

Alternatives

With animal-based research so entrenched in our scientific community, one may wonder how medical progress could ever occur without the use of animals – to test new drugs, to determine biological, neurological and pathological processes etc. There are better ways!

A different approach

The move away from animal use in medical research is not simply a matter of replacing such procedures with alternative non-animal methods, but rather, there is a need to re-evaluate the entire process of how we approach medical research.

Far more emphasis needs to be placed on epidemiology, clinical research and autopsies so that we can address the real disease rather than a replica in a model of another species.

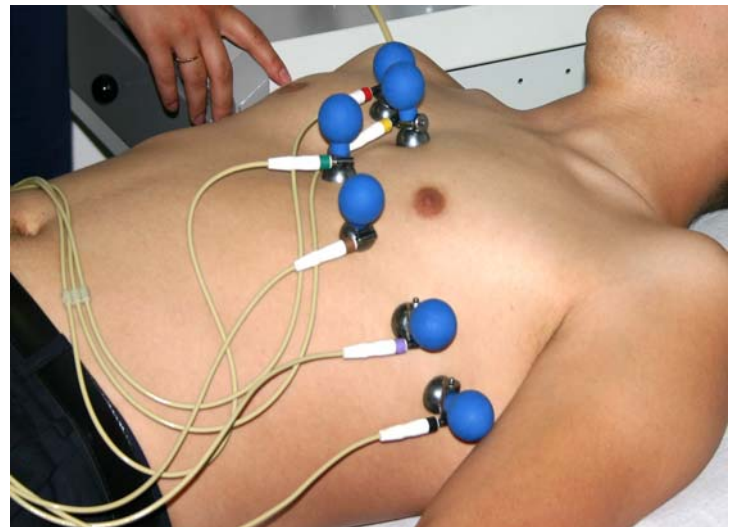
There are also now revolutionary techniques already underway that do not rely on animal use and are clearly the way forward if we are to truly understand the science of human disease.

Prevention is clearly the best option when it comes to human health. The large majority of illnesses and deaths in our society today are attributable to lifestyle choices rather than to genetic disorders and disease. Heart attack and stroke (atherosclerosis), many cancers, obesity and motor accidents are largely preventable. By placing greater emphasis on diet and lifestyle education our society would enjoy a much higher level of health and longevity.

Epidemiology is the study of human populations and the direct observation of disease progression so that preventative measures can be taken. These population studies have led to a vast knowledge in regards to the causes of many cancers – including the link to smoking, the effect of diet on atherosclerosis, the benefits of a diet rich in fruit and vegetables and reduced salt intake. The analysis of data obtained through epidemiology can also factor in environmental and lifestyle aspects that impact on the disease and recovery. These studies have become vastly more sophisticated as accumulated data can now be stored through computer accessible medical records tracking thousands of patients at various institutions.

Autopsies

Back in the 18th century autopsies provided a huge amount of knowledge about the human body, and disproved much



that was learned previously through animal experiments.¹ They are a credible way of determining the cause of illness, revealing undiagnosed findings and making valuable discoveries, however they are no longer routinely performed.

In vitro literally means “in glass” and is an alternative to using live animals in experiments. The advantages of using tissue and cell cultures are that they can be derived from humans (often after death) and so there is no inter-species variation, the cells are the same and so can be compared with other laboratories, and the experiments are quicker, cheaper and more humane. Examples of these methods include the Ames Test, which uses bacteria to test for mutagenicity (which usually correlates to carcinogenicity), growth of human skin cells to test toxicity and the use of human placentas to study a variety of processes.²

Computer Modelling is used to screen thousands of chemicals by building on the knowledge that we have already obtained about their structure and predicting their likely reaction with living cells. Computers are now able to simulate parts of the human body as mathematical equations. They can also create three-dimensional graphical models of molecules, which will

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allow the study of their shape and structure. Examples of such programs include DEREK (Deductive Estimation of Risk from Existing Knowledge) - a system developed by Unilever whereby toxicity predictions are made on the basis their chemical structure, and COMPACT, a program used by Surrey University which predicts chemical toxicity based on the chemical's likely interaction with body enzymes.³ The use of computer modeling means that information can be obtained through comprehensive medical databases rather than having to repeat experiments conducted previously.

New technologies

Despite claims by some researchers that alternative methods are not yet sophisticated enough to replace animal tests, they are certainly more dependable and produce more accurate results than tests on species who differ from humans in their metabolism of toxins, rates of detoxification and protein binding, absorption of chemicals, mechanisms of DNA repair and lifespan – all factors that would have a profound effect on the efficacy of drugs. The following list provides just a snapshot of some of the emerging technologies that will replace outdated and unreliable animal tests.

Genomics – The study of nucleotide sequences, structural genes, regulatory sequences and DNA within the chromosomes of an organism.

Proteomics – Analysis of the expression, functions and interactions of proteins expressed by the genetic material.

Nanotechnology – The science of assembling materials one atom at a time by combining molecular biology, chemistry, physics, engineering, computer science and electronics. It enables scientists to see atoms they are working with and piece them together in different ways.

Pharmacogenomics – Using cell-based assays, computer modeling and innovative technology, it identifies complex patterns of gene variations and enables scientists to classify patient populations according to their own individual response to a drug.

Phage Display – A method of quickly evaluating a huge range of potentially useful antibodies and then producing large quantities of the selected ones. It is the interaction between a virus and a bacteria to produce antibodies, which can be produced in a much shorter time than traditional animal methods.

Human Genome Project

The Human Genome Project (HGP) was initiated in 1990 and was an international 13-year joint effort between the U.S. Department of Energy and the National Institutes of Health. Its goal was to identify and map out and database all of the 30,000 genes present in human DNA, and to determine the sequences of the 3 billion chemical base pairs that make them up.

The Project has cost more than \$3,000,000,000 of US Government funding, but has provided researchers with detailed DNA information that will be invaluable in understanding the structure, organization, and function of

DNA in chromosomes. This will of course lead to a far greater understanding of hereditary diseases and genetic disorders such as Huntington's disease and Down's syndrome, and the prospect of cures.

According to Eugene Chan, founder of U.S. Genomics, rapid genome sequencing will impact every single element in medicine. "When a person is born, their genome will be scanned, analysed and stored. That information will then be reaccessed later. Healthcare will be cheaper because of the amount of preventative care by you can provide having this genetic information. Drugs will be cheaper to develop. And these new therapies are going to be so much more elegant than traditional therapies... What we're going to start seeing with genomics-based medicine is the ability to be able to customize drugs so they will be targeted only to the disease-causing cells and will have only minimal side effects. People will be making fewer doctor visits, they'll be feeling healthier, living longer, and having a better quality of life."⁴

Alternatives Research

A number of non-profit organizations around the world now focus on funding non-animal research:

The Dr Hadwen Trust www.drhadwentrust.org.uk in the UK

The Lord Dowding Fund www.navs.org.uk/research in the UK.

The MAWA (Medical Advances Without Animals) Trust www.mawa-trust.org.au in Australia.

Similarly, a number of government-funded initiatives are acknowledging the need to further develop and validate non-animal methods of research:

NC3Rs

The National Centre for the Replacement, Refinement and Reduction of Animals in Research is an independent UK organisation, established in 2004, that reports to the Science Minister. It is funded by the Home Office, the Medical Research Council, the BBSRC (Biotechnology and Biological Sciences Research Council), the ABPI (Association of the British Pharmaceutical Industry) and The Wellcome Trust.

The centre brings together members of academia, industry, government and animal welfare organisations in order to facilitate the exchange of information and ideas, and the translation of research findings into practice that will benefit both animals and science.

The Centre's mission is to advance and promote the 3Rs in research and testing using animals. This is being achieved by:

Developing a UK strategy for the implementation of the 3Rs

Supporting high-quality research that advances the 3Rs

Promoting a co-ordinated approach to 3Rs research

Providing advice and guidance on the 3Rs and animal welfare to the scientific community
Supporting the UK scientific community's commitment to best practice in all aspects of laboratory animal science and welfare
Working with regulators on the acceptance of alternative methods.⁵

ECVAM

The European Centre for the Validation of Alternative Methods (ECVAM) was established 1991. Its mission is: To promote the scientific and regulatory acceptance of non-animal tests which are of importance to biomedical sciences, through research, test development and validation and the establishment of a specialised database service.

To co-ordinate at the European level the independent evaluation of the relevance and reliability of tests for specific purposes, so that chemicals and products of various kinds, including medicines, vaccines, medical devices, cosmetics, household products and agricultural products, can be manufactured, transported and used more economically and more safely, whilst the current reliance on animal test procedures is progressively reduced. ECVAM has completely validated 17 alternatives with nine more being in the last stage of peer review and another 25 undergoing final trials or analysis.⁶

ICCVAM

In the U.S., the Interagency Coordinating Committee on the Validation of Alternative Methods (ICCVAM) was established in 1997. The committee consists of representatives of 15 federal agencies and appoints panels of independent experts to review the available literature to access the validity of a test.

Since its inception, ICCVAM has evaluated 16 alternative methods. Six have been adopted by regulatory authorities and others are undergoing recommended improvements. It is supported by NICEATM, The National Toxicology Program Interagency Center for the Evaluation of Alternative Toxicological Methods, established in 1998 to provide operational and scientific support.

The ultimate goal of ICCVAM is the validation and regulatory acceptance of test methods that are more predictive of adverse human and ecological effects than currently available methods. Such methods are expected to support improved protection of human health and the environment.⁷

ZEBET

ZEBET, established in 1989, is the Centre for Documentation and Evaluation of Alternatives to Animal Experiments, which forms part of the German Federal Institute for Risk Management, Berlin. The goal of this scientific institution is to bring about the replacement particularly of legally prescribed animal experiments with alternative test methods, to reduce the number of test animals to the absolutely necessary level and to alleviate the pain and suffering of animals used in experiments.

ZEBET is responsible for the documentation and assessment of alternatives to animal experiments, and recommending them for legislative acceptance both nationally and internationally.

The ZEBET database of alternatives is accessible free-of-charge on the Internet

ZEBET undertakes its own research and has a separate budget to promote specific projects on the development of alternative methods by other institutions.

ZEBET's mission is:

Creation of a database and an information service on alternative methods, both on the national and international levels;

Research support for the development of alternative methods to animal experiments;

Coordination of validation studies, both on the national and international levels;

Development of alternative methods based on the principle of the 3Rs of Russel & Burch (1959): Replace - Reduce - Refine;

Cooperation with validation centres and institutions to promote research in the field of alternative methods, both on the national and international levels;

forum for the exchange of information on alternative methods: scientists, animal protectionists, politicians, media and the general public.

Australian authorities, including NHMRC, ARC (Australian Research Council), ANZCCART (Australian and New Zealand Council for the Care of Animals in Research and Teaching) and ANZSLAS (Australian and New Zealand Society for Laboratory Animal Science) promote the *welfare* of laboratory animals. Indeed Australia boasts high standards of lab animal legislation (incidentally, so does the UK – despite undercover footage suggesting otherwise!) but is this focus on welfare doing more damage than good? Instead of changing our approach to research and seeking alternatives, are we instead promoting animal use inadvertently?

While other nations forge ahead in the area of alternatives research, Australia sadly lags behind. Instead of committing to actively seek alternatives to animals, Australia focuses on ensuring that our laboratory animals are handled correctly, have comfortable bedding and toys to play with. While such environmental enrichment may clearly improve the lives of individual animals doomed to exist as mere laboratory tools, it does not address the fact that these animals should not be there at all. Instead, it reinforces the justification for using animals and detracts from the importance of finding alternatives.

It seems unjust that in Australia, research that is deemed more ethical and scientifically valid is dependent on charitable groups while animal-based research continues to receive vast amounts of government funding. If our government and research community were truly committed to the 3R's concept then Australia too would have a government-funded centre dedicated to replacing animals in research. Until this is addressed, Australia will never be at the forefront of medical research.

(Footnotes)

¹ Greek, C. Ray & Swingle Greek, Jean, (2000) Sacred Cows and Golden Geese.

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⁴ Animal Experimentation, Resource Material for Students (1991) Animal Liberation SA.

³ Greek, C. Ray & Swingle Greek, Jean, (2000) Sacred Cows and Golden Geese.

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⁵ 'Unraveling the Genome

', Newsweek June 24 2002 p.76 Quoted by Greek, C. Ray & Swingle Greek, Jean,

'What Will We Do If We Don

't Experiment On Animals? 2004

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<http://www.nc3rs.org.uk>

⁶ "Reducing animal suffering often has the unexpected benefit of yielding more rigorous safety tests" Alan M. Goldberg and Thomas Hartung, Scientific American, Jan 2006.

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<http://iccvam.niehs.nih.gov/>