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HUMANE SCIENCE

NEWS

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Inside this issue:

The articles featured in this edition of ANZCCART News have all been prepared by our colleagues in New Zealand and present some excellent examples of the work being done in New Zealand to protect the welfare of animals used in research and teaching as well as some of the research work being done that relies on the use of animal models.

Breathing through my nose

Hon Pete Hodgson
Chair, ANZCCART New Zealand

Many years ago New Zealand was governed by a rather pompous but nonetheless successful Prime Minister, one Keith Holyoake, whose many aphorisms included the advice that new members of parliament ought to 'breathe through their nose', presumably to avoid the wind blowing their tongue around. Today such advice is quaint; new MPs strive to opine from the get-go. The profound changes in media technology demand as much. Indeed social media ensures that instant opining is available to us all. So 'breath through your nose' is no longer plausible advice from the patriach of the day.

But as the new "independent NZ chair" of ANZCCART, I wonder whether old Keith (later Sir Keith) didn't have a point. Here is why. Since I stopped practising as a veterinarian, almost three decades ago, much has changed. Indeed as a politician myself I was the cause of some of those changes because I was instrumental in the passage of New Zealand's Animal Welfare legislation. But even that was almost 15 years ago and I have spent most of the intervening time sitting around a Cabinet table, inevitably disconnected from the day-to-day detail of this or that animal welfare issue. No longer. Out of politics and invited by the Royal Society of New Zealand to fill this role, I am now wondering whether to breathe through my nose for a while, or not. I am mindful first and foremost that, if I ever did possess an expertise in these matters, it is now dated.

Because things change.

A brief consultation of history of Animal Welfare issues reveals the obvious; change has been inexorable. Presumably, change will remain inexorable. Never radical and never glacial. But always in the public domain, always under debate and always shifting. Reflect that in my lifetime New Zealand has gone from harpooning whales to according them a popular status that ranks with the great apes. Or that in the area of research, teaching and testing these days there are legally binding ethical processes and legally binding transparency; the public's involvement is accordingly guaranteed.

But more change will come, because change is inexorable.

A role of ANZCCART is therefore to facilitate discussion on how that change will evolve. In my humble view that is why ANZCCART exists. It mirrors the function of many other advisory bodies in society that deal with challenging stuff, especially in bioscience. My able predecessor, Dr Mark Fisher, has described such issues as 'wicked'. There are plenty of wicked problems in public policy and one thing they reliably have in common is that they can never be solved. By that analysis climate change or drug abuse are wicked problems; landing a man on the moon was not. It was just technically hard. But if solving wicked problems is impossible, making progress on them is normal. In the case of the use of animals in research, teaching and testing that progress depends on open, continuous public engagement. Science takes place in a society and shifts in societal norms influence that science, properly.

So that is a peek at my opening prejudices, and I shall now revert to a period of breathing through my nose. I'm looking forward to this new role and to meeting folk who have made a difference over the years.

From the sheep paddock to a newborn baby's cot

How Kiwi sheep are helping improving the survival and wellbeing of newborn babies

Professor Laura Bennet, Dept of Physiology
The University of Auckland

Despite our advances in obstetric and neonatal care, many babies are born each day suffering brain damage which in turn leads to life-long disabilities. Damage to a baby's brain can occur after events like a reduction in the supply of oxygen before or during birth. Until recently we have had no treatments to help reduce or prevent brain damage. Now, thanks to the use of Kiwi sheep, and the research efforts of scientists at the University of Auckland, we have the first available treatment: brain cooling. This treatment is now in use around the world.

This is not the first time Kiwi scientists and Kiwi sheep have come to the rescue of newborn babies. In the late 1960s, Mont Liggins and Ross Howie, then based at Greenlane Hospital in Auckland, discovered that giving a pregnant sheep steroids could help reduce breathing problems in prematurely born lambs. In 1972 they published a landmark paper showing that steroids could also help human babies breathe better and that this treatment significantly improved their survival. Today, ongoing research at the University of Auckland is focused on developing new treatments, and in studying the far more delicate pre-term babies before and after birth. These babies are at far greater risk of injury and considerable research is required to understand why this happens, and how we can treat or prevent injury.

In recent years there has also been a great deal of research interest in something called "the fetal origins of adult disease". Many studies now show that challenges to an unborn baby's environment, like poor nutrition and even maternal stress, may not cause the unborn baby injury, but will cause its physiology to develop differently. In adult life, this in turn can predispose us to diseases such as diabetes, heart disease and even cancer. How this happens is poorly understood, and to improve adult health requires that we understand a lot more about how unborn babies grow and develop. Sheep provide the ideal model for such studies.

The question that many readers may be asking is why sheep? The sheep fetus is very comparative in size to a human baby, and we know the ages at which they match human development very well. They are an ideal size to comprehensively study fetal physiological responses. This enables scientists to obtain a vast amount of scientific and clinically relevant information using significantly fewer animals, thus helping to address our Three Rs responsibilities. Such intensive monitoring of pregnant sheep of course comes with challenges for all the staff involved in such studies, because there is the ewe and unborn lamb(s) to care for. Animal technicians and researchers must work side by side as a strong team to ensure the health and wellbeing of these animals. Training and communication are key to success, and it has been vital to develop intensive welfare monitoring and ethical guidelines. Indeed, New Zealand animal care and scientific research staff lead the world in the development of such guidelines.

There is no doubt that humble Kiwi sheep have contributed to improving human health from even before we are born, and current and future research with sheep will yield many more therapies for humans and animals alike.

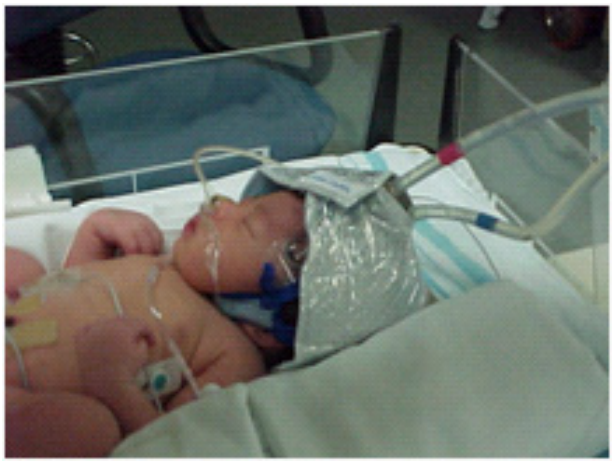

Figure 1: A newborn baby receiving the brain cooling treatment in the USA, after having suffered oxygen deprivation at birth. This treatment works by cooling the brain temperature down to around 34◦C for 3 days through a plastic cap which sits on top of the baby's head beneath the silver thermal cap. Research in sheep and other animal models provided the basis for international clinical trials led by New Zealand researchers. The success of these trials led to the implementation of this technique as the first treatment available to help reduce brain injury.

Models, motor cars and noise: an alternative perspective on study design engineering for the use of experimental animals

Dr John Schofield, Animal Welfare Office
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As a laboratory animal veterinarian I interact with research scientists on a daily basis and I am regularly consulted for assistance in many aspects of study design. This paper reflects these experiences and has been written to issue a challenge to the reader.

The challenge is to identify the problem in the chain of reasoning in the next paragraph. The argument is most commonly used by researchers when defending their choice of laboratory rodent. If you agree with the following, frequently stated premise, then perhaps you will be surprised at the conclusion and perhaps this article will have proved useful.

The premise is often presented as follows: *"we are studying a biological phenomenon in humans, using a rat model, and because humans are outbred, we need to use an outbred rat".* This statement has a certain "ring of truth" and seems quite sensible.

Professional golfers have mastered the basic mechanics of the swing and the science behind the equipment they use. They can discuss ball composition, compression values, flight trajectory and endless details of their favourite club design. Some amateur golfers enjoy watching TV programmes which "go through the bag": providing engineering details of the clubs used by the world's best. Non-golfers are bored rigid by the whole process. Professional Master Builders have learnt the science behind the products they work with: which type of board to use in wet areas; how to apply adhesives correctly; and how to measure to avoid wastage of materials. Professional Research Scientists using rodent animal models don't generally understand the laboratory bench reagents they work with, in my experience. To the layperson these reagents have strange names: Wistar; F344; Sprague-Dawley; Lewis; Long-Evans; BALB/c; Swiss Webster; DBA/2; and so on. The first five identify rats and the others are mice. Chemical reagents are available in a range of quality, from absolutely pure to unspecified and unrefined for everyday use. Just so with laboratory rodents.

Which quality to use? The most effective analogy I have discovered, in teaching this subject to graduate students, is one that involves the automotive industry. For basic transport the Volkswagen has functioned well, if all you want to do is travel at 50kph from A to B. However, the Volkswagen doesn't compare at all well to the Porsche, in terms of performance-- acceleration, top speed, road stability, and comfort. Both provide transport, but the Porsche offers a noiseless, smooth and totally reliable option, admittedly at a much higher price. Just so with rodents.

A useful example from the literature to illustrate the difference in quality involves hexobarbitol sleep times in mice.[1] It is estimated that an experiment set up to detect a 10% change in sleeping time between a treated and control group, would require only 7 BALB/c mice. This is remarkably different from the 257 Swiss Webster mice which would be required if Swiss mice were to be used. These details and a discussion about them are well argued in a very useful reference entitled "The Design of Animal Experiments" [2].

In our teaching programme at the University of Otago, we explain that 257 Volkswagens (Swiss Webster mice) are needed to detect the 10% change in sleeping time. The same information could also be obtained using only 7 Porsches (BALB/c mice). Consider the cost savings of 250 animals? Consider the time required to inject 257 versus 7 mice? The reason for this difference is best understood, in my experience, by the automotive analogy [3]. The Porsche is a finely tuned, hand-crafted piece of machinery where the engineering tolerances are exceeding small. This creates a vehicle which operates more quietly and smoothly than the Volkswagen, which is assembled from parts stamped out of a mould and bolted together, with significantly less care and attention. The between- vehicle (mouse) variation for the Porsche example is a Standard Deviation (SD) of 4 with a power calculation of 95%, whereas the Volkswagen example has a SD of 15 and a power of 14%.

Clearly the quality of these bench reagent laboratory mice is very different. And it is important to appreciate that both SW and BALB/c mice are phenotypically the same. Both are albino mice with red eyes, impossible to tell apart with the naked eye. But a necropsy of each would reveal a larger spleen in the BALB/c [4].

The BALB/c mouse is inbred while the SW mouse is outbred. The BALB/c mouse represents the nearest thing to a pure analytical grade reagent that is possible with animals. In effect, any background noise caused by variations in genotype has been minimised. The BALB/c mice are all genetically identical, while the SW mice are as heterogeneous as the readers of this article. The professional golfer understands the variables present in his or her equipment. Golf balls differ in their flight path depending on their design and construction. The length and loft of a club has a major effect on the result. The research scientist faces a challenging range of variables when using experimental animals as the bench reagent. Most statistical tests are comparing the biological signal (or size of the treatment effect) against the background noise (or the variability in the data). The ratio of signal to noise determines the significance. Hence if the background noise is large, the signal or treatment effect may not be heard--may be obscured. Conversely, if the background noise is reduced, the signal will be received loud and clear. The use of inbred animals is a simple strategy to reduce background noise.

Research scientists using animals, to ultimately improve the human condition, are doing so in order to model some aspect of human biology. Their hypothesis is nothing more or less than a question. One dictionary definition of an animal model is: *"an animal sufficiently like humans in its anatomy, physiology, or response to a pathogen to be used in medical research in order to obtain results that can be extrapolated to human medicine"* [5]. This indicates that the animal is used to answer a research question. The animal resembles the relevant function under investigation, but the animal does not have to resemble the human in every single respect.

Can the reader now understand the flaw in this statement: *"we are studying a biological phenomenon in humans, using a rat model, and because humans are outbred, we need to use an outbred rat"?*

This statement indicates a misunderstanding of the concept of animal models. It also indicates a lack of awareness of signal: noise ratios and the variables at play in any experimental design. It is regrettable in my view, that most scientists I interact with appear to have almost no appreciation of the value of inbred strains of rodents. I am surprised at their lack of understanding of the basic bench reagents they are using. Many do not know the genotype of the animal they use. Many would be unable to indicate which of the list of 5 rats or 3 mice detailed above are inbred. The basic science curriculum does not appear to provide fundamental training in the design of animal studies, using the principles outlined in the text by Professor Michael Festing. What commonly occurs, in my experience, is a repetition of the materials and methods section of whatever reference the scientist has based their next study on. If the reference cites the use of male Sprague-Dawley rats at 250 g, then that is what is proposed for their next study. And when these scientists are challenged with the signal to noise discussion, most appear unwilling to change.

These aspects of study design are important when one considers the Three Rs of Russell and Burch[6]. Why would one use 257 mice, when just 7 would give an equivalent result? This must be one of the best examples of reduction one could imagine? If the scientific community is committed to the principles of humane experimental technique, then surely more effort would be invested in training the next generation of scientists? Animal Ethics Committees would be more rigorous in their review of research applications? Is it ethically acceptable to allow more animals to be used than are needed? Is it acceptable for the research community to continue practising their science, without being aware of their bench reagents?

A strategy to increase the power of an experiment, in order to test a group of heterogeneous animals, is through the use of several different inbred strains in a factorial design. For example, instead of using ten outbred animals per treatment group, they are replaced with two animals of each of five different strains; still retaining a total of ten animals per treatment group. This will increase the signal: noise ratio and the power of the experiment. This design is recommended for toxicology studies as it more accurately duplicates the

heterogeneous population at risk[7].

For my part, whenever I hear the justification: *"we need outbred rats because the human population is outbred*", I relish the impending challenge of a debate with the scientist, because I am a bush lawyer at heart and because it presents an opportunity to discuss the concept of animal models, using the literature presented in this article. If the scientist is receptive, he or she may be persuaded to adopt the Russell and Burch principles. But this effort requires a certain evangelical zeal, for change is slow progress. Most are comfortable in their Volkswagens.

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Acknowledgements:
Some of the statistical terminology used in this paper has been transposed from the Festing et al. publication.

Laboratory mice: are you getting more than you paid for?

Dr Jacqueline Keenan, Dept of Surgery
University of Otago, Christchurch

Mice are held in research laboratory facilities under a range of conditions which reflect infection control programmes. Conventional mice are housed under basic conditions not designed to prevent the spread of infections. In contrast, housing for Specific Pathogen Free (SPF) animals involves a number of protective measures to minimise the spread of infection. Ideally, SPF mice are also tested regularly to confirm that the animals remain pathogen-free. However, in reality, testing is a cost overhead that some facilities are not prepared to meet.

These mice are widely used for *in vivo* study of many human diseases, including the link between chronic *Helicobacter pylori* infection and gastric cancer. *H. pylori* is a bacterium that persistently colonises the human stomach unless treated. Infection is always associated with a degree of superficial gastric inflammation (gastritis) that can drive a cascade of histological changes, resulting in an increased risk of gastric cancer, the second leading cause of cancer death worldwide. Infected C7Bl/6 mice develop a robust inflammatory response that is characterised by neutrophil and mononuclear cell infiltration into the submucosa of the stomach. Over time, this chronic inflammation can lead to the development of atrophy, metaplasia and dysplasia, similar to the multistep model of gastric cancer development in humans.

Cytokines within the gastric mucosa determine the type and severity of damage in mice and humans. C57BL/6 mice respond to *H. pylori* infection with cytokines that reflect a pro-inflammatory Th1-response.

In contrast, infected BALB/c mice develop significantly less inflammation, despite high levels of colonisation. This is attributed to their predominantly Th2-polarised response to infection and is associated with protection from *Helicobacter*-associated disease. Intriguingly, these responses can be altered. Specifically, an intestinal helminth infection in C57BL/6 mice can reduce *H. pylori*-associated disease severity by shifting the animal's immune response towards a Th2-type response.

There are areas of the world where the geographic prevalence of *H. pylori* infection does not parallel the prevalence of gastric cancer, notably Africa, where endemic helminth infections are thought to contribute to host resistance to *H. pylori*-associated disease. In unrelated studies, helminth antigens are currently being trialled as a means to stimulate anti-inflammatory Th2-type responses in people with Crohn's and other type 1-mediated autoimmune diseases. However, these exciting studies should serve to sound a warning to researchers using mouse models of Th1-mediated human disease because occult pinworm infection in

their animals might have the same effect.

There is evidence that *Syphacia obvelata*, a murine pinworm and gastrointestinal nematode, can induce a Th2 response that involves multiple signalling pathways, reflected in the cytokine profile of infected versus uninfected mice. Additionally, *S. obvelata* infection can influence an animal's response to nonparasitic antigenic stimuli. Thus, a helminth infection that can modulate the murine immune system may affect the outcome of unrelated experiments. This gains more significance when one considers that pinworms are reportedly common in rodent animal facilities. In fact most, if not all, conventional animal facilities have pinworm positive rodents. The exclusion of pinworms from these facilities is generally very difficult and requires sophisticated barrier systems. Not all institutions screen regularly for these parasites and, when they do, eradication is time-consuming and not always effective. Additionally, there is growing evidence that treatment with anthelminthic compounds may independently alter the host response in some experimental models.

In summary, mouse models are widely used for the *in vivo* study of human disease. However, researchers should be aware that using animals infected with pinworms may result in significantly different outcomes to those generated when using animals that are pinworm free.

The New Zealand National Animal Ethics Advisory Committee (NAEAC) invites applications or nominations for the:

THREE Rs AWARD 2012

To reward and promote implementation of Three Rs principles in research, testing and teaching

The Three Rs (replacement, reduction and refinement) are the cornerstone of the ethical use of animals in research, testing and teaching. This award celebrates achievements in the implementation of the Three Rs and promotes the concept within the scientific community and to the wider public. The award is co-ordinated by NAEAC and sponsored by the Royal New Zealand SPCA and is made to **an individual, group or institution within New Zealand** that shows

NAEAC AEC workshop on Friday 16 November 2012. Receipt of the award will be publicised in selected media, although specific details of the work involved can be restricted if appropriate.

Applications or nominations (with knowledge of nominee) should be sent to:

NAEAC Secretariat
c/- Ministry for Primary Industries
P O Box 2526
Wellington 6140

There is no application form but you must provide:

- evidence of the applicant or nominated individual, group or institution qualifies for the Award (maximum of three pages)
- curriculum vitae of the applicant(s) or nominee(s)
- the names and contact details of up to two potential referees (who may, at the committee's discretion, be approached for comment)

Applications close on Friday 20 July, 2012.

Please direct enquiries to the NAEAC Secretariat
email naeac@mpi.govt.nz

Dairy fractions and their uses

Dr Michelle McConnell, Dept of Microbiology and Immunology, University of Otago, Dunedin

Research around the world is looking at potential bio-actives from milk including antioxidant activities, anti-microbial activity, immune health, bone health, cognitive support, cancer support, dental support, diabetes, gut health, HIV/Aids, infant nutrition, sports recovery, and weight management/satiety. Most of this research involves fractions isolated from the whey component of milk.

In New Zealand, in 2002, a joint venture called Lacto-Pharma was set up between Fonterra and Auckland Uniservices funded by the Foundation for Research, Science and Technology to discover bioactive molecules in cow's milk. The aim was to focus on bioactive discovery research to support the development of functional food

ingredients, health supplements and pharmaceuticals that may be useful in the prevention and management of conditions such as osteoporosis, infectious diseases, various inflammatory disorders (including asthma and inflammatory bowel disease), diabetes, and atherosclerosis.

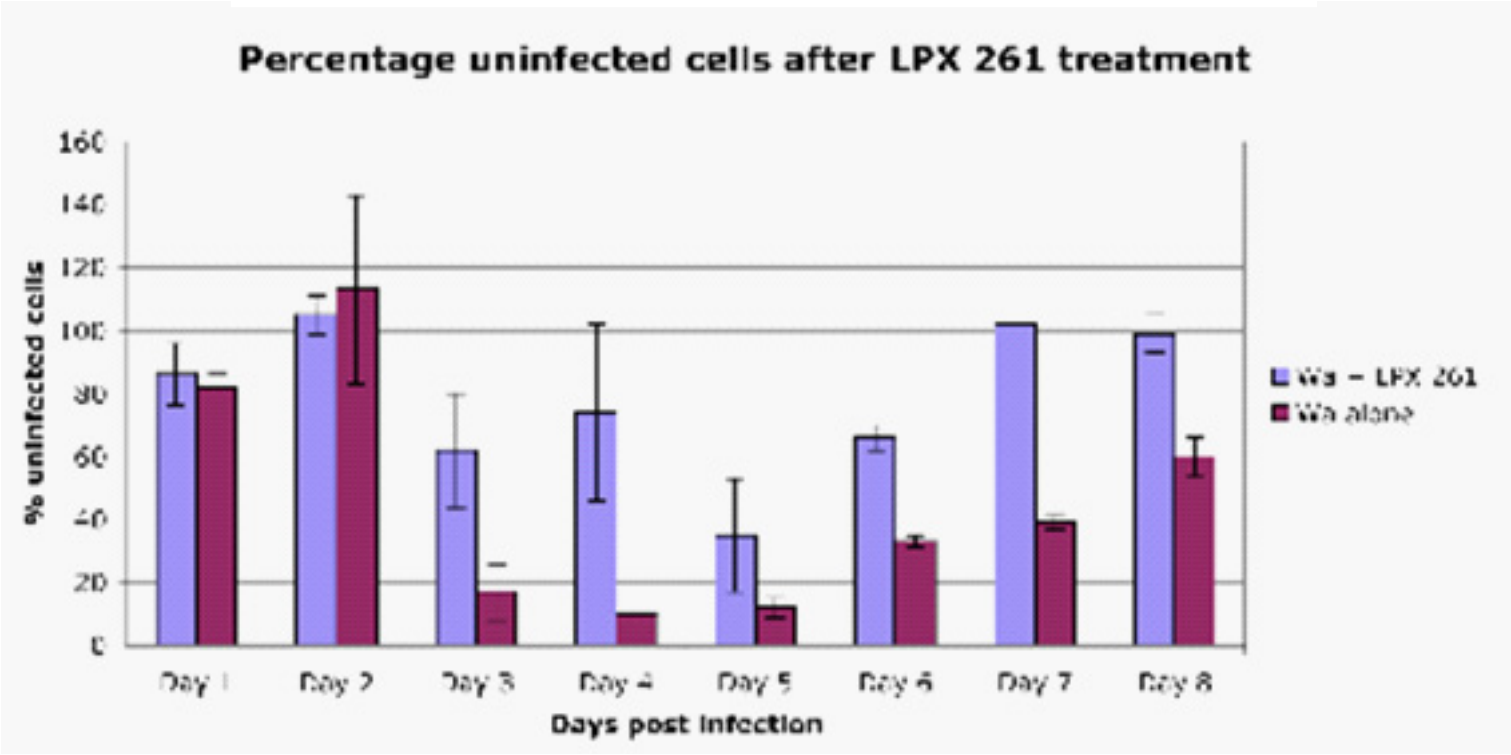
As part of that group we worked on fractions that Fonterra scientists had identified as having possible anti-infective or immunological properties. Since the wind up of Lactopharma in 2010 we have continued to be supported by Fonterra for research on the effect of dairy fractions on the immune system.

Protein and lipid chemists at Fonterra have taken whole milk and fractionated it using various techniques to release bioactive molecules. Many of these techniques were used to release fractions with predicted function. These fractions have then been screened in a number of in vitro assays. It was already known that milk contains many antimicrobial and anti-inflammatory proteins such as lactoferrin and lactoperoxidase but this project was designed to find novel compounds.

One of our most successful projects involved screening 65 protein and 23 lipid fractions against the human strain (Wa) of rotavirus in an in vitro assay. Lactoferrin was used as a positive control. A large number of these fractions were effective in preventing infection in vitro. However, further analysis showed many of these fractions contained compounds already known to have anti-viral effects. Excitingly though, neutral lipids, in particular the high CLA milk fats and those containing gangliosides, were identified as novel for anti-rotaviral activity and these were then screened in a baby rat model of rotavirus infection. Animals were fed the fraction daily following infection with the virus. While both fractions reduced symptoms of infection, the ganglioside fraction was particularly effective (see Figure 1 below) leading to a patent being applied for and granted and a subsequent clincial trial using the fraction has been carried out in India. We are awaiting analysis of results from this trial. As you can see fewer rotaviral particles were recovered from the faeces of treated animals each day and by seven days after infection animals were back to normal.

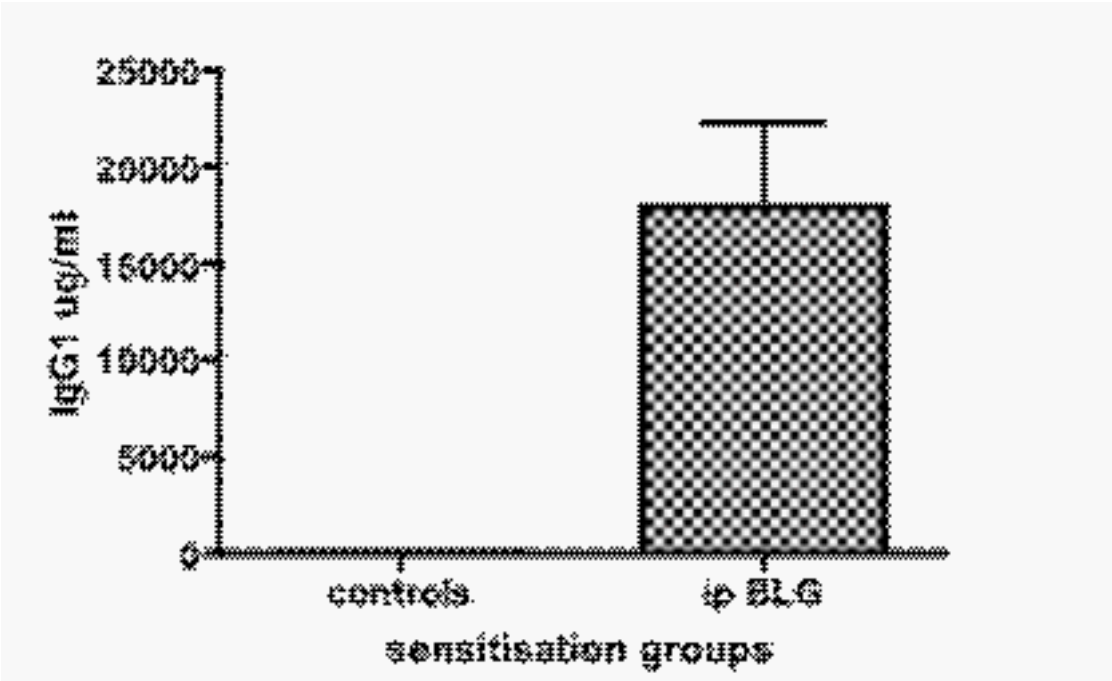
Some of the other LactoPharma projects have also shown success and progression to clinical trials – one with gout, where symptoms are reduced, and one with an ice-cream (ReCharge) containing an ingredient shown in animal trials to ameliorate some of the side-effects of chemotherapy. This study is still under way with recruited patients both in New Zealand and Australia. Another area we have been involved in is the reduction of allergenicity of milk proteins for inclusion in infant formulae. It is well known that a number of milk proteins are allergenic for infants, in particular beta-lactoglobulin but also to a lesser extent alphaS1-casein, alpha-lactalbumin, bovine serum albumin, and lactoferrin. Fonterra scientists have been working with some different methods to try and hydrolyse these proteins so that they are less allergenic. In order to

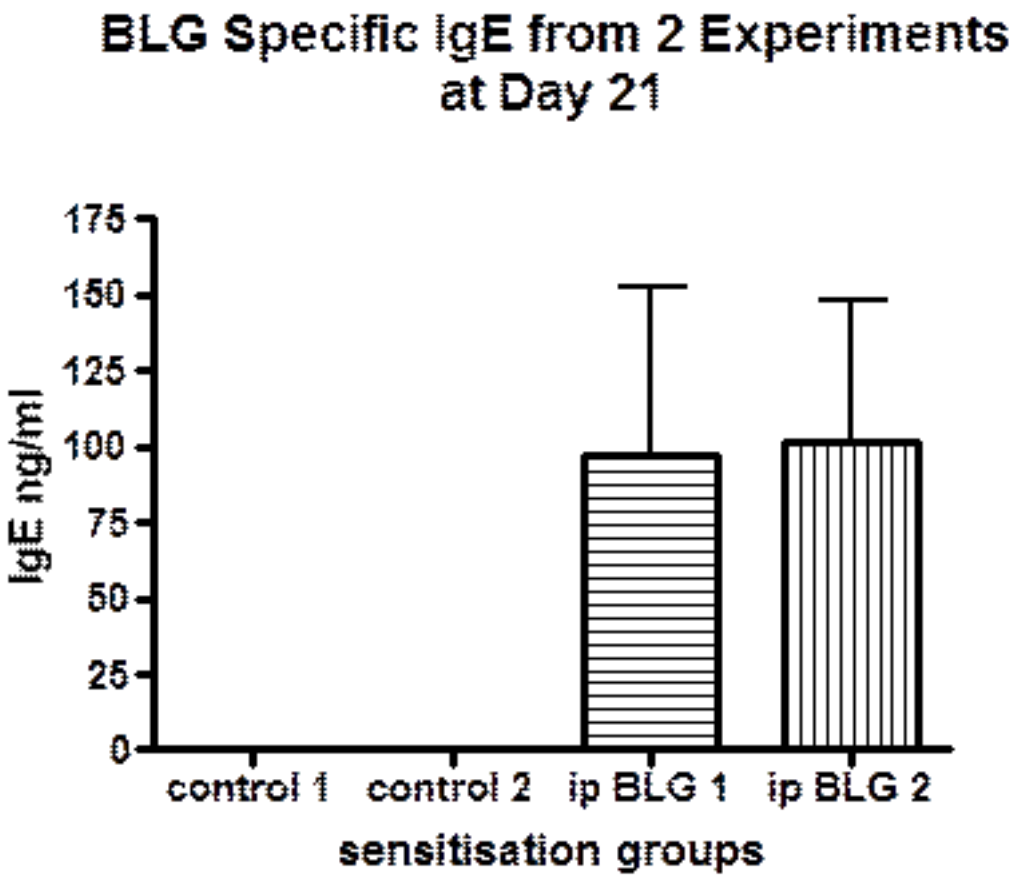
Figure 1: Percentage of cells uninfected by virus from faecal samples from animals fed LPX261 (ganglioside containing lipid fraction)



test this we have set up a sensitisation model in mice using BLG IP as the sensitising protein and then using this as a positive control against which to measure the hydrolysed proteins.
Measurements include markers of allergy IgE and IgG1. Typical results from the positive control group are given below (Figure 2). Using this model we have been successful in identifying some hydrolysed fractions that are now being incorporated into infant formulae in place of the whole protein.

Figure 2: BLG specific IgGI in serum of mice 21 days after challenge with BLG intraperitoneally





Working with animals in New Zealand

Associate Professor Craig Johnson
Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Palmerston North

There are two major legislative acts in New Zealand that together cover a wide variety of the animal welfare aspects of working with animals. The Animal Welfare Act 1999 covers both routine animal husbandry practices as well as the use of animals in research, teaching and testing. The Veterinarians Act 2005 covers the special circumstance of clinical medicine carried out by a registered veterinarian. Routine animal care of common domestic animals can be carried out without prior dispensation and is covered by a series of Welfare Codes that have been published by the Ministry of Agriculture and Forestry (now called Ministry for Primary Industries) from time to time. These codes which, once gazetted, are regulations under the Animal Welfare Act, are useful as an indicator of standards of normal animal husbandry practice. Failure to comply with a Welfare Code does not in itself constitute a breach of the Act, but it may be used as evidence in cases of prosecution under the Act. On the other hand, demonstrating that reasonable steps have been taken to meet minimum standards in relevant codes may be used as a defence. Dispensation to practise as a veterinarian and dispensation to use animals in research, testing and teaching are both privileges that are conferred by legislation and incur responsibilities on those to whom these privileges are extended. In each case both the privileges and restrictions are different due to the different scope of the two pieces of legislation.

Clinical obligations under the Veterinarians' Act

The obligations on a registered veterinarian are detailed in the New Zealand Veterinary Council Code of Professional Conduct. The section covering animal welfare states (Animal Welfare point 6):

Veterinarians must not carry out treatments or procedures on animals unless they meet the following criteria. Treatments or procedures must:

a. Only be performed:

i. When the procedure is reasonable and appropriate in the circumstances in order to prevent, diagnose or treat an illness or injury; or

ii. In accordance with accepted farming practices (e.g.develvetting deer); or

iii. In accordance with generally accepted principles of responsible pet ownership (e.g. de-sexing cats and dogs).

b. Not be performed primarily for the convenience of the owner.

c. Meet accepted professional standards.

The spirit of this code is that veterinary procedures will only be carried out when there is a contract with the animal's owner and where the procedure is in the best interests of that particular animal or group of animals. Once it has been decided that a particular instance lies within this jurisdiction, a veterinarian is free to carry out any procedures subject to the continued best interests of the patient and the veterinarian's area of competence. Breaches of this code are potentially a matter of professional misconduct and are subject to disciplinary proceedings by the Veterinary Council that may result in revocation of the right to practice.

Research and teaching obligations under the Animal Welfare Act

Any use of animals for research or teaching purposes must be carried out under the authority of a local animal ethics committee. This committee will have a Code of Practice detailing its normal practices and requirements. Anyone who wishes to utilise animals for research and teaching will normally be required to have read the code and to undertake to abide by it.

The spirit of this code will usually include stipulations that manipulations carried out on animals may only be undertaken when there is no alternative to the use of animals, in such a way as to minimise the impact to those animals and with the prior written approval of the local animal ethics committee. A manipulation is defined by the Animal Welfare Act as follows (clause 3):

Definition of manipulation

(1) In this Act, unless the context otherwise requires, the term **manipulation**, in relation to an animal, means, subject to subsections (2) and (3), interfering with the normal physiological, behavioural, or anatomical integrity of the animal by deliberately -

(a) subjecting it to a procedure which is unusual or abnormal when compared with that to which animals of that type would be subjected under normal management or practice and which involves -

(i) exposing the animal to any parasite, micro-organism, drug, chemical, biological product, radiation, electrical stimulation, or environmental condition; or

(ii) enforced activity, restraint, nutrition, or surgical intervention; or

(b) depriving the animal of usual care;—

and **manipulating** has a corresponding meaning.

(2) The term defined by subsection (1) does not include—

(a) any therapy or prophylaxis necessary or desirable for the welfare of an animal; or

(b) the killing of an animal by the owner or person in charge as the end point of research, testing, or teaching if the animal is killed in such a manner that the animal does not suffer unreasonable or unnecessary pain or distress; or

(c) the killing of an animal in order to undertake research, testing, or teaching on the dead animal or on prenatal or developmental tissue of the animal if the animal is killed in such a manner that the animal does not suffer unreasonable or unnecessary pain or distress; or

(d) the hunting or killing of any animal in a wild state by a method that is not an experimental method; or

(e) any procedure that the Minister declares, under subsection (3), not to be a manipulation for the purposes of this Act.

(3) The Minister may from time to time, after consultation with the National Animal Welfare Advisory Committee and the National Animal Ethics Advisory Committee, declare any procedure, by notice in the Gazette, not to be a manipulation for the purposes of this Act.

(4) The Minister must, in deciding whether to publish a notice under subsection (3) in relation to a procedure, have regard to the following matters:

(a) the nature of the procedure; and

(b) the effect that the performance of the procedure will or may have on an animal's welfare; and

(c) the purpose of the procedure; and

(d) the extent (if any) to which the procedure is established in New Zealand in relation to the production of animals or commercial products; and

(e) the likelihood of managing the procedure adequately by the use of codes of welfare or other instruments under this Act or any other Act; and

(f) the consultation conducted under subsection (3); and

(g) any other matter considered relevant by the Minister.

Once it has been decided that a particular activity involves a manipulation and so lies within this jurisdiction, a researcher/teacher may only carry out such procedures as are specified by a previously approved protocol. Any alterations or extensions to the manipulations undertaken or increases in the number of animals manipulated must be approved prior to them being carried out. Breaches of this code are subject to disciplinary proceedings by the animal ethics committee and may result in the revocation of an individual's dispensation to undertake research or teaching that involves animals.

Recent Articles of Interest

Restoring Voluntary Control of Locomotion after Paralyzing Spinal Cord Injury

Half of human spinal cord injuries lead to chronic paralysis. Here, we introduce an electrochemical neuroprosthesis and a robotic postural interface designed to encourage supraspinally mediated movements in rats with paralyzing lesions. Despite the interruption of direct supraspinal pathways, the cortex regained the capacity to transform contextual information into task-specific commands to execute refined locomotion. This recovery relied on the extensive remodeling of cortical projections, including the formation of brainstem and intraspinal relays that restored qualitative control over electrochemically enabled lumbosacral circuitries. Automated treadmill-restricted training, which did not engage cortical neurons, failed to promote translesional plasticity and recovery. By encouraging active participation under functional states, our training paradigm triggered a cortex-dependent recovery that may improve function after similar injuries in humans.

http://www.sciencemag.org/content/336/6085/1182

Recent Articles of Interest

The Reluctant Toad Killer

The on-going battle to control the spread of Cane Toads across northern Australia has been both an ethical and a biological issue at many levels. Recently released findings from the group of prominent researcher Professor Rick Shine may offer some hope for those involved in the protection of Australian native animals by slowing the rate at which the Cane Toads can spread by using their own toxins to selectively bait tadpole traps. This apparently simple solution has come out of nearly a decade long study of the basic biology of the toads and while it is not going to be a magic bullet cure for all the damage the toads have done, it does seem to offer a highly specific and very effective way to reduce the otherwise exponential growth of the toad population in targeted areas.

http://www.sciencemag.org/cgi/content/full/336/6087/1375?sa_campaign=Email/sntw/15-June-2012/10.1126/science.336.6087.1375

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