Enhancement of human sperm motility by inclusion of acetyl-L-carnitine in processing media

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Objective: Various methods are employed in assisted reproductive technologies for separation of highly motile human spermatozoa for insemination. The swim-up method is one of the most commonly used due to its simplicity and cost effectiveness. Unfortunately, the yield of highly motile sperm fraction by this method varies widely, depending on initial sample quality. Research has demonstrated the importance of L-carnitine and acetyl-L-carnitine (ALC) to sperm metabolism and their benefits to sperm development and maturation. Our aim was to study the inclusion of acetyl-L-carnitine in sperm processing media to assess whether it can improve the recovery of motile sperm fraction during swim-up.

Design: Prospective in vitro study

Materials and Methods: Ejaculated human semen samples from 27 normozoospermic men were divided into two equal parts after completion of liquefaction and each aliquot was incubated for 15 minutes with either Ham’s F-10 media (HF-10) alone or HF-10 with 175µMol/L of ALC respectively. Following centrifugation, the pellets formed were layered with HF-10 (control) or HF-10 with ALC (test) and incubated for 45 minutes at 37°C. The supernatants were removed and assessed for motility by using a computer assisted semen analyzer (CASA; Hamilton Thorn, CEROS).

Results: Semen samples, treated with ALC, showed significantly better sperm motion parameters compared to the control, like % motility (33.7 ± 15.4 vs. 16.0 ± 15.8; p value 0.019), % rapid motility (21.8 ± 13.3 vs. 8.6± 13.3; p value 0.033), average path velocity, VAP (29.7±3.6 vs. 25.3 ± 6.0; p value 0.022), amplitude of lateral head displacement, ALH (2.5±0.7 vs. 1.5 ± 1.2; p value 0.010). No significant change was seen in VSL, VCL and linearity (p=0.331, 0.107 and 0.612 respectively).

Conclusion: The results show that the inclusion of ALC in culture media during sperm processing can yield a higher fraction of motile spermatozoa with better velocity parameters. ALC is thought to maintain sperm plasma membrane stability through its involvement in acetylation of membrane phospholipids and exerts an antioxidant activity.
This may help in scavenging reactive oxygen species (ROS) generation during centrifugation steps and ROS produced by certain culture media like HF-10 due to ferrous iron content.

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