

Sea moss has recently seen increasing popularity for use in “healthy” smoothie beverages, with some products formulated with sea moss appearing to be a major ingredient. Despite the unpermitted vendors selling in various local venues, there are several safety concerns associated with sea moss (*Chondrus crispus*) that require specific controls to ensure the safety of consumers. The production process requires regulatory approval, and the producer must operate from a commercial kitchen under a Retail Food Establishment permit.

Here are the safety concerns:

1. The spores of *Clostridium botulinum* are present in the marine environment and may be present on the product. These bacteria, often referred to as “**C. bot.**”, produce the toxin that causes botulism poisoning. In producing the sea moss gel, growth and toxin formation by *C. bot.* must be controlled by one of two methods:
  - a. Use of a scientifically backed cooking process to destroy the spores and bacteria, or
  - b. Acidification of the product to a pH of 4.6 or lower to prevent growth and toxin formation by any *C. bot.* that may be present.

A written procedure must be submitted to the regulatory authority for approval of the production process using one of the two options above as the safety control. The [“Fish and Fishery Products Hazards and Controls Guidance,”](#) March 2020 includes validated guidance on cooking processes for destruction of the spores of *C. bot.* If the product will be acidified, an initial product assessment for pH must be obtained from a recognized Process Authority. That report must be provided to the regulatory authority as one requirement for approval of the production process. The retail producer will be required to do their own pH testing of each process batch, and must maintain batch production records that include the pH test results for each batch.

2. The supplier of raw sea moss must harvest from an area free from contaminants such as heavy metals, agricultural or industrial chemicals and microorganisms associated with septic waste, which are commonly associated with runoff water from populated and industrial areas. An approved harvester/producer of the sea moss must be able to provide a letter to the retail establishment attesting that their harvesting practices meet this requirement. This letter must be made available to retail food inspectors, and a copy of the letter must be supplied to the regulatory authority as another requirement for approval of the production process.
3. Sea moss and seaweed are natural sources of iodine. Maximum serving sizes must consider the maximum daily allowance of dietary iodine. The concentration of iodine in the sea moss gel will depend on factors such as the local source of the raw material as well as the processing of the gel. The National Institutes of Health (NIH) have [published a study](#) of various seaweed products showing, anecdotally, that sea moss had the lowest concentration of iodine of all types of seaweed in the study (see Table 4 of the study). For the sample tested, an 8 gram serving of sea moss would provide 85% of the NIH recommended [150 micrograms daily intake](#) of iodine. NIH recommended a tolerable [upper limit of 650 micrograms](#) of daily iodine intake, corresponding to approximately 40 grams of sea moss. NIH further reports that [iodine toxicity](#) can occur with more than 1100 micrograms iodine intake per day, resulting in a variety of thyroid health problems. The best guidance is to maintain a balanced diet and moderate consumption of sea moss products.

4. Sea moss is the natural source from which the thickener/emulsifier carrageenan is refined. Use of carrageenan is regulated as a food additive under [21 CFR 172.620](#). Additional information on allowed use is found at [21 CFR 172.623](#). The FDA [Food Additive Status List](#) provides maximum allowed concentrations of food additives in food.

The above requested documentation should be submitted to [foodvariances@dhec.sc.gov](mailto:foodvariances@dhec.sc.gov) for review and approval.

Be aware that if the sea moss gel will be processed using the acidification option, you will need a pH meter with which to test each production batch to be sure the critical pH value is met.

The topic of health claims is one that requires specific FDA guidance to navigate the fine details of what is allowed or not allowed. No health claims can be approved by local agencies such as SC DHEC, and the use of health claims renders the associated product as a dietary supplement, and not a food. As such, the product would be regulated by FDA, not by any local regulatory agency. Here are resources to assist you:

FDA Customer Service Hotline: 1-888-463-6332

FDA Office of Nutritional Products, Labeling and Dietary Supplements 240-402-2375

CFSAN [Industry Assistance Information](#)

Additional Resources:

[FDA Warning Letter – Everything Health LLC](#) 05-24-2021

[FDA Warning Letter – Red's Kitchen Sink](#) 03-02-2021

[Consumer Advisory](#) – Michigan Dept. of Agriculture and Rural Development

[Sea Moss Fact Sheet](#) – Ohio Department of Agriculture

[Iodine Intake from Sea Moss](#) – National Institutes of Health

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## Consumer Advisory: MDARD Urges Consumers to Dispose of Royalty Sea Moss Lemonade and Gel Products Because of Possible Health Risk

Michigan Dept of Agriculture & Rural Development sent this bulletin at 10/17/2022 10:30 AM EDT



For immediate release: October 17, 2022

MDARD Program Contact: [Tom Tederington](#), 517-749-5849

MDARD Media Contact: [Jennifer Holton](#), 517-284-5724

## Consumer Advisory: MDARD Urges Consumers to Dispose of Royalty Sea Moss Lemonade and Gel Products Because of Possible Health Risk

LANSING - The Michigan Department of Agriculture and Rural Development (MDARD) is advising consumers not to eat, drink, or consume any sea moss lemonade or gel products produced by Royalty Sea Moss of Mt. Pleasant, MI.

MDARD initiated the investigation after receiving a complaint from the Maryland Department of Health, Office of Food Protection. During the investigation, MDARD identified the firm produced these products with inadequate processing controls required to stop the growth of deadly foodborne pathogens including botulism. In addition to inadequate process controls the firm does not hold a license to manufacture, hold, or sell food products, which is a violation of the Michigan Food Law of 2000, P.A. 92, MCL 289.5101(1).

Improperly processed beverages and food products may have the potential to be contaminated with *Clostridium botulinum*, a tasteless and odorless bacterium which can cause life-threatening illness or death.

Botulism, a potentially fatal form of food poisoning, can cause the following symptoms: general weakness, dizziness, double-vision and trouble with speaking or swallowing. Difficulty in breathing, weakness of other muscles, abdominal distension and constipation may also be common symptoms. People experiencing these problems should seek immediate medical attention.

No illnesses have been reported at this time. Consumers are warned not to use the product even if it does not look or smell spoiled.

Products were primarily distributed across the U.S. through the firm's website, and social media platforms. Products advertised on their website lack adequate and consistent labeling including but not limited to ingredient statements, lot codes, and sell by dates.

- Regular Sea Moss Gel
- Fruit Flavored Sea Moss Gel:
  - Mixed Berry with Blueberry Strawberry Raspberry
  - Pineapple Cherry Strawberry
  - Peach Strawberry Flavor
  - Strawberry Dragon fruit
  - Mango Pineapple
  - Strawberry Banana
- Sea Moss Lemonade:
  - Blue Raspberry

- Mango
- Lemonade
- Watermelon
- Strawberry Peach
- Green Apple
- Pink Strawberry
- Strawberry Lemonade
- Grape
- Pineapple
- Strawberry Kiwi
- Cherry
- Fruit Punch

If consumers have additional questions or concerns, they may contact MDARD at 800-292-3939, Monday through Friday between 8 am and 5 pm.





###

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[Picture of seaweed removed due to file size constraints]

## The identification of potential food safety hazards in seaweed

Words by Clare Winkel

The consumption of seaweed has many health and nutritional benefits and Australia currently imports a significant amount of seaweed for human consumption.

Between 2017-2018, seaweed imports were worth \$40 million and 85% of that was for human consumption. Every year there are at least 36 recalls or import alerts worldwide for seaweed-based foods. In 2019, Australia instigated at least 50% of these recalls or rejections.

There are currently only a small number of domestic harvesters, growers and processors producing and selling seaweed for human consumption, but given the food safety concerns with imported seaweed, how does the local product compare?

### AgriFutures

To assist this small industry, AgriFutures has funded Integrity Compliance Solutions (ICS) to undertake a project to identify potential food safety hazards and develop HACCP Plans (Hazard Analysis Critical Control Point) for two seaweed case studies. These documents will provide the basis of a readily adaptable program for seaweed processors and

guidance for regulators in terms of minimising risks in the processing of seaweed for human consumption.

The project is focused on two seaweed species: one grown and one wild harvested. The first case study is *Phyco Health & Venus Shell Systems*, run by Dr Pia Weinberg. This business grows sea lettuce in large 'swimming pools' which is then heat dried and processed. The second case study is *Sea Health Products*, run by Jo Lane. This business harvests kelp from the beach which it then sun dries and processes.

The end-products from both businesses in the case studies are similar dried flaked products that can then be further processed into almost any type of processed foods including pasta, seasonings, chips, cheese, chocolate and coated snacks such as roasted nuts.

To start the hazard identification process, a literature review was undertaken. One study by the European Union Rapid Alert System<sup>1</sup> identified 22 food safety hazards in European seaweed - four were considered major, five moderate and thirteen minor.

The four major hazards identified

were: arsenic, cadmium, iodine and Salmonella. Some of the minor hazards included pesticide residues, dioxins, polychlorinated biphenyls, brominated flame retardants, polycyclic aromatic hydrocarbons, pharmaceuticals, marine bio toxins, allergens, nano plastics, pathogenic bacteria and viruses. The pathogenic bacteria include Salmonella and viruses include norovirus and hepatitis B.

These minor hazards are organisms or chemicals that are found within the European environment. Some are naturally occurring, such as marine biotoxins, and some are clearly a result of human activities such as nano plastics, pesticides, dioxins and flame retardants. There are safety concerns related to adverse events associated with seaweed consumption, particularly the variable and potentially dangerously high concentrations of iodine and heavy metals (including inorganic arsenic) in certain seaweeds.<sup>2,3</sup>

Only one publication by the University of Connecticut<sup>4</sup> focused on seaweed sold to the consumer (including raw and chilled), whether in restaurants or as a processed product. The food safety hazards identified

[Picture of person collecting seaweed removed due to file size constraints]

*Jo Lane collecting Golden Kelp (Ecklonia radiata) at dawn from case study 2. Photo taken by Honey Atkinson and supplied by Jo Lane.*

were pathogens from the harvest area, which were potentially significant because the seaweed may be consumed as a raw product, without any additional processing kill step.

Pathogens of concern include *Vibrio*, *Salmonella*, *E.coli* O157:H7, *Shigella*, *Norovirus* and Hepatitis. Environmental chemical contaminants were considered potentially significant as certain species of seaweeds exhibit a high affinity for accumulating heavy metals and other contaminants in their tissues. Natural toxins from the harvest area including outbreaks related to the consumption of several *Gracilaria* species. These toxins are often heat-stable and even if seaweed is cooked before consumption, the toxin will remain in the final product.

The spores of *Clostridium botulinum*, that form botulinum toxin, are naturally occurring in the marine and estuarine environment. It could be considered for seaweed products that are raw or blanched and then packaged in a modified/reduced atmosphere package (e.g. vacuum packed). Almost all papers reviewed were based on Northern hemisphere seaweed species and environments.

In addition to the literature review, the project reviewed 20 years of worldwide recall notices and border rejections using the Horizon Scan database.<sup>5</sup> This process identified the

following food safety hazards:

- Iodine: 262 incidents between 2000 – 2022
  - Inorganic arsenic: 64 incidents between 2000 – 2022
  - USA Import refusals: 35 incidents between 2002 – 2021 including labelling failure, processing failure, 'filth' and unauthorised colours
  - Cadmium: 13 incidents between 2005 – 2020
  - Salmonella: 11 incidents between 2011 – 2018
  - E. coli O7:H4: 3,000 school students and staff in Japan in 2020 (red seaweed salad)
  - Chemical hazards: Nitrofurans, sulphites, benzopyrene and aluminium
  - Unauthorised colours
  - Unauthorised irradiation
  - Microbiological organisms: *Listeria*, mould and coliforms
  - Allergens: soy, gluten and sesame
  - Fraud: documentation (labelled as organic from Nth Korea in 2020) and species substitution (Vietnam 2021).
- The process steps undertaken in the case studies were reviewed for actual food safety hazards, control measures and critical control points (CCP). The hazards identified were quite different to those identified in most of the publications. These were:
- Allergens: crustaceans and molluscs - controlled by washing in fresh water
  - Physical contamination: sand and marine debris - controlled by washing in fresh water
  - Micro contamination: *Salmonella* - controlled by the drying process resulting in a final product of Aw below 0.83 and salt content
  - Chemical contamination: iodine - possibly controlled by blanching of raw material
  - Almost all hazards were controlled or eliminated by growing seaweed in controlled tank conditions.

Variables that need to be considered to identify further controls for the identified food safety hazards include:

- Species specific hazards in local seaweed species


- Seaweed plant age and which parts of the plants are used
- Local harvest environmental conditions
- Rainfall levels in the local harvest area and harvest water temperature
- Blanching process.

### Project partners:

1. Sea Health Products: <https://www.seahealthproducts.com.au/>
2. Phyco Health & Venus Shell Systems: <https://www.venusshell-systems.com.au/>

### References

1. Banach, JL, Hoek-van den Hil, EF, van der Fels-Klerx, HL. Food safety hazards in the European seaweed chain. *Compr Rev Food Sci Food Saf.* 2020; 19: 332- 364. <https://doi.org/10.1111/1541-4337.12523>
2. Holdt SL, Kraan S. Bioactive compounds in seaweed: functional food applications and legislation. *J Appl Phycol.* 2011;23:543–597.
3. Suleria HA, Osborne S, Masci P, Gobe G. Marine-based nutraceuticals: an innovative trend in the food and supplement industries. *Mar Drugs.* 2015;13:6336–6351.
4. University of Connecticut, USA <https://seagrant.uconn.edu/>
5. Horizon Scan Database of worldwide recalls and border rejections <https://horizon-scan.fera.co.uk/>

Clare Winkel is the Executive Manager – Technical Solutions for Integrity Compliance Solutions (ICS). 

[Picture of seaweed removed due to file size constraints]

*Photo supplied by Pia Winberg; finished product (dried farmed seaweed- Ulvophyceae) from case study 1.*