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Arsenic, Lead and Microorganisms in Hair and Nails of Some Women from Saudi Arabia

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Hair and nails samples were collected from different adults women from Riyadh region, Saudi Arabia and analyzed for arsenic (As), lead (Pb) and microbial flora. The hair and nails contain higher concentrations of Pb 4.47 ± 0.41 ; 10.48 ± 0.53 followed by As 0.036 ± 0.001 ; 0.087 ± 0.005 , respectively. Ten genera of microorganisms were isolated from the tested samples but hair contains higher bacteria and fungi than nails. The results provide evidence of high accumulation of lead and arsenic, which might be important in dealing with metal pollution in Saudi Arabia.

Key words: Heavy metals, micro-organisms, hair, nails, Saudi Arabia

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Introduction

Little attention has been paid to the environmental aspects of pollution in Saudi Arabia especially that dealing with heavy metals and micro-organisms in human body. Measurement of the concentrations of heavy metals in the human body is achieved, either by acquiring, with a persons consent, material from their body, or post-mortem samples. Samples in the first case include blood, urine, feces, saliva, sweat, hair, nails, milk and shed, teeth. Post-mortem samples can be any part of the body, but sections most often analyzed are kidney, liver, heart, muscle, brain, lung and pancreas (Furgusson, 1990) Air, water, soil, plants and animals are the clear routes by which human beings are come into contact with micro-organisms and heavy metals (Hashem, 1995). There are, however, less obvious sources, called adventitious sources, which include surface dust, paint and consumer items such as heavy metals in glazed pottery and cadmium (Cd), and sometimes selenium (Se), in red colored plastic food concentrations. Arsenic occurs in soils, mainly as arsenate, as O_4^{3-} , under toxic conditions. Arsenic compounds are toxic to most living organisms (Ehrlich, 1981). Lead has been brought into circulation, it occurs in storage batteries, motor fuel, lead shielding soldering wire, shielding materials for X-ray radiation, pigments, alloys, ceramic glazers and stabilizers for plastic and rubber. The two most significant source of lead in dust, paint and automobile emissions (Al-Nasser and Hashem, 1996). Hair and nails are the most frequently studied tissues for estimation of heavy metals, although a great deal is known about the microbial flora of Saudi Arabia, no information in the microbial flora of hair and nails from Saudi Arabia.

This research work was undertaken to examine the arsenic, lead and microbial flora in hair and nails of some Saudi Arabian women. This study part of a more extensive investigation in which the heavy metal contents of hair and nails in different places in Saudi Arabia being determined.

Materials and Methods

Hair and nails samples were collected from different adults women from Riyadh, region, Saudi Arabia. Microbial isolation of hair and nails were carried out using on petri dishes containing nutrient agar for bacterial growth and malt extract agar. Identification of isolated microorganisms were determined according to Ellis (1971), Ramirez (1982), Buchanan and Gibbons (1974). For metal analysis, hair and nails samples (0.5g) were added separately to 10 ml of concentrated nitric acid (HNO_3) and heated moderately under refluxing for complete digestion. Dilute nitric acid was used for dissolution of the ash obtained by wet decomposition and volumes were completed to 10ml with deionized water. The undissolved residue was removed by centrifugation at 700g for 5 min. and supernatant were stored refrigerated in plastic vials. Samples were measured on Electrothermal Atomization Atomic Absorption Spectrophotometer (Pye Unicam SP9) equipped with graphite Furnace and Video Computer Programmer.

Results and Discussion

Arsenic (As) and lead (Pb) content of hair and nails from some adults women from Saudi Arabia are given in Table 1. Hair and nails samples contained the highest amount of lead, while arsenic were much less because of widespread of lead occurrence, it occurs in storage batteries, motor fuel, ceramic glazers, stabilizers for plastic and rubbers, lead shielding soldering wire, shielding material for X-ray radiation, pigments and alloys (Al-Nasser and Hashem, 1996). The volunteer subjects were Saudi females with an average of 20 years. No information is available on arsenic and lead content of human bodies in Saudi Arabia, the information available is mostly restricted to soil, plants water and air. Hair and nails are the most frequently studied tissues for heavy metals estimation (Sen and Chaudhuri, 1996; Al-Nasser and Hashem, 1996; Hashem and Al-Othman, 2001). Many of the toxic effects

Table 1: Arsenic (As) and lead (Pb) concentration in hair and nails of some women from Riyadh region, Saudi Arabia (n = 5, ± standard deviation)

Hair ($\mu g g^{-1}$)		Nails ($\mu g g^{-1}$)	
As	Pb	As	Pb
0.036 ± 0.001	4.47 ± 0.41	0.087 ± 0.005	10.48 ± 0.53

Table 2: Microbial flora isolated from hair and nails

Hair		Nails	
Bacteria	Fungi	Bacteria	Fungi
<i>Bacillus</i> sp.	<i>Aspergillus</i> sp.	<i>Pseudomonas</i> sp.	<i>Microsporium</i> sp.
<i>Klebsiella</i> sp.	<i>Cladosporium</i>	<i>Micrococcus</i> sp.	<i>Trichophyton</i> sp.
<i>Micrococcus</i> sp.	<i>Penicillium</i>	<i>Staphylococcus</i> sp.	
<i>Pseudomonas</i> sp.	<i>Trichosporon</i> sp.		
<i>Staphylococcus</i> sp.	<i>Trichophyton</i> sp.		

of the heavy elements are general and not specific for the element. Also many of the effects are similar for the different elements. In general more information is necessary, such as investigation if the person had access to the element or is living in an environment, where the element occurs. Hair and nails are the more important organs affected by the heavy metals (Cu, Mn and Zn). This study indicated that the level of As and Pb lower than of the earlier studies in different places the world (Bown, 1979; Chatt *et al.*, 1985; Kim *et al.*, 1985; Sarmani *et al.* 1985; Ward *et al.*, 1987). As little attention has been paid to the role of heavy metals in Saudi Arabia environment, this basic information is a part of more future studies dealing with the environmental monitoring of trace elements (Hg, Co, Ni) in human body and pollution in Saudi Arabia. The results of microbial isolated from hair and nails are given in Table 2. A total number of 10 genus of bacteria and fungi were is isolated from the hair samples, while 5 genus of bacteria and fungi were isolated from the nail samples and this because the hair contains rich and suitable media for the microbial growth (Hashem and Al-Othman, 2001).

There are thousands of known species of bacteria and fungi, but few of them cause disease in human. Table 2, showed that all the isolated micro-organisms in this investigation were isolated from different places of the world from hair and nails of human beings (Brooks *et al.* 1995; Danile and Elewski, 2000; Ghannoun *et al.* 2000). It is clear from Table 2 that hair of the tested samples contained higher bacteria and fungi than the nails samples and this may be due to the contamination of the hair from different sources of shampoo and soap, which they are a good media for the microbial growth. Hair, nails and microbial flora can be ideal indications of heavy metals and micro-organisms pollution in Saudi Arabia.

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