sensitive sub-populations including application of sex and gender-based analysis plus framework are recommended.

The presentation will focus on some relevant examples and make a case for using a broad climate change lens to address various short-duration and chronic exposure issues and to evaluate complex Chemical, Biological, Radiological, Nuclear and Explosives (CBRNe) HHRAs.

Disclaimer: The presentation is based on two contract projects. The contractor reports and papers cited in the presentation neither reflect the views and opinions of Health Canada, nor is it Health Canada guidance.

#### Biography – Asish Mohapatra



Asish is a toxicologist and a human health risk assessment specialist with Health Canada and a regional member of the Chemical Emergency Preparedness and Response Unit (CEPRU). His interdisciplinary areas of expertise include toxicology, human health risk analysis, CBRN toxicology, chemical fate, transport and transformation analyses, climate change health risk assessments and data fusion tools and methodological applications. Asish is one of the Editors-in-Chief for the journal – Global Security: Health, Science and Policy (Taylor and Francis). Current major publications include "Information Resources in Toxicology" (5<sup>th</sup> edition, 2020, two volumes) and "Encyclopedia of Toxicology" (4<sup>th</sup> edition,

to be published in 2023) as part of the Elsevier's Reference Collection in Biomedical Sciences.

# **61. Determination of Immune Status by Detection of Mucosal Immune Antibodies in Saliva**

## David Trudil<sup>1\*</sup>

L.Loomis<sup>1</sup>, G.Siragusa<sup>1</sup>, S.Tsang<sup>1</sup>, S.Snowberger<sup>1</sup>, S.C.Francesconi<sup>2</sup> <sup>1</sup>New Horizons Diagnostics Corp., 1450 S. Rolling Rd, Baltimore, MD 21227 <sup>2</sup>Defense Threat Reduction Agency, 8725 John J Kingman Rd #6201, Fort Belvoir, VA 22060

## Abstract

The portal of entry for all respiratory viruses is the mucosal lining of the nasopharynx. The IgA2 antibody (ab) is the most effective and abundant mucosal antibody available to inhibit and neutralize any viral infection. This IgA2 ab, therefore, may be a target for determining initial viral infection for asymptomatic as well as symptomatic individuals and, with IgG, indicating immune status. Saliva of unexposed, vaccinated and unvaccinated individuals were collected throughout 2020 and 2021 with different saliva collection devices for Covid-19.

ELISA and LFI assays were developed for: anti-Human IgA and IgG antibodies directed against the RBD, Nucleocapsid (N), and both RBD/N. The ELISA result and LFI test line indicated a significant increase over the two weeks following the second dose of a vaccine, with a subsequent gradual decline after 6 months.

This assay detected the presence of Anti- IgA and IgG in infected individuals and tracked levels of IgG and IgA during the months post vaccination as well as infection/immune status in unvaccinated individuals. Correlation with a neutralization assay was observed. The study indicates a saliva POC assay may be applicable as a tool to screen for asymptomatic individuals and to track immune status.

### Biography – David Trudil



David P Trudil – Bio D. Trudil, a former US Army Chemical Officer, has been involved with detection and control of infectious agents including state of the art materials, monoclonal antibodies, luminescence, bacteriophage and phage lytic enzymes for over 40 years. David is the Executive Director of New Horizons Diagnostics currently managing various technology and business functions and projects.

These have focused on both rapid diagnostics as well as therapeutics. As PI for a DTRA Project for the Development of a Rapid Mucosal Immune Status Assay targeting SARS-CoV-2,

included the development of a novel microarray system as well as standard ELISA and Lateral Flow Immunoassay technologies. He is also PI for another DTRA project, currently under development with submission to the FDA under 510k for a rapid, field-based Plague assay. Field Clinical Trials were conducted in Madagascar with pathogenic analytical testing in US DoD BSL-3 laboratories. Other past projects managed by him include 8 separate Biological Based projects within the Former Soviet Union (FSU) under a Department of Energy Program. These include detection & diagnostics as well as therapeutics. In addition to projects in the FSU, he has managed projects focused on infectious disease, Gastric Cancer, therapeutics and immune response in the Middle East, Georga, China, Indonesia, Philippines, Singapore, Europe, Latin America and other countries.

# 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

## 64. Legislation on Chemical Safety Management

## Dr. Zdravko Lovrić,

*Head of the Risk Assessment Department, Croatian Institute of Public Health, Croatia, e-mail:* <u>zdravko.lovric6@gmail.com</u>

## Abstract

Jurisdiction on chemical legislation is under different directorate general in European Union. Same situation is in Republic of Croatia. Competent authority for manufacturing, putting on market and use of chemicals is Ministry of Health, for chemical weapons is Ministry of Economy and Sustainable Development, for pesticides and mineral fertilizer is Ministry of Agriculture, for accidents and waste is Ministry of Physical Planning, Construction and State Assets, for transport are Ministry of the Sea, Transport and Infrastructure, and Ministry of Interior, for water protection permissions is Ministry of Regional Development and EU Funds, etc. That means that horizontal cooperation is the most important.

From the point of health, the most important legislative act is Regulation concerning he Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and its amendment Regulation on classification, labelling and packaging of substances and mixtures (CLP). Two more regulations are also important such are Biocidal Product Regulation (BPR) and Regulation concerning the export and import of hazardous chemicals based on Rotterdam convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade.

Beside the laws on implementation of these regulations in Croatian legislation, we strength some important characteristic points by Law on Chemicals. This act provides measures and conditions for environmental standards and protection of the environment and population, chemical management, classifying, labelling and packaging of chemicals, manufacturing, trading, importing and exporting chemicals, controlling and monitoring of chemicals. Measures of this act are also to be applied on biocide products and import and export of hazardous chemicals. Law on chemicals is supported by four main ordinances: Ordinance on Conditions for the Manufacturing, Placing on the Market and Use of Dangerous Chemicals that covers majority of Law on chemicals; Ordinance on the Manner of Keeping the Register on Chemicals and Manner and Deadline for Submitting the Data from Register; Ordinance on the Conditions and the Manner for Acquiring and Verification of Knowledge About Protection from Dangerous Chemicals; Ordinance on the Storage of Dangerous Chemicals Which Act in Gaseous Phase.

# Biography - Dr. Zdravko Lovrić



Education

1982 – graduated chemistry on Faculty of science and mathematics on University of Zagreb and 2010 – university magister of toxicology

Employment

1982-1984 – assistant on Faculty of Science and Mathematics

1985-1998 – chemical analyst in Centre of Medical Science Zagreb

1998-2007 – head of Division and Department for Documentation and Evidence in Croatian

Institute for Toxicology

2012-2018 – director of Croatian Institute for Toxicology
2019-2023 – assistant director of Croatian Institute of Public Health
Activities
Member of Croatian chemical society and Croatian Toxicological society
Memeber of croatia tim for screening of Croatian legislation compatibility with EU akqui
Expert reviwer of croatian translations of EU chemical legislation *Publications*5 CC papers
3 coauthors of educational books
3 educational handbooks

# 65. Technology and Talent: The Synergistic Combination needed to Protect Critical Infrastructure

# Bobby R. Baker, Jr B.A.Sc., M.P.S,

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# Abstract

Due to the immediate interest and engagement in defense of civil authorities and Defense of the Homeland hosting the World Cup 2026, world dignitaries and leaders will be visiting five major cities in the United States and another five in the North American hemisphere to include Canada and Mexico. Resilient organizations are often referred to in many government circles, however a further look into the current research shows that the need for more pliable response teams to include multi-domain and intra-agency collaborative teams are needed to overcome complex and often ambiguous response and combat environments. This presentation will take a deep dive into the current threats, technologies and deployment methodologies needed to rapidly detect,
characterize, and mitigate all asymmetric threat components in the steady state deployment in protecting critical infrastructure.

**Keywords**: Pliable response teams; Asymmetric Threat Detection integration with AI; Talent Development for CBRNE Environments

#### **Biography - Bobby R. Baker**



Bobby Baker, (RET.) B.A.S, M.P.S., retired after 21 years with the Dallas Fire and Rescue Department to join the Counter-Terrorism Operations Support group at the Nevada National Security Site. He rose through the ranks of the Dallas Fire Department, where he served 14 of his 21 years of service as a front-line fire officer and supervisor. Capt. Baker was very influential in the building and equipping of the City of Dallas Joint Hazards

Assessment Team (JHAT), an all-hazards multi-department asymmetric threat protection team consisting of members from DFD and Dallas Police, primarily deployed to prevent and respond to low-frequency mass casualty events.

Captain Baker is a member of the bachelor's and master's degree programs academic advisory board in Homeland Security at the distinguished George Washington University in Washington, D.C, and currently serves as a Principal CBRNE Training Specialist with the Counter-Terrorism Operation Support team with Mission Support Test Services, LLC, the primary contractor for the Nevada National Security Site with the Department of Energy's National Nuclear Security Administration, where he trains all first responders and military assets in the radiological, nuclear and biological detection and consequence management domains.

Captain Baker is a lifelong learner, holding a Bachelor of Applied Science degree from Dallas Baptist University, a master's degree in Homeland Security from The George Washington University in Washington, D.C., and earned an advanced certificate in paramedicine from the former University of Texas Southwestern Medical School at Dallas Allied Health Paramedic Program. He is currently pursuing his doctorate in public policy with a concentration in Weapons of Mass Destruction and critical infrastructure protection from Liberty University in Lynchburg, Virginia.

Captain Baker is a highly sought-after speaker and trainer both domestically and internationally in highperformance team leadership and the incident command of CBRN incidents. He has presented at CBRN Convergence in Nashville, TN, in the United States and internationally; he has presented twice at the European CBRN Summit in Rome, Italy, in 2017 and 2018 in Birmingham, United Kingdom.

In December 2019, Capt. Baker was asked to lead a pandemic biological tabletop exercise at the 2019 Asian CBRN Summit in Bangkok, Thailand, attended by members of Duke University Singapore, the Royal Thai Army, local first responders, The United States Department of State, and members of the Defense Threat Reduction Agency. In 2020, he was appointed as an honorary international member of the Scientific Committee of the Observatory of Security and Defense in CBRNE based in Rome, Italy, an international think tank established to educate and support the CBRNE training modalities.

Captain Baker continues serving in the DFW community as a volunteer firefighter and hazmat technician with the Plano-Fire and Rescue Department in Plano, Texas. Captain Baker is a certified Hazardous Materials Specialist, an Incident Safety Officer through the National Fire Academy, and a Pro-Board certified NFPA 472 Incident Commander of Hazardous Materials Incidents.

Capt. Baker is an active member of the International Public Safety Association, the American Association of Prevention of Infection and Epidemiology, and active member of the DFW chapter of the World Affairs Council of America.

Captain Baker is a current member of the National Council on Radiation Protection Part 179 Dosimetry Commentary 28 Committee, which seeks to increase dosimetry measurement capabilities for all first responders involved in mitigating radiological and nuclear emergencies in the United States.

In his spare time, he enjoys civil aviation, specifically vintage military aircraft, reading biographies, and volunteering and advising for the safety and medical mission of Watermark Community Church, which aims to serve the underinsured and uninsured population of the City of Dallas.

He and his wife Sheila reside in Dallas, Texas, with their two latest rescue Jack Russel terriers, 10 y/o Bailey and 14 y/o Lucy.

#### 66. Foreign Consequence Management challenges and programs

#### Mr. Kenneth L. Deal, Jr

Chief, CBRN Operational Response Division, US Department of State, USA

#### **Abstract** (will be added)

#### Biography - Mr. Kenneth L. Deal, Jr



#### Division Chief, CBRN Response Operations, US Department of State

Kenneth L. Deal Jr, is the Division Chief for CBRN Response Operations at the U.S. Department of State. He previously served 30 years in the US Army in various tactical and WMD assignments. He was commissioned as an Armor Officer in 1986.

As an Armor and Cavalry officer he served in leadership and staff positions at the tactical level throughout the United States, Republic of Korea and Germany. In 2000 he was designated a CWMD and Nuclear Operations Officer (FA52). In that capacity he has worked all areas of the CWMD mission including Non-proliferation, Counterproliferation, Consequence Management, and Targeting.

Assigned to DTRA from 2000-2005 he conducted Arms Control inspections under the Plutonium Production Reduction Agreement, and Audits and Examinations of Cooperative Threat Reduction projects throughout Russia, Ukraine and Kazakhstan. He organized, trained and deployed as the deputy team chief for a Sensitive Site Exploitation Team during OPERATION IRAQI FREEDOM in 2003, where he participated in combat operations with the 1<sup>st</sup> Marine Division and the 3<sup>rd</sup> Infantry Division.

He returned to Iraq as the J3 (operations) for Task Force DTRA in Baghdad, Iraq, where he coordinated the collection of orphaned radiological sources and yellowcake. Upon his return in 2004 he was appointed Branch Chief for the International Counterproliferation Program that operated in 23 countries throughout Eastern Europe, Central Asia, the Baltic States, and the Balkans delivering over 60 discrete WMD related training and equipping events annually. Mr Deal has served on the Joint Staff as a Nuclear Operations Officer; The Army Staff as the Plans and Operations Chief for the US Army Nuclear and CWMD Agency; and the Office of the Secretary of Defense Staff as the Senior Military Advisor for domestic rad/nuc defense.

In 2011 he deployed to Afghanistan and served as the Chief of Staff (Ops) for the NATO Training Mission – Afghanistan. His final assignment was as the Deputy for operations and training at the Defense Threat Reduction Agency. COL Deal is a graduate of the University of Idaho (1986); Syracuse University (2002); and the Eisenhower School (2009).

## 67. Reducing Biological Risk in the Built Environment: Biodefense Research Capability and Testbed Development

#### **Bryon Marsh**

Idaho National Laboratory bryon.marah@inl.gov

#### Abstract

In 2021, a U.S. congressional request was made through the conference report (FY 2021 Conference JES Report (BILLS-116RCP68-JES-DIVISION-F Built Environment)) that the Department of Homeland Security Science and Technology Directorate (DHS S&T) invest up to \$6M towards developing a national testing capacity to assess vulnerabilities and mitigate biological risks in building systems; namely air, water, and wastewater.

Idaho National Laboratory (INL), Montana State University (MSU), and Northwestern University (NU) created a Built Environment Surveillance Testbed for Biological Hazards (BEST Bio) Project Team to assist DHS S&T in assessing stakeholder requirements. The team also developed an associated business case model for operational facilities needed for integrated testing and evaluation of biological pathogen detection and surveillance technologies for the built environment.

This capability was designed to monitor the movement of a pathogen exposure—from point-of-release, to building water / air distribution systems, to detection of the bioagent, response, and decontamination. The BEST Bio Project Team hosted a national virtual summit in June 2023 to engage stakeholders on national needs and priorities for biothreat detection and surveillance in the built environment. The BEST Bio Test and Evaluation Capability Gap Assessment Report summarizes the Team's findings based on analysis of extensive stakeholder input obtained during and after the workshop related to use case needs for biodefense research in the built environment.

#### **Biography - Bryon Marsh**



Bryon Marsh, MPH, MHS Bryon Marsh is a CBRN project and business relationship manager at the Idaho National Laboratory (INL), and has over 20 years of experience in CBRN response and research. Bryon is a retired U.S. Army 72D Environmental Science and Engineering Officer. His military assignments included 3/75th Ranger Regiment, 3/325th Airborne Combat Team, 121st Long Range Surveillance Detachment, and the 4th Weapons of Mass Destruction – Civil Support Team (CST). While assigned to the 4th CST, he managed and operated a

mobile ISO/IEC 17205 certified analytical laboratory for WMD incident response. Bryon's professional interest is implementing research into practice. Post 9/11 Bryon worked extensively within the U.S. government interagency process to develop a national biothreat response framework. Bryon holds a Master of Public Health from Emory University, and a Master of Homeland Security from the Naval Post Graduate School.

#### 68. Consequence Management Training in a "Live" Radiological Environment

#### John Giles\*1, D. Walker1, D. Egbert1

<sup>1</sup>Idaho National Laboratory, 2525 N. Fremont Ave., Idaho Falls, ID, USA \*Corresponding Author: John R. Giles, john.giles@inl.gov

#### Abstract

Effective consequence management after an event involving the release of radioactive material results from safe mitigation of the radiological hazards to both responders and the public. Effective consequence management will lead to a higher level of public trust. Proper mitigation of the radiological hazards for the responders and public is achieved through several key objectives including accurate predictive plume and ground deposition modeling, rapid and complete ground deposition characterization to include 1-meter dose rates.

These objectives are met through the deployment of competent field data collection and processing teams. Competency in field teams is achieved through routine training. Excellence in field teams is achieved through routine training in realistic training environments, including the use of short-lived radioactive materials.

Idaho National Laboratory maintains a unique training environment where field teams can train in "live" radiological environments where short-lived radioactive materials have been dispersed to simulate different types of events including transportation accidents or the spread of radioactive contamination from the activation of a radiological dispersal device.

The process of the consequence management training evolution, including field data collection reports is described.

Keywords: Consequence management; radiological contamination; characterization

#### Biography – John Giles



John Giles is recognized nationally and internationally throughout the NA-84 Emergency Response community as a subject-matter expert (SME) in radiation detection and measurement, radiological dispersal device materials and health physics applications related to emergency response. Mr. Giles is a member of the U.S. Department of Energy (DOE) Region 6 Radiological Assistance Program (RAP) Team and serves as a Team Scientist and Health Physics Support. Serving in a lead role for multiple projects within the INL Defense Systems directorate, Mr. Giles has extensive experience in coordination and execution of training and testing exercises at on- and

off-INL locations. Mr. Giles is also a lead instructor for the Radiological Dispersal Device Materials Training Program at INL.

In this position, John provides instruction to personnel from various groups within the United States government, as well as international response assets. Courses of instruction include basic radiation physics, health effects of ionizing radiation, radiation detection and instrumentation, radiological dispersal device materials, and x-ray radiography. Mr. Giles is also a lead instructor for the Radiological Dispersal Device Materials Training Program at INL.

In this position, John provides instruction to personnel from various groups within the United States government,

as well as international response assets. Courses of instruction include basic radiation physics, health effects of ionizing radiation, radiation detection and instrumentation, radiological dispersal device materials, and x-ray radiography. Mr. Giles has both a bachelor's of science and master's degree in physics and health physics from Idaho State University.

#### 69. US DOE's Office of Counterterrorism and Counterproliferation (CTCP)

#### Steven Buntman

## Program Manager, International Operations, Office of Nuclear Incident Policy and Cooperation, Department of Energy, National Nuclear Security Administration, USA

The presentation discusses the U.S. Department of Energy's Office of Counterterrorism and Counterproliferation (CTCP), which falls under DOE's National Nuclear Security Administration (NNSA). The CTCP is integral to the U.S. Government's layered defense against nuclear terrorism and nuclear proliferation and for response support to nuclear security and nuclear safety incidents. CTCP is responsible for countering nuclear terrorism and nuclear proliferation and responding to nuclear incidents and accidents domestically and overseas. To meet this mission requirement, CTCP manages the Nuclear Emergency Support Team (NEST) that leverages the Department's scientists and technical experts to contend with nuclear and radiological incidents and accidents of any size or category. Additionally, CTCP missions include both national security and public health and safety disciplines.

The principal intention of the presentation is to outline the CTCP's Office of Nuclear Incident Policy and Cooperation (NA-81) capabilities for international assistance programs and training opportunities based on DOE's domestic expertise. International support activities take the form of Policy & Partnership agreements, Preparedness & Operations, and Exercises & Interdiction Training.

A possible model of regional organization to share CTCP'S mission requirements and capabilities for the preparedness and response to potential or release of radiological or nuclear material into the environment. The model will include the NEST structure for consequence management based the Radiological Assistance Program (RAP) and the Federal Radiological Monitoring and Assessment Center (FRAMC). The prestation will outline the CTCP support capabilities for rapid deployment in emergencies and concepts for a coordinated operational response structure with other Federal, State, local, Tribal, and territorial (FSLTT) governments. Additionally, the presentation will outline potential training and exercise opportunities that utilizes CTCP/NEST capabilities and lessons learned and best practices provided by international partners and organizations.

#### Biography - Steven Buntman

Program Manager, International Operations, Office of Nuclear Incident Policy and Cooperation, Department of Energy, National Nuclear Security Administration, USA

#### 70. Low Cost Smart Sensor Networks

#### Matevž Ferjančič

CEO Mil Sistemika, Slovenia

#### Abstract

Mainstream CBRN sensors are currently too expensive, and ill suited for massive deployments in scenarios to protect critical infrastructure. We need to develop an autonomous sensor network system that will be a low cost, highly portable, solution. Will enable emergency services to monitor crisis situations like fires, landslides, floods, industrial pollution etc. more easily with less human resources in the field. Sensor network must be designed to be used with no or very little training, so can be used in a hurry or by untrained personnel. The network must operate completely autonomously, and must not rely on working infrastructure.

#### Demonstration during congress exercise:

We will bring a military tablet computer, where we will show a live demo of simulated CBRN detections being integrated with a battlefield management system, and Common Operational Picture data. Due to time constraints we will not be able to deeply integrate with the exercise. You can consider this as a practical standalone demo.

## **71. RESILIENCE:** European strategic alliance for research, development and innovation on medical countermeasures against CBRN threats

#### Yannick Saintigny

<sup>1</sup>CEA, Institut de Biologie François Jacob, Fontenay aux Roses, France \*Corresponding Author: **Yannick Saintigny**, Email: <u>yannick.saintigny@cea.fr</u>

#### Abastract

The EU is facing security challenges as CBRN threats especially of intended origin. It is thus critical that Europe develops relevant capabilities through medical countermeasures for which today very few are approved for use and available to European armed forces. The RESILIENCE project aims to build a European collaborative ecosystem against current or future CBRN threats, including research institutes, universities, RTOs, hospitals, industries, mid-caps and SMEs. It will be based on a multiannual action plan of research and development activities established in consultation with relevant authorities leading to effective and efficient medical countermeasures. Such countermeasures would then be industrialized, transferred and used by the armed forces for improving EU preparedness for CBRN military crises and fostering EU sovereignty.

The main concept of the RESILIENCE multiannual action plan is based on a time-related deployment of armed forces in a theatre of operations where multiple health conditions requiring MCMs may occur. The action plan is organized around three main pillars of MCMs: Diagnosis, Prevention/Prophylaxis and Treatment which will respond to chemical (nerve agents, yperite, ricin and abrin), biological (pox viruses, viral hemorrhagic fevers, Y. pestis, B. anthracis, B. pseudo mallei and Botulinum toxins) and radiological and nuclear threats. Innovative diagnostic tools (e.g., on-field tools), novel vaccines (e.g., antibody-based, vaccine with high cross orthopox protection efficacy) and more efficient treatments (e.g., decorporating agents, reactivators of cholinesterases, phage therapy) will be developed.

By gathering a critical mass of European players who will collaborate to provide European armed forces with novel efficient MCMs, RESILIENCE will contribute to strengthening the autonomy of the European sovereignty, to developing EU autonomous industrial segments and to maintaining the operational capacity of soldiers in the field.

# 72. COUNTERACT: European agile network for medical countermeasures against CBRN treats

**Yannick Saintigny<sup>1\*</sup>**, Nathalie Dereuddre-Boquet<sup>1</sup>, Roger Le Grand<sup>1</sup> <sup>1</sup>CEA, Institut de Biologie François Jacob, Fontenay aux Roses, France

\*Corresponding Author: Yannick Saintigny, Email: <a href="mailto:yannick.saintigny@cea.fr">yannick.saintigny@cea.fr</a>

#### Abstract

The CEA coordinates the European project COUNTERACT which aims to reinforce the European Union's preparedness for nuclear, radiological, biological and chemical (NRBC) threats.

COUNTERACT is co-funded for 49 million euros by the European Defence Fund and aims to set up pre-clinical and clinical studies on the safety and efficiency of medical countermeasures targeting NRBC-type threats. COUNTERACT is also cofunded by France, Germany and Norway with dedicated funds.

The project will cover a four-year period and started in December 2022. This project brings together key European players: 27 partners from 11 EU Member states (five universities; three technological research bodies, including the CEA; ten public research institutes; nine SME and start-ups). COUNTERACT will:

Develop and mature four types of medical countermeasures, for which two will aim to achieve the stage of application for authorization to place the products on the market by the European medicines Agency;

Promote EU independence in the development and production of countermeasures against NRBC threats by establishing a European network of sustainable industries, research laboratories, research bodies and clinical centers, aiming to achieve a flexible and efficient umbrella structure for the health sector targeting defense;

Draw up a road map for the development of the future generation of medical countermeasures against current and future threats, simplify the process for obtaining market authorizations, guarantee independent EU supply chains and prepare storage and deployment strategies.

Keywords: Medical Counter Measures, European Defense Fund

#### **Biography - Yannick Saintigny**



Dr Yannick Saintigny, PhD is EU Affairs Officer at the François Jacob Institute of Biology of CEA (<u>www.cea.fr</u>). Dr Saintigny is a radiation biologist now specialized on EU funding of CRBN medical countermeasure research and development projects. Dr Saintigny is deputy coordinator of RESILIENCE FPA and COUNTERACT projects (European Defence Fund). Dr Saintigny is member of the Education and Training working group, Multidisciplinary European Low Dose Initiative (MELODI). ORCID: 0000-0002-3839-3562

# **73.** Convergence of Deliberate Threats and Emerging Infectious Diseases Advancing Biosurveillance Awareness

#### Kenneth F. Martinez

Idaho National Laboratory, Infrastructure Security, PO Box 1625, MS 3545, Idaho Falls, ID /83415, USA \*Corresponding Author: Kenneth F. Martinez, kenneth.martinez@inl.gov

#### Abstract

"The use of biological weapons or their proliferation by state or nonstate actors presents a significant challenge to our national security, our people, our agriculture, and the environment. Multiple nations have pursued clandestine biological weapons programs, and a number of terrorist groups have sought to acquire biological weapons." Deliberate threats were considered a low risk, high regret scenario. However, the U.S. anthrax letter attacks of 2001 elevated awareness of the reality of deliberate threats and the advantages that could be gained through environmental biosurveillance. The selling point was that early warning safes lives. A national biosurveillance program has now existed in the U.S. for 20 years that has succeeded in preparing cities for the detection and response to deliberate threats. Three years of the COVID-19 pandemic have elevated awareness of the medium risk, high regret scenario of emerging infectious diseases and the impact to communities, nations, and the world. In 2022, the White House the U.S. National Biodefense Strategy and Implementation Plan. Goal 1 emphasizes a need to build national risk awareness to characterize biological risks at the operational level through One Health surveillance and detection activities to detect and identify biological threats and anticipate biological incidents. This presentation will discuss the current deliberate threat landscape and detection and response practices, the intersection with emerging infectious disease prevalence.

#### 74. Towards Comprehensive Biological Agent Detection: Introducing the HoloZcan Multi-Modular System

#### Bela Mihalik<sup>1</sup>

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- <sup>6</sup> Dipartimento di Elettronica, Informazione e Bioingegneria, Politecnico di Milano, Milan, Italy
- <sup>7</sup> Institut Pasteur, Biological Resource Center ICAReB, Paris, France
- <sup>8</sup> Komenda Stołeczna Policji, ul. Nowolipie 2, 00-150 Warszawa

<sup>9</sup> DMI - Communication, End Users & Training, Lyon, France

\*Corresponding Author: Béla Mihalik, ideas.science.co@gmail.com

#### Abstract

The urgency for comprehensive platforms capable of detecting airborne biological agents has never been greater. Existing systems, however, fail to fulfil key criteria such as rapid detection. Portability & userfriendliness, and

multiplex capability. Recent advancements in optical and morphological-based detection methods for bioagents are promising yet face challenges.

These challenges arise from a large variability in the morphological characteristics of bioagents, partly due to particle agglomeration and varying water content. Additionally, measurement repeatability remains a critical challenge, as single-point data collection without automated sample preparation inadequately captures the environmental variability of biological agents.

To address these issues, the HoloZcan (H2020) project has developed a working concept prototype, which will be presented in this poster. This prototype integrates several modalities and employs a multi-component approach consisting of a sampling unit, a preparation unit, a digital holographic and fluorescent microscope, a control module, and an artificial intelligence system.

Developed in collaboration with end-users, this system could offer a user-friendly and field-adaptable solution that significantly enhances the efficiency, repeatability of measurements and reduces the cost of detection. Its versatile applications range from pinpointing possible biological sources and air quality control to tracking epidemiological outbreaks. By focusing on complex integration and minimizing sample preparation steps, the HoloZcan system provides a holistic solution to the multifaceted problems plaguing airborne biological agent detection.

Keywords: Biological Agent Detection, Digital Holographic Microscopy, Field Detection

#### Biography – Bela Mihalik



With over two decades of experience in technology development and scientific research, the focus has been on CBRN defense, environmental protection, and medical devices. Currently serving as one owner of IDEAS-Science Ltd. (Budapest, Hungary), responsibilities include the research and development of specialized measurement and detection solutions. Current notable projects include HoloZcan for biological and RadiZcan for radiological hazard detection, while CityZcan device development project is in the service of environmental protection. Prior to the current role, extensive experience was gained in technology and

healthcare sectors. Contributions have been made to the development of medical imaging systems, specifically in SPECT, PET, MRI and X-ray modalities. Expertise includes the design of algorithms for gamma scintillation position estimation and 3D reconstruction, 3D segmentation, development of subsystems for surgical x-ray fluoroscopy machines and real-time angiography systems. From earlier years installation of hospital networks, PACS, development of DICOM image server and intrusion detection system for hospital internet servers must be mentioned.

Additional skills encompass computer vision, sensor fusion, and real-time data acquisition related algorithms, exhaustive knowledge about mobile and desktop Linux platforms. Participation in proof-of-concept research projects, like developing handheld devices for simultaneously measuring functional respiratory parameters, ECG, and SpO2 levels, processing non-invasive medical sensor data is also noteworthy. Holding a Bachelor of Science in Electrical Engineering from Universitas Budensis, the focus was on Measure Automation Institute with a specialized module in Biomedical Engineering.

#### 75. John Sandefur

Abstract – Will be added

76. Ed Locke

Abstract – Will be added

#### 77. Bio risk Management Network

#### Eng. Mohammed Al-Gburi

Head of operations Department, raqi National Monitoring Authority (INMA), Baghdad, Iraq

#### Abstract

The main goal of the Bio Risk Assessment Network project is to build private computer network between relevant laboratories in the Iraqi Institutions. In order to, monitor the biorisk management program in Institutions labs. This project will provide greater transparency, ensures interagency coordination during the review process, and allows facilities to advance from a highly corruptible paper-based process to a more efficient electronic system. This Project divided in two phases Hardware and Software (Applications). The Hardware phase: this phase is to build private computer network between the Iraqi Ministries and Institutions including Server and Clients distributed to these facilities, and connected to each other by using the Virtual Private Network (VPN). This type of connection (VPN) has very high security, Extend geographic connectivity, Improve security where data lines have not been ciphered and Provide telecommuter support. This phase of the project considers very Important, because it considers the Infrastructure of the project. Moreover, It will very easy to add any clients in the future. The software phase (Applications): At this phase, the main biorisk management processes; assessment, development of appropriate mitigation measures, and performance will be conducted. It is designed to lab managers and workers who will receive preset forms to assess the pathogens they dealing with and work (procedures and process). These forms contain different criteria on the probability of risk and its consequences that may occur in a facility that deals with pathogens. The set of these forms was adopted from Sandia National Laboratories BIO- RAM software, and international organization, for example, the World Health Organization and the CWA. Within receiving the forms, lab managers and workers will conduct a pre assessment for their work to identify risk and collect data that can be used evaluate their work environment. In addition to risk assessment (where data will be analyzed by BIO-RAM software), we will provide appropriate mitigation measures for lab managers/ workers who can clearly identify the gaps and needs in their daily practices. Thus, mitigation measures will enhance a facility biorisk management program, as it will help to find the best solutions to protect and safe work, workers, and the community. This project considered an excellent tool for evaluation of facilities, where it can be used on a regular basis to test the effectiveness of measures taken by relevant facilities and determine when training is needed for the staff. In addition, an easy to use tool does not require a lot of time, efforts, and money for sustainability.

#### BIO – Eng. Mohammed Al-Gburi



Mr Al-Gburi is member of the National Team for Nuclear and Radiological Emergencies. I have worked with Texas Tech University team on planning theradioactive characterization of the Al Tuwaitha Nuclear Research Center and surrounding areas. BioSecurity and Biosafety Mangment. Administer the Tracker Project tracking the Dual – Use materials from manufacture to the end user.

Iraqi Ministry of Scince & Technology work experiance incude:

- Project Manager for the National VPN Project and for the CBRN-Risk Management Project
- Member of CBRN National Team
- Working in Nuclear Security and preparing the National Nuclear Security papear
- Administer the Tracker Project "tracking the Dual Use materials from manefacture to the end user
- Escorting UN and IAEA Inspection teams in their task to disarm Iraq of its WMD
- Administer and Manager IT Project teams and the CTBTO National Data Center (NDC)
- Project Manager for the Information Security Project.
- Work on Installation of IT application in E-Government project-Iraq.
- Provide technical consulting to all departments of INMA

### CSCM World Congress on CBRNe Sciences & Consequences Management Zagreb, Croatia, 23-27 October 2023

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33.	Giacomo Mangiagalli	Fast Detection of Nuclear Threats and Weapon Grade Material with realtime identification of Gamma and (n,alpha) Radiological Emission in realistic scenarios			
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38.	Peter M. Leitner	Strategic Dispersal of CBRN Defense Materials for the Protection of Civilian Populations: Reviving Civil Defense Thinking			
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41.	Tristan Learoyd	Analytical Estimation of Novichok Exposure Risk and Economic Consequences Using an SCR Vertex Mathematical Model			
42.	Arkandiusz Trzos	Specialist CBRNEmedicine training for medical personnel – Polish experience			
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45.	Sabol Jozef	Risk assessment of radiological weapons			
46.	Sabol Jozef	Communication of CBRN risk to the public with special emphasis on radiation exposure and radioactive contamination			
47.	Pavle Jeličić	Croatian experience in health crisis management			
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49.	Helena Řehulková	Effect of antidotal therapy on sarin intoxication			
50.	Pavel Rehulka	Proteomic Identification of Radiation Biomarkers in Blood Plasma of Total Body Irradiated Leukemia Patients			
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53.	János Pálhalmi	Cross-validation based approach to develop and evaluate an AI- supported microscopy platform to detect and classify airborne biothreat			
54.	Matthias Berger	Analysis of VX and its degradation products in conjunction with plasma decontamination			

55.	Kenneth F. Martinez	Amerithrax 22 Years Later – The Case for Environmental Surveillance for Intentional Releases of Infectious Agents and Emerging Infectious Diseases		
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73.	Kenneth F. Martinez	Convergence of Deliberate Threats and Emerging Infectious Diseases Advancing Biosurveillance Awareness		
74.	Bela Mihalik	Towards Comprehensive Biological Agent Detection: Introducing the HoloZcan Multi-Modular System		
75.	John Sandefur	Will be added		
76.	Eduard P. Locke	Will be added		
77.	Mohammed Al-Gburi	Bio risk Management Network		

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