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POTENTIAL HEALTH EFFECTS OF SARGASSUM

Background

1. Since 2011, massive quantities of *Sargassum spp*, a type of brown seaweed, have been washing up on beaches in Brazil, Central America, and the Caribbean. Factors that may be stimulating the growth and accumulation of sargassum include the recirculation of seaweed mats in the tropical Atlantic Ocean, nutrients from the flooding of major rivers such as the Amazon and Mississippi River, Atlantic hurricanes, higher sea surface temperatures, and changes in sea currents *(1, 2)*. Climate change may also increase the frequency and number of algal blooms or cause them to be more severe *(3)*.

2. Onshore, sargassum starts decomposing after 48 hours *(4)*, releasing hydrogen sulfide (H_2S) and ammonia (NH_3) gases, which can cause respiratory and neurological symptoms in exposed populations *(5, 6)*. Ammonia has a pungent smell and H_2S has a rotten egg smell.

3. Dose-response relationships for NH_3 and H_2S in enclosed occupational exposures are well established *(5, 7)*. Safe threshold values in open beach shore environments have not been established, therefore adjustments need to be made *(5)*. Acute inhalation of H_2S can block the mitochondrial respiratory chain with an accumulation of lactic acid. Hypoxic reactions specifically affect the central nervous system (atmospheric concentration levels above 500 ppm) and cardiovascular systems *(5, 8)*. Chronic exposure to H_2S (atmospheric concentration of 50–100 ppm) can affect the central nervous system (headache, fatigue, memory loss, ataxia) and the ocular system (eye irritation, inflammation of the cornea and conjunctiva, and light sensitivity), and can irritate the upper respiratory system.

4. Ammonia gas is an irritant and acute inhalation can affect the eyes and respiratory system (e.g., coughing, shortness of breath and distress, and ulceration in the upper respiratory system). Chronic exposure can increase the severity of effects on the eyes and respiratory system *(5, 8)*.

5. Sargassum is also an important habitat for organisms that can cause skin reactions on direct contact, such as jellyfish living in the seaweed, whose tentacles and larvae can cause rashes and blisters *(9).*

6. Populations in condition of vulnerability, such as people with asthma and other respiratory illnesses, can be particularly sensitive and may have difficulty breathing when exposed to H_2S. Children are generally more sensitive to irritants than adults and may also be more bothered by the stinging sensation from jellyfish and other stinging organisms.

Situation Analysis

7. There is limited information regarding the negative health effects of the current sargassum blooms in the Region of the Americas. Between January and August 2018, health surveillance programs in Martinique and Guadeloupe reported some 11,400 consultations and hospital admissions due to acute exposures to H_2S. Further analytical epidemiological research is underway to better understand cases and exposure levels in different scenarios on these islands *(4).* Removal of large amounts of sargassum biomass could also become an occupational hazard.

8. In addition, the negative impacts of sargassum blooms on marine ecosystems could have economic impacts affecting fishing and other food production systems, as well as tourism.

Action Necessary to Improve the Situation

9. Public health authorities should address this recurrent and growing problem. In the short term, health actions should include strengthening surveillance, developing clinical response protocols, and establishing risk communication strategies. Data on environmental exposure to sargassum, as well as clinical data, should be collected, analyzed, interpreted, and disseminated. Clinical response protocols should be tested for validation. Surveillance strategies and methods need to be integrated with ecological models to optimize research results applicable to health protection.

10. The risk communication strategy should target different exposed groups using participatory approaches. A health promotion focus should also be encouraged among community workers. Key messages should be tailored to the different groups at risk of exposure.

11. The Haut Counseil de la santé publique de France *(5)* has issued management recommendations to mitigate sargassum-related H_2S and NH_3 exposures, recommending that sargassum be collected from shallow ocean waters before it reaches shore. However, massive amounts of biomass already need to be removed on a regular basis throughout the affected areas of the Caribbean. Furthermore, the technology available to implement chemical stabilization by blocking anaerobic fermentation in decomposing sargassum is costly. An operational center with a daily work schedule is recommended in order to

address collection, transportation, storage, decomposition and final disposal of biomass and toxic gases. This will require expertise, equipment, and training.

12. In the medium and long term, it will be necessary to continue to develop a complex and wide range of ecological models to predict and facilitate preparedness and prevention of sargassum blooms.

13. As addressed elsewhere *(10)*, joint protocols and efforts should be undertaken by different national and international organizations. Capacity building that integrates academic experts with local communities should be promoted.

14. Given the recent emergence of this problem and the subregional scope of the work involved, concerted efforts are recommended in order to develop and implement a sargassum management plan. Terms of reference for response and mitigation actions should be the first steps in the plan, based on consultation with different national and international entities. The management team for implementation of the plan should include multi-stakeholder representatives from all relevant sectors and disciplines.

Action by the Directing Council

15. The Directing Council is invited to take note of this document and provide any comments it deems pertinent.

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