

# OPINION

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## No reason for a reduction in the number of offspring per sperm donor because of possible transmission of autosomal dominant diseases

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**A limit of 25 offspring per sperm donor has been imposed in The Netherlands since 1992, in order to prevent children from donors having a greater risk of consanguineous relationships than would occur in random individuals. An incident with a donor who developed a serious hereditary brain disease raised the question whether the limit of 25 should be reduced. Here I consider this suggestion from a genetic, psychological and legal standpoint. There appears to be no valid population genetics argument for limiting the number of donor offspring to below the figure that would prevent an increased chance of inbreeding. Reduction of the number of children per donor theoretically only results in transmission of greater diversity to donor offspring. Moreover, as within the general population, the total number of children conceived from sperm donors is negligible, the impact of donor offspring on the population genetics is anyhow insignificant. From a psychological standpoint, it should be noted that individuals making use of a donor, or their offspring, have no knowledge of other offspring conceived with their particular donor. This implies that the number of offspring per donor is of no relevance to them (provided of course there is an acceptably low chance of inbreeding). The new Dutch law on disclosure of donor identity to donor-insemination children, also produces no compelling reasons for a general reduction in the number of offspring per donor. Reduction desired by individual donors can be obtained by means of mutual agreements between sperm banks and donors. In conclusion neither the possible transmission of late-onset autosomal dominant diseases, nor other considerations necessitate a reduction in the offspring limit calculated to prevent increased risks of inbreeding among donor offspring.**

*Key words:* consanguinity/genetic disorders/offspring/sperm donor/The Netherlands

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### Introduction

In 1992 professionals involved in donor insemination (DI) in The Netherlands reached a consensus on the maximum number of children they considered to be responsible to allow per sperm donor (de Bruyn, 1997). A limit of 25 was adopted, based on the principle that children from sperm donors may have at most a similar risk as random population members for unintentionally obtaining consanguineous relationships when they grow up. The figure of 25 resulted from calculations, making use of specific data about the Dutch population, including figures on inbreeding, the average number of children parents have, the chance for donor-children to have children themselves, age and geographical factors determining the likelihood of meeting a partner in the district of the donor bank, and the size of the population being served by a single donor bank (800 000 persons), (de Boer *et al.*, 1995). A self-regulatory limit of 25 offspring per sperm donor was accepted by the government and has been retained since (de Bruyn, 1997).

Last Spring (February, 2002) a sperm donor in The Netherlands, having fathered 18 children by means of artificial insemination, developed a serious late-onset hereditary brain

disease (Janssens, 2002; Sheldon, 2002). This disease, autosomal dominant cerebellar ataxia, was neither evident at intake of the donor or from the donor's family history, nor in the subsequent period of semen donation. The cerebellar ataxia manifested itself several years after the donor had stopped sperm donation (Janssens, 2002; Sheldon, 2002).

The danger of inbreeding, used to calculate the tolerable number of offspring for sperm donors, is directly related to the transmission of autosomal recessive hereditary traits—offspring of related mates having a significant risk of homozygosity with resultant manifestation of defects. However, the aforementioned donor had a dominant hereditary disease of a late-onset type. The question raised with respect to the transmission of dominant hereditary traits (of late-onset type) is whether the limit should be lower than the 25 based on the transmission of recessive traits. This question is approached in this article from a genetic, psychological and legal point of view, taking into consideration the consequences of DI for the general population, for parents seeking help from DI plus their offspring, and semen donors.

### Genetic considerations

When in a population, a certain total number of offspring is produced by DI, the genetic load propagated by sperm donors is independent of the number of offspring per sperm donor. Thus, for obtaining the same total number of offspring more donors are to be used when the offspring-limit per donor is set low, and fewer donors when the limit is set high. The number of children per donor affects only the variation (diversity) of genetic traits transmitted to the general population. When the number of offspring per donor is low, the genetic variation transmitted is higher than when the number of offspring per donor is high—a fact which is independent of the actual limit for donor offspring. Use of less donors only results in a somewhat higher chance of an imbalanced transmission of hereditary traits, whether they be ‘good’ or ‘bad’, favourable or pathologic, autosomal recessive or dominant, to name just the extremes. In other words, a high number of children per donor may be fortunate or unfortunate, depending on whether a donor carries more or less unfavourable traits compared with the average male in the general population. So in fact, many offspring per donor might also result in increased spreading of favourable traits. Furthermore, it should be realised that even while allowing a maximum of 25 children per donor, the transmission of characteristics to the general population and the possible genetic imbalance is negligible. Only very few children are the result of DI. For instance, in The Netherlands it is estimated that about 0.5% of the newly born children are conceived by DI (Janssens, 2002).

### Psychological considerations

Individuals, whether it be parents using DI or offspring from DI, have no knowledge of the other offspring for which their donor was or will be used. This kind of information is exclusively restricted to specific professionals in the sperm bank and/or the physicians performing the DI. Therefore, for the individuals being helped by DI, and their offspring, the number of offspring per sperm donor is of no relevance—assuming, as stated (de Boer *et al.*, 1995; de Bruyn, 1997), that the offspring has no increased risk for consanguineous relationships. For the individual only the safety of the donor sperm counts. This is safeguarded by the mandatory microbiological and genetic screening of donors at intake, and subsequent control thereafter (de Bruyn, 1997; Barratt *et al.*, 1998). As donors are accepted only when found free of any microbiological and genetic risks, one may state that donor semen is even safer than semen from random males in the population.

Still, it might be asked what it means for parents or DI-offspring to know the accepted maximum number of offspring per donor in general. Parents seeking help from DI may simply accept the general offspring-limit, knowing that this figure does not necessarily apply to their own donor. However, they may also feel uneasy about it. In Dutch practice it is not considered desirable that sperm banks enter into specific agreements with parents concerning the donor’s characteristics. This applies equally to the number of offspring from a particular sperm donor. Therefore, for parents feeling uneasy about the high

level of the donor-offspring limit an alternative might be to seek a donor of their own.

In conclusion, considerations of a psychological nature provide no reason for a systematic reduction of the number of offspring per sperm donor below the limit of 25.

### Legal considerations

In the spring of 2002, a law came into force in The Netherlands, ruling that children conceived by DI having reached the age of  $\geq 16$  years have, on request, the right to be informed about the identity of the donor from whose semen they were conceived (Wet Donorgegevens Kunstmatige Bevruchting, 2002). This means that donors might in the future be contacted by their offspring, and in one way or another be involved with (some of) them. It should be noted, however, that it is still far from clear how many children will actually make acquaintance with their donor-fathers. After all, not all offspring will be aware of their DI-origin and/or feel an urge to seek their biological roots. Experience from Sweden, where similar legislature as the one instigated in the Netherlands has been operative since 1985, suggests that ~50% of the parents from children conceived by DI will not tell their child about their biological background (Gottlieb *et al.*, 2000). Moreover, only 11% of the Swedish parents had actually told their children about their background at the time of the aforementioned survey.

Formerly, with the anonymity of sperm donors strictly guaranteed, the number of offspring was only of theoretical relevance to donors. Now, however, these offspring may come to have practical significance. The implications of abandoning the anonymity-guarantee for the semen donors seem reasonably clear. Simply speaking, in our experience there exist two types of donors. Donors of the first type offer their services for DI because, for various reasons, they are interested in (or have at least no reluctance to) personal procreation. Such donors most probably would not have problems with meeting their grown up DI-offspring. It seems reasonable to assume that these donors would not have much problem with the conception of quite a number of children from their sperm—even up to the limit of 25. Moreover, some of these donors, being interested in meeting their offspring (and taking into account that only a fraction of their offspring might try to get in contact with them), could even reason that a high number of offspring would result in the best chance of their getting to know some of their offspring. The second type of donor is not interested in personal procreation by means of DI at all (or may even be averse to personal procreation). This type of donor offers his services purely because of altruistic motives. Donors of this type have no wish to meet their DI-offspring. At best they tolerate such contact, being forced to do so by law. These donors will probably find it acceptable that only a reasonably low number of children are conceived with their sperm. Taken together, it will therefore depend on the attitude of the donor what possible future contact with offspring will mean to him. Some donors might consider contact with a rather great number of offspring to be a threat, others may find it a surprise or a challenge. The interest of the donor therefore provides no unambiguous measure for a preferred number of offspring per

donor. Therefore, for sperm donors the best option appears to be that sperm banks explain the situation and make individual agreements on how many offspring they would find an acceptable maximum.

In principle, the abandonment of the anonymity guarantee could also mean that children from the same donor (or their families) might get to know each other—although such complicated associations would probably be rare. This would imply that the number of offspring per donor might also become relevant for donor children (and maybe others). The implications in these circumstances, although probably very exceptional, are difficult to comprehend. However, as previously stated, professionals in The Netherlands are reluctant to enter into specific agreements with parents concerning donor characteristics or the number of offspring a particular donor might have. Therefore the new Dutch law on disclosure of donor identity does not make the number of offspring from donors an issue for parents seeking help from DI.

In conclusion, legal considerations provide no reasons for a general reduction of the number of offspring per sperm donor in The Netherlands.

## Discussion

Little doubt exists about the disposition of sperm donors who demonstrate dubious characteristics or abnormalities themselves, in their families or their offspring (de Bruyn, 1997; Barratt *et al.*, 1998; Kuller *et al.*, 2001). It is also obvious that the use of a sperm donor should be stopped instantly in the case of a late-onset hereditary disease manifesting itself. In contrast, there are no obvious rules about how to deal with the theoretical possibility of diseases which are not evident in the donor, or from his personal or family history at intake. One of the measures to control the possible transmission of unfavourable traits/diseases is to limit the number of children one single donor may produce. Such a limit has actually been calculated, based on the transmission of autosomal recessive hereditary diseases and the chances of consanguinity (de Boer *et al.*, 1995). In this paper the risk of transmission of autosomal dominant hereditary diseases of late-onset type is considered and whether genetic or other considerations should lead to different limits for the offspring of donors.

No arguments were found for limiting the number of donor offspring below the number guaranteeing no increase in inbreeding (de Boer *et al.*, 1995), neither from a population-genetic point of view, nor because of psychological needs of the parents helped by DI, or their offspring. An obvious reason not to lower the number of children per sperm donor is that it would create greater shortage of donors, something that is not in the interest of those seeking help from DI. Thus, in the absence of compelling reasons for generally reducing the number of offspring from semen donors, it is most rational not to reduce the limit set for preventing increased inbreeding among DI-offspring.

A case for reduction of the number of donor offspring may exist, however, in individual situations. This does not arise from genetic or psychological arguments, but from consider-

ation of the implications of the new Dutch law on disclosure of donor identity to DI-children, operative since 2002. As such a case would probably involve individual requests by particular donors for a reduction of the number of offspring, this could easily be mutually arranged between the sperm bank and the donors concerned.

It may be noted that compared with other countries the offspring-limit of 25 as practised in The Netherlands is rather high. For instance in the UK the maximum number of offspring per sperm donor is set at 10 and in France, five (Deech, 1998; Le Lannou *et al.*, 1998). It should be noted, however, that these limits seem to have been reached quite arbitrarily, apparently more or less based on social-psychological and cultural considerations (Deech, 1998; Le Lannou *et al.*, 1998). Medical-genetic and/or demographic arguments and calculations, based on the transmission of autosomal recessive disorders, lead to higher offspring limit per sperm donor (de Boer *et al.*, 1995). There seem to be no reasons for lowering this limit because of the small, though never to be excluded possibility of transmission of late-onset autosomal dominant disorders to donor offspring, as discussed here. Mutual agreements by sperm banks with individual donors suffice to fulfil the wishes of individuals wanting to deviate from the generally accepted rules.

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