

Mortality of dogs associated with a mass development of *Nodularia spumigena* (Cyanophyceae) in a brackish lake at the German North Sea coast

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Abstract

Mortality of two dogs, after exposure to water of a brackish lake on the German North Sea coast in 1990, is considered to be caused by a toxic *Nodularia spumigena* Mertens bloom.

In August 1990 the water of the brackish 'Banter See', a public bathing lake in the city of Wilhelmshaven on the German North Sea coast, was covered with cyanobacteria floating on the surface. Water samples showed high concentrations of the filamentous cyanobacterium *N. spumigena*. The whole area of the Banter See (~1.1 km²) was covered with flocks of living *N. spumigena*. Cell counts revealed a density of 128 000 filaments l⁻¹ or 1.7 x 10⁷ cells l⁻¹.

After swimming in the lake on 26 August 1990 and, probably, having drunk water or licked it off their fur, two dogs showed the first symptoms of poisoning (vomiting, diarrhoea) within 5 h after exposure to the water. Ten hours later, one dog, a 4.5-year-old setter, became apathetic. On 28 August one of the dog's kidneys failed and on 29 August the dog had to be put to death. On 31 August the other dog, a 2.5-year-old Welsh terrier, had to be put to death.

The concurrent large amounts of *N. spumigena* in the Banter See strongly suggest that the dogs were affected by algal toxins. The results of the autopsy, suggesting a poisoning by a hepatotoxic agent, agree well with the characterization of the toxin isolated from *N. spumigena*. This potent hepatotoxic pentapeptide, named Nodularin, induces massive haemorrhages in the liver of mammals, causes a disruption of the lobular and sinusoidal structure, and has some effects on the kidneys.