

Delaware Valley Institute of Fertility & Genetics

Conceptions

Winter 2002

A NEW WAY TO PRESERVE EMBRYOS

By **Kimberly Beth Gleason, Ph.D.,**
Director of DVIF&G's Reproductive Laboratories

In vitro fertilization (IVF) offers a chance at parenthood to thousands of couples. For those that hope for a sibling or two, freezing excess embryos for future transfer is a great option. Unfortunately, using traditional methods of freezing (cryopreserving) embryos is often extremely time-consuming and can lead to irreversible damage. This damage can include disruption of chromosomes. Embryos also sometimes do not survive the freezing and thawing process. A new method, known as vitrification or ultra-cooling, may be the answer to cryopreserving embryos at any stage while keeping their chromosomal integrity intact.

In traditional embryo cryopreservation techniques, embryos are slowly exposed to freezing solutions containing sugars and low concentrations of cryoprotectants (~10% v/v) at room temperature. Then, using liquid nitrogen, the embryos are slowly cooled over several hours to a temperature of about -36°C before being plunged into a storage temperature of -196°C. This process has been fairly successful in providing a safe and effective means for freezing embryos. While success rates for frozen embryo replacements can vary considerably from center to center, at DVIF&G we have reported pregnancy rates as high as 50 percent in the past year from frozen embryo replacements using these traditional methods.

The sugars in the freezing solutions, usually sucrose, serve to essentially dehydrate the embryos before they are exposed to cooling temperatures. This protection is vitally important to the embryo, since an embryo is comprised mostly of water and water-soluble salts and macromolecules. If water is not removed from the embryo before cooling, it can form ice crystals inside the cells that can puncture through delicate cell membranes like a sword. Cell membranes are protein and lipid bilayers that surround the cell, maintaining its integrity and physiological functions. If ice crystals slice them, the membranes may not be able to keep the cells intact, causing severe cell damage. When the cell damage is extensive, an embryo may not be able to recover and will not survive the freezing and thawing process.

Like the antifreeze in your car that works to protect the engine from freeze damage, cryoprotectants are chemicals that function to protect the fragile cells that comprise an embryo. Cryoprotectants have the ability to reduce the toxic effects of high salt concentrations when an embryo becomes dehydrated. Cryoprotectants also protect the inner cell membrane from ice crystal damage by creating a viscous coating around it.

We know from our experiences, and from national reports published by the Society for Assisted Reproductive Technology (an affiliate of The American Society for Reproductive Medicine) that as many as 20 percent of embryos do not survive



Fast Fact

According to a recent survey conducted by the Society for Assisted Reproductive Technology, there are “tens of thousands of embryos” in frozen storage, awaiting their fate in this country alone.

cryopreservation and subsequent thawing. While the majority of these losses probably result from the inability of poor quality embryos to overcome chromosomal damage incurred during the process, some losses are attributed to mechanical rupture of cell membranes.

What is vitrification?

Researchers over the past decade have been developing new and improved methods of cryopreserving embryos in a way to reduce cell membrane damage. The most successful of these processes is ultra-cooling, or vitrification.

By definition, vitrification simply describes a process resulting in a “glass-like” property. In contrast to traditional methods, this freezing method requires that embryos be exposed to extremely high concentrations of cryoprotectants (40% v/v) for a short period of time. Because highly concentrated cryoprotectants are toxic at room temperature, embryos are initially exposed to cooled vitrification solutions. They are then plunged directly into liquid nitrogen at a storage temperature of -196°C !

Compared to traditional methods that can take upwards of several hours, vitrification can be completed in a matter of minutes. The astounding benefit of this new procedure is that the

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high concentrations of cryoprotectants, coupled with super-cooling, prevent the formation of ice crystals. Vitrified embryos do not exactly freeze inside, but rather form a glass-like suspension. Embryos can then be frozen without the risk of cell membrane damage resulting from ice.

Other benefits include a short amount of time to complete, and cost-effectiveness. Modern embryo freezing machines that control the rate at which embryos are cooled can cost over \$20,000. Vitrification requires only a small container filled with liquid nitrogen, at a

cost of a few dollars.

Clinically, vitrification has broadened our understanding of cellular processes during cryopreservation, and has in many ways improved our ability to freeze embryos at any stage of development. With vitrification we can now freeze oocytes (unfertilized ova) which could not be frozen successfully by traditional means. It is also an alternative cryopreservation method for blastocysts (embryos after 5 or 6 days of development) that routinely require a four to five hour freezing protocol.

The results from vitrification are still variable. Researchers are continuously finding ways to optimize the entire process, by trying new concentrations and types of cryoprotectants. Due to its benefits, vitrification should become the primary cryopreservation method in the future.

We look forward to offering vitrification to patients here at DVIF&G later this year, along with traditional cryopreservation methods.



An expert on in vitro fertilization (IVF), andrology and embryology, Kimberly Beth Gleason, Ph.D. is exceptionally skilled in the procedures of embryo micromanipulation and extended embryo culture. If you have any questions regarding vitrification or other cryopreservation techniques, please contact Dr. Gleason at (856) 988-0072.

Miller of DVIF&G Receives Sonographer Honor



Laurie Miller, BS, RDMS, a Staff Sonographer with the Delaware Valley Institute of Fertility & Genetics (DVIF&G), recently completed the requirements for designation as a Society of Diagnostic Medical Sonography (SDMS) Advanced Practice Sonographer (APS) member.

This designation is the most difficult and demanding level of clinical recognition to achieve within the ultrasound profession. To receive this honor, candidates must meet specific educational standards, have five years of national specialty certification, and must document stringent clinical scanning requirements and a minimum of 800 specialty cases yearly. Each candidate must also meet certain continuing medical education requirements on an annual basis and have an ultrasound-related article published in a peer-reviewed journal.

Before joining the DVIF&G staff, Ms. Miller served as staff sonographer for the division of Maternal Fetal Medicine at Cooper University Hospital. She received her BS degree from the Thomas Jefferson College of Allied Health Sciences and also has experience in general ultrasound and other OB/GYN specialties.

DVIF&G also is pleased to announce that the practice has been granted accreditation for performing first trimester obstetrical and gynecological ultrasound from the prestigious Ultrasound Practice Accreditation Council of the American Institute of Ultrasound and Medicine. DVIF&G received this accreditation after meeting the council's highest standards.

"To receive this accreditation, the whole practice has to be behind quality ultrasound," says Ms. Miller. "We had to pass an extensive application process to qualify. Only practices with the proper equipment, proper licenses, and current schooling make the grade."

Insurance Corner

By Carla Scott

The Family Building Act of NJ and You

The New Jersey State Legislature recently signed a new law to help thousands of infertile couples receive the care they need. Called "The Family Building Act of NJ," this law requires insurance policies that cover more than 50 people to provide pregnancy-related benefits for the diagnosis and treatment of infertility. The law defines infertility as "the disease or condition that results in the inability to get pregnant" as follows:

- Two years of unprotected intercourse (under the age of 35)
- One year of unprotected intercourse (over the age of 35)
- The inability to carry a pregnancy to term

This coverage includes but is not limited to:

- Diagnosis and diagnostic testing
- Medications
- Surgery
- In vitro fertilization
- Artificial insemination
- GIFT (gamete intrafallopian transfer) / ZIFT (zygote intrafallopian transfer)
- ICSI (intracytoplasmic sperm injection)
- Four completed egg retrievals per lifetime

Coverage for IVF, GIFT, and ZIFT is required only if:

- The patient has used all reasonable, less expensive, and medically appropriate treatments and is still unable to get pregnant or carry a pregnancy.
- The patient has not reached the maximum number of allowable egg retrievals and the patient is 45 years of age or younger.
- The procedures are performed at facilities that conform to standards set by the American Society for Reproductive Medicine or the American College of Obstetricians and Gynecology.

Who Is Exempt?

- Religious organizations, which believe that the covered procedures violate their teachings and beliefs
- The self-insured, unions, and programs regulated by the federal government

Who Qualifies for Benefits?

This new law became effective on December 31, 2001. If you are insured in New Jersey and work in a group with 50 or more employees, you may qualify for this new benefit once your policy renews this year. Please check with your Human Resources Department or call me. I will be happy to help you investigate whether the New Jersey Family Building Act applies to you.

Have an insurance question?

Call Carla Scott, DVIF&G's staff insurance consultant at (856) 988-0072, extension 5.



DVIF&G

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Happy Birthday to . . .



Gavin Ancheta and Garrett Ancheta, born on November 4, 2001, to Shelleen and Herman Ancheta.

Aadhi Palaniandavar, born on November 25, 2001, to Kavitha Manekavasagam and Senthilkumar Palaniandavar.

Alexander Nathaniel Fritz, born on November 25, 2001, to Nancy and Andy Fritz.

Victoria Tarrach and Jessica Laura Tarrach, born on November 28, 2001, to Carolyn and Christopher Tarrach.

Alexander James Edward Selnek, born on December 4, 2001, to Lori and James Selnek.

Jeremy David Smith, born on December 18, 2001, to Aracely and David Smith.

Jake Trewaren and Ronnie Trewaren, born on December 21, 2001, to Leeann and Ronald Trewaren.

Mason Nathaniel Merrill, born on December 28, 2001, to Audrey and Morgan Merrill.

Sarah Elizabeth Rosette, born on January 3, 2002, to Marilyn and Leo Rosette.

McKenzie Elizabeth Dawson, born on February 17, 2002, to Tracy and Brian Dawson.

All the babies and parents are doing well. Thank you, DVIFG!



DVIF&G recently welcomed Maureen C. Scaramella, R.D., M.B.A. to its staff. A registered dietitian and medical nutrition therapist, Ms. Scaramella will offer nutritional counseling and educational literature to patients. She received her B.S. degree in Nutrition from Cornell University in Ithaca, NY, and earned her Registered Dietitian certificate while serving a post-graduate internship at Brigham and Women's Hospital in Boston, MA. She later received her M.B.A. in Marketing from Temple University. Ms. Scaramella has over a decade of experience as a clinical dietitian and educator.

"DVIFG is thrilled to have a second nutritionist on staff to complete our full spectrum of fertility care. Some couples have infertility problems due to excess weight or metabolic disorders," says Chung H. Wu, M.D., of DVIF&G. "A nutritionist can help solve these problems and increase the likelihood of conceiving. Moreover, research has shown that being at your optimum weight and health can boost conception."