

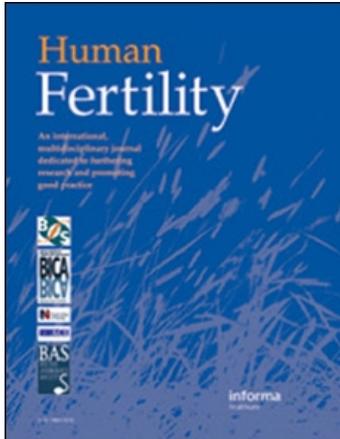
This article was downloaded by: [Braga, Daniela P. A. F.]

On: 17 November 2009

Access details: *Access Details:* [subscription number 916930378]

Publisher *Informa Healthcare*

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Human Fertility

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713736600>

Deciding the fate of supernumerary frozen embryos: parents' choices

Rose Maria Massaro Melamed^a; Tatiana Carvalho De Sousa Bonetti^b; Daniela Paes De Almeida Ferreira Braga^b; Camila Madaschi^c; Assumpto Iaconelli Jr.^d; Edson Borges Jr.^{be}

^a Department of Psychology, Fertility - Assisted Fertilization Center, São Paulo, SP, Brazil ^b Scientific Research Department, Sapientiae Institute - Educational and Research Center in Assisted Reproduction, São Paulo, SP, Brazil ^c IVF Laboratory, ^d Clinical Directory, ^e Clinical Head Directory, Fertility - Assisted Fertilization Center, São Paulo, SP, Brazil

Online publication date: 16 November 2009

To cite this Article Melamed, Rose Maria Massaro, Bonetti, Tatiana Carvalho De Sousa, Braga, Daniela Paes De Almeida Ferreira, Madaschi, Camila, Iaconelli Jr., Assumpto and Borges Jr., Edson(2009) 'Deciding the fate of supernumerary frozen embryos: parents' choices', *Human Fertility*, 12: 4, 185 – 190

To link to this Article: DOI: 10.3109/14647270903377186

URL: <http://dx.doi.org/10.3109/14647270903377186>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

CHOICES

Deciding the fate of supernumerary frozen embryos: parents' choices

ROSE MARIA MASSARO MELAMED¹, TATIANA CARVALHO DE SOUSA BONETTI²,
DANIELA PAES DE ALMEIDA FERREIRA BRAGA², CAMILA MADASCHI³,
ASSUMPTO IACONELLI, JR.⁴, & EDSON BORGES, JR.^{2,5}

¹Department of Psychology, Fertility – Assisted Fertilization Center, São Paulo, SP, Brazil, ²Scientific Research Department, Sapientiae Institute – Educational and Research Center in Assisted Reproduction, São Paulo, SP, Brazil, ³IVF Laboratory, ⁴Clinical Directory, and ⁵Clinical Head Directory, Fertility – Assisted Fertilization Center, São Paulo, SP, Brazil

Abstract

Embryo cryopreservation is a routine procedure in assisted reproductive technologies. Although couples have been informed about all potential procedures, some of them face the dilemma of what to do with surplus frozen embryos. The purpose of this qualitative study was to evaluate the attitude of patients toward their surplus cryopreserved embryos. Fifty patients who had undergone successful IVF cycles, and had surplus embryos cryopreserved were selected from a clinical database. We could contact twenty two patients agreed to participate in the study and responded the interview. Seventeen participants (77.3%) believed that cryostored embryos were 'life'. Patients who would discard embryos rather than donate to research expressed their concern about the misuse of embryos. Those who would discard rather than donate to other couples considered that donating an embryo would be like giving away a child. Seven patients were unsure whether life had begun at this stage of development. Although some couples thought of their embryos as little more than biological material, others envisioned them as living entities or 'virtual' children. The decisions on whether to donate embryos to another couple, or discard them were coloured by strong values about human life and equated with child abandonment.

Keywords: *Assisted reproduction, counseling, psychology, embryo cryopreservation*

Introduction

In 1983, (Trounson and Mohr) announced the first pregnancy from a previously frozen human embryo obtained from *in vitro* fertilization (IVF). The first live birth after embryo cryopreservation was reported in 1984 in Australia, and followed in 1986 in the United States (Bankowski et al., 2005).

Currently, embryo cryopreservation allows embryos from a stimulated cycle, which are not transferred in the fresh cycle, to be stored and used in subsequent treatment cycles to enable pregnancy. This is an integral part of assisted reproductive technology (ART) (Borini et al., 2008), that can reduce multiple pregnancies, avoid embryo disposal, improve cost-effectiveness and cumulative pregnancy rates, and preserve future options for infertile couples (Bankowski et al., 2005).

Human embryos can be safely cryopreserved and successfully thawed up to 12 years (and possibly longer) following frozen storage (Revel et al., 2004).

The number of embryos stored in IVF clinics, as well as public interest in the matter, has therefore increased in recent years (de Lacey, 2005, 2007a).

The statutory maximum storage time and the options available to couples with surplus frozen embryos vary between countries and sometimes between states within countries (Hammarberg & Tinney, 2006). Worldwide, federally regulated limitations on time limits for maintaining cryopreserved embryos vary from 24 months to an infinite duration (Klock, 2004).

One of the most difficult problems associated with a long duration of embryo cryopreservation has been the accumulation of 'unclaimed' embryos and the ethical, legal, and economic pressures that ensue for clinicians who must decide the disposition of these embryos. A significant concern related to the long-term cryostorage of embryos is maintaining contact with the infertile couple from whom the embryos originated (Bankowski et al., 2005).

Once a woman and her partner have decided that further treatment is no longer possible or desirable, they are faced with the dilemma of what to do with their frozen embryos; i.e., the 'disposition decision' (Fuscaldo & Savulescu, 2005; Nachtigall et al., 2005; Hammarberg & Tinney, 2006; de Lacey, 2007b).

The decision to dispose of unused embryos is widely acknowledged as emotionally difficult, involving time and various cognitive stages (Soderstrom-Anttila et al., 2001; Svanberg et al., 2001; McMahon et al., 2003; Nachtigall et al., 2005). A couple's conceptualization of their embryo is an important factor that contributes to the complexity and difficulty of the decision (de Lacey, 2005; Nachtigall et al., 2005).

Emerging evidence suggests that couples may believe that embryos replicate a child or existing children (Laruelle & Englert, 1995; Svanberg et al., 2001; McMahon et al., 2003; Parry, 2006). Also, the couple's decision is inherently complicated by the variety and disparity of the potential embryo uses and outcomes: embryos can be used by the couple in further attempts to conceive, 'donated' to other infertile couples who are unable to conceive their own child, used in medical research, destroyed, disposed of by intentionally transferring them at a time that precludes implantation, or stored indefinitely (de Lacey, 2005; Nachtigall et al., 2005).

In recent years, the use of embryos to create embryonic stem cell lines for the development of regenerative therapies has become widespread (Hammarberg & Tinney, 2006). In Brazil, the Medicine Federal Counsellor established ethical rules for assisted reproductive techniques, which govern the consent for embryo cryopreservation and the couples' decision on the embryo destination (CFM, 1992). Since 2005, Brazilian Federal legislation has permitted embryos that have been cryostored for more than 3 years or non-viable embryos to be used in stem cell research (ANVISA, 2005). However, little is known about the social implications of maintaining cryopreserved embryos for infertile couples, especially with regard to these couples' family planning strategies and personal relationships (Bankowski et al., 2005).

Using qualitative methods, this study evaluated the decision-making process of IVF patients with regard to their cryopreserved surplus embryos, exploring the patients' views on options for the embryos' destination and the factors that influence these decisions.

Materials and methods

Patients

This study was conducted with 50 couples who underwent successful controlled ovarian stimulation

for IVF through intracytoplasmic sperm injection (ICSI). All couples achieved a healthy birth, and had embryos cryopreserved for 6 months to 3 years at the Fertility - Assisted Fertilization Center, Brazil. This study was approved by the Institutional Review Board, and all couples receive the standard counseling about the possibility of producing supernumerary embryos and gave signed consent to participate in the study.

Controlled ovarian stimulation

Controlled ovarian stimulation was achieved by long pituitary down regulation using a gonadotropin-releasing hormone agonist (GnRH_a, Lupron KitTM, Abbott S.A Societ  Franaise des Laboratoires, Paris, France) followed by ovarian stimulation with recombinant-FSH (Gonal-F[®], Serono, Geneva, Switzerland). Follicular dynamics were followed by ultrasound, starting on day 4 of gonadotropin administration. When adequate follicular growth and serum estradiol levels were observed, recombinant human chorionic gonadotrophin (r-hCG, OvidrelTM, Serono, Geneva, Switzerland) was administered to trigger final follicular maturation. The oocytes were collected 35 h after hCG administration by transvaginal ultrasound ovum pick-up.

Intracytoplasmic sperm injection and embryo transfer

For intracytoplasmic sperm injection (ICSI), oocytes were placed individually in 4 μ l droplets of buffered medium (G-MopsTM-V1, Vitrolife, Kungsbacka, Sweden). The sperm were placed in a central 4 μ l droplet of polyvinylpyrrolidone solution (PVP, Irvine Scientific, Santa Ana) in a 50 \times 40 mm² glass culture dish (WillCo-dish[®], New Jersey) covered with warm mineral oil (OvoilTM, Vitrolife, Kungsbacka, Sweden). The sperm injection was carried out on the heated stage (37°C) of an inverted microscope (Eclipse TE 300; Nikon[®], Tokyo, Japan) 40 h after hCG trigger.

Embryo transfer was performed on the second or third day of development. For each couple, one to three embryos were transferred, depending on the embryo quality and the woman's age.

Embryo freezing and thawing procedures

Embryos generated by ICSI that were not used for embryo transfer were cryopreserved. Cryopreservation was carried out with a programmed biological freezing chamber (Cryochamber CL8800; Cryologic, Mulgrave, Victoria, Australia), following a slow-freeze protocol using propanediol (PROH) as a cryoprotectant. Freezing and thawing were

performed using an Embryo Freeze and Embryo Thaw media kit (Irvine Scientific).

Questionnaire and psychological evaluation

The couples were contacted and asked to make a decision regarding their embryos, which were in long-term storage. Semi-structured interviews were conducted by a psychologist, in person or by telephone, in a narrative style. Using an interview guide, the psychologist asked participants to answer questions regarding their frozen embryos. The responses were listed and couples were asked to indicate the reasons for choosing a particular option. Each participant could give more than one response. Also, the participants were asked to describe their thoughts and feelings regarding having embryos frozen and making a decision about the fate of those that were unused.

All interviews were with the female partner. Direct answers (yes or no) were tabulated, the reasons for choosing answers and the thoughts and feeling described for participants during the interviews were recorded, and the data were subjected to a process of coding according to grounded theory. Close attention was paid to how participants described their perceptions and the moral values they drew upon.

Results

Of the 50 couples contacted, 25 participants ignored efforts by the program to maintain contact, three participants were not confident in answering the questions, while 22 participants agreed to respond to the psychologist's inquiries.

First, the interview aimed to identify whether, before the IVF cycle, the couples had thought about the possibility of having surplus embryos and if there was adequate counseling on that issue. Before treatment, most of the patients (73%) believed that they would have surplus embryos, and desired them since they were considered to increase the possibility of achieving a pregnancy. Of those, 32% considered the cryopreserved surplus embryos a further chance to conceive a child if IVF failed and 68% believed this to be the case even if success was achieved on that cycle.

In addition, 91% of participants stated that the counseling about the storage and possibilities of usage of surplus embryos was adequate.

In terms of the questions relating to embryo destination, the patients could choose one or more options, and 29 answers were obtained from 22 patients. The alternatives chosen for the frozen embryos are shown in Table I.

Decisions about embryo destination reflect the couples' views about the nature of embryos and

Table I. Options chosen for frozen embryos (22 patients, 29 answers).

	<i>n</i>	%
Maintain the cryostored embryo for own future use	9	31.1
Donate to research	9	31.1
Dispose	7	24.1
Donate to another couple	3	10.3
Were unable to make a decision	1	3.4
Total answers	29	100

whether they held the view that embryos are 'life' or have a 'right to life'. When couples were asked about the nature of embryos, five patients did not consider the embryos as a potential for life, but that the embryos had a legal/moral status, or represented 158 the necessity of decision-making. The other 17 participants (77.3%) recognized their cryostored embryos' potential for life. Among those, one patient was unable to make a decision about embryo destination, one would donate the embryos to another couple, and two patients declared that maintaining them in cryostorage for their own usage was the only option for their embryos.

Nine patients did not consider the option of thawing the embryos to have another chance to conceive a child. Of these patients, four would dispose of the embryos and five would donate them to scientific research. The 'own usage' or 'donate for scientific research' ($n=2$) and the 'own usage' or 'dispose of them' ($n=2$) were possible options for embryo destination for four patients.

Those who associated the embryos with religion would not dispose of them and those who associated the embryos with legal/moral issues would not donate them to scientific research. The participants mainly stated that discarding their embryos was a 'last minute decision'. Those who chose to discard rather than donate the embryos to research most frequently expressed their concern about the misuse of embryos. On the other hand, those who chose to discard rather than donate the embryo to other couples stated that 'donating an embryo would be like giving away a child' or 'a resulting child would be a sibling to [their] own children'.

Seven patients were unsure about whether life began in the embryos and for that reason, would not discard the embryos.

Discussion

Although the options for embryo destination appear to provide a range of choices, the decision primarily involves choosing between the donation or destruction of embryos or in the case of embryo research, both. The findings from this study allow some insight

into the issues faced by couples who make a decision about stored embryos and the determinants of their decisions.

A number of studies relating to surplus donor embryos using anonymous surveys have yielded response rates between 14% and 45% (McMahon et al., 2003; Greenfeld & Klock, 2004; Klock, 2004; Nachtigall et al., 2005; Hammarberg & Tinney, 2006). In the current study, the response rate was 44%, while 56% of couples avoided making a decision about their cryostored embryos by not responding to the interview (6%) or not informing the clinic of changes in address (50%).

In a recent study, it was demonstrated that patients' conceptualization of their embryos plays an important role in embryo disposition decisions. In this study, participants spontaneously followed a two-stage decision sequence in ranking their disposition options. In the first stage, the presence of the themes 'genetic link' or 'symbolic meaning' were linked with a clear reluctance to donate to other infertile patients. At the second stage of the decision sequence, two aspects were relevant. First, a lack of confidence in medical science was linked with a clear reluctance to donate; second, the idea that the embryo is an entity with a high instrumental value was positively linked with donation for science and to donation to other couples (Provoost et al., 2009).

Brzyski (1998) also found that a significant number of patients with cryopreserved embryos ignored efforts by the centre to maintain contact. This may reflect the inability of couples to make a decision, or to indifference about what happens to the embryos.

Counselling before undergoing ART treatment is mandatory in our clinic and includes information about the options available for couples with super-numerary embryos. Most couples stated that counselling was adequate; however, a small percentage felt that there was a lack of adequate counselling although this may represent a type of 'self-defense' response and avoidance of the responsibility for their embryos.

The consideration of embryos as 'life' or having a 'right to life' is often referred to in ethical analysis as the question of 'moral status'; whether the embryo is deserving of the same rights, respect, and protection owed to a child or adult. It has been reported that patients' conceptualization of embryos is complex and may range from envisaging embryos as little more than tissue to envisaging them as independent children (Nachtigall et al., 2005; de Lacey, 2007b).

In a recent publication, McMahon and Saunders (2009) suggested that patients' reluctance to donate their embryos was related to a view of the embryo not only as a potential child but as a full sibling to

existing children, and a feeling of ongoing responsibility for the well-being of the offspring (McMahon & Saunders, 2009). In the current study, although most participants perceived their embryos as 'potential life', paradoxically, many chose an option that resulted in the embryo's destruction (i.e. discard or donate to research). This observation has been noted by other researchers (Laruelle & Englert, 1995).

Our results agreed with those of others (Darlington & Matson, 1999; Kovacs et al., 2003; Elford et al., 2004; Hammarberg & Tinney, 2006) in respect of donating embryos to another couple, which was the least frequently chosen alternative. Evidence suggests that embryos are believed to replicate a child or existing children (de Lacey, 2005; Nachtigall et al., 2005; Parry, 2006; Fuscaldo et al., 2007), which presupposes that donating the embryos to another couple signifies giving away a child.

The patients who disagreed with donating their embryos to another couple may view the embryo donation as metaphorically like relinquishing a child for adoption, and typically consider the family as an organic unit that is biologically bounded by genetics (de Lacey 2007a,b). Moreover, patients may be concerned about consanguinity (McMahon & Saunders, 2009).

Although disposal is acknowledged as the most commonly chosen option for surplus embryos (Robertson, 1995; Darlington & Matson, 1999; Kovacs et al., 2003), the couples in this study were more likely to donate embryos to research than to discard them, which may also be seen as a consequence of a decision not to waste, as shown by Hammarberg and Tinney (2006).

Zweifel et al. (2007) reported that that only a small percentage of couples consider donation of embryos to research. This study suggests that many stem cell candidates may misunderstand or not receive adequate information about their disposition options and that additional psychological support is needed, particularly for couples considering embryo donation for research.

The reason given by the few couples who chose to discard the embryos was that it was a 'last minute decision' which could suggest that they disagree with embryo research and feel that they are unable to donate their embryos to another couple.

We found an equal proportion of responses agreeing to donate embryos to research and maintaining them in cryostorage for future usage. The recent and intensive public debate about issues relating to research on human embryos in Brazil may have raised awareness about the potential benefits of this research to other infertile couples and the potential benefits of embryonic stem cells for regenerative medicine.

Similar studies have found that the importance of not wasting embryos was stated by patients who chose to donate embryos to research (McMahon et al., 2003; de Lacey 2007a,b). Although a reasonable percentage of patients had manifested the intention to donate the embryos to research, we observed a minimal clear reference to 'waste', in spite of the public campaigns concerning the potential benefits of embryo research. As reviewed by Hug (2008) and observed in this study as well, not knowing the aim of medical research appeared to motivate the patients who did not donate their surplus embryos to research.

We noted that a couple's opinion on the respective social relation to the embryos influenced how they decided between donating or discarding their embryos. The patients who associated the embryos with legal/moral issues would not donate them to scientific research, even though it is legal in Brazil. Patients who associated the embryos with religion did not dispose of them, as Brazil is overwhelmingly a Roman Catholic country and Roman Catholicism disagrees with this practice. Other authors have reported similar situations, where couples who emphasized social bonding were more likely to donate embryos to other couples (Laruelle & Englert, 1995).

The decision to dispose of embryos is widely acknowledged as emotionally difficult (Fuscaldo et al., 2007) and begins at the time of original embryo storage and involves various cognitive stages (Nachtigall et al., 2005). A root cause of the ambivalence about the disposition decision is that couples are initially focused on the immediate goal of achieving a pregnancy while working their way through the complex intermediate steps and decisions required by the IVF technique, and do not anticipate that having surplus embryos will present a challenge in the future.

During this initial reassurance stage, the ability to store surplus embryos is viewed as a bonus because at this point, the couples do not know how many attempts they will need to achieve their first pregnancy. All couples in this study had a successful outcome and once pregnancy had been successfully achieved and their childbearing completed, the second-stage reaction of most couples was characterized by avoidance of the issue. This avoidance may have been associated with the implied assumption that the decision could be postponed, perhaps indefinitely, as it was impossible to contact 50% of them.

When couples finally entered the confrontation stage, their initial reaction was frequently one of discomfort and uncertainty. Part of the distress for several couples was that they were not immediately comfortable with any of the options.

Previous qualitative data had largely drawn upon the perspectives of participants who had not yet been able to come to a decision about embryo destination (Nachtigall et al., 2005) and had found that the process of making a decision hard and emotionally fraught (Fuscaldo et al., 2007). The strength of the present study is that almost all participants who could be contacted had engaged in the cognitive process of decision-making and finalized a decision.

Embryo cryopreservation, a technique that has only been successfully employed in the last two decades, is now widely used to improve the cost-effectiveness of IVF and expand the options available to infertile couples. However, the magnitude of embryo cryopreservation and its accompanying future societal consequences are not well understood.

All participants in the study were parents who had a successful IVF cycle, and the surplus embryos were cryostored. As previous findings support that patients' decisions regarding embryos are unaffected by whether they are parents (Lornage et al., 1995; Lyerly et al., 2006), we believe that the information obtained here may represent the views of couples with cryostored embryos in general.

Simple steps can be implemented by clinics to help people in making decisions about their surplus embryos (Fuscaldo et al., 2007) and we must learn how to improve our roles as counsellors to help alleviate couples' uncertainties during the decision-making process.

This was a qualitative study concerned with the thoughts, feelings, attitudes, actions, and experiences of the participants. In this way, we believe that the interview methodology was suited to the assessment of personal issues in the decision-making process on embryo destination and, despite the small number of respondents, this methodology provides valuable information about these complex issues.

Our study also supports the role and effectiveness of psychological counselling in easing supernumerary embryo decision-making and includes strategies to minimize unclaimed embryos.

Acknowledgments

Rose Maria Massaro Melamed was involved in study conception, design, acquisition of data, analysis and interpretation of data. Tatiana Carvalho de Sousa Bonetti and Daniela Paes de Almeida Ferreira Braga were involved in the analysis, interpretation of data, drafting the article and revising it critically for intellectual content. Camila Madaschi was involved in drafting the article. Assumpto Iaconelli Jr. was involved in the final approval of the version to be published. Finally, Edson Borges Jr. was involved in revising the article critically for intellectual content and for final approval.

References

- ANVISA. (2005). Lei de Biossegurança, D.O.U. DE 28/03/2005. 11.105: P.1.
- Bankowski, B.J., Lyerly, A.D., Faden, R.R., & Wallach, E.E. (2005). The social implications of embryo cryopreservation. *Fertility and Sterility*, *84*, 823–832.
- Borini, A., Cattoli, M., Bulletti, C., & Coticchio, G. (2008). Clinical efficiency of oocyte and embryo cryopreservation. *Annals of the New York Academy of Sciences*, *1127*, 49–58.
- Brzyski, R.G. (1998). Efficacy of postal communication with patients who have cryopreserved pre-embryos. *Fertility and Sterility*, *70*, 949–951.
- CFM (1992). Normas éticas para a utilização das técnicas de reprodução assistida, Conselho Federal de Medicina. CFM n° 1.358/92.
- Darlington, N. & Matson, P. (1999). The fate of cryopreserved human embryos approaching their legal limit of storage within a West Australian *in-vitro* fertilization clinic. *Human Reproduction*, *14*, 2343–2344.
- de Lacey, S. (2005). Parent identity and ‘virtual’ children: why patients discard rather than donate unused embryos. *Human Reproduction*, *20*, 1661–1669.
- de Lacey, S. (2007a). Decisions for the fate of frozen embryos: fresh insights into patients’ thinking and their rationales for donating or discarding embryos. *Human Reproduction*, *22*, 1751–1758.
- de Lacey, S. (2007b). Patients’ attitudes to their embryos and their destiny: social conditioning? *Best Practice and Research Clinical Obstetrics and Gynaecology*, *21*, 101–112.
- Elford, K., Lawrence, C., & Leader, A. (2004). Research implications of embryo cryopreservation choices made by patients undergoing in vitro fertilization. *Fertility and Sterility*, *81*, 1154–1155.
- Fuscaldo, G., Russell, S., & Gillam, L. (2007). How to facilitate decisions about surplus embryos: patients’ views. *Human Reproduction*, *22*, 3129–3138.
- Fuscaldo, G. & Savulescu, J. (2005). Spare embryos: 3000 reasons to rethink the significance of genetic relatedness. *Reproductive Biomedicine Online*, *10*, 164–168.
- Greenfeld, D.A. & Klock, S.C. (2004). Disclosure decisions among known and anonymous oocyte donation recipients. *Fertility and Sterility*, *81*, 1565–1571.
- Hammarberg, K. & Tinney, L. (2006). Deciding the fate of supernumerary frozen embryos: a survey of couples’ decisions and the factors influencing their choice. *Fertility and Sterility*, *86*, 86–91.
- Hug, K. (2008). Motivation to donate or not donate surplus embryos for stem-cell research: literature review. *Fertility and Sterility*, *89*, 263–277.
- Klock, S.C. (2004). Embryo disposition: the forgotten “child” of *in vitro* fertilization. *International Journal of Fertility and Women’s Medicine*, *49*, 19–23.
- Kovacs, G.T., Breheny, S.A., & Dear, M.J. (2003). Embryo donation at an Australian university *in-vitro* fertilisation clinic: issues and outcomes. *The Medical Journal of Australia*, *178*, 127–129.
- Laruelle, C. & Englert, Y. (1995). Psychological study of *in vitro* fertilization-embryo transfer participants’ attitudes toward the destiny of their supernumerary embryos. *Fertility and Sterility*, *63*, 1047–1050.
- Lornage, J., Chorier, H., Bouliou, D., Mathieu, C., & Czyba, J.C. (1995). Six year follow-up of cryopreserved human embryos. *Human Reproduction*, *10*, 2610–2616.
- Lyerly, A.D., Steinhauser, K., Namey, E., Tulsy J.A., Cook-Deegan, R., Sugarman, J., et al. (2006). Factors that affect infertility patients’ decisions about disposition of frozen embryos. *Fertility and Sterility*, *85*, 1623–1630.
- McMahon, C.A., Gibson, F.L., Leslie, G.I., Saunders, D.M., Porter, K.A., & Tennant, C.C. (2003). Embryo donation for medical research: attitudes and concerns of potential donors. *Human Reproduction*, *18*, 871–877.
- McMahon, C.A. & Saunders, D.M. (2009). Attitudes of couples with stored frozen embryos toward conditional embryo donation. *Fertility and Sterility*, *91*, 140–147.
- Nachtigall, R.D., Becker, G., Friese, C. Butler, A., & MacDougall, K. (2005). Parents’ conceptualization of their frozen embryos complicates the disposition decision. *Fertility and Sterility*, *84*, 431–434.
- Parry, S. (2006). (Re)constructing embryos in stem cell research: exploring the meaning of embryos for people involved in fertility treatments. *Social Science and Medicine*, *62*, 2349–2359.
- Provoost, V., Pennings, G., De Sutter, P., Gerris, J., Van de Velde, A., De Lissnyder, E., et al. (2009). Infertility patients’ beliefs about their embryos and their disposition preferences. *Human Reproduction*, *24*, 896–905.
- Revel, A., Safran, A., Laufer, N., Lewin, A., Reubinov, B.E., & Simon, A. (2004). Twin delivery following 12 years of human embryo cryopreservation: case report. *Human Reproduction*, *19*, 328–329.
- Robertson, J.A. (1995). Ethical and legal issues in human embryo donation. *Fertility and Sterility*, *64*, 885–894.
- Soderstrom-Anttila, V., Foudila, T., Ripatti, U.R., & Sieberg, R. (2001). Embryo donation: outcome and attitudes among embryo donors and recipients. *Human Reproduction*, *16*, 1120–1128.
- Svanberg, A.S., Boivin, J., & Bergh, T. (2001). Factors influencing the decision to use or discard cryopreserved embryos. *Acta Obstetrica et Gynecologica Scandinavica*, *80*, 849–855.
- Trounson, A. & Mohr, L. (1983). Human pregnancy following cryopreservation, thawing and transfer of an eight-cell embryo. *Nature*, *305*(5936), 707–709.
- Zweifel, J., Christianson, M., Jaeger, A.S., Olive, D., & Lindheim, S.R. (2007). Needs assessment for those donating to stem cell research. *Fertility & Sterility*, *88*, 560–564.