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USE OF BIOLOGICAL AND SYNTHETIC POLYMERS FOR HUMAN SPERMATOZOA CRYOPRESERVATION

Maryna Petrushko[1,2] and Taisiia Yurchuk[1*]

[1]Institute for Problems of Cryobiology and Cryomedicine (IPC&C) of the National Academy of Sciences of Ukraine, 23, Pereyaslavska Str., Kharkiv 61016, Ukraine.
[2]ART-Clinic of Reproductive Medicine, 38B, Gagarina av., Kharkiv 61000, Ukraine.
Corresponding author's E-mail: taisiya.yur@gmail.com

Abstract

BACKGROUND: Spermatozoa cryopreservation is an integral part of the assisted reproductive technologies for treatment of infertility. It is also used to preserve the reproductive potential of men. However, using a standard freezing method with glycerol leads to a decrease in morphological and functional characteristics of spermatozoa in the case of oligoasthenoteratozoospermia (OAT). Therefore, it is relevant to develop effective methods of cryopreservation for such sperm. The use of various biopolymers can stabilize the membrane and bind excess water, which forms ice crystals in the medium that causes cell damage when temperature decreases. **OBJECTIVE:** To study the effectiveness of using cryoprotectant mixtures based on biological and synthetic polymers [serum albumin, polyvinylpyrrolidone (PVP) and insulin] for the cryopreservation of human spermatozoa with OAT. **MATERIALS AND METHODS:** Human spermatozoa with OAT were cryopreserved using different cryoprotectant media containing 10 % glycerol or 10 % PVP, 20 % albumin and 1 μg/mL human insulin. The viability, motility and mitochondrial membrane potential of spermatozoa were assessed after rewarming. **RESULTS:** A cryoprotectant solution containing 10 % PVP, 20 % human serum albumin and 1 μg/mL insulin enabled a similar level (%) of viable gametes compared with the standard method using glycerol, while the number of motile cells was significantly lower ($p < 0.008$). The membrane mitochondrial potential did not differ significantly from fresh sperm. **CONCLUSION:** The data obtained in this study show the effectiveness of a biopolymer mixture containing PVP, serum albumin and insulin for the cryopreservation of human OAT spermatozoa.

Keywords: cryopreservation; insulin; oligoasthenoteratozoospermia; polyvinylpyrrolidone; serum albumin; spermatozoa.

INTRODUCTION

Cryopreservation of cells, tissues and organs is an important part of modern biotechnology and transplant medicine (1). Low-temperature preservation has upgraded the effectiveness of infertility treatment programs to a new level and has become especially important in assisted reproductive technologies (ART). Modern methods of spermatozoa cryopreservation are based on the use of organic solvents such as glycerol, 1,2-propanediol or dimethylsulfoxide (DMSO) as cryoprotectants. However, these permeable cryoprotectants have cytotoxicity and, moreover, mutagenic activity (2). Therefore, they must be removed from the cells after warming by double centrifugation and change of the media. However, these manipulations negatively affect the morphology and functional spermatozoa characteristics (3).