

Cryopreservation and Vitrification

What is cryopreservation?

Cryopreservation is freezing tissue or cells in order to preserve it for the future. With current technology, we can freeze some cells (like sperm and embryos) and small tissue fragments fairly well. I think we could all think of a few people that we would prefer as frozen wall decorations. However, we can't freeze and thaw people yet...



Cryopreservation is used in infertility programs mainly to freeze and store sperm or to freeze "leftover" embryos from an in vitro fertilization cycle.

What is vitrification for IVF?

To embryologists, vitrification is ultra-rapid IVF embryo freezing instead of the traditional slow freezing process.

To a science dictionary, vitrification is the process of converting something into a glass-like solid that is free of any crystal formation.

For example, by adding a cryoprotectant, water can be cooled until it hardens like glass without any ice crystals forming. This is important in the embryology world because ice crystal formation can be very damaging to frozen embryos (or other frozen cells).

Vitrification in IVF can allow freezing of spare embryos with better post-thaw survival rates and higher pregnancy and live birth rates from frozen embryo transfer cycles.

Techniques:

Cryoprotectants are used in the solution that the embryos are frozen in. There are 2 basic types - permeating (e.g. propanediol) and non-permeating (or extracellular) such as sucrose.

Cryoprotectants are useful because they:

Lower the freezing point and may prevent intracellular ice formation.

May protect cells by interacting with membranes as they change from a pliable to a rigid state.

Embryos can be frozen at the pronuclear stage (one cell), or at any stage after that up to and including the blastocyst stage (5-7 days after fertilization). Different cryoprotectants and freezing solutions and protocols are used for different stages of embryo development.

Many IVF clinics (including ours) are currently doing all of their embryo freezing at the blastocyst stage. There has been a recent trend in the IVF world away from the traditional slow freezing method that has been used since the 1980's. Vitrification for IVF embryo freezing is becoming a more widely used technology.