Effects of N-acetyl-L-cysteine and Myo-inositol on sperm quality in men with infertility: Insights from a quantitative analysis

The problem

- Elevated ROS are a major contributor to idiopathic male infertility, and an antioxidant deficiency is strongly associated with male-factor infertility.
- High ROS levels cause DNA damage, membrane instability, reduced motility and overall impaired fertility.

The potential solution

Role of NAC

- Scavenges free radicals
- Supports spermatogonia survival
- Enhances sperm motility
- Protects cell structure by reducing lipid peroxidation
- Lowers ROS levels
- Improves chromatin density
- Reduces DNA fragmentation
- Attenuates endoplasmic reticulum stress in Sertoli cells

Role of Myo-inositol

- Regulates intracellular calcium
- Supports sperm motility
- Plays a role in sperm capacitation
- Maintains mitochondrial membrane potential
- Contributes to cytoskeletal integrity
- Impacts lipid composition
- Facilitates gene expression
- Regulates the acrosome reaction
- Plays an important role in sperm maturation and epididymal migration

Clinical evidence

Study method

- A controlled trial involving 63 men (22–58 years) with male-factor infertility
- Semen samples collected and incubated at 37°C for 20 minutes
- Participants were divided into control and treatment groups (NAC or Myo-inositol)

Study findings

- **Sperm motility**
  Sperm motility increased significantly in both the NAC and Myo-inositol groups compared with the control group ($P < 0.001$).
- **DNA integrity (TUNEL assay)**

It was evaluated using the TUNEL assay	
The NAC group showed a significantly higher percentage of TUNEL-negative (intact DNA) cells than the control group ($P < 0.01$).	The number of TUNEL-positive (damaged DNA) cells was significantly lower in the NAC group, indicating reduced DNA fragmentation.

Conclusion

- The findings of this study indicate that NAC and Myo-inositol can enhance sperm motility and DNA integrity by reducing ROS.

Key takeaway

- NAC and Myo-inositol may improve sperm motility and DNA integrity, suggesting potential roles in the management of male infertility.

Abbreviations

DNA: Deoxyribonucleic acid; NAC: N-acetyl-L-cysteine; ROS: Reactive oxygen species; TUNEL: Terminal deoxynucleotidyl transferase dUTP nick end-labelling

Reference

Nemati M, Ansaripour S, Samadi N. Effect of Myo-inositol and N-acetyl-L-cysteine on processed human spermatozoa for use in modern methods of fertility treatment. *J Shahrekord University Med Sci.* 2020;22(2):53–60.
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