Scientists for Global Responsibility

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Promoting ethical science and technology

Career choice, ethics and animal experimentation

By Dr Gill Langley

A Scientists for Global Responsibility briefing

This briefing provides background insight into the issues surrounding the use of animals in scientific experiments and the underlying factors that have given rise to the current legislative and cultural setting. Readers will gain greater awareness of how their choice of career makes a positive or negative impact on the welfare of laboratory animals as well as some pointers to alternative career routes.

Career choice, ethics and animal experimentation is of relevance to students and graduates of:

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Cell biology
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Engineering
Genetics
Mathematics
Medicine
Microbiology
Molecular biology
Molecular genetics
Nursing
Pharmacology
Physics
Physiology
Statistics
Veterinary science

Dr Gill Langley is Scientific Advisor to the Dr Hadwen Trust for Humane Research. For more information see: http://www.drhadwentrust.org.uk/

This briefing is part of a series entitled ***Thinking About an Ethical Career in Science and Technology***.

Thinking about an ethical career in science and technology

Thinking About an Ethical Career in Science and Technology is intended to give young scientists and engineers an understanding of the wider ethical dimensions of various careers in science and technology. Each briefing focuses on an area in which science and technology can play a major role, either good or bad, and examines the social and environmental controversies in that area. It then gives guidance on how to make an informed, 'ethical' career choice.

Animal experimentation: the ethical controversy

At the heart of the controversy over animal experiments lies the question of the moral status of non-human animals.

Everyone agrees that animals should be accorded some moral value, but the difficult question – especially in the animal research field – is how much? Clearly animals who are sensitive to pleasure and pain demand greater consideration than insensate organisms such as plants and rocks. However the degree of suffering and enjoyment that different animals experience is difficult to know for sure, and uncertainty permits the argument that while other animals have moral value they do not have moral equality with humans. Thus, where human desires (for knowledge, for new medicines, for more productive farm animals or for whiter washing) conflict with the interests of the rats, mice, dogs, monkeys and pigs who will be used in research, the mainstream view is that human needs are paramount.

There are two major (and several other) challenges to this perspective. Peter Singer, a leading bioethicist at Princeton University, takes a utilitarian approach, applying a cost/benefit analysis to animal research but on the basis that because many other animals are sentient, like us, then there must be equality of consideration [1]. There are no valid grounds for granting all humans a higher moral status than all other sentient animals, except an irrational prejudice in favour of our own species, akin to racism or sexism, and known as speciesism. By Singer's analysis, sometimes it may be ethically more acceptable to experiment on a brain-damaged human infant with no quality of life than on a healthy chimpanzee. A direct comparison of this kind would force society to think deeply about whether the information obtainable from such an experiment is worth acquiring at that cost.

The animal rights position has been expounded most eloquently by philosopher Tom Regan [2]. He starts from the premise that some animals other than humans not only feel pain, but also have thoughts, beliefs, memories, intentions: that is, they are "subjects of a life", with a biography as well as a biology. These attributes are morally significant because it means that other animals can also, like us, be harmed not only by the infliction of pain but also by other kinds of interference, such as barrenness of environment, loss of family members, isolation and, of course, loss of life (even if painless).

In effect, Regan suggests that some other animals share with us the status of personhood and the possession of inherent moral value, independent of their instrumental value or usefulness to us. Evidence suggests that most mammals including cetaceans (whales and dolphins) are likely candidates for moral equality, and probably birds too [3]. This would include approximately 95% of the species counted in animal experiment statistics.

Questions of mind and consciousness are important in calculations of moral status. After all, an organism whose reactions to aversive stimuli are limited solely to a reflexive level without subjective experience (such as a single-celled animal like the paramecium, perhaps) presumably does not experience pain in the way that an individual does whose higher faculties elaborate the pain reflex and generate feelings of suffering and distress. While the capacity to experience pain fully is sufficient to confer moral value, the ability to remember past events, to have desires and intentions for the future, to form concepts and have a complex emotional life, also count in the equation. Utilitarianism is based on outcomes or consequences of actions, and Singer's version might permit limited experiments on certain individuals (animals or humans) on a case-by-case basis, if the harms to the research subjects were outweighed by benefits to others (humans or animals). The animal rights position is that animal experimentation is wrong in principle and should be abolished, regardless of any benefits it may bring.

What is the prevailing situation with the use of animals in research and testing? The orthodox view is broadly utilitarian with a marked human bias: the pain and distress of other animals count in the balance, but not as heavily as human interests [4]. Thus, animals should not be made to suffer in laboratories for frivolous reasons, they should not be used in excessive numbers or subjected to "unnecessary" pain, and non-animal alternative methods should be employed where possible. This results in a situation where an estimated 100 million animals are used in scientific procedures worldwide every year.

The background influences

The way animals are viewed, by scientists and by society, has been deeply influenced by the behaviourist school of psychology which, although not denying that animals may have mental states, strictly excluded them because of the difficulty of observing or obtaining direct evidence about those states [3]. Consequently, behaviourists virtually ignored conscious experience, intentions, desires or purposes in animals.

Behaviourism

Behaviourism allowed biomedical researchers to consider laboratory animals as insensitive to suffering. It is still considered unscientific to describe a mouse squealing in pain as anything other than "vocalisation" [5]. Painful stimuli are merely "aversive" and death from starvation is due to "nutritional insufficiency". Even today, some scientists find it hard to use the words "play" or "boredom" in connection with laboratory animals, although it is generally accepted that "environmental enrichment" is good for their health and well-being.

In contrast to the behaviourist position, animal ethology, psychology and modern evolutionary biology combine to suggest that a continuum of cognitive and emotional functions throughout the animal kingdom is more likely than a major discontinuity between humans and all other species [3, 6, 7, 8].

Moral philosophy

As a rule, research biologists have little training in or understanding of moral philosophy, and most have not read the literature on the moral status of animals. Even those scientists employed by pro-vivisection organisations debate the ethical issue at a simplistic speciesist level. Most pro-vivisection groups represent either patient groups or sectors of the research community, both of whom maintain that anti-vivisectionists are also anti-science. These groups fear that, without animal experiments, medical and scientific progress will be substantially hindered; they are often also keen to defend scientists' freedom of investigation at all costs.

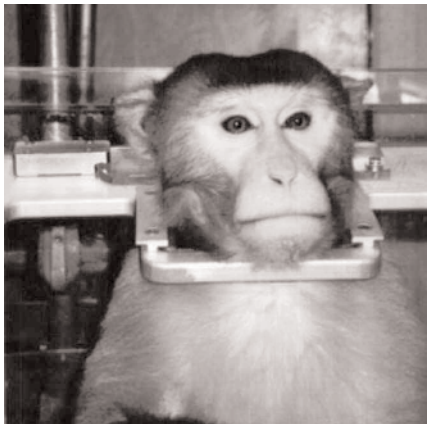
Economic interests

Apart from organisations and individuals conducting animal research, many commercial sectors have an economic interest in its continuation. These include breeders and suppliers of normal, transgenic and surgically-prepared animals, companies offering microbiological and genetic screening, suppliers of laboratory animal diets, feed hoppers, automatic watering equipment, bedding and nesting materials, manufacturers of lab cages and racking systems, suppliers of isolators and specialist equipment such as infusion pumps, restraint devices, inhalation chambers, telemetry equipment, behaviour monitors, and so on.

The opposition

Ranged against these interests are the anti-vivisectionists. There are two main planks to the modern anti-vivisection position: opposition to animal experiments for ethical reasons and opposition on scientific grounds. Ethical opposition is based on the moral status of other animals, while scientific criticisms are relevant mainly to medical research, and centre on problems of extrapolation to humans from animal experiments. These include limitations to the animal model of disease itself (such as artificiality of causation or dissimilarity of symptoms) as well as species differences in pharmacology, anatomy or physiology. These two viewpoints may be held singly or in combination and to very different degrees among anti-vivisectionists.

As individuals, many anti-vivisectionists often also support environmental and human rights causes, but until recently the anti-vivisection movement has had few allegiances with other pressure groups or sectors of society. Potential natural allies might include environmental organisations, but their focus is the ecology of species rather than the rights of individual animals (which can conflict). Moreover, environmental groups have sometimes



Experiments on primates look likely to increase
Photo courtesy of World Laboratory Animal Liberation Week

called for animal testing in efforts to define the safety of chemicals. For example, in the late 1990s the US testing programme for potential endocrine disruptors, devised with input from environmental groups, was based on a paradigm which required excessive animal tests, most of which had not even been validated.

The genetic era

One issue in Europe that has recently brought together a range of religious, consumer, human rights, environmental and anti-vivisection organisations is genetic engineering. Public concern about genetic engineering and about animal experimentation in general is high and growing. The 1996 Eurobarometer survey of 16,000 people throughout the European Union revealed that the majority felt genetic engineering of animals for research and for xenotransplantation (animal to human transplants) to be risky and morally unacceptable. More recent opinion polls in Britain have demonstrated that most people are opposed to experiments on animals [eg. 9].

Animal alternatives

Funding the exploration of non-animal methods of research offers a way forward that all sides of the vivisection debate can support. The concept of non-animal methods, developed in Britain in the late 1950s, was taken forward in practical terms by anti-vivisection organisations by means of humane research charities, established in the 1960s and 1970s. These charities funded the development and application of techniques such as tissue culture specifically to replace animal experiments, at a time when governments, scientists and mainstream funding bodies were dismissive even of the possibility. Consequently there were no official funding programmes and no initiatives within the scientific community.

It was not until the mid- to late-1980s that replacement methods were widely accepted as a worthwhile aim with a chance of practical success. High-profile anti-vivisection campaigns against cosmetics testing on animals persuaded cosmetics companies to start funding research into alternative testing protocols. This helped to provide scientific credibility at a time when legislation controlling animal experiments was being reviewed and updated in Europe and the USA.

Today, replacement techniques such as molecular research, cell culture, the use of isolated tissues, computer modelling and human volunteer studies are often perceived as beneficial to scientific standards as well as to animal welfare. However, scientists applying to mainstream funding bodies specifically to develop non-animal techniques are unlikely to find success, unless they couch their justification purely in terms of scientific rather than ethical benefits.

Politics and regulations

Change is occurring at the regulatory level: national and international bodies that regulate the safety of chemicals are starting to review the role of animal tests and the acceptance of alternative methods. Long-term idiosyncrasies have been revealed, such as the tendency to accept animal tests for predicting toxic effects in humans, even when not properly validated. In contrast, in vitro (test tube) methods have been subjected to extensive, rigorous and prolonged validation studies.

Politically, the issue of animal experimentation has a high profile. Present laws, many passed in the 1980s, offer opportunities for a stricter control of animal experiments. The British Animals (Scientific Procedures) Act 1986, for example, enshrines in statute the belief that other animals are sentient, by defining a regulated animal procedure in terms of whether it causes “pain, suffering, distress or lasting harm”. People who defend animal rights continually seek the rigorous implementation of legislative requirements that the fewest animals and the least sentient species should be used in experiments, that the least amount of suffering should be caused and that replacement methods should be used where available.

The consequences of pursuing various paths

In European countries and the USA, the number of experiments on animals has been falling since the 1970s and annual figures are now some 30-50% lower than at their peak. This has come about through changing attitudes to animals in research, through stricter regulation requiring minimum numbers to be used, and through the development of techniques that reduce and replace animal use. There has also been a trend away from the most severe procedures, and in some countries governments have banned or substantially restricted the use of animals for purposes such as testing cosmetics or tobacco products, or the manufacture of monoclonal antibodies. Both Britain and New Zealand have implemented de facto bans on experiments using the great apes.

However, unless difficult decisions are made in the near future, there is a risk that these trends will start to reverse. Animal genetic modification is a growth area and has increased enormously. From 1991 to 2001 the number of scientific procedures on GM animals in the UK increased by more than 1,307% from 62,445 to 630,759 [10]. Partly because the techniques are imprecise and partly due to insufficient understanding of the function of the genome and its interaction with the environment, as well as inter-gene activity, genetic engineering has great potential to cause substantial and often unexpected or undetected suffering in animals.

Conflicting interests

Increasingly, science is being driven by commercial enterprises whose interests conflict with public opinion on animal experimentation. Two commercial offshoots of genetic engineering – the development of animals as "bioreactors" for protein production and as sources of organs for transplantation – are particularly likely to escalate animal use. The demand for highly sentient species such as primates looks likely to grow, for the testing of drug and gene therapies for central nervous system disorders and of biotechnology products, such as human antibodies and hormones. Multinationals threaten to evade Britain's relatively strict control of animal experiments by moving their research overseas, and world trade agreements do not permit a country or a trading bloc (such as the European Union) to ban the import of products because they have been tested on animals.

These developments could reverse the long-standing decline in the numbers and severity of animal experiments. Governments will need to develop a coherent programme across all departments to resist increases in animal use and to consolidate recent gains in animal protection. Research to make available more non-animal research methods is also overdue an injection of resources, both of time and funding. The British government's response in 2003 to a House of Lords report on animal experiments was hardly encouraging. While acknowledging that non-animal methods represent advanced science and offer many benefits, the government accepted little responsibility for developing them, suggesting instead that other sectors should take the lead. Its most emphatic commitment was to "consult further" about the proposal in the House of Lords report for a national centre to develop alternatives.

Alternative employment choices

Today's young scientists are the first generation able to choose non-animal alternatives in their biology education [11], and to grow up familiar with anti-vivisection arguments. In research, avoiding animal experimentation is relatively easy and working to minimise its impact or to develop alternatives is possible.

Addressing the negative impacts

Working for an animal welfare organisation is many people's dream, and certainly these organisations have had a major impact in changing attitudes to animal experiments and achieving welfare improvements for laboratory animals. However there are only a limited

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number of such organisations, and posts within them for scientists are few.

There are research opportunities for modifying or 'refining' traditional animal models or procedures to reduce suffering. For example, anti-arthritic drugs are developed using animal models of induced joint inflammation, a painful condition that is allowed to progress over weeks or months. Biological markers of the condition, which are expressed before overt symptoms occur, can be used instead to identify novel drugs.

Another example of refinement is telemetry, where an implanted sensor can be used instead of long-term instrumentation for monitoring biological responses. The advantage for animals is that they do not need to be confined in isolation from cage-mates because of indwelling tubes and wires, and data can be obtained from living animals rather than killing groups at sequential time intervals [12].

There is also a field of research that seeks ways of improving the husbandry of laboratory animals, by identifying the needs of different species with regard to space requirements, social interactions and environmental enrichment. The findings of this research will help to guide and update various national and international regulations on animal care and husbandry.

Research into the refinement of procedures or husbandry practices are funded by or conducted under the auspices of a range of organisations, including government departments, the European Pharmacopoeia, drug companies, veterinary organisations, animal welfare groups and the European Commission. There is as yet no established career path in refinement research, so finding suitable locations and funding remains ad hoc.

Developing more beneficial technology

Although tens of millions of animal experiments take place worldwide every year, the majority of biomedical research does not, in fact, involve laboratory animals. There are plenty of career opportunities in these fields, although completely escaping any contact with animal experiments is difficult if colleagues or nearby departments are involved. There are very few major companies or institutes that, as a matter of ethical policy, eschew all animal use but there are many research areas and departments that do not conduct animal procedures.

The focus of the following research areas is (or can be) primarily non-animal: clinical and human volunteer studies (including brain imaging), cell and tissue culture, molecular research, computer modelling and epidemiology. Relevant qualifications or experience for these areas range from cell and molecular biology, biochemistry, pharmacology, computing, mathematics, physics and statistics to engineering, clinical medicine and nursing.

There is also a growing research effort specifically aimed at developing alternatives to replace animal experiments. Some countries have national centres for this kind of work and many governments provide budgets earmarked for replacing animal experiments. This trend is particularly notable in toxicology, with a number of in vitro tests being approved in recent years (such as the cell-based neutral red uptake assay for photo-irritation, or the transcutaneous electrical resistance test for skin corrosion which uses isolated skin slices instead of rabbits). Some drug companies have research and development initiatives for drug selection and toxicity testing in vitro, and there are several humane research organisations which award grants for the development and application of non-animal methods in a number of biomedical fields.

Summary and recommendations

Attitudes to animal experimentation have changed enormously in the last twenty years, both inside and outside the scientific community. The debate about the moral status of other animals may not have been absorbed in every detail, but nevertheless a seismic shift has occurred, and the concept of animal rights is taken seriously even by those who dispute it.

The changing climate is reflected in the stricter laws that now control animal experimentation, in the steady reduction in animal use, and in new research directions such

as the development of techniques to replace animal use. There is a risk, however, that humane progress may be slowed by the explosive growth of animal genetic engineering and by the multinational corporations which resent what they see as excessive regulatory interference, particularly in Britain.

Against this, the youngest generation of scientists is much more animal-friendly, being the first to be well informed about the issues and to have had an opportunity to gain scientific qualifications without participating in animal-based practical classes. Those who opt for research careers will inevitably influence consensus in the scientific community.

It is relatively easy to avoid direct involvement in animal experimentation since it arises in only a minority of biomedical research endeavours. There are also some research opportunities for reducing the severity of animal experiments and specifically developing alternatives to replace them. Cell and molecular biology are growth areas, as is computer modelling, which is impacting animal use both at the molecular and the systems levels. New imaging techniques and highly sensitive analytical equipment are increasingly permitting safe, non-invasive studies in human volunteers.

Within the scientific community it is considered acceptable, even laudable, for researchers to have animal welfare concerns, but the anti-vivisectionist biologist remains a rare and somewhat feared creature. As a one-time researcher who has worked in the anti-vivisection movement for 20 years, I have experienced unprovoked and sometimes knee-jerk verbal onslaughts, in public and behind the scenes, by pro-vivisection scientists who presumably see me as a particularly dangerous renegade. On the other hand, I have also come under attack from animal rights supporters who suspect my motives simply because I once trained as a scientist.

As a self-confessed animal welfarist or even an anti-vivisectionist you can still pursue a research career, although you may well come under fire from time to time. You would be welcomed by many animal protection organisations as an applicant for advertised posts. Either way, you would be influencing the future directions and character of biomedical research.

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SGR promotes ethical science and technology, i.e. that which contributes to peace, social justice and environmental sustainability. Our work involves research, education, lobbying and providing a support network for ethically-concerned scientists. Founded in 1992, we are an independent UK-based membership organisation.

**Scientists for Global Responsibility,
PO Box 473, Folkestone, Kent, CT20 1GS, UK
Tel: 07771 883 696 Email: info@sgr.org.uk Web: http://www.sgr.org.uk/**