Animal Research Saves Lives

A publication of ANZCCART New Zealand

Humans and animals both benefit

Introduction

Animals play a big part in our way of life. We treasure our pets and native fauna. We enjoy television programmes about wildlife and movies featuring animals.

Farmed animals provide us with milk, cheese, eggs, meat, leather and wool. The export of animal products is very important to the economy.

Laboratory animals play an equally important role. Because we all love and respect animals, it can be hard to accept that we are better off because of animal research but, thanks in part to animal research, most New Zealanders enjoy long and healthy lives, and our pets and farm animals are vaccinated against painful and fatal diseases.

Many advances in human and animal health this century have resulted from animal research.

Vaccines developed using laboratory animals are used to protect infants, children and adults from diseases such as polio, diphtheria, and whooping cough. Additionally, vaccination has eradicated smallpox throughout the world.

Pets and farm animals used to die in their tens of thousands from parasites and infectious diseases. Medicines and vaccines developed through animal research have made these problems a thing of the past.

Medicines and surgical techniques perfected on animals have saved the lives of countless people who would have otherwise died from injuries, and illnesses such as appendicitis, heart disease and cancer.

The challenges are not over and research into many human and animal diseases continues but these days “the Three Rs", replacement, reduction, refinement, are the guiding principles of modern animal research (See http://www.nc3rs.org.uk/page.asp?id=7 for details).

This means that where alternatives to the use of animals are available, they are strongly promoted. However, sometimes there are no other options and in these instances, animals are used.

This booklet explains why animals are essential for medical, agricultural and veterinary research. It outlines the benefits, both to humans and to animals themselves. And most importantly, it lists the safeguards which protect laboratory animals in New Zealand.

Why are animals used in research in New Zealand?

Animals are used mainly to find cures and ways to prevent human and animal diseases. They are also used to:

- find ways of making farming more efficient and humane;
- discover ways to improve the nutrition of people and animals;
- check that animal vaccines are effective and safe;
- test new medicines and other products to make sure they are safe for people, animals and the environment;
- understand more about the needs of animals;
- find ways to conserve endangered species.

Do animals benefit from research?

Yes. Many diseases cause great suffering and some kill millions of animals.

A vaccine developed through animal research means that cattle plague (also known as rinderpest) is now eradicated. Before then, millions of cattle in Europe died in extreme pain from this disease.

Pets and farm animals also benefit from human medical research. Many drugs developed for humans such as painkillers and antibiotics are also used in veterinary medicine. Additionally, there are several vaccines (such as for rabies) that benefit humans and animals alike.

What are the main benefits for pets?

Thanks in part to animal research, our pets lead healthier and happier lives than ever before. It's not so long ago that distemper epidemics used to sweep the country, killing thousands of dogs and leaving many others weakened and with permanent nerve damage. These days, because most puppies are vaccinated, distemper is almost a thing of the past.

Similarly, feline enteritis used to be a major killer of cats. Vaccination of kittens means that the disease is now rarely seen in veterinary clinics. Other cat diseases like "snuffles", which is caused by a virus that can cause widespread misery in cats, can also be prevented by regular vaccination.

Antibiotics are vital in curing and preventing infections, and in treating pets that have been injured in fights and accidents, or that require life-saving surgery.

What about farm animals?

Animal health companies in New Zealand have been pioneers in the development of veterinary medicines for farm animals. Research using relatively few animals has brought huge benefits for all animals.

The development of vaccines for diseases like tetanus, yersiniosis and pulpy kidney means that sheep, farmed deer and cattle no longer need to die from these painful infections.

Vaccines have also been developed to combat leptospirosis and toxoplasmosis in farmed animals. These diseases cause miscarriages in cows and pigs (leptospirosis), and abortion in sheep (toxoplasmosis) and both can be transmitted to humans. Leptospirosis can cause blindness, headaches and extreme muscle pain in humans whereas toxoplasmosis can cause abortions. Thus, vaccinating farm animals can also reduce the risk of human disease.

What benefits do we enjoy from medical research using animals?

Some of the major milestones achieved through animal research include:

- coronary by-pass operations, replacement heart valves, cardiac pacemakers and heart transplants;
- broad spectrum antibiotics;
- blood transfusions;
- kidney transplants and dialysis for people suffering from kidney disease;
- life support systems for premature babies;
- drugs for high blood pressure and diabetes;
- hip replacement surgery;
- cataract surgery;
- rehabilitation for head injury and stroke victims;
- cerebral cooling as the first treatment for newborn babies suffering brain damage after oxygen deprivation at birth;
- steroid and surfactant treatments to improve the survival of preterm babies by maturing their lungs to help them breathe;
- reducing birth defects, such as spina bifida, through the discovery of the importance of nutrients such as folate during pregnancy;
- drugs to treat leukemia and cancers (The cure rate for children dying from one type of leukaemia has been increased from 4% in 1965 to more than 70% today largely as a result of research with animals);
- vaccines developed in mice provide protection from meningococcal disease, whooping cough, hepatitis B and influenza.

The list of benefits from animal research is almost endless. Thanks to this research, plus better diet and improved hygiene, we live 25 years longer on average than our great grandparents.

The development of vaccines to prevent disease is another area where New Zealanders have benefitted from medical research using animals.

Until the 1960s, polio epidemics used to cripple young New Zealanders every few years. Vaccines perfected using monkeys have almost eradicated this disease from our country.

Mice were also used to develop a vaccine against the human papilloma virus (HPV) that is associated with increased risk of cervical cancer.

Leprosy is still a major health problem in the Pacific Islands. Now, thanks to a vaccine developed using armadillos, leprosy is likely to be eradicated.

Why are animals needed in medical research? Are there no alternatives?

Medical researchers are committed to reducing or replacing the use of animals but the functions of the human body are so complex that some animal research will probably always be needed.

Cells and tissues grown in the laboratory can be used to test medicines or chemicals. These cultures are now also used to make vaccines which once could only be made by using live animals. However, a cell-culture experiment can't tell you the effect of a new medicine or chemical on the function of complex organs like the brain, liver or bone marrow. It won't tell you how much should be used, how often it should be administered, the likely side-effects of its use, or when these side-effects might occur. For these reasons, there is no choice but to work with whole animals whose bodily functions are similar to ours.

It would also be unethical to sell medicines, vaccines and other treatments for veterinary use without first testing them on animals and the same principle also applies to chemicals used in food production.

But what about experimental surgery, is that also essential?

New surgical techniques, such as for organ transplants and bone grafts, cannot be simulated on a computer or practised on humans. Blindness cannot be studied in bacteria, nor can high blood pressure by studied in tissue cultures.

New-generation orthopaedic prosthetic devices, such as hip and knee replacements are being developed using technology to increase their strength and long-term stability. However, all these new devices must first be tested in animals to prove their safety and efficacy.

How is anaesthesia managed in experimental animals?

All animals undergoing experimental surgery are first given a combination of drugs to induce and maintain anaesthesia and prevent pain. Experimental animals are managed in exactly the same way as domestic pets at the local veterinary clinic, because their anaesthetic delivery is prescribed by practising veterinarians through the legislative requirements of New Zealand. Hence experimental animals benefit from new developments in anaesthetics and analgesics, as do people undergoing surgery in our hospitals.

Are animals still being used to test the safety of medicines and chemicals?

Information about the toxicity of all medicines and chemicals is required by law before they can be registered for human or animal use. For many years the LD (Lethal Dose) 50 test, a test that measures the dose that kills 50% of a test population following exposure by mouth, skin contact, injection and/or inhalation, was the only test used.

However, these days, medicines and chemicals are first subjected to a battery of tests on cultured cells and simple life forms. This practice has greatly reduced the number of animals used in LD_{50} testing in New Zealand and overseas. In addition, new tests are being developed that promise to reduce (or even eliminate) the number of animals used in safety testing.

The LD_{50}, or lethal dose for 50% of animals, is an outdated test for chemical toxicity. It has largely been replaced with safer alternatives.

What about shellfish toxin testing?

Until recently a mouse bioassay was used in New Zealand to test for the presence of biotoxins in shellfish and in coastal waters affected by algal blooms. This animal-based assay has now been replaced with an internationally accepted alternative that involves a high performance analytical method that was developed in New Zealand.

What about cancer testing?

New substances are tested on animals to see whether they cause cancer. Tests involve life-time feeding trials using strains of laboratory animals that are known to be susceptible to cancer.

If low doses of a substance cause cancer, these tests work very well. However, there is a lot of debate in scientific circles about the value of testing substances which only cause cancer at very high doses. Critics ask whether feeding high levels of a relatively safe chemical over a long period has much relevance to chemical exposure in everyday life. They say that any cancer which arises in these trials may be more a result of stress on the test animals than the cancer-causing ability of the product being tested.

TARGETING CANCER

Animal research also plays a key role in the development of new technologies and methodologies that:

- help improve cancer drug delivery;
- enable more effective tumour targeting and;
- reduce or eliminate the debilitating side-effects of many cancer treatments.

On the other side of the debate there are some doctors and medical scientists who argue that there is no particular dose at which a cancer-causing chemical can be said to be safe.

In modern western societies, many of us want increasingly tighter assurances that we aren't being exposed to environmental cancer risks, such as ultraviolet rays. Yet, paradoxically, we want fewer animals used in research to test substances to protect us. While the debate on the relevance of many types of cancer testing is likely to continue for many years yet, animal research has led to new treatments for a variety of cancers, such as the breast cancer drug tamoxifen which is considered one of the most important cancer drugs of all time. This drug has saved the lives of hundreds of thousands of women. More recently animal research has resulted in the introduction of a vaccine for the human papilloma virus (HPV); a virus associated with the development of cervical cancer.

Can animal research guarantee the safety of human medicines?

No. It is impossible to guarantee the absolute safety of any medicine. But by testing new medicines on a wide range of laboratory animals for several generations, the risks are reduced to levels which are low enough for final tests to be carried out on human volunteers.

THALIDOMIDE

An example of this is the drug thalidomide, which was first sold in 1957 to control nausea in pregnant women. In the 1960s, after thousands of children were born with major limb defects, it was discovered that the German manufacturer had tested this drug on pregnant women outside Germany, and that no problems had been reported. However, thalidomide toxicity is quite complex and studies carried out after the drug had been withdrawn from market showed that problems occurred only when pregnant women were exposed to the drug between 20 and 36 days after fertilisation. Why wasn't this detected before the drug was available to the public? One reason could be because a full range of toxicity tests, including tests on pregnant animals, may not have been conducted as they were not required by law. Unfortunately, the full extent of testing is not known because records have been lost. But, it is true that thalidomide is a complex case study; the toxicity differs across species, different chemical forms are important and the effects are only seen if the drug is taken at a particular time point in the pregnancy. As a result of the thalidomide tragedy, new medicines must now undergo more comprehensive tests (animal and other) before they can be used on people. Legal requirements around safety testing were also improved after the thalidomide tragedy, worldwide standards were established and it became mandatory to submit detailed data to the regulatory bodies, not just summary information. Thalidomide has also taught researchers a great deal about species-specific toxicity, information that is used today when developing new drugs.

No human being should ever be put at risk because of a reluctance to do the necessary tests on animals.

Where do laboratory animals come from?

With New Zealand's focus on animal husbandry and veterinary research, farm animals, particularly sheep and cattle, generally account for over 40% of the national total of animals used in this type of research. Nearly all of these animals return to the normal farming routine once a research study is completed.

Research institutions primarily use species such as rats, mice, rabbits and guinea pigs. These animals are purpose-bred for research in breeding units. Larger animals, such as sheep and pigs, are also used as they provide good models of heart disease and diabetes.

Cats and dogs are rarely used (0.3% of total number of animals used in 2011). Moreover, 90% of these animals are returned to their owners after being used for teaching and basic veterinary research. Similarly small numbers of birds (0.1% of the total) were used in 2011. More recently zebra fish have been recognised as a model to study the effects of vertebrate development and genetics on human diseases such as cancer. These fish are bred in purpose-designed breeding containers, before being transferred to state-of-the-art aquariums.

Are native animals used in research?

Yes. Research studies are essential to ensure the survival of threatened and endangered species, including many native mammals and birds. New Zealand scientists have a world-wide reputation for their skills in this area.

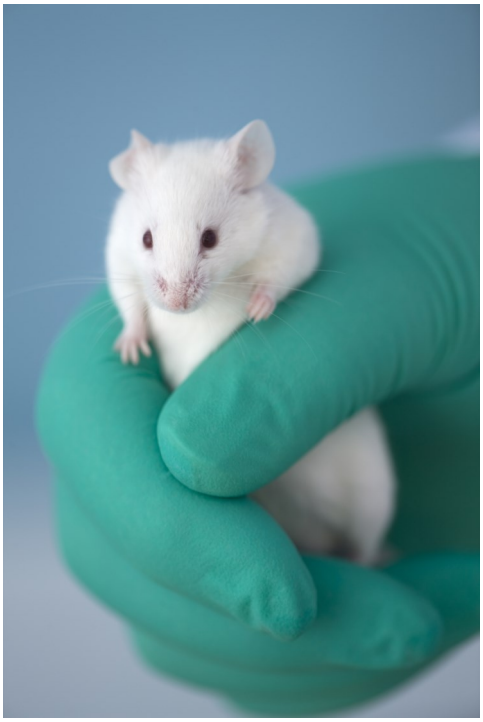
For example, knowledge gained from research with more common species like the domestic fowl has helped New Zealand scientists develop techniques which are helping to save the Takahe, Chatham Island Black Robin, Kakapo and other native birds from extinction.

Is it necessary to use animals in teaching?

Science, veterinary and medical students can learn much about how the bodies of humans and animals work from videos, slaughtered animals and human cadavers. But, while trainee surgeons usually acquire basic skills under the supervision of a more experienced surgeon, our future scientists and veterinarians must have hands-on experience using live animals.

Surgical techniques, such as key-hole surgery, was first tested on animals and this technique is now routinely used in human and animal surgeries. Thanks to advances in computer programmes, practitioners are now taught this technique using a virtual surgery programme rather than practising on animals. Advances in life-like mannequins also allow surgeons and anaesthetists to practise new techniques and trial new instruments. Similarly, for those caring for animals, such as vet nurses or animal technicians, there are now animal mannequins which allow them to practise everyday procedures like dosing by mouth, inserting feeding tubes and injecting, without causing discomfort to live animals. Animal mannequins are also available for veterinary students to practise a range of anaesthetic and monitoring techniques.

Who protects animals from needless or cruel research?



Scientists are sometimes depicted in movies and videos as being heartless and cruel. This is both misleading and false.

Just like the rest of us, most researchers and scientists appreciate and respect animals and are quick to protect them from cruelty.

Scientists strongly promote the use of non-animal alternatives for testing products, and are against the indiscriminate use of animals in research.

Also, they have a very good scientific reason for looking after the animals in their care, as only healthy animals provide reliable research results.

Animals are only used where there is no alternative and where there is a scientific or educational justification, and every effort is made to minimise the animals' pain and distress.

As a final safeguard, there are strict laws which protect laboratory animals. These include:

All research and teaching using animals must be carried out under a Code of Ethical Conduct. In New Zealand, every institution has its own Code, which is based on the requirements of the Animal Welfare Act 1999. The Codes must be approved by the Minister for Primary Industries (formally the Minister of Agriculture and Forestry).

Every New Zealand institution which uses animals in research and teaching must have access to an Animal Ethics Committee. These committees look at all research proposals and decide whether the work proposed is ethically acceptable and likely to be useful. The committees include scientists, "outside" nominees of animal welfare organisations (such as the SPCA), the veterinary profession, and the public.

Animal Ethics Committees have the power to accept proposals, to reject them completely or to request changes to make the proposal acceptable. Each research proposal is approved for a specified time, typically up to three years.

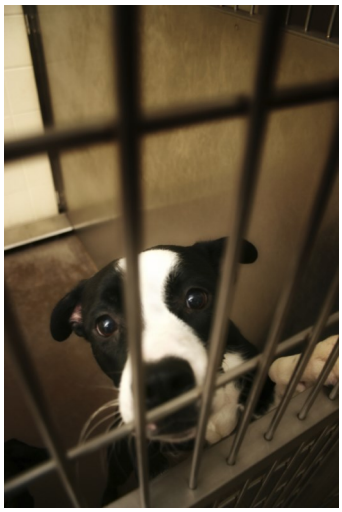
Committees have the power to inspect work on an approved project at any time. If the animals are not being cared for properly, they can order the research to stop. The committees also examine non-animal alternatives, and ensure there is no unnecessary repetition of previous research.

Even primary and secondary schoolchildren using animals in classroom programmes and science fair exhibits must have ethics committee approval first. To get this, they need to apply to the NZASE Ethics Committee. See http://www.nzase.org.nz/ethics/ for details.

Can we avoid unnecessary duplication of research?

The answer is yes, and modern means of communication are helping to make a big difference. It is easier now for scientists to rapidly and easily check the scientific literature for similar research in their area to make sure they are not duplicating other studies. It also makes it easier for those peer-reviewing scientific grants, to ensure money is not awarded for the same studies. Scientific journals also now recognise the need to publish “negative” studies. Despite not providing exciting positive findings, publication of these studies also reduces duplication of research.

But what about those emotive photos of animals in laboratories which are used by those who oppose animal research?



Photos and videos of animals which are in pain or being held in poor conditions have huge emotional effect. The intention is, of course, to deliberately play on our feelings but we are seldom given the details of what is being done, when it was done, or why it was done.

These pictures may have been taken overseas many years ago, before the introduction of our current strict guidelines on the use of animals in research. Some of the animal testing procedures are no longer used and a number have been replaced by tests which do not involve live animals.

Can you give some examples?

Some of the photos used by those who oppose the use of animals in research show animals with their heads in clamps, rabbits with their eyes held open to test chemicals (the "Draize" test) and live animals used in burn research.

Head clamps: Head clamps are used to restrain the heads of people and animals when they are undergoing brain or eye surgery. Using head clamps allows the site of the operation to be precisely identified. It also prevents involuntary head movements causing damage to delicate tissues during the operation. People and animals are kept unconscious with an anaesthetic during such operations. However, once electrodes and tubes are implanted directly through the skin and skull into the brain, the animals and people can be conscious because the brain does not have pain receptors.

The Draize test: This test is not used in New Zealand but some medicines we use here have been tested overseas using this method. The Draize test involves applying a small amount of a substance to the eye of a rabbit to test for a possible irritant effect. Only relatively mild substances are tested and products shown to be corrosive to the skin are never tested on rabbits' eyes. The Draize test has now been replaced by the chorioallantoic membrane (CAM) test, which instead uses a fertilised hen’s egg.

Burn research: The antivivisection video "Hidden Crimes" shows the use of a blow torch on a pig. This was filmed at an American defence research institute during the Second World War some 60 years ago. At that time many pilots and aircrew were dying from burns to as little as 5% of their body surface. As a direct result of this research, people with burns to as much as two-thirds of their body can now be successfully treated and return to a normal life. This sort of research would obviously be unacceptable today. But it is worth reflecting on the pressures of a World War and the human lives which were saved then and continue to be saved now as a result.

Is there any need to test cosmetics and other consumer products on animals?

New consumer products are constantly being developed (disinfectants and sun screens are good examples) that have potential to greatly improve human and animal health and welfare.

There is no law which requires manufacturers to test these products on animals before marketing them and, indeed, many products are labelled as being not tested in animals.

However, although a company claims a product is not tested on animals, it is likely that the individual ingredients have been tested in the past and proven safe for human and/or animal use. This is because countries have strict guidelines about the safety of chemicals and ultimately manufacturers are legally liable for side-effects arising from their use.

WHAT IF WE HALTED ANIMAL RESEARCH TODAY?

- It would stop the development of new antibiotics – we are becoming resistant to current antibiotics leaving us at risk of dying from common infections, and new superbugs such as MRSA.
- We would be unable to develop treatments in time to treat pandemics of new diseases or variants on diseases such as influenza. Such diseases have the capacity to kill millions very rapidly.
- New ways of repairing congenital heart and other defects would have to be abandoned or tested on humans.
- A cure for diabetes would be much less likely.
- The chances of finding an effective and safe cure for AIDS would be greatly reduced.
- Work on techniques to treat paralysis in people with spinal cord injury would have to cease.
- Developing treatments for reducing or preventing stroke or other brain injuries would be prevented.
- Development of new surgical techniques for humans and animals which are more successful and reduce painful outcomes would be greatly inhibited.
- There would be little hope of a normal lifespan for the one in 400 young Australians and New Zealanders who have cystic fibrosis.
- Potential cures for schizophrenia, multiple sclerosis and Alzheimer's disease would be delayed decades (or possibly forever).
- The development of urgently needed new drugs to treat heart disease, cancer and a host of other diseases would be severely restricted.
- It would be very difficult to develop drugs for new diseases, or find new cures for old diseases like tuberculosis which have developed resistance to available drugs.
- It would be too dangerous to test exciting new products like artificial blood, which shows promise for saving the lives of critically injured accident victims.
- Cures for many painful and deadly animal diseases would probably never be found or take much longer to discover.
- It would be much more difficult to conserve endangered species.

If the animals used in research are protected, why do some people want to have animal research abolished?

The welfare of animals used for research in New Zealand is closely monitored by scientists, government officials and veterinarians. Animal welfare groups have nominees on each Animal Ethics Committee.

All these people are working towards reducing the use of animals in research. They seek to ensure laboratory animals are humanely cared for and, most importantly, they know about the great benefits for people, pets, farm animals and endangered species.

The strong opposition to animal research comes from some sections of the antivivisection movement who believe medical research using animals is "a scientific fraud", despite the many examples of animal-based research that have provided direct clinical benefits for people. However, on balance, it should be noted that not all animal-based studies provide answers to the scientific questions being asked. There is a growing membership of the antivivisection movement that believe that humans and animals have equal rights and therefore cannot accept the use of animals for human benefit under any circumstances.

Some antivivisectionists argue that to hold animals in captivity for research, farming, or other human benefit is immoral. They are opposed to the use of animals and animal products for food, clothing or other purposes.

Their philosophy is not new. Antivivisectionists opposed Louis Pasteur's vaccine for rabies last century, because it involved animals. They also campaigned against the introduction of the first effective diphtheria vaccine into Britain in the 1930s at a time when thousands of British children were dying in agony every year from this horrific disease. Since the introduction of the vaccine, diphtheria has all but disappeared.

Whether you agree or not with the antivivisection philosophy is a matter of personal choice. But before choosing, it is important to understand the difference between animal welfare and animal rights and what this means for all of us.

In contrast to antivivisectionists, animal welfarists generally accept that animals may be used for human benefits under well-controlled conditions. These include prior approval by an Animal Ethics Committee, careful and humane treatment and the use of anaesthetics and analgesics to manage pain.

CONCLUSIONS

The knowledge gained from animal use can be multiplied around the world and shared amongst research scientists and health care professionals working in both human and veterinary fields. Internationally accepted test standards help to reduce animal use by making further testing unnecessary.

New diseases will occur on a regular basis and the popularity of international air travel can potentially expose hundreds of people during a single flight to an infection for which no vaccine has been developed.

The history of biomedical science teaches us that only by careful and thoughtful investigation can researchers find treatments and cures for clinical problems and diseases. Scientific methods are constantly being refined, to reduce their impact on the animals being used and to improve the quality of the research information obtained from their use. A number of Centres for Alternatives to Animal Testing (CAAT) have been established in Asia, Europe and North America and their findings are readily available to the public via the internet.

Some would argue that since we have the knowledge and technology to improve the welfare of our children's children, it would be unethical not to do so.

This is a fully revised 2013 edition of a booklet originally published in New Zealand in 1990 on behalf of a range of organisations involved in medical, agricultural and veterinary research. Publisher (2013 edition): The Australian and New Zealand Council for the Care of Animals in Research and Teaching (ANZCCART).

For additional copies or more information, please write to:

ANZCCART New Zealand

PO Box 598, Wellington

Telephone 64-4-472 7421 Fax 0-4-473 1841

anzccart@royalsociety.org.nz

http://www.royalsociety.org.nz/organisation/panels/anzccart