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# **Establishment of Interdisciplinary Working Group for Review of Kinetic Energy Munitions Final Report 2010**

2005-MU-MU-K001

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## **Background**

Two distinct interdisciplinary review panels were formulated between 2006 and 2010: Behind Armor Blunt Trauma (BABT) review panel and the Less Lethal Technologies Medical and Scientific Advisory Panel (LLTMSAP). Each panel consists of members that have qualifications specific to the panel on which they are members. This report will be divided into two sections (BABT and LLTMSAP) with an overview of each meeting and a summary of findings.

## **Behind Armor Blunt Trauma (BABT)**

Of approximately 1,200 officers killed in the line of duty since 1980, it is estimated that more than 30% could have been saved by body armor [1]. According to the James Guelff Body Armor Act, the risk of dying from gunfire is fourteen times higher for an officer not wearing a vest [1]. In addition, the US Department of Justice estimates that 25% of state, local, and tribal law enforcement officers are not issued body armor [1]. Since establishing the IACP/DuPont™ Kevlar® Survivors' Club® in 1987; over 3,000 law enforcement personnel have survived both ballistic and non-ballistic incidents because they were wearing body armor [2].

Body armor is comprised of fibers that have been woven together into sheets. Numerous sheets are used to make up one ballistic panel. The sheets work individually and together to help prevent the penetration of the bullet. Some materials that are used include: Kevlar®, Spectra® Fiber, Aramid Fiber, and Dyneema. The material fibers work to absorb and spread the energy over the entire torso so all of the energy from the impact is not focused on one area of the body, resulting in serious injury. Standards are set by the National Institute of Justice (NIJ) for the amount of deformation that is allowed into a person's torso, this is termed backface signature. With body armor becoming more pliable, more deformation is experienced and a certain type of injury has become more prevalent and is known as the backface signature injury. This is defined as an open wound that almost resembles a bullet wound, however, in these cases the bullet is captured in the armor and doesn't perforate the vest [3]. With these injuries becoming more common, the current standard for body armor should be evaluated to ensure officers are not at an increased risk.

In early 2000, National Institute of Justice [NIJ] and DoD were investing a significant amount of funding to lay the ground work for developing computer models to predict the injuries from LL devices. Much of the data being used to develop these finite element models were derived from animal and cadaveric data. Although many suspects were being exposed to LL devices, there were no human data available to validate these models. NIJ studied the issues surrounding the difficulties of obtaining human injury data, to include privacy issues, IRB issues, HIPPA issues, legal issues with potential law suits and many other regulations and sensitivities required to protect an injured person, their privacy as well as not compromising [and hopefully improving] the injured person's treatment. Exemptions were explored and a potential way forward was identified. It was then necessary to verify all regulatory and social issues and a pilot program was developed in order to verify all concerns. The pilot program was designed at NIJ and it was named the Less Lethal Incident Monitoring Program. It was to confirm that injuries and severity of injury data from LL device could be collected in a responsible, non-interfering way. If successful, these injury data could be used to assess the accuracy of the existing animal and cadaveric data and assist law enforcement and DoD in the verification of their computer models.

This program was successfully started and has recently yielded very interesting research reports in medical journals. It has also provided NIJ and the LL community with data to establish a formal baseline on the number of uses and their outcomes graded into three levels of injury severity. It additionally addressed the number one requirement, a methodology to obtain human injury data within all legal constraints.

This pilot on obtaining injury data on humans was revised to establish a methodology to obtain human injury data on officers that were shot while wearing body armor. With some minor revisions to the original Less Lethal Incident Monitoring Program pilot, a second pilot was begun, called the Body Armor Incident Monitoring Program. This pilot was designed to understand injuries to officers wearing body armor and to study blunt force trauma injuries (bruising, lacerations, and/or internal injuries caused by a bullet striking but not perforating the vest).

### **Study Methodology**

Wayne State University and the IACP/DuPont™ Kevlar® Survivors' Club® have collaborated to determine the types of injuries that are likely to occur from a blunt impact to the chest and to determine if the current standard is effective at preventing serious injuries to the chest. Ballistic cases are identified by the Survivors' Club database. In addition to the Survivors' Club members, packets are also sent out to those that have been contacted by the Survivors' Club but have not joined. The packets that are sent include requests for their participation in the study, release of their medical records for that incident, and their contact information for a phone interview.

If the survivor agrees to participate, the medical records will be procured and a follow up interview will be administered over the phone. Also, to enhance the information received, police reports are also requested. All of the information collected is analyzed by a panel of experts.

### **Study Overview and Progress**

All of the past ballistic cases from the Survivors' Club database have been contacted. As new cases enter into the Survivors' Club, packets continue to be sent to request their participation. Currently, 355 letters have been sent to IACP/DuPont™ Kevlar® Survivors' Club® members and 124 have been sent to potential members. A total of 77 have agreed to participate, 70 are members and 7 are potential members. Medical records have been procured for 50 cases. Follow-up interviews were conducted with 54 of the survivors'. In addition, to acquire more details from each of the participating cases, police reports are now being requested from the appropriate agencies. Nine police reports have been received to date.

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### **Interdisciplinary Review Panel Meetings**

As part of this process, a blue ribbon panel of experts was brought together to review the findings of the study. Prior to convening this panel, a meeting was held to give an overview of the project and to receive approval for the expert panel. The meeting included representatives from DuPont, IACP/DuPont™ Kevlar® Survivors' Club®, Wayne State University, NIST, NIJ, and two police officers.

The meeting was opened by providing an explanation of and a history pertaining to the IACP/DuPont™ Kevlar® Survivors' Club® database. This was followed by an overview of the National Institute of Justice Less Lethal program workflow that is being adapted to create the Body Armor workflow.

After the introductions and overviews, the current state of Wayne State Universities' project was presented to the panel. The purpose of the study, the data retrieving process, and the types of data being retrieved were described for the panel members. The purpose of the study was outlined as determining the types of injuries that are occurring while officers are wearing body armor. The data retrieval process was reviewed and includes sending letters asking for participation. With the return of the paperwork, including the medical release form and short survey, contact is made with the hospitals/doctors to retrieve the medical records and the survivors' to get their story. Officers with ballistic related injuries are the only ones that are contacted.

Suggestions were made to look at other data collection options than just the IACP/DuPont™ Kevlar® Survivors' Club® database to recruit participants. A possibility of contacting individuals that have been contacted by the Survivors' Club but have yet to join has been promised to help get more participants. Another suggestion that was made was to set up policies for the ER doctors to follow when a police officer arrives at the hospital.

Behind armor body trauma (BABT) panel meetings have been held to discuss the progress of the study. The panel is comprised of researchers, administrators, physicians, and representatives from the law enforcement community. Three meetings have been held thus far. Each participating case is looked over by the panel and discussed. Input is then generated by the panel members on how to improve the data that is received. A summary from each meeting is provided below.

#### **BABT Panel Meeting Summary April 2007**

The panel members that were present for this meeting included: Joe Cecconi, Cynthia Bir, Ron McBride, Ian Horsfall, Duane Cronin, Brenda Worthington, Daniel Longhurst, Cathleen Higgins,



Kirk Fitch, Mary Jo McMullen, Martin Raftenberg, Chris Sloane, Ed Davis, Sarah Stojasih, and Charlene Schreiner.

This was the first meeting that was comprised of the expert panel. On the first day of the panel meeting, an overview of the project was given. All the data that was gathered for each of the 56 cases was presented and discussed carefully. The data that was presented incorporated a synopsis of the incident, the threat level of the vest, injuries, and the caliber and type of weapon and ammunition. On the second day, the panel members were separated into subject matter expert (SME) groups to discuss each case individually. The SME groups were separated into researchers, administrators, and physicians. The final day was comprised of each group summarizing their thoughts and suggestions on what is needed to enhance the study.

The medical records were separated based on the threat level of the vest that was worn during the incident. Each SME group was designated a threat level, once discussions subsided, the records were passed to another group. The focus of the discussions included strikes to the armor and associated direct injuries, the coverage of the body armor, and the identification of cases that could be re-created in a laboratory setting.

The physicians looked through the medical records searching for indications of the quality of the exam that was given to the injured officers. Receiving complete medical records is crucial for this study, especially the ER report and the discard summary which include detailed information regarding injuries and treatment. The need for photographs of the injuries was also expressed during the meeting. This would allow verification of the severity and exact location of the injury. It was indicated by the end users that most police departments keep photographs of the injuries and of the vest. Another option would be to inquire about photographs of the injuries during the phone interview since some survivors' might have documentation of the injuries readily available. Discussions also involved the need for physician guidelines that ER physicians can follow when faced with an officer that had been shot. Stating tests that should be conducted depending on the shot location would be beneficial to the medical community. In addition, allowing the physician access to the vest that was worn by the officer could aid in the treatment. That way the treating physician would know where the impact occurred even if there wasn't a visual injury. In general, a portion of the medical records were incomplete and some were not helpful. More information is needed which can be obtained through the correct medical records or the phone interview with the officer.

The administrative group was focused on whether the armor, depending on the threat level and ammunition, was effective. However, they needed more specific information such as model numbers, detailed information about the weapons and bullets, and distances. The administrative group found from the cases that each threat level was well matched with the ammunition and was effective. There was no evidence of an over performing vest.









































