



THE ROLE OF ZINC OXIDE NANOPARTICLES IN THE MODULATION OF MOVEMENT CHARACTERISTICS OF BULL SPERMATOZOA

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INTRODUCTION

Zinc oxide (ZnO) nanoparticles have gained significant attention in reproductive biology due to their unique physicochemical properties and potential applications in enhancing gamete functionality. This study investigates the effect of ZnO nanoparticles in modulating the motility characteristics of bull spermatozoa, which are critical for successful fertilization. Given the importance of spermatozoa motility in agricultural and veterinary practice, understanding the interactions between ZnO nanoparticles and spermatozoa could provide insight into new strategies to improve reproductive efficiency in cattle.

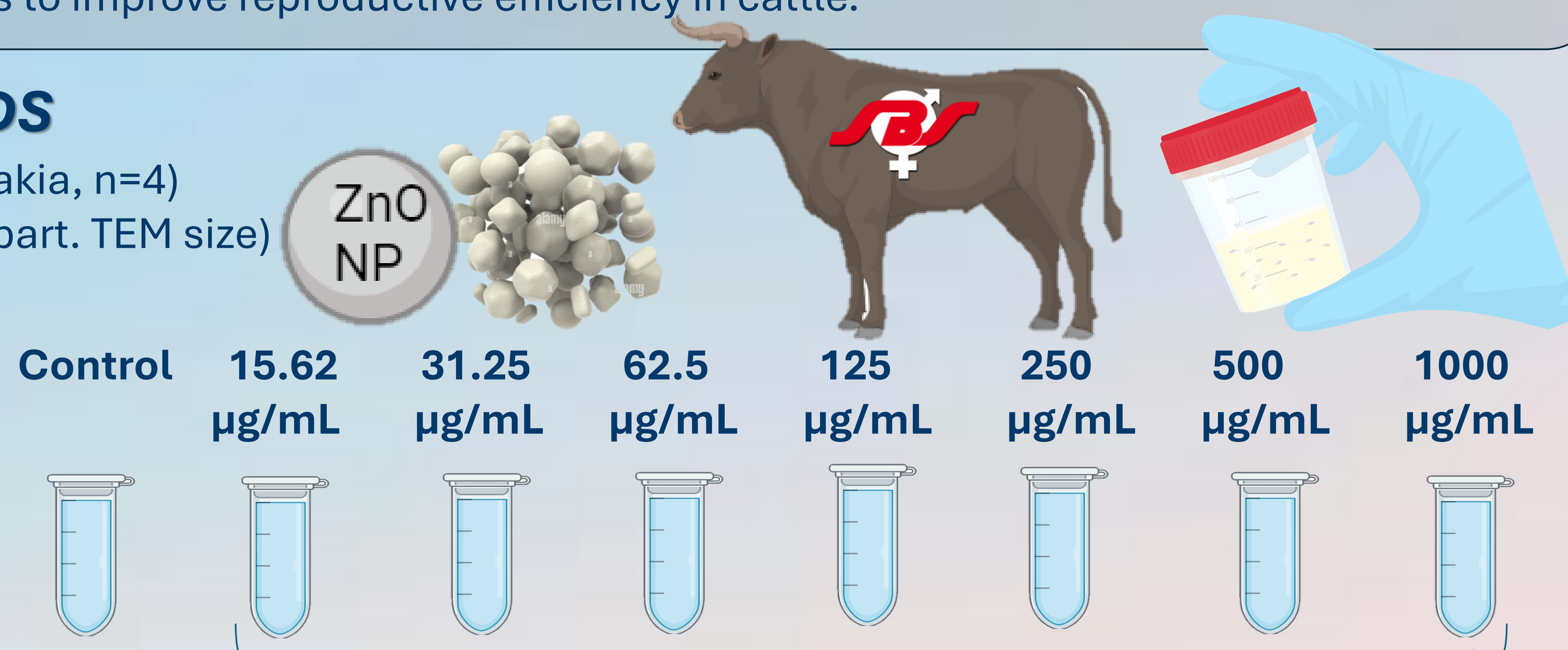
MATERIALS and METHODS

- Bull ejaculate (Slovak biological service, Nitra, Slovakia, n=4)
- Zinc oxide nanoparticles ZnO (40 nm ≤ 100 nm ave. part. TEM size)
- Incubation 0h, 3h and 5h at 37°C
- Computer-assisted sperm analysis (CASA system):

Total Motility (MOT, %)

Progressive motility (PRO, %)

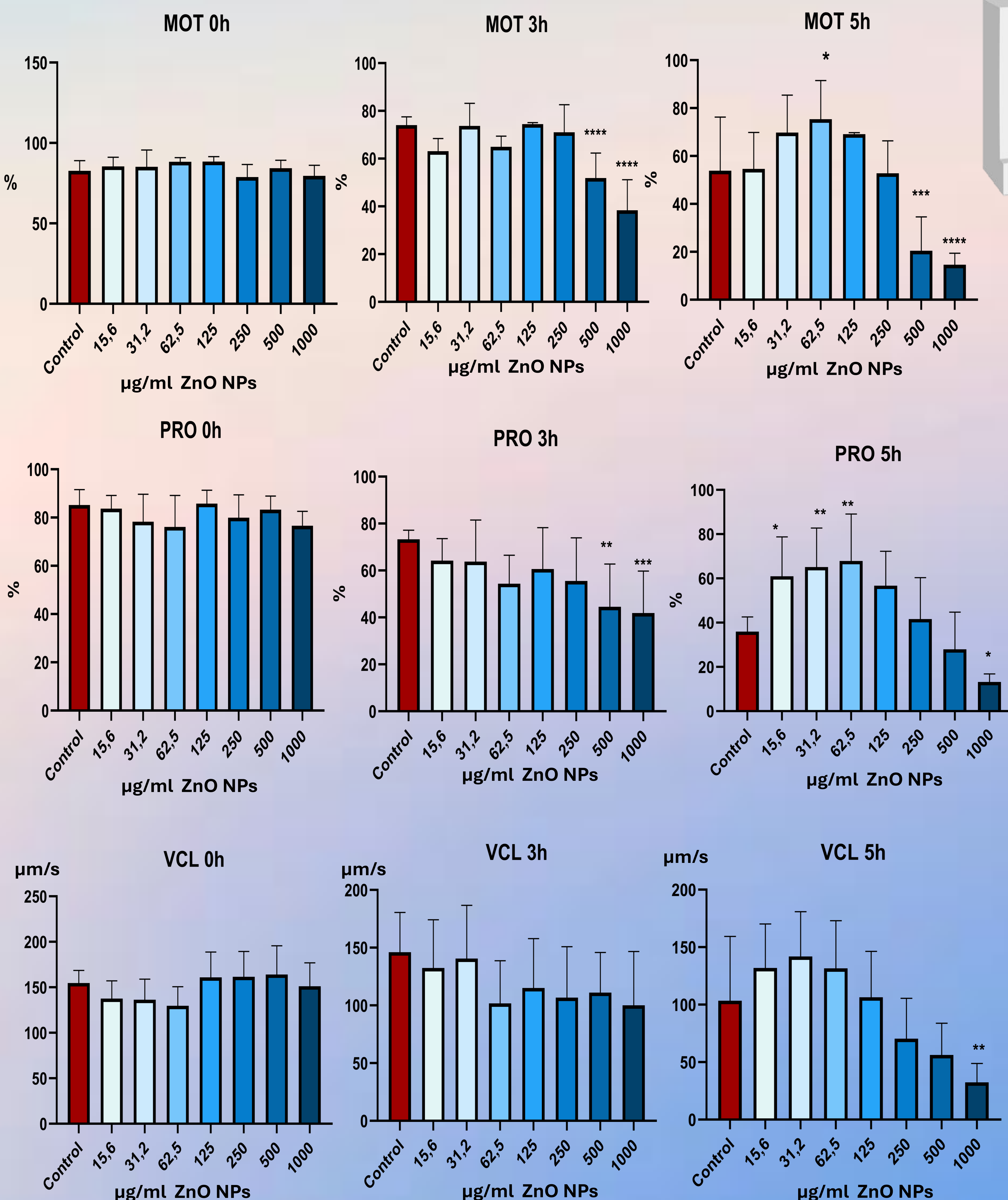
Velocity curved line (VCL, μm/s)



RESULTS

Pure saline and ejaculate

saline + ZnO NP in different concentration and ejaculate



The data were processed using One-Way ANOVA and Dunnet's test (GraphPad Prism9)
The level of significance was set at ***
(P<0.001), ** (P<0.01) and * (P<0.05).

CONCLUSION

The results of our experiments show that the addition of 31.2 and 62.5 μg/mL ZnO NPs has a beneficial effect on the motility characteristics of bull spermatozoa. On the other hand, concentrations of 1000 and 500 μg/mL ZnO NPs were cytotoxic. Our findings suggest that it is necessary to elucidate the mechanistic pathways by which ZnO nanoparticles affect spermatozoa motility, thus contributing to the broader discourse on nanotechnology in the field of reproductive health.

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