

Maine Coast Sea Vegetables
Arsenic FAQs
July 2014

SEA VEGETABLES AND ARSENIC

For a list of acronyms used here, please go to the end of the page.

Do sea vegetables contain arsenic? Is there arsenic in your products?

From what we've learned, it seems likely that most seaweeds contain at least trace amounts of arsenic—it is ubiquitous in seawater and easily taken up by seaweeds along with other minerals. Testing has indicated that all seaweed species that we sell do contain some arsenic.

What is Arsenic? Where does it come from and how does it get into sea vegetables?

Arsenic is a naturally occurring element found in the ocean, bedrock, freshwater, air, and soils. Arsenic is also released into the environment by some industrial processes. Seaweed tends to accumulate a wide range of minerals and trace elements from the ocean, potentially including arsenic.

How much arsenic is in your products?

We are mostly concerned with inorganic arsenic as opposed to total arsenic because inorganic arsenic is considered more harmful. In most sea vegetable species that we sell, test results have shown inorganic arsenic levels of less than one part per million (1 ppm). There are currently no established limits for arsenic in foods in the US or in Europe. The US Food and Drug Administration (FDA) has not established a standard nor have they established a testing protocol for seaweed. However, the Food Chemicals Codex (FCC), which establishes international standards for food ingredients, uses 1 ppm inorganic arsenic as its standard.

Bioavailability

Bioavailability is a way of gauging how much of a substance in food or drink actually gets taken up by the body during digestion. This is another crucial part of the picture when trying to understand the absorption of elements from seaweed or any other food. Bioavailability of minerals from seaweed is not yet fully understood, and research on the topic is relatively recent but increasing. One unique aspect of seaweeds is their fibrous polysaccharides (such as alginates) that may affect the absorption of metals, radioactive elements, and even minerals.

Are there regulations or limits for arsenic in food and water?

In the United States, the Environmental Protection Agency (EPA) limits the amount of arsenic allowed in drinking water (10 ppb). Currently there are no limits in the US for arsenic in foods, although the Food and Drug Administration (FDA) has monitored arsenic in foods for decades. Some international bodies and other countries have set limits and regulations for arsenic in water and in food.

Why are you selling foods that contain arsenic?

We believe seaweeds are beneficial because of their high mineral and iodine content, the wide range of bioactive compounds they contain (such as fucoidans, polyphenols, essential fatty acids, antioxidants), their unique fibers and polysaccharides, and more. All of our seaweeds contain

trace amounts of arsenic. However, sea vegetables have been eaten by people in coastal communities for centuries for their nutritional and healing qualities without any documented harm to those populations. For more than forty years the founding members of Maine Coast Sea Vegetables have been eating sea vegetables with wonderful health benefits.

How can sea vegetables be healthy foods if they contain heavy metals/arsenic?

We believe the beneficial aspects of seaweed outweigh the potential risks from trace amounts of metals or other toxins they may contain. Coastal cultures have been eating these species with no documented harmful effects for centuries. There is also the issue of bioavailability which is a measure of the amount of a substance our bodies take up during digestion. Researchers have only recently begun to tease apart what happens in human digestion when we eat sea vegetables, and what happens to arsenic, specifically.

How is MCSV addressing arsenic in our products?

We have been expanding our knowledge base on the relationships between seaweed and arsenic. We have also been researching the most appropriate testing methods for arsenic in seaweed and evaluating our products in the context of what we are learning. As a result, we are now moving from higher- to lower-inorganic arsenic products. We have invested considerable time and energy in this issue because we believe it's important. At this point, conclusive information is limited, and there are no FDA standards for arsenic in foods.

Sea vegetables in traditional diets

People in coastal cultures around the world have been eating sea vegetables for hundreds to thousands of years, without documentation of toxicity. For example, Japanese consumption of "brown" sea vegetables, which tend to have higher levels of arsenic, has been estimated at between 5 g and 12 g per day. And yet no signs of arsenic toxicity have been documented in Japan.

What is the status of scientific research on arsenic and seaweeds?

Research on arsenic in seaweeds has been undertaken since at least the early 1900s, but there was not a strong focus on arsenic in foods or seaweeds until the 1970s when different forms of organic arsenic began to be identified (arsenobetaine, arsenosugars). Since the 1970s, and especially the 1990s, there has been more research focus on arsenic in foods, but research on arsenic in sea vegetables was fairly sparse until late 1990s/2000s. Research and consumer concern on all kinds of food nutrients, as well as heavy metals and other potential contaminants, have increased markedly since the 1970s. In addition, research and testing methods are rapidly changing, particularly in the past decade. From the limited information available, it appears that arsenic has always been present in seawater and in seaweeds.

How is arsenic tested for in seaweeds?

Many test methods that are currently used for arsenic in foods were originally developed for soil and water samples and modified for foods. Only recently has more focus been placed on developing appropriate methods for seaweeds. It is crucial to identify methods that are best suited to seaweeds since they are substantially different from animals and land plants. Comparative laboratory trials in recent years have indicated that it's difficult to derive methods

for seaweed that generate consistent results. Test results vary by methods used (for analysis, extraction, and sample preparation), species, age of plants, geography, season, and other factors.

Please note that MCSV does not conduct its own testing. Over the past several years, we've tried several labs as we've learned about methods. What we've learned is that although there are many qualified commercial and academic labs, understanding of seaweed's unique chemistry was often missing because seaweed has received relatively little research attention. It took a long time to find a lab that has the understanding of and experience with seaweeds and the capability and track record to do rigorous analysis.

Acronyms

FDA: US Food and Drug Administration

EPA: US Environmental Protection Agency

FCC: Food Chemicals Codex

WHO: World Health Organization

ppm: parts per million; 1 ppm = one part in a million parts

ppb: parts per billion; 1 ppb = one part in a billion parts

mcg: microgram; one-millionth of a gram; also written μg