

# Embryonic stem cells

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In the embryo, stem cells are able to give rise to all of the different cell types of the body at the gamete stage (totipotent) and nearly all cell types (pluripotent) when at the blastocyst stage ( Figure 4.1 ). ESCs can be obtained from the inner cell mass of the early human blastocyst (days 4-5), using embryos that have been created through in vitro treatment of infertility and are surplus to those needed for reimplantation. The technique for isolating and growing human ESCs in culture was developed by James Thomson in 1998. ESCs have proliferative ability and possess key characteristics of self-renewal and pluripotency . However, their use in the clinic has major limitations, one of which is ethical. The surplus embryos used for derivation of ESCs would otherwise be discarded but, because they need to be destroyed to obtain ESCs, the approach has raised major ethical and political debate. The dominant view in many countries, including the UK, is that the potential therapeutic benefits of ESCs justify their use but there are very strict guidelines for their derivation; to date their clinical use has been limited. Cells from ESCs would be allogeneic and therefore be at risk of immunological rejection. Embryonic stem cells

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