

Effects of adenosine A1 receptor antagonist and phosphodiesterase type 4 inhibitor on sperm fertilizing capacity

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INTRODUCTION:

The acrosome reaction was inhibited by the adenosine with a concentration-dependent, and adenosine A1 receptor (A1AR) is localized in the acrosomal cap. Therefore, it is suggested that the presence of adenosine in the seminal fluid of mammals modulates the fertilization process of spermatozoa. While, inhibition of sperm phosphodiesterase type 4 (PDE4) has been shown to increase cAMP concentrations and stimulate motility and the acrosome reaction. We investigated the effect of A1AR antagonist (A1AR-A: FK838) and PDE4 inhibitor (PDE4-I: FR196093) on the activation of human spermatozoa.

METHODS:

- (1) Effect on the sperm motility; Human semen samples were obtained from seven donors of proven fertility. Informed consent was obtained from donors prior to the study. Semen parameters were normal by WHO standards. Samples were processed according to the swim-up procedure. Following incubation for 90 and 180 min with 10^{-5} M, 10^{-7} M, 10^{-9} M of A1AR-A, or PDE4-I, the sperm motility parameters (%motility, % progressive motility, VAP : average path velocity, VSL : straight line velocity, VCL : curvilinear velocity, %hyperactivated sperm) were assessed by the computer-aided sperm motion analysis (CASA).
- (2) Effect on the acrosome reaction; The AcroBeads test was performed on semen specimens from 10 normal fertile donors. Following incubation for 24 h with 10^{-5} M, 10^{-7} M, 10^{-9} M of A1AR-A, or PDE4-I, sperm populations were examined for sperm-bead agglutination.
- (3) Effect on the zona-free hamster oocytes human sperm penetration test (ZSPT); The ZSPT was performed on semen specimens from 5 normal fertile donors. Following incubation for 6h with 10^{-9} M of A1AR-A, or PDE4-I, penetration rates, polyspermy rates, and mean number of penetrated spermatozoa were assessed.

RESULTS:

- (1) There are no significant differences among the each concentration of A1AR-A and PDE4-I in the sperm motility parameters.
- (2) The AcroBeads score is significantly higher dose dependently in the treatment with A1AR-A compared with control ($P<0.05$). In the treatment with PDE4-I, there is no significant difference.
- (3) There are no significant differences among the each concentration of A1AR-A and PDE4-I, penetration rates, polyspermy rates, and mean number of penetrated spermatozoa.

CONCLUSION:

It was suggested that in the case of normal semen parameters, A1AR antagonist stimulates the acrosome reaction. However, both A1AR antagonist and PDE4 inhibitor did not effect on the sperm motility parameters and the hamster test. It is necessary to assess the effect of A1AR antagonist and PDE4 inhibitor on the activation of human spermatozoa in the case of subfertile semen quality.