George River Catchment Investigation (NE Tasmania)

Prepared by Dr Alison Bleaney (GP) and
Dr Marcus Scammell (Marine Ecology), February 2010.

Independent laboratory investigations have revealed that there are toxins in the George River (N.E.Tasmania) that will kill organisms used in toxicity testing and human cells. The laboratories have further determined that the toxins appear to originate from the eucalyptus tree (*Eucalyptus nitens*) grown for plantation timber.

Background

This study was produced following observations of anomalous oyster mortality following rainfall and observations of anomalies with respect to human health in the St Helens area of Tasmania.

The largest of the oyster kills occurred following the crash in the George River Catchment in December 2003 of a helicopter carrying agricultural chemicals for spray application to plantation timbers. This event was closely followed by a flood in January 2004. It was suspected that chemical contamination was a possible source of the anomalies in oyster mortality and human health. These anomalies were brought to the Tasmanian Government's attention in the expectation that the Government would fully investigate. A full investigation did not occur.

Instead, Tasmanian Departments issued the following responses:

1. the oysters were probably killed by freshwater;
2. the human health anomalies were a result of poor data collection and inadequate data analysis.

Neither Dr Alison Bleaney (a local Medical Practitioner) nor Dr Marcus Scammell (a Marine Ecologist called in to assess whether the oyster kills resulted from anti-fouling paint pollution) could find evidence to support these explanations.

As a result, they decided to conduct an investigation in accordance with the ANZECC 2000 Guidelines.

Investigating Laboratories

Six separate laboratories in Australia and the USA were used to analyse samples collected from the catchment. These laboratories included private and university laboratories.

The task given to these laboratories was to determine the extent of toxicity and to identify an already known chemical in the samples or to exclude its presence. Once all predicted known chemicals were excluded, the analysis turned to identifying the unknown chemical or chemicals.

The findings set out below represent the amalgam of all of those individual laboratory test results.

Investigation Findings

Tasmania, The George River System Dry Weather Toxin (Jan 2005 to 2008)	Supported	Confirmed	Falsified
Are toxins present?	**x**	**x**	
Are toxins present at concentrations that are hazardous? *	**x**	**x**	
Is the toxin a known man made chemical?			**X**
Is the toxin degraded with time?	**x**	**x**	
Is the toxin a cation?			**X**
Is the toxin volatile?			**X**
Is the toxin an organic chemical?	**x**	**x**	
Is the toxin enhanced or inhibited by the addition of PBO?	see text		
Is the toxin a pyrethroid?			**X**
Is the toxin methanol soluble?	**x**	**x**	
Is the toxin Cineole or Pineole?			**X**
Is the toxin a non-polar molecule?	**x**	**x**	
Is the toxin toxic to human cell lines?	**x**	**x**	
Is the toxin a cyanobacterial toxin?			**X**
Is the toxin a known protein?			**X**
Do the surface soils and sediments contain biologically active toxins?			**X**
Are undisturbed catchments free of biologically active toxin?	**x**	**x**	
Are toxins present in *E.nitens* leaves?	**x**	**x**	
Do the characteristics of the leaf toxins match the toxin identified in the TIE**?	**x**	**x**	

*To Oysters, Sea Urchins, & Cladocerans.
** Toxicity Identification & Evaluation

Initially, the toxic water samples were enhanced in the presence of Piperonyl butoxide (PBO) which disappeared as testing continued. PBO enhances the toxicity of some man-made chemicals and reduces the toxicity of others.

Funding

The tests have been funded by local oyster farmers, Dr Alison Bleaney and Dr Marcus Scammell. In consultation with the investigating laboratories, they determined what tests needed to be run.

Simple Explanation

The toxin that was first identified as being present in January 2005 in the George River system appears to originate from *Eucalyptus nitens* monocultures. This particular tree is not indigenous to Tasmania and has been introduced as a plantation timber. During dry weather, man-made chemicals were not identified and the toxin was not present in catchments that do not contain upstream plantations but do contain native vegetation including Eucalypt forests.

Ongoing Investigation

Peter Long of the law firm Slater & Gordon, commissioned New Zealand's National Institute of Water and Atmospheric Research Ltd ("*NIWA*") (the equivalent of our CSIRO) to conduct tests on behalf of his clients for the purpose of validation via repeating the pilot study and for the purpose of determining the risk that the toxin may present.

Funding for this further testing has been made available through Peter Long of Slater & Gordon.

To date, *NIWA* has confirmed the findings set out above (with respect to aquatic organisms using Cladocerans and Blue Mussels) and is now attempting to further define the toxin and determine if the toxin is likely to periodically occur at concentrations hazardous to oysters and other organisms. Testing by *NIWA* has also revealed that the organisms used to measure the level of toxicity have not only been killed by the toxins but actually dissolved by them: a finding not previously observed in their laboratory's other scientific research.

The potential risk to humans is being assessed at Universities contacted directly by Peter Long of Slater & Gordon.

Recommendations

A comprehensive risk assessment and management strategy to remove the toxin from the water is urgently needed.

Participating Laboratories

1. Advanced Analytical Australia Pty Ltd., Sydney, Australia. – Chemical Analysis

2. Australian Proteome Analysis Facility, Macquarie University, Sydney, Australia. – Protein and Amino Acid Analysis and Chemical Fractionation

3. Australian Water Quality Centre, a business unit of South Australian Water, Adelaide, Australia. – Blue Green Algal Analysis

4. Chemical Safety and Applied Toxicology Laboratories, University of New South Wales, Sydney, Australia. – Human Cell Line Toxicology

5. Ecotox Services Australia Pty Ltd., Sydney, Australia. – Toxicology to Aquatic Organisms and Chemical Fractionation

6. Genetic ID (NA) Inc., Iowa, USA – Genetically Modified Organism Identification

Ongoing Investigation

7. NIWA (National Institute of Water & Atmospheric Research), New Zealand. – Repeating and extending toxicology and chemical findings from the above laboratories with respect to aquatic organisms.

8. Human cell line work being verified under the direction of Slater & Gordon