

Journal of Andrology, Vol. 25, No. 1, January/February 2004
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Identification of Glutamate Receptors and Transporters in Mouse and Human Sperm

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γ -Aminobutyric acid (GABA) and glutamate (Glu) are considered as the predominant inhibitory and excitatory neurotransmitters in mammalian central nervous systems (CNS), respectively. The presence of the GABA system and metabotropic glutamate receptors in sperm prompted us to explore the existence of ionotropic glutamate receptors and glutamate transporters in sperm. Immunofluorescent analysis was used to investigate the existence and location of glutamate, glutamate receptor (NR2B), and glutamate transporter (GLT1) in mouse and human sperm. Our present results showed that NR2B was located in the midpiece of sperm, whereas GLT1 mainly existed in the head. Moreover, glutamate uptake activity was detected in mouse sperm and it could be blocked by dihydrokainic acid (DHK, GLT1-selective inhibitor) and DL-threo-beta-hydroxyaspartic acid (THA, nonselective inhibitor). In addition, reverse transcription-polymerase chain reaction technique and sequencing analysis revealed that glutamate transporters (GLT1 and EAAC1) and ionotropic glutamate receptors (NR1, NR2B, GluR6, and KA2) existed in mouse sperm as well as in human sperm. The present findings are the first direct evidence for the existence of ionotropic glutamate receptors and glutamate transporters in sperm. It also indicates that, in sperm, glutamate receptors and transporters might have functions other than neurotransmission.

Key words: Uptake, immunocytochemistry, RT-PCR, inhibitor

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