Dr Ian Hermans is investigating the development of new vaccines for human diseases. He is looking at a series of compounds that can activate a certain set of immune cells. This may form the basis of distinctive new vaccines against the bacterial and viral diseases for which no effective vaccine currently exists. The research also has direct implications for the development of vaccination strategies against cancer.

The HRC has been supporting Dr Hermans to undertake this work since he was awarded the Sir Charles Hercus Postdoctoral Fellowship in 2004, which supplied a secure salary for four years for him to take up the position of Team Leader at the Malaghan Institute of Medical Research. The HRC funding provided an incentive for Dr Hermans to return to New Zealand from the UK, where he had been working as a staff scientist at Oxford University.

Dr Hermans believes that while there is a pressing need to make successful vaccines for global threats like HIV, malaria and tuberculosis, appropriately designed vaccines may also be used in the future as effective therapies for a number of common, non-infectious conditions.

“There is accumulating evidence that vaccines can be used to treat conditions like cancer, allergy and autoimmune disease. For all of these applications, it is critical that vaccines are designed to stimulate immune responses of the correct ‘character’,” Dr Hermans says.

Research to date has shown that some patients respond very well to cancer vaccine therapy, but the overall response rate is relatively low. There is little or no associated toxicity to the treatment and so the incentive to realise the full potential of such vaccines is high. To do this, the vaccine technology needs to be improved.

One of the issues that need to be addressed is that, because of genetic differences between individuals, tumour fragments that stimulate a strong response in one individual may not do so in another. The team are tackling this by synthesising longer tumour fragments with new technology. The longer fragments can incorporate several different antigens derived from tumours and this should increase the number of people that will mount a good response to the vaccine.

The team has also found that immune cells called natural killer T-cells (NKT) provide support to the dendritic cells and the response may be improved if they can be stimulated by adding a synthetic substance to the vaccine.

The improved vaccine technology will be tested in patients with advanced melanoma by the end of the study period and a synthesis pipeline to produce vaccines for other cancers will also be established. This direct relationship between chemists, immunologists and oncologists is invaluable, providing the means to propel discoveries in the lab into the clinical arena where they can benefit patients at the earliest opportunity.

For example, a vaccine for treating asthma will need to stimulate quite a different immune response from a vaccine designed to treat cancer.”