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## **Arsenic in Food: A Resource for Health Professionals**

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### **Summary of Key Points**

- Recent reports have described inorganic arsenic levels in a variety of foods, including rice and rice milk; cereal and energy bars sweetened with rice syrup; and apple juice and baby food.
- There is minimal exposure from breast milk.
- Low-level inorganic arsenic exposure from food products may be associated with abnormal learning and neuromotor function in children.
- Until there is greater regulation of inorganic arsenic in food products, a varied diet may be the best strategy to limit low-level, chronic exposure.

*Health professionals are encouraged to follow the guidance below to help navigate discussions with patients and families who are concerned about arsenic exposure in children.*

### **Arsenic Exposure and Risk Factors**

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Arsenic is a naturally occurring element, found widely in the environment as an inorganic salt. Groundwater may flow through arsenic-containing bedrock or soil, contaminating drinking water drawn from wells. Past use of arsenic-containing pesticides and fertilizers may also contaminate fields where rice (which selectively absorbs arsenic) and apples are grown.<sup>1,2</sup> Arsenic historically was used as a wood preservative, including use on outdoor wood structures such as playgrounds and decks. Workers in industrial processes and communities near these industries may be exposed to arsenic from coal-fired power plants, hardening metal alloys, purifying industrial gases, and in the electronics industry in the form of gallium arsenide and arsine gas as components in semiconductor devices. Arsenic has been reported in imported folk or homeopathic remedies.<sup>3</sup>

There are organic forms of arsenic that are found in seafood (farm-raised and wild) – these organic forms are generally considered non-toxic.<sup>4</sup>

### **Health Effects and State of the Science**

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An ingestion of a very high amount of arsenic-containing product can cause a serious sudden illness. Chronic high-level inorganic arsenic exposure, as from elevated water levels, has been associated with chronic skin problems and future development of a variety of adult cancers of the bladder, lungs, skin, kidney, nasal passages, liver, and prostate, as well as respiratory and cardiovascular disease. Low-level exposure, more typical of some food products and well water, has possible health effects on learning and neuromotor function in children. Arsenic can cross the placenta, increasing the likelihood of exposure to the fetus. There is no level of inorganic arsenic that is safe, but patients may not present with specific symptoms or signs. The provider

should have an index of suspicion for arsenic based on suspected or confirmed exposure to certain foods or well water.

## Medical Management

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Most arsenic exposures are chronic, without obvious symptoms or signs, and so medical management shifts to prevention, mitigation, and risk assessment. If, despite avoidance of arsenic (primarily in water and food), there is remaining concern or clinical suspicion for potential ongoing arsenic exposure, a first-morning “spot” urine can be collected, along with a urine creatinine to correct for concentration. An acid-washed container should be used to avoid sample contamination. If the laboratory reports total arsenic, it should be “speciated” or fractionated to distinguish between the toxic inorganic species (if present) as well as the organic species (currently considered non-toxic) typically found in seafood. Consultation with laboratory staff is recommended before ordering the test. For more information, visit [ATSDR’s Arsenic Toxicity webpage](#).

## Prevention and Risk-reduction Communication

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US Environmental Protection Agency (EPA) has an enforceable maximum contaminant level (MCL) for municipal water supplies of less than or equal to 10 micrograms of arsenic per kg of water (10 parts per billion, or ppb), to protect from chronic arsenic exposures, and a non-enforceable MCL goal of 0 ppb, which reflects the level at which no adverse health effects are expected.<sup>5</sup> The US Food and Drug Administration (FDA) has tested various foods for arsenic, finding, for example, elevated levels in rice<sup>6</sup>, and proposed a limit for inorganic arsenic of 100 ppb in infant rice cereals in 2016<sup>7</sup>; this action level was adopted in 2020.<sup>8</sup> The risk of chronic exposure to low-level arsenic can be mitigated through a varied diet. Infants who have a restricted diet (e.g., rice cereal as a first solid food and juice) may have arsenic exposures that are proportionately higher than those in older children and adults. FDA conducts routine surveillance for arsenic in apple juice and generally levels have been below 10 ppb, the same level allowable in drinking water<sup>9</sup>. Children’s toys are tested and must demonstrate compliance with [CPSC regulations](#) that limit arsenic in toys that may be mouthed. Until more is known, providers can advise families to:

- Encourage breast milk for the first 6 months of life, as it has little to no arsenic.<sup>10</sup>
- Test well water for arsenic, and consider bottled water if results exceed EPA recommendations, particularly if water is used to reconstitute formula.<sup>11</sup> Reverse-osmosis filters can mitigate arsenic in water but must be maintained regularly; an iron-impregnated biochar has been shown to perform as a low-cost arsenic sorbent.<sup>12</sup>
- Consult with local or state environmental health agencies to determine the potential for arsenic in drinking water, especially important for private well users, as these systems are not regulated by EPA.
- Choose rice products, including baby food, that are lower in inorganic arsenic.<sup>13</sup>
- As part of a varied diet, limit the serving size and frequency of foods that may have higher inorganic arsenic content, such as rice. Manage fruit juice consumption as part

of a healthy diet per the recommendations for children from the American Academy of Pediatrics (AAP).<sup>14</sup>

- Avoid rice milk for younger children.
- Avoid products sweetened with brown rice syrup.
- Parboil rice (brown or white) before cooking, or wash and pre-soak rice (effective only for white) before cooking to reduce inorganic arsenic.<sup>15</sup>
- Avoid smoking, as cigarette smoke contains arsenic.
- Do not use older, arsenic-containing pesticides (now banned in the US).
- Do not allow children to play in areas or structures known to have arsenic contamination. Avoid sawing, sanding, or burning “pressure-treated” chromated copper arsenate (CCA)-containing lumber; do not grow vegetables in planters made of CCA-containing lumber.

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## About PEHSU

The Pediatric Environmental Health Specialty Units (PEHSUs) are a source of medical information and guidance on prevention, diagnosis, management, and treatment of environmental conditions that influence reproductive and children's health. PEHSUs work with health care professionals, parents, schools, community groups, as well as federal, state, and local agencies to address reproductive and children's environmental health issues where families live, learn, play, and congregate. For more information on PEHSUs and available resources, please visit: <https://www.pehsu.net/>.

For additional resources and information on reproductive and children's environmental health topics that offer continuing education for health professionals, visit: <https://www.pehsu.net/nationalclassroom.html>

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