Leigh Fenton on the need to start training forensic technicians to work in the hot zone, rather than hazmat techs learning forensics

An inconvenient truth

It's an inconvenient truth that the only people who don't destroy the crime scene at a CBRN event are the deceased! Picture the scene … an explosion in a highly populated area, first responders donning PPE, hot zones and decontamination areas set up, medical responders moving quickly between victims carrying out triage, firemen moving debris and rescuing victims from the rubble, making pathways to allow the walking wounded to exit the hot zone and make their way to the decontamination points, and bystanders aiding responders in the rescue of people seeking medical attention. Each one of them focussed on life saving, some of them aware at one level that they are also moving and potentially destroying vital evidence. Preservation of forensic evidence is not on the top of their list, understandably so. It does, however, need to be on there.

Forensics not only has to compete with life saving, but also the identification of the agent, which can mean the difference between life and death. This identification will determine the medical treatment received by the victim, the choice of PPE and the type of decontamination procedure that need to be put in place; like life saving agent identification is also time sensitive. Taking further priority over this agent analysis is the identification of the individual, or individuals, responsible for the attack and taking whatever steps are possible towards arrest.

To go back to forensics, at a conventional crime scene the identification of method and perpetrator is 'bread-and-butter' for crime scene officers and forensic scientists, but how do you forensically process a CBRN scene? Firstly there are the hazards, not just the destruction of the crime scene, with first responders trampling around, but also the possible presence of lethal agents (even if the air monitors are clear there is a chance that agent might lurk under victims or evidence) and then finally senior politicians and the media screaming for answers: answers that might involve a military outcome. It is a crime scene that requires a different breed of forensics officer.

Traditionally the placement of items at a crime scene speaks volumes about the source of the event, but – with all the chaos of a CBRN event – locating this source can prove a lot more difficult and presumptions that cannot be verified in court cannot be made. CBR events that have an explosive dissemination will at least have a start point. Forensic scientists confronted with a non-explosive release might not have anything other than quantitative analysis from detectors to work out where the agent was released from. Documenting the scene through photography, video and note taking traditionally assists responders in piecing the scene back together. Yet this is for crime/terrorist scenes where the area to be covered is measured, at most, in tens of metres, whereas a CBRN release might span hundreds of metres or more. If the source can be found, identification of agents and method of dissemination will be a lot easier. Once the scene has been documented it can be examined and decisions can be made on where samples should be taken from and what physical evidence should be retrieved for further analysis.

At some point evidence will want to leave the site for further analysis, and that is when the decontamination process must be taken into consideration. The prevention of secondary contamination to other parts of the country or other facilities is a top priority and therefore this retrieval is a very delicate operation. Nobody in a multimillion dollar lab likes surprises. If they open their double-bagged item in a bio lab and find that it is a chemical agent then there will be significant repercussions. The US has the advantage of the CST labs, and some European countries have deployable labs, but if you can do presumptive identification only on site then you might well have issues with the decontamination processes. Some samples, gamma emitters for example, should not be taken into a lab, and decontamination will have no effect, so forensic technicians need to be alive to what is, and is not, scientifically possible. Strict national guidelines will be in place regarding the removal and transportation of contaminated items to a laboratory, and these will have to be followed, no matter how much of an emergency it is.

Other factors to take into consideration are that some traditional forensic techniques cannot be performed. Techniques such as lifting fingerprints using powders or chemical development techniques cannot be carried out as the chemicals used in these techniques may contaminate the scene further or change the properties on the CBRN agent. Technicians should keep an eye on optical, stand-off devices, that might well be able to do some of the imaging at a safe distance – it might not be perfect, but it is better than nothing. Weather conditions, like decontamination, increases the destruction of the evidence; in mass-disaster incidents a tent cannot be simply set up over the scene if it starts raining. Therefore time is of the essence, and this need for 'more speed, less haste' will be a novel concept for some forensic technicians. Should there be a chance to erect a tent then the type of agent will also pose a problem. Some degrade faster than others, some will contaminate the tent (meaning its subsequent destruction) and some TICs may even attack the tent material, reducing its efficiency.

Let's not forget those bodies waiting patiently for the forensic pathologists. At a mass disaster what happens to all of those bodies? How are they moved? Where are they moved to? How are they examined? When and how are they decontaminated? Where are they stored? How are they disposed of? What are the standards put in place to do all of the

above? The list goes on. The examination of a body can tell investigators much about the incident; injuries can depict where the blast came from and what type of weapons and agents were used. The terrorist may also be among the victims and so every effort must be made to identify the bodies. The disaster victim identification branch may have to step in to assist or take over. At a contaminated scene there is no time to perform full examinations of each and every body and so again more decisions have to be made. The pathologists will use their knowledge to decide what bodies should be examined, but they will need to be able to do so in a safe environment – either they must be trained in PPE, or they will need an expensive CBRN-proof mobile mortuary. Once the identification has taken place, temporary mortuaries will be set up to ensure mortuary facilities will not be contaminated, and procedures and teams set up to explain to relatives why they cannot (in principle) collect their loved one.

It is symptomatic of the type of CBRN situations that the international community have faced that there are currently no international standards and procedures put in place to deal with contaminated remains at CBRN events. All previous attempts at creating a device have been interdicted long before its dissemination and the need for forensic scientists. We cannot always expect to be so fortunate, and thankfully some national institutions are taking up the reins. The National Forensic Science and Technology Center (NFSTC) in Largo, Florida, and the Netherlands Forensic Institute (NFI) in The Hague are in the process of putting these standards together, but there is still a lot of work to be done

Despite that the fact that forensic involvement at CBRN events is fundamental to managing the incident it is usually performed by other first responders, while the forensic scientists advise from the side lines. As such the focus has been on training CBRN responders in forensics, rather than vice versa.

An example of this is in the work that NFSTC does in their training of

Forensics is more than just ensuring that the meter readings are recorded properly. ©CBRNe World

first responders for CBRN events. Keith Lothridge, CEO of the NFSTC, said that they tend to train "CBRN responders in forensic practices rather that forensic practitioners going into CBRN events".

He is not alone in this approach, Dr Ed Van Zalen, CBRN Programme Manager at the NFI, one of the world's leading forensic laboratories that specialises in CBRN response, agreed with this approach and stated that they also educate first responders in forensic practices and the preservation of critical evidence.

The NFSTC train responders through lectures (20%) and hands-on exercises (80%) using CBRN detection equipment in different scenarios set up in their crime scene rooms, explosive scenes and site exploitation scenes,

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these can be set up in a number of different environments. Responders go to the NFSTC to get the skills needed to use the equipment they have available to them. They are taught how to identify agents using their own detectors and how to protect the scene. Once they have been through the training sessions they are given scenario packs that they can use to train themselves when they return to their jurisdiction. The NFSTC also provides samples for agencies to use so they can test their own equipment to ensure it is functioning properly and ready for deployment.

NFSTC's Keith Lothridge explains that "Realistically the forensic investigation in a CBRN event tends to get pushed aside by the identification and decontamination of agent. We like to teach a medical model, 'first do no harm and do your job', and then follow up with the tools you would need to submit evidence for conventional forensic analysis, but in a hostile environment. We train everybody including the military in the 'first do no harm': evidence, awareness and collection. The additional training is based on the level of capabilities the responders have and what their job function will be. We teach forensic awareness to just about everyone, from law enforcement to medical examiners to the crime lab examiners."

The NFI has a different approach to its training. They use computer-based simulators to create scenarios that the first responders spend time going through and make decisions founded on the information presented to them following lectures in the classroom.

Dr van Zalen explained: "We train specifically for forensic awareness because in our opinion there is a need to explain what forensic investigation means in a CBRN incident, because everyone is focussed on rescuing people and bringing society back to its former self. This means forensic investigators have to investigate the incident scene afterwards and then most of the traces that are interesting for forensic investigators are either destroyed or not of any use anymore, so what we usually explain to the first responders, but also policy makers, is that there's a need for responders to be aware that forensic traces are important. We also have a multi-disciplinary exercise twice a year where we bring together police, fire brigade and forensic staff who investigate a mock CBRN incident that has occurred."

It is not just the Dutch and the US that are heavily involved in training individuals for the CBRN crime scene and forensic appreciation. The Royal Canadian Mounted Police (RCMP), for example, have their own in-house training. Staff Sergeant Jeffrey Young gives an overview of the training provided to the RCMP by Public Safety Canada and the role they have at a CBRN event: "The courses our police officers complete are mainly based on classroom learning with approximately twelve different laboratory sessions and exercises in live agent training. Public Safety Canada also provide a number of online training courses of different levels depending on what the responder specialises in, for example chemistry or biology.

"For CBRN events we have a team of mainly police officers and depending on the type of event fire or military to help with decontamination, site survey, risk assessment and other forensic work." Jeffrey Young continued, "We like to do as much forensic work in the hot zone as possible as we do not want to bring evidence that is contaminated with CBRN out and have the possibility of cross contaminating other facilities, therefore we use out mobile laboratories to carry out analysis."

Much of this depends on the national structure of law enforcement and forensic science. Those countries that have a national, or Federal, law enforcement structure have the advantage of creating over-arching guidelines, without this it can differ between region to region or institute to institute. The FBI's 12-step process for crime scene management is probably the well-recognised set of procedures for the handling of crime scenes and is used by agencies throughout the US.

Others are catching up with them, the NFI have their own set of certified standards that they use for crime scene management and the RCMP are in the process of certifying their own set of guidelines. They have the benefit of coming second and both stated that their crime scene investigation strategies were very similar to the FBI's 12-step process. The lack, however, of standards between agencies could potentially slow processes down and lead to the unnecessary destruction of evidence. It would be beneficial for research into the best forensic practices for CBRN events to be undertaken and international standards codified.

The training of forensic practices to CBRN responders is a step forward but teaching police officers or firemen to gather evidence should not be the end of the continuum. Forensics is not usually part of a Fireman (for examples) daily routine (arson investigators not withstanding); this should be the job of a forensic scientist. Having forensic scientists working in the hot zone would not only take pressure from the medical professionals, police officers and fire department and would let them work to the best of their ability but improve the quality of evidence collection. Not only would it take pressure off first responders, but training forensic scientists in CBRN safety measures and procedures and putting them into the hot zone could cut the time taken to identify substances and increase the likelihood of capturing the perpetrator. While this is recognised the truth is that it is easier and more financially beneficial to train first responders in forensic practices than forensic scientists in CBRN response.

Setting up a forensic team for CBRN response would involve scientists going through extensive training for all types of CBRN events, expensive PPE and equipment being purchased and training being set up with other first responders to teach a new way of working at a CBRN scene. The funding for such a big venture is outside all but best funded UASI Tier One Cities (such as LA and New York), but inroads are starting to be made with national teams. The FBI, RCMP and NFI have their own forensic teams trained and ready for deployment to CBRN events and seeing more teams like this would be an even greater step forwards in forensic sampling response.