

How NaProTechnology compares with Assisted Reproductive Technology

Comparación de la NaProTecnología con las Técnicas de Reproducción Asistida

*Pasquale Gallo, * Joseph Tham***

<https://doi.org/10.36105/mye.2022v33n1.05>

Abstract

The progressive medicalisation of infertility in the last three decades has corresponded to an increasing diffusion of the Assisted Reproductive Technologies (ART) which have nearly completely concealed other more physiological, less risky, inexpensive and equally effective approaches to infertility. This paper tries to show how a systematic and integrated approach, such as NaProTechnology (NPT), which aims at optimising the physiological conditions in each menstrual cycle to allow a natural conception, seems to be a better solution for the treatment of infertility from ethical, medical, social, legal and environmental points of view. Governments should promote and finance NPT, and at the same time, medical and scientific societies should design studies to fairly compare NPT success rate, costs and complications to traditional ART.

Keywords: Infertility, *In Vitro* Fertilization (IVF), natural conception methods, fertility awareness, Ovarian Hyperstimulation Syndrome (OHSS), human dignity, intentional parenthood.

* University of Edimburgh, College of Medicine and Veterinary Medicine. Edimburgh. United Kingdom. Email: pasqualegallo.vr@gmail.com
<https://orcid.org/0000-0002-1204-5172>

** Regina Apostolorum Pontifical University, School of Bioethics. Rome, Italy.
Email: jtham@legionaries.org <https://orcid.org/0000-0002-6514-4107>
Reception: August 15, 2021. Acceptance: September 12, 2021.

1. Introduction

Infertility, defined as the inability to conceive after a year of regular intercourse without contraception, is a common and chronic problem affecting women and men and has an incidence of nearly 15% among couples worldwide (1). Infertility in women ranks among the 5th highest serious global disabilities leading to distress, depression, and, in some cases, discrimination (2). In most cases, the underlying cause, if properly investigated, can be identified and addressed (3). These are usually medical conditions (infectious, environmental, and genetic factors) and lifestyle practices (dietary, post-abortion complications, etc.) that have historically been under the realm of care of the family doctors (4).

Nonetheless, the treatment of infertility has increasingly shifted in the last three decades toward Assisted Reproductive Technology (ART), including in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI) (5). ART is invasive, remarkably expensive, presents several risks for women, and concerns the short and long-term outcomes of the offspring produced. Furthermore, the technique has a moderate success rate that we can optimistically estimate at around 30-40% in women younger than 35 (3).

NaProTechnology (NPT) is a systematic and integrated approach to treat infertility based on a detailed knowledge of the woman's ovarian and menstrual cycle events to identify the abnormalities and treat them as far as possible. This technique is more economical, has no contraindication and close to zero side effects, educates couples about their fertility, and monitors it, and family doctors can deliver it. The goal of NPT is to optimize the physiological conditions in each menstrual cycle to allow natural conception. Even if it remains difficult to compare the two approaches, NPT cannot be considered inferior to ART in terms of success rates (3).

This paper will argue that NaProTechnology is a better solution for infertility treatment than ART from several points of view: ethical, religious, medical, social, legal and environmental.

2. Religious and ethical concerns with ART

The longing for a child can be intense and overwhelming, and infertility can affect the stability of the couple and undermine the marriage itself. The Catholic Church recognizes the relevance of this issue and has deeply evaluated, beyond the spiritual support to these men and women, reproductive technologies that are morally acceptable, respectful of human dignity, and in line with the Magisterium. In judging the ethical soundness of any therapy for infertility the instruction of *Dignitatis Personae* specifies three criteria: a) the right to life and to physical integrity of every human being from conception to natural death; b) the unity of marriage, which means reciprocal respect for the right within marriage to become a father or mother only together with the other spouse; c) the specifically human values of sexuality which require «that the procreation of a human person be brought about as the fruit of the conjugal act specific to the love between spouses (Congregation for the Doctrine of the Faith, 2008 n. 12) (6). The central tenet of the Church teaching is the inseparability of the procreative and unitive aspects of married love, two essential aspects of creating the proper environment to nurture a new, defenseless human life (7). *Gaudium et Spes* (n. 50) –cited in *Humanae Vitae* (n. 10)– affirms that transmitting human life is the parents' primary mission. In doing so, *they are cooperators with the love of God the Creator and are the interpreters of that love* (8).

Modern secular society has severed this sacred union starting with the widespread use of contraception, which has gravely affected the stability of the marriage, increasing the infidelity and divorce rates and promoting a hedonistic idea of sexuality (9). This further advanced with the legalization of abortion as «routine medical practice», which ultimately becomes a human right with a progressive «de-escalation of consideration for the anthropological value of the human life» (10). In particular, the human embryo becomes a biological product freely disposed to fulfil our desires. The door

further opens with the introduction of ART. It is a slippery slope that undermines human dignity as children become products of our technology, *consumer goods which parents paid for and have a «right» to expect* (11).

ART also poses other ethical dilemmas, mainly related to the practice to increase the success rate, such as the production of supernumerary embryos or selective abortion to eliminate extra embryos, and multiple pregnancies. There is a well-founded worry that we can abuse this technique for eugenic purposes, and, possibly, for human cloning (12). It is true that many states have put a moratorium on reproductive human cloning but permit at some degree therapeutic cloning, hence the only true ban, at the moment, remains to implant the clone embryo into a womb. In addition, human cloning has received in last decade a strong endorsement by several renown scientists such as Prof James Watson (Nobel prize in Physiology or Medicine in 1962), Prof. Udo Schuklenk, Prof. Hugh McLachlan and Prof. Edwards (who performed the first successful IVF baby in 1978), just to mention the most famous ones (13-15).

3. Medical, social and legal concerns

3.1 Medical concerns

IVF has become so popular that over 5,4 million babies have been born in this way from 1978 till 2012 (16). However, these techniques are associated with critical medical risks both for women and future children. Some complications are dangerous and potentially life-threatening. The most common maternal complications are: first trimester bleeding (29-36%), miscarriage (15-23%), ectopic (2-5%) and heterotopic pregnancies (ART 1-10/1000 versus non-ART 1/2,600-30,000), pregnancy-induced hypertension and gestational diabetes mellitus (15% incidence in IVF compared to non-IVF),

placenta previa (3-6 folds higher compared to naturally conceived pregnancies) and preterm labour (21.5-37% of births). The most common foetal risks are molar pregnancy (where a foetus does not form properly in the womb, and a baby does not develop. In ART, this is probably due to the use of immature ova, disruption of normal meiosis, and loss of maternal chromosomes), multiple pregnancies (1-3 in 50 in ART even when the number of embryos is limited to 3, otherwise even higher; compared to 1 in 80 natural conceptions), prematurity which can be associated with long term disability (e.g., cerebral palsy) and neonatal mortality (4 times higher) (17).

Another severe complication, often understated by ART advocates and still not thoroughly characterized in the medical literature, is the Ovarian Hyperstimulation Syndrome (OHSS). In patients undergoing IVF, several iatrogenic modifications to the ovarian cycle are necessary to increase the chances of success. Gonadotrophins are administered at much higher doses than physiological levels to overstimulate the ovaries so that they can produce multiple eggs. The eggs are then retrieved before ovulation with an ultrasound-guided needle, with the woman under anaesthesia. OHSS is a iatrogenic complication caused by an excessive response to ovarian stimulation during ART with a complication un up to 30% of ART cycles. Women can face several potentially life-threatening complications, including ascites, abdominal compartment syndrome, renal dysfunction, acute respiratory distress syndrome, thromboembolic disease, and hemodynamic instability (18). The long-term consequences of ovarian hyperstimulation are still unclear (3).

To increase the success rate, doctors transfer multiple embryos into the uterus, which is why IVF can result in multiple pregnancies with all the associated increased risks for the mother, particularly older women, and the offspring. Moreover, when patients do not want multiple pregnancies, they may choose to have a selective abortion of one or more embryos, which carries medical and psychological sequelae.

Finally, the costs associated with ART are prohibitive in some countries (e.g., in the USA, over \$12,000 per cycle), and most national health systems do not routinely cover the expenses of ART. Also, we should include the short and long-term costs associated with iatrogenic complications. For instance, we can just consider the length of stay in Paediatric Intensive Care Unit due to the prematurity of many of these children and the long-term costs associated with the care of the neurological and neurosurgical complications (epilepsy, cerebral palsy, etcetera).

3.2 Social and legal concerns

In a survey of experiences of adults conceived with donor sperm regarding their identity, kinship, well-being, and social justice, donor offspring had significantly more issues with the law and substance abuse-related problems than those raised by biological parents. Young adults conceived with sperm donation experience a profound struggle with their identity and origins. Their family relationships were also more likely to be characterized by confusion, tension, loss, and they are more likely to have criminal offenses, drug substance abuse, depression, and socioeconomic difficulties. They are more likely to experience parental divorce or multiple family transitions during their childhood (19).

Some advocates of ART affirm that donor conception is just an alternative form of adoption (20). Nonetheless, the only similarities noted in the literature are the pain of separation and not knowing their biological parents (17). Adoption is often a lengthy and complicated legal process. In comparison, ART is mostly under-regulated. There are no policies to safeguard the best interest of the child. Anonymous sperm and egg donations, especially in the USA, remain a huge problem and a clear violation of the children's rights to know their biological identity. Moreover, creating babies with DNA of three or more parents and the DNA of a dead man is already a reality (21). Great Britain has allowed scien-

tists to create hybrid embryos containing human and animal cells for research purposes. In January 2008, The Human Fertilisation and Embryology Authority (HFEA) License Committee granted two one-year licenses permitting scientists at King's College London and Newcastle University to carry out research using human-animal embryos. Nobody can see where and if this drift will end.

ART has also inaugurated complex and unprecedented dilemmas in family law, such as the formulation of «intentional parenthood». The term appeared in the 1990s to resolve disputed lesbian surrogacy law cases in the USA. Since then, it has been broadly used within family law, in public discussion about reproduction, and by advocates of family diversity. Intentional parenthood, proponents say, is suitable for children. *Intention makes a wanted child. Anyone can be an intentional parent (straight, gay, married, partnered, or single)* (22). Unfortunately, evidence has shown that intentional parenthood is not beneficial for children, and there are many reasons to question this possibility (22).

Medical and Sociological literature has extensively showed so far that children born from a married father and mother display an increased physical and mental health as well as better academic and intellectual performances (23-26). Furthermore, these children are more likely to build a successfully family relationship when adults (27-30), they are less likely to experience poverty, physical and sexual abuse, alcohol and drug abuse, being involved in criminal behaviours, early sexual activity and premarital childbearing (25, 26).

4. Environmental concerns

According to the Environmental Protection Agency (EPA) report, released in 2010, and listing the 24 causes of global warming, there is *clear evidence that the composition of the atmosphere is being altered as a result of human activities and that the climate is changing* (31). Furthermore, the world's richest half billion people, seven percent of the

global population, are responsible for fifty percent of the world's carbon dioxide emissions. Meanwhile, the poorest fifty percent are responsible for just seven percent of emissions (32).

Policy and lawmakers are gradually starting to reduce vehicle pollution and other known sources of environmental degradation as the global awareness of the human activities contribution to climate change is rising. Nonetheless, the ecological impact of medical industry is still largely overlooked. ART's industry, in particular, warrants a special consideration amongst all healthcare activities, because beyond producing a carbon footprint, which is an additional source of carbon emission contributing to anthropic environmental degradation, it has the unique peculiarity of creating also a carbon legacy (33). A carbon footprint is a cumulative use of resources and carbon emission that each individual generates during his life on this planet, whilst a carbon legacy results when a human being decides to procreate.

Obviously, carbon legacy also applies to people procreating through natural means, but procreation through ARTs in fertility centres provide this service for a fee and they can and should be regulated. From a bioethical point of view, one must ask if it is wise to artificially create more human beings contributing to an already overburden ecosystem and if an overly unregulated ART business is ethically justified.

Since 1978, birth of the first human baby through in vitro fertilization, till 2018 over 8 million babies have been born as a result of ARTs (34). This number is not very impressive in general terms and surely is not the responsible of local population growth especially if we consider that ARTs are mostly offered in low birth rates countries.

However, if we look at this number in terms of carbon footprint, the situation appears concerning because the vast majority of these births happens in USA, the number one carbon emitter in the world. A country where each child will consume 7 times the resources of a child born in China (35). In light of the above evi-

dence, some authors have suggested that a moratorium on all fertility clinics would be the soundest decision from an environmental point of view (33). This seems unlikely in the short term. An initial solution could be, at least, applying carbon caps to ARTs business and cutting the funds to ARTs for not biologically infertile couples.

5. NaProTechnology: an alternative solution

Many couples experiencing infertility believe that ART is the only hope for their condition. In most cases, infertility is a symptom of underlying problems causing difficulty in conceiving or recurrent miscarriages. If properly investigated, we can identify and correct infertility. NPT works precisely to identify the underlying correctable causes of women's reproductive issues and use therapies that work cooperatively with the women's naturally occurring fertility cycle.

NPT starts with an initial consultation to explain reproductive physiology, investigative and treatment options to the patients. In this way, dietary, lifestyle, and underlying medical causes of infertility (e.g., thyroid dysfunction, hormonal problems, etc.) will be diagnosed and addressed. At the same time, providers can teach patients how to gain confidence with fertility tracking methods (Creighton Model Fertility Care system) to understand their cycles. The initial process takes at least 3 months to familiarize with it, plus several follow-ups (36).

The tracking of the cervical mucus may identify suboptimal hormonal levels' underlying abnormalities and short or variable luteal phases. When the quality and quantity of cervical mucus is inappropriate, patients may take medications and supplements to improve them (e.g., Vit. B6, guaifenesin, several antibiotics) (37). They may receive hormonal supplementation with human chorionic gonadotropin or progesterone support the luteal phase. Pa-

tients may need to take Clomiphene, an estrogenic medication, to stimulate ovulation (38). Depending on the hormonal biomarkers in charting and serum levels measured during the mid-luteal phase, they may adjust the medication dosages.

Simultaneously, couples learn about the ovulation biomarkers to plan intercourse accordingly and maximize their chances of fertilization. In some cases, surgical intervention may be necessary (e.g., blocked or damaged fallopian tubes, endometriosis, etc.) to restore the woman's normal reproductive cycle. NPT can also investigate and treat possible correctable causes of male infertility. NaProTechnology is, most importantly, a couple therapy.

The crucial distinction between NPT's and standard ART's approach to infertility is a commitment to exhaustively identify and treat the underlying correctable causes of infertility so that the couple may conceive through natural intercourse. NPT's success rate is difficult to compare with ART for several reasons. The main ones are that there are too many differences in methods utilized and study populations at present and no properly structured randomized controlled trials.

A systematic Cochrane review concludes that there is insufficient data to demonstrate ART's effectiveness over less intensive therapy for infertility (39). There are some reports of data from NPT centres that effectiveness is similar or, in some cases, even better than ART (40).

Stanford et al. reported the outcome of their experience with NaProTechnology in 1072 couples with an average female age of 35.8 years from 1998 till 2002. A third of these women had previously undergone ART and the mean length of time they had tried conceiving before starting NPT was 5.6 years. Approximately 40% of the couples conceived using NPT. Their mean age was 34.8 years and only 21% underwent ART before NPT. Amongst the live births, 4.6 % were twins, 88% were to term and only 1.4% of live births had low birth weight (less than 1.5 Kg) (3).

These results are to be considered at least in line with the best data available on ART, as it is also confirmed by the abovementioned Cochrane systematic review which found no data to consider that ART effectiveness is superior to other less invasive techniques, including NPT (39).

Kiani *et al.* performed an extensive review of the literature of all articles published till July 2019 comparing ART and NaProTechnology and they found, beyond the high incidence of maternal and foetal complications (already discussed above) also a concerned increased frequency in genetic and epigenetic abnormalities in children born via ARTs (41).

According to Niemitz and Feinberg, epigenetic alterations could be related to some of the procedural steps used in ARTs, such as: in vitro culture, the media used, the induced ovarian hyperstimulation, or the maturational timing of the gametes that are harvested (42).

NPT's approach appears ethically and medically sound with its close to zero rate of complications, low costs, and the ability to disclose and treat several medical conditions affecting infertility and women's general health, such as irregular cycles of abnormal bleeding, premenstrual syndrome, and polycystic ovarian syndrome (43).

6. Conclusions

Human procreation is a personal act that should ideally involve the responsibility of a married couple and the structure of marital life. For believers, the procreation is a direct act of the Creator, and the spouses are cooperators and interpreters of God's love in bringing to life a new person. The noble intention of treating infertility and having a child cannot justify any method or reproductive procedure to achieve the aim. Medical activities should be limited to assist the couple in their mission, treating or removing obstacles to the natural process without becoming a substitutive and manipulative act.

Assisted reproductive technology inherently endanger the essential and sacred values of human life and marriage. It undermines the harmony between human freedom and responsibility. It devaluates the Hippocratic nature of the medical profession by perpetrating a «divorce between science and morality» (44), which compromises the primacy of person over things. Furthermore, ART poses potentially life-threatening risks for the woman and the foetus and carries long-term expensive medical, social, and legal drawbacks. In addition, the carbon footprint and legacy created by ART should be carefully considered by policy, and lawmakers in light of the growing evidence and concerns on anthropic contributions to climate change.

Providentially, there are ways to raise the next generation without the need to use ART. NaProTechnology is non-invasive, less risky, less expensive and protects «the physical and spiritual unity of the conjugal act» (45), an approach that can treat infertility with success rates apparently similar to ART. NaProTechnology should be promoted and financed by governments and widely endorsed by the medical and the scientific communities.

Acknowledgments

This paper is partially drawn from an essay written by the first author as part of the requirements for the «Bioethics, Sexuality and Human Reproduction» course of a Master's degree in Global Bioethics (MS), a co-sponsored program of the School of Bioethics of Universidad Anáhuac México in collaboration with Ateneo Pontificio Regina Apostolorum and the UNESCO Chair in Bioethics and Human Rights, Rome. The first author gratefully acknowledges the comments and contributions to the final draft from Professor Joseph Tham, the course director, as part of the evaluation of the essay.

Disclosure

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. The views, thoughts, and opinions expressed in this article belong solely to the authors; in particular, the first author is acting on his own and is not representing the health system or the University he works for.

Bibliographic references

1. Boivin J, Bunting L, Collins JA, Nygren KG. International estimates of infertility prevalence and treatment-seeking: Potential need and demand for infertility medical care. *Human Reproduction*. 2007; 22(6): 1506-1512. <https://doi.org/10.1093/humrep/dem046>
2. Mascarenhas MN, Flaxman SR, Boerma T, Vanderpoel S, Stevens GA. National, regional, and global trends in infertility prevalence since 1990: A systematic analysis of 277 health surveys. *PLOS Medicine*. 2012; 9(12): e1001356. <https://doi.org/10.1371/journal.pmed.1001356>
3. Stanford JB, Parnell AT, Boyle PC. Outcomes from treatment of infertility with natural procreative technology in an Irish general practice. *Journal of the American Board of Family Medicine: JABFM*. 2008; 21(5): 375-384. <https://doi.org/10.3122/jabfm.2008.05.070239>
4. Cates W, Farley TM, Rowe PJ. Worldwide patterns of infertility: Is Africa different? *Lancet*. 1985; 2: 596-598. [https://doi.org/10.1016/S0140-6736\(85\)90594-X](https://doi.org/10.1016/S0140-6736(85)90594-X)
5. Copperman AB, DeCherney AH. Turn, turn, turn. *Fertil Steril*. 2006; 85(1): 12-13. <https://doi.org/10.1016/j.fertnstert.2005.07.1297>
6. Lee P, Tham J. Catholic approaches to procreation and infertility. In: Joseph Tham, Alberto García Gómez, John Lunstroth eds. *Multicultural & Interreligious Perspectives on the Ethics of Human Reproduction*. Springer. 2021 (In press).
7. Genesis 1: 28, «Be fertile and multiply»; Genesis 2: 24, «That is why a man leaves his father and mother and is united to his wife, and they become one flesh».
8. Pope Paul VI, Pastoral Constitution on The Church in The Modern World, *Gaudium et Spes*, December 7, 1965.
9. Wilson MA. The practice of natural family planning versus the use of artificial birth control: Family, sexual and moral issues. *Catholic Social Science Review*. 2002; 7. <https://doi.org/10.5840/cssr2002718>
10. Sgreccia E. *Personalist Bioethics: Foundations and applications*. 1st edition. Philadelphia: National Catholic Bioethics Center. 2012: 475-531.

11. United States Conference of Catholic Bishops. Life-giving love in an age of technology. 2017. Available at: <http://www.usccb.org/upload/lifegiving-love-age-technology-2009.pdf>
12. Tham J. Will to power: A critique of nihilistic tendencies in reproductive technology. *The New Bioethics*. 2012; 18(2): 115-132. <https://doi.org/10.1179/2050287713Z.00000000014>
13. «Leading Bioethicist Supports Reproductive Cloning». *BioEdge*, no. 241; March 21, 2007.
14. «What Is Wrong with Cloning Anyway». *BioEdge*, no. 221; October 3, 2006.
15. «Let's Legalise Human Cloning, Says Bioethicist». *BioEdge*, no. 259; August 1, 2007.
16. Assefi N, Levine BA. How in Vitro Fertilization (IVF) works. *TED-Ed*. 2015. Available at: <https://www.youtube.com/watch?v=P27waC05Hdk>
17. Hilbert SM, Gunderson S. Complications of assisted reproductive technology. *Emergency Medicine Clinics of North America*. 2019; 37(2): 239-249. <https://doi.org/10.1016/j.emc.2019.01.005>
18. Timmons D, Montrief T, Koefman A, Long B. Ovarian Hyperstimulation Syndrome: A review for emergency clinicians. *Am J Emerg Med*. 2019; 37(8): 1577-1584. <https://doi.org/10.1016/j.ajem.2019.05.018>
19. Marquardt E, Glenn ND, Clark K. *My daddy's name is donor: A new study of young adults conceived through sperm donation*. 1st Edition, Broadway Publications; 2010.
20. See Alternativefamilies.org which has information to help gays and lesbians to have children through different means.
21. Gallagher J. It is time to make three-person babies. *BBC News, Sec. Health*. November 30, 2016. Available at: <http://www.bbc.com/news/health-38159777>
22. Marquardt E. One parent or five: A global look at today's new intentional families. *The Institute for American Values*. September 2011.
23. Jaynes HS. The effects of several of the most common family structures on the academic achievement of eighth graders. *Marriage and Family Review*. 2000; 30(1-2): 73-97. https://doi.org/10.1300/J002v30n01_06
24. Stack S, Ross Eshleman J. Marital status and happiness: A 17-Nation study. *Journal of Marriage and the Family*. 1998; 60(2): 527-536. <https://doi.org/10.2307/353867>
25. Dawson DA. Family structure and children's health and well-being: Data from the 1988 national health interview survey on child health. *Journal of Marriage and the Family*. 1991; 53(3): 573-584. <https://doi.org/10.2307/352734>
26. Rohner RP, Veneziano RA. The Importance of father love: History and contemporary evidence. *Review of General Psychology*. 2001; 5(4): 382-405. <https://doi.org/10.1037/1089-2680.5.4.382>
27. Putnam F. Ten year research update review: Child sexual abuse. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2003; 42(3): 269-279. <https://doi.org/10.1097/00004583-200303000-00006>

28. Stiffman M. *et al.* Household composition and risk of fatal child maltreatment. *Pediatrics*. 2002; 109(4): 615-621. <https://doi.org/10.1542/peds.109.4.615>
29. Brown SL. The effect of union type on psychological well-being: Depression among cohabitators versus marrieds. *Journal of Health and Social Behaviour*. 2000; 41(3): 241-255. <https://doi.org/10.2307/2676319>
30. Horwitz AV, Raskin H. The relationship of cohabitation and mental health: A study of a young adult cohort. *Journal of Marriage and the Family*. 1998; 60(2): 505ff. <https://doi.org/10.2307/353865>
31. Environmental Protection Agency. Climate change indicators in the United States. 2010. Available at: <http://www.epa.gov/climatechange/indicators.html>
32. Asin D. Covering Climate: What's population got to do with It? Woodrow Wilson International Center for Scholars Events, October 14, 2009. Available at: <http://www.wilsoncenter.org/event/covering-climate-whats-population-got-to-do-it>
33. Richie C. What would an environmentally sustainable reproductive technology industry look like. *J Med Ethics*. 2015; 41: 383-387. <https://doi.org/10.1136/medethics-2013-101716>
34. Scutti S. At least 8 million IVF babies born in 40 years since historic first. July 3, 2018. Available at: <https://edition.cnn.com/2018/07/03/health/worldwide-ivf-babies-born-study/index.html>.
35. Murtaugh P, Schla M. Reproduction and the carbon legacies of individuals. *Global Environ Change*. 2009; 19: 14-20. <https://doi.org/10.1016/j.gloenvcha.2008.10.007>
36. Hilgers TW. Introduction to the Creighton Model System. In: Hilgers TW, ed. The medical and surgical practice of NaProTechnology. *Ohama (NE): Pope Paul VI Institute Press*. 2004: 43-56.
37. Check JH. Diagnosis and treatment of cervical mucus abnormalities. *Clin Exp Obstet Gynecol*. 2006; 33: 140-142.
38. The Practice Committee of the American Society for Reproductive Medicine. Use of Clomiphene in women. *Fertil Steril*. 2003; 80(5): 1302-1308. [https://doi.org/10.1016/S0015-0282\(03\)01184-1](https://doi.org/10.1016/S0015-0282(03)01184-1)
39. Pandian Z, Bhattacharya S, Vale S, Templeton A. In Vitro Fertilization for unexplained infertility. *Cochrane Database Syst Rev*. 2005; 18(2): CD003357. <https://doi.org/10.1002/14651858.CD003357.pub2>
40. Johnson NP, Proctor M, Farquhar CM. Gaps in the evidence for fertility treatment, an analysis of the Cochrane menstrual disorders and subfertility group database. *Hum Reprod*. 2003; 18(5): 947-954. <https://doi.org/10.1093/eshremonographs/2003.3.21>
41. Kiani AK *et al.* Complications related to *In Vitro* Reproductive techniques support the implementation of natural procreative technologies. *Acta Biomed*. 2020; 91(13-S): e2020018.
42. Niemitz EL, Feinberg AP. Epigenetics and assisted reproductive technology: A call for investigation. *Am J Hum Genet*. 2004; 74(4): 599-609. <https://doi.org/10.1086/382897>

43. Saint Peter's Healthcare System. NaProTechnology, new hope in infertility. 2012. Available at: <https://www.youtube.com/embed/ylaZGW028y8>.
44. John Paul II. Address to UNESCO. June 2, 1980. Available at: <http://inters.org/John-Paul-II-UNESCO-Culture>
45. Congregation for the Doctrine of the Faith. *Donum Vitae*. Part II: Interventions upon human procreation. 1983.

This work is under international license Creative Commons Reconocimiento-No-Comercial-CompartirIgual 4.0.

