



## Detection of trace elements concentration from human nails

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### ABSTRACT

Trace elements have several roles in living organisms. Some are essential components of enzymes where they attract substrate molecules and facilitate their conversion to specific end products. Some donate or accept electrons in reactions of reduction and oxidation, which results in the generation and utilization of metabolic energy. One trace element, iron, is involved in the binding, transporting, and releasing of oxygen in higher animals. Some trace elements impart structural stability to important biological molecules. Finally, some trace elements control important biological processes through such actions as facilitating the binding of molecules to receptor sites on cell membranes, altering the structure or ionic nature of membranes to prevent or allow specific molecules to enter or leave a cell, and inducing gene expression resulting in the formation of proteins involved in life processes. Human nail has been accepted as an effective tissue for biological monitoring of toxic heavy metals by the U.S. Environmental Protection Agency and is being used for this purpose throughout the World

### Keywords : Trace elements, human nails

#### Introduction:

Trace minerals are essential in countless metabolic functions in all phases of the life process.

- Zinc is involved in the production, storage and secretion of insulin and is necessary for growth hormones.
- Magnesium is required for normal muscular function, especially the heart. A deficiency has been associated with an increased incidence of abnormal heart conditions, anxiety and nervousness.
- Potassium is critical for normal nutrient transport into the cell. A deficiency can result in muscular weakness, mild depression and lethargy.
- Excess sodium is associated with hypertension, but adequate amounts are required for normal health.
- Deficiency of iodine leads into goiter. Increased iodine intake was associated with decreased endemic cretinism, the arrested physical and mental development caused by the lack of thyroid hormone. The variety of nutrients from the organism's environment that have been made available by absorption must be transported through the circulatory system to the aqueous microenvironment of the cells. Then they serve their ultimate purpose — participation in the metabolic activities in the cells on which the life of the total organism depends.

- 1) Nails accumulate all the important trace elements.
- 2) It is a commonly available tissue.
- 3) It is widespread geographically.
- 4) Nail is easily collected, stored and transported.
- 5) It is suitable since specimens can easily be re-sampled.
- 6) It is present in polluted and non-polluted areas.
- 7) The content of the nail correlates with environmental gradients of metals.
- 8) There is sufficient background and exposure data.

Nail is especially suitable for biological monitoring for exposure assessment as well as global, regional and local surveillance monitoring. The use of hair has advantages over other tissues. Monitoring metals in the urine measures the com-

ponent that is excreted. Blood on the other hand, measures the component that is absorbed and temporarily in circulation before it is excreted and/or sequestered into storage depot.

#### Observation and Discussion

To obtain more nail masses, participants should be asked in advance not to trim their nails for a couple of weeks or longer. Nails are collected by clipping with a stainless steel clipper from the two great toes (or thumbs) and small toes (or other fingers). Instruction need to be given to the participants to obtain as much nail as possible and clippings should be from both feet and . or hands. The nail clippings from the great toes or thumbs and the rest of the toes or fingers are better to be stored separately as the time frame represented by the great toe or thumb is different from the rest of the toe- or finger-nails. These nail samples can be placed in a labelled envelope and stored at room temperature in the driest condition possible in a predesignated area until the samples can be analysed in the future. Participants can cut their nails at a clinic or at home and then mail their sample in. Ash prepared with the digestion with nitric acid.

#### Atomic Absorption Spectrophotometer analysis:-

20 plus varian atomic absorption spectrometer with a hollow cathode lamp, using an N<sub>2</sub>O - acetylene flame for determination of traces of heavy metals.



Fig 1:- Nails collection



Fig 2:- Digested nails

A progressive increase in zinc concentrations in hair with age indicated no significance difference indicated. Our results are in agreement with several other authors who reported varying concentrations of these metals in hair samples. From the zinc levels in nail, it is reasonable to believe that zinc in human tissues may be playing some physiological roles (Vivoli et al., 1990).

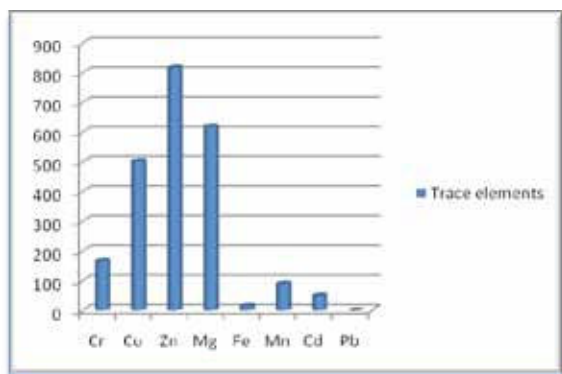


Fig 3:- Showing levels of different trace elements in human nails.

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