Human Reproduction, Vol.29, No.7 pp. 1353–1359, 2014
Advanced Access publication on May 23, 2014 doi:10.1093/humrep/deu111

human reproduction **ESHRE PAGES** ***Reproductive genetics***

ESHRE Task Force on Ethics and Law 21: genetic screening of gamete donors: ethical issues†

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Submitted on March 10, 2014; resubmitted on March 10, 2014; accepted on March 20, 2014

ABSTRACT: This Task Force document explores the ethical issues involved in the debate about the scope of genetic screening of gamete donors. Calls for expanded donor screening arise against the background of both occasional findings of serious but rare genetic conditions in donors or donor offspring that were not detected through present screening procedures and the advent of new genomic technologies promising affordable testing of donors for a wide range of conditions. Ethical principles require that all stakeholders' interests are taken into account, including those of candidate donors. The message of the profession should be that avoiding all risks is impossible and that testing should remain proportional.

Key words: ethics / donor conception / genetic screening / reproductive risk / reproductive safety

Introduction

For gamete donation, when performed in a clinical setting, only donors are used who have been screened for a range of medical risk factors including risks of transmitting genetic disease to the children conceived with their help. According to present recommendations genetic screening of gamete donors mainly consists of a medical history of the donor and his or her family taken by a qualified genetics professional. In addition to this, tests for some specific disorders may be part of the procedure, either for all sperm or oocyte donors or for those from higher risk populations. However, the number of disorders for which such additional testing is recommended is small (with some notable differences with regard to what tests are proposed).

Although this makes the risk of transmitting a serious genetic disorder through donor conception very small, there is still a chance that this may happen. Cases where serious genetic disorders are found either in donor offspring or in past donors attract extensive media attention and lead to calls for expanded testing of gamete donors. Until recently, such proposals were not realistic given practical limitations and costs. However, this may change with the advent of new genomic technologies allowing affordable testing of donors for a wide range of conditions that a family history will not always pick up. The question is whether this is a scenario that should be welcomed and promoted or not. This is not just a technical or a scientific question, but very much also one about what levels of risk we should try to avoid and at what price.

This document contributes to the debate about the scope of genetic screening of donors, not by providing concrete guidance about what conditions to screen for, but by identifying the ethical issues and proposing an outline for a normative framework. The document was drawn up by the Task Force on Ethics and Law together with invited specialists from the Special Interest Group Reproductive Genetics. The document is limited

†ESHRE pages content is not externally peer reviewed. The manuscript has been approved by the Executive Committee of ESHRE.

‡ The authors except U.E. and F.T. are members of the Task Force; U.E. and F.T. contributed as invited experts.

to screening for genetic risks; it does not address screening for infectious diseases, nor issues related to tracing and informing donors or offspring in concrete transmission cases.

A preliminary remark is needed regarding terminology. In this document we use the term '(genetic) screening' for the whole of the procedure used to determine whether the level of genetic risk of a donor is acceptable. This may involve the use of several kinds of screening instruments, including a medical evaluation, an extensive family history and additional tests. Screening, therefore, will be used as a wider term than 'testing'.

Background and facts

Guidelines

In Europe, the Corsendonk consensus statement process of 1993–1996 was an important catalyst for professional guidelines setting shared minimum standards for donor screening (Barratt *et al.*, 1998). In the same period, similar recommendations were issued by American professional societies, such as the American Society for Reproductive Medicine (1993) (ASRM) and the American College of Obstetricians and Gynecologists (1998). In this section, we summarize what present European, for example UK (Association of Biomedical Andrologists, 2008) and US (ASRM, 2013) guidelines require with regard to genetic screening of gamete donors. The purpose is not to give an overview of the specifics of all relevant national guidelines. However, we refer to some of those in order to highlight salient points of disagreement or debate.

Medical history of the donor

The donor should not have (or have had) any significant hereditable condition, including major Mendelian disorders, major malformations of complex cause, significant familial disorders with a major genetic component or a chromosomal rearrangement that may result in unbalanced gametes. An issue of divergence regards candidate donors known to be heterozygous for an autosomal recessive disorder. Whereas the German guidelines state without qualification that carriers of such disorders need to be excluded (Richtlinien, 2006), the British guidelines state that 'in exceptional cases' (for instance where recipients bring a friend or family member as a candidate donor) such donors may be matched to a non-carrier recipient, provided the view of a clinical geneticist is obtained and the recipient (couple) is informed about and willing to accept the residual risk.

Donors should not only be healthy, but also young, given that maternal age is a known risk factor for aneuploidy in oocytes, and paternal age may give a higher risk for a range of complex disorders.

Family history

The family history (to be taken by a qualified clinical genetics professional) should establish that the candidate donor's first-degree relatives (parents, siblings and offspring) are free of major Mendelian disorders, major malformations of complex cause and significant familial disorders with a major genetic component. If the donor is found to have an abnormal karyotype (other than a rearrangement that would already lead to his or her exclusion), these relatives should moreover be free of chromosomal abnormalities. In several countries, professional guidelines add further requirements to what should be excluded on the basis of the candidate donor's first-degree family history, for instance: mitochondrial disorders (in the family history of oocyte donors; UK guidelines: Association of Biomedical Andrologists, 2008), or mental retardation of undocumented etiology (ASRM, 2013). Unlike most other guidelines, those of the French CECOS Federation allow for matching donors and recipients on the basis of family history-derived risk profiles for multifactorial disorders (Le Lannou *et al.*, 1998; CECOS website, 2014), which indeed requires evaluating the family history of the recipient as well. For example, if insulin-requiring diabetes mellitus affects only one of the donor's first-degree relatives, this is regarded as a 'cumulative risk factor', which would allow using the donor's sperm for recipients without the same risk factor (Siffroi *et al.*, 2010). The respective guidelines stress that candidates whose family history reveals them to carry genetic risks should be offered appropriate counseling and further screening or testing as may be necessary.

Genetic tests

In addition to taking a medical and family history, donor screening may also include genetic testing for specific conditions. However, professional guidelines differ with regard to what this should include. One remarkable difference concerns the need for standard karyotyping (testing for chromosomal abnormalities) of gamete donors. The reason for considering this is that candidate donors may be carriers of balanced translocations that do not affect their own health (and would therefore not be found when taking a medical history) but that may be transmitted in an unbalanced way, causing serious disorders in their offspring. Whereas in normally fertile men, the risk of carrying a balanced translocation is $<0.2\%$, research has shown subfertile men to be at a 8–10 times higher risk of unsuspected chromosomal abnormalities (Van Assche *et al.*, 1996; Chandley, 1998). This is why in assisted reproduction routine karyotyping of men with a sperm concentration <10 million/ml has been recommended (McLachlan and O'Bryan, 2010). However, the hypothesis that in a population of healthy young donors with a high sperm count the risk of unsuspected chromosomal abnormalities would be smaller than in the general population was not confirmed in a large study using data from the French CECOS Federation (Ravel *et al.*, 2006). On their website, CECOS states that as donors are not a protected population, all sperm and oocyte donors are to be karyotyped. Referring to the same study, this is also the position in the British guidelines. In contrast, the ASRM guidelines state that 'In the general population, the chance of having a chromosomal rearrangement that could be transmitted in unbalanced form to offspring is small, provided the family history is negative for risk factors. Therefore, routine karyotyping of all donors is optional'. Also in other countries, such as Germany and the Netherlands, routine karyotyping of donors is not recommended.

A second category of genetic risk that will often not be found when taking the donor's medical and family history is his or her carrier status of autosomal recessive disorders, such as cystic fibrosis, hemoglobinopathies, Tay Sachs disease, etc. Under the European Union (EU) Directive on human tissues and cells, gamete donors should be screened (tested) 'for autosomal recessive genes known to be prevalent (. . .) in the donor's ethnic background' (Commission Directive, 2006). This general requirement has been translated into testing recommendations for donors from specific populations in the professional guidelines of different EU countries. The option of matching heterozygous carriers with non-carriers of specific autosomal recessive disorders, as referred to in the British guidelines, entails that recipients may have to be tested for carrier status of the relevant disorder as well. In the USA, preconception carrier

testing for certain autosomal recessive disorders is recommended for the whole American population of reproductive age, regardless of ethnicity. At present, this includes carrier testing for spinal muscular atrophy (Prior, 2008) and for cystic fibrosis (ACOG, 2011). The ASRM guidelines state that donors should undergo (or have undergone) those general population tests and should additionally have ethnicity-based testing for further autosomal recessive disorders with a higher frequency in the relevant population of descent.

Finally, guidelines differ with regard to possible testing of oocyte donors for carrier status of fragile-X syndrome (FXS). FXS is the most common form of inherited mental retardation in males (affecting ~1:4000 males in the general Caucasian population) (Crawford *et al.*, 2001). Of females with a full mutation, 25% will have intellectual disability; one or two further quarters have lesser learning difficulties. Not only women with a full mutation (>200 CGG-repeats, FM) are at risk of having a child with FXS, but also those with a premutation (~55–200 repeats, PM), as those PMs are unstable and may expand into a full mutation during maternal transmission. Whereas under the present guidelines, diagnosed carriers will be excluded as donors, there is still a risk that healthy carriers will have a child with FXS. According to the ASRM guidelines, testing of oocyte donors for FXS carrier status should be considered, but is not required (ASRM, 2013). European professional guidelines do not recommend this.

The call for wider testing

Occasionally, cases are reported where, despite genetic screening according to the present guidelines, a serious but rare genetic condition was found either in donor offspring or in a person who is or was a gamete donor. Typically, such cases lead to societal concerns about whether the present guidelines for genetic testing are sufficient. Reports of such cases in the medical and scientific literature also often end in a call for more testing. For instance, Maron *et al.* (2009) describe a case where hypertrophic cardiomyopathy (HCM; autosomal dominant) was transmitted by sperm donation to at least nine recipients (with a high risk profile in three, one of which died of HCM). The authors criticize present (ASRM) guidelines: taking a family history is 'not very effective for the identification of most HCM-patients' and recommend donor testing by electrocardiography.

In a recent survey carried out by the Donor Sibling Registry among 1700 (mostly American) women who formed their families through sperm donation, a large majority 'believed that sperm banks should be legally required to perform comprehensive genetic tests on all sperm donors and [that] they be [should be] screened more rigorously than is currently required under US Federal guidelines' (Sawyer *et al.*, 2013). In response to these views about the need for greater safety, some commercial centers seem to use the width of their testing range as a means to attract more potential users to the fertility market ('No sperm bank does more testing') (Fairfax website, 2014).

Developments with regard to test options

New techniques, such as the use of DNA chips and next generation sequencing (NGS), will make it possible in principle to simultaneously test gamete donors for a large number of mutations and other genetic risk factors, without significantly increasing the costs of testing. One possible application is 'comprehensive' preconception carrier testing. American researchers recently reported to have developed a carrier status test for more than 500 severe recessive childhood diseases (Bell *et al.*, 2011; Kingsmore, 2012). Even broader testing, looking also at *de novo* mutations for dominant disorders that as such would not be picked up in current donor screening, as well as at genetic risks for multifactorial disorders, may become available in future scenarios of whole exome or genome analysis. Given debates about the future place of such technologies in other areas, including neonatal, prenatal and embryo screening, it is only to be expected that this will also become an issue with regard to genetic testing of donors. Beyond the claim that this will make donor conception safer, commercial application may include offering donor trait selection to recipients (Sterckx *et al.*, 2013). First experiences with single-nucleotide polymorphism-based testing not just aimed at avoiding risky combinations but also at improving upon current phenotypic matching between donors and recipients, have recently been reported by authors from a Spanish oocyte donation program (Aizpurua *et al.*, 2013). Similar services are announced by the American company GenePeeks. This would start on the basis of DNA arrays but move on to whole exome/genome sequencing as soon as that technology becomes affordable (Ashford, 2012). Clearly, tests of which the clinical validity has not been established should not be considered for donor screening.

General ethical principles

Beneficence

Although, internationally, the moral acceptability of third-party reproduction is still debated, it is the view of the European Society of Human Reproduction and Embryology (ESHRE) that in principle donor conception is a morally sound reproductive option for individuals or couples who have a fertility problem that makes it impossible for them to reproduce with their own sperm or oocytes, who are at risk of transmitting a genetic disorder if using their own gametes, or whose sexual orientation precludes them from having children through natural conception (ESHRE, 2002). Like other forms of medically assisted reproduction, helping people to have children with donor gametes should be regarded as a moral practice aimed at serving reproductive health and wellbeing. This then entails a commitment to provide good quality care on the basis of professional guidelines ensuring quality and safety when using third-party material in reproduction.

Non-maleficence

When helping their patients, health professionals should try to avoid as much as possible the infliction of harm. In this context, the ethical principle of '*primum non nocere*' not only refers to possible harms that the recipients of donor gametes may suffer, but also to possible welfare affecting consequences for the children that may be born with donor gametes, and to possible consequences for the donors. We will briefly consider each of these perspectives.

Firstly, people who turn to a fertility center for medical help expect services of good quality, including the use of donor gametes without serious genetic risks that could have reasonably been detected and excluded. Although it may seem that broadening the scope of donor screening is always in the interests of the recipients as it would further increase their chances of having a healthy child, one should not ignore the possible drawbacks that expanded screening may also have for them. These include the counterproductive effect of draining the pool of available donors, either by excluding candidates with relatively small risks or by scaring off potential donors who fear the consequences that genetic

testing may have for themselves. Where expanded screening leads to donor shortage, this might have the further adverse effect of encouraging people to go ahead with risky donation by unscreened sperm donors found via the Internet, or to travel to centers in countries where the quality of care may not be assured. Expanded screening may lead to higher costs that can put the service out of reach for some (Daar and Brzyski, 2009). Recipients may also be harmed when wrongly led to believe that given expanded screening protocols, they can be assured of healthy children (false reassurance).

A second perspective concerns the possible consequences for the welfare of the children to be conceived with donor gametes. According to earlier Task Force documents, professionals should refrain from providing assisted reproduction if there is a 'high risk of serious harm' to the future child (Pennings *et al.*, 2007). Clearly, that should also be the bottom line here: providing gamete donation services is not acceptable if there is a high risk that this will lead to a child with a seriously diminished quality of life. It can be argued that the present donor screening guidelines are sufficient in this regard. However, the Task Force has also argued that above this line, doctors (and centers) have a *prima facie* obligation to further reduce reproductive risks to the extent that doing so is reasonably possible and proportional (ESHRE, 2010). Whether this translates to an ethical requirement to broaden the scope of donor screening depends on whether these conditions are met.

Thirdly, for the donor and his or her close relatives, genetic screening may reveal risks knowledge of which may be beneficial (if the finding allows for prevention, treatment or other meaningful courses of action), but that may also turn out to be psychosocially harmful, especially if findings reveal a serious genetic risk that is not medically actionable. Furthermore, concerns have been raised that findings resulting from expanded genetic screening may lead to exposing donors to societal discrimination and/or stigmatization (Bream and Lott, 2010). In scenarios where recipients are tested as well, these considerations also apply to them and to their close relatives.

Respect for autonomy

The principle of respect for autonomy requires the donor's informed consent for all screening and testing procedures. This involves information not only about the nature of those procedures and their purpose in the context of gamete donation, but also about possible implications that especially testing procedures may have both for him or herself and for any close relatives. With the scenario of broad-cope NGS-based testing, the feasibility of meaningful informed consent will become a serious challenge, as has also been observed with regard to the use of similar testing in other contexts (Van El *et al.*, 2013).

Where, in the context of possible matching of donors and recipients on the basis of carrier status (or other risk profiles), the recipient will also be tested, the above considerations apply to him or her as well. Moreover, the recipient and his or her partner should understand and accept that there remains a residual risk. For both donors and recipients, this requires specific implications counseling by a genetics professional.

Justice

Expanding the range of screening may lead to a shortage of available donors and raise costs, thus limiting access to medically assisted reproduction for those dependent on donor gametes. If more testing is needed to avoid serious reproductive risks, this outcome, however unfortunate, would not in itself be unjust. But if there is no such evidence, or if adding tests is motivated by other (e.g. commercial) reasons, the limiting effect upon access does create a problem of justice. As the Task Force has argued in an earlier document, access to reproductive care is not something that the field can simply leave to governments to take care of. Practitioners also have a responsibility to bring down the costs as far as reasonably possible and also not to raise other barriers for patients without a good reason (Pennings *et al.*, 2008).

Specific considerations

Donor conception and the handling of genetic risk

The differences found between professional guidelines with regard to whether donors should or should not be karyotyped reflect different underlying views with regard to how safe donor conception should be, in terms of genetic risks.

One view is that donor conception should be as safe as reproduction between healthy partners (CECOS website, 2014). As the aim of the practice is to help couples who in ideal circumstances would have tried to have children together while accepting the small risk of having a child with a serious genetic disorder that is inherent in human reproduction, there is no need to make donor conception any safer than that. Following this standard, it is important to take an extensive medical and family history, as this rules out serious risks that when known prior to reproduction between partners would lead to referring the couple to a clinical geneticist for counseling about reproductive options.

However, further testing of gamete donors should on this view only be done if it is also offered or recommended in reproduction between healthy partners (e.g. preconception carrier screening for specific disorders, or as in the USA—for the whole population).

The opposite view is that donor conception is a service that, as such, should be as safe as reasonably possible. If remaining risks of transmitting serious disorders can be tested for against reasonable expenses and without other drawbacks, then this should be done. On this view, all donors should be karyotyped: although the risk of a healthy donor carrying a balanced translocation is small (2 per 1000), the implications (an abortion or a handicapped child) are severe, and the test to avoid this is not too expensive and without adverse consequences for the donor. Other tests with similar profiles should then be considered as well.

Reflecting on these views, the Task Force observes that on the one hand, the 'accepting normal reproductive risk' view seems to ignore a morally relevant difference between donor conception and reproduction between partners. Partners want to reproduce together, whereas people needing donor gametes do not (in most cases) want to reproduce only with this donor. And whereas partners cannot be replaced, donors, as providers of gametes, are replaceable. On the other hand, it is important to stress that in human reproduction, genetic risks can never be completely ruled out. Although donors are indeed replaceable, not much is gained if by doing so one rare condition tested for is unknowingly replaced by another one, possibly equally severe or even graver, for which no testing is yet available. Even if in a future scenario it becomes possible to affordably and reliably select donors on the basis of a completely analyzed genome scan, this will still not mean that donor conception can be absolutely safe. Although such a scenario will allow excluding donors with small risks of transmitting more serious disorders that at

present remain undetected, for the rest it will turn donor selection into a matter of choosing between donors with different genetic risk profiles. Moreover, serious disorders caused by *de novo* mutations will still emerge; however, widely donors are tested.

Finally, to the extent that expanded testing could make donor conception safer, doing so must be 'reasonably possible' also in the light of avoiding counterproductive effects, such as imposing cost barriers or limiting donor availability, that would undermine the practice of donor conception as a service for infertile couples or women, and of avoiding serious harm to donors and their families.

Taken together, these considerations suggest that, even on the view that donor conception should be 'as safe as reasonably possible', the case for expanded testing is not obvious.

Taking donors seriously

In proposals for added testing, the need to avoid harm to donors is crucial but often neglected. For instance, the quoted proposal to use electrocardiography (ECG) as a simple and cheap means to find donors at risk of transmitting HCM to their offspring (Maron *et al.*, 2009)) does not even discuss the possibility that such testing may lead to false-positive results (Thompson and Levine, 2006; Siffroi *et al.*, 2010). Donors excluded because of a false-positive HCM test may lose confidence in their own health without good reason and may wrongly be led to adapt their lives for fear of provoking life-threatening cardiac events. The possibility of such effects should at least be taken into account when determining the proportionality of expanded testing.

Another example is testing oocyte donors for carrier status of FXS, which is done in several American and also European centers. Proponents stress that without such testing, healthy carriers at risk of having offspring with FXS will be missed (Reh *et al.*, 2010). However, this ignores the reasons behind the consensus that FXS carrier testing should not be offered to all women of reproductive age (Musci and Moyer, 2010). There is much uncertainty and controversy about the clinical importance of findings in a 'grey zone' (intermediate alleles), leading to different proposals about cutoffs. It is a mistake to think that when testing oocyte donors rather than women who may want to have children themselves, outcomes in this range are less of a problem, given that candidates with these findings can simply be excluded as donors. That indeed ignores the extent to which this will leave these women (as well as their female relatives) in a state of great uncertainty about their own reproductive risk. Moreover, for women found to be carriers, the option of becoming pregnant and having prenatal diagnosis may lead to a situation of very difficult decision-making and counseling needs: if the fetus turns out to be a female FM carrier, there is a one in two chance that this will lead to an unaffected girl. Finally, women identified as carriers may not only have children with FXS, but also are at a potential risk for premature ovarian insufficiency and untreatable adult onset 'fragile-X-associated tremor/ataxia syndrome' (Musci and Moyer, 2010). Taking donors seriously requires treating them as persons whose interests (as well as those of their close relatives) are also at stake, rather than reducing them to the sperm or oocytes that they contribute.

Matching for carrier status

Testing donors for carrier status of autosomal recessive disorders need not lead to similar problems. At present donors are tested only for a few autosomal recessive disorders, but this might be extended to a much wider range of such conditions. These are individually rare, but together account for a considerable burden of disease: 1–2% of all couples are carrier couples, entailing a 25% risk of having an affected child (Ropers, 2012). As all donors are carriers of some such conditions, extended carrier testing only makes sense if heterozygosity does not necessarily lead to exclusion. This requires that recipients are also tested, so as to allow matching of donors and recipients in order to avoid carrier combinations.

Although this has the potential of making donor conception somewhat safer for recipients and their future children, proportionality considerations should be taken into account. In order not to generate uncertainty and anxiety in both donors and recipients with regard to their personal reproductive risks, the panel should be carefully targeted to only include conditions and mutations that allow for accurate testing, and of which the clinical implications are sufficiently understood (Sims *et al.*, 2010). This also means that not all risks implied in matching carriers and non-carriers can be avoided; an issue about which the recipients need to be properly informed and counseled. Whereas with new genomic technologies, additional testing costs need not be high, counseling costs may still affect the affordability of donor conception. This may be a further reason for limiting the test panel to well understood recessive disorders with a higher frequency in the population.

As the logic of avoiding risky combinations of recessive genes is as relevant for reproduction between healthy partners, introducing or expanding carrier testing in donor conception may amount to creating a comparative advantage for those who cannot reproduce with their partner that would be difficult to justify. This means that the case for extended carrier testing in donor conception should be discussed in concert with the wider debate about the potential benefits of offering such testing to the whole population or (for a start) to all fertility patients.

Whole genome scanning (NGS)

With NGS technology it will become possible to scan the entire genome of both donors and recipients. It is suggested that in addition to finding donors at risk of transmitting rare autosomal dominant disorders and avoiding risky combinations of recessive genes, this will enable risk profiling for low-penetrance mutations, again with the aim of matching donors and recipients (Ashford, 2012; Aizpurua *et al.*, 2013). However, with the present still rudimentary knowledge of the human genome and its relation to phenotype, both aims are vulnerable to the as yet limited clinical validity of whole genome scanning as a comprehensive test for reproductive risks, meaning that donors may be excluded for risks that would never materialize (Winand *et al.*, 2014). Moreover, even if current concerns about predictive accuracy will be overcome with increasing scientific knowledge, a further problem is that sequencing and analyzing their genomes will put donors and recipients at risk of findings that may expose them to psychosocial harm. Genetic risk profiles will reveal strengths but also weaknesses that may lead to loss of confidence or anxiety. Outcomes predictive of late-onset disorders may be experienced as a threat without meaningful options, and may have adverse social consequences as well.

It has been suggested that this problem can be solved by letting the donor decide what he or she wants to know (Daar and Brzyski, 2009). However, this ignores that a positive test would lead to exclusion from the program. Moreover, the interests of relatives in knowing about a possible increased risk of developing a serious but preventable condition may in concrete cases make it very hard to heed a donor's request not to be informed about specific test outcomes. A more obvious way

out for donors not wanting to be informed about their genetic risks is to refrain from becoming a donor. Clearly, chasing donors away by wanting to test them for more than they want to know about themselves will undermine the practice of donor conception rather than make it safer.

Although adequate informed consent together with appropriate counseling is a precondition for genetic testing of donors, this should not be turned in an excuse for exposing donors to genetic tests the possible consequences of which may be disproportionally harmful to them or their close relatives. As long as our understanding of complex genetics is not sufficient for responsibly offering genome scanning as part of personalized medicine (Okser *et al.*, 2013), it is also premature to impose this kind of testing upon donors.

Commercial interests and medico legal implications

It is unfortunate that the debate about the scope of genetic screening of gamete donors is partly driven by commercial interests rather than by a proper assessment of clinical utility. With the advent of powerful new testing technologies, centers may be even more inclined to use claims to greater genetic safety as a competitive edge. There is a clear risk that this leads to setting inappropriate medico-legal standards with regard to what can be expected from professionals and centers in terms of genetic testing of donors, also in terms of liability for harm resulting from neglect to offer specific tests. That would lead to a reinforcement of the tendency towards further expansion of the scope of testing. Clearly professional standards should be determined by the field on the basis of scientific evidence and a proper assessment of pros and cons, involving the interests of all stakeholders including the donor, rather than by the mere imperatives of technology and commerce.

Recommendations

- The current differences between guidelines for donor screening reveal a need for harmonization on the basis of a shared understanding of relevant principles.
- Proposals for expanded screening should be assessed in terms of their effectiveness and proportionality, taking the interests of all stakeholders into account.
- There is a need for expert guidance with regard to the clinical validity and utility of expanded donor screening protocols.
- Carrier testing of donors should be considered in concert with debates about carrier testing as an offer to all couples or persons of reproductive age, or to all patients in assisted reproduction.
- At the moment, NGS (or array) based risk profiling is fully disproportional.
- Donors should be treated as interested stakeholders and not merely as providers of genetic material.
- No tests of donors and recipients should be carried out without proper informed consent and adequate implications counseling.
- Commercial interests should not be allowed to drive the debate about the scope of genetic screening of donors.
- Instead of giving in to the illusion of 'preventative perfectionism', the message of the profession should be that avoiding all risks is impossible and that testing should remain proportional.

Acknowledgements

The Task Force acknowledges the contribution of Dr Elisabet Clua Obradó, head of the Oocyte & Embryo Donation Program at the Hospital Universitari Quirón Dexeus, Barcelona, during one of the preparatory meetings.

Funding

This work was funded by the European Society of Human Reproduction and Embryology (ESHRE).

Conflict of interest

None declared.

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