Theological Trends

ETHICS AND GENETICS

By BERNARD HOOSE

It was a dark, moonless night, and tiny pink elephants flew in a southerly direction, attracted by the brightness of the tobacco plants.

A PASSAGE LIKE THIS MIGHT be thought to be a description of a hallucinatory experience brought about with a little help from a powerful drug. On the other hand, it might not have anything at all to do with hallucinatory experiences. It might instead be the sort of thing that some people would seriously expect to result from genetic engineering in the – perhaps far distant – future. One part of the fantasy, however, has apparently already been realized. A few years ago, it seems, scientists removed genetic material from fireflies and put it into tobacco plants, with the result that these plants glowed in the dark.

Genetic manipulation in animals and plants

Pink flying elephants – big or small – might not generally be regarded as useful things to aim at producing. Other results of genetic manipulation in the animal and plant worlds, however, could, we are told, bring enormous benefits to humans. We hear, for instance, of proposals to produce medicines in cows' milk and in the saliva of rats. Other proposed projects concern the production of pigs that are fast growing and lean, tomatoes that rot slowly and plants with built-in resistance to pests or tolerance to weed killers (or both). Such results can be expected from genetic manipulation because genes are those minute parts of the cells of a living creature which are responsible for that creature's characteristics such as size and colour.

Although it is conceivable that innumerable benefits for humankind might result from such manipulation of genetic material, we would do well to temper our enthusiasm by reflecting on various other scientific advances which have brought remarkable benefits and in addition, it would seem, holes in the ozone layer, pollution of various kinds, the destruction of many species, and so on. Our record regarding such matters is quite evidently far from unblemished. It would seem, therefore, that even a purely consequentialist approach to the ethics of genetic manipulation would result in calls for extreme caution.

Genetic manipulation in humans

In spite of widespread concern for animal welfare, the matters mentioned so far are probably not among those that arouse the greatest controversy. That would seem to be reserved for genetic manipulation carried out on humans. The projects already begun in this sphere and those envisaged as likely to

materialize in the future are usually classified under the following four headings: somatic cell gene therapy; germ-line gene therapy; enhancement genetic engineering; and eugenic genetic engineering.

The first mentioned in this list concerns the correcting of genetic defects in the body cells of a patient. Treatment of the reproductive cells is not included. Trials involving this kind of therapy began a few years ago. The first involved a little girl suffering from a very rare immunodeficiency disease which results from the absence of the gene responsible for the production of an enzyme called adenosine deaminase (ADA). Normal ADA genes had been cloned in the laboratory. The aim was to get these genes into those white blood cells in the girl's body known as T lymphocytes, which form part of the immune system. In order that this could be done, the genes were inserted into murine (mouse) leukaemia retroviruses[1] which had first been rendered harmless. Some T lymphocytes were extracted from the girl's body. The viruses then acted as a transport system to carry the missing genes into the cells. The modified cells were then grown in culture and transfused into the little girl's body.

Some serious questions regarding the ethics of this procedure had to be faced before the trial could begin. What, for instance, were the chances of causing cancer? This, of course, was important, but such risks are not limited to gene therapy. They also have to be taken into account where some other kinds of therapy are concerned. Another matter that demanded serious consideration was the possibility that, although rendered harmless, the virus being used might combine with other material (perhaps another virus) in the girl's body to form a completely new pathogenic and highly infectious virus.[2] It seemed to me, pondering these issues shortly before the first trial began, that, if research showed the chances of producing a pathogenic and infectious virus were negligible, and that the risk of cancer was only very slight, the employment of such therapy could be morally acceptable in certain cases in which the patient's condition was life-threatening and in which we had every reason to believe that she would benefit. Similar therapy, I thought, could be extended to other categories of patients as further developments regarding science and safety take place.[3]

Even if somatic cell gene therapy were carried out successfully, however, the genetic defect concerned could still be passed on to future generations. To overcome that problem, we would need germ-line gene therapy. In other words, the genetic correction would also have to be made in the reproductive cells of the patient. This is obviously desirable, but it would be unethical to rush headlong into such procedures because any mistakes made could be passed on to offspring. It may be that, one day, scientists will acquire sufficient information and expertise to be able to indulge in such therapy without causing adverse effects to the gene pool. Until then, however, more than a little caution is called for. Recently, James V. Neel wrote: 'To me, as a population geneticist, germ-line gene therapy represents the ultimate in the manipulation of the biological order. Let's for once take our time.'[4]

The third category listed above is enhancement genetic engineering. Some years ago, W. French Anderson, one of the world's leading geneticists, pointed

out that too little was known to be able to understand the effects of trying to alter the genetic machinery of a human being. He noted that there are people in the United States who give growth hormone to their normal sons in order to produce very large football- or basketball-players. He questioned the wisdom of this practice.

> But even worse, why would anyone want to insert a growth hormone *gene* into a small child? Once it is in, there is no way to get it back out. The child's reflexes, coordination, and balance might all be grossly affected. In addition, even more serious questions can be asked: might one alter the regulatory pathways of cells, inadvertently affecting cell division or other properties? In short, we know too little about the human body to chance inserting a gene designed for 'improvement' into a normal healthy person.[5]

Writing some time later, but acknowledging that nothing had since happened to cause me to disagree with Anderson, I nevertheless considered the possibility of a movement away from complete prohibition some time in the future if an enormous increase in knowledge were to warrant such a change. One supposes that the immediate reaction of many people to the prospect of enhancement genetic engineering would be to say that it is not really therapy. It is not difficult to imagine, however, that some forms of dwarfism or gigantism might be experienced as maladies by some people. Another candidate, it seemed to me, could be appalling ugliness if it, or the reaction of other people to it, were a cause of great suffering.[6]

Mention eugenic genetic engineering in some quarters and you are likely to provoke copious reminders of the Nazi regime, coupled with warnings about the quest for a super-race and the culling of the imperfect. One imagines that most – hopefully, all – of the scientists working in the field of genetics share none of Hitler's motives or intentions regarding such matters. The danger that genetic élitism might somehow appear on the scene, however, is a very real one. The situation already existing in many parts of the world with regard to race, colour, gender, education and economic status provides sufficient warning against naïveté in this regard. A few years ago, Richard McCormick wrote of eugenic genetic engineering thus:

> This refers to the systematic preferential breeding of superior individuals (genotypes). It involves the attempt to intervene genetically to select for character traits, intelligence, various talents and mental and emotional characteristics. Scientifically, such proposals are sheer fantasy because the traits in question are probably influenced by many unknown genetic factors. Furthermore, such genetic backgrounds interact with the environment in as yet very mysterious ways. Ethically, the matter is quite straightforward, and it is all bad. What characteristics are to be maximised to get a 'better' human being? Is brighter

> necessarily better? Or, more pointedly, is white skin preferable to yellow or black? And who decides all of this? Questions like this point inevitably to the wisdom of C. S. Lewis's assertion: 'The power of man to make himself what he pleases means, as we have seen, the power of some men to make other men what they please'.[7]

Playing at God?

One often hears the expression 'playing at God' in reference to genetic manipulation. The implication would seem to be that the mere applicability of this label renders the activity concerned morally wrong. Before arriving at such a conclusion, however, one needs to ponder a little just what 'playing at God' means. If we are merely discussing human activity which is aimed at improvement in the physical or mental condition of a person, or both, we can say that the whole science of medicine is about playing at God. If we are discussing interference in nature to improve our lot more generally, then we can say that a very large percentage of all human activity is classifiable as 'playing at God'. Nothing in any of this, however, is a sufficient indicator of immorality. In fact, there would seem to be a good case for saying that it is natural for humans to 'play at God'. That does not mean that we should somehow set ourselves up as rivals to God, a somewhat weird notion, anyway. It means rather that we are creative creatures with a capacity for love and a sense of responsibility for ourselves and others. We may not always use our creative capacities well, but we need some criterion other than 'playing at God' to help us decide whether or not a particular use of those capacities is morally wrong.

Abandonment of the divine-sovereignty argument, however, does not mean abandoning ourselves to the clutches of consequentialism. For instance, the four-principles approach to medical ethics developed by Tom L. Beauchamp and James Childress could be useful here. In the words of Beauchamp:

> The principles included in the framework are:
> 1. Beneficence (the obligation to provide benefits and balance benefits against risks).
> 2. Non-maleficence (the obligation to avoid the causation of harm).
> 3. Respect for autonomy (the obligation to respect the decision-making capacities of autonomous persons).
> 4. Justice (obligations of fairness in the distribution of benefits and risks).[8]

Stated in this way, of course, none of these principles can be expected to supply crystal clear answers to all moral dilemmas in the sphere of human gene therapy or, indeed, in any other branch of medicine. In considering the second, for example, we need to bear in mind that, in some cases, a minimum of pain or discomfort (and, in the case of surgery, mutilation) may be unavoidable. Moreover, there are cases in which the demands of these four principles appear to be in competition with each other. Taking them into account, however,

would seem to be a prerequisite for any attempt to achieve what is the best that can be achieved for all the people concerned in any case. Underlying all of them is the notion of respect for human dignity.

Sex-selection

It has become common in the sphere of environmental ethics to stress the importance of the effects of our actions on future generations. We have already seen that this could be an important consideration where germ-line gene therapy is concerned. Sex-selection, whether brought about by means of genetic manipulation or by aborting foetuses of the undesired gender, also warrants investigation because of its effects on the as yet unborn. We hear that in some parts of the world, where there is a clear preference for male children, there could be considerable imbalance between the sexes as a result of such interference. Steve Jones writes:

> The Indian government recently shut down clinics which chose the sex of a baby by looking at the chromosomes of the foetus – and aborting those with two Xs. More than two thousand pregnancies a year were ended for this reason in Bombay alone. The main reason was the need for large dowries when daughters were married off. The clinics advertised with slogans such as 'Spend six hundred rupees now, save fifty thousand later'. The effect is not trivial. India is one of the few countries of the world where there are fewer females than males – four girls to five boys in some states – and, because of infanticide and selective abortion, there is an overall deficit of Indian girls and women equivalent to the whole British female population.[9]

It is difficult to foresee quite how disastrous the effects of the resulting imbalance could be if left unchecked. One thing that does seem to be predictable, however, apart from an amazing reduction in population size and a decrease in the appreciation of women as persons, is an absence of gratitude toward the previous generation on the part of men deprived of female companionship. Nevertheless we should perhaps note that serious arguments have been put forward in favour of sex-selection – although not on the enormous scale that cultural preference for male children might produce in some countries. There are certain genetic diseases which are sex-related because they are caused by genetic defects in the X chromosome. Women normally have two X chromosomes – one from each parent – whereas men have only one. Robin McKie notes:

> Trouble occurs when a defective, usually recessive, gene appears on the X chromosome. When passed to a boy from his mother (fathers can only give Y chromosomes to their sons), there is no second X chromosome with a normal gene to offset his troublesome X-linked one. He is then affected by an X-linked genetic disorder. But a girl has another X

> chromosome, which carries a dominant, normal gene, and is therefore unaffected by the condition. She can, however, become a carrier.[10]

Such diseases can be distressing. Two of the better-known ones are muscular dystrophy and haemophilia. Some people might opt for abortion if tests showed that a male foetus was carrying the gene responsible for such a disease. Obviously, any consideration of such a course of action would bring into play all the usual arguments about killing the innocent, but what if there are other ways of effecting sex-selection? Steve Jones mentions using only X-bearing sperm as a technique which may be acceptable to people who are opposed to abortion.[11] If such sperm selection were part of an *in vitro* fertilization procedure, many people would still have objections on the grounds that such procedures often involve wastage of embryos. The Congregation for the Doctrine of the Faith, furthermore, is opposed to artificial insemination even where the sperm used is that of the woman's husband. The reason given is that such a procedure effects a separation between the unitive and procreative aspects of sexual intercourse in marriage.[12] Not everybody, of course, will be convinced by such an argument. Moreover, it is at least conceivable that genetic scientists will, some time in the future, find ways of selecting the gender of offspring which do not run into the traditional objections of the Congregation. Whatever one makes of all that, it does seem that the arguments in favour of opting for female children in order to avoid diseases deserve far more serious consideration than cultural preference for males.

Genetic screening

Abortion is not the only ethical problem likely to arise from tests on individuals such as those mentioned above or from genetic screening. An example is confidentiality. As is the case with other matters associated with the world of medicine, there is an obligation to preserve confidentiality in so far as it is reasonable to do so. Some other problems likely to arise are associated with insurance and the workplace. How much information, for example, can insurance companies and employers reasonably demand? Clearly, such questions are not easily answered. Much may depend upon circumstances. One may incline, rather simplistically, towards saying that insurance companies should have no powers to demand any such information. What should happen, however, if enormous life insurance policies are taken out precisely because of information gained from screening by the insured? In taking into account what is best for all concerned, we would surely need to take into account what is good for the insurance company. After all, even insurance companies can collapse or at least suffer severe financial crises with subsequent bad effects on many people.[13]

Cloning

Some consternation was caused in 1993 when it was announced that scientists at George Washington University in the United States had cloned

human embryos. Put simply, the technique involved 'splitting' an embryo into identical twins, triplets or quads. In carrying out this experiment, the scientists concerned apparently had nothing in mind other than increasing the chances of pregnancy resulting from *in vitro* fertilization. However, apart from the obvious difficulties attached to what happens to unused or defective embryos, numerous questions of an ethical nature were quickly posed. Would it not become possible, for instance, for prospective parents to choose a frozen embryo on the grounds that it is genetically identical to a child that they have seen? Some went on from this to talk about the possibility of something like a supermarket in embryos. It was also pointed out that a woman could give birth to her own twin.[14] Some of the questions raised in the debate about cloning were also presented recently in debate about the possibility of using the eggs of aborted foetuses to help infertile women if some method of maturing the eggs could be found. Whatever other doubts we may or may not have about any of these techniques, it seems to me that one matter which must be given great weight is the possibility of causing psychological confusion or distress in the people who will be born as a result of using those techniques.[15]

What next?

Wonderful things could result from advances in the field of genetics. We would be foolish, however, to ignore the possibility of some rather nasty things resulting too. Assertions that we should stop 'playing at God' may not be well founded, but it seems to me that we would do well to reflect a little more than has been our wont so far on how to use our creative abilities wisely in order to promote the true flourishing of humankind. We would also do well to remember that such flourishing can only take place in an atmosphere of respect for the rest of creation.

NOTES

1 Retroviruses contain RNA. Well-known examples are HIV1 and HIV2. Robin McKie writes: 'All viruses replicate by inserting genetic material into the genes of host cells, but retroviruses are particularly efficient at this – hence their popularity among gene therapists'. *The genetic jigsaw: the story of the new genetics* (Oxford: Oxford University Press, 1988), p 126.

2 One of the team involved in the first trial was Dr W. French Anderson. He addressed the subject of the safety of retroviral vectors in an editorial in the scientific journal *Human Gene Therapy* in February 1993.

3 See Bernard Hoose, 'Gene therapy: where to draw the line' in *Human Gene Therapy* 1 (1990), p 301.

4 James V. Neel, 'Germ-line gene therapy: another view' in *Human Gene Therapy* 4 (1993), p 128.

5 W. French Anderson, 'Human gene therapy: scientific and ethical considerations' in *The Journal of Medicine and Philosophy* 10 (1985), p 288.

6 B. Hoose, *op. cit.*, pp 302–303.

7 Richard A. McCormick, *The critical calling: reflections on moral dilemmas since Vatican II* (Washington DC: Georgetown University Press, 1989), pp 266–267.

8 Tom L. Beauchamp, 'The "Four-principles" approach' in Raanan Gillon (ed), *Principles of health care ethics* (Chichester: John Wiley & Sons, 1994), p 3.

[9] Steve Jones, *The language of the genes: biology history and the evolutionary future* (London: Flamingo, 1994), pp 14–15.
[10] Robin McKie, *op. cit.*, pp 33–34.
[11] Steve Jones, *op. cit.*, pp 15 and 16.
[12] Congregation for the Doctrine of the Faith, *Instruction on respect for human life and its origin and on the dignity of procreation*, II, 4.
[13] For a lengthy discussion of such matters, see Nuffield Council on Bioethics, *Genetic screening: ethical issues* (London, 1993). Raanan Gillon has criticized the report for what he calls 'the relative lack of academic rigour of its argument and justification for its conclusions'. See 'Ethics of genetic screening: the first report of the Nuffield Council on Bioethics' in *Journal of Medical Ethics* 20 (1994), p 67.
[14] For an interesting and readable report on the experiment and its immediate aftermath see Philip Elmer-Dewitt, 'Cloning: where do we draw the line?' in *Time* (8 November 1993), pp 63–68.
[15] For a longer discussion on the subject of the use of eggs from aborted foetuses, see Bernard Hoose, 'Who is my mother?' in *The Month* 255 (1994), pp 118–121.