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Production of Non-Human Primates Cloned Embryos for the Therapeutic Cloning

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Production of cloned mammals is achieved routinely only in those well-studied species that provide enormous number of both oocytes and surrogates, systems often capable of multiple deliveries and amenable transfers of supernumerary embryos. In non-human primtes (NHPs), despite apparentlynormal preimplantation development, production of somatic cell nuclear transfer (SCNT)-NHPs did not result. Here, in NHPs, the strategies used with human SCNT improve NHP-SCNT development significantly. Protocol improvements include; enucleation just prior to metaphase-II arrest; extrusion rather than extraction of the meiotic spindle-chromosome complex (SCC); nuclear transfer by electrofusion with simultaneous cytoplast activation; and sequential media. These results demonstrate that: i. Protocols optimized in humans generate in NHPs preimplantation embryos; ii. Some, though perhaps not yet all, hurdles in deriving SCNT-nhpES cells from cloned embryos have been overcome; iii. Reproductive cloning with SCNT-nhp-embryos appears significantly less efficient than with fertilized embryos; iv. Therapeutic cloning with matured metaphase-II oocytes, aged oocytes or 'fertilized failures' might remain difficult, since enucleation is optimally performedprior to metaphase-II arrest; and v. challeges remain for producing reproductive successes since defects resulting from centrosome and motor deficiencies result in aneupliod preimplantation embryos.