



Mineral profile of human hairs as influenced by oral supplementation of vitamin 'A'

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Abstract

To find out the influence of oral administration of vitamin A on the mineral profile of human hairs, six adults i.e., persons. (3 males and 3 females) selected randomly from the group based on various traits (age 30.2 ± 3.5 Y; live weight 60.1 ± 5.4 Kg; annual income 105833.3 ± 30342 Rs) were given identical feed as per the specification of ICMR, to meet their daily nutritional requirements. They were given oral administration of vitamin A at the rate of 5000 IU per Kg live weight, in the morning daily. Samples of hairs collected from the various parts of the body on the days 00, 30, 90, and 120 of the experimental trial were subjected to estimation of major (Calcium, phosphorus, and magnesium) and trace (Sodium, Cobalt, Copper, Iron, and Nickel) elements using standard techniques. Collected data were analyzed statistically using standards to draw a valid conclusion. It can be concluded based on the present investigation that enhancement in iron content of human hairs was outstanding, contents of phosphorus and magnesium were also increased but those of calcium, sodium, cobalt, copper, and nickel in the hairs remained unchanged due to supplementation of this vitamin.

Keywords: Hairs, Human, Iron, Minerals, Vitamin A.

Introduction

Hair cycle-dependent changes in adrenergic skin innervations on the one hand, and hair growth modulation by isoproterenol, accompanied by changes in β 2-adrenoreceptor expression of selected regions of the hair follicle epithelium on the other (Botchkarev *et al.*, 1999), further support the concept that bi-directional interactions between the hair follicle and its innervations play a part in hair growth control. The general role of trace metals in carcinogenesis indicated an appreciably different pattern of selected metal distribution and their mutual correlations in the hairs of cancer/ benign patients in comparison with the normal donors (Ali, 2008). Robbins and Kelly, (1970) compared amino acid data from human hair with that from Merino wool and indicated substantial differences between cystine, glycine, tyrosine, and phenylalanine.

Selenium is involved in antioxidant activity and therefore can be considered synergistic with vitamin A. Both vitamin A and selenium have similar effects on inhibiting carcinogenesis (Clement, 1987). Other minerals synergistic with vitamin A include magnesium, manganese, potassium, and phosphorus. Like vitamin A, these minerals are closely related to thyroid function. Watts, (1991) showed the

minerals that are considered antagonistic to vitamin A. Vitamin A may also be mutually antagonistic to these elements. Excessive tissue iron accumulation may increase vitamin A requirements due to destruction by peroxidation.

Attention has yet not been given to studying the effect of vitamin A on the mineral profile of human hair. The present investigation was an effort to make attempts to find out the influence of oral administration of vitamin A on the mineral profile of human hairs.

Materials and Methods

The study was carried out on six adults(3 males and 3 females) persons selected randomly from the group in village Chaumuhan of Mathura district of UP, based on various traits (age 30.2 ± 3.5 Y; live weight 60.1 ± 5.4 Kg; annual income 105833.3 ± 30342 Rs.). The subjected persons remained at their homes and were allowed to act as their normal daily routine works. They were given identical feed as per the specification of ICMR, to meet their daily nutritional requirements. The steps were taken for Deworming under the prescription and supervision of a registered medical practitioner to make sure that they will remain free from internal and external parasitic infection during the investigation.

They were given oral administration of vitamin A at the rate of 5000 IU per Kg live weight, in the morning daily. Samples of hairs were collected from the various parts of the body on days 00, 30, 90, and 120 of the experimental trial. The collected samples were subjected to estimation of major (Calcium, phosphorus, and magnesium) and trace (Sodium, Cobalt, Copper, Iron, and Nickel) elements using standard techniques. The trace minerals in hair samples were analyzed by atomic absorption spectrometer (GBC Avanta PM) using acetylene as fuel and air as oxidant. The cobalt content was estimated with the help of an automated graphite furnace system (GBC GF 3000) using an autosampler (PAL 3000). Among the major elements, calcium was determined by the calcium oxalate precipitation method (AOAC, 1992), phosphorus by the calorimetric method (Ward and Johnson, 1962), and magnesium by magnesium ammonium phosphate precipitation method (McCance and Shipp, 1933; Holzapfel, 1934). Collected data were analyzed statistically using standard techniques (Snedecor and Cochran, 1994) to draw a valid conclusion. SPSS software

(SPSS, 1998) was implemented for various statistical calculations for the purpose. The graphic presentation was prepared using Microsoft excel software (MS Office, 2006).

Results and Discussion

The most affected ($p < 0.01$) element in human hair due to oral supplementation of vitamin A was observed to be iron (Table, Figure 1 and 2) and the increment in this regard was recorded even up to 67 per cent. Vitamin A has a synergistic effect on iron because of its antioxidant property (Watts, 1991), and caused enhancement of this element in human hairs. The increase ($p < 0.01$) in phosphorus and magnesium content in hairs was also caused due to supplementation of this vitamin but the intensity in this regard was not too high and remained only up to about 5 and 3 per cent, respectively. The respected values recorded on day 0 of the experimental trial confirmed the findings of Clement, (1987); Iyengar and Wolttlez, (1988); Watts, (1991), and Onwuka *et al.* (2001). In blood serum, similar trends were also observed (Watts, 1991; Ali, 2008; Raofi *et al.*, 2010).

Table: Mineral profile of human hairs (mg/Kg)

Component	Unit	0 month	1 month	2 month	3 month
Calcium	(mg/Kg)	601.5±3.1	606.0±4.1	605.7±5.9	603.3±2.7

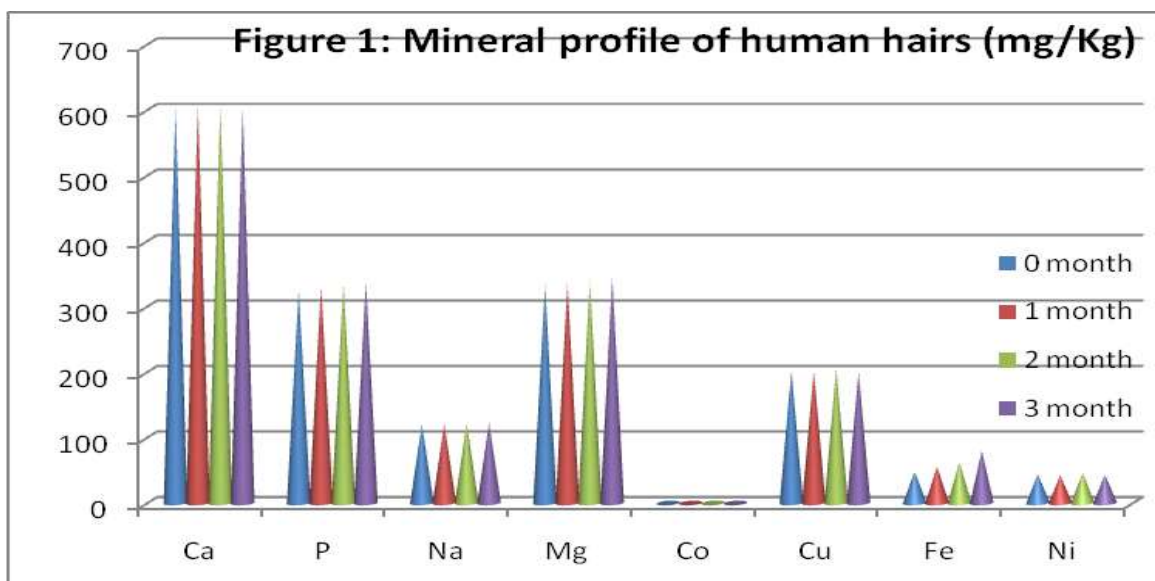
Phosphorus	(mg/Kg)	325.0±1.4 ^d	331.7±0.6 ^c	335.5±0.6 ^b	338.3±0.4 ^a
Sodium	(mg/Kg)	120.0±2.1	120.5±2.7	121.8±4.2	122.5±3.3
Magnesium	(mg/Kg)	333.2±2.6 ^b	335.7±2.3 ^b	338.7±2.6 ^{a,b}	344.0±2.6 ^a
Cobalt	(mg/Kg)	1.03±0.03	1.12±0.02	1.07±0.02	1.15±0.05
Copper	(mg/Kg)	202.2±7.5	201.7±2.3	205.2±2.3	200.2±1.5
Iron	(mg/Kg)	48.2±0.9 ^d	55.5±0.8 ^c	62.7±0.9 ^b	80.2±1.1 ^a
Nickel	(mg/Kg)	44.3±1.6	42.3±1.6	45.5±1.5	43.3±2.2

a,b,c,d - Values bearing different superscripts differed significantly, i.e. *p*,0.01.

The content of calcium, sodium, cobalt, copper, and nickel in human hairs remained unaffected due to oral supplementation of vitamin A. As far as the values of these constituents in human hairs on day 0 of the experimental trial are concerned, those confirmed the findings of Clement, (1987); Iyengar and Wolttlez, (1988); Watts, (1991); Onwuka *et al.* (2001) and Ali, (2008). Detailed information was found not available to show the impact of vitamin A

supplementation on hairs composition but, in blood serum, a similar trend was observed (Ali, 2008; Raofi *et al.*, 2010).

It can be concluded based on the present investigation that enhancement in the iron content of human hairs due to vitamin A supplementation was outstanding. The content of phosphorus and magnesium was also increased but calcium, sodium, cobalt, copper, and nickel in the hairs remained unchanged due to the supplementation of this vitamin.



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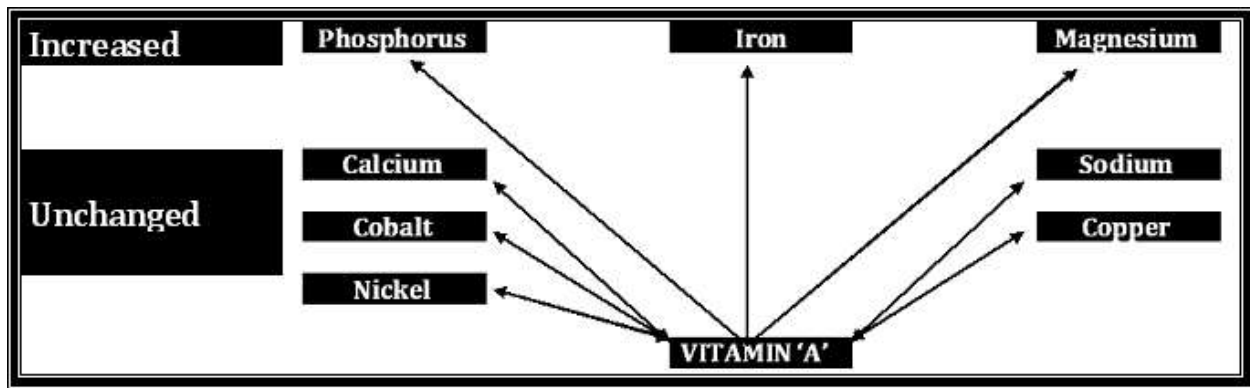
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Figure 2: Effect of Vitamin A supplementation on the mineral profile of human hairs



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