Evaluation of the protective effect of L-carnitine and acetyl-L-carnitine on human spermatozoa during freezing and thawing

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Introduction: L-carnitine (LC) and acetyl-L-carnitine (ALC) are known to contribute to the antioxidant defenses of the spermatozoa. The objective of our study was to assess the protective effect of carnitine derivatives on oxidative damage to spermatozoa during cryopreservation and thawing.

Materials and methods: Semen samples were collected from 20 normal healthy volunteers. Specimens were divided into 2 aliquots (A and B) and each diluted in Ham's F-10 media to a uniform concentration of 20X10^6/mL. Aliquots A, were further divided and into each L-carnitine or acetyl-L-carnitine were added in concentrations of 0, 10, and 30 µM separately. All aliquots were cryopreserved for 3 days. Sperm motility, viability, fertilizing capacity, reactive oxygen species (ROS) formation and the level of lipid peroxidation (LPO) were analyzed before and after cryopreservation.

Results: The sperm viability showed significant higher levels in aliquots A, which was directly correlated with the concentration of ALC (p<0.05). Also, the sperm fertilizing capacity was significantly higher, and ROS generation and LPO were significantly lower in proportion to the concentration of LC and ALC (p<0.05 for each). There was no improvement in sperm motility with the increase in concentration of acetyl-L-carnitine (p>0.05).

Conclusions: Our results suggest that carnitine derivatives can effectively scavenge free radicals in semen specimens. Therefore, supplementation of carnitine to the cryoprotectant can prevent oxidative damage incurred by spermatozoa during freezing and thawing.

Key words: Infertility, carnitine, oxidative stress, cryopreservation