Microcystin and Human Health

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A disturbing story is bubbling under in the media and is about to burst into the public domain. It is about human health associated with a toxin known as microcystin. The story is one of tragedy arising from the loss of central nervous system functionality. The South African face of this story is the popular former Springbok scrum-half Joost van der Westhuizen as he battles the debilitating effect of Motor Neurone Disease (MND).

There is an aside to this story, because recently I have been engaged by the organizers of a major swimming event in South Africa. This engagement was around fears of human health risk arising from exposure to cyanobacteria now found in great abundance in more than 60% of our dams. The organizers asked me to retract my statements about blue-green algae in this specific dam. Always willing to cooperate I undertook to gladly work with the organizers, on condition that the authorities made a clear statement that the dam in question was free of blue-green algae at the time of the event. The authorities are unable to do this, so I am unable to retract my statement because the science is clear – more that 60% of our bulk storage is contaminated by cyanobacteria including this specific dam.

So what is the science underpinning this drama playing itself out?

In 1931 there was a massive bloom of cyanobacteria in the Ohio and Potomac Rivers in the USA, during which more than 5,000m people fell ill. The culprit was found to be a family of blue-green algae (cyanobacteria) that produce a toxin called microcystin. Things went quiet until the 1950's when an epidemic involving a central nervous system disruption occurred on the islands of Guam and Rota in the Pacific. Scientists working on this epidemic identified cyanobacteria as the culprit. In 1967 two scientists named Arthur Bell & Peter Nunn isolated a protein known as ß-methylamino-L-alanine (BMAA) associated with the presence of microcystin toxin from cyanobacteria in Guam. Of great importance BMAA was found to be in the seeds of cycad trees. The significance of this scientific discovery is that microcystin formed by cyanobacteria around the roots of the cycad tree, were absorbed into the fruit where they manifest as BMAA. This fruit was eaten by large bats known as flying foxes, where it was bio-accumulated. The flying foxes were eaten by locals, transferring the BMAA to the humans, where is manifest as a disruption of the central nervous system. What this science shows us is that cyanobacteria occur wherever water is present, including the root zones of plants. Depending on the species of cyanobacteria, a range of toxins are produced. One of these toxins is transferred from the roots to the seed so transmission is possible up the food chain. The toxin is accumulated in the animal that eats the seed, eventually becoming toxic to humans that eat the meat. An alternative pathway is *via* consumption of produce irrigated by contaminated water.

This triggered some new science, so a study done in 1987 involving the administration of BMAA to monkeys indicated Parkinsonian characteristics with motor neuron degeneration.

In 2006 a study demonstrated injury to motor neurons in mice exposed to BMAA. A year later a study done on mice revealed death (necrosis) of the neurons in the hippocampus of the brain. This was confirmed in 2010 when an independent study demonstrated that BMAA is selectively toxic to neurons.

The science is clear – microcystin is hazardous and it bio-accumulates. Sadly the extent of microcystin contamination of our national waters is actively downplayed by gate-keepers in government. The good news is that an easy to use test kit is now available from a South African company called ToxSolutions (www.toxsolutions.net). It works like a pregnancy test to measure whether drinking water has more or less than the WHO standard of 1µg/l. The kit is available from hesmarie@telkomsa.net at an affordable price and comes with whatever technical advice is needed to interpret the findings.