There are several classes of shellfish toxins. Each class is caused by a different type of marine algae over-proliferation and poses specific threats to humans who ingest shellfish. 

- Amnesiac Shellfish Poisoning (ASP) caused by domoic acid and its isomers when concentrations exceed 20 ng/kg of shellfish tissue. The causative agents of ASP is detected with HPLC in the European Union.
- Diarrhetic Shellfish Poisoning (DSP) is caused by Okadaic acid (OA), diophosphoinositols (Dtx), yessotoxins (YTX), pectenotoxins (PTX), and azaspiracids (AZA) when concentrations of OA, DTX, PTX, or AZA exceed 160 μg/kg of shellfish tissue. YTX causes DSP when concentrations reach 1 mg/kg of shellfish tissue. Toxins responsible for DSP are detected with the mouse bioassay, although PETA has begun working towards the adoption of available non-animal detection methods for this class.
- Neurotoxic Shellfish Poisoning (NSP) is caused by brevetoxins. The EU is not affected by this class of toxins.
- Paralytic Shellfish Poisoning (PSP) is caused by saxitoxins, neosaxitoxins, gonyautoxins, and their isomers when the concentrations of these toxins reach 800 μg/kg of shellfish tissue. Following PETA lobbying, the Lawrence Method of HPLC replaced the mouse bioassay for detecting this class of toxins in the European Union.

How do shellfish toxins effect public health?

The mouse bioassay (intraperitoneal injection of homogenized shellfish to test shellfish toxicity) is the traditional method to test the safety of shellfish destined for human consumption. The endpoint is the death of the mice. Thousands of mice are used for this assay each year and suffer painful convulsions prior to their death.

Problems associated with this method include:

- Lack of reproducibility (McFarren, 1992; LaDove and Hall, 2000; Tosti et al., 2001; BfR Expert Opinion No. 032/2005, 2005)
- Lack of accuracy (Stibbe et al., 1992; Prasad et al., 1971; Nagashima et al., 1991)
- Lack of sensitivity (Jorgensen et al., 2004)
- False positives (McNabb et al., 2004)
- False negatives (McNabb et al., 2004)
- Subject to artifacts of the extraction process (Ramstad, Larsen, and Aune 2001)
- Cannot be validated (Stibbe et al., 2002; FAO/WHO ad hoc Expert Consultation on Biotoxins in Bivalve Molluscs, 2004)
- Violates animal welfare statutes since non-animal methods are validated for the same purpose (Council Directive 86/609/EEC)

Discussion

In vitro methods that make the detection of shellfish toxins possible have evolved dramatically since the era when animal test results were considered by some to be the gold standard. Animal experimentation has shown itself to an unreliable and irreproducible scientific and public-health gamble. Non-animal, analytical methods such as high performance liquid chromatography (HPLC) and mass spectrometry (MS) have outperformed animal experimentation by every measure.

The Lawrence method of high performance liquid chromatography (HPLC) is the method validated by the Association of Analytical Communities (AOAC) for PSP detection, and was implemented by the European Parliament for this purpose following lobbying by PETA. It is a prime example of the kind of improvements that analytical methods can make in protecting public health and the lives of animals. Because the Lawrence method is able to detect significantly lower toxin levels than the mouse bioassay with precision and reproducibility while also providing the exact toxin concentrations in the sample, it allows public health authorities ample time to close shellfish fishing beds in order to protect human health.

The Regulatory Testing Division of People for the Ethical Treatment of Animals (PETA) works to bring together high tech scientific methods and the appropriate regulatory bodies responsible for protecting the public health. This division of scientists is committed to the modernization of toxicity testing. Our work in implementing modern, non-animal methods that are relevant to humans, helps prevent a great deal of animal suffering in laboratories and results in greater protection for the public.