

**DEFRA DWI**

**RISK ASSESSMENT OF BMAA**

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## SUMMARY

### I OBJECTIVES

- Collation and review of published and unpublished data on BMAA.
- Simple assessment of the risk of BMAA to human health through drinking water.
- Identification of gaps in information.

### II REASONS

The finding of the non-protein amino acid,  $\beta$ -methylamino-L-alanine (BMAA) with neurotoxic properties in the brain of patients with degenerative disorders and its reported presence in cyanobacteria found commonly in water sources used to provide drinking water has led to concern over its potential widespread effects on human health. This report collates the information currently available to inform a risk assessment of BMAA through this route.

### III CONCLUSIONS

- No risk assessment can be made because of the extremely limited current state of knowledge on BMAA.
- Toxicological studies indicate that BMAA is a neurotoxin although some experiments indicate that it has only a weak effect on systems concerned with the neurotransmitter, glutamate. There is also some evidence that it may not easily cross the blood brain barrier. There is a lack of toxicological information based on standard tests using the oral route of exposure which is more relevant to environmental exposure upon which to base a health-based value for use in a risk assessment.
- At present, there are insufficient data to confirm an association between the presence of BMAA in the brain and degenerative diseases and this remains a hypothesis.
- BMAA appears to be present in laboratory cultures of a wide variety of cyanobacteria from natural blooms. However, there have been some contradictory results and more data are required to confirm that BMAA might be present in natural waters.
- Intact cyanobacteria have been shown to be removed by the mechanical processes of drinking water treatment; however, lysis of cells may release cyanotoxins including BMAA. This may be less for BMAA than for other toxins because at least a portion of BMAA may be protein-bound and potentially less likely to be released from the cell.
- While drinking water treatment methods such as chlorination, ozonation and granular activated carbon (GAC) may remove other cyanotoxins, the simpler structure of BMAA may make it less susceptible to these types of treatment, particularly breakdown by oxidants. However, there is no evidence for this at present.

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## **IV RECOMMENDATIONS**

The following knowledge gaps have been identified, where further research is required before a meaningful assessment can be made of the potential risk posed by BMAA to human health, particularly by exposure via drinking water:

- Further studies on the toxicity of BMAA are required including the use of standard protocols using the oral (and to a lesser extent dermal) route of administration which is more relevant to environmental exposure;
- Measurement of the physicochemical properties of BMAA would give information on its fate and behaviour in the environment;
- Agreement on the standard analytical protocols to be used for the measurement of BMAA in cyanobacteria, water, foodstuffs and human tissue;
- More confirmatory information is required on the presence of BMAA in cyanobacteria;
- Laboratory studies on the removal of BMAA by drinking water treatment;
- Monitoring of raw water sources in the presence of cyanobacterial blooms; and
- When the toxicity assessment is adequate to set a Tolerable Daily Intake, monitoring of drinking water should be undertaken.