

Genetic metamorphosis

In 1935, the South American cane toad, *Bufo marinus*, was introduced into Northern Queensland by the Australian Bureau of Sugar Experimental Stations. Instead of controlling the cane beetles that were damaging sugar cane harvests, the toads began a steady invasion of Queensland, the Northern Territory and New South Wales.

With no natural predators or parasites, cane toads have now reached a density 10 times that found in their native Venezuelan habitat. And their spread continues further south and west at a rate of about 30 kilometres a year.

Ironically the toad, a failed biological control agent, could be reigned in by a new biological control method aimed at disrupting toad development.

CSIRO scientists, Dr Lyn Hinds and Dr Tony Robinson, from Sustainable Ecosystems, and Dr Alex Hyatt from the Australian Animal Health Laboratory, have begun a two-year study to identify genes involved in toad development and to define a viral vector.

'We're undertaking two parallel streams of research that will potentially come together towards the end of the project,' Hinds says. 'The first involves identifying a gene that is expressed at a critical stage of toad development and disrupting its function so that the tadpoles don't metamorphose into adults.'

To do this, Robinson will compare genes expressed in different stages of tadpole development with genes expressed in adults. Genes specific for the tadpole development will then be isolated and examined as potential developmental candidates. When a likely candidate gene is found, its protein product will be produced and used to immunise tadpoles to see if it has any effect on development.

'A precedent for this approach has been described using bullfrogs, where immunisation of tadpoles against adult haemoglobin disrupts their development,' Robinson says.

The second stream of research involves development of a viral vector for delivery of the developmental gene. This research will build on earlier work by Hyatt, which identified and tested an Australian

'ranavirus' (a member of the family Iridoviridae), similar to ranaviruses originally isolated from South American cane toads. Ultimately, it is hoped this virus can be genetically engineered to carry a gene that will disrupt metamorphosis of the tadpole. But first, a few problems relating to specificity and disease must be addressed.

'There are at least two Australian ranaviruses found in the environment. Under experimental conditions one of these will infect a range of amphibians and fish,' Hyatt says.

'So we need to modify the infectious characteristics of the virus by passage through cell culture or genetic manipulation whereby the virus maintains infectivity but does not cause disease. We will also identify sites in the viral genome that can be used to add foreign DNA that will ultimately express a product or products that is cane toad specific.'

If all goes well during the next two years, the scientists will be able to determine the feasibility of this approach for cane toad control. It is hoped the research will then continue beyond the original two-year proposal, until a suitable control agent is produced.

The project is jointly funded through the Natural Heritage Trust's National Feral Animal Control Program and CSIRO.

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