



Bred to Suffer:

Animals as Models of Human Disease





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'The moral is that animal model systems not only kill animals, they also kill humans.'

Dr Irwin Cross, former Director of the world's largest cancer research institute.



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ISBN: 0-9508990-4-6 • February 2002

Introduction

We humans suffer from a multitude of diseases and disabilities; some inherited, some induced by our lifestyle or environment, some acquired through infection and others just appearing spontaneously or through accident or injury.

The major causes of premature death in the western world are often called 'diseases of civilisation'; meaning that they are attributable to our modern lifestyle of poor diet, lack of exercise and environmental pollution. The 'big three' are heart disease, cancer and stroke.

The major causes of death in the 'developing world' are still infectious diseases and malnutrition; both being a consequence of poverty and inadequate living conditions, including lack of food and clean water.

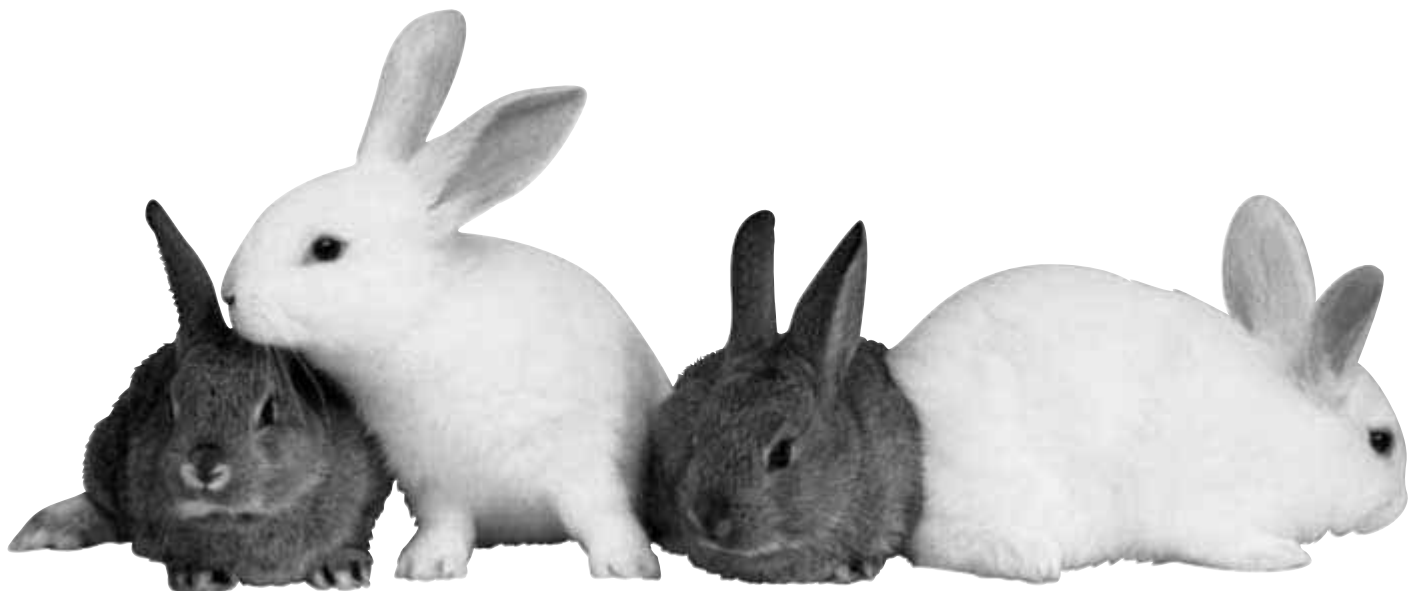
In the West, we no longer suffer (in such numbers) from diseases of poverty, such as TB, cholera, typhoid, diphtheria and dysentery, thanks entirely to improvements in our housing, sewerage, water supply and diet.^{1 2} Instead, we are now suffering an epidemic of heart disease and cancer, whose massive growth can be clearly correlated with the rise in intensive farming and meat consumption following the Second World War. We could halve these deaths through dietary changes alone; in fact 80-90% of cancers are preventable.³ Clearly our national health

could be transformed through a range of disease prevention measures.

Sadly, though, we seem to prefer to become ill and then look to high-tech medicine for a cure. There is no shortage of patients to study and learn from, but in a catastrophic neglect of reason, we turn to animals for answers instead. Forgetting the biochemical and physiological differences between animals and ourselves, which have led to so many drug disasters⁴, we look to deliberately-damaged animals to help solve human ills from which they do not even suffer in any equivalent way. The idea is to recreate symptoms of human disease in animals in order to use them as 'models' of our diseases and then find ways to cure them.

So how is disease induced in animals?

Animals are either physically or chemically damaged to produce some of the symptoms of the disease or, increasingly, they are bred with a specific genetic defect, which causes them to display one or more characteristics of the disease. Usually this involves 'knocking out' a gene, or inserting one from a human or another animal: the resulting animal is thus 'transgenic'. We will begin by looking at physically-induced 'models' and then go on to consider transgenic models and the particular problems they face.



Physical / Chemical Manipulation

Heart disease

The most common cause of heart disease in people is atherosclerosis (cholesterol deposition on artery walls). This leads to bottlenecks in blood flow, thereby restricting oxygen supply, raising blood pressure and, ultimately, culminating in a heart attack.

Dogs are often the model of choice for research into heart disease although 'it is virtually impossible to produce atherosclerosis in a dog' even when vast amounts of cholesterol and saturated fat are added to their diet.⁵ To imitate this condition artificially, the coronary arteries are tied around with wire⁶ or blocked by plastic plugs. The most obvious cure for the condition in humans is to lower cholesterol levels but this would clearly have no effect in such a model, which is therefore of no real relevance.

Of course, a great deal of heart disease is avoidable and the money spent on such expensive treatments as bypass surgery would be far more profitably invested in strategies such as health and nutrition education. According to the National Heart Forum, if current knowledge were to be put into policy action, death and disability from avoidable coronary heart disease among people under 65 could be virtually eliminated. 'Inaction now creates a public health time bomb for future generations.'⁷

Stroke

Naturally-occurring strokes are extremely rare in animals. In humans, strokes are 'brain attacks', much like heart attacks, where blood vessels in the brain become blocked by a clot or an atherosclerotic plaque (cholesterol build-up). The cause is usually high blood pressure (also high cholesterol, diabetes and smoking) and it takes years or decades to develop.

Artificial strokes are induced in cats by blocking arteries in their brains,⁸ which clearly gives no useful insight into the cause of a stroke.

The damage caused by a stroke can be reduced if treatment is received quickly enough. All the currently accepted treatments, such as anti-clotting medications, have been identified in people, while animal experiments have an abysmal record of predicting useful treatments. Researchers at the Mayo clinic concluded that

'over-reliance upon such animal models may impede rather than advance scientific progress in the treatment of this disease'.⁹

Again, prevention is far more valuable than cure, and most strokes could be avoided by improvements in diet and exercise. In fact, it has been calculated that the incidence of strokes could be cut by 39% through a daily reduction of 3 grams of salt in an individual's diet.¹⁰

Cancer

There are more than 200 different cancers in humans, many of which have been 'replicated' in animals by exposing them to carcinogenic chemicals, radiation, onco-viruses or by injecting them directly with tumour cells or inserting some of the genes involved.

But, even in supposedly equivalent cancers, there are major differences between species that invalidate the models. In fact, it is true to say that the lack of success in finding treatments for cancer in humans is because the research effort has been concentrated in animals. Thomas E. Wagner, senior scientist at Ohio University's Edison Biotechnology Institute, remarked: 'God knows we've cured mice of all sorts of tumours. But that isn't medical research.'¹¹ And according to Dr. Albert Sabin, developer of the polio vaccine, 'Giving cancer to laboratory animals has not and will not help us to understand the disease or to treat those persons suffering from it...Laboratory cancers have nothing in common with natural human cancers'.¹²

When it comes to curing these experimental tumours, the animal models turn out to be of little value. For every 30-40 drugs effective in treating mice with cancer, only one is effective in people.¹³ This problem is inherent in all research using animals because 'for the great majority of disease entities, the animal models either do not exist or are really very poor'.¹⁴

Animal responses to carcinogens are so different from ours that it took 50 years to induce lung cancer in laboratory animals forced to breathe tobacco smoke,¹⁵ thus delaying the health warning to humans and resulting in millions more unnecessary deaths. The following words from Dr. Irwin Bross, former director of the largest cancer research institute in the world - the Sloan-Kettering, say it all: 'While conflicting animal results have often delayed and hampered advances in the war on cancer, they have never produced a single substantial advance either in the prevention or treatment of human cancer.'¹⁶

AIDS

Tens of thousands of primates and other animals, notably cats, have been consumed in AIDS research over the past 20 years. This is despite the fact that infecting animals, even chimpanzees, with HIV does not produce an equivalent disease to human AIDS. The immune systems of different primate species are so diverse that data from one species does not even translate to another species, much less to humans. 'SIV in monkeys is not the same as HIV in humans.'¹⁷ This has long been recognised by many in the research community and by AIDS activists, who have campaigned hard against futile vaccine research in monkeys. Leading AIDS researcher Dr. Mark Feinberg puts it thus, 'What good does it do you to test something [a vaccine] in a monkey? You find five or six years from now that it works in the monkey, and then you test it in humans and you realise that humans behave totally differently from monkeys, so you've wasted five years.'¹⁸



Everything we know about HIV and AIDS has been learned from studying people with the disease, through epidemiology and in vitro research on human blood cells, which is where the virus operates and, therefore, where it needs to be studied. 'It is now clear...that a strategy for an effective HIV vaccine can be devised only with a thorough understanding of the biology of HIV and the immunopathogenesis of AIDS.'¹⁹

According to Dr. Ray Greek, President of Americans For Medical Advancement, 'Far too frequently animal models have been used to develop vaccines that are effective in laboratory animals but are ineffective or worse, harmful, in humans. AIDS is a terrible

illness, and research money and personnel need to be directed toward methodologies that are viable. Using an archaic methodology like animal models to combat a 21st century disease is more than foolish, it is immoral.'²⁰

Arthritis

In arthritis research, animals are injected in their joints (with collagen or various other substances) to produce the painful swellings and destruction of cartilage and bone that is characteristic of the disease. The usual

subjects are rats, mice and rabbits, but sheep and dogs are used too. The extent of swelling (eg. of a paw or knee) and its temperature are monitored. The degree of pain is also measured by various assays, including the speed of response to noxious pressure, a needle or hot-plate applied to a paw.

Because the idea is to find drugs to relieve the pain or swelling, the animals are force-fed these candidate substances.

Alternatively, they are injected into their spine or swollen joint. After weeks of such misery, the animals are killed to assess the effectiveness of the treatment.

For example, scientists at the Kennedy Institute of Rheumatology in London operated on beagles to induce surgically symptoms of osteoarthritis, which was then allowed to develop for six months until the dogs were killed for analysis of their cartilage.²¹ Even one of the scientists conducting the research acknowledged that animal cartilage differs from human cartilage in important ways and that studying human surgical specimens is preferable.²² There is no shortage of these!

Diabetes

Type 1 diabetes is an autoimmune disease appearing in childhood, which necessitates insulin injections up to four times a day for life.

Rodent 'models' of the disease are produced by injecting the animals with a chemical called streptozotocin, which damages the insulin-producing cells in their pancreas. But 'diabetic' rats and mice bear little relation to humans with diabetes, in that they do not require insulin to survive. Some 'models' do not even have raised levels of glucose in their blood - a hallmark of the human disease. Regardless, many researchers are studying numerous animal 'models', even while acknowledging that 'they differ markedly from the human disease'.²³

The more common Type 2 diabetes usually affects overweight people in later life. Dramatic improvements in their condition can be made through dietary control and exercise, which can also significantly reduce the chances of getting the disease in the first place. Its incidence is projected to double in the next ten years, so the need for preventive strategies is urgent. Sadly, research into these important factors has been neglected in favour of the search for treatments effective in animals. One such medication, Rezulin, was launched on to the market in 1997 after its success in treating 'diabetic' animals, only to be withdrawn three years later when it was found to cause liver failure and had killed 391 people.²⁴

Brain Disorders

Neurological conditions such as Alzheimer's and Parkinson's diseases are particularly amenable to study in conscious human patients using non-invasive scanning techniques such as MRI, PET and CAT scans. These remarkable techniques are able to show the healthy or diseased brain (or other organs) in action while performing a variety of cognitive tasks. Donated brain tissue from patients who have died, but wanted to help research into the condition they suffered, is also extremely useful to researchers. The Humane Research Trust funds work using human neural cell cultures at the Cambridge Brain Bank at Addenbrooke's Hospital.

Despite these technological advances, animal models of ageing and associated neurological

disorders are a large and rapidly growing area of research worldwide, even though many experts agree that 'there is no successful animal model of Alzheimer's Disease'.²⁵ The experiments are particularly crude and barbaric.

At Cambridge University, marmosets were repeatedly injected into the brain with destructive, seizure-causing chemicals. Then they were injected with drugs that made them spin uncontrollably in their cages, up to 300 times in an hour. The researchers claim their intention was to advance treatment of Huntington's Disease, even while admitting that the brain damage they inflicted 'did not replicate the pathology or the symptoms of Huntington's Disease'.²⁶

Marmosets are also popular for similarly traumatic 'Parkinson's research' even though their brains do not develop Lewy bodies, a generally recognised marker for the disease in humans.

Recent epidemiological studies suggest a link between Alzheimer's disease and consumption of dairy products.²⁷ Other research shows a link between garden pesticide usage and Parkinson's disease.²⁸ Surely, these are the types of enquiry we should be pursuing, rather than generating spurious data in animals.

Mental Illness

If researchers believe animals are capable of experiencing the same kind of complex emotional stresses as people, they should not be experimenting on them in the first place. Yet this is indeed the basic premise of such wilfully cruel experiments as separating young animals, including primates,²⁹ from their mothers at an early age. The deliberate intent is to cause them stress and induce symptoms of schizophrenia and other disorders for further study. Schizophrenia manifests as speech disturbances, delusions and hallucinations. How can these problems be diagnosed in animals?

Many animals, particularly monkeys, have been deliberately brain-damaged over the years to monitor the effects on their behaviour and mental state. Many psychology researchers themselves have asked questions such as 'is the infliction of so much pain and terror warrantable?'³⁰ Such callous 'research' can clearly have little relevance for humans, plenty of whom are suffering these various disorders and who could reveal an abundance of information for study if they were only asked.



Brain Injury

There is, unfortunately, no shortage of human accident victims whose brains could be studied - with their consent - during recovery or after death. Yet animals are still subjected to deliberate brain damage, despite important differences between species that render extrapolation to humans invalid.

Monkeys at Oxford University were brain-damaged to assess the effect on their emotion and motivation. This was measured by depriving them of food and then placing food in front of them, but out of reach. The animals resorted to biting their own limbs.³¹

Others had parts of their brains' visual cortex removed and were then tested at various times for their visual abilities over the next nine years, until they had all died.³²

The Dr. Hadwen Trust for Humane Research is funding other research at Oxford University using an innovative technique called transcranial magnetic stimulation (TMS). This temporarily disrupts the functioning of the brain in human volunteers, allowing scientifically valid study of the human brain itself.

Pain

Pain in humans is a subjective experience whose assessment and treatment can be complex but, in general, most people can tell a doctor where and how much something hurts. This is clearly not possible for animals, in whom the measurement of pain must rely on other indicators, such as attempted movement away from a painful stimulus.

In fact, there is a range of pain assessment tests employed in laboratories that would not be out of place in a medieval torture chamber. These include the 'mouse writhing test', induced by injecting acetic acid into the stomach; the 'tail-clip assay'; the 'paw-licking response' to wounds induced by injections of formalin; the 'rat tail-flick response' to intense heat; the 'hot-plate response'; and, of course, electric-shock avoidance responses. Scientists in Japan are investigating pain transmission in cats by administering electric shocks to their canine tooth pulp and recording the impulses generated in the spinal column.³³

Epilepsy

Scientists have devised around 50 methods to induce epileptic fits in mice, rats, baboons and other animals. These include the use of electric shocks, chemical treatments and exposure to flashing strobe lights. At Porton Down, guinea-pigs had holes drilled in their heads and electrodes and probes implanted into their brains, in order to monitor cerebrospinal fluid and electrical activity during the course of chemically-induced seizures.³⁴ Yet, even according to epilepsy researchers themselves, 'none of the models is fully trustworthy as an imitation of clinical epilepsy'.³⁵

Meanwhile, other researchers are using a non-invasive brain scanner called MEG (magneto-encephalography) to study patients with light-sensitive epilepsy, one of the commonest forms of epilepsy affecting children.

The director of a leading epilepsy research facility in Europe said, 'As a scientist, I am of the opinion that animal experiments bring no progress in the diagnosis and therapy of epilepsies. I have a well-founded suspicion that similar facts apply in other areas of medicine'.³⁶

Blindness and Deafness

Blindness and deafness are inextricably related to the development and functioning of the brain, the mechanisms and intricacies of which, in humans, are unique to humans. New brain-scanning techniques are increasingly valuable in pinpointing damage and the related brain areas involved. However, animals have been deliberately blinded and deafened in pointless attempts to model the human afflictions.

Cats and monkeys have had their eyelids stitched shut, their optic nerves or optic lobes of the brain removed, polystyrene beads injected into their eyes, and have been reared in total darkness. Concerning a series of such experiments using two species of macaque monkey, in whom the

results were quite different, the British Institute of Medical Ethics concluded that 'neither can serve as an animal model for human myopia, because there is no way to decide which, if either, mechanism is similar to the human'.³⁷ Similarly, a group of American researchers showed that 'the feline visual system is a poor analogue to the human one'.³⁸

All of the 'disease models' described above are created in a crude and artificial manner that renders them invalid for comparison with the naturally occurring disorder in humans. Indeed, the Medical Research Modernisation Committee analysed ten animal models of human illness and found 'little, if any, contribution towards the treatment of patients'.³⁹ It seems so obvious that complex human disorders require sophisticated models based on human anatomy, physiology and biochemistry. It is surely equally obvious that the maimed and broken animals described in this report do not fulfil that requirement.

Transgenic Animal Disease Models

Animals have been genetically manipulated to model all of the diseases mentioned above and many more. In fact many scientists think that animals can now be engineered to represent practically any human complaint simply by adding or disabling bits of DNA.

Numbers rocketing

Many species of animals are used in this research. But mice are the favourite (at present) and their use is rocketing - up by 960% over the past 10 years, with this rate of increase predicted to continue for the foreseeable future.⁴⁰ There are already over 650 different transgenic mouse models sold commercially through catalogues, as though they were just another piece of laboratory equipment.⁴¹ The RSPCA has expressed concern that 'GM animals may be produced simply because it is possible, and not because it is necessary'.⁴²

Sheep, cattle, pigs and chickens have all been genetically modified to increase their production of milk and meat, which is already beyond the limits their bodies can bear without damage.

They have also been engineered to secrete therapeutic protein products (which could be obtained more safely and cheaply from transgenic micro-organisms or plants) for human medicine; a process called 'gene pharming'. These abuses are outside of the scope of this report, but see *The Gene and the Stable Door* - a Compassion in World Farming Trust report, available at www.ciwf.co.uk

Suffering at every step: creation of transgenic animals

In order to create a new strain of transgenic mice, young females are injected with powerful hormones to make them superovulate. After mating, they are killed to extract the embryos, which are microinjected with the foreign DNA. These altered embryos are then surgically implanted into many surrogate mothers, who have also been hormone-injected to assist implantation and who will later be killed before or after giving birth. Many of the resulting baby mice are malformed and die before or shortly after birth. The surviving babies have to be tested to see if they have the new gene: this can be done by saliva or faecal sampling but is more often conducted by cutting off the tips of their tails or a notch from their ears.

Massive failure rate: millions of animals killed as 'rubbish'

Only 1-10% of the baby mice will have successfully incorporated the new gene. The other 90-99% will be destroyed as 'failures'. This translates into so much killing that many of the animal technicians responsible for killing all the 'waste' animals find it traumatic and are left feeling 'physically and emotionally exhausted'.⁴³ While hundreds of animals are sacrificed to produce a new transgenic 'model', life for the survivors can be even worse than for the failures.

Multiple misery

A gene is not a unit, but part of an integrated system. When introduced into a foreign environment it may take effect in the wrong tissue, switch on at the wrong time, or be uncontrolled in its effects and inflict damage on non-target organs or tissues. As a consequence, there is always a likelihood that the animals will suffer unpredicted side effects in addition to the intended suffering resulting from their designer disease. For example, 'giant' mice were given a human growth hormone gene to make them bigger than normal. But they also suffered unplanned-for liver and kidney damage, grossly deformed hearts, spleens and genitalia, together with high infant mortality and a shortened life-span.⁴⁴

Often, scientists create a 'model' by removing or disabling a gene. The resulting animals are called 'knockouts'. The effects cannot be predicted in advance. Researchers can guess, for example, that knocking out a receptor gene for thrombin (a blood-clotting enzyme) in mice will affect their control of blood coagulation. But only by creating the animals can they discover that such a deletion causes half of the altered embryos to bleed from multiple sites so that they die in the womb.⁴⁵ Other mice have been accidentally produced with no legs or with only one eye.⁴⁶

Models of dubious value

Just as physically damaging animals results in poor 'models' of human disease, human conditions cannot be replicated in mice simply by giving them a human gene or two.

For example, none of the current 'cystic fibrosis' mouse strains accurately models the human condition, in which the major symptoms are excess mucus in the lungs, leading to lung infections. The mice, in

contrast, suffer principally from bowel disorders and are clearly not a very helpful model of the disease.⁴⁷

As already discussed, many human cancers have been 'replicated' in animals by inserting some of the genes involved. 'One might expect that these animals would mimic human symptoms, not just the genetic mutations. In fact, that is usually the exception, not the rule.'⁴⁸

Even the industry's own *Lab Animal* magazine stated, 'Mice are actually poor models of the majority of human cancers.'⁴⁹ Yet the media constantly announces 'breakthrough' cancer treatments (developed in mice), raising false hopes in patients and their families. Dr. Richard Klausner, director of America's National Cancer Institute commented, 'The history of cancer research has been a history of curing cancer in the mouse. We have cured mice of cancer for decades, and it simply didn't work in humans.'⁵⁰

Fundamental flaw

The whole concept of modelling diseases on the basis of their genetic component alone is fundamentally flawed. There is indeed a genetic element to our susceptibility to many diseases, but our genes are not an automatic ticket to illness or health. In all the fanfare about the sequencing of the human genome, their contribution has been massively exaggerated. Other factors such as diet, lifestyle and environmental pollution are far more important in determining whether or not we will succumb to a particular disease at a particular time. Most of us are carrying the genes for a variety of serious diseases but are not suffering from them. This is because these 'disease genes' are not switched on unless triggered through, for instance, exposure to cigarette smoke, a high-fat diet or some other environmental risk factor. Even if one identical twin suffers from a particular disease, the other twin usually does not,⁵¹ showing that genes alone are not enough to cause disease. (Except, of course, inherited disorders like cystic fibrosis.)



And a mouse with a gene for a human disease is still a mouse, whose 30,000 or so other genes will affect the expression and behaviour of the gene in question. The gene will perform in a completely different way in the mouse from the way it is expressed in its natural human environment. As Philip Abelson, editor of the prestigious journal *Science* commented, 'Are humans to be regarded as behaving biochemically like huge, obese, inbred, cancer-prone rodents?'⁵²

Even when scientists think they have a 'good model' it is difficult to determine how much its attributes are due to its genes or to environmental factors. Wildly differing results have been found to occur in different

laboratories using the same strains of animal in the same procedures.⁵³ Part of the explanation is that the stress of handling, confinement and isolation alter an animal's physiology in various ways - increasing susceptibility to certain diseases and tumours and altering levels of hormones and antibodies.⁵⁴ But new research has also shown that the brains of



animals housed in standard barren laboratory cages are severely abnormal.⁵⁵ The sheer boredom of cage life literally drives them insane, causing brain damage, which must surely render much accepted research invalid.⁵⁶

Transgenic animals also used to test poisons and carcinogens

Transgenic rats and mice are used in toxicity tests, for example, to measure the carcinogenic (cancer-causing) potential of various chemicals. The animals are designed to be genetically susceptible to cancer and it is claimed that this is beneficial to animal welfare because the tests should be less prolonged and use fewer animals than the traditional 'chronic rodent bioassay', which consumes 400-500 animals per compound. However, human hazard would be better predicted by using human cells.

'Toxicogenomics' (or pharmacogenetics) is a new technique using DNA arrays: tiny glass plates or 'chips' covered with a matrix of DNA fragments are washed over with fluorescent 'probes' that can detect which fragments have been affected by the substance in question. Thousands of chips can be processed in a matter of hours. The results are more accurate and sensitive than animal tests and (when human DNA is used) are directly relevant to humans.⁵⁷

Legal protection inadequate

Having read this far, it will be apparent that no laboratory animals are properly protected under the 1986 Animals (Scientific Procedures) Act. But there are certain problems unique to GM

animals, which require changes in the law to afford them due consideration. This is, not least, because their use, certainly on its current scale, was not foreseen when that legislation was introduced. Even the Home Office recognised this inadequacy and, in 1999, published guidance notes for project licence applicants who were intending to create or use GM animals. These notes stipulate, for example, that mice should be at least five weeks old before they

can be superovulated by repeat hormone injections - a week after which they will be killed for egg/embryo harvesting. The notes also specify a maximum of 0.5cm tail-tip removal, or a maximum 15% of total blood volume removal by tail-bleeding for DNA-typing. However, DNA can be typed by faecal or saliva-sampling: clearly these more humane methods should be mandatory. The massive wastage of animals as 'failures' should be prohibited. There are methods that achieve much greater levels of success and these should be mandatory. Equally significant is that the Home Office notes still classify the production and maintenance of GM animals as 'mild' severity procedures. Yet, as we have seen, the consequences of transgenesis cannot be predicted and often seriously compromise the welfare of the resulting animals.

Ethical, moral and religious concerns

Altering the genetic material of animals raises a whole host of ethical, moral and religious questions.

- Changing the genetic make-up of animals compromises their essential nature and fails to respect their unique identity.
- Deliberately designing animals to suffer, as disease models inevitably do, is morally repugnant.
- GM animals are more than likely to suffer in unexpected ways as well as in the ways intended by their manipulators. Altering animals' genes without knowing the consequent harm they will suffer raises fresh ethical problems.
- Because researchers want to protect their

'inventions', each of many thousands of GM animal strains are 'owned' by private patent-holders, who sell them as just so much laboratory equipment. The very idea of patenting life, particularly sentient life, is abhorrent to many.

- A moral dilemma that applies equally to all animal research is this: who are we to decide whether the potential benefits to mankind outweigh the costs to the animals? This 'dilemma' should be resolved, however, when policy-makers understand that the 'potential benefits' are much more usually potential harms to human beings themselves, from bogus and misleading animal results. As leading surgeon Moneim Fadali states, 'conclusions drawn from animal research are likely to delay progress, mislead and do harm to the patient'.⁵⁸

Conclusion

A fatal mistake

Using animals as model humans is absolutely unscientific. It contravenes fundamental principles of evolutionary biology, which state that species adapt to diverse niches in varied and unrelated ways, thus precluding the extrapolation of data from one to another.⁵⁹ The consequence of continued animal use puts all of our lives at risk. Says Dr Irwin Bross, former Director of the world's largest cancer research institute, 'the moral is that animal model systems not only kill animals, they also kill humans'.⁶⁰

In fact, adverse reactions to animal-modelled medicines are now the fourth largest cause of death in America, accounting for two million people being hospitalised every year - 100,000 of whom die.⁶¹ The figure for the UK has been estimated as 70,000 deaths and cases of serious disability per year.⁶² According to Dr. Ray Greek our unscrupulous dependence on animal data means these deaths 'are not accidents; they are inevitabilities'.⁶³ (See www.curedisease.com)

If it is so harmful to us, why does animal experimentation continue? One reason is simply the momentum of convention – it has been happening for a long time, many careers have been built upon it and, with little scientific dispute until comparatively recently, it has become deeply ingrained. 'Sadly, young doctors must say nothing, at least in public, about the abuse of laboratory animals, for fear of jeopardising their career prospects.'⁶⁴

But the main reason is money. The vested interests intent on maintaining the very profitable status quo are an immensely powerful lobby. The pharmaceutical industry in Europe alone will be worth over \$100 billion by 2005.⁶⁵ Many in the industry are well aware that animal experiments are scientifically invalid but recognise that they are a convenient means of generating 'safety' and 'efficacy' data that will allow a new drug to jump the regulatory hoops and win licensing approval. Or, as one leading exponent acknowledged, '...the chief objective here is to keep us all employed.'⁶⁶ German surgeon Werner Hartinger asserts: 'There are, in fact, only two categories of doctors and scientists who are not opposed to vivisection: those who don't know enough about it, and those who make money from it.'⁶⁷

Homo sapiens: a much better model

Proponents of animal experiments claim that medical progress would cease without them. In reality, precisely the opposite would be the case, with immeasurable benefits flowing from the development and application of superior non-animal techniques, a wealth of which we already have at our disposal. The truth is, enormous improvements have been made in the diagnosis and treatment of many diseases, thanks to advances in technology that have nothing to do with animal experimentation. The arsenal of medical tools and techniques available today includes ultrasound, arterial catheters, lasers, electron microscopes, pacemakers, electrocardiograms, electroencephalograms, laparoscopic surgery, bone and joint replacements, artificial organs and much more.

MRI, CAT and PET scanners, for example, allow detailed analysis of the brains and other organs of conscious patients without surgery or even discomfort. New and ever more sophisticated techniques are rapidly becoming available.

New tissue and organ culture techniques provide human material for analysing disease processes and testing new therapies. At a stroke, interspecies differences that have plagued biomedical research for decades are eliminated. After all, 'the only universal model for a human is other humans'.⁶⁸ British pharmaceutical company Pharmagene tests drugs exclusively on human tissue with the philosophy, 'If you have information on human genes, what's the point of going back to animals?'⁶⁹

Computer modelling is a sophisticated way to analyse and design the molecular structure of drugs to target specific receptors. In 1997, Hoffman La Roche had a new heart drug approved on the strength of data from a virtual heart because the animal data was inconclusive. Research teams around the world are working on a 'virtual human',⁷⁰ which is designed to predict drug metabolism and metabolite interaction with any given organ - information that animal models will never be able to provide.

Autopsy studies are immensely valuable: 'Virtually the whole of modern medical knowledge was created through the study of autopsies.'⁷¹ There is still much more to be learned.

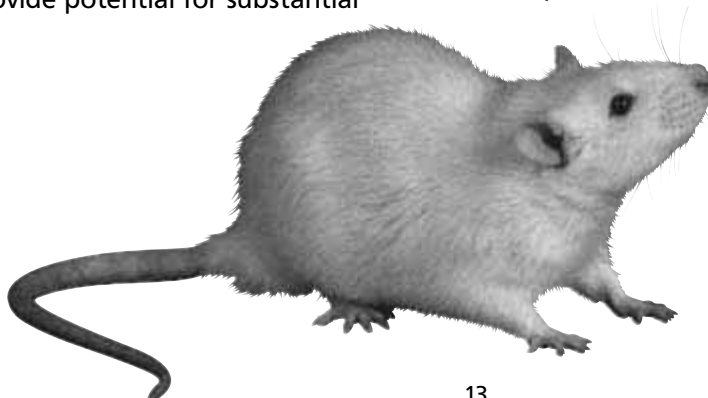
Clinical (patient) research and clinical trials of drugs and other therapies are very powerful tools, shaping treatment decisions for individual patients and advancing the standards of medical care. So long as they are conducted responsibly they can make enormous contributions to medical progress. Clinical trials would be safer for participants if the animal testing stage was removed. 'It is impossible to establish the reliability of animal data until humans have been exposed.'⁷²

Technological improvements continue to be made, and provide potential for substantial

future medical advancement. At the technological cutting edge, claims are made that human stem cells may be able to repair and even replace damaged organs in the future⁷³. It is also predicted that genetic screening could allow medicines to be better tailored to individual patients, thus potentially eliminating many harmful side-effects responsible for so many deaths as described above.⁷⁴ Advocates also say that such screening programmes will encourage people with particular disease risks to adopt preventive health strategies. Time will tell if these promises translate into genuine and lasting benefits. Recent years have also seen the public turn increasingly to non-allopathic therapies, based on a holistic model of health and disease, whereby the focus is on strengthening and nourishing the body's immune defences rather than making a 'self-destructive' high tech war on pathogens, tumours and the like.

Disease prevention offers the greatest hope for the 'big three' killers - heart disease, cancer and strokes. All the evidence for the major risk factors (smoking, high-fat diets, lack of exercise, etc.) has come from epidemiological (population) studies of people and their lifestyles. Prevention is always better than cure, and as far as illnesses such as AIDS are concerned, 'prevention is not just better than cure - it is the only cure'.⁷⁵ Epidemiology has taught us how the AIDS virus is transmitted and how we may combat it. Combined with genetic, clinical and in vitro research, epidemiology is a very powerful tool whose scope is unlimited. The animal model, by contrast, is 'an archaic paradigm whose scope peaked 100 years ago. It must be replaced if we expect to improve the quality of human life'.⁷⁶

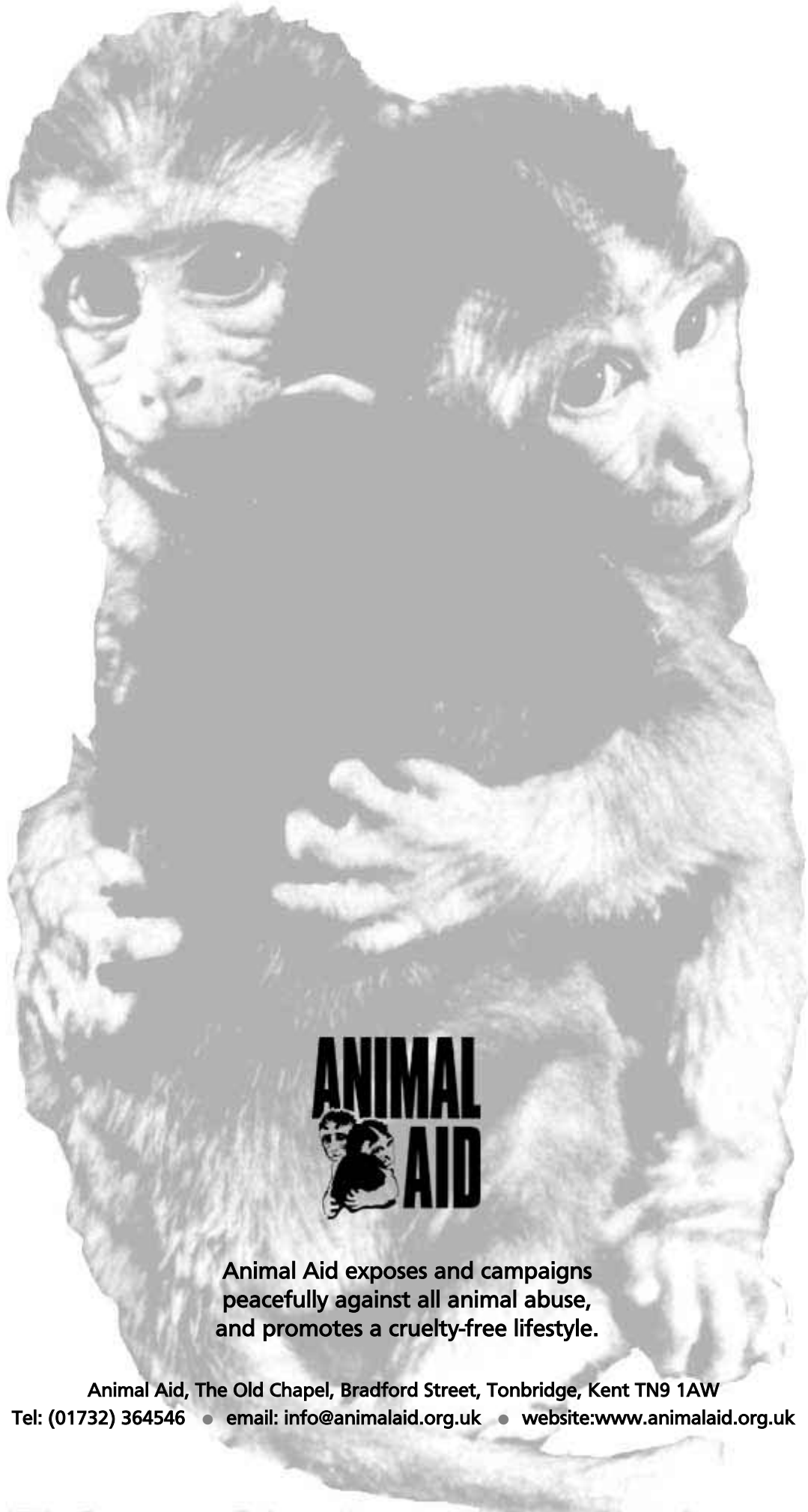
Thanks to advances in molecular biology and other technologies, and also to a greater appreciation of the holistic, integrated nature of humans and their diseases, we may be entering a new phase of medical advancement. But as long as animal research is involved in any way, it will continue to de-rail progress as it has done so often and with such devastating consequences in the past.



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