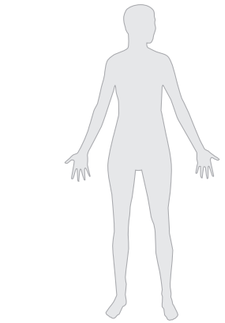
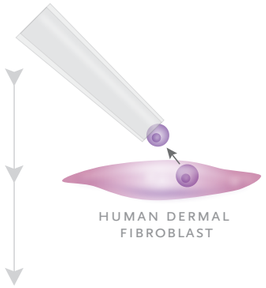
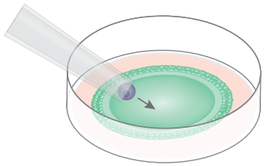
EMBRYO . GENETICALLY MODIFIED EMBRYO . *Cybrid in vitro*



biopsy



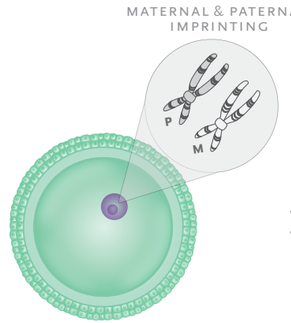


TISSUE BIOPSY & OOCYTE PROCUREMENT

Somatic cell donor DNA is procured via human tissue biopsy. Mature oocytes are surgically removed from a mammal undergoing artificial hormone stimulation and the nucleus is removed from these animal eggs.

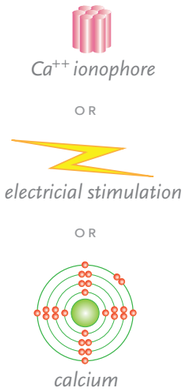
NUCLEAR TRANSFER

Nuclear Transfer:
The human adult somatic cell nuclear DNA is transferred to the enucleated rabbit oocyte. The cybrid now has two sets of the human nuclear genome containing the maternal and paternal imprints of the somatic cell donor, and the mitochondrial DNA and cytoplasm of the rabbit oocyte donor.



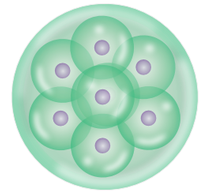
CYBRID CLONES

Nuclear Reprogramming:
The adult human somatic nuclear DNA is reprogrammed by the cytoplasmic factors of the rabbit oocyte. These factors physically alter chromosomes via chemical modification. The specific location of these modifications allows genes involved in pluripotency to be activated. This reprogramming returns the genome to an "embryonic" state.



Mitotic Activation:
Cybrids are exposed to agents that mimic the calcium gradient waves of sperm entry during fertilization. The electrical gradient triggers mitosis.

mitosis

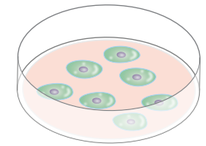


BLASTOMERES

day 3
8 cells

Clonal Cell Division:
In response to cell culture conditions, the cybrid undergoes mitotic cell division and continues to develop into a blastocyst. In 1999, scientists at Advanced Cell Technology created human-cow cybrid blastomeres in hopes of generating interspecies nuclear transfer stem cell lines (intSC) to study diseases.

blastomeres
cultured



intESC LINE

Interspecies nuclear transfer stem cell lines:
In 2003, Chen et al. transferred a human nucleus into rabbit eggs and successfully produced intSCs to advance our understanding of cloning technology for the generation of patient-specific embryonic stem cell lines. Though successful, the approach is inefficient, requiring many oocytes.

CYBRIDS: ***Cybrid technology provides an alternative to obtaining "human" embryonic stem cells*** *from clones using human eggs. Cybrids are created using somatic cell donor DNA from humans and oocytes from another species, such as rabbit or cows. This approach minimizes risks to human oocyte providers, but the interspecies nature of this singular cell is unsettling to some, thereby limiting public support.*