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Rabbit spermatozoa: a model system for studying ATP homeostasis and motility

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This paper studies the adenosine triphosphate (ATP) homeostasis and the motility parameters of rabbit spermatozoa. Rabbit sperm, collected by artificial vagina, were studied in various buffer systems to determine motility over time. Sperms were also extracted to measure enzyme activity. Analyses of motility by Computer Assisted Semen Analyzer system were run in parallel with energy metabolic studies of sperm cells maintained in different physiological solutions sometimes containing inhibitors of energy metabolism. Rabbit spermatozoa were shown to be able to form ATP either via glycolysis or via oxidative phosphorylation. Both these metabolic pathways were active in viable cells where creatine kinase and adenylate kinase systems were also present (1.1 and 7,000 nmol/min per 100 x 10⁶, respectively) and involved in maintaining high ATP levels. A dynamic balance between ATP synthesis and ATP-hydrolyzing enzymes was suggested by the fact that rabbit sperms in their seminal plasma preserved their motility for hours. The decrease in sperm ATP content was mainly due to its hydrolysis by dynein ATPases coupled with movements. Therefore, motility of rabbit spermatozoa appeared to be dependent only on the ATP available to dynein ATPases. In fact, statistical analyses of motility parameters and the concentrations of intracellular ATP or ATP-metabolite did not show any significant correlation.

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