Q&A Best bone samples for post mortem lead test

Question: What is the best site to take bones for lead analysis post-mortem? Standard procedure?



From: Dr Ananda [surname withheld], Ministry of Health, Colombo, Sri Lanka

Sent: Monday, January 30, 2017

Comments: Your web site www.lead.org.au is a very useful source of information. My question is what is the best site to take bones for lead from post mortem samples? Is there a standard procedure?

Thank you

Ananda

[Editor's note: as I did not know the answer to this Sri Lankan doctor's question, and I was not in 2017 aware of the Specht et al research since 2014 using portable XRF (pXRF) analysers to test bone lead (see LEAD Action News vol 22 no 4, Article 13, December 2025 [LID 28278]), I added the following when forwarding the questions to Professor David Chettle:

Please answer in relation to both bone X-Ray Fluorescence (bone XRF) lead testing (presumably the Dr would need to send – if permitted by customs - the bone/s to you), and bone ash lead testing. And presumably any lead results data that you can provide on bone ash lead testing would be vital too, as I know of no guidance or interpretation service on bone ash lead.

Kind regards, Elizabeth O'Brien, Lead Advisor, The LEAD Group Inc, Australia]

Answer:

I'm not entirely sure that I understand the question correctly. I am taking it as "From what site in the body should a bone sample be taken at autopsy in order to measure lead (Pb) in a way that would be most informative?"

Firstly, I don't think there is a standard procedure. If only one sample is to be taken, I would suggest a sample of cortical bone, perhaps mid shaft of tibia. If more than one sample can be taken, one might add a sample of trabecular bone, perhaps from the hip (or patella, or calcaneus).

I'm not quite sure if this was asked, but one might go on to ask what analytical method should be used and what laboratory might be recommended. For an autopsy sample I would NOT recommend x-ray fluorescence, certainly not in the form we use it for living human subjects.

The two methods which seem to be used most widely are electrothermal atomic absorption spectrometry (ETAAS) and inductively coupled mass spectrometry (ICPMS). I have heard that particular care must be taken in analysing a sample from a calcified matrix (bone) when one is using ICPMS. The doctor should contact an expert if he decides to use either of these techniques.

When we have needed to do these ex vivo analyses we have had the opportunity of collaborating with the New York State Department of Health Wadsworth Laboratory, in Albany, headed by Patrick Parsons. Patrick is an outstanding analyst. However, I'm sure there are excellent analytical laboratories a lot closer to Sri Lanka than upper New York State.

There is an issue as to how results are then reported. They can be microgram of Pb per gram of wet bone, per gram of dry bone, per gram of bone ash (almost equivalent to per gram of bone mineral), or per gram of calcium.

The units in which the result is reported usually comes from the way the sample is prepared for analysis. One of the reporting units will most naturally reflect the analytical procedure used.

If possible, I like to request results in microgram of Pb per gram of calcium (unless per gram of bone ash or per gram of bone mineral is available, because those most closely relate to our in vivo measurements). It is usually possible to trace some moderately reliable relationship between per gram calcium and per gram wet bone or the others.

Regards,
David.

Professor David Chettle, Department of Physics and Astronomy, McMaster University, Hamilton, Ontario, Canada