IMPORTANCE OF NUMBER OF HYPERACTIVATED SPERMATOZOA FOR SUCCESSFUL FERTILISATION TROUGH MECHANICAL OSCILLATORY MODEL OF MOUSE *ZONA PELLUCIDA*

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The quality of a whole ejaculate is important for fertilization success. Number of sperm with effective swimming velocity, capable to reach the oocyte and to undergo complex adaptations within the female reproductive tract is a key determinant of male fertilization success. According to the literature, total sperm numbers are positively correlated to proportions of normal sperm, acrosome integrity and motile sperm and also with gonadosomatic index.

Treating the fertilization process as an oscillatory phenomenon we use oscillatory spherical net model of mouse *Zona Pellucida* (mZP) to investigate the impact of sperm count on successful fertilization. To describe impact of number of hyperactivated sperm cells relative to the oscillatory behaviour of mZP, the discreet continuum model in the form of spherical net model is used. mZP is modelled as a discrete system of material particles (corresponds to mZP glycoproteins) interconnected with massless linear elastic elements on a manner that preserves molar ratio of m ZP glycoproteins. According to the model, under external numerous vibro-impacts of spermatozoa, mZP oscillatory net oscillates in forced regimes.

To estimate the influence of sperm count a numerical analysis was conducted. Using generalized Lissajous curves, parametric frequency analysis of oscillatory behaviour of ZP1 molecules in oscillatory model of m*ZP* is realized. Numerical analysis identified favourable oscillatory states of ZP1 molecules under the impact of different number of spermatozoa with effective velocity.

We can conclude that ZP1 molecules in the mZP oscillatory model have different oscillatory states when exposed to the external vibro -impacts of different number of hyperactivated spermatozoa, indicated that certain number of hyperactivated spermatozoa is necessary for reaching the favourable oscillatory state of mZP for fertilisation.

Key words*:* sperm kinetic parameters, sperm count, *Zona pellucida*, oscillations, discreet continuum model, *Lissajous curves*

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