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Kwang Yul Cha

Pochon CHA University College of Medicine,
Fertility Center, CHA General Hospital

2005 - Present	President CHA Regenerative Medicine Institute (CHA RMI), Los Angels, USA
2005 - Present	CEO CHA Health Systems, Los Angels, USA
2003	Ph.D. Graduate School of Pochon CHA University, Seoul, Korea
2002 - Present	CEO & Scientific Director CHA Fertility Center, Los Angeles, USA
1998 - Present	Professor & Chancellor Obstetrics and Gynecology Department College of Medicine, Pochon CHA University, Korea
1998 - Present	Research Scientist Obstetrics and Gynecology Department College of Medicine, Columbia University, USA
1998 - 2001	Visiting Professor Obstetrics and Gynecology Department College of Medicine, Columbia University, USA
1997 - 1998	President College of Medicine, Pochon CHA University, Kyungki-do, Korea
1992 - Present	Clinical Associate Professor Obstetrics & Gynecology Department Medical School of Yonsei University, Korea
1992 - Present	President Infertility Medical Center of CHA General Hospital
1992 - 1997	Vice President SungKwang Medical Foundation
1990 - 1992	Vice President CHA General Hospital, Seoul, Korea
1984 - 1990	Vice President CHA Women's Hospital, Seoul, Korea
1984 - 1986	Postdoctoral Endocrinology & Infertility Department of Obstetrics & Gynecology University of Southern California, USA
1983 - 1984	Research Fellow Department of Medical Science, The Graduate School, Yonsei University, Seoul, Korea
1979 - 1983	Resident Department of Obstetrics and Gynecology, Severance Hospital, Yonsei University, Seoul, Korea
1978 - 1980	M.S. Graduate School of Yonsei University, Seoul, Korea
1978 - 1979	Intern Yonsei University, Seoul, Korea
1977 - 1978	Research Assistant Pathological Anatomy Department at Severance General Hospital Affiliated with Medical School of Yonsei University
1973 - 1977	Medical School, Yonsei University, Seoul, Korea Graduated Summa Cum Laude
1971 - 1973	Premedical College, Yonsei University, Seoul, Korea

Clinical Application of Human Oocyte Vitrification

Kwang Yul Cha, MD

CHA Research Institute, Fertility Center of Center, CHA General Hospital, Pochon CHA University College of Medicine, Korea

Generally, vitrification requires a high concentration of cryoprotectants and an elevated cooling speed for no ice crystal formation, which is one of the major causes of cryoinjury. Novel techniques and a variety of different types of cryo-containers to improve the results of oocyte and embryo freezing were developed. To improve the viability and quality of oocytes after vitrification, our group has recently introduced several changes, new type of cryo-containers and slush nitrogen (SN2). Boiling of liquid nitrogen (LN2) occurs when a sample is immersed and results in gas bubbles around the specimen, which, in turn, results in poor heat transfer. By applying negative pressure with a vacuum, LN2 will freeze and convert into a slush state. SN2 has a lower internal temperature of -210℃ without vaporization. Since it may offer high-speed cooling rates, it may be possible to increase the survival rate as well as other characteristics. Our group has achieved improved survival rate, embryonic development, and pregnancy rate after human oocytes vitrification by applying SN2.

Oocyte vitrification could not only be one of the most valuable tools used for human ART programs in the future but also contribution in establishing an oocyte bank system, which is a feasible system to treat a number of congenital infertility disorders, such as hypoplastic ovaries and premature ovarian failure. This system can also provide the chance of pregnancy in patients who receive anticancer treatments, and help innovative family planning to support the social activity of modern women. In addition, the oocyte bank system can lessen the ethical and legal dilemmas caused by human embryo freezing.