

Attitudes towards embryo donation among infertile couples with frozen embryos

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STUDY QUESTION: What are the attitudes towards different aspects of embryo donation among Swedish infertile couples who have surplus cryopreserved embryos?

SUMMARY ANSWER: Nearly three-quarters of infertile couples with surplus embryos were in favour of embryo donation. A majority of respondents were also in favour of embryos being donated for research.

WHAT IS KNOWN ALREADY: Currently, embryo donation to other infertile couples is prohibited by law in Sweden. Encouraging results have been published from countries allowing embryo donation, although it is a complex procedure associated with many emotional, ethical, legal and psychosocial aspects.

STUDY DESIGN, SIZE, DURATION: This cross-sectional study included 471 infertile couples (942 patients) treated during the period March 2006 to March 2009.

PARTICIPANTS/MATERIALS, SETTING, METHODS: Infertile couples who had been treated at a Swedish university-based hospital and private IVF clinic and who had cryopreserved embryos were sent questionnaires with questions regarding socio-demographic data and their attitudes towards embryo donation.

MAIN RESULTS AND THE ROLE OF CHANCE: The response rate to the questionnaire was 58%. Of the respondents, 76% supported the donation of surplus embryos to other infertile couples, but there were divided opinions regarding the disclosure of the genetic parents' identities. Close to 60% of the participants indicated that donations of embryos should be allowed for research and about 45% of the participants approved donations of embryos to single women.

LIMITATIONS, REASONS FOR CAUTION: The relatively low response rate and the hypothetical nature of the questions may limit the validity of the results.

WIDER IMPLICATIONS OF THE FINDINGS: The results from the study indicate that cryopreserved embryos may be available for donation to other infertile couples, particularly where restrictions can be set on recipient characteristics.

STUDY FUNDING/COMPETING INTEREST(S): The study was supported by Uppsala University. No competing interest exists.

Key words: attitudes / embryo donation / infertile / cryopreserved embryos / research

Introduction

In vitro fertilization (IVF) is the most common method of treatment for infertility and is contributing to 1–4% of all newborns in many countries (Nyboe Andersen *et al.*, 2009). More than 4 million children worldwide have been born after IVF, 40 000 in Sweden alone (Bergh and Wennerholm, 2010). Embryo donation may be indicated for women who for various reasons have no or poor quality oocytes and/or a partner with

severe male factor as a cause of infertility. Another group of people who may benefit from embryo donation are couples with genetic or chromosomal abnormalities. Women with repeated failed attempts to become pregnant using IVF treatment may also consider embryo donation. About two-thirds of couples who complete a maximum of three (often publicly funded) optimal IVF treatments become pregnant (Olivius *et al.*, 2002). Approximately one in three couples is therefore still in need of help conceiving children after completing the offered

treatment programme. Embryo donation also opens up an additional opportunity for single women and lesbians couples to raise families.

The source of cryopreserved embryos is either from embryos created from separate donors or from stored embryos from completed IVF treatments. The majority of couples choose to freeze their extra embryos (Svanberg *et al.*, 2001a,b; Newton *et al.*, 2003). However, research shows that only a limited number of couples with frozen embryos would consider donating to other couples and only about 10% actually donate (Kovacs *et al.*, 2003; Bangsboll *et al.*, 2004; McMahon and Saunders, 2009). Many couples choose continued cryopreservation of surplus embryos, where the maximum freezing time internationally varies between 5 and 10 years (Jones *et al.*, 2011). In Sweden, the maximum storage period is 5 years, with a possibility to extend this due to exceptional circumstances (Riksdag, 2006). Many couples however, mainly due to the completion of family formation, never use their stored embryos which means that many embryos are not used and are therefore discarded (Bangsboll *et al.*, 2004; Hammarberg and Tinney, 2006). In Sweden alone, up to one-third of the couples do not require their frozen embryos (Svanberg *et al.*, 2001a,b, 2003a,b). These stored embryos could be a source of potential donations (Lee and Yap, 2003).

The first attempt to introduce a donated embryo to an infertile woman was performed in 1983 (Trounson *et al.*, 1983). Encouraging results have been published on successful implantation, clinical pregnancy and child-birth after embryo donation (Soderstrom-Anttila *et al.*, 2001; Kovacs *et al.*, 2003; Keenan *et al.*, 2012). Pregnancy chances vary with figures from 19.1 to 52.4% (Lee and Yap, 2003).

Currently, embryo donation to other infertile couples is prohibited by law in many countries mainly due to the complex procedure associated with the many emotional, ethical, legal and psychosocial aspects. It is however allowed in some countries such as, Armenia, Australia, Bulgaria, Belgium, Brazil, Canada, Estonia, Finland, France, Greece, Hong Kong, Hungary, the Netherlands, New Zealand, Portugal, Russia, Slovakia, Spain, South Africa, the UK and some states in the US. Guidelines and regulations on embryo donation vary substantially between different countries (Shenfield *et al.*, 2001; Jones *et al.*, 2011). Few clinicians, even in countries where embryo donation has been permitted, have clear guidelines for the procedure (ESHRE, 2002; ASRM, 2004). The question about anonymity is complex and affects the welfare of donors, recipients and children (ESHRE, 2002). In the USA, the American Society for Reproductive Medicine developed practical and psychological guidelines for gamete and embryo donation for clinicians to follow (ASRM, 2006, 2013). The guidelines recommend counselling for both donors and recipients. Donors are not allowed any compensation for their donated embryos and confidential records on donors shall be kept for at least 10 years. The embryo donation process is complex and needs to be designed according to conditions of both donors and recipients (Frith *et al.*, 2011). In New Zealand, where embryo donation has been allowed since 2005, the procedure is strictly regulated by specific guidelines, which include a mandatory consultation for donors and recipients, donor registration and openness regarding the genetic link (Goedeke and Payne, 2009). In the UK, counselling has been formalized according to the Human Fertilization and Embryology Act, and must be offered by all clinics to embryo recipients (Machin, 2011). In Sweden, guidelines for embryo donation have not yet been formulated. Since laws and regulations vary between different countries, some couples

go abroad to get treatments with donated embryos. The donation of embryos for reproduction is not permitted in Sweden because the law demands a genetic link to at least one of the parents (Riksdag, 2006).

The use of pre-embryos for research is also prohibited in most countries because of ethical reasons (Jones *et al.*, 2011). However, the Swedish law does allow gamete donation and use of embryos for research for up to 2 weeks after fertilization. The aim of this study was to investigate the attitudes towards donation of surplus cryopreserved embryos in a sample of Swedish infertile couples, in order to achieve information on how to design rules and regulations for embryo donation.

Materials and Methods

Study population

The sample consists of 407 couples (814 patients) who over the period 1 March 2006 to 1 March 2009 underwent IVF treatment at a public Swedish IVF centre and at the time of study entry had frozen embryos. The remaining permitted storage times varied from 0 months to 3 years. We also included 64 couples (128 patients) from a private Swedish IVF clinic. These couples had surplus cryopreserved embryos at the end of permitted storage, i.e. the couples had their embryos stored for the maximum of 5 years. All patients had successful births following IVF treatment prior to inclusion in the study.

Study design

The study was designed as a descriptive questionnaire survey. The setting was a university-based IVF clinic. The questionnaire was composed of questions used in previous similar surveys and regarded relevant for the study (Soderstrom-Anttila *et al.*, 2001; Bangsboll *et al.*, 2004; McMahon and Saunders, 2009; Mohler-Kuo *et al.*, 2009). Part one consisted of 15 structured questions regarding the respondent's personal and socio-demographic background (Table I). Part two consisted of 22 statements about attitudes towards embryo donation, which are divided into three subgroups (Tables II, III and IV). In order to answer the statements contained in part two, a Likert scale (Likert, 1932) was used, where 1 represents 'strongly agree', 2 'agree to some extent', 3 'neither agree nor disagree', 4 'agree only a little' and 5 'completely disagree'. A sixth option for those who could not decide was 'cannot take a position'. On subsequent statistical processing, the 5 point scale was collapsed to a 3 point scale. The two positive statements 'strongly agree' and 'agree to some extent' were combined into 'agree', and the two more negative statements 'agree only a little' and 'completely disagree' were combined into 'disagree'. The 'neither agree nor disagree' option was called 'neutral' and 'cannot take a position' was left unchanged. The questionnaire was distributed in two similar versions with differences in gender-related issues, one to the woman and another to the woman's partner. Together with the questionnaire came a brief information sheet with information about the study and contact information and information about the purpose of the investigation. Consent was sought and obtained by the participants who semi-anonymously filled out the coded questionnaire and sent it back to the researcher in an enclosed stamped envelope. The code was used to register who responded to the questionnaire. A first reminder with a new survey form was sent to non-respondents after 3 weeks, and a second reminder was sent after a further 3 weeks to those who had not returned the questionnaire.

Additionally a subset of 258 couples treated at the public IVF clinic during the years 2005–2007 were sent a letter, 3 months before the permitted time for their frozen embryos expired. In the letter, the couples were asked if they

Table I Socio-demographic data regarding study participants.

	Women (n = 281) % (n)	Men/partners (n = 263) % (n)
Mean age (SD)	36.3 (3.9)	38.5 (5.0)
Level of education		
University	64.1 (180)	50.8 (133)
High school at least 3 years	23.8 (67)	29.8 (78)
Upper secondary school	9.6 (27)	13.4 (35)
Elementary school	2.5 (7)	6.1 (16)
Marital status		
Single	3.6 (10)	1.9 (5)
Lives alone, steady partner	0.7 (2)	0.8 (2)
Lives with wife/husband/partner	95.7 (269)	97.3 (256)
Caused/experienced pregnancy	97.9 (275)	83.9 (219)
Difficulties in becoming pregnant/ cause pregnancy	95.0 (267)	84.4 (221)
Have own children	93.6 (264)	94.3 (248)
Through assisted reproductive technologies (ART)	70.5 (186)	68.1 (169)
By ART + naturally	20.5 (54)	22.6 (56)
By natural means	7.6 (20)	8.1 (20)
By adoption	1.1 (3)	1.2 (3)
Have cryopreserved fertilized oocytes	86.1 (242)	84.4 (222)
Have donated oocytes/sperm	1.8 (5)	4.7 (12)
Religious community/church		
None	22.4 (63)	29.3 (76)
Swedish church	70.5 (198)	66.0 (171)
Other	7.1 (20)	4.6 (12)
Active in help organization	19.9 (56)	11.2 (29)
Is/has been blood donor	11.0 (31)	18.5 (48)
Familiar with infertility in the surroundings	96.4 (271)	93.4 (242)

The figures are given in frequency % (n) of the total number of respondents to each question/statement. The mean age is presented with standard deviations (SD).

wanted to have their embryos transferred, discarded or if they wanted to donate their embryos to research.

Statistical analysis

Survey registration, statistical processing and analysis were performed in Statistical Package for the Social Sciences (SPSS) version 18. Frequency analyses and comparisons between the woman and partner were performed on all data. Significance was calculated from the 3 point scale using Mann–Whitney *U*-test, and $P < 0.05$ was set as the level of statistical significance. The median value for each statement was calculated on the original data (5 point scale). Average ages in Table III were calculated using Excel.

Ethical approval

The study was approved by the regional ethical review board, Uppsala University, Sweden.

Results

Study population

From a total of 942 persons (814 patients treated at the public clinic and 128 patients at the private clinic) as 471 infertile couples, we received 544 individual responses, representing an overall response rate of 58%. A total of 283 women responded (52%) and 261 men (48%).

Socio-demographic characteristics of the respondents are shown in Table I. Only 84–86% of the patients answered that they had cryopreserved embryos. Some patients must have used or discarded their embryos after inclusion in the study or had forgotten about them. The mean age was 36.3 years for women and 38.5 years for men/partners.

Attitudes towards embryo donation

Infertile couples' attitudes towards donation of embryos in Sweden are presented in Table II. The results show that nearly three-quarters of respondents were in favour of embryo donation in general. More than three-quarters of the respondents were in favour of allowing donation of embryos to other infertile couples. More than half of the respondents agreed on allowing embryos to be donated for research. As for the statement that donation of embryos should be allowed to single women, the responses were distributed fairly evenly between the more positive and negative options.

Special conditions and restrictions for recipients

Infertile couples' attitudes to special requirements for embryo recipients are shown in Table III. The majority of participants agreed that there should be restrictions on the recipients' age (for women 61.9% and men 58.5%). The majority of respondents answered that an appropriate age for recipient women would be within the range of 25–43 years and the appropriate age for men/partners would be within the range 25–45 years. Women and men/partners believed that there should be restrictions on the recipient's alcohol and drug abuse and criminal background, with women feeling more strongly about criminal record than men/partners ($P = 0.024$).

Attitudes towards anonymity

Table IV shows the infertile couples' attitudes towards anonymity in conjunction with embryo donation. Opinions varied about whether embryo donors should remain anonymous to the child, or not. A majority of the respondents believed that embryo donors should remain anonymous to the recipients and that the recipients should remain anonymous to the embryo donors.

Answers to the letters regarding the fate of the couples cryopreserved embryos

A total of 197 out of 258 couples (76%) answered the letters. There were 21 couples (8%) who wanted to have their embryos replaced and 42

Table II Infertile women's and men/partners' attitudes to embryo donation in Sweden.

Statement	Answer	All (n = 544) % (n)	Women (n = 281) % (n)	Md	Men/partners (n = 263) % (n)	Md	P
Embryo donation should be permitted in Sweden	Agree	73.1 (398)	76.2 (214)	4	70.0 (184)	4	NS
	Neutral	4.5 (25)	3.2 (9)		6.1 (16)		
	I disagree	14.7 (80)	14.6 (41)		14.8 (39)		
	Cannot decide	7.5 (41)	6.0 (17)		9.1 (24)		
Embryos should be allowed to be donated to research	Agree	56.6 (308)	55.2 (155)	4	58.2 (153)	4	NS
	Neutral	7.0 (38)	6.8 (19)		7.2 (19)		
	I disagree	24.4 (133)	25.3 (71)		23.6 (62)		
	Cannot decide	11.9 (65)	12.8 (36)		11.0 (29)		
Embryos should be allowed to be donated to infertile couples	Agree	76.5 (416)	77.6 (218)	5	75.3 (198)	4	NS
	Neutral	3.1 (17)	2.1 (6)		4.2 (11)		
	I disagree	12.3 (67)	12.1 (34)		12.5 (33)		
	Cannot decide	8.1 (44)	8.2 (23)		8.0 (21)		
Embryos should be allowed to be donated to single women	Agree	43.8 (238)	48.0 (135)	3	39.2 (103)	2	NS
	Neutral	8.3 (45)	7.8 (22)		8.7 (23)		
	I disagree	35.8 (195)	30.2 (85)		41.8 (110)		
	Cannot decide	12.1 (66)	13.9 (39)		10.3 (27)		

The figures are given in frequency, % and number (n) of the total number of respondents to each statement. Median (Md) is calculated on original data (5 point scale) for each statement. Differences between women and men/partners are statistically evaluated according to Mann–Whitney U-test.

NS, Not significant.

$P < 0.005$ is set as the threshold for significance.

couples (16%) who wanted to have them discarded, while 133 couples (52%) donated their embryos to research and 61 couples (24%) did not answer the letter.

Discussion

We found that a majority of the participating infertile couples who had surplus cryopreserved embryos were in favour of embryo donation. Swedish infertile couples' attitudes to embryo donation have not been previously studied and, although similar studies from other countries can be found, the area is still relatively unexplored. This study represents a sample of infertile couples who have surplus cryopreserved embryos, and who in the near future have to decide what will happen to their embryos. Since the respondents are potential embryo donors, their views are of particular interest on the issue regarding whether or not embryo donation to others should be allowed in Sweden. One possible explanation for why a large majority of respondents are in favour of embryo donation is that they themselves have their own experiences, knowledge and understanding of various forms of assisted reproduction and are more positive about the donation of embryos, in order to help other infertile couples in their effort to have children. In this study the respondents had experienced success with the help of assisted reproduction, which possibly affects the response rate, acceptance and altruistic motive positively. However, previous studies evaluating patients' willingness to donate their surplus embryos, in relation to treatment outcome, have shown mixed results (Lornage *et al.*, 1995; Newton *et al.*, 2003; Fuscaldo *et al.*, 2007; Mohler-Kuo *et al.*, 2009; Nachtigall *et al.*, 2010). Opinions and statements, however, are part of a dynamic process and may very likely differ depending on how attitudes and values change over time.

The positive attitudes to embryo donation in the present study are in agreement with results presented in a similar study from Switzerland (Mohler-Kuo *et al.*, 2009). Similarly, in the Swiss study, almost three-quarters of the respondents were in favour of embryo donation despite the fact that in Switzerland, like in Sweden, it is not allowed at present. Unlike previous studies (Lornage *et al.*, 1995; Newton *et al.*, 2003), more recent studies indicate that there is support for embryo donation among infertile couples as a further alternative to the handling of their surplus embryos (McMahon *et al.*, 2003; Hammarberg and Tinney, 2006; Mohler-Kuo *et al.*, 2009). However, the willingness of couples to donate their embryos decreases when the permitted time limit for cryo-storage of their embryos reaches its end (Lornage *et al.*, 1995).

Also in Australia where embryo donation to other infertile couples is allowed, studies show that donation of embryos for reproduction is the least preferred option when couples need to make a decision regarding their cryopreserved embryos (Kovacs *et al.*, 2003; Hammarberg and Tinney, 2006; McMahon and Saunders, 2009; Provoost *et al.*, 2012). We studied patients' attitudes to donation of embryos for research and a subgroup of patients, with cryostorage times near completion, was asked if they wanted to donate their embryos for research. The study showed that 57% of the patients were in favour of donation of embryos for research and 52% of couples actually donated their own embryos to research. This is a relatively high proportion compared with earlier studies from other countries (McMahon *et al.*, 2003; Bangsboll *et al.*, 2004). However, a Swedish study evaluating the willingness to donate embryos to stem cell research shows even higher figures (Bjuressten and Hovatta, 2003). The relatively high rate of willingness to donate to research might be due to the fact that the patients were informed about the nature of the research. Several Swedish and international studies show that infertility and associated treatments are perceived as stressful and 45% of couples donating embryos have felt this decision

Table III Swedish infertile women's and men/partners' requirements on the recipient of donated embryos.

Statement	Answer	All (n = 544) % (n)	Women (n = 281) % (n)	Md	Men/partners (n = 263) % (n)	Md	P
Recipient's level of education	Agree	6.8 (37)	5.7 (16)	1	8.0 (21)	1	NS
	Neutral	7.7 (42)	8.5 (24)		6.8 (18)		
	I disagree	72.2 (393)	73.7 (207)		70.7 (186)		
	Cannot decide	13.2 (72)	12.1 (34)		14.4 (38)		
Recipient's economic situation	Agree	23.5 (128)	24.9 (70)	2	22.1 (58)	2	NS
	Neutral	8.5 (46)	7.1 (20)		9.9 (26)		
	I disagree	53.9 (293)	54.1 (152)		53.6 (141)		
	Cannot decide	14.2 (77)	13.9 (39)		14.4 (38)		
Recipient's sexual orientation	Agree	16.2 (88)	13.2 (37)	1	19.4 (51)	1	NS
	Neutral	9.7 (53)	8.2 (23)		11.4 (30)		
	I disagree	57.0 (310)	61.9 (174)		51.7 (136)		
	Cannot decide	17.1 (93)	16.7 (47)		17.5 (46)		
Recipient woman's medical history	Agree	35.8 (195)	35.9 (101)	2	35.7 (94)	2	NS
	Neutral	8.8 (48)	9.3 (26)		8.4 (22)		
	I disagree	36.2 (197)	35.9 (101)		36.5 (96)		
	Cannot decide	19.1 (104)	18.9 (53)		19.4 (51)		
Recipient partner's medical history	Agree	34.4 (187)	34.9 (98)	2	33.8 (89)	2	NS
	Neutral	9.2 (50)	9.3 (26)		9.1 (24)		
	I disagree	37.9 (206)	38.1 (107)		37.6 (99)		
	Cannot decide	18.6 (101)	17.8 (50)		19.4 (51)		
Recipient tobacco use	Agree	40.1 (223)	46.1 (129)	3	35.7 (94)	2	0.031
	Neutral	9.2 (50)	9.6 (27)		8.7 (23)		
	I disagree	36.8 (200)	31.1 (87)		43.0 (113)		
	Cannot decide	12.9 (70)	13.2 (37)		12.5 (33)		
Recipient alcohol abuse	Agree	83.6 (455)	84.3 (237)	5	82.9 (218)	5	NS
	Neutral	1.5 (8)	1.4 (4)		1.5 (4)		
	I disagree	5.9 (32)	5.7 (16)		6.1 (16)		
	Cannot decide	9.0 (49)	8.5 (24)		9.5 (25)		
Recipient's drug abuse	Agree	87.5 (476)	87.2 (245)	5	87.8 (231)	5	NS
	Neutral	0.6 (3)	0.7 (2)		0.4 (1)		
	I disagree	4.0 (22)	5.0 (14)		3.0 (8)		
	Cannot decide	7.9 (43)	7.1 (20)		8.7 (23)		
Recipient's criminal background	Agree	65.6 (357)	70.5 (198)	4	60.5 (159)	4	0.024
	Neutral	5.0 (27)	3.9 (11)		6.1 (16)		
	I disagree	16.5 (90)	13.9 (39)		19.4 (51)		
	Cannot decide	13.0 (70)	11.7 (33)		14.1 (37)		

The figures are given in frequency, % and number (n) of the total number of respondents to each statement. Median (Md) is calculated on original data (5 point scale) for each statement. Differences between women and men/partners are statistically evaluated according to Mann–Whitney U-test.

NS, Not significant.

P < 0.05 is set as the threshold for significance.

to be very stressful (Svanberg et al., 2003a,b; Hammarberg and Tinney, 2006). For this reason, counselling plays an important role in the process. Several studies show that there is a great need for good information, education and access to personal support and guidance, in order to assist and facilitate the decision of potential donors and recipients (Svanberg et al., 2001a,b; Hammarberg and Tinney, 2006; Goedeke and Payne, 2011; Machin, 2011; ASRM, 2013).

Special requirements on recipients

There are many and varied opinions about whether special requirements for potential embryo recipients should be permitted (Newton et al., 2003). Studies on conditional relinquishment of surplus embryos show

that IVF parents have different views on how they want to donate their embryos. Some donors want to actively choose the recipients, while others do not want this (Frith et al., 2011). However, it is not surprising that potential donors want input on recipient profiles (Newton et al., 2003). Results from this study indicate that a majority of respondents felt that there should be requirements in terms of the recipient's age, alcohol, tobacco and drug habits and criminal background, while a minority felt that there should be requirements in terms of the recipient's educational level, economic situation and sexual orientation. Women more than men felt that there should be restrictions on recipient's tobacco use (P = 0.031). The respondents' interest in being able to set requirements on the recipient's alcohol and drug habits was expected. In most countries, alcohol abuse or addiction to other drugs will probably disqualify

Table IV Swedish infertile women's and men/partners' attitudes to embryo donation and anonymity.

Statement	Answer	All (n = 544) % (n)	Women (n = 281) % (n)	Md	Men/partners (n = 263) % (n)	Md	P
Embryo donors should be anonymous to the child	Agree	32.7 (178)	27.8 (78)	1	38.0 (100)	2	NS
	Neutral	7.9 (43)	7.8 (22)		8.0 (21)		
	I disagree	33.5 (182)	38.8 (109)		27.8 (73)		
	Cannot decide	25.9 (141)	25.6 (72)		26.2 (69)		
Embryo donors should be anonymous to the recipients	Agree	55.3 (301)	54.1 (152)	4	56.7 (149)	4	NS
	Neutral	6.8 (37)	6.4 (18)		7.2 (19)		
	I disagree	14.5 (79)	15.7 (44)		13.3 (35)		
	Cannot decide	23.3 (127)	23.8 (67)		22.8 (60)		
The recipients should be anonymous to the embryo donor	Agree	58.3 (317)	55.5 (156)	4	61.2 (161)	4	NS
	Neutral	4.2 (23)	3.9 (11)		4.6 (12)		
	I disagree	14.0 (76)	15.3 (43)		12.5 (33)		
	Cannot decide	23.5 (128)	25.3 (71)		21.7 (57)		

The figures are given in frequency, % and number (n) of the total number of respondents to each statement. Median (Md) is calculated on original data (5 point scale) for each statement. Differences between women and men/partners are statistically evaluated according to Mann–Whitney U-test.

NS, Not significant.

P < 0.05 is set as the threshold for significance.

a person from receiving donated gametes or embryos. The results may reflect the infertile couples' awareness that negative lifestyle factors affect and reduce fertility as outcome (Hassan and Killick, 2004).

Criminal background was also shown to be of interest and a majority of respondents wanted to set conditions on the recipients' criminal background. Women especially were in favour of this restriction ($P = 0.024$). These demands are probably dependent on the nature of the criminal record. A record of violent crime, domestic or child abuse would most probably prevent a person from receiving a donated embryo.

Guidelines on acceptance for donation treatment are also considered important as for all forms of assisted reproduction. The child's best health and the woman's health should be considered from medical, psychological and ethical perspectives. With the child's best interests in focus, the genetic parents might naturally not want to expose the child to unnecessary and foreseeable risks (McMahon and Saunders, 2009).

Attitudes towards anonymity

The anonymity/disclosure in embryo donation is often perceived as being more complex than in a gamete donation. Embryo donation, unlike oocyte or sperm donation, involves the full genetic material of the donor pair, and not only the genetic material from one individual. In embryo donation, the child becomes a full biological sibling of the donor couple's own children, not a half-sibling as in oocyte or sperm donation (Goedeke and Payne, 2011).

Despite the strong support among infertile couples to allow embryo donation, it was interesting and somewhat surprising that a third of respondents stated that embryo donors should remain anonymous to the child. This is similar to earlier studies, where a large percentage of respondents do not think that the donor's identity should be revealed to the children (MacCallum and Golombok, 2007; Mohler-Kuo *et al.*, 2009; Readings *et al.*, 2011). Similarly, prior to oocyte donation being allowed in Sweden in 2003, a third of the participating women and men participating in Svanberg *et al.*'s study were reluctant to accept that the child should be told the donors' identity (Svanberg *et al.*,

2003a,b). However, although a large percentage of the respondents in this study were against access to genetic background, there were also a great proportion of respondents who answered that access should be possible for the child in the future. According to current Swedish legislation regarding oocyte and sperm donation, a child who has reached maturity shall be entitled to identifying information about the donor. Follow-up studies of mothers who conceived after gamete donation also suggest that those who do not tell the child about their origin show higher stress levels than women who disclose (Golombok *et al.*, 2011). With the child's best interests in mind, and in order to reduce psychosocial and medical consequences in the future, disclosure should be encouraged when new methods of assisted reproduction such as embryo donation are introduced.

The majority of the participants also indicated that embryo donors and embryo recipients should be anonymous to each other, which is more the rule than the exception in the countries where embryo donation is currently allowed (Lee and Yap, 2003). In the case of conditional relinquishment of embryos, there are a variety of views on anonymity. Some donors favour anonymity, while others want to choose the recipients and have various degrees of relation to the recipients and the child (Frith *et al.*, 2011). It is possible that different options need to be available to satisfy the legislators in different countries, as well as the wishes of both donors and recipients (Laruelle *et al.*, 2011).

Limitations of the study

The overall response rate of 58% can be questioned, but can be acknowledged and still considered relatively high when there is often a low response rate reported in studies that involve attitudes to embryo donation. Previously conducted anonymous studies have reported response rates ranging between 29 and 45% (Hammarberg and Tinney, 2006). The participants in the study were mainly from a university city and a limited part of Sweden and may therefore not be representative for infertile couples throughout Sweden. The mixture of patients from both public and private clinics will probably make the results more valid. However, donation in Sweden is currently performed only at university

clinics, while a majority of the IVF treatments are done at private clinics. The fact that not all patients answered that they had cryopreserved embryos and the hypothetical nature of the questions may limit the validity of the results. It is not possible to ascertain to what extent patients who express positive intent will actually follow through with donation.

Conclusion

In conclusion, embryo donation, from a medical perspective, is a relatively simple procedure, where the difficulty lies mainly in its complexity in terms of legal, moral and ethical aspects. This study demonstrates that nearly three-quarters of surveyed Swedish infertile couples with surplus embryos are in favour of embryo donation. Some of these couples can be considered to be potential embryo donors. A majority of respondents are also in favour of embryos being donated for research. The results from the study indicate that cryopreserved embryos may be available for donation to other infertile couples if embryo donation becomes available in Sweden.

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Authors' roles

All authors have been involved in planning and performance of the study and have been involved in preparation of the manuscript.

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Conflict of interest

None declared.

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