THE UNIVERSAL BIOPSY TOOL: A NOVEL TISSUE COLLECTION AND PRESERVATION DEVICE FOR DNA IDENTIFICATION AFTER MASS FATALITY INCIDENTS

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Introduction: The universal biopsy tool was originally conceived in the wake of the 2004 Asian Tsunami, as a solution to tissue handling concerns when disaster victim identification by DNA analysis is required. This concept was also extended to the collection of tissue after contaminated events e.g. chemical or biological incidents. Prior to the development of this instrument, DNA sample collection was only undertaken during post-mortem examination of cadavers, using two separate tools, scalpel and forceps, in a process requiring several manipulations. Under normal conditions where a small number of bodies are being examined this method of collection poses no problems as time and facilities permit a prolonged examination of the deceased. This may not be the case during disaster victim identification projects, whereby numerous individuals may require identification. Under such conditions the rapid collection of biological samples, *in situ*, is desirable to facilitate the identification process at the earliest opportunity. An additional observation following the Asian Tsunami was that sample deterioration during transit was adversely affecting the quality of collected samples, and the results of DNA analysis, a method of room temperature preservation for worldwide transit of sample would also be greatly beneficial to this work.

Aim & objectives: Design, development and testing of an 'all-in-one' DNA collection and preservation device for use in major identification projects. To fulfil this aim several objectives were set including; assessment of current market, testing of DNA preservation solutions; design and testing of a tissue collection device capable of working on whole, disrupted or otherwise damaged/decayed tissue and final prototype production, ease of use wearing full personal protective equipment and design evaluation.

Methodology: The current market for tissue collection devices was assessed and numerous medical biopsy tools were discovered and tested. It was quickly discovered that the tools designed for the living were not performing the same function for the deceased, tissue samples were not removed by these tools, they would cut, but not excise the intended samples. A new tissue collection device was designed to overcome the problems experienced with existing technology and prototype models were produced. Meanwhile, two solutions, designed for room temperature preservation of DNA had been identified. A series of experiments were initiated to determine the quantity of soft tissue that needed to be collected in order to produce a DNA profile, whilst allowing for sufficient preservation to be achieved. It was determined that 25-50mg soft tissue was sufficient for multiple DNA analyses to be carried out. This finding was fed back into our tool design modifications, ensuring that the designs we were testing were consistently collecting the desired amount of sample. Following this initial research and prototype testing and re-design, 20 units of our final prototype were produced to allow for extensive testing both within our research Unit and by outside agencies.

Outcomes: We have designed and produced a novel tissue collection device that allows for the safe and easy collection small samples from whole or disrupted corpses, which can then be preserved at room temperature within the sampling apparatus until required for DNA analysis within the laboratory. This work was supported by the East Midlands Development Agency and was Highly Commended at the Da Vinci Health Technology Awards in October 2008.