THE COLLECTION OF CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL EVIDENCE IN A GLOBAL JUSTICE ENVIRONMENT

By: Steven C. Drielak

Today's global justice environment demands a new standard as to how chemical, biological and radiological criminal evidence is collected in cases involving weapons of mass destruction. Recent criminal trials at the UN Tribunal in Arusha, Tanzania (Rwanda genocide), The Hague (Milosevic), U.S. Federal Court (U.S. Embassy Bombings East Africa) and the Scottish court sitting in the Netherlands (Pan AM flight 103, Lockerbie) all reflect a growing trend toward international prosecutions. In addition, the treaty establishing the International Criminal Court, under UN auspices, was founded in 1998 and currently has 97 member states. It is a fair assumption that the various international justice systems, including the United States criminal justice system, will eventually be charged with the prosecution of a case involving mass casualties that are the end result of the criminal use of a weapon of mass destruction. The practical implication of this global justice movement will be, in all likelihood, a future judicial examination of the law enforcement procedures used to collect chemical, biological and/or radiological forensic evidence.

False Perceptions

The international courts may involve judges, juries, prosecutors, defense attorneys, and witnesses. As in most criminal trial settings, scientific and law enforcement reports will be secondary to actual witness testimony. Unfortunately, there is a perception by many in the WMD emergency response arena that laboratory reports and supporting sampling documentation can stand alone in a criminal trial proceeding. In

fact, nothing could be further from reality. Prosecutors may be forced to produce as witnesses those individuals who personally conducted the various types of evidence collection, analysis and examination. This is best illustrated by the attempt to introduce as evidence a single chemical laboratory report indicating the presence of a chemical agent. The simple introduction of a gc/ms laboratory report may require the testimony of every single person in that analytical chain. This may include the person who received the samples into the laboratory, the individual who prepared the sample (dilution), the individual who prepared and ran the standards (calibration), the individual who ran the sample, the individual who interprets the data, as well as, the individual who issued the final laboratory report. In addition, members of the hot zone forensic evidence team will be called upon to testify to equipment preparation protocols, quality controls, cross contamination and outside contamination controls, sampling protocols, and protocols for the chain of custody. Each member of this team may be required to defend each and every action that was taken during the evidence collection event. In addition, their formal sample training, experience and qualifications will be examined and, in all likelihood, challenged. Clearly this type of *adversarial* examination far exceeds that of the regulatory oversight and/or peer review that has been previously associated with chemical, biological and radiological sampling. This type of adversarial judicial review will have two immediate effects. First, the sampling and analytical concerns similar to those raised in the 1998 Sudan (EMPTA) sampling event will be fully and publicly addressed.[1] Secondly, governments (including the United States and its localities), through their scientific and law enforcement communities, will be forced to create

stringent evidence collection protocols for cases involving the use, threatened use or manufacture of a weapon of mass destruction.

Criminal Justice System Standards

The standard for which chemical, biological, and radiological evidence will be held will be the criminal standard. In some jurisdictions throughout the world this may be described as "beyond a reasonable doubt." Unfortunately, many of the sampling protocols utilized by the United States and the international community have been designed to meet a regulatory, compliance monitoring or scientific standard. While the sampling protocols may be acceptable within these environments, they may prove to be woefully inadequate when challenged in an adversarial-based judicial system. This point is clearly illustrated in the "*Recommended Operating Procedures for Sampling and Analysis in the Verification of Chemical Disarmament."* These procedures are the recommended chemical sampling protocols utilized by international inspection teams. One of the shortcomings (from the criminal evidence perspective) of this particular sampling protocol is the absence of a *documented* procedure for the sampling equipment sterilization process.[2] Without a proper equipment preparation protocol, a defense issue may be raised regarding the possibility of evidence collection equipment contamination which may have occurred prior to its use. In order to counter such a defense allegation, prosecutors may be forced to prove the existence of such a quality control procedure. The prosecutor may also feel compelled to prove that the procedure was, in fact, conducted on each individual piece of sampling equipment and each individual sampling container. In an effort to counter this type of defense allegation it is essential that law enforcement agencies document their equipment preparation protocol(s). The

documentation process should include the method of sterilization, the date it was completed, and the *name* of the individual conducting the procedure. In an adversarial judicial proceeding, one of the first attacks upon the evidence will be an allegation that the sampling containers were contaminated prior to use. The prosecution may be forced to counter this allegation by bringing forth testimony from the *individual* who conducted the actual sterilization procedure. Sampling Equipment supplier's certificates of "cleanliness" and/or "sterilization" are practically useless in a criminal prosecution and will not stand on their own as evidence of proper equipment preparation. In simple terms, *if a defense attorney can make the sampling containers go away, then the evidence they contain will go away.* These same international sampling protocols also call for "the cleaning of gloves if contaminated during sampling.[3] " With a quality control/cross contamination protocol such as this, many questions will be raised. The very first question that will be raised in an adversarial proceeding will focus on the ability of the human eye to see 100ppb of Sarin or 100 spores of Anthrax. Clearly, any chemical, biological and/or radiological sampling protocol facing a challenge must call for a complete glove change in-between each sample point.

The Protocol's Foundation

To understand *why* the existing sampling protocols (chemical, biological, radiological) are inadequate in today's global justice environment, you must look at their origination and intended purpose. The "*Recommended Operating Procedures for Sampling and Analysis in the Verification of Chemical Disarmament"* is based upon many of the sampling protocols recommended by the U.S. Environmental Protection Agency (EPA).[4] The EPA's sampling protocols, for which these are based, were

originally designed for a regulatory regime. In fact, the majority of chemical samples collected under EPA sampling protocols, is done so for compliance monitoring and/or site restoration. Should this type of chemical evidence be introduced into a regulatory hearing, it would be measured against the *preponderance of evidence* standard. This of course falls far short of the *beyond a reasonable doubt* standard that exists within the United States criminal justice system. When examining the existing international biological and radiological sampling protocols a similar pattern emerges. Each has been designed for regulatory, compliance monitoring or scientific acceptance. Chemical, biological and radiological evidence collection programs that are based upon these types of protocols may have a very short lifespan when properly challenged by competent defense counsel. However, it must be understood that the original designers of these protocols could not have possibly envisioned the type of intense scrutiny that will be brought upon this type of evidence in the future. It is this type of evidence that may determine the life or death for a defendant in a capital murder prosecution.

The existing procedures for chemical, biological and/or radiological sampling do provide a *foundation* for those evidence collection protocols needed in cases involving weapons of mass destruction. Many *scientifically* acceptable sampling protocols can be found in the current and proposed compliance monitoring procedures of the Chemical Weapons Convention[5] and the Biological Weapons Convention. In addition, the U.S. Department of Energy has developed numerous sampling techniques for the acquisition of radiological evidence[6] and the EPA offers many useful chemical sampling protocols.[7] Each of these protocols can be refined and adjusted to meet the standards set by the various international criminal justice systems. In fact, the molding of these types of

regulatory and scientific sampling protocols into those that can be utilized in a criminal venue has already been successfully completed. This has been accomplished in United States criminal cases involving the release of hazardous substances and the unlawful handling of hazardous wastes.[8] These cases are more commonly referred to as environmental crimes. This should not be confused with concept of environmental sampling. Although environmental crime evidence collection may include environmental sampling, it is only a small part of the chemical, biological and radiological forensic requirements needed for a successful environmental crimes prosecution. These types of criminal investigations have been conducted for over two decades by the EPA's Criminal Investigation Division. These cases have included chemical, biological, and radiological evidence collection in every possible matrix. These thousands of evidence collection events have included hazardous chemical precursors, raw production products, biological organisms, contaminated drinking water, radiological contamination, organophosphate poisoning and the sampling for trace forensic evidence. Many of these past and present criminal environmental prosecutions involve hazardous substances that are just as deadly as any that can be found in a weapon of mass destruction. With few exceptions, this evidence has survived the various gauntlets of adversarial judicial challenge commonly found within the United States criminal justice system. By examining all of these pre-existing regulatory and scientific sampling procedures closely, an effective criminal evidence collection protocol can be designed to meet the needs of a WMD/capital murder prosecution.

The Law Enforcement Learning Curve

The proper collection of evidence samples at a suspected WMD manufacturing

facility or a WMD event requires preparation, planning and a strong commitment on the part of law enforcement. Unfortunately, in many parts of the world, this evidence collection responsibility has been left to fire service personnel and other types of emergency responders. Capital murder/mass murder investigations and prosecutions that rely on non-law enforcement trained personnel to collect critical forensic evidence may end with the acquittal of a terrorist. A terrorist that may very well kill again if given an opportunity to do so.

The discipline of hot zone forensics comes with a steep learning curve. Knowing *when*, *where* and *how* to sample are just a few of the components in this complex, and at times dangerous, evidence gathering process. In addition, the proper selection and preparation of sampling equipment, types of analyses required, cross and outside contamination control, evidence transportation and evidence storage are all critical to any successful criminal investigation and prosecution.

When an evidence sample should be taken will vary and will depend upon the circumstances surrounding the manufacture, use or attempted use of a WMD. In cases involving a recent detonation of a device, air sampling may become the immediate priority of any hot zone forensic investigative team. In cases involving a suspected manufacturing facility, factors such as chemical agent degradation (hydrolysis products), destruction or denaturing of biological agents or the breakdown of radiological materials (daughter products) may have to be considered. Fortunately, current analytical techniques will allow for proper identification of the original agents or materials. However, the analysis of breakdown products may not be the best evidence for a capital murder prosecution. When given the choice between a positive Sarin identification or the

positive identification of a Sarin degradation product (e.g. isopropyl alcohol), most prosecutors would choose the former over the later. With this in mind, law enforcement hot zone forensic teams should be prepared to conduct sample collection as soon as it is safe and practical to do so.

Knowing *where* to sample is crucial. A recent detonation or release will, in all likelihood, be self-guiding. However, the key to locating proper sample points rests upon the training and experience level of the initial criminal investigators entering the hot zone. As stated earlier, the law enforcement investigative function must not be confused with role of the emergency responders at a critical incident. In most cases, emergency responders will not be trained in the proper chemical, biological, or radiological evidence collection techniques that may be required in a capital murder prosecution.

When entering any WMD crime scene it should be clear that evidence collection is secondary to both the public's safety and the safety of the hot zone forensic teams. Logic dictates that any case involving the use, threatened use or manufacture of a WMD will require strict safety protocols during any evidence collection operation. However, there is an additional concern that must be addressed regarding *mandatory* safety protocols. The law enforcement investigative personnel must ascertain whether there are existing laws and/or regulations regarding safety issues within the jurisdiction of the evidence collection event. In the United States, the Occupational Safety and Health Administration (OSHA) governs such issues. This agency has adopted strict safety regulations regarding these types of activities.[9] With in the jurisdiction of the United States, law enforcement personnel who violate these federal safety regulations will, in all likelihood, pay a severe penalty at the time of criminal trial. One of the first questions

that will be undoubtedly asked by the defense counsel will be, "*How many federal laws did you violate while collecting this evidence on that day*?" In the global justice environment there is a strong likelihood that the chemical, biological, and/or radiological evidence will be collected to enforce some pre-existing law. It must be made clear to all investigative law enforcement officers that *they cannot violate one law to enforce another law*.

The law enforcement learning curve must also include a complete understanding of those forensic issues that may impact upon the quality of the analysis and the evidence's integrity at trial. *The quality of the evidence analysis will rest upon the quality of the sampling event and the quality of the sampling event will rest upon the integrity of the equipment used and the sampling protocols that are followed.* Each piece of sampling equipment and every sample container must be free of contamination. As stated earlier, the sampling equipment preparation methodology must be documented. There are numerous equipment sterilization methodologies available (e.g. chemical treatment, autoclaving, and irradiation). Whatever sterilization protocol is chosen, it must meet the needs of the analytical methodology that will be used. An example of this can be found in biological agent sampling. While standard autoclaving (super heated steam) is an acceptable sterilization practice for the biotechnology industry, it should not be used when the analytical methodology includes DNA/PCR analysis. The reason for this is that autoclaving, may not destroy DNA.[10] The presence of extraneous DNA in the sample evidence can only diminish the prosecution's case and may serve as a tool for the defense in an effort to confuse a jury in this extremely technical subject matter. In an adversarial judicial proceeding, there may be an immediate defense claim that *all* of the

sampling equipment was pre-contaminated prior to use. It will be the job of the prosecutor to counter this allegation by producing *witnesses* and their supporting documentation.

The cross contamination of sample points may become a major issue during the criminal proceedings. In order to avoid this issue, there must be a detailed *glove change protocol*. The layering and stripping of sampling gloves *is not* the recommended glove change method for all sampling situations. This is especially true when handling liquid agents, their precursors or waste products. The process of filling the sample bottles with these liquids *will* cause some spillage onto the sampler's gloved hands. If this contamination should enter the wrist area, all underlying layers of gloves may become contaminated. An additional concern in this area is that many chemical agents and precursors are volatile. Sampling gloves may become contaminated due to the volatizing vapors coming into contact with the glove's surface. This unseen contamination on the exterior of the glove surface may then be carried over to the next sample point. Due to the sensitivity of laboratory analytical equipment (e.g. parts per billion), this small amount of cross-contamination could produce a false-positive analytical result for the next sample point. Once a matter such as this reaches the criminal trial stage, the sample team members can expect long and grueling cross-examination testimony on this very issue. Therefore, the best protocol may be the simplest protocol. *When sampling for chemical and biological evidence, sampling gloves must be changed in between each sample*. There should be no exceptions to this rule. When dealing with radiological evidence, a simple *frisk* may be done over the sampler's gloved hands to insure that they are free from contamination. This is accomplished by examining the gloved hands with

the probe of a Geiger-Mueller counter that is capable of detecting alpha, beta, and gamma radiation. If contamination is found, the gloves should be changed immediately.

Conclusion

The collection of chemical, biological and/or radiological evidence can be broken down into 15 basic sampling disciplines, which cover 5 basic sample matrixes. These matrixes include aerosols (or air), liquids, solids, surfaces, and dermal samples. Each of these evidence collection disciplines has it own unique and detailed requirements. Each of these must be addressed and mastered by law enforcement if we are going to successfully investigate and prosecute future terrorist/WMD acts. It is essential that all *investigative* law enforcement personnel involved in the WMD field realize that the global justice environment will demand that quality sampling protocols be created and maintained. Genocide, ethnic cleansing and the use of weapons of mass destruction all share a common ground. Each is a crime against humanity that will, in all likelihood, be prosecuted in a future criminal court and that court will be both demanding and unforgiving.

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1. Michael Barletta, "Chemical Weapons in the Sudan: Allegations and Evidence," Nonproliferation Review (Fall 1998), p.123.

2. Ministry of Foreign Affairs of Finland, *Recommend Operating Procedures for Sampling and Analysis in the Verification of Chemical Disarmament*, 1994, G.T. 5.3.

3. Ministry of Foreign Affairs of Finland, *Recommend Operating Procedures for Sampling and Analysis in the Verification of Chemical Disarmament*, 1994, S.C. 6.4 (a).

4. U.S. Environmental Protection Agency, *Test Methods for Evaluating Solid Waste, SW-846*, (Washington DC, 1994) 4.1.

5. [1] Ministry of Foreign Affairs of Finland, *Recommend Operating Procedures for Sampling and Analysis in the Verification of Chemical Disarmament*, 1994.

6. U.S. Department of Energy, Environmental Measurements Laboratory, *HASL-300*, 28th Edition, (New York, February 1997).

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10. Lynn C. Klotz, "Evasion Scenarios and Countermeasures," *The Utility of Sampling and Analysis for Compliance Monitoring of the Biological Weapons Convention*, (February 1997) p. 52.