

There are more things in Obstetrics and Gynaecology, Horatio, than are dreamt of in your Philosophy – Part II

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Abstract

This paper will review contemporary advances in fertility and sterility and future prospects for the treatment of such conditions.

Treatment options

New sciences and technologies can have unintended consequences, and certain possibilities relating to infertility and its management are quasi-science-fictional, raising awkward ethical issues. For example, the administration of drugs to induce ovulation is now routine, while surgery to reopen blocked Fallopian tubes is also possible. In vitro fertilization (IVF) in which eggs are removed from a woman, fertilised and then placed in the woman's uterus, bypassing the Fallopian tubes, is now routine as well, and babies produced in this way are popularly known as test-tube babies. Gamete intrafallopian transfer (GIFT) involves the harvesting of ova from the woman that are then placed in one of the Fallopian tubes along with the partner's sperm, allowing fertilization to take place inside the woman's body. Zygote intrafallopian transfer (ZIFT) is slightly different in that the ovum is fertilised externally (as in IVF) and then placed in the woman's Fallopian tubes rather than the uterus. Ovum donation from another woman, who may or may not be related, in combination with IVF, GIFT or ZIFT is also possible if a woman's own ova are unusable or if she has a heritable genetic condition which she does not want to run the risk of passing on to her offspring.

Intracytoplasmic sperm injection (ICSI) is a revolutionary process in which a single sperm is injected directly into a harvested ovum, and the zygote is then implanted using

IVF techniques. ICSI has completely reversed the approach to male infertility with very few cases of male infertility remaining untreatable. Even men who can only produce few sperm that are poorly twitching and completely morphologically abnormal can avail themselves of this technique to ensure fertilization and pregnancy. Success rates for this procedure are comparable to IVF in men with normal sperm counts. In the few cases where even ICSI is not possible, insemination with donor sperm remains a possibility. If a woman is completely unable to gestate, it is possible for a surrogate mother to carry a baby to term on a couple's behalf.¹

Even more extraordinary scenarios can be contemplated. For example, while posthumous births are common, with the father of the child dying after conception, posthumous reproduction is now also feasible, extending fertility literally beyond the grave. This has been made possible by sperm cryopreservation, a technique that has many applications such as the storage of undamaged sperm from men prior to undergoing radio- or chemotherapy for malignancy, should they wish to have children in the future, with the possibility of using such sperm even if the disease is fatal.² Moreover, it is also possible to harvest sperm from freshly deceased individuals.³ Cryopreservation has recently also been applied to ovaries and to ova, and with in-vitro fertilization and host mothering, it is theoretically possible to conceive and give birth to a child who has no living biological parents.⁴ These techniques raise not only ethical quandaries, but also issues of legitimacy and inheritance, while the economic and psychological burdens on a child who is

the product of posthumous reproduction remain uncertain.⁵

Even more fantastically, recent research has shown that mammalian testicular tissue, for instance, from monkeys, goats and pigs, can be grafted onto mice with the production of viable sperm identical to that which would be produced by the donor species. In theory, human testicular tissue grafted on to mice would also produce sperm. This technique could benefit prepubescent boys undergoing treatment for cancer that would render them sterile. Such tissue would rapidly mature in response to the host animal's androgenic hormones and the sperm produced could theoretically enable a boy to become a father before he reaches puberty.⁶ It is worth noting at this point that many science-fiction stories have plumbed equally fantastic scenarios and the fictional cautionary encyclical by Pope Alexander VII set in the future year 2043 with regard to actualities that, for example, include the male production of sperm that is not of the individual himself, or the carrying to term of fetuses that are bizarrely and capriciously manipulated in-utero, in Greg Bear's *Slant* (1997), ends with 'a warning that sounds like a curse: As you sow, so shall you reap!' an admonition that we should consider the consequences of our action.⁷

Issues

More urgent problems raised by infertility treatments include the tendency for such procedures to yield premature babies,⁸ especially in association with multiple births, particularly when three or more embryos are implanted after IVF or ISCI, or after multi-ovulation following ovarian chemical hyperstimulation during artificial or intrauterine insemination,

as complete control over numbers of released ova following such ovarian stimulation is not possible.⁹ Such babies are far more likely to suffer from medical complications that bear significant morbidity and mortality, with high financial costs to society. For example, mortality rises from 5% among infants born at 31 weeks of gestation to 56% at 24 weeks of gestation.¹⁰ This has ethical implications in the allocation of very finite resources in modern health care systems, especially when the treatment of such infants may result in significant, long-term or permanent morbidity with a poor quality of life.¹¹

Such babies are also more prone to congenital defects¹² and genetic/ chromosomal anomalies,¹³ raising additional ethical issues. The frequency of multiple births in this situation is best controlled by implanting only one or two embryos, and this has become formal legislation in Sweden since 2003.¹⁴ Ironically and paradoxically, a large number of multiple births will result in the very premature delivery of tiny babies, possibly under 1kg in birth weight, that are extremely small even for their gestational age, and the selective abortion of several of these babies may have to be carried out in utero in order to increase the chance of the remaining fetus/es being carried closer to term, a termination that falls within the parameters of abortion legislation and that is paradoxically carried out as part of the treatment of infertility.¹⁵

Moreover, these advanced assisted reproduction techniques frequently result in the creation of excess (three or more) embryos. Such supernumerary embryos are initially cryopreserved and if not used by the couple, are later discarded or used for scientific investigation such as stem cell research.¹⁶ While some religions, such as Catholicism, take the extreme view of frowning on almost all fertility treatments, many others would argue that this is equivalent to an abortion and at best, a waste of potential life.¹⁷

Even more worryingly, in species' survival terms, are scientists' concerns that males born by ICSI may inherit their fathers' infertility problems? It

has been estimated that even if only half of infertile men were to use ICSI to father children, then the incidence of significant male infertility could double in developed countries within seven generations, a truly science-fictional prospect.¹⁸ IVF is now so commonplace that it is also being used to boost the numbers of endangered species, such as pandas in China, a truly ironic situation stemming from a country wherein the populace is strictly schooled to a one-family, one-child concept.¹⁹

Prospects and possibilities

Most of the above scenarios and extrapolations are ably summarised by Baker in *Sex in the Future* (1999), who prophesies that

[d]uring the first half of the twenty-first century, the divorce of sex from reproduction – which is currently nisi – is expected to become absolute. The result will be [...] an ever-burgeoning range of reproductive choices. The latter will be as varied as the menu of a good restaurant [...]. At first, only the infertile will benefit from the full menu, but there will no stemming the demand for equality from the fertile [...] should a couple use sperm and eggs to reproduce? [...] freshly collected or banked? Or [...] manufactured gametes, derived from cell lines they banked at puberty? [...] with somebody they know? [...] Or [...] purchase the gametes of someone famous – or even dead? [...] or parent a clone? Should they reproduce with somebody of the same sex as themselves or of the opposite sex? [...] should they commission a surrogate? And when should they have their first child – in their teens, or in their twenties, thirties, forties, fifties – or even sixties? The range of choices will be almost endless.²⁰

Conclusion

These options, along with definitive identification of the father of any child by simple genetic testing, may yet produce a social revolution, such as the decline of the family in favour of single parenthood, the complete

separation of sex from reproduction, and a plethora of reproductive options. It should be noted that such a social revolution was prefigured in Clarke's *Childhood's End* (1953) for exactly the same reasons: paternal identification and totally reliable contraception.²¹ Baker claims that future techniques will remove all barriers to fertility, and even individuals without gonads will be able to procreate.

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