Germline Intervention Glossary

Adenoviral vectors: A type of viral vector based on a family of viruses that normally cause benign respiratory tract infections in humans that is used to introduce inheritable genetic modifications.

Artificial chromosomes: Chromosomes that are produced to contain several extra genes together with their appropriate regulatory sequences.

Chromosome: The self-replicating genetic structure of cells containing the cellular DNA that bears in its nucleotide sequence the linear array of genes.

Deoxyribonucleic acid (DNA): The molecule that encodes genetic information. DNA is a double-stranded molecule held together by weak bonds between base pairs of nucleotides. The four nucleotides in DNA contain the bases adenine (A), guanine (G), cytosine (C), and thymine (T). In nature, base pairs form only between A and T and between G and C; thus, the base sequence of each single strand can be deduced from that of its partner.

Electroporation: A process using high-voltage current to make cell membranes permeable to allow the introduction of new DNA; commonly used in recombinant DNA technology.

Embryonic stem cells (ES cells): Embryonic cells that can replicate indefinitely, transform into other types of cells, and serve as a continuous source of new cells.

Gene: The fundamental physical and functional unit of heredity. A gene is an ordered sequence of nucleotides located in a particular position on a particular chromosome that encodes a specific functional product.

Gene expression: The process by which a gene's coded information is converted into the structures present and operating within the cell.

Gene therapy: An experimental procedure aimed at replacing, manipulating, or supplementing nonfunctional or misfunctioning genes with healthy genes.

Germ cells: Egg and sperm cells.

Germline manipulation: Germline manipulations introduce genetic changes at early stages of embryonic development before the organs have formed. The effect is to alter the reproductive, or "germline" cells. Germline manipulations create inheritable genetic modifications.

Homologous recombination: Swapping of DNA fragments between paired chromosomes.

Inheritable genetic modification: Altering the genetic material of cells or organisms to enable them to make new substances or perform new functions. Also known as genetic intervention, genetic engineering, germline engineering, and germline gene therapy.

Intracytoplasmic sperm injection (ICSI): A method of assisted reproductive technology that involves the injection of sperm directly into the cytoplasm of an unfertilized egg cell using a glass needle pipette.

***In vitro*:** Made in a laboratory mixture which contains all of the necessary enzymes and components that would be necessary in a living cell

Microinjection: A technique for introducing a solution of DNA into a cell using a fine pipette.

Nonhomologous recombination: The insertion of DNA using the pronuclear microinjection method in a nontargeted fashion.

Nucleus: The cellular organelle that contains most of the genetic material.

Preimplantation selection: The selection of embryos for desired traits prior to implantation into the womb. Also known as preimplantation genetic diagnosis.

Pronucleus: The nucleus of the egg or sperm after fertilization but before they fuse to form the nucleus of the fertilized egg cell

Recombinant DNA technology: Procedure used to join together DNA segments in a cell-free system (an environment outside a cell or organism).

Retroviral vectors: A type of viral vector used to introduce inheritable genetic modifications. Retroviruses are single-stranded RNA viruses that contain an enzyme called reverse transcriptase, which enables the production of viral DNA from cellular material of the viral RNA

Ribonucleic acid (RNA): A chemical found in the nucleus and cytoplasm of cells that has a key role in protein synthesis and various chemical activities of the cell.

Somatic cells: Any cell in the body except egg and sperm cells and their precursors.

Somatic manipulations: Manipulations that are not intended to affect reproductive cells (also known as "germ" cells), such as sperm and eggs. Also known as somatic gene therapy.

Transgenic: An experimentally produced organism in which DNA had been artificially introduced and incorporated into the organism's germ line.

Viral vectors: A method to introduce inheritable genetic modifications where the desired genes are incorporated into the viral genome, and then the virus is used to infect early stage embryos. Two types commonly used in animal research are retroviral vectors and adenoviral vectors.