Full details

All details held on the selected case study are shown below.

Went live on	Title	Reference
21 Jul 2008	New tools for monitoring biological effects of fresh and seawater pollution.	SID0099

Synopsis
Academics are training Scottish regulators in the latest `omic techniques, and collaboratively developing new monitoring tools for fresh and seawater pollution.

Description
The Scottish Environment Protection Agency (SEPA) and a team led by Professor JA Craft at Glasgow Caledonian University have joined forces. Together, researchers and regulators will develop two new monitoring tools and train staff in the possibilities that 'omic* techniques offer for freshwater and marine quality assessments.

Water quality is important to Scottish industries like agriculture, fish farming, brewing, whisky distilling and tourism.

The project plans to deliver prototypes of two biomonitoring tools that can then be further developed and validated for routine use.

The tools should enhance SEPA's capacity to monitor the biological effects of pollutants, because they will let regulators measure hundreds of 'biomarkers' simultaneously in a single biological sample.

These biomarkers are genes that are known to respond when exposed to chemical pollutants or other environmental stress conditions. Chemicals like brominated flame retardants, and new formulations (e.g. nanoparticles), are producing new challenges for ecological assessments. Regulators increasingly need to assess how mixtures of chemicals, often at levels that are not lethal, affect ecosystem health.

This is where 'omic techniques can help. Quantitative Real time PCR (qPCR) arrays can take a single biological sample and check it for multiple genetic reactions to pollutants such as copper, dibenzanthracene and ethinyl oestradiol. In principle, the biological samples can be processed and the test conducted in one day.

The project will develop qPCR arrays to monitor environmental stress in two indicator species-sticklebacks (in freshwater environments) and blue mussel (in the sea). The arrays contain indicators for several series of functionally-related genes from these species. The tests work by monitoring gene expression using the array. Gene expression is triggered by chemicals in the environmental water and sediment samples. So the responses in the array indicate the genes' exposure to different chemicals. The level and pattern of response may show that pollution is harming populations of the indicator species.

The new techniques will complement SEPA's existing biomonitoring work by measuring the combined effect of many contaminants in the water sample and will help to prioritise more specific chemical monitoring.

The project will train SEPA staff in new 'omics-based techniques. SEPA is seconding a staff member to work alongside academic researchers on the qPCR project.

Stickleback and mussel have been chosen because a lot of genomics techniques have already been developed for these species. There is potential in the longer-term to develop additional arrays for other environmental indicator species, such as earthworms and Daphnia.

The research was supported by NERC's Post-Genomics and Proteomics programme.

Impacts	
Actual impacts	Policy, Practice
Impact evidence	SEPA staff are being trained in new techniques. SEPA are seconding someone part time to work alongside the academic developing new monitoring tools.

Research and funding	
Funding type	Research Programme
Date of research	March 2008 - August 1990

Funding partners	*£ Unknown*	Scottish Environment Protection Agency

Researchers at Universities		
Grant reference	NE/F006535/1	
Investigator	Professor JA Craft	Glasgow Caledonian University, Biological and Biomedical Sciences

Classification	
Science themes	Sustainable use of natural resources, Environment, pollution and human health
Science areas	Freshwater, Marine
Policy areas	Agriculture, food and fisheries, EU requirements, Natural resources, Pollution, Water

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