

# Marine Biotoxins in Shellfish

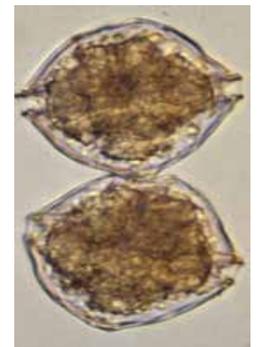
Filter feeding bivalve shellfish can accumulate toxins from naturally occurring microscopic algae. These algae are periodically present in the water column and as such become available to the shellfish as part of their diet. Occasionally these toxins are also available to other organisms, such as carnivorous gastropods, through trophic interactions. The consumption of contaminated shellfish can pose health risks to the consumer as well as economic risks to the shellfish industry. In the European Union (including the UK) there are currently three major shellfish biotoxin groups that can be detected in shellfish and which are subject to statutory testing to protect human health. These are:

- paralytic shellfish poisoning (PSP) toxins
- lipophilic toxins, including those responsible for diarrhetic shellfish poisoning (DSP)
- amnesic shellfish poisoning (ASP) toxins

## Paralytic shellfish poisoning (PSP) toxins:

The active component in PSP is saxitoxin and its derivatives, which block the voltage dependent sodium channels in nerves, thereby preventing nerve conduction. The toxins are quickly absorbed following consumption with symptoms in humans usually observed within 30 minutes. These symptoms include numbness in the mouth and fingertips followed by impaired muscle co-ordination. In high doses respiratory distress and paralysis can occur and this may be fatal. The potential public health risk can be seen in rural areas of Latin America and South East Asia, where death rates of 2-14% have been recorded during PSP intoxication incidents. PSP is associated with algae of the genera *Alexandrium*, *Gymnodinium* and *Pyrodinium*.

PSP toxins can be detected in UK shellfish and are annual events at specific locations. Toxin levels can at times exceed, the maximum permitted limit of 800 µg [saxitoxin equivalence (STX eq.)] per kilogram of flesh (EC Regulation 853/2004).

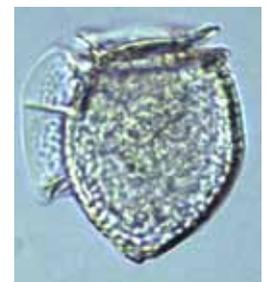


*Alexandrium Sp.*

## Diarrhetic shellfish poisoning (DSP) toxins:

Okadaic acid (OA)/Dinophysins toxins and Azaspiracids (AZA) are responsible for human Diarrhetic Shellfish Poisoning (DSP). They are caused by a number of dinoflagellate species including *Dinophysis*, *Prorocentrum lima* and *Azadinium spinosum*. DSP toxins lead to the inflammation of the intestinal tract. Symptoms include diarrhoea, nausea, vomiting, abdominal pains and chills. Symptom onset is from 30 minutes to several hours and recovery is within 3 days. EC Regulation 853/2004 does not allow shellfish containing DSP toxins at or above the permitted limits of 160 µg [OA eq.] per kilogram of flesh or 160 µg [AZA eq.] per kilogram of flesh (EC Regulation 853/2004) onto the market.

DSP toxins are regularly detected in the UK, sometimes leading to prolonged closure of production and relaying areas. They were responsible for toxin outbreaks from contaminated shellfish consumption in the UK in 2006 & 2010.



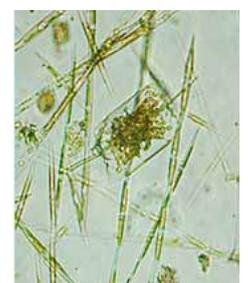
*Dinophysis Sp.*

## Other lipophilic toxins:

Other non-DSP lipid-soluble toxins include yessotoxins, pectenotoxins and cyclic imines. These are again produced by dinoflagellates including *Protoceratium reticulatum*, *Lingulodinium polyedrum* and *Dinophysis*. Both yessotoxins and pectenotoxins have regulatory limits set in EC Regulation 853/2004. These toxins are occasionally detected in the UK.

## Amnesic shellfish poisoning (ASP) toxins:

Amnesic shellfish poisoning is caused by domoic acid produced by marine diatoms of the genus *Pseudo-nitzschia*. Symptoms of intoxication include vomiting, diarrhoea, abdominal cramps and loss of short term memory which may be permanent. In a small number of cases ASP has been fatal. ASP toxins can be detected in UK shellfish, particularly during the April to October season and at concentrations which at times exceed the maximum permitted limit of 20 mg per kilogram of flesh (EC Regulation 853/2004).



*Pseudo-nitzschia Sp.*