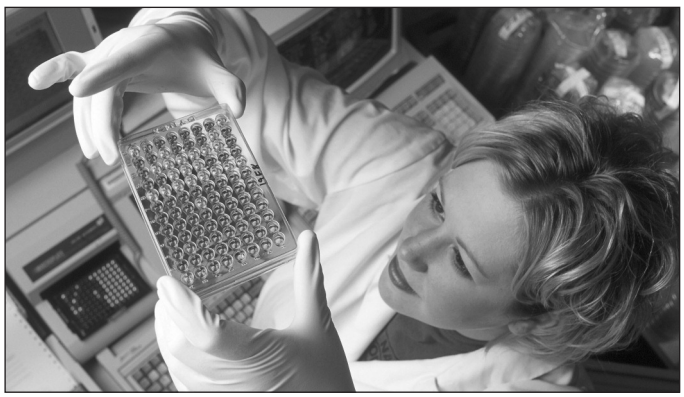
HUMANE RESEARCH

Every year, millions of animals suffer and die in laboratory experiments. Animal Aid argues that the future of medical research lies in replacing outdated animal experiments with modern, scientifically sound research methods based on human data.
Almost every month there is a new development in non-animal medical research that makes use of advances in tissue engineering, cell biology, genetics and computer modelling.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The Way Ahead

Human tissues

Scientists can study the effects of chemicals and new medical drugs on human cells or tissues in the laboratory in what are called test tube, or in vitro, studies. There are about 200 different cell types in the human body. They can be obtained from any organ and grown in the laboratory. These cells can then be studied using a range of new technologies including microfluidic systems, genetic science (using DNA chips for example), robotics and computers. Today, cell cultures are routinely used in vaccine production, toxicity testing and drug development and to diagnose disease.

Microfluidics

We can now create a lab-on-a-microchip and carry out safety (toxicity) tests to find out if new medical drugs as well as industrial, agricultural and household chemicals are safe for people to use.
Microfluidic chips have tiny chambers, each containing a sample of tissue from different parts of the body. The compartments are linked by channels through which a blood substitute flows. The test chemical or drug is added to the blood substitute and circulates around the device, thus mimicking what goes on in the body on a micro scale. Sensors in the chip send the results on how the different cells react to the test compounds to a computer for analysis.

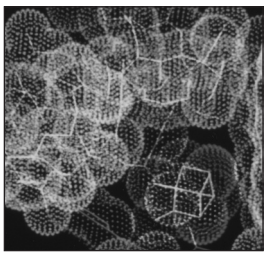
DNA chips

DNA chips are glass slides the size of a postage stamp, studded with samples of genes. They can be used to monitor how cells respond to a new drug. They can also be used to study patients, to identify whether they will react well to a drug, offering the possibility of personalised medicine tailored to the individual. This is called pharmacogenomics. It is the science of studying whether a patient, or group of patients, will have a good or bad response to a drug.

Robotics

Many of these tests can now be carried out with great efficiency using high-speed computerised robots.
New methods of high throughput screening (HTS) can test 200,000 compounds in two days using robots. It would take a researcher using animal tests 12 years working eight hours per day, seven days a week, to do the same amount of work.

Computer modelling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Drug research usually begins with computer studies to identify new chemical compounds or molecules that may be useful for treating human illness.
Computers have been used to design the molecular structure of potential new drugs. For example, the protease inhibitors* for patients with HIV were designed by computer and tested in human tissue cultures and computer models, bypassing animal tests due to the urgent need for a treatment.
Computer models have been developed that simulate the workings of different human organs. Virtual human organs and virtual metabolism programmes can predict how a new medicine will affect different parts of the human body. These models are based on relevant human data and can be used to carry out simulated experiments, in place of experiments on animals. Data from a virtual heart, for example, was used in the development of a new heart drug because the animal data was confusing.
Research teams around the world are working on a 'virtual human', which will model how drugs affect any organ in the human body. This will improve our understanding of how the body works and lead to the development of better drugs and other treatments – without using animals.

** A class of drugs that slow the progression of AIDS by inhibiting the virus from reproducing.*

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Microdosing is a recently developed technique, which enables potential new drugs to be tested safely in humans at an earlier stage (after they have been tested on human tissues and with computers). Based on the principle that 'the best model for man is man', microdose studies involve giving volunteers minute amounts of a new drug (less than one hundredth of a normal dose). Hi-tech scanners are used to study how the drug acts in the human body.

Scanners, such as magnetic resonance imaging (MRI), functional MRI (fMRI), magnetic resonance spectroscopy (MRS), and positron emission tomography (PET), are able to show what is happening inside the human body and, particularly, the brain – something that animal studies cannot do.

Stem cell research is a new technology that is expected to deliver great benefits in the future. Human stem cells are reported to have been used successfully to treat some leukaemias, as well as improving outcomes for heart attack patients and for some patients suffering from Parkinson's disease. Donated adult stem cells and umbilical cord stem cells can be engineered to provide an ethical source of human material for research.

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Clinical research, which involves the careful observation of people who are ill, has been responsible for most of the medical knowledge we have today. Better use could and should be made of ethical clinical research on patients to help find new treatments.

Autopsy studies involve the medical examination of dead people in order to establish the cause of death. Post mortem studies remain the best method of studying the effects of a disease on the whole body.

Epidemiology is one of the best ways to find out what causes disease. It involves studying different groups of people to find the links between disease and lifestyle, or environmental factors. This is how doctors discovered that smoking causes lung cancer and that the main causes of heart disease are high blood pressure, lack of exercise, being overweight, smoking and having excess blood cholesterol.

New developments

In 2008, three leading US government agencies announced that they are going to phase out the use of animals for testing the safety of new chemicals and medicines. The Environmental Protection Agency, National Toxicology Programme and the National Institutes of Health (NIH) will start replacing animal tests with methods based on high throughput screening using human cell cultures and computerised robots. They aim to eliminate live animal use in toxicity testing within ten years.

"Animal testing won't disappear overnight" said NIH director Elias Zerhouni "but the agencies' work signals the beginning of the end" of animal experiments to test the safety of new chemicals and drugs.

For a table showing the current methods and the non-animal humane alternatives for the different stages of drug development, please visit our website.

Glossary

Drug metabolism: The processing whereby a drug is broken down and altered in the body.
Efficacy: Whether a drug has a beneficial effect (whether it works).
In vitro: Experimenting 'in glass' – test tube studies.
In vivo: Experimenting on a whole living system (living animal).
Stem cell: Cells that can reproduce themselves and that have the ability to develop into other cell types.
Toxicity: How poisonous a substance is.

With thanks to Safer Medicines Campaign for help with background information for this factsheet.
See: http://www.safermedicines.org/superior_methods.shtml

WHAT CAN YOU DO?

- **Join the Animal Aid Youth Group and help to campaign against all animal experiments.**
- **Contact us for a free Animal Testing Info Pack (see our website).**
- **Find out more. Check out our website: www.animalaid.org.uk/youth**
- **Only give donations to medical charities that use non-animal research methods. Contact us for a list.**
- **Ask your teacher if someone from Animal Aid can come to your school to give a talk on animals in medical research.**

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