

ARSENIC IN FOOD

Arsenic is a naturally occurring compound. Colourless, odourless and tasteless, arsenic is commonly found in food and its raw ingredients. However, scientific literature indicates that its consumption, in high quantities, can be linked to skin lesions, cancer and diabetes.

NATURALLY OCCURRING, BUT...

Arsenic exists naturally in our environment and can be found in the air we breathe, the water we drink and the ground we walk on. But today the amount of arsenic from anthropogenic sources, released into the environment as a by-product of agricultural and industrial processes, is increasing. Its presence in food is therefore no surprise, and entirely natural at low levels. Today we discriminate between two forms of arsenic. Inorganic arsenic is more toxic than organic arsenic and more closely associated with the potential for long-term health effects.

Experts at the European Food Safety Authority (EFSA) identified the following foods as having the highest total arsenic levels (organic and inorganic levels combined):

- Cereal and cereal products, with particularly high concentrations in rice and rice-based products.
- Fish and seafood.
- Food products or supplements based on algae, especially hijiki.
- Bran.
- Germ.

Most crops absorb arsenic from the soil and water in their environment. However rice, which grows in flooded conditions, absorbs and stores arsenic more readily. Brown rice especially, contains high levels of arsenic, particularly in its inorganic forms. This can pose an increased risk for specific population groups for which rice is a staple food, especially where the cooking water is also contaminated.

Similarly, rice is a key ingredient in many pre-prepared baby foods. Statistically, children under three years of age are the group most exposed to arsenic. Their diet and relatively low body weight means they are exposed to an average

of two to three times the levels of inorganic arsenic ingested by adults.

Fish and seafood are known to be high in arsenic, but mainly in its organic form. This difference in content versus severity demonstrates the need for new analyses taking into account the speciation of arsenic and not just the total content.

SPECIATION AND EVALUATION

Studies into arsenic in food have been restricted by a lack of speciation data. Of more than 100,000 arsenic concentrations submitted to EFSA for evaluation, some 98% were reported as total arsenic but only a few broke figures down into organic and inorganic. European authorities have adopted EFSA's 2009 report and maximum limits for inorganic arsenic are planned to be introduced for rice and rice-based infant food. The introduction of maximum limits for cereals, algae and food supplements is also under discussion.

In the US the Food and Drug Administration has been measuring total arsenic concentrations in food products since 1991, but has yet to establish a specific standard. A guideline for arsenic (total) in crustacean and molluscs of 76ppm and 86 ppm respectively, was introduced in 1993, but it is currently examining the risks associated with long-term exposure.

CODEX has a standard for total arsenic in various foods (fats, margarine, olive oil, vegetable oil, mineral water and salt), but the issue of organic against inorganic has not yet been addressed.

STATE-OF-THE-ART TECHNOLOGY

To detect and distinguish between species the most effective method combines HPLC, a powerful separation technique with inductive coupled plasma-mass spectrometry (ICP-MS). In LC-ICP-MS the compounds are separated by



HPLC and the resulting fractions ionised and detected by ICP-MS.

LOW LEVEL EXPOSURE IN EVERYDAY LIFE

In low doses, arsenic is not harmful to humans. However, exposure to higher doses over longer periods may produce negative side effects, with dietary exposure having a more significant impact on human health than environmental exposure. Long-term inorganic arsenic consumption has been linked to skin lesions, cancer and diabetes. Organic forms are less toxic, but data on toxicity and occurrence is lacking.

The presence of arsenic in food and water is unavoidable, but food producers should be aware of legislation and the impact of the more toxic inorganic arsenic on raw materials and ingredients.

For more details on SGS Food services visit: www.sgs.com/foodsafety.

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