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# Assessment of lead contamination in Aleppo soaps available in Iraqi markets

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## Abstract

This work was designed to examine lead content in samples of Aleppo soaps. Twelve soap brand samples were collected from various Baghdad local markets. The results showed that the samples of three soap brands were lead free while the samples of remaining nine Aleppo soap brands had measurable and elevated lead content (0.2 mg/kg) exceeding lead level suggested by WHO. The current study may conclude that such lead levels in these tested soap samples may be due to soil contamination of cultivating olive trees by the waste of pesticides, vehicle lead emissions from highway and several industrial processes.

Keywords: Allepo soaps, Lead, Contamination, Health risk, Iraqi markets.

## Introduction

Soaps and detergents industries are currently produce approximately 4 billion pounds of detergent and 1 billion pounds of soap annually. Detergents are used in scouring powders, shampoos, dentifrices, industrial cleaners, liquid detergents, and in the familiar cartons of home laundry granules. Of the 4 billion pounds of detergent production, about 3 billion pounds is produced in a solid form (Cavich, 1995; Maine, 1995; CPCI, 2011).

The most popular and common solid form is Aleppo soap is (also known as laurel soap, Syrian soap, or ghar soap). Aleppo soap is classified as a castile soap as it is a hard soap made from olive oil and lye. Aleppo soap is symbolises something special for many people, as it stands for a much older tradition than many of the detergents and washing agents that are in use nowadays (Phelps,2012). Olive oil and laurel oil are usually fundamental ingredients of Aleppo soaps. Traditional Aleppo soaps (or *Ghar*), are made with 100% natural olive and laurel berry oils, water and with additive as colorings, artificial perfumes, and foam stabilizers.

Aleppo soap promotes wound healing (Mosquin, 2008 ; CPCI, 2012) as effective protector against insect bites[7] and is used for a variety of skin ailments such as skin allergies, irritated skin or conditions such as general dermatitis like eczema, psoriasis, bacterial dermatitis, acne, herpes, rosacea, it also helps prevent hair loss and it aids in the recovery of skin diseases, while Laurel oil is an effective cleanser, antibiotic (Partington, 1960; Loizzo *et al.*, 2007), anti-fungal (Khaled, 2010) and anti-itching agent. Compounds extracted from Laura's oil have recently been identified as an inhibitor of human melanoma (skin cancer) cell proliferation (Ursula et al, 2008) as well as inhibiting other human tumor cell growths such as amelanotic melanoma, renal cell adenocarcinoma, and breast cancer cell lines ( Shivanand *et al.*, 2006).

Despite these benefits, several studies have reported elevated lead concentrations in top soils of olive farms, and surrounding air. Also, there are other sources of lead contamination such as waste materials from certain mines, agricultural, petrochemical, conventional fossil fuel, raw materials and wastewater (Riekie, 2006). It is well known that lead polluted environment may present serious threats to public health causing behavioral problems (NIOSH, 2009; Williams, *et al.*, 2000; AHT, 2005; ATSDR, 2007), high blood pressure, anemia, kidney damage, memory and learning difficulties in addition to effect sperm-production, blindness and deafness brain damage digestive problems (Hodgson, 2004; Wang *et al.*, 2005; Khan *et al.*, 2008; Timbrell, 2008).

Soap requires two major raw materials: fat and alkali. The alkali most commonly used today is

sodium hydroxide. Potassium hydroxide can also be used. Potassium-based soap creates a more water-soluble product than sodium-based soap, and so it is called "soft soap." Soft soap, alone or in combination with sodium-based soap, is commonly used in shaving products. Early soap manufacturers simply boiled a solution of wood ash and animal fat. A foam substance formed at the top of the pot. When cooled, it hardened into soap. Soap requires two major raw materials: fat and alkali. The alkali most commonly used today is sodium hydroxide. Potassium hydroxide can also be used. Potassium-based soap creates a more water-soluble product than sodium-based soap, and so it is called "soft soap." Soft soap, alone or in combination with sodium-based soap, is commonly used in shaving products (Spitz, 1990).

## Materials and Methods

Samples of twelve brands of Aleppo soap were collected from different local markets. These soap brands were Zanabilli golden star, AbdAlhadi znabilli, Alshami Mhmood, Altkwa, Alatar Ahmed, Brakat Thamer, Suodi Hasan, Old duka with diamond, Znabilii Abd Albadeea, Old duka with rose , Old duka pure and ghar Al-Hasney. The Samples were taken to laboratory, and left to oven dried at 80 °C then powdered and sieved using stainless steel of 2mm sieve and subjected to the following tests:

1- pH and EC tests: Another powdered soap sample of each brand was used to evaluate pH and EC by using 5 g from each powder soap sample with 25 ml demonized distil water shacked thoroughly and gently for about 30 minutes and both pH and EC values were determined (APHA, 2005 ).

2- Lead content: One gram of each soap powder sample was placed into 100 ml cylinder and received 5 ml concentrated HCl. The mixture was left overnight for predigesting process at room temperature. The cylinders were reheated gradually until acid fume was vanished and left to cool. Solution of samples were filtered and diluted to 50ml using demonized water and analyzed for Pb using flameless atomic absorption spectrophotometer (Abbawi and Hassan, 1990) using lead cathode lamps.

## Results and Discussion

Data of pH, EC and lead concentrations in examined twelve Allepo soap brands are given in Table (1). Figure (1) shows the mean values of pH samples which seem to be within alkaline rang. These data were found to vary from 10.1 ± 0.5 of Alshami Mhmood brand to 10.6 ± 0.6 of Brakat Thamer brand. However, all these twelve samples had levels higher than those of natural value (6.5-7.5). Figure (2) shows the mean values of EC samples. These values were varied from 4905± 53µs/cm of Old duka pure brand to 5930 ± 374 µs/cm of Old duka with diamond brand. All examined samples had EC values higher than that of natural value (500Ms/cm) except for Old duka pure brand. For lead content, the study has found concentration ranging from N.d in only three soap brands to 1.014 ± 0.59 µg/g of Znabilii Abd Albadeea brands (Figure 3).

Table (1): Allepo soap brands and mean values of pH, EC, and lead content.

| Brand | Code | Mean ± Sd | | |
|---|---|---|---|---|
| | | pH | EC µs/cm | Pb µg/g |
| Zanabilli golden star | Zgs | 10.3 ± 0.8 | 5310 ± 288 | 0.054 ± 0.02 |
| AbdAlhadi znabilli | Az | 10.3 ± 0.9 | 5715 ± 210 | 0.083 ± 0.05 |
| Alshami Mhmood | Am | 10.1 ± 0.5 | 5795 ± 325 | 0.126 ± 0.07 |
| Altkwa | A | 10.3 ± 0.8 | 5410 ± 195 | 0.132± 0.08 |
| Alatar Ahmed | Aa | 10.4 ± 0.6 | 5460 ± 148 | 0.164 ± 0.028 |
| Brakat Thamer | Bt | 10.6 ± 0.6 | 5750 ± 45 | 0.186 ± 0.065 |
| Suodi Hasan | Sh | 10.4 ± 0.8 | 5100 ± 250 | 0.231 ± 0.091 |
| Old duka with diamond | Odd | 10.2 ± 0.9 | 5930 ± 374 | 0.264 ± 0.077 |
| Znabilii Abd Albadeea | Zaa | 10.4 ± 0.7 | 5230 ± 144 | 1.014 ± 0.59 |
| Old duka with rose | Odr | 10.1 ± 0.7 | 3990 ± 97 | Nd |
| Old duka pure | Odp | 10.3 ± 0.8 | 4905± 53 | Nd |
| ghar Al-Hasney | gA | 10.2 ± 0.6 | 5790 ± 332 | Nd |

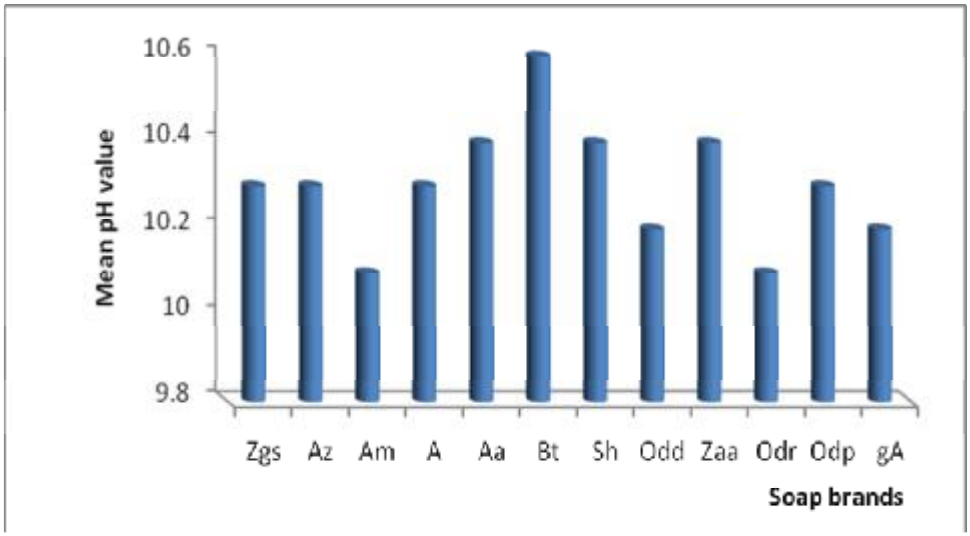


Figure (1): Mean pH values of twelve Allepo soap brands collected from local markets

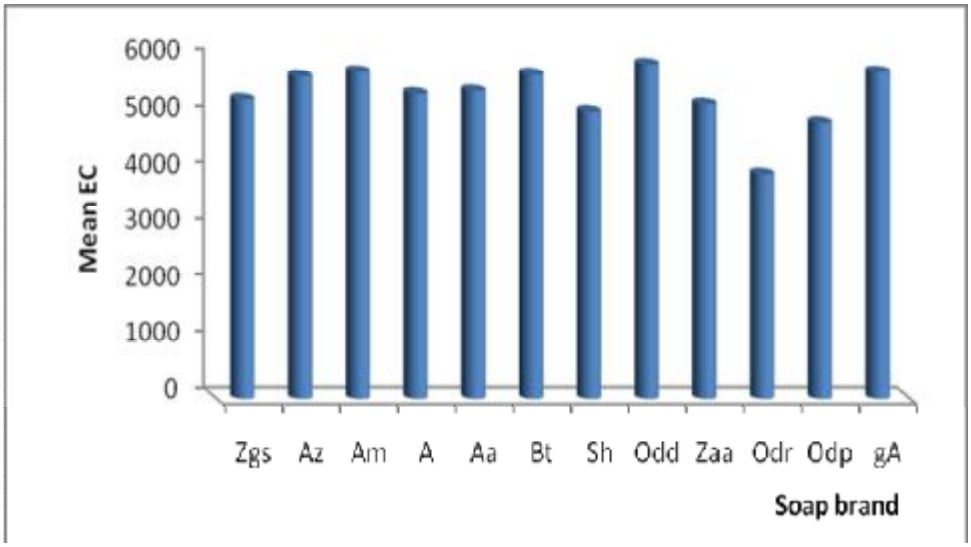


Figure (2): Mean EC (µs/cm) of twelve Allepo soap brands collected from local markets

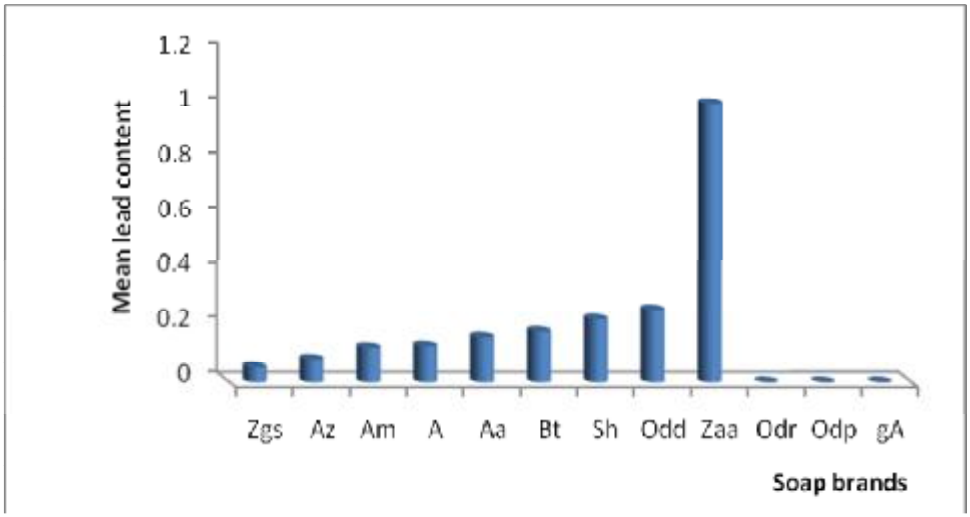


Figure (3): Mean lead content (µg/g) of twelve Allepo soap brands collected from local markets

The present study reports on heavy metal content (Pb) in some samples collected from different markets in Baghdad. Lead content was found higher and exceeding the allowed levels (0.2 mg/kg) as recommended by WHO (Maleki & Zarasvan, 2008) but several brands were lead free or had very low content (Figure 3).

The current results indicate that certain brands of Aleppo soap were likely to cause systematic health effects such as hair fallen because the elevated of lead content while the other were not.

Public health is subjected to various environmental contamination via different exposure routes such as digestive, inhaling, dermal and intravenous (IPCS, 1999; 2001; 2006; IARC, 2006; Ronsseau et al, 2007) and with passing time elevated levels t may build up sufficient to cause significant health problems (Steenland and Boffetta, 2000; Williams, *et al.*, 2000; Hodgson, 2004; IPCS, 2006).

In Iraq, there is a significant demand upon such soaps for quite long time particularly by women for various applications but mainly for hair cleaning. However, such frequent use may enhance the opportunity to threaten health for lead toxicity being elevated levels is related to the lead accumulation not only from Allepo soaps but also from other chemicals that contain lead (IPCS, 2001; AHT, 2005; ATSDR, 2007; Timbrell, 2008).

It is suggested that regular monitoring regarding the heavy metal contamination should be encouraged in Aleppo soap industry to control lead content.

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