



TRAVEL REPORT



2015

Allan Hodda Memorial Award - Natasha Mitchell

'They shall not grow old, as we that are left grow old;
Age shall not weary them, nor the years condemn.
At the going down of the sun and in the morning
We will remember them'.

Laurence Binyon, 1914

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Travel REPORT

ALLAN HODDA MEMORIAL AWARD - NATASHA MITCHELL

Introduction

'At the going down of the sun and in the morning, we will remember them'. For most of us these immortal words serve to remind us of the many soldiers who lost their lives on the battlefield. For the Australian Defence Force these words extend beyond remembering their sacrifice. Unrecovered War Casualties – Army (UWC-A) work tirelessly to not only remember but to locate and identify the many thousands of soldiers who remain unaccounted for from past conflicts. Most of the recovered remains require identification using DNA methodology, however, several factors make this process very challenging. Historical records are incomplete, access to appropriate Family Reference Samples is limited and DNA recovered from skeletal remains is in limited supply and often severely degraded, particularly remains recovered from the Asia Pacific arena. UWC-A does not have dedicated laboratory facilities rather it engages with research and service providers that employ standard Y-STR and mitochondrial DNA methods to determine ancestry and/or lineage. However, in several cases current methods have not successfully resolved ancestry or assisted identification. The primary purpose of my travel to the USA was to identify Massive Parallel Sequencing (MPS) methods and potential service providers to address these challenges. Additionally, I intended to strengthen my own knowledge of MPS as well as mitochondrial DNA analysis for the identification of degraded human remains.

Executive Summary

The 2015 Allan Hodda Memorial Award was used to partly fund travel to:

- 27th International Symposium on Human Identification, Hyatt Regency Hotel, Minneapolis, Minnesota, USA
- Armed Forces DNA Identification Laboratory (AFDIL), Dover, Delaware, USA
- University of North Texas (UNT), Fort Worth, Texas, USA
- Defense POW/MIA Accounting Agency (DPAA), Pearl Harbor, Hawaii, USA

Key Benefits and Outcomes

- Knowledge acquisition about the application of MPS in the USA forensic setting
- Established professional relationships with leading experts in MPS technology and its application to the identification of degraded human remains
- Collaborative project initiated between UWCA, Griffith University and Indiana University - Purdue University Indianapolis (IUPUI)
- Knowledge and exposure to bone sampling and bone demineralization DNA extraction protocols
- Strengthened the relationship between UWCA and AFDIL and DPAA facilitating the development of future interagency collaborations
- Promoted and broadened the international exposure of the ANZFSS

Itinerary and Outcomes

27th International Symposium of Human Identification, Minneapolis, Minnesota, USA 26th - 29th September, 2016

- I attended two pre-symposium workshops:
 - 25th September – Determining Phenotypes from Genotypes presented by delegates of the Human Identity Trade Association. This workshop focused on the use of biomarkers to predict hair and eye colour, including the use of the HlrisPlex assay in addition to other assays. The workshop concluded with a panel discussion about where phenotyping technology is headed.
 - 26th September - Moving Implementation mountains: Experiencing the Forensic laboratory NGS and bioinformatics Workflow through Simulation presented by delegates of RTI international. Attendees gained hands on experience the simulation tool designed to facilitate the implementation of an MPS workflow into a standard forensic laboratory. Key MPS researchers were present and considerable discussion about bioinformatics, its challenges and potential solutions were discussed.

- Key topics at the conference included MPS and analysis of low copy DNA. Other topical areas included the sexual assault kit backlog and the use and implementation of rapid DNA instruments. In total 29 oral presentations were delivered and 126 posters presented. Approximately 840 people attended and 23% of those were international delegates representing 44 different countries. Outside session times several 2-hour vendor showcase sessions were held. I attended the ThermoFisher and Batelle sessions, both of which explored forensic validation of MPS technology.

- Outcomes:
 - I met with leading scientists MPS technology including those with experience in the validation of MPS for a routine forensic laboratory such as Michael Brandenhagen, Federal Bureau of Investigation and David Ballard, University College London.
 - In March 2017, I visited David Ballard in London to learn more about his experience with different MPS platforms.
 - I met with Dr Susan Walsh from IUPUI, a co-developer of the HlrisPlex assay. On return to Australia I facilitated the collaboration of a project between IUPUI, Griffith University and UWC-A.
 - Gained an understanding about current issues in forensic science in the USA.
 - ISHI provided delegates with access to most speaker presentations and poster abstracts which I subsequently shared with my colleagues at FSSA.
 - I presented a seminar about ISHI at FSSA to provide feedback about emerging methods and technologies and key issues in the US forensic environment.

Armed Forces DNA Identification Laboratory, Dover Air Force Base, Delaware, USA

3rd – 4th October, 2016

- AFDIL is a subdivision of the Department of Defense (DoD) DNA Registry and perform worldwide medico-legal services and investigations for the DoD. In addition to current day criminal casework and personnel accounting they work in collaboration with the DPAA to perform DNA identification of past or historical remains of Defense personnel.
- Plans were initially made to visit the AFDIL facility and spend two days talking with staff and learning more about their MPS methods. Unfortunately a few days prior to departure I received notification that my security clearance had not been approved. This was due to a processing error at AFDIL and subsequently I was unable to enter the facility. Travel and accommodation to Dover was pre-paid therefore I continued as planned and met with Suni Edson, Assistant Technical Leader from the mitochondrial DNA section at AFDIL, at a nearby location. Having worked at AFDIL for many years she has extensive knowledge about the operation of AFDIL and the application of mitochondrial DNA analysis for identification of degraded human remains. Unfortunately, this limited my access to key staff, however, with the assistance of Suni I have been able to connect with other staff and source key documents and protocols.
- The MPS strategy at AFDIL is two-fold. The 'Punchbowl Project' was initiated to develop a specialised mitochondrial DNA sequencing protocol for chemically treated remains interred at the Punchbowl cemetery in Hawaii. The DNA from these remains was determined to have a mean fragment length of 48 base pairs rendering it unsuitable for standard AFDIL methodology. By ascertaining the fragment size, AFDIL developed a targeted method to capture these small fragments and ultimately improve the sequencing success rate from 6% to 52%. UWC-A is currently exploring the application of this assay for remains deemed too degraded for current methods available to UWC-A.
- The second strategy relates to the ongoing improvement of MPS methodology for routine samples. The purpose is to develop a simple and rapid MPS method with a view to increasing the information obtained and decreasing the overall cost. They seek to achieve this by undertaking an in-depth comparison of MPS platforms, marker types, data analysis parameters and enrichment strategies. Given the casework similarities between UWC-A and AFDIL it is advantageous for UWC-A to develop an ongoing relationship that facilitates information sharing.
- Outcomes:
 - Strengthened awareness of the AFDIL MPS strategy
 - Gained an appreciation of the DNA strategy employed for the identification of degraded human remains
 - Obtained relevant protocols and standard operating procedures
 - Developed point of contact for advice and future training and collaboration opportunities



University of North Texas Health Science Centre, Fort Worth, Texas, USA
6th – 7th October, 2016



- The UNTHSC contributes to both forensic casework and research. It is the location of the Centre for Human Identification which provides forensic anthropology and criminal DNA service casework services. In addition it encompasses the Missing Persons Unit (MPU) which analyse unidentified human remains recovered both at the state, national and international level. The MPU process approximately 70 cases per month and they are accustomed to analyzing samples from severely degraded skeletal remains. The Centre's Forensic Service Unit facilitates the co-ordination of anthropological examinations, DNA work and management of the National Missing Person System.
- Professor Bruce Budowle is the Executive Director of the Centre and additionally has a research laboratory focusing on MPS technology and data analysis. The group work with leading companies developing MPS technology and provide feedback to improve the technology and ensure that it is fit for purpose.
- Outcomes:
 - Appreciation of the DNA strategy employed for the identification of degraded human remains
 - Appreciation of the merits of different MPS platforms and methodologies
 - Discussions with key staff from MPU, research laboratories and Bruce Budowle
 - Offer for future collaboration
 - Provided with protocols and standard operating procedures
 - Developed point of contact for advice and future training and collaboration opportunities

Defense POW/MIA Accounting Agency (DPAA), Pearl Harbor, Hawaii, USA
12th October, 2016



- The DPAA is responsible for the investigation and recovery of human remains believed to be amongst the 83,000 missing US service personnel. To achieve this they partner with US and foreign agencies, universities, non-government agencies, volunteers and corporations that can support their mission with resources or expertise. DPAA are required under federal legislation to complete 200 identifications each year.
- Audrey Meehan is the DNA specialist and is responsible for the sampling of skeletal remains to be sent to AFDIL for DNA analysis. Typically the group will sample all bones where multiple sets of remains are recovered. Additionally bones considered optimal for DNA analysis may not be recovered. Subsequently, DPAA have developed methods to sample a wide range of different bones to specifically target the optimal site for DNA analysis.
- Outcomes:
 - Demonstration of various bone sampling techniques and storage of bones
 - Obtained relevant documents and protocols for bone sampling procedures
 - Developed point of contact for advice and future training and collaboration opportunities
 - Strengthened relationship between UWCA and DPAA

Financial Summary

- Original receipts were provided to the ANZFSS Executive (Treasurer) on 18th January 2017.
- The table below is a summary of expenses

| Summary of Expenses | | | |
|--|------------|----------------|------------------|
| | USD | AUD | Date Paid |
| Conference (ISHI) Registration | 900 | 1323.49 | 17/07/2016 |
| Conference Accommodation - Minnesota | 1666.98 | 2196.9 | 30/09/2016 |
| International and Domestic Air fares, train fare, and car hire | | 4549.50 | 17/10/2016 |
| Lab visit AFDIL - Dover Accommodation | 163.5 | 214.07 | 2/10/2016 |
| Lab visit UNTHSC - Texas Accommodation | | 540 | 14/09/2016 |
| Lab visit DPAA - Honolulu Accommodation | | 639 | 14/09/2016 |
| Total | | 9462.96 | |
| Award funds received from ANZFSS | | 3000 | 27/4/2016 |
| | | 2000 | 19/1/2017 |

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- Australian New Zealand Forensic Science Society
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- Unrecovered War Casualties – Army, Australian Defence Force
- Forensic Science SA
- Dr Tim McMahon and Suni Edson Assistant Technical Leader -Mitochondrial DNA, Armed Forces DNA Identification Laboratory
- Professor Bruce Budowle, Executive Director of Institute of Applied Genetics, Dixie Peters, Manager of Missing Persons Unit, Dr Jennifer Churchill, Dr Angie Ambers and Dr Jonathon King - University of North Texas Health Science Centre
- Dr John Byrd and Audrey Meehan – Defense POW/MIA Accounting Agency

