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Ethics watch

COMPREHENSIVE PRE-IMPLANTATION GENETIC SCREENING: ETHICAL REFLECTION URGENTLY NEEDED

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Pre-implantation genetic screening (PGS) is an adjunct technology to *in vitro* fertilization (IVF) that involves carrying out biopsies and testing embryos of subfertile couples to improve the chances of a successful pregnancy. Until now, PGS has been limited to aneuploidy screening by fluorescent *in situ* hybridization (FISH). However, clinical trials have shown this approach to PGS to be ineffective[1]. In response, both the European Society of Human Reproduction and Embryology (ESHRE) and the American Society for Reproductive Medicine (ASRM) have discouraged the clinical use of cleavage-stage PGS using FISH.

Comprehensive testing techniques, such as array comparative genomic hybridization (aCGH) and SNP arrays, are now being introduced and are thought to improve the outcome of the procedure[2–4]. Should clinical trials show that array-based testing for aneuploidy improves IVF outcomes, it is likely that this technology will become standard in the IVF clinic. It is also conceivable that next-generation sequencing (NGS) could soon be used for PGS, but this has not yet been clinically validated.

However, using SNP arrays (and eventually NGS) for testing pre-implantation embryos extends beyond identifying aneuploid embryos, as these techniques allow for the investigation of the genomic make-up of the embryos. This could be used to increase the chance of a pregnancy that leads to a healthy child. For example, it may be possible to set up health profiles for each embryo and to select the best for transfer. In theory, this approach could be also expanded to include genetic variants that are associated with several non-health-related traits.

These prospects raise difficult ethical questions[5]. Some people may see this as the slippery slope towards the 'designer child'[6], whereas a different perspective is that it enables prospective parents and professionals to take account of the welfare of the future child. Some have argued that prospective parents have a moral duty to select those children whose lives are likely to be better[7]. Therefore, a first question concerns the notion of 'the best embryo': how should this be defined and by whom? Second, genetic counselling and informed decision-making will become much more difficult if broader tests are introduced, as the information obtained will be extremely complex. A further issue is the concern that by selecting comprehensively tested embryos, a child's 'right to an open future' could be violated[8]. This might occur if children have to grow up under the cloud of the knowledge that they are likely to develop a serious, untreatable, late-onset disorder. If this is to be prevented, a condition for testing may be that embryos that are found to be carriers of such disorders are not transferred.

As most of these problems may be avoided by routine preconception-screening of IVF applicants, followed by targeted pre-implantation genetic diagnosis, the pros and cons of these options are in need of urgent debate.

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