

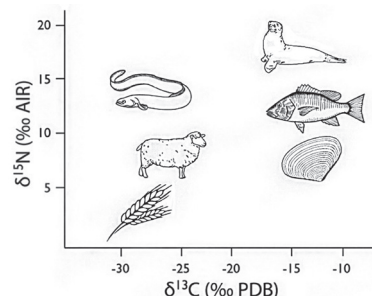
How can we determine whether a person came from overseas or was born in New Zealand?

It is possible to assess the movements of people between geographic regions by analysing the chemical signatures taken up in the bones and teeth from food and water sources (Strontium isotope ratios and oxygen isotopes). Because the enamel in teeth develops during childhood and does not change once they have finished development, the chemical signatures are held within the enamel permanently. The geological signatures of the United Kingdom and Europe have been well researched and will help us to identify immigrants into a community and where they came from.

How can we assess what foods people ate?

Patterns of dental disease such as tooth cavities and gum disease can tell us about the types of foods people ate- eg; whether their diet was high in carbohydrates and sugars. A more direct way of investigating diet can also be achieved through chemical analyses of stable isotopes (Carbon, Nitrogen, Sulphur) in the collagen of bone and Oxygen from the inorganic components of teeth and bones. This type of analysis is based on the premise that 'you are what you eat-isotopically' and is very valuable for building a detailed profile of diet and how that may have affected a person's health.

Because baby teeth develop in utero and adult teeth develop during childhood and through the teenage years, it is possible to compare the early diet of a person with the types of foods they ate as an adult. The isotopes in bone tell us about what the person ate in the last few years of their life. New methods assessing isotopes at different development stages of a single tooth can also tell us about the foods people ate at specific times of their childhood and teenage years.



How can we identify the diseases people suffered from?

If a person experiences stress during childhood from under-nutrition or infection then this affects the growth of bones and the production of enamel in teeth. This leaves signs in the teeth and bones that we can use to tell when this stress occurred. There are also some diseases, such as tuberculosis that leave distinctive changes in the bones that we can diagnose. We can also sometimes identify the DNA of the disease pathogens themselves in the skeletal remains of infected individuals. Genetic analysis of TB strains can provide evidence of where the disease was contracted and when. We can also tell whether someone broke a bone within the last few years of their life and also whether the bone broke around the time of death.

Will these methods require destruction of bone?

Yes. For the Isotope (diet and migration) and DNA studies it will be necessary to destroy a piece of bone from each person the size of an old 50cent coin and 1-2 teeth. The teeth will be split and shared between the isotope and DNA work.

For the other analyses of assessing a person's height, age, sex, ancestry (from skull shape) and disease (dental and skeletal) it is not necessary to destroy the bone.

Proposed project

- **WHAT?** We wish to assist the Chinese and wider Lawrence community in establishing the boundaries of the unmarked graves at the southern end of the cemetery and identifying the people in some of the unmarked graves.
- **HOW?** We would do this by surveying the cemetery and then excavating the area of unmarked graves within of the current fenced boundaries and checking for graves outside the fenced area. This will be followed by exhuming a number of people (20-30) from unmarked graves.
- **WHY?** The skeletal remains of the people buried in the graves will be analysed using forensic techniques to try and identify who they were and the lives they lived.
- **WHEN?** We wish to begin surveying as soon as possible and excavate in the first half of 2018. ALL skeletons will be reburied back in their original graves after the analysis is complete. This would likely be within 1 year of excavation. Grave markers would describe who the person was and their life history.
- **POTENTIAL BENEFITS FOR LAWRENCE?** The cemetery would be left in a condition that will allow for easy maintenance and there will be more marked graves
- All information found will be shared with the community and made available for display as the community sees fit.

Explanation of methods we use

What is Forensic Anthropology and Bioarchaeology?

Bioarchaeology investigates the origins and quality of life of people from the past from archaeological sites and forensic anthropology uses the same methods. This is done using information from their skeletons and also how they are buried and what they are buried with.

How can we identify a person from their skeleton?

From bones and teeth it is possible to assess:

- The ancestry of a person and where they came from
- How tall they were
- The age at which a person died
- Whether they were male or female
- What foods they ate as a child and what they ate in the last few years of life
- What diseases they suffered from
- It may even be possible to tell how a person died

