



Journal of Andrology, Vol 20, Issue 1 47-53, Copyright © 1999 by The American Society of Andrology

JOURNAL ARTICLE

Motility potential of macaque epididymal sperm: the role of protein phosphatase and glycogen synthase kinase-3 activities

G. D. Smith, D. P. Wolf, K. C. Trautman and S. Vijayaraghavan
Division of Reproductive Sciences, Oregon Regional Primate Research Center,
Beaverton, USA.

Human and monkey ejaculated sperm contain protein phosphatase-1 (PP1), PP1 inhibitor 2 (I2), and glycogen synthase kinase-3 (GSK-3). Inhibition of ejaculated human sperm protein phosphatase (PP) activity with calyculin-a (CL-A) significantly stimulates motility, implicating protein dephosphorylation in motility regulation. The present experiments were conducted to characterize and compare PP and GSK-3 activity in monkey caput and caudal epididymal sperm, to determine the cellular distribution of these enzymes, and to test the thesis that epididymal sperm PP activity is inversely related to motility. Caput epididymal sperm populations, (8.8% motile) contained levels of PP activity that were >3 times as high as those of caudal spermatozoa. This PP activity was further identified by inhibitor response profiles as PP1. In both caput and caudal sperm, the majority of this PP1 activity was localized in 100,000 x g soluble fractions. Western blot analysis indicated that a portion of this difference was the result of elevated amounts of PP1 in caput compared with caudal epididymal sperm. The presence of GSK-3 activity was undetectable in 100,000 x g insoluble fractions of epididymal sperm, whereas both caput and caudal sperm soluble fractions contained GSK-3 activity, which was approximately threefold higher in caput sperm compared with caudal populations. Treatment of caput epididymal sperm from the rhesus macaque with the PP inhibitor CL-A resulted in a significant, dose-dependent increase from 8 to 38% motile cells (without any effect on their path velocity). In contrast, CL-A had no significant influence on either percent motility or path velocity of caudal epididymal sperm. Cytosolic PP1 and GSK-3 activities appear to be inversely related to the motility of monkey epididymal sperm and may have a regulatory role in the development of the potential for motility in epididymal sperm.

This article has been cited by other articles:



BIOLOGY of REPRODUCTION

[HOME](#)

Z. Huang, P. R. Somanath, R. Chakrabarti, E. M. Eddy, and S. Vijayaraghavan
Changes in Intracellular Distribution and Activity of Protein Phosphatase PP1{gamma}2 and Its Regulating Proteins in

This Article

- ▶ [Full Text \(PDF\)](#)
- ▶ [Alert me when this article is cited](#)
- ▶ [Alert me if a correction is posted](#)

Services

- ▶ [Similar articles in this journal](#)
- ▶ [Similar articles in PubMed](#)
- ▶ [Alert me to new issues of the journal](#)
- ▶ [Download to citation manager](#)

Citing Articles

- ▶ [Citing Articles via HighWire](#)
- ▶ [Citing Articles via Google Scholar](#)

Google Scholar

- ▶ [Articles by Smith, G. D.](#)
- ▶ [Articles by Vijayaraghavan, S.](#)
- ▶ [Search for Related Content](#)

PubMed

- ▶ [PubMed Citation](#)
- ▶ [Articles by Smith, G. D.](#)
- ▶ [Articles by Vijayaraghavan, S.](#)



Journal of **ANDROLOGY**

[▶ HOME](#)

P. R. Somanath, S. L. Jack, and S. Vijayaraghavan
Changes in Sperm Glycogen Synthase Kinase-3 Serine
Phosphorylation and Activity Accompany Motility Initiation and
Stimulation

J Androl, July 1, 2004; 25(4): 605 - 617.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



BIOLOGY of REPRODUCTION

[▶ HOME](#)

Z. Huang, K. Myers, B. Khatra, and S. Vijayaraghavan
Protein 14-3-3{zeta} Binds to Protein Phosphatase PP1{gamma}2
in Bovine Epididymal Spermatozoa

Biol Reprod, July 1, 2004; 71(1): 177 - 184.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



BIOLOGY of REPRODUCTION

[▶ HOME](#)

Z. Huang and S. Vijayaraghavan
Increased Phosphorylation of a Distinct Subcellular Pool of Protein
Phosphatase, PP1{gamma}2, During Epididymal Sperm Maturation

Biol Reprod, February 1, 2004; 70(2): 439 - 447.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



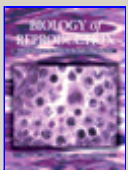
BIOLOGY of REPRODUCTION

[▶ HOME](#)

Z. Huang, B. Khatra, M. Bollen, D. W. Carr, and S. Vijayaraghavan
Sperm PP1{gamma}2 Is Regulated by a Homologue of the Yeast
Protein Phosphatase Binding Protein sds221

Biol Reprod, December 1, 2002; 67(6): 1936 - 1942.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



BIOLOGY of REPRODUCTION

[▶ HOME](#)

J. S. Tash, S. Kim, M. Schuber, D. Seibt, and W. H. Kinsey
Fertilization of Sea Urchin Eggs and Sperm Motility Are Negatively
Impacted under Low Hypergravitational Forces Significant to Space
Flight

Biol Reprod, October 1, 2001; 65(4): 1224 - 1231.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)