AUSTRALIAN PERSPECTIVES ON EMBRYO EXPERIMENTATION: AN UPDATE

CHRISTINE EWING
FINRRAGE (Australia), P.O. Box 248, East Kew, Victoria, 3102 Australia

The debate in Australia about human embryo experimentation has largely focused on the moral status of the embryo. This focus on the disposition of embryos is encapsulated in the Victorian Infertility (Medical Procedures) Act (1984). The Act provides for approved experiments on embryos designated as spare or excess, that is, those that are not created specifically for the purposes of experimentation. In 1987, amendments were made to the Act to include provisions for experimentation on presyngamous[1] embryos, created specifically for the purposes of destructive embryo experimentation. Discussion which centres on the embryo itself as a separate entity have masked two central aspects. First, embryo experimentation is only possible because eggs are taken from women's bodies during an experimental and rarely successful procedure called in vitro fertilization (IVF),[2] or from women undergoing sterilizations (so-called *donor women*). Second, the genetic screening, selection, and reimplantation of embryos based on their genetic quality is inherently eugenic (Ewing, 1988).

The term *genetically defective* implies that there are those of us who are genetically inferior, and by inference, that there is genetically superior condition. It is often argued that technology such as genetic screening is value free or neutral, and that it can then be used or abused. But techniques of embryo screening and selection are developed with a eugenic intention—they are *designed* for eugenic outcomes, that is, only *genetically perfect* embryos will be selected in the embryo transfer stage of IVF. The intention is to get rid of bad genes from the human population. In the language of eugenics, it is to increase the reproduction of fit individuals. Indeed, leading French IVF expert, Jacques Testart, when referring to the screening of IVF embryos for genetic diseases or for sex, said: "If we have such techniques we can use them for many things. Eugenics is not far away. I think it is better to abandon the technique than to take the risk" (Walgate, 1986, p. 385).

Melbourne IVF scientists have said publicly that they are not interested in genetic manipulation of embryos for correction of defective genes (germ line gene therapy). However, there *is* no qualitative distinction between genetic screening and genetic manipulation. Through genetic screening, embryos which are considered abnormal will be thrown away. The rationale and its ends are the same for both screening and gene therapy—to eliminate undesirable genes from the human population. Ultimately, however, it is likely that when scientists consider gene manipulation techniques are sufficiently developed to correct embryos with problem genes, they may argue for its use ostensibly to appease community concerns about the discarding of embryos.

Indeed, genetic manipulation and screening of embryos or gametes has been on the agenda ever since IVF began. Dr. Alan Trounson, Australian IVF scientist, has previously stated that the screening or manipulation of IVF embryos to overcome genetic disease is still on the agenda:

> There are many more complex situations that require the development of sophisticated

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> methods such as DNA insertion by techniques of genetic engineering to overcome genetic diseases, and the sexing of human embryos for cases of sex-linked genetic disease. (Trounson, 1982, p. 62)

Dr. Anand Kumar of the Institute for Research and Reproduction in India sees that IVF technology will have beneficial effects in medicine as a whole, especially in the treatment of inherited diseases by gene manipulation of embryos (Jayaraman, 1986).

THE NECESSITY OF SUPEROVULATION FOR EMBRYO RESEARCH

Embryo experimentation is only possible through the process of IVF, which brings human gametes into the laboratory environment for the creation of embryos. Particularly, it relies on a continuing supply of oocytes from women, obtained by the administering of superovulatory drugs and invasive surgery for egg collection. Superovulatory drug and hormone regimes may pose serious health risks for women undergoing IVF. The adverse effects of clomiphene citrate, routinely used as part of superovulation, have been extensively documented (Klein & Rowland, 1988). Adverse effects of superovulation reported in some women are hyperstimulation of the ovaries, ovarian cysts, and possible cancers. A new drug, buserelin, on trial in Australian IVF programmes has been promised to yield much higher pregnancy rates (Miller, 1989). Buserelin is an agonist of LH-RH (luteinizing hormone-releasing hormone). It works by desensitizing the pituitary gland and induces an artificial but reversible menopause, that is, buserelin blocks the natural production of hormones by the woman that are necessary to induce ovulation. It can induce hot flushes and other menopausal symptoms in women. Following the administration of buserelin, other exogenous gona-dotrophins are given to induce ovulation. However, prior to the blocking of hormone production, buserelin can actually *stimulate* the production of LH-RH hormones. This is a very dangerous effect called flare-up, and may lead to hyperstimulation and cysts on the ovaries. A second hyperstimulation may occur after the administration of the egg-releasing hormones in the same cycle (Laborie, 1988).

The use of buserelin as an agent in superovulation means that egg collection can be programmed for convenience of medical staff. It also reportedly yields a greater number of eggs per cycle than previous drug regimes. British IVF teams have been using buserelin in IVF programmes and see the greater egg harvest as facilitating the use of preimplantation diagnosis:

> An important advantage of treatment with buserelin is that large numbers of fer-tilisable eggs are produced during one cycle of treatment. This will allow the simultaneous screening of many zygotes for single gene defects for preimplantation diagnosis. (Rutherford et al., 1988, p. 1768)

EMBRYO EXPERIMENTATION IN VICTORIA

Victoria was the first locality in the world to enact legislation pertaining to experimentation on human embryos. A distinction was made in the Infertility (Medical Procedures) Act (1984) between destructive and nondestructive experiments, and between spare embryos and those created specifically for the purposes of experimentation. Since 1985, IVF scientists at Monash Medical Centre have sought permission to perform destructive experiments on embryos created by a procedure called microinjection. A sperm is injected directly into an egg in the laboratory, because the sperm is weak or defective and unable to fertilize the egg. In clinical practice, microinjection is supposed to alleviate male infertility. Before attempting the clinical use of microinjection on couples on IVF programmes, the scientists wanted to examine the embryos to see if their chromosomal status was normal. Following this request, the Victorian Standing Review and Advisory Committee on Infertility deliberated at length, and, in 1987, amendments were made to the Act which allowed approved experiments on embryos (deliberately created for experimentation) up to the point of syngamy. In April 1988, prior to the full proclamation of these amendments, it was discovered that the IVF team had already begun to proceed with the microinjection technique with

couples on the IVF programme (Pirrie, 1988). The IVF team were ordered to stop using the procedure by the then Health Minister, David White, as it contravened the spirit of the Victorian law, that is, the Standing Review Committee should have approved the use of a new procedure relating to the alleviation of infertility. Undoubtedly frustrated at not being allowed to perform experiments on embryos created by microinjection, the scientists decided to bypass this restriction and attempt to transfer the embryos directly to women in their IVF programme. Once the embryos were created and implanted, the developing foetus could be monitored by ultrasound throughout the pregnancy, and Professor Carl Wood advocated therapeutic abortion if a defective foetus was discovered (Pirrie, 1988). This outrageous proposal showed very little concern for the women involved. It also clearly reflected their view that women can freely be used as vessels to test the success of their experiment of creating embryos by microinjection. It may also be argued that the use of microinjection in a clinical setting appeared to bring pressure to bear on the Minister to fully proclaim the Act, with respect to the provisions for destructive presyngamous embryo experimentation.

The IVF scientists had their way because the Standing Committee approved the microinjection embryo experiments using 80 human embryos. Before approval, however, Dr. Trounson collaborated in setting up the microinjection experiments at a private IVF clinic in Sydney. In New South Wales, there are no laws to prevent or regulate human embryo experimentation (Downie, 1988). The approval of these embryo experiments in Victoria set a questionable precedent because of the likelihood that other types of embryo experiments would be approved in the future. A technique developed at Monash Medical Centre, at present using mouse embryos, is embryo biopsy. It involves removing one cell from an early embryo and analysing the genetic material from that cell to determine whether the embryo is carrying genetic or chromosomal aberrations. The remainder of the embryo is presumably able to develop normally. As predicted, the Standing Review and Advisory Committee approved experiments to use embryo biopsy to test for genetic defects in human embryos before transferring them to patients (a euphemism for women) in IVF programmes (Pirrie, 1989). The tests are to be carried out on a batch of two-day-old (four-celled) embryos formed from eggs that have taken longer than normal to fertilize. The controversy which followed this decision was concerned with the fact that the embryos were two days old, and therefore outside the time limit (22 hours) for experimentation set down in the amendments to the Victorian Act. However, if the embryos are called *spare,* that is, not specifically created for purposes of experimentation, then there is no inconsistency with the legislation. (It is still unclear whether the experiments will go ahead based on how the legislation stands at present. Caroline Hogg, the Minister for Health in Victoria, imposed a voluntary moratorium on postsyngamy embryo experimentation in 1989, subject to a review of community opinion to be conducted by the State's Standing Review and Advisory Committee on Infertility.) The distinction between spare embryos and those created specifically for experimentation is one made for expediency. The creation of embryos, spare or otherwise, relies on the fact that women are superovulated to produce many eggs and therefore many embryos. Debates and concerns focused on the moral status of the embryo perpetually keep women invisible in the issue—they are merely the source of eggs on which embryo experimentation relies (Rowland, 1987).

At present, the proposals for embryo biopsy experiments by the Centre for Early Human Development at Monash Medical Centre are confined to embryos created from eggs that have taken longer than normal to fertilize. Professor Carl Wood said that about 3% of IVF embryos had delayed fertilization, and at present these embryos are not transferred to patients because of a risk that such embryos carry genetic abnormalities. If embryo biopsy could identify which embryos were healthy, he said, then they could be saved and used by patients instead of being wrongly discarded (Pirrie, 1989). Therefore, the apparent motive is to save this small number of embryos. However, it is shortsighted to believe that that embryo biopsy and genetic analysis in future will not be used to select out and discard embryos which carry specific genetic diseases, such as Huntington's disease, muscular dystrophy, cystic fi-brosis, etc. Genetic probes for such diseases have already been developed and are used in association with amniocentesis and chorion villus biopsy. For some diseases, however, the probes are based on marker

genes, that is, segments of DNA that are located close to and may be inherited along with the so-called disease gene, which remains unknown. The error margin in diagnosis using marker gene probes is considerable. But Dr. Robert Winston from the Hammersmith Hospital IVF clinic in London is reportedly already offering services to detect certain hereditary disease genes in IVF embryos for couples who have a risk of passing on genetic diseases to their offspring (Vines, 1989). The Hammersmith group have also been able to determine the sex of three-day-old pre-implantation IVF embryos by amplification of Y-chromo-some segments in the genetic material of one cell taken from the early embryo. The first sex determination test for early human embryos, developed in Edinburgh, used a Y-chromosome probe and also involved the destruction of the embryo (West et al., 1987). The new test developed at the Hammersmith Hospital does not require the use of a genetic probe and leaves the remainder of the embryo intact.

FEMALENESS AS A GENETIC DEFECT

Sex determination of foetuses by amniocentesis or of embryos using the biopsy technique is an issue of great concern. While scientists have maintained that the sexing of embryos applies to cases of sex-linked genetic disease, clearly it offers the opportunity for selection of embryos solely on the basis of sex. Dr. John West, from the Edinburgh team which developed the first test for sex determination of human embryos, said that it would not be ethical to use the test for sex determination, but he admits, "we couldn't prevent the technique from being used in that way" (Johnston, 1987, p. 547). We already know that in some countries, female foetuses are aborted in the thousands. Following the introduction of amniocentesis into India in 1975, it rapidly became a commercially available test used almost exclusively for sex determination, followed by selective abortion of female foetuses. It is estimated that 78,000 female foetuses were aborted in India between 1978 and 1983 (Forum Against Sex Determination and Sex Pre-Selection, 1989). This practice, combined with the long legacy of female infanticide, has lead to an alarming decrease in the ratio of females to males in India. There are many male-preferring societies, including Western societies, and female feticide is practiced in Western countries too, albeit disguised. A newspaper report last year revealed that in Sydney, foetuses of a sex unwanted by the parents were being aborted following chorion villus biopsy tests (West, 1988). Similarly, in Britain there have also been reports of selective termination of foetuses following amniocentesis based on learning their sex (Hulten et al., 1987).

CONCLUSION

The rapid technical developments in genetic and reproductive technology research may well provide the justification for genetic screening (and possibly genetic manipulation) of human embryos to eradicate genetic disorders. Moreover, the techniques contain and reflect the values of our society that does not seek to deal with the issue of disability, but rather eliminate it. The nature of this research is eugenic because the aim is to apply genetic screens to select which embryos are implanted, and therefore which babies are born. As the number of genetic probes for diseases rapidly expands, the window of normality will become narrower. In addition, multinational companies involved in genetic engineering technology are spending millions of dollars in developing gene probes to diagnose diseases. The creation of a market for these probes is essential to justify the expenditure. More and more probes for so-called defective genes will become part of this enterprise. Dr. Anne McLaren, British embry-ologist, has already suggested that any couples who fear passing on defective genes to their offspring should either use IVF with preimplantation diagnosis, or have the embryo flushed from the woman's uterus and screened (McLaren, 1987). More and more women will be pressured to use these dubious technologies. And finally, of course, it will be women who test the product—only when women have carried their children to term with science know if its manipulation and intervention have succeeded. What will the cost be? Will science foot the bill if it has failed?

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ENDNOTES

1.*Syngamy* is defined in the Victorian Infertility (Medical Procedures) Act as the point when the pronuclei of the egg and sperm fuse. This occurs at about 22 hours after the sperm enters the egg.

2.The Commonwealth Report on Funding to IVF (Department of Community Services and Health) 1988 estimates a success rate of live births per treatment cycle as 8.8%. The rate for "unproblematic" births was put at 4.8%.

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130 CHRISTINE EWINGMiller, Calvin. (1989, May 2). IVF drug boosts pregnancy rate. *The Herald* (Melbourne), p. 5.

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