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Department of Health

Poisoning Watch

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Introduction

Arsenic is a naturally occurring element found in the earth. It can exist in three forms — elemental (metallic) arsenic, inorganic arsenic compounds (such as arsenic trioxide (Figure 1)) and organic arsenic compounds (such as those found in seafood). The inorganic forms are usually considered more toxic to the human body, whereas the organic forms are of much less concern in toxicity. Arsenic poisoning can occur if a certain amount is absorbed and accumulated in our body.[1,2]

Figure 1: Arsenic trioxide

Sources of arsenic

There are many sources of exposure to arsenic [1-5]. The major ones include:

- drinking contaminated water (especially contaminated groundwater);
- using contaminated water in food preparation and irrigation of food crops;
- using pesticides, herbicides and fungicides;
- Industrial processes (for example, arsenic as an alloying agent, as well as in the processing of glass, pigments, textiles, paper, metal adhesives, wood preservatives and ammunition);

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- eating contaminated food;
- using drugs, Chinese herbal medicines and proprietary Chinese medicines which contain arsenic as intended ingredient or as contaminant; and
- smoking tobacco (because tobacco plants take up arsenic naturally present in the soil).

Recent notifications of arsenic poisoning

In mid-August 2015, the Department of Health (DH) received three notifications from the Hospital Authority (HA) of suspected cases of heavy metal poisoning after consumption of medications prescribed outside Hong Kong. Laboratory testing had detected excessive amounts of arsenic in medication samples submitted by the three patients.

The first patient was a 16-year-old girl who presented with limb numbness and was admitted to Princess Margaret Hospital on 23 June 2015. She described a recent history of use of capsules prescribed by a person who claimed to be a doctor in Thailand for treatment of eczema for a few weeks before symptoms appeared. Her urine sample revealed an arsenic level higher than the reference level which was clinically suspected to be related to the use of the aforesaid capsules.

The second female patient was admitted to Prince of Wales Hospital on 13 August 2015 for numbness, weakness, skin pigmentation and weight loss after recent consumption of pills (Figure 2) for five months. The third patient, a man aged 27, was admitted to Queen Mary Hospital from 7 to 9 June 2015 for weakness, numbness, unsteady gait and weight loss after recent consumption of pills for two months. According to the second and third patients, they consulted a man who claimed to be a Chinese medicine practitioner in Changping, Dongguan, Guangdong for treatment of psoriasis in February 2015 via a tour arranged by an agent in Hong Kong. Both cases were clinically suspected to be related to their use of the aforesaid pills.

Figure 2: Pills collected from the patients
Source: Prince of Wales Hospital Poison Treatment Centre

Follow-up actions

Upon these notifications, investigations by DH including reviewing patients' clinical conditions and consumption history were commenced immediately. Letters had been issued to doctors to alert them of the recent cases. A hotline was also set up for related enquiries and case finding. Subsequently, 39 additional patients were identified comprising 31 men and 8 women aging from 23 to 64. They all had consulted the man in Guangdong as mentioned above for treatment of chronic skin conditions from August 2012 to August 2015. Many of them developed pain, weakness, numbness and a tingling sensation in limbs, weight loss and increase in skin pigmentation after consumption of pills. All of them were in stable condition. Subject to patients' consent, they were referred to the Hong Kong Poison Information Centre (HKPIC) or the Prince of Wales Hospital Poison Treatment Centre (PWH PTC) of HA for clinical assessment and follow-up treatment where appropriate.

On the other hand, DH had informed the cases to the regulatory authority of Thailand and the Mainland for their further actions.

What do you know about arsenic poisoning?

Signs and symptoms

Arsenic poisoning can be divided into acute and chronic cases, with different presenting symptoms and signs. [1,3,4]

1. Acute poisoning

    - Acute poisoning may result from accidental ingestion of pesticides and less commonly from attempted suicide. The immediate symptoms usually start within 30 minutes to two hours which include nausea, vomiting, abdominal pain and diarrhoea. These are followed by numbness and tingling of the extremities and muscle cramping. Exposure to high amount of arsenic can be fatal.

2. Chronic poisoning

    - Most chronic poisoning incidents are mainly related to prolonged exposure to high levels of inorganic arsenic such as through drinking-water and food. The

first symptoms are usually observed in the skin, and include pigmentation changes (Figure 3), hard lesions on the palms and soles of the feet (hyperkeratosis) (Figure 4) and scaly lesions on the body and limbs (Figure 5). Some of these scaly/ hyperkeratosis lesions may be precancerous or even cancer of skin. Other possible adverse health effects include developmental effects, neurotoxicity, diabetes and cardiovascular disease. According to the International Agency for Research on Cancer (IARC), long term exposure to arsenic and arsenic compounds may be a precursor to cancers of skin, urinary bladder and lungs.[3,6]

Figure 3: pigmentation changes
Source: Prince of Wales Hospital Poison Treatment Centre

Figure 4: hard lesions on the palms
Source: Prince of Wales Hospital Poison Treatment Centre

Figure 5: skin thickening on soles of the feet
Source: Prince of Wales Hospital Poison Treatment Centre

Diagnosis

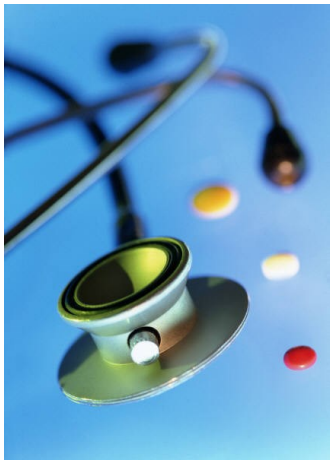
Generally, blood and urine arsenic levels are useful for quantifying and monitoring exposure to arsenic. However, due to the short half-life of arsenic in the blood (around 10 hours)[8], urine is the preferred specimen for detection of exposure. For chronic or past exposures, analysis of hair or nail may also be used sometimes. However, because the

arsenic content of hair and nails may be increased by external contamination, caution must be exercised in using the arsenic content of these specimens to diagnose arsenic poisoning.[9] An individual with arsenic poisoning usually has compatible symptoms and signs of toxicity and an elevated level of arsenic in blood or urine.[7] There is often a positive history of exposure to arsenic.

Management

Individuals with significant exposure to arsenic and/or having symptoms of arsenic poisoning are advised to seek medical attention for examination and treatment as indicated. It is most important to stop further exposure once the source of arsenic is identified. The source should be isolated and removed if possible.

For patients with elevated arsenic level in blood or urine and with compatible symptoms and signs, treatment may be considered after thorough investigation and assessment. Treatment using chelating agents such as Dimercaptopropane sodium sulphonate (DMPS) should be used very cautiously as there are side effects including gastrointestinal upset, skin rashes, drowsiness and dizziness, low white cell counts, and renal and liver impairment. Chelation therapy is the use of chemical compounds to remove heavy metals from the body. It may be indicated for those with documented exposure with increased blood or urine arsenic level and target organ toxicity. In general, it is not recommended for cases with chronic symptoms, when the risk of exposure is remote and/ or in the absence of elevated urine arsenic level.



Use of arsenic in medicine

Despite the safety concerns, arsenic is often used as a part of extremely diluted homeopathic remedies that are used for digestive disorders, food poisoning, sleep problems, allergies, anxiety, depression, and obsessive-compulsive disorder. Inorganic arsenic compounds (e.g. 雄黃[As_2S_2]) have been used in Chinese medicine to treat skin diseases.[10] Sometimes, arsenic trioxide is even used intravenously to treat leukemia.[4]

Prevention of arsenic poisoning

Making people aware of the risks of arsenic poisoning is the key factor of prevention. This can be done by educating the public and high risk groups (i.e. occupational: persons working in industries such as wood preservation, metal alloys and glass production) about the harmful effects of arsenic poisoning and how it can be avoided.[1]

Another important preventative measure is to have health professionals check people at risk for the early signs of arsenic poisoning.

Advice on seeking consultation for medical conditions

In seeking consultation for management of medical conditions such as eczema and psoriasis, the public are advised to:

1. Pay special attention, especially when seeking consultation outside Hong Kong, to ensure that they are qualified or registered with relevant jurisdictions for practicing; and
2. Seek advice from qualified healthcare professionals as soon as possible if they experience discomfort after consumption of medications obtained from suspicious sources. They should stop using them immediately.

Supplementary information: Legal requirements related to the sale or supply of medicines in Hong Kong

DH is responsible for overseeing the safety, efficacy and quality of all medicines marketed in Hong Kong. Medicines can be divided into western medicines and Chinese medicines as they are regulated under difference Ordinances, i.e. Pharmacy and Poisons Ordinance (Cap.138) and Chinese Medicine Ordinance (Cap. 549) respectively.

In general, western medicine refers to pharmaceutical product. According to the Pharmacy and Poisons Ordinance (Cap.138), "pharmaceutical product" means any substance or combination of substances—

(a) presented as having properties for treating or preventing disease in human beings or animals; or

(b) that may be used in, or administered to, human beings or animals, either with a view to –

(i) restoring, correcting or modifying physiological functions by exerting a pharmacological, immunological or metabolic action; or

(ii) making a medical diagnosis.

According to the Chinese Medicine Ordinance (Cap 549), "Chinese herbal medicine" means any of the substances specified in Schedule 1 or 2 of the ordinance; "proprietary Chinese medicine " ("pCm") means any proprietary product -

(a) composed solely of the following as active ingredients-

(i) any Chinese herbal medicines,

(ii) any materials of herbal, animal or mineral origin customarily used by the Chinese; or

(iii) any medicines and materials referred to in subparagraphs (i) and (ii) respectively;

(b) formulated in a finished dose form; and

(c) known or claimed to be used for the diagnosis, treatment, prevention or alleviation of any disease or any symptom of a disease in human beings, or for the regulation of the functional states of the human body.

As stipulated in the Ordinance, no person shall sell, import or possess any pCm unless the pCm is registered with the Chinese Medicines Board under the Chinese medicine Council of Hong Kong ("CMCHK"). A pCm must comply with the requirements in the aspects of safety, quality and efficacy set out by the CMCHK in order to obtain the registration. Moreover, any person who wishes to carry on the business of retail and wholesale of Chinese herbal medicines, wholesale and manufacture of pCm must apply for a relevant licence from the Chinese Medicines Board.

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10. Pharmacopoeia of the People's Republic of China 2015

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