



20170811 Otago University lead analysis of Brian Arndt's teeth

Otago University –Chemistry Department -August 2017

Dr Malcolm Reid

Request –investigate possible elevated lead levels in teeth.

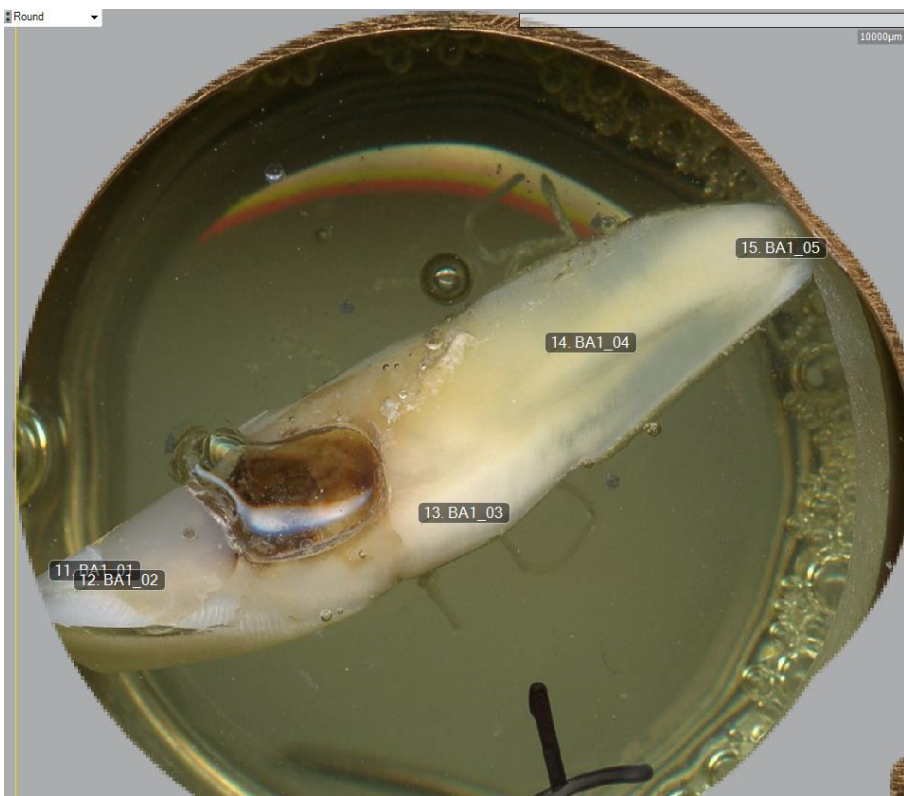
Method of analysis

Laser Ablation inductively coupled plasma –mass spectroscopy

Two teeth molar and another (assumed to be incisor) from Brian Arndt and a control were cut to avoid cavities and to present a flat surface to allow laser sampling from as much of the tooth length as possible. 0.3mm tracks were positioned at 5 different positions on each tooth –all numbered from enamel to root. Samples were moved under the laser (193nm excimer firing 50µm spot at 10Hz 2.5Jcm⁻² fluence) at 5µms⁻¹. Ablated material transported in helium to ICP-MS for multiple element detection.



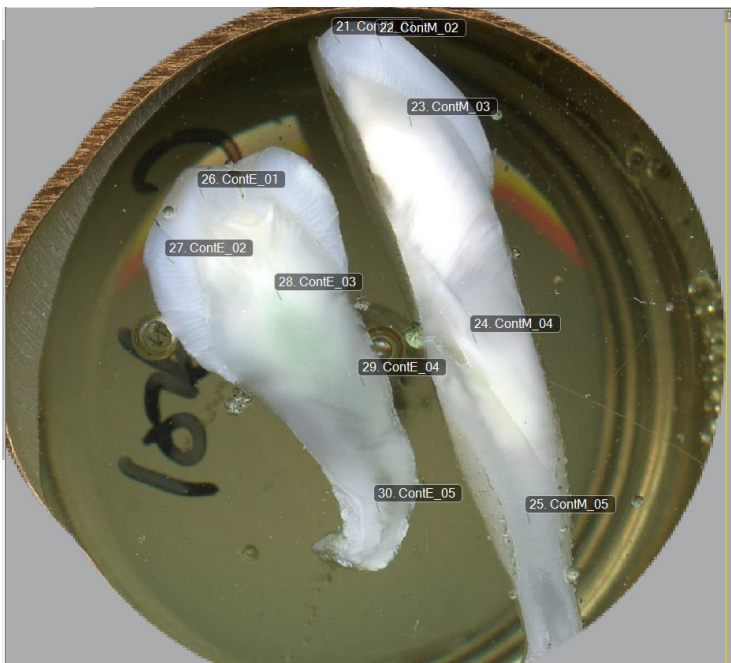
A molar and incisor from Brian were sectioned along indicated lines then mounted and polished to present a smooth flat surface to the laser. Control teeth supplied via Brian from his dentist were treated similarly.



Section of Brian's molar mounted in resin showing planned laser sampling tracks. Top BA1_01 and _02, middle BA_03 and _04 and root tip BA_05

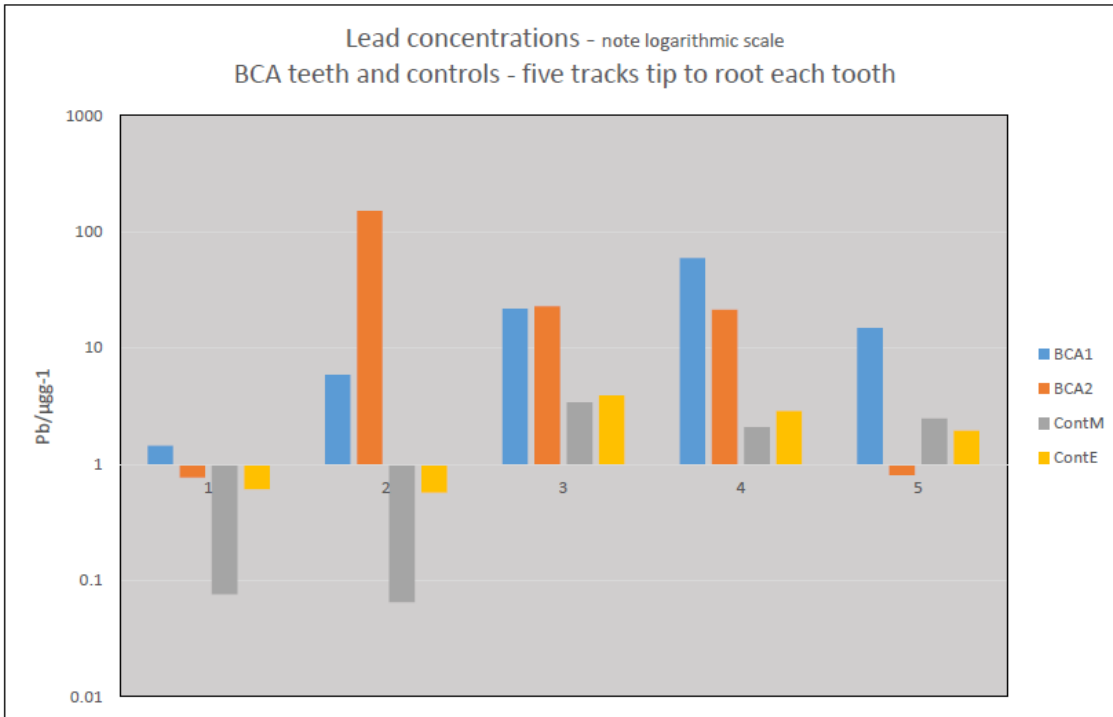


Section of Brian's incisor mounted in resin showing planned laser sampling tracks. Top BA2_01 and _02, middle BA2_03 and _04 and near root tip BA2_05. Note bright white zone in enamel may not actually be tooth material.



Control teeth –molar and incisor sectioned and mounted in resin.

Laser sampling tracks labelled ContM_01 –ContM_05 and ContE_01 to ContE_05.



	[Pb]/μg ⁻¹			
Track no.	BCA1	BCA2	ContM	ContE
1	1.4	0.8	0.1	0.6
2	5.9	151.2*	0.1	0.6
3	21.7	22.9	3.4	3.9
4	59.4	21.3	2.2	2.9
5	14.9	0.8	2.3	2.0

* Other elements from this trace suggest the area sampled may be some sort of filling so this point should be treated with caution.

Raw instrument data calibrated against NIST 610. Signals normalized to Ca –assumed teeth structure calcium hydroxyapatite.

Lead detection limit ~0.05μg-g⁻¹

Observations:

Low Pb in enamel of all teeth –as expected

Large differences in Pb in middle and root tip zones between Brian’s teeth and control.