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Arsenic: Interpreting Urine Arsenic Levels

What does an elevated urine arsenic level really mean?

When a patient's urine arsenic level is found to be elevated, there are several important factors to keep in mind when determining the significance of the result.

1. Was the specimen collected accurately?

Urine samples should be collected in a metal-free, acid-washed container to ensure accurate results. The patient should refrain from eating any seafood, seaweed, or rice for one week prior to the collection.

2. Was the patient really exposed to a toxic form of arsenic? Was the test influenced by nontoxic arsenic?

a. Seafood (particularly shellfish, seaweed, & cold-water bottom-dwelling fish), is a rich source of organic arsenic compounds that are not associated with toxicity. These compounds, such as arsenobetaine and arsenocholine, are generally eliminated more quickly from the body than the inorganics. Any seafood ingested within a week of the laboratory test will cause a false positive result.

b. Toxic arsenics include elemental arsenic (rare), inorganic trivalent and pentavalent compounds, and arsine gas. Arsenic trioxide (As₂O₃) is one of the most common and toxic of the substances ingested. If a patient has an elevated arsenic level and a history of exposure to one of these compounds, there is cause for concern.

c. Some of the more common sources of toxic arsenic are listed below:

Natural Sources

Arsenic-containing groundwater

Medicinals

Folk remedies
Kelp-containing health foods

Commercial Products

Wood preservatives
Pesticides
Herbicides
Fungicides
Cattle and sheep dips
Paints and pigments
Fire salts

Industrial Processes

Burning, cutting, or sanding arsenic-preserved wood
Electronics manufacturing
Hardening metal alloys
Bronze plating
Clarifying glass and ceramics
Vineyard spraying

3. What type of laboratory test is it?

a. A detectable blood arsenic level indicates that the exposure has just happened, as arsenic is rapidly distributed and is only transiently present in the blood stream.

b. A 24-hour urine is the diagnostic tool for determining arsenic exposure. A level of ≥ 50 mcg/L, >100 mg/g creatinine, or >100 mcg total arsenic represents a potentially toxic value. This test is frequently confounded by the presence of nontoxic organic arsenic compounds from seafood.

c. A speciated 24-hour urine test chromatographically distinguishes different arsenic compounds ingested and their metabolites. This separates the nontoxic seafood arsenics – arsenocholine & arsenobetaine, organic metabolites of toxic inorganic forms - monomethylarsonic acid (MMA) & dimethylarsonic acid (DMA), and toxic inorganic forms - arsenic trioxide, copper-chromium-arsenate (CCA). This is the definitive test if the non-speciated 24-hour urine test yields a toxic level in someone suspected of recent seafood ingestion.