Mitochondria replacement strategies – When is it justified, and when NOT

Peter Braude, UK

Mitochondrial disease caused by maternally inherited mutations in the oocyte mtDNA is not easily prevented by preimplantation genetic diagnosis because both normal and mutated mtDNA are represented within each cell of the embryo (heteroplasmy). Generally only higher from lower risk embryos can be distinguished, and where very high levels of mutation are present (homoplasmy), unaffected embryos are unlikely to be found. Complete replacement of the mitochondrial complement with healthy mitochondria from a donor oocyte using pronuclear or spindle transfer has been investigated as an alternative to PGD. Although this novel use of gene therapy may be appropriate where the inevitable alternative is severe disease or death, its use in unexplained IVF failure is less justifiable especially when mitochondrial dysfunction as its cause is unproven.