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A Perspective on *In Vitro* Fertilization

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The birth of Louise Brown in 1978 was undoubtedly an event of historical significance – both for the medical community as well as for society. While at the time, understandably, there were skeptics-very soon the medical community realized that a major medical breakthrough had been achieved. Her birth brought in vitro fertilization (IVF) from a laboratory vision to a clinical reality, thus creating an entirely new field of medicine. Indeed, in just over three decades, IVF has evolved from a laboratory curiosity to a commercialized medical technology responsible for more than 4 million births. IVF has changed the structure of families across the world and has indelibly changed .our views and perceptions of maternity.

As we enter the fourth decade of this field, we are faced with ongoing technological advances to help patients achieve reproductive success. In a short lifespan, the field of assisted reproductive technology (ART) has allowed patients to overcome essentially any form of infertility. The serendipitous discovery of intracytoplasmic sperm injection (ICSI) by Andre van Steirteghem in 1998 has provided a means to even treat men with azoospermia. Egg donors have allowed postmenopausal women to have families. More recently, preimplantation genetic diagnosis (PGD) has given us the option to screen embryos for inherited disease and enable couples with recurrent pregnancy loss deliver a healthy child at term. Improvements in oocyte freeze-thaw technology have provided women a means to electively preserve their future fertility The current pace of innovation suggests that we will be seeing even more advances in the coming four decades.

At the same time that developments in ART have been evolving, so have the ethical, social, and political controversies that surround nearly all aspects of ART. Few other areas in medicine have posed as many social and ethical questions and have attracted so much public attention. When IVF was first launched, there was significant debate about the ethics of creating embryos outside of the womb. Currently, significant concerns have been raised about embryo research, preimplantation diagnostic testing and its potential eugenic implications. The philosophical dilemma regarding the status of the embryo is an issue that has yet to be resolved and this discussion plays a significant role in our political landscape. As reproductive endocrinologists we are faced with the challenge of staying informed of the latest advances in the scientific aspects of our field while recognizing their greater social, psychological, and humanistic roles.

So, what does the future hold for ART? The pace of medical innovation is relentless and we can expect that similar to laparoscopy replacing laparotomy, current treatments for infertility be rendered obsolete. Sequencing of the entire human genome has allowed for initial gene expression profiling but these are yet to be incorporated into everyday practice. Pharmacogenomic and proteomic evaluation of patients will become standard clinical practice, thus truly personalizing medicine. In this manner, determining the ability of couples to produce competent gametes/embryos and selecting individualized IVF stimulation protocols will become the norm. Pharmaceutical innovation will likely make hormonal treatments more convenient, predictable and cheaper. The much maligned complication to multiple pregnancy will be essentially eradicated. From a societal perspective, ART will likely be more widespread, not limited to treating infertility and more the norm.

Our goals moving forward are neither simple to define nor easy to accomplish. We must vigilantly continue to innovate and advance the science of ART while avoiding their potential abuse. We must advocate for our patients and increase access to ART for all couples who seek our help. Future medical historians will scrutinize how we take these steps, as the choices we make today will have consequences that will last beyond our lifetimes.

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