QUO VADIS CBRNe FORENZNÍ ANALÝZO?

QUO VADIS CBRNe FORENSICS?

Pavel Častulík[a*]

[a] Research Centre for Toxic Compounds in the Environment, Masaryk University Brno, Faculty of Science, Kamenice 753/5, Pavillion A29, 625 00 Brno, Czech Republic,

**Corresponding author.* e-mail: castulik@recetox.muni.cz, tel.: +420 736 674 793

Abstract

Poznatky zjištěné v průběhu vyšetřování zneužití chemických zbraní „Investigation of Alleged Use of CWs" (IAU), které prováděly inspekční týmy OPCW/UN v Syrské arabské republice a při vyšetřování otrav osob v U.K., jasně ukázaly, že problematika CBRNe forenzní analýzy se týká řady oblastí, od bezpečnostních složek přes toxikologická vyšetření biomedicinských vzorků a identifikaci zdroje CBRNe až po rekonstrukce dějů, které události předcházely. Při důkladné komplexní CBRNe forenzní analýze je třeba brát v úvahu související rizika vyplývající z možné přítomnosti vysoce nebezpečných CBRNe materiálů v místě vyšetřování. Nedávné kriminální případy s vysoce toxickou látkou v U. K. jsou názornou ukázkou toho, že tradiční postupy při forenzní analýze v místě vyšetřování (odběr vzorků, DNA, otisků prstů, biologických vzorků, fyzických i elektronických stop ad.) je třeba přizpůsobit novým potřebám. Příspěvek pojednává o efektivním propojení formálních procesů IAU a potřeb úpravy tradičních postupů vyšetřování o nové prvky související s rizikem přítomnosti CBRNe materiálů za účelem zlepšení forenzních postupů při evidenci sběru vzorků a laboratorních vyšetření při identifikaci CBRNe materiálů.

Key words: *CBRNe, forenzní analýza, IAU*

Abstract

The experience from the Investigation of Alleged Use of CWs (IAU) inspections conducted by the OPCW/UN inspection teams in the Syrian Arab Republic and the event with poisoning of the individuals in UK, brought the essential needs of the broader applications of CBRNe forensics in law enforcement, biomedical sample toxicology, CBRNe source identification and reconstruction of the past events such as in the field of CBRNe archaeology.

The well-developed fields of CBRNe forensics become considerable more challenging when additional hazards, such CBRNe are present at a scene of an investigation. Recent case of high toxic substance used during a crime incident in UK is significantly legitimate case for the improvement of traditional forensics to operate and collect all evidence in contaminated crime scene environment (substances, DNA, fingerprints, bio-samples, physical and electronic evidences, etc.). The presentation will focus on the synergy activities of a formal IAU process in combination of the needs with improved traditional and new CBRN forensics components in order to enhance forensic capabilities for the evidence collection and of the laboratories for CBRNe substances identification.

Key words: *CBRNe, forensics, IAU*

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1. INTRODUCTION

Forensic identification represents the application of forensic science (or the application of science in the investigation of legal matters for the courts"), and technology to identify specific objects from the trace evidence they leave, often at a crime scene or the scene of an accident. A French criminologist Dr. Edmond Locard (1877-1966), was the pioneer in forensic science and formulated the basic principle of forensic science stated that "every contact leaves a trace", means that whenever the objects come into contact, there is an exchange of material from each other. This became known as Lockard's exchange principle of the traditional forensics. It applies also for any responders and investigators operating in a scene that their presence should compromise the original evidence to some extent, if joint standard operation procedures and proper training of individuals would be not sufficient.

When a crime or a labour negligence are committed or technological failure occurs, fragmentary (or trace) evidence needs to be collected from the scene for the process of an investigation. A conventional scene of traditional forensic evidences collection represents relatively safe operational environment for the forensics technicians and other supported personnel.

If trained traditional forensic technicians collect such evidence as a part of a criminal investigation in accordance with local protocols, in a case of hazardous materials (HAZMAT) and/or CBRN substances presented at a scene, this will dramatically change safety of on-site operations in collection, recording, handling and identification of the evidences from a scene, a person or an item of interest connected to a HAZMAT/CBRN event. It is important to note that the collection of traditional forensic evidence may be difficult as the items of interest may be contaminated and successful decontamination may not be possible without destroying critical evidence. Forensic police may be required to adapt to the challenges presented by a contaminated crime scene. For example, the collection of traditional forensic evidence, such as latent fingerprints and their development, may be conducted on the scene and recorded using digital imaging with waterproof housing. All forensic equipment and tools from the scene will need to exit through HAZMAT/CBRN screening and decontamination process prior to leaving the hazard control area.

2. A NEW CHALLENGE FOR TRADITIONAL FORENSICS

There is a worldwide shortage of CBRN related incidents and this fact is usually „rational excuse“ in defending a reluctance for a program of the CBRN forensics science development. At the levels of the politicians and the law enforcement executives the CBRN forensics science is still not in a priority.

However, today attacks with CBRN compounds are not a distant future. Chemical attacks and assassinations have already been in use by the insurgents in many cases worldwide. The smuggling and trafficking of chemical, biological, radiological or nuclear, explosives and precursor materials remains global issue as one of the threats and the risks posed to the national and international communities. A single case of undetected and un-prevented CBRNe material trafficking can cause a serious number of casualties.

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Regarding deployment of HAZMAT/CBRN materials the improvised explosives devices combined with CBRN load are current concerns in combat against terrorism and organised crime. In recent days there even more effective means available for disseminating of HAZMAT/CBRN materials as the unmanned aerial and ground vehicles, representing significant risks in CBRN attacks of a large scale on many targets in parallel. Therefore different CBRN dispersal devices are highly likely to become a frequent occurrence in terrorists' tactics in future. Each CBRN attack is unique in nature, and it is very difficult to develop a comprehensive and reliable approach for the CBRN terrorism prevention, deterrence and response.

No matter whether the CBRN related incidents are terrorist`s or state sponsored, the complexity of producing and storing hazardous substances, combined with the various legislative restrictions, has meant that the aspiring CBRN forensic technicians have a little opportunity to practice their mission knowledge and skills. In fact as revealed from analysis gaps from completed EU FP7 project the Generic Integrated Forensic Toolbox1 [1] (GIFT CBRN) demonstrated one fundamental truth about CBRN forensic science, that there are very few traditional forensics technicians and first responders having specialist CBRN forensic knowledge and/or experience.

It is not only absence of standard operating procedures with related trainings and case load that is lacking, however without a customer base to buy and support industry there is also a lack of specialist CBRN forensic investigation equipment available for CBRN type investigations.

Technical challenges are also associated with the tasks on decontamination of CBRN contaminated evidences, collection and sampling of evidence on CBRN contaminated crime scenes. Decontamination of CBRN contaminated evidence facilitates the handling of the materials and enables the examination of evidence at "normal" forensic laboratories. Both the decontamination methods used needed to inactivate also the dangerous agent and microorganism and not affect forensic evidence.

However, a terrorist or criminal act involving the use of a CBRNe material brings with it a new branch of forensic science of CBRNe forensics - that seeks to analyse and characterise the chemical, biological, radioactive and nuclear materials, non-conventional explosives and the precursors as well the application of traditional forensic science to the items contaminated with these materials. This is a rational need for establishing CBRN forensics program in order to eliminate current gaps in preparedness for CBRN investigation.

The experience from the Investigation of Alleged Use of CWs (IAU) inspections conducted by the OPCW/UN inspection teams in the Syrian Arab Republic and the events with poisoning of the individuals in UK, brought the essential needs of the broader applications of CBRNe forensics in law enforcement, biomedical sample toxicology, CBRNe source identification and reconstruction of the past events such as in the field of CBRNe archaeology.

[1] The GIFT CBRN focused on procedures, methods, instruments and guidelines for forensic investigators at the CBRN crime scene. It included methods for decontaminating exhibits so that traditional processes can be applied safely, methods that can be applied in a containment device, and laboratory methods that can identify the CBRN agents and then characterise and relate them to a possible source (see www.giftforensics.eu).

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The well-developed fields of CBRNe forensics become considerable more challenging when additional hazards, such CBRNe are present at a scene of an investigation. Recent case of high toxic substance used during a crime incident in UK is significantly legitimate case for the improvement of traditional forensics to operate and collect all evidence in contaminated crime scene environment (substances, DNA, fingerprints, bio-samples, physical and electronic evidences, etc.). Traditional forensic investigations techniques along complementary to CBRNe forensics will still be vital for a CBRN crime scene the successful collection and processing of an evidence at a crime scene contaminated with CBRN agents. The identification of the agents themselves is a vital part of CBRN protection and defence policies.

Complementary to already existing radiological/nuclear forensics a scientific discipline dedicated to analysing an evidence from an act or crime involving radioactive material for the purposes of the identification and characterisation of the nuclear or other radioactive material and also the people who committed the crime [2] and the process of on-site forensics operations [3] there are further needs to extend the capabilities of traditional forensic technicians in chemical and biological scientific disciplines in order to support investigators with needs to analysing the CBRNe material in question (chemical, biological and isotopic composition). This knowledge might reveal characteristics of CBRNe material compositions, their impurities with production processing pathways or geographic information that might, in turn, help to narrow the field of suspects and CBRNe material origin.

Such identification of CBRNe materials will be limited to on-site monitoring detection and analytical assets and namely to off-site specialist laboratories within own country or abroad. Due to a lack of a comprehensive CBRN forensics science capabilities and capacities of the law enforcement, interim collaboration with specialised CBRNe laboratories is essential in addition to initiation of the CBRN forensics science program on national and international levels. Direct collaboration with recognised international institutions such as the IAEA and the OPCW laboratories, the INTERPOL and the EUROPOL would be essential.

3. RATIONALE FOR CBRN FORENSICS PROGRAM

In order to coordinate enhancement of national and international capabilities in CBRNe forensics science the outcomes from the EU project GIFT CBRN should be implemented in a view to create a joint European Centre of Excellence in CBRN Forensics network with the aim to lead the programs for training, research and innovation in the field, across the whole of EU, including to provide very high specification laboratory work to support countries without the capabilities themselves. The network should also collaborate with other CBRNe related EU and non-EU national and international institutions. The NATO`s forensic capabilities of Sampling and Identification of Biological, Chemical and Radiological Agents (SIBCRA) and OPCW`s Investigation of Alleged Use of Chemical Weapons (IAU) teams should effectively contribute to CBRN forensics program from their procedures, knowledge, skills and technology lessons.

Some following additional thoughts should be considered or have begun instituting a CBRNe forensic program as a part of readiness and preparedness policies to cope with CBRNe investigation processes.

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First-an aim and the objectives for CBRNe program should be drafted taking into account synergies between existing traditional forensics science and new CBRN forensics science and understanding requirements how forensic science does or would contribute to decision making in law enforcement agencies and the associates;

Second- it should not be assume that existing forensic laboratories have the infrastructure, resources and personnel with the formal training, knowledge and expertise to properly and safely conduct and effectively communicate CBRN forensic analyses, results and interpretations. Dealing with very hazardous materials and associated evidence requires special expertise, certifications, equipment and laboratory configurations, safety considerations, evidence logistics and preservation and storage. Therefore exploiting CBRN contaminated physical evidence for traditional forensic results of investigative or intelligence value (e.g., latent fingerprints, human DNA, documents, digital media, trace evidence and materials) requires HAZMAT/CBRN trained forensic personnel, and specialised instrumentation or equipment, methods, safety programmes and facilities. Therefore an essential element in the effective management of CBRNe forensic evidence is a need to identify the forensic laboratory or laboratories to which evidence should be submitted for examination. These laboratories should be designated in advance;

Third- evidence collection should seek only that of probative value and maintain integrity and accountability. Analyses performed on CBRN evidence should be properly validated, accurate, reliable, repeatable and defensible. The science and practice being performed should match the outcomes being sought, and stay within the bounds of what the science is capable of. Validation of methods and protocols should meet forensic requirements, which incorporate legal and other priorities;

Fourth- a CBRN forensic program capability should be scalable and adaptable to the types, range, dynamics and uncertainties of the realistic scenarios that the performers and beneficiaries expect to conduct.

Fifth – a CBRN forensic program would be more complex in a number of dimensions when the involvements of a number of response agencies have to be coordinated, in order to maximise return on investment and minimise duplication of efforts. The best of various agencies can be fitted together under the command and control of a single agency or interagency leadership council. Technical capabilities of CBRN forensic individuals are so high that ordinary individuals, such as the responders or an army personnel not "forensically minded" could actually compromised the successful identification of CBRN materials and a nature of a CBRN event;

Six- a CBRN forensic programme initially may not warrant a full time presence. Part time elements will need to stay focused on their principal missions while being available and focused on demand. These situations can be accommodated by aligning the part time duties, responsibilities, expectations and outcomes with forensic support as closely as possible with full time assignments. Parallel capabilities are often present in civilian forensics, public health, agricultural and environmental agencies, specialised national laboratories, and military medical and CBRN programmes that can be leveraged and knitted together, then staged, prepared and maintained or called up as required; and

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Finally- a CBRN forensics program would require substantial investment in personnel, science and technology, consumables, equipment, infrastructure, transportation and logistics, training and exercises and unexpected expenses. Further, it should be accepted that there will be a substantial up front and continuing resource investment for a capability that is fundamentally for rare events. Decision makers should accept the fact going in that CBRN forensics is an expensive proposition.

References

[1] www.giftforensics.eu
[2] IAEA, Nuclear Forensics Support, IAEA Nuclear Security Series No. 2, Vienna (2006).
[3] Radiological and Nuclear Terrorism Guidance Manual, INTERPOL, 2015.

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