

Developing Role of Forensics in Deterring Violence and Genocide

The development of DNA-testing capabilities within the former Yugoslavia to identify the missing began the process of returning names to thousands of people. The most striking example was the successful application of a DNA-led identification system for the victims of Srebrenica. To date, almost 4100 individuals related to the Fall of Srebrenica in July of 1995 have been identified, almost all of whom were Bosniaks. Without DNA testing, very few of these victims could have been identified. The overwhelming weight of evidence and number of identifications, made possible by forensic DNA testing, was a critical factor in helping to compel a national entity to admit their role in genocide. Forensic DNA testing was instrumental in the admission of genocide and in the indictment of hundreds of alleged perpetrators.

Forensic DNA testing provided critical evidence that was used to hold individuals and nations accountable for crimes against humanity and genocide. The rapid advances in the understanding and application of not only the science of forensic DNA testing, but also its legal-judicial implications, permits such testing to be used in a new context – to help deter violence, systematic rape, and genocide.

Background

The fall of Srebrenica in July of 1995 represents the single worst loss of life during the breakup of

Yugoslavia. The ground fighting associated with the breakup of Yugoslavia was centered in Croatia and Bosnia and Herzegovina (BH) from 1991-1995 and then in Kosovo in 1999, and resulted in the loss of over 200 000 persons, 20 000-30 000 of whom were listed as missing after the cessation of hostilities (1). The large number of missing became a political issue within the former Yugoslavia and acted as a destabilizing force in several of the newly emergent democracies. Without the use of advanced forensic techniques, based upon DNA testing, the accurate identification of large numbers of these missing was not possible. It was against this background that the world's most successful DNA-led identification program was established. The identification of thousands of missing helped unite various factions for a common purpose and, by doing so, advanced far more than the scientific understanding; the ability of forensics to hold individuals and nations accountable for their actions was clearly demonstrated and serves as a model for similar missions in the future, as well as helped develop an understanding of how forensics can be designed to help deter violence and genocide.

Srebrenica, a town located in east central BH, became synonymous with genocide and also serves as the example of how large numbers of DNA-led identifications can bring accountability on both individual and national scales. During a one-week period in July 1995, an estimated 7000-8000 mostly Bosniak men went missing in the Srebrenica area.

Units of the Army of Republika Srpska were accused of the killing under the command of Ratko Mladić (2). If the accusations and the number of killed were correct, this would represent the largest mass killing in Europe since the end of the World War II. At first, the Republic of Srpska denied their forces were involved or responsible for large-scale, systematic killing in and around Srebrenica in July of 1995. However, as mass graves began to be uncovered that contained hundreds of bodies and body parts, the once steady denial of human right violations gave way to overwhelming evidence of large-scale killings of what appeared to be unarmed civilians (3,4). Within a few years, thousands of body bags containing an unknown number of remains had been recovered. Most of these body bags were taken to the city of Tuzla in Bosnia for storage and examination. However, few identifications were possible using non-DNA techniques, and without accurate identifications the truth of what happened would be masked to some degree and more easily denied and debated.

System development

As the conflict in Croatia subsided in 1995, government officials began the successful application of using DNA testing to identify victims of the conflict, demonstrating the feasibility of these techniques for such identifications (5). To further the identification of the missing in Croatia via a DNA-based identification system, Croatia developed several DNA laboratories within its borders. BH emerged from the conflict with thousands of unidentified bodies and a shattered infrastructure. The identification system developed by the International Commission on Missing Persons (ICMP) became the leader of the DNA-testing system initially in BH and then in Kosovo. Multiple DNA laboratories were established within the former Yugoslavia and gained support from family organizations of the missing. Strategies were developed to unite local and

international political and government entities, representatives of the local legal-judicial system, financial donors, and others, to create a system within the region to aid in the identification of estimated 20 000-30 000 missing persons (6). By 2003, the system developed within the former Yugoslavia by the ICMP was producing more than 400 DNA reports per month, which included DNA-based reassociations of disarticulated skeletal remains. The day when the first in-country DNA-led identification was made in BH became a National Day of Remembrance for the missing.

Results

The DNA-led identification system developed by the ICMP was used to identify thousands of bodies that had been recovered from the mass graves throughout the former Yugoslavia, including Srebrenica. DNA testing supported the contention that the overwhelming majority of the bodies recovered around the Srebrenica area were missing Bosniaks. The re-exhuming of Srebrenica-related primary mass graves and transporting bodies to different locations for subsequent re-burial in secondary or tertiary mass graves resulted in substantial disarticulation. Such exhumations and re-burials resulted in bodies being spread across multiple mass graves, sometimes hundreds of kilometers apart. Without the use of DNA to reassociate these remains, many families would have received only a few skeletal fragments of their loved ones for burial. However, the DNA-led identification system developed by the ICMP has not only produced almost 4100 DNA matches of individuals believed to have died during the fall of Srebrenica in July of 1995, but also helped to re-associate many previously disarticulated skeletal elements and in doing so, has provided information on the movement of bodies from mass graves. The ICMP Web site lists the total number of 11 600 DNA matches for missing individuals from the former Yugo-

slavia as of May 4, 2007 (<http://www.ic-mp.org>). Each year on July 11, the recognized anniversary date of the genocide at Srebrenica, hundreds of identified bodies are interred at the Potočari Memorial located at Srebrenica (7).

The weight of DNA evidence became undeniable and was a critical factor in compelling the Republic of Srpska to not only admit that genocide occurred, but also that their forces were involved in these killings (8). Based to a large degree upon this evidence, The Criminal Tribunal of the Former Yugoslavia issued roughly hundreds of indictments related to the killings in and around Srebrenica in July 1995. DNA testing forced a national entity to accept responsibility for genocide. This is precedent setting not only for the former Yugoslavia, but also for other regions that teeter on the brink of instability and violence; individuals and nations can be held accountable for large-scale killing and violence, and forensics will be able to provide the truth of what happened.

The three authors of this paper spent a total of 12-man years living in the former Yugoslavia employed by the ICMP and served as the Director of the Forensic Sciences Program, the Head of DNA Laboratory Development and Operations, and Head of DNA Laboratories. The creation of this system presented many challenges on scientific, political, cultural, and financial terms. However, all of these challenges were overcome and the lessons learned can be applied not only to help identify the missing in other areas, but also in addressing other types of violent crimes, including acts of terrorism, interdiction against drug trafficking, and even to help combat human trafficking. Not only can forensics be used to address past and current day crimes, but it is now conceivable to consider the use of forensic science to help proactively deter violence, including genocide and systematic rape.

Within the last decade, the successful development and application of DNA testing methods has forever altered the way in which

biological samples can be traced, including identifications of large numbers of missing, such as might occur after a natural disaster (9), or man made events like mass killings and terrorist attacks (10). Forensic DNA systems and techniques can be developed or applied in many places throughout the world, including those regions where large-scale killings have occurred, are occurring, or have a potential of occurring. The identification of victims combined with thorough investigative work makes it possible to return names to the bodies of the missing and, in doing so, to at least somewhat reconstruct their history and the truth of what happened to them. This brings solace to families of the victims, as well as crucial evidence in judicial processes, which assists in the reconciliation process both at the family and the national levels. It also permits successful prosecution of the perpetrators of the violence and killing and has been demonstrated to hold individuals, as well as national entities, accountable for their actions. The possibility of holding the guilty accountable may be one of the greatest deterrents to violence and killing. As in the example of Srebrenica, the truth can be revealed, resulting in individual prosecution and international consequences.

Hypothesis of prevention

To date, identification efforts for the victims of genocide have been performed after the killings have occurred. However, it is now possible to use forensic techniques in an effort to not only lay the foundation for future identification efforts, but to also send a message to future perpetrators that they will be held accountable for their actions. The ultimate goal of this type of an effort is to help alleviate or prevent killing and violence. Such methods will also aid in developing a historical and forensic context of events associated with violence or the potential of violence. It should be noted that DNA testing is not reserved only for prosecution; it is a neutral science. It provides in-

formation to the source of a biological sample, whether it is from a skeletal sample, from a rape, or even from a fingerprint. It is recommended that other evidence be combined with the DNA data in order to present a more complete understanding of the identity of the individual and the events that led to that sample being present in the location where it was found. Recently, DNA testing has been used to help exonerate those who were falsely convicted of past crimes, clearly demonstrating the multidimensional judicial use of DNA testing.

While the science of DNA testing remains the same, how it can be most effectively applied to meet each specific need varies. The history, culture, and existing capability of each nation is different, as is the context in which violence and killing are taking place, and these differences should be taken into account in preparing to apply or develop forensic techniques. In addition, the forensic system and/or DNA laboratories involved in any collection and testing process should be both accredited and subject to outside, independent inspection. The quality of work will need to be guaranteed and any such system must resist pressure to influence results, either by altering data, or by showing a bias of testing toward or against certain groups. The integrity of a forensic system and its operations should be able to withstand outside scrutiny from internationally recognized and empowered bodies. Not only should the system adhere to internationally accepted scientific and forensic principles, but also all staff members should be able to express concerns related to pressures in performing their duties. DNA profiles should be considered highly confidential and any and all DNA data must be maintained according to strict guidelines involving the collection, storage, and dispersion of confidential data. Such safeguards will help forensic systems provide reliable results and will be more readily accepted by both the local and international communities they serve.

Non-suspect casework, where biological samples are recovered from the victim or crime scene where there is not a suspect (which is often the case with rape victims) would preserve into perpetuity the DNA profiles of the attacker(s) and could one day assist in their identification and prosecution. It would also be able to demonstrate if the same individuals are engaged in multiple and widespread criminal activities and if a pattern exists to the violence, potentially indicating state sponsorship. Moreover, new computer programs now allow different police jurisdictions, even in different countries, to instantly share critical data electronically (11), potentially linking suspects who once thought they had escaped justice by simply crossing the border. Coupled with other evidence obtained by traditional forensic investigations, forensic DNA testing can provide the critical information needed to proceed with prosecution.

Many cases in which the threat of widespread violence and killing exist are not in areas or regions that have either developed forensic system or that are easily accessible. In addition, it may often be difficult to perform the extensive collection, recovery, and forensic tests that are required to produce numerous identifications or tracking of suspects. Nonetheless, even in the most inhospitable of areas, forensics may be able to help deter violence via a pilot study mechanism. For example, collection of DNA samples from family members who are missing loved ones would create a DNA database of the missing, showing the families that their loved ones are not forgotten, while at the same time showing those who are killing the innocent that steps are being taken to hold them accountable.

Such a pilot study could begin with an initial collection of 500 samples from unrelated individuals within a population experiencing, or that may experience, violence or that has been displaced due to violence, such as individuals in refugee camps. The 500 samples would provide the scientific understanding needed to help design

a DNA database for statistical analysis, as well as the number of loci needed to produce a given statistical power (as measured by posterior probability). Information explaining the purpose of the pilot study collection and the process would need to be communicated both verbally and in a local language pamphlet to the participants of the study so that they are fully informed. The type and number of forms to be completed during the collection process would need to be determined beforehand and may include a consent form, a missing person questionnaire (if appropriate), and DNA sample card, among others. Upon completion of the forms, any collection team should then collect the biological sample from the donor. It is recommended that a barcode system be employed to link any forms and/or questionnaires to the corresponding reference samples.

Such a limited DNA collection campaign geared toward collecting biological samples from surviving family members of missing persons or from rape victims would constitute a significant step forward in developing a DNA database for future prosecution against those who are committing crimes today, and in doing so would demonstrate resolve to act against the continuing violence. The efforts described above are scientifically doable today and would require minimal resources. At the same time, such initiatives would push the frontiers of forensic DNA testing from post-conflict use into a proactive, preventative role. Successful application of this method in any one region or incident could be used as an example and a springboard into other areas that are at risk of destabilizing. The ability to link an individual to biological material left at a crime scene and/or to demonstrate that a given individual has been at the scene of multiple crimes not only helps to provide evidence for current and past crimes, but also serves as a warning to other potential perpetrators that they can be held accountable for the crimes.

The authors of this paper are currently employed by The Bode Technology Group (Bode;

<http://www.bodetech.com>), a leader in providing forensic DNA analysis headquartered in Lorton, Virginia, USA. Bode has assisted in the DNA testing associated with mass fatality incidences in the United States and abroad, having assisted in identifying over 1500 victims of war, terrorism, crime, and natural disasters. Portions of Bode's international work include the identification of missing persons, developing forensic systems to assist in the safety and security of their peoples, creating DNA database capabilities, testing samples from sexual assault cases, developing forensic laboratories, and training of scientists.

The number and variety of samples, cases, and circumstances encountered in testing samples from across the world has aided in improving not only the technical know-how needed to obtain profiles from such samples, but also in further developing an understanding of some of the political and cultural issues sometimes associated with these cases. It is this combination of scientific, political, and cultural knowledge that helps form a basis of understanding on how forensic testing and forensic systems can best be developed and applied within nations. As the case shown in BH, the transfer and development of a world leading DNA testing system is possible even in war-torn nations.

It should be noted that many of the nations in need of such services are also nations that might not have sufficient funds available to pay for the cost of such testing or system development. In such instances, a source of funding will need to be found, and this will often require joint support from both within the host nation as well as among outside supporters. There are examples in South-eastern Europe and Latin America on how such efforts can be successfully applied, but it is beyond the scope of this paper to detail these efforts.

Conclusion

Forensic testing, especially forensic DNA testing, has made remarkable advances within the

past decade. No longer is such testing reserved for only a few special cases; it can now be used to identify tens of thousands and to help reveal the source of biological samples on scales and in conditions that would have been unimaginable more than a decade ago. Just as the laboratory capabilities of forensic DNA have evolved, so has its legal-judicial applications and implications. Forensic DNA testing needs no longer be reserved for the application only after the fact – after the violence and killing has taken place. A proactive strategy conducted during or prior to the onset of violence instead of years after the conflict has ended has the potential of interceding against violence and against genocide. In this manner, forensic DNA testing, which has proven to be one of the most effective crime deterrents for crimes committed by individuals in Western nations, can be used to help deter organized and “officially” sanctioned and supported violence and killing. It is possible to foresee the use of forensic DNA testing in both a proactive and preventative role against such violence and, thus, in not only identifying the missing, but in playing an active role to help prevent their deaths.

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References

- 1 Missing persons in Southeast Europe. Hearings before the commission on security and cooperation in Europe. 108th Cong., 1st sess. (Aug 1 and Sep 18, 2003). Available at: <http://www.csce.gov>. Accessed: July 13, 2007.
- 2 Srebrenica mothers search for sons for 10 years. Reuters. June 26, 2005. Available at: http://www.srebrenica2005.org/index.php?page=srebrenica_now. Accessed: July 13, 2007.
- 3 Baker R. Grisly clues in Bosnia's largest mass grave. The Christian Science Monitor. September 8, 2003. Available at: <http://www.csmonitor.com/2003/0908/p08s01-woeu.html>. Accessed: July 13, 2007.
- 4 Bosnia-Herzegovina. Srebrenica: still waiting for the truth. Amnesty International Web site. Available at: <http://web.amnesty.org/library/Index/ENGEUR630032005?open&of=ENG-BIH>. Accessed: July 13, 2007.
- 5 Primorac D, Andelinovic S, Definis-Gojanovic M, Drmic I, Rezic B, Baden MM, et al. Identification of war victims from mass graves in Croatia, Bosnia, and Herzegovina by use of standard forensic methods and DNA typing. *J Forensic Sci.* 1996;41:891-4. [Medline:8789853](#)
- 6 Huffine E, Crews J, Kennedy B, Bomberger K, Zinbo A. Mass identification of persons missing from the break-up of the former Yugoslavia: structure, function, and role of the International Commission on Missing Persons. *Croat Med J.* 2001;42:271-5. [Medline:11387637](#)
- 7 The Potocari memorial cemetery for the victims of the Srebrenica massacre. Available at: http://www.war-memorial.net/mem_det.asp?ID=62. Accessed: July 13, 2007.
- 8 Bosnia Serbs admit to Srebrenica. Available at: <http://news.bbc.co.uk/1/hi/europe/3799937.stm>. Accessed: July 13, 2007.
- 9 Three months later, DNA tests to start on Katrina bodies. Available at: <http://www.cnn.com/2005/US/12/06/katrina.dna/index.html>. Accessed: July 13, 2007.
- 10 Dajani D. Iraq to establish centre for missing, disappeared persons. *Jordan Times.* January 17, 2005. Available at: <http://www.jordanembassyus.org/01172005001.htm>. Accessed: July 13, 2007.
- 11 Combined DNA Index System (CODIS), Federal Bureau of Investigation. Available at: <http://www.fbi.gov/hq/lab/codis/index1.htm>. Accessed: July 13, 2007.