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Behind the scenes: the case of reproductive technologies¹

Abstract: The over-representation of extraordinary births obtained through procreative technologies has been brought to the forefront by the French media and cultural landscape since the 1970s. It gives medicine and biotechnology an image of “all mighty power.” However, this representation obscures not only an aspect of the ordinary reality of these techniques, namely their many failures and misfires but also the difficult, sometimes unbearable, choices faced by their users.

Keywords: Assisted reproductive technologies, preimplantation genetic testing, in vitro fertilization, embryo, failure.

1. Introduction

Since the 1970s, several births obtained through assisted reproductive technologies (ARTs) have been brought to the forefront in the mediatic and cultural landscape: in 1978, Louise Brown is the first child, born after an *in vitro* fertilization (IVF); in 1990, England advertised the first preimplantation genetic testing (PGT) ever made, a genetic analysis performed on the embryo before its transfer in the uterus to avoid the transmission of a hereditary disease or a chromosomal anomaly. More recently, in 2018, the Chinese scientific He Jiankui announced the birth of two children, Nana and Lulu. Their DNA has been modified *in vitro* to protect them against a potential HIV infection. The over-representation of “miracle babies”, saved by perinatal medicine, contributes also to this tendency to celebrate births presented as “extraordinary” (Casper 1998). These announcements have provoked intense political and scientific debate. The reactions are even more intense since these techniques are related to procreation, often considered one of the foundations of humanity. They would upset a “natural” order that would not be modified by the intervention of third parties or technologies. Procreation would ideally result from the loving and procreative relationship between two individuals, a man and a woman (Schneider 1980). The media and cultural treatment of these extraordinary stories contribute to giving medicine and biotechnologies an image of “all mighty power”. We would be caught up in the inevitable march of progress.

In this paper, I argue that this representation obscures not only one aspect of the ordinary reality of these techniques, namely the many failures and misfires, but also the difficult, sometimes unbearable, choices faced by their users (patients, professionals and donors). Drawing on the

¹ This article is part of a research project funded by the Fyssen HuMa Foundation, *Humanity through its margins*. Jérôme Courduriès (LISST-Cas, UT2J), Laurent Gabail (LISST-CAS, UT2J), Léa Linconstant (LISST-Cas, UT2J) and Jennifer Merchant (CERSA, Université Panthéon Assas) were members of this project. The ANR research project NorPro, *Procreative norms* (ANR-22-CE41-0001), is its continuation.

experiences of those directly involved, I offer a more nuanced view than is usually presented in the media and cultural landscape. I will use more specifically the example of PGT.

FIGURE1. Reproductive biology engineer collecting cells from an embryo for genetic analysis. Photo by the author. 2021.

II. Materials and methods

This paper is based on two research studies conducted in France conducted in France during a span of 20 years, between 2003 to 2022. The first was carried out as part of my thesis between 2011 and 2015 on the status of the embryo and the foetus in France. I studied it through the status of embryos produced in IVF, and of foetuses that died *in utero* (Giraud 2015). In addition to my own research, I used data from a previous study conducted in 2003 and 2004 on IVF patients by Dr. Maurice Adjiman (2006). The second was part of the collective research project HuMa (Humanity through its margins) funded by the Fyssen Foundation between 2020 and 2022 on PGT. These two research studies consisted of ethnographic observations for a few months in two fertility centres in 2014 and 2015 and one PGT centre in 2020 and 2021. I also conducted 62 semi-structured interviews with IVF professionals and 27 PGT professionals), 64 interviews with people who experienced a stillbirth, 40 with IVF patients and 13 interviews with PGT couples. The research on PGT is still ongoing.

III. The myth of modern medicine

Biomedicine and biosciences (genome editing, cloning, IVF or genetic sequencing) have made it possible to understand, manipulate and transform the field of life (Franklin and Lock 2003). In the process, these techniques have shaped collective imagination, between hopes and fears, particularly in procreation.

Procreative technologies have generated a lot of hope. Capable of creating and modifying life, they could alleviate pain and cure diseases (Watson 2001). For example, they can prevent the birth of children with severe hereditary genetic diseases. These techniques have also enabled infertile couples to achieve parenthood. Conversely, these new forms of choice and control are criticised and feared as unnatural, immoral, and unsafe. Since procreation is thought to be one foundation of our humanity, the possibilities that these techniques open up give rise to a feeling of a civilisational shift in the media and cultural landscape: dehumanisation, eugenics, the end of sexual relations, conjugal and parental

love, and the family (Bonnet et al. 2021). This discourse is carried as much by Catholic pro-life associations as by scientists. When critics focus in particular on “selective reproductive technologies”, such as PGT, they aim to prevent or allow the birth of a certain type of child (Wahlberg and Gammeltoft 2018). Critics accuse the use of these techniques as a means to satisfy the fantasy of the “designer baby” and conducting genetic discrimination that could challenge the rights of people with disabilities (Kerr and Shakespeare 2007).

Whether these techniques are considered harmful or positive, the emphasis is always put on ever greater control, now or in the future, in the reproductive field. Human existence, and life in general, would no longer have biological limits and could be shaped at will (Squier 2004, 9). This image of the all mighty technology and biomedicine is based on the “meliorist myth” (Fussell 2000) that has been particularly prevalent since the industrial revolution and Newtonian science. Technoscientific progress is believed to be unending and linear and would be necessarily and inevitably cumulative. Although the issue of biomedical abuses has been prominent in the French bioethical debate since the 1990s, few people doubt its progress. This conviction is particularly present in the field of procreative technologies since the birth of Louise Brown. All the people I interviewed involved in ARTs, especially in PGT, indeed had great confidence in the development of medicine and technologies. They relied on the progress already made, and the development of knowledge in the field of procreation and genetics. In PGT, carrier embryos of a chromosomal anomaly in a balanced state can be transferred². When I asked people about the possibility of the transmission of their infertility due to this chromosomal anomaly, most of them were confident it would not be an issue because, by the time their child is of childbearing age, the techniques will have evolved and it will be easier for their child to procreate than for them: “We already have to be able to make children. And by the time they can have children, the techniques will have evolved further. Then maybe they won't have to go through that too [PGT]. By then, techniques will have evolved” (Amandine Hameaux,³ undergoing PGT, 2021).

Even when techniques are only at the experimental stage, the certainty that they will eventually work or even that they will work beyond expectation is never questioned. In the “anxiety-provoking futurology⁴” (Merleau-Ponty 2022) present in the media, a future is taking shape in which all procreation would necessarily involve easy-to-use technologies, that would aim to give birth to a tailor-made child, the *designer baby*. Procreation would no longer be left to ‘chance’ but to the ‘choices’ of parents who could and should select the right traits for their children (Greely 2016). However, this

² All the chromosomes are present, but not in the right place. It has no impact on the phenotype (malformation, mental retardation, etc.) but has consequences on gametogenesis and therefore infertility.

³ All the names have been pseudonymised.

⁴ My translation for “futuresologie anxieuse”.

figure of the designer baby is based on an overestimation of the degree of choices possible between the embryos produced in each IVF cycle.⁵ This is not at all consistent with the experience of the professionals I met in my research or others (Ehrich and Williams 2010, 27). The probability of having “healthy” embryos, i.e. free of the targeted genetic disease, remains low. Moreover, not all transferred embryos result in pregnancy. This overestimation of the success of biotechnology is reinforced by the legislature’s desire to regulate technological innovations, even when they are only in the making. This is the case with *in vitro* gametogenesis, a technique that makes it possible to produce 'artificial gametes' from embryonic cells or skin cells (Merleau-Ponty 2022). *In vitro* gametogenesis has generated numerous bioethical debates on the national and international scene, even though the technology is not developed for human use.

IV. The procreative “failures” and the rejected

This myth of an all-mighty medicine hides many aspects of the ordinary reality of procreative technologies, the reality the users may experience, namely the many failures and misfires as well as the profound anxiety that they may cause. This myth also tends to mask their unequal access.

The actual effectiveness of procreative technologies has first to be put into perspective. In Europe, the average pregnancy rate following embryo transfer is 30 per cent (Kupka et al. 2014). It has been stable since the beginning of IVF. In the case of PGT, the probability of even having embryos to transfer is lower than in IVF. This is due to the double selection of embryos: morphokinetic⁶ selection, as in all IVF, and genetic selection, as the aim of PGT is to transfer only “healthy” embryos.

FIGURE 2. Morphokinetic selection of embryos for PGT by an engineer and a reproductive biologist. Photo by the author. 2021.

Repeated failures have the effect of making the ARTs process even longer and more difficult than it already. This is due to the side effects of hormonal treatments and associated pain, particularly for women, the difficulty of medicalised procreation (Franklin 1997) or because of the impact on

⁵ An IVF cycle includes all the steps from hormonal stimulation for the woman to the embryo transfer in her uterus.

⁶ Morphokinetics combines the criteria of the appearance of the embryo - morphology - with the importance of knowing when and how the cellular processes that lead to that appearance occur - kinetics. It provides information on which embryos are most likely to develop and implant.

professional life (Hertzog 2014). These procreative pathways are also fraught with uncertainty and anxiety (Franklin and Roberts 2006; Wahlberg and Gammeltoft 2018). People endure situations and choices that they do not normally face in the context of 'natural' childbearing. This is the case when couples have to decide whether to undergo PGT or attempt a spontaneous pregnancy and then risk terminating it if the foetus has a genetic disease (Franklin and Roberts 2006; Giraud 2022). This is also the case when professionals have to decide which types of embryos to transfer or destroy (Ehrich et al. 2007; Giraud 2020b). These decisions affect all users of these techniques: practitioners who apply them, patients who benefit from them, and those whose bodies are directly tested such as gamete donors.

Finally, the extraordinary narratives about biotechnologies contribute to the invisibilisation of what Shellee Collee has called "stratified reproduction". Access to reproductive care and technologies varies according to class, race, gender and the place of the actors in the global economy (Collen 1986). In France, until 2021,⁷ ARTs have long been dominated by a certain family model, the heterosexual, two-parent family, therefore excluding female couples and single women. While these still-evolving requirements are enshrined in the law, others are implicit and left to the discretion of professionals. In that sense and to some extent, they control access to parenthood (Memmi 2003). This is the case of the 'psychosocial' criteria. At a staff meeting to examine the various requests for PGT, one file was refused because the couple's situation was deemed too "sensitive." Mrs Dutertre is a carrier of a hereditary genetic disease that results in muscle damage, heart problems and a slight intellectual disability. The refusal is motivated by the family context. Mrs Dutertre already has a daughter from a previous spouse, who is in foster care and whom she visits only very rarely and briefly. "Will it be a stable home?" wondered one of the professionals. This example shows that the medical teams do not only evaluate the biological, hormonal and genetic criteria for PGT. They also assess the social and psychological abilities of the couples to be 'good' parents, capable of caring for a child and providing a conducive environment for its proper development (Giraud 2022). Every person who does not meet these criteria, either because they are in an irregular situation (Schuller 2021), have psychiatric disorders or are disabled (Memmi 2003), can be excluded. People who want to seek medical help must therefore be allowed to become parents by third parties, the professionals. The couple are forced to discuss with medical professionals about decisions that are normally considered private and intimate (Bateman-Novaes and Salem 1998).

⁷ In France and until the revision of the bioethics laws in 2021, ARTs were only allowed "to remedy the infertility of a couple or to avoid the transmission to the child or a member of a couple of a particularly serious disease. The pathological nature of the infertility must be medically diagnosed" (CSP. Art. L2141-2 version from 09 July 2011 to 01 January 2021).

V. Troublesome leftovers

Procreative technologies, like any production activity, generate "surpluses", and troublesome "leftovers" to be destructed: embryos carrying a genetic disease, non-compatible, or not developing. However, just like procreative failures, this issue is often absent from bioethical debates. While the status of the embryo is strongly debated, little mention is made of the ethical and practical dilemmas faced by the users of these techniques when they have to manage these remains and, above all, decide what is a leftover and what is not.

FIGURE 3 and 4. A container of DASRI - waste of care activity with infectious risk [Déchet d'activité de soins à risque infectieux] - One of the fates of embryos in ARTs. Photo by the author. 2014.

This invisibilisation of waste may seem paradoxical because the process of designating of what is waste or not and the ethical issues it raises are one of the main features of the 'biomedical mode of reproduction' identified by C. Thompson. This mode of production is the product of procreative technologies, biotechnologies, biomedicine and information sciences (Thompson 2005). It coexists with and is part of the capitalist mode of production. If in the capitalist industry, the disposal of waste is a major political and logistical problem, in this biomedical mode of procreation it is an ethical problem and it is the very act of designating material life as waste that is problematic. This blind spot is partly related to bioethical and political debates, centred on the notion of "life" (Roberts 2007). The complexity of situations and relationships are discussed only with the contested term, "life". This prevents us from thinking of other futures for embryos or foetuses than to become new persons or to have a use as 'biological life' whose vitality can be used for research. In contrast, there is rarely any mention of the destruction of embryos (Giraud 2015). Yet the number of embryos destroyed in an IVF cycle is significant. In 2011, out of the 28 353 embryos created in IVF, almost half (46.3%) were "neither frozen nor transferred" (INSERM 2014). I also stress here that the very use of the term 'destruction' by INSERM⁸ and the term "neither frozen nor transferred" are symptomatic of this difficulty in thinking about the destruction of embryos. Yet, as a procreative biologist points out, it is an inherent part of procreative techniques:

⁸ National Institute of Health and Medical Research.

From transfer to freezing, for me, is associated with destruction. It's simple, it's like all our biological products, it goes into the same container and it's disposed of as a hospital product without any further processing.

Access to embryos has led to the need to introduce selection standards and criteria to increase the chances of pregnancy and live birth rates. The selection of embryos, which used to take place without human intervention, is now in the hands of professionals. They must remove from the procreative process embryos that do not have characteristics deemed compatible with a viable pregnancy, transforming them from potential human beings to “waste” (Thompson 2005).

VI. Biotechnologies as a waste lens

The silencing of failures in producing viable embryos and successful pregnancy in the debates as well as in the media and cultural landscape also seems paradoxical because biotechnologies, by making it possible to directly observe living organisms and to manipulate them (as in the case of in vitro embryos), have the effect of making procreative failures visible in addition to modifying their perception and temporality. Procreation has acquired an unprecedented depth because biotechnologies have created new thresholds (gamete collection, embryo transfer, chemical pregnancy and physiological pregnancy, etc.), as well as revealing existing ones (fertilisation, implantation, etc.) (Giraud 2020a).

Procreative technologies present individuals with an apparent contradiction. They concentrate ten to twenty cycles of spontaneous procreation into a single IVF cycle. Hormonal stimulation and embryo selection make it possible to reduce the time between the first try and the first pregnancy. This is what Agathe Guerrier and her partner Arnaud Morel testify when they start their PGT in January 2021. After fourth embryos diagnosed during their first cycle, only one is found “healthy”

Arnaud: if we hadn't done [PGT], out of the four embryos, you might have had two miscarriages. If we hadn't done this study before we found the only one, let's say genetically healthy...

Agathe: but in each [spontaneous] cycle, you only have one.

Arnaud: Plus, yes.

But this increase in chances through ARTs produces a magnifying glass effect. Failures are concentrated in a more limited time frame, and their impact is therefore amplified. In an ordinary setting, couples increase sexual intercourses and wait each month for signs of a possible pregnancy, attested by a test and then an ultrasound at the end of the first trimester. This process sometimes takes several months or even years. In IVF, the attempts are divided into a large number of highly formalised stages, a

veritable obstacle course, and are concentrated in a short period: hormone treatment, oocyte retrieval, fertilisation, embryo selection, embryo transfer into the uterus, pregnancy test, and ultrasound. Each of these steps is in turn subdivided into multiple other steps, each of which may be successful, but each of which may also fail, failing in the entire attempt (Franklin 1998, 109).

But in addition to concentrating them, procreative technologies make failures visible. In a spontaneous pregnancy, the absence of fertilisation or implantation failure is experienced as a simple delay of menstruation in the case of an early miscarriage, or as “non-events” because they are not perceptible. In the case of procreative technologies, failures are made visible to couples and experienced as such by people, or even by some couples as the loss of a future child (Giraud 2015). Embryos in IVF are indeed more accessible to experience for couples (Becker 2000): they see them in pictures and are informed of their development day by day. Moreover, it is no longer just the loss of one embryo but of several that they experience. Camille Fagot, who has been on the PGT process with her husband Edouard since February 2021, recounts the moment when the biologists call them to inform them of the number of fertilised oocytes and diagnosis embryos:

Camille: It was a bit of a rollercoaster ride because the day [the biologist] told us, there are nine fertilised oocytes, we thought, that's great! And two days later, there was only one good one left and the others hadn't given anything, so we thought "damn!" Then when she told us that the other eight had been biopsied and that they were frozen while waiting for the results, we were a little bit relieved.

Finally, procreative biotechnologies play the role of a lens. They make procreative failures all the more perceptible as they are more numerous and made visible. They diffract a single event, such as the beginning of a pregnancy, into a multitude of dimensions. The interruption of pregnancy is no longer embodied by the delay in menstruation or the expulsion of the product of a miscarriage but is diffracted into several events: the failure of the oocyte retrieval, the sperm collection, the fertilisation, the embryo development, the implantation.

VII. Conclusion

Political debates as well as the treatment of procreative technologies in the media and cultural landscape are based on an imagination of all-mighty technologies and an overestimation of their effectiveness. “Too” easy to access and use, they are said to be a threat to natural procreation. Even when they are still at the experimental stage, it is never questioned that they will eventually work.

But this tends to obscure one aspect of the ordinary reality of procreative technologies, namely the many failures and misfires, as well as the difficult, sometimes unbearable choices faced by their users. An analysis of the experience of those directly confronted with them shows that rather than leading to greater control of the procreative process, they plunge their users into paths fraught with

uncertainty. They have to face new anxieties and uncertainties, often more intense than in a “normal” procreative process.

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