InterClinical Laboratories Practitioner
Newsletter

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Season's Greetings

It's the time of year where the theme of our 2014 seminar series, '*Family Health, Generations & Environmental Toxicity*', really hits home. The Christmas lights, BBQs, and humming cicadas are all a treat to the senses, but the most enjoyable sensation is the big warm hugs from relatives and friends.

To all those who attended the lectures, utilised our analytical services and our range of nutritional and herbal products, thank you! Our guest speaker for this year's seminar series, Janine Castle brought the phrase 'nothing exists in isolation' to a whole new level. Taking care of your loved ones also means taking care of yourself, particularly when it comes to environmental toxicity! Janine has proved to be one of our most successful guest lecturers to date, and due to popular demand presented the very first InterClinical Laboratories webinar in November, which was a great success.

2015 brings its new projects, including an exciting new webinar series and key note speakers – details to be published in the New Year.

The feature of this newsletter, the last for 2014, is regarding the ubiquitous natural element, uranium. Hair tissue mineral analysis proved to be an excellent tool to assess possible exposure to environmental or occupational heavy metals. In this article, we are highlighting uranium and have included our own statistics. We have analysed our Australian hair tissue data from a six month period, with interesting results. See the article below for details.

We hope you launch into the New Year happy, healthy and with a newly invigorated approach to your practice. The staff at InterClinical have been overjoyed by the enthusiasm from both the new practitioners joining forces with us, along with our loyal practitioners. Thank you for taking advantage of our services this year, and for your continued support into 2015 and beyond.

Yours in good health
The team at InterClinical Laboratories

The uranium in your backyard: Australia, uranium and hair tissue mineral analysis.

Uranium (U) is a naturally occurring element in the earth and is present in most soils, rock and water. Its concentration in the earth's crust is about 3 parts per million, which is a higher concentration than silver, tin, cadmium and mercury, and similar to the concentrations of arsenic and molybdenum. Higher concentrations of uranium can often be found in granite formations. Natural uranium is found in three isotopes; U-234, U-235 and U-238. Over ninety-nine percent of this mixture is U-238. Although radioactive, the alpha emissions from naturally occurring uranium is not considered a health hazard compared to enriched uranium in the form of a higher percentage or concentration of U-235. Enriched uranium is produced for use in nuclear energy and contains approximately three percent U-235, while further enrichment for weapons contains over ninety-seven percent. Both are highly radioactive, and exposure to these forms presents a serious health hazard. Depleted uranium contains less U-235 and is not as radioactive.

Continued overleaf

Ranger Uranium mine in the Northern Territory, Australia

Sources of uranium

Although naturally present in the earth's crust, uranium can be found in much higher concentrations in different areas of the country, primarily in those regions with granite deposits. Increased concentrations may also be found in or near uranium mining and milling operations as well as industrial manufacturing that use deplete uranium for production of aircraft parts, plating, munitions etc. Ore is used for the productions of phosphate fertilisers, this may also be a source of uranium.

The main source of uranium intake or exposure, other than in those working with or living near mining operations is through ingestion of water and foods containing uranium. Foods grown in soils high in uranium may contain higher than normal concentrations, particularly root vegetables. There is no data available on concentrations of uranium in Australian drinking water. The Australian National Health and Medical Research Council (NHMRC) has established a maximum contaminate level for uranium in drinking water at 0.0174= mg/L.

Health effects of uranium

Even though naturally occurring uranium has radioactivity, this is not the main issue with exposure. The most common finding with prolonged exposure is related to abnormal renal function. Inhalation can cause irritation to the lungs and skin exposure to soluble uranium can produce dermal irritation. Uranium accumulates largely in bone, but is also distributed and deposited in the liver and kidneys.

Biological tests for uranium

Uranium can be analysed in hair, blood, urine and tissues. Total body radiation detection can also be used to assess uranium exposure. Urine is the most common specimen used to test for uranium. However, since ingested uranium that is not deposited in body tissues is excreted in the urine within a few days the test can only detect an exposure from approximately a week prior and does not provide information about body retention. As with other heavy metals, uranium may be cleared from the circulation and sequestered into tissues after exposure has ceased.

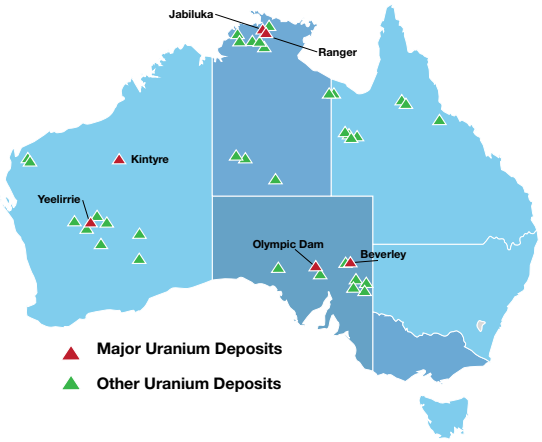
Hair analysis as an indicator of uranium exposure

Urine testing for environmental and occupational exposure to uranium is commonly used. However, some problems exist with this method. According to Karpas (Karpas Z 2001), urinalysis reflects recent exposure (within a few days) or chronic ongoing exposure. Also, due to the normal diurnal fluctuations, the use of "spot samples" makes it difficult to estimate the amount of internal dose received. Further, he states that if urine samples are not collected in a short time following exposure, internal dosimetry calculations may be misleading. These drawbacks may be overcome with the use of hair and nail sample analysis, and may show better insights for internal dosimetry of uranium exposure.

Other researchers have also found that hair uranium analysis is useful and that uranium levels correlate with uranium intake. (Karpas, Z. et al 2005). Testing of groups exposed to high uranium intake from drinking water found that the hair content of uranium could be traced to the water source and that hair tests can serve as an excellent indicator of occupational or environmental exposure, and provide information about the source of uranium as well (Karpas, Z. et al 2005). Muikku and colleagues reported that the uranium content of hair samples can be used for occupational exposure and studies also reveal that variation of uranium concentrations in water sources are shown by the variations in hair uranium content. (Muikki, M. et al. 2007, Muikki, M. et al. 2009). Zunic et al. found that the heavy metal content in human hair may serve as a good indicator of dietary, environmental and occupational exposures to uranium (Zunic, ZS, et al. 2012).

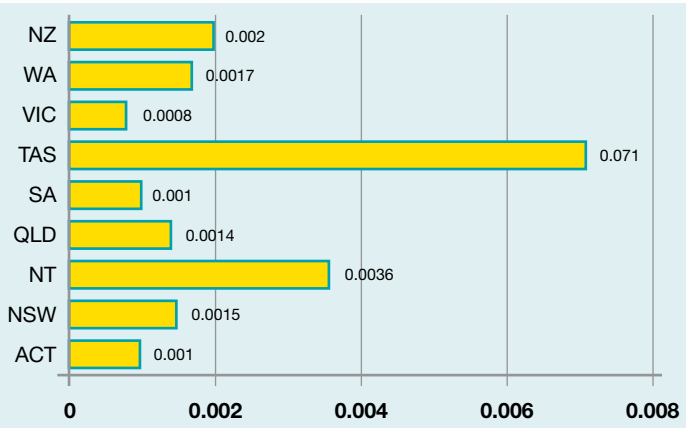
Hair Tissue Mineral Analysis (HTMA) and Australian geographic uranium findings

At InterClinical Laboratories, we have often found high levels of uranium in individuals in various geographic pockets throughout Australia. Australia possesses the world's largest uranium deposit in South Australia. The main type of deposit of uranium in Australia is in hematite breccia complex deposits, which are examples of 'iron oxide copper gold deposits' – from which copper, gold and uranium ores can be extracted. Uranium is relatively common in Australian soil, and common sources of contamination seen in the HTMA include food, drinking water, and exposure to the mining industry. The main deposits in Australia are shown below.



The main area in New Zealand that uranium has been discovered is the west coast of the south island, typically in sandstone formations. Common source of contamination would be through food and water. It should be stressed again that uranium is a naturally occurring element and therefore will be found in all humans to some extent. HTMA has proven to be an effective screening tool in determining excess exposure in individuals and families which otherwise would not have been detected.

The chart below shows the average HTMA results for uranium levels found in individuals living in Australia and New Zealand. The state with the highest average in Australia is Tasmania (TAS) followed by the Northern Territory (NT). Interestingly, the third highest average is New Zealand (NZ). Although these average uranium levels found in individuals tested should not be construed to represent the entire years' worth of samples, this sample provides an average for a period of six months.



Hair testing for uranium by InterClinical Laboratories

Uranium is analysed by InterClinical Laboratories, using ICP-MS. In our method, mass 328.050 atomic mass units is monitored using 19 sweeps per reading. This mass is read for 50.0 ms each sweep for a total of 950ms per sample. We use both the AutoLens system and Dual Detector system of Perkin Elmer Elan models to take advantage of the ion detector's full dynamic range. Internal standardisation on Lutetium mass 174.941 is used to stablise the uranium reading. No correction factors are necessary to read U-238. No interference acts on this mass. Uranium is quantified by the Elan software using a calibration curve of three standards and a calibration blank. The concentrations of calibration standards are 0.05, 0.08 and 0.8 parts per million. Internal standardisation occurs throughout the run with the in-line addition of Lu-175 standard which stabilises the uranium signal. Detection limits and liner reporting ranges are verified every six months per CLIA regulations. The calibration limit for U is 0.0005 milligrams percent (mg %). The linear reporting range is 0.0005 to 0.4000 mg%. Re-checks are performed on samples with uranium values of 0.0590 mg% or higher. Accuracy for the laboratory ICP-MS technique and methodology/procedures in use are based upon NIST (National Institute of Standards and Technology) traceable standard reference material. We have found hair uranium analysis to be highly accurate and reproducible. (Dutrizac, L. 2006).

Discussion

We have seen many cases of individuals being unknowingly exposed to high uranium levels in their environment. In most cases these have been found to be water sources that were discovered to be excessive after HTMA tests of individuals and their families. Studies have shown that HTMA is an excellent tool for the assessment of excessive metals that may be in their environment. These studies support findings of other researchers who have reached similar conclusions. After completing a study involving over one-hundred different households where drinking water was supplied from private wells in southern Finland Karpas stated, "These results conclusively demonstrated that the uranium found in the bioassays can be traced to the drinking water, thus providing a direct link to the source of exposure." Hair may serve as an excellent indicator of occupational or environmental exposure to uranium and provide information regarding its source. Bioassay of hair is attractive as it is an effective bioconcentrator, samples can be easily stored and the concentration reflects an integrated value. (Karpas, et al. 2005.).

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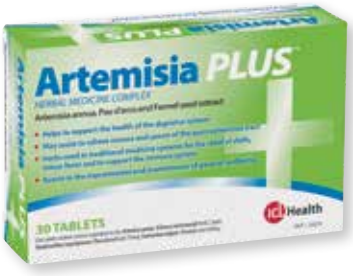

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