A humanist discussion of... GENETIC RESEARCH AND ENGINEERING

What's the issue?

Genes direct the production and structure of proteins, the basic building blocks of body tissue, and the chemicals which drive the multitude of reactions which form the basis of life itself. By experimenting with them, it is possible that we will find cures for diseases such as cancers and cystic fibrosis, and be able to create completely new species. But although research in these new areas of biotechnology is still in its infancy, and we have seen few of the advantages or disadvantages yet, there is much public concern about the possible consequences, combined with a low level of public understanding of the facts.

There are two main areas of genetic research that currently cause ethical concerns:

- genetic engineering - the manipulation of genetic material for specific reasons, for example to clone organisms, or to genetically modify crops, or to create animals with human-compatible organs for transplantation. It is faster and more specific than traditional selective breeding. Some of this genetic manipulation is "transgenic", that is, it combines genes from different species, and so would be impossible without genetic engineering.
- genetic mapping, testing and therapy. Some diseases are caused by changes in genes, mutations, that result in a protein not being made at all or in the production of an abnormal protein. More and more is being discovered about which human genes are responsible for which characteristics, and what normal genes are like. This means that more diseases and disabilities will become detectable or predictable very early, sometimes even before birth. They may then be treatable by gene therapy, which can take the form of "somatic" therapy, which replaces a defective gene in a particular body tissue without affecting the reproductive capacity of the patient or future generations, or "germline" therapy in which new genetic information is injected into fertilised eggs and can be passed on to future generations. Currently, somatic therapies offer only short-term improvements in conditions; germline therapies offer better hopes of long term cures, but because of fears about their effects on future generations, they are illegal in many countries (including the UK). Many gene-related diseases are very complex, involving many different genes as well as environmental factors, or may not be treatable, and these factors also raise new issues in medical ethics.

The discussion begins with a cautiously optimistic article by a well known scientist, reprinted with the kind permission of The Evening Standard, where it was first published on 19/8/98, and the writer, who is a supporter of the BHA. Richard Dawkins is the Charles Simonyi Professor of the Public Understanding of Science at Oxford University. He has written extensively about scientific issues, most recently in Climbing Mount Improbable and Unweaving the Rainbow.

"Who's afraid of the Frankenstein wolf?" by Richard Dawkins

"To listen to some people, you'd think genetically modified foods were radioactive. But genetic engineering is not, of itself, either bad or good. It depends on what you engineer. Doubtless a malevolent geneticist could stick a poison gene into a potato. If we insert a gene for making oil of peppermint, we'll end up with peppermint flavoured potatoes. It's up to us.

There's nothing new about genetic modification. That's precisely what evolution is, and it's Darwinian evolution that put us all here. All plants, and animals including humans, are genetically modified versions of ancestors. Darwinian modifications are not designed; they evolve by natural selection - the survival of the fittest - which may or may not be good from our point of view. Mosquitoes are genetically modified to eat humans, which is good for them and bad for us. Silkworms are genetically modified to by natural selection to make silk, which is good for them and also good for us because we steal the stuff.

Most genes are placed where they are by natural evolution. We can achieve a little further adjustment by artifice, and here we at least have the opportunity to tailor changes that are good for us. We can selectively breed - a kind of artificial version of Darwinian selection which we've been practising for thousands of years. And we can genetically engineer. This is a technique that we're only just beginning to learn, and like all novelty it arouses fear.

Genetically engineered plants have been sensationally called Frankenstein plants. But traditionally bred domestic peas are 10 times the volume of their wild ancestors. Does this make them Frankenstein peas? The wild ancestors of corn cobs were half an inch long. Today a domestic cob may be one and a half feet long. Yet nobody accuses our forebears of "playing God" when they bred them. Are spaniels and whippets Frankenstein wolves?

Presumably selective breeding seems less sinister because it's a little older than genetic engineering. But both techniques are extremely young compared with the long history of Darwinian genetic modification that produced wild plants and animals in the first place. I am reminded of the

old lady who refused to enter an aeroplane, on the grounds that if God had meant us to fly He'd never have given us the railway.

Both natural selection (which gave us the maize plant in the first place) and artificial selection (which lengthened its cobs thirty-fold) depend on random genetic error - mutation - and recombination, followed by non-random survival. The difference is that in natural selection the fittest automatically survive. In artificial selection we choose the survivors, and we may also arrange cunning hybridization regimes. In genetic engineering we additionally exercise control over the mutuations themselves. We do this either by directly doctoring the genes, or by importing them from another species, sometimes a very distant species. This is what "transgenic" means.

And now, here's a potential problem. Natural selection favours genes that have had plenty of time to get adjusted to the other genes that are also being favoured in the species - the gene pool becomes a balanced set of mutually compatible genes (I explain this in a chapter called the "The Selfish Cooperator" in my forthcoming book, Unweaving the Rainbow). One of the problems is that the balance may be upset. Pekineses, bred to satisfy questionable human whims, have consequent difficulties with their breathing. Bulldogs have trouble being born. Transgenic importation of genes might raise even worse problems of this kind, because the genes come from a more distantly alien genetic climate, and the translocation is even more recent. This is a danger we must think about.

Genetic engineering is a more powerful way to modify life than traditional artificial selection, so the potential for danger is greater as well as the potential for good. Environmental dangers are likely to outweigh nutritional ones, mainly because knock-on environmental effects are so complicated and hard to predict. But some risks can be foreseen. Suppose there is an indiscriminate poison which is cheaper to produce than sophisticated selective weedkillers, but which cannot be used because it kills the crop along with the weeds. Now suppose a gene is introduced which makes wheat, say, completely immune to this particular herbicide.

Farmers who sow the transgenic wheat can scatter the otherwise deadly poison with impunity, thereby increasing their profits but with potentially disastrous effects on the environment. If the same company patents both the poison and its genetic antidote, the monopolistic combination would be a nice little earner for the company, while the rest of us would see it as a menace. On the other hand, enlightened genetic engineers might achieve exactly the opposite effect, positively benefiting the environment by reducing the quantity of weedkiller required. There is a choice.

Part of what we have to fear from genetic engineering is a paradox - it is too good at what it does. As ever, science's formidable power makes correspondingly formidable demand's on society's wisdom. The more

powerful the science, the greater the potential for evil as well as good. And the more important it is that we make the right choices over how we use it. A major difficulty is political - deciding who is the "we" in that sentence. If decisions over genetic engineering are left to the marketplace alone, the long-term interests of the environment are unlikely to be well served. But that is true of so many aspects of life.

Hysterical damners of genetic engineering in all its forms are tactically inept, like the boy who cried wolf. They distract attention from the real dangers that might follow from abusing the technology, and they therefore play into the hands of cynical corporations eager to profit from such abuse."

What is the humanist view?

Humanists, like other thoughtful people, are interested in the facts and the truth of the matter. They value reason, and knowledge for which there is evidence, such as the discoveries of scientists. Humanists tend to have a scientific outlook on the world, and recognise the huge contribution that science has made to our understanding of ourselves and the universe. But humanists also recognise that scientific discoveries are amoral - they increase our knowledge of the world, but they contain no moral values or indications of what we are to do with that knowledge. It is for technologists to show us how to apply scientific knowledge, and for society (and that means us) to decide whether to apply it.

Humanists seek to live good lives without religious or superstitious beliefs. They use reason, experience and respect for others when thinking about moral issues, not obedience to dogmatic rules. Because humanists believe that this is the only life we have, they believe in making the best of it. Because they do not believe in supernatural forces that will help humanity to solve its problems, they believe humans must use their knowledge and understanding to solve problems and make life happier. If specific scientific developments turn out to be for the good of humanity, then humanists would support them, unless they felt the costs (and this includes environmental and social costs, as well as economic) were too great.

Genetic research and engineering may have important contributions to make to human happiness and welfare. Members of society should try to understand as much about the science as possible, and then thoughtfully weigh up the possible consequences. This view of ethics is usually called "consequentialist", and the view that the only important consequence that should be considered is the effect on well-being or happiness is called "utilitarianism". Most humanists would judge the morality of an action by these criteria.

Almost all the potential benefits of genetic engineering have the potential

to cause problems. Getting hold of and understanding the facts, assessing the risks realistically, and balancing the possible benefits against the possible harms, must be the basis of ethical decision making.

A humanist would consider the following questions:

- **Where can we get reliable information?** If we are to make reasonable decisions about the uses and misuses of scientific developments such as genetic engineering, we need to understand the facts. But impartial advice on these developments is hard to come by. What are our soruces of information? How much do they really know? What biases and interests influence their pronouncements? Should we rely on: The media? Public opinion? Politicians? Scientists? Doctors? Religious leaders? The food industry? Environmentalists? Animal rights campaigners? Philosophers?
- **What are the potential benefits** for human health and welfare, for animal welfare, for food production, for the environment?
- **What are the potential problems** for human health and welfare, for animal welfare, for food production, for the environment?

Humanists want to see improvements in the quality of human lives, but, even when everything is take into account, it can be difficult to see whether some aspects of genetic science will or will not achieve this. Humanists think that open and well informed debate is essential, and that it should be based on good evidence and research, not irrational fears. Destroying well run experiments is unlikely to lead to better understanding, and tax-payers should be prepared to pay for research to be carried out by impartial scientists, as it is ultimately in their own interests. We should also distinguish between likely problems (for example, some of the environmental problems caused by GM crops) and those that are highly unlikely to arise because the science will be too complex and costly (for example, "designer babies"). Each development should be judged on its own merits and constantly reviewed as our knowledge increases, and until we are very clear about the risks and consequences, we should try to avoid choices from which there will be no going back. On the other hand, few human activities are without risk, and a small amount of risk may be justified if the gains are important.

The BHA has played a part in the debates on these developments, participating in Government committees and consultations on genetic issues, and presenting the arguments to students and members of the public as clearly as possible.

Questions to think about and discuss

- Find current examples of the benefits of genetic research and engineering, and think of developments which could realistically happen in the next ten years.
- Find current examples of problems caused by genetic research and engineering, and think of problems which could realistically happen in the next ten years.
- How much information about your own health do you want? Are there some things that it is better not to know? Or does knowledge give more control over one's life?
- Should others - employers, insurance companies, the police, family members - have access to personal genetic information?
- Should society fund research into very rare disorders?
- Are experiments on genetic material an ethical problem in the same way that experiments on people or foetuses or animals might be? Can one be cruel to genes?
- Current theories suggest that most of our inherited characteristics are the results of complex combinations of and interactions of genes rather than individual genes. How likely, then, are "designer babies"? Should we be worrying about them?
- What ethical issues do cloning or the possible creation of life in the laboratory raise? Make lists of the possible good consequences and possible bad consequences. (The relative length of the lists is not necessarily a guide to the right answer - if one of your bad consequences was, say, "The eventual destruction of all life on earth" you might feel that this outweighed numerous advantages.)
- What special ethical problems would the cloning of human beings raise? Do embryos have human rights? At what point do they acquire them? If all the potential health problems of clones were solved, would there be other, moral, objections to cloning human beings?
- Is therapeutic cloning different? Would it be right to use "stem cells" from very early embryos to treat diseases or grow spare parts? What should be done with spare or left over embryos?
- If a severely ill or disabled baby is not born, is this a good or bad consequence - for the family? for society? for the baby?
- What issues are raised by the possible patenting of genetic sequences or genetically engineered organisms?
- Are GM crops a huge scale experiment that we cannot afford? Or a necessary step towards solving some human problems? How much risk are you prepared to tolerate? Should one generation risk the health and welfare of future generations? Do humans always come first?
- "The precautionary principle" is a popular one - but many technological advances that we now find useful would not have been permitted if the precautionary principle had been invoked. Can you think of examples?

- How are you deciding your answers to these questions? What principles and arguments influence your answers?

How is the humanist view on this issue similar to that of other worldviews you have come across? How is it different?

Further reading:

On genetic engineering:
Issues : The Ethics of Genetic Engineering (Independence Publishers)

On ethics:
Simon Blackburn, *Being Good* (Oxford)
Jonathan Glover, *Causing Death and Saving Lives* (Penguin)
Peter Singer, *Practical Ethics* (Cambridge University Press)
Nigel Warburton, *Philosophy: the Basics* (Routledge)
Mary Warnock, (1998), *An Intelligent Person's Guide to Ethics* (Duckworth)

See also:
http://www.bioethik-diskurs.de/documents/Newstick/gen.ethix/gen.ethix_engl/view for Gen.ethix, a game about decision making on ethical issues raised by advances in biomedicine, the joint project of the German Research Group Bioethics & Science Communication, the German Human Genome Project and the University of Applied Sciences in Potsdam.

Human Genetics Commission: **www.hgc.gov.uk**