Journal of Andrology, Vol 20, Issue 2 198-213, Copyright © 1999 by The American Society of Andrology

JOURNAL ARTICLE

Adhesion and signaling proteins spatiotemporally associated with spermiation in the rat

R. N. Wine and R. E. Chapin
Reproductive Toxicology Group, National Toxicology Program, National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina 27709, USA.

Spermiation, the process by which late spermatids separate from the Sertoli cell, is disrupted by a number of toxicants. In this study, we used immunohistochemistry (IHC) to identify some of the proteins associated with the spermatid-Sertoli junction. We confirmed the presence of tubulin, actin, and vinculin at the luminal edge of the seminiferous tubule, and we determined that paxillin is also present here. In other cell types, these proteins have been reported to colocalize with beta integrins. Numerous attempts to identify beta integrins by IHC and by use of Western blots were unsuccessful. Clear evidence was found for the presence of N-cadherin and its associated intracellular proteins: beta-catenin, pp120, desmoglein, pp60(src), and Csk. In addition, N-cadherin and desmoglein were found around spermatids retained by the epithelium. From these data and previous literature reports, we propose a hypothetical model for spermatid adhesion and the control of that adhesion, thus providing a framework for hypotheses on the steps involved in the complex process of spermiation in rat testes.

This article has been cited by other articles:

BIOLOGY *of* REPRODUCTION HOME

K. S Vaid, J. A Guttman, R. R Singaraja, and A. W. Vogl
A Kinesin Is Present at Unique Sertoli/Spermatid Adherens Junctions in Rat and Mouse Testes
Biol Reprod, December 1, 2007; 77(6): 1037 - 1048.
[Abstract] [Full Text] [PDF]

Journal of Endocrinology HOME

P. P Y Lie, W. Xia, C. Q F Wang, D. D Mruk, H. H N Yan, C.-h. Wong, W. M Lee, and C Y. Cheng
Dynamin II interacts with the cadherin- and occludin-based protein complexes at the blood-testis barrier in adult rat testes
J. Endocrinol., December 1, 2006; 191(3): 571 - 586.
[Abstract] [Full Text] [PDF]

Journal of Endocrinology HOME

A. Beardsley, D. M Robertson, and L. O'Donnell
A complex containing {alpha}6{beta}1-integrin and phosphorylated focal adhesion kinase between Sertoli cells and elongated spermatids during spermatid release from the seminiferous epithelium.
J. Endocrinol., September 1, 2006; 190(3): 759 - 770.
[Abstract] [Full Text] [PDF]

Journal of Endocrinology HOME

P Sluka, L O'Donnell, J R Bartles, and P G Stanton
FSH regulates the formation of adherens junctions and ectoplasmic specialisations between rat Sertoli cells in vitro and in vivo.
J. Endocrinol., May 1, 2006; 189(2): 381 - 395.
[Abstract] [Full Text] [PDF]

BIOLOGY *of* REPRODUCTION HOME

N. P.Y. Lee, D. D. Mruk, C.-h. Wong, and C. Y. Cheng
Regulation of Sertoli-Germ Cell Adherens Junction Dynamics in the Testis Via the Nitric Oxide Synthase (NOS)/cGMP/Protein Kinase G (PRKG)/{beta}-Catenin (CATNB) Signaling Pathway: An In Vitro and In Vivo Study
Biol Reprod, September 1, 2005; 73(3): 458 - 471.
[Abstract] [Full Text] [PDF]

Journal of ANDROLOGY HOME

K. M. Wolski, C. Perrault, R. Tran-Son-Tay, and D. F. Cameron
Strength Measurement of the Sertoli-Spermatid Junctional Complex
J Androl, May 1, 2005; 26(3): 354 - 359.
[Abstract] [Full Text] [PDF]

Endocrinology HOME

J. Zhang, C.-h. Wong, W. Xia, D. D. Mruk, N. P. Y. Lee, W. M. Lee, and C. Y. Cheng
Regulation of Sertoli-Germ Cell Adherens Junction Dynamics via Changes in Protein-Protein Interactions of the N-Cadherin-{beta}-Catenin Protein Complex which Are Possibly Mediated by c-Src and Myotubularin-Related Protein 2: An in Vivo Study Using an Androgen

Suppression Model
Endocrinology, March 1, 2005; 146(3): 1268 - 1284.
[Abstract] [Full Text] [PDF]

Toxicologic Pathology HOME

P. Howroyd, R. Hoyle-Thacker, O. Lyght, D. Williams, and E. Kleymenova
Morphology of the Fetal Rat Testis Preserved in Different Fixatives
Toxicol Pathol, February 1, 2005; 33(2): 300 - 304.
[Abstract] [Full Text] [PDF]

ENDOCRINE REVIEWS HOME

D. D. Mruk and C. Y. Cheng
Sertoli-Sertoli and Sertoli-Germ Cell Interactions and Their Significance in Germ Cell Movement in the Seminiferous Epithelium during Spermatogenesis
Endocr. Rev., October 1, 2004; 25(5): 747 - 806.
[Abstract] [Full Text] [PDF]

BIOLOGY of REPRODUCTION HOME

N. P.Y. Lee and C. Y. Cheng
Adaptors, Junction Dynamics, and Spermatogenesis
Biol Reprod, August 1, 2004; 71(2): 392 - 404.
[Abstract] [Full Text] [PDF]

BIOLOGY of REPRODUCTION HOME

M. K.Y. Siu and C. Y. Cheng
Extracellular Matrix: Recent Advances on Its Role in Junction Dynamics in the Seminiferous Epithelium During Spermatogenesis
Biol Reprod, August 1, 2004; 71(2): 375 - 391.
[Abstract] [Full Text] [PDF]

HUMAN REPRODUCTION UPDATE HOME

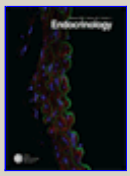
N. P.Y. Lee and C. Y. Cheng
Ectoplasmic specialization, a testis-specific cell-cell actin-based adherens junction type: is this a potential target for male contraceptive development?
Hum. Reprod. Update, July 1, 2004; 10(4): 349 - 369.
[Abstract] [Full Text] [PDF]

Journal of ANDROLOGY HOME

N. P. Y. Lee, D. D. Mruk, A. M. Conway, and C. Y. Cheng
Zyxin, Axin, and Wiskott-Aldrich Syndrome Protein Are Adaptors That Link the Cadherin/Catenin Protein Complex to the Cytoskeleton at Adherens Junctions in the Seminiferous Epithelium of the Rat Testis
J Androl, March 1, 2004; 25(2): 200 - 215.
[Abstract] [Full Text] [PDF]

BIOLOGY of REPRODUCTION HOME

Y.-m. Chen, N. P.Y. Lee, D. D. Mruk, W. M. Lee, and C. Y. Cheng
Fer Kinase/FerT and Adherens Junction Dynamics in the Testis: An In Vitro and In Vivo Study
Biol Reprod, August 1, 2003; 69(2): 656 - 672.
[Abstract] [Full Text] [PDF]



Endocrinology HOME

M. K. Y. Siu, D. D. Mruk, W. M. Lee, and C. Y. Cheng
Adhering Junction Dynamics in the Testis Are Regulated by an Interplay of {beta}1-Integrin and Focal Adhesion Complex-Associated Proteins
Endocrinology, May 1, 2003; 144(5): 2141 - 2163.
[Abstract] [Full Text] [PDF]

BIOLOGY *of* REPRODUCTION HOME

A. Beardsley and L. O'Donnell
Characterization of Normal Spermiation and Spermiation Failure Induced by Hormone Suppression in Adult Rats
Biol Reprod, April 1, 2003; 68(4): 1299 - 1307.
[Abstract] [Full Text] [PDF]

BIOLOGY *of* REPRODUCTION HOME

N. P.Y. Lee, D. Mruk, W. M. Lee, and C. Y. Cheng
Is the Cadherin/Catenin Complex a Functional Unit of Cell-Cell Actin-Based Adherens Junctions in the Rat Testis?
Biol Reprod, February 1, 2003; 68(2): 489 - 508.
[Abstract] [Full Text] [PDF]

Journal of ANDROLOGY HOME

W.-Y. Lui, D. D. Mruk, W. M. Lee, and C. Y. Cheng
Adherens Junction Dynamics in the Testis and Spermatogenesis
J Androl, January 1, 2003; 24(1): 1 - 14.
[Full Text] [PDF]

Physiological Reviews HOME

C. Y. Cheng and D. D. Mruk
Cell Junction Dynamics in the Testis: Sertoli-Germ Cell Interactions and Male Contraceptive Development
Physiol Rev, October 1, 2002; 82(4): 825 - 874.
[Abstract] [Full Text] [PDF]

BIOLOGY *of* REPRODUCTION HOME

P. Sluka, L. O'Donnell, and P. G. Stanton
Stage-Specific Expression of Genes Associated with Rat Spermatogenesis: Characterization by Laser-Capture Microdissection and Real-Time Polymerase Chain Reaction
Biol Reprod, September 1, 2002; 67(3): 820 - 828.
[Abstract] [Full Text] [PDF]

BIOLOGY *of* REPRODUCTION HOME

K. J. Johnson and K. Boekelheide
Dynamic Testicular Adhesion Junctions Are Immunologically Unique. II. Localization of Classic Cadherins in Rat Testis
Biol Reprod, April 1, 2002; 66(4): 992 - 1000.
[Abstract] [Full Text] [PDF]

THE JOURNAL OF CLINICAL ENDOCRINOLOGY & METABOLISM HOME

R. I. McLachlan, L. O'Donnell, P. G. Stanton, G. Balourdos, M. Frydenberg, D. M. de Kretser, and D. M. Robertson
Effects of Testosterone Plus Medroxyprogesterone Acetate on Semen Quality, Reproductive Hormones, and Germ Cell Populations in Normal Young Men
J. Clin. Endocrinol. Metab., February 1, 2002; 87(2): 546 - 556.
[Abstract] [Full Text] [PDF]

RECENT PROGRESS IN HORMONE RESEARCH HOME

R.I. McLachlan, L. O'Donnell, S.J. Meachem, P.G. Stanton, D.M. de Kretser, K. Pratis, and D.M. Robertson
Identification of Specific Sites of Hormonal Regulation in Spermatogenesis in Rats, Monkeys, and Man
Recent Prog. Horm. Res., January 1, 2002; 57(1): 149 - 179.
[Abstract] [Full Text] [PDF]

BIOLOGY *of* REPRODUCTION HOME

M. Maekawa, Y. Toyama, M. Yasuda, T. Yagi, and S. Yuasa
Fyn Tyrosine Kinase in Sertoli Cells Is Involved in Mouse Spermatogenesis
Biol Reprod, January 1, 2002; 66(1): 211 - 221.
[Abstract] [Full Text]

Toxicologic Pathology HOME

T. Jindo, R. N. Wine, L.-H. Li, and R. E. Chapin
Protein Kinase Activity Is Central to Rat Germ Cell Apoptosis Induced by Methoxyacetic Acid
Toxicol Pathol, October 1, 2001; 29(6): 607 - 616.
[Abstract] [PDF]

THE JOURNAL OF CLINICAL ENDOCRINOLOGY & METABOLISM HOME

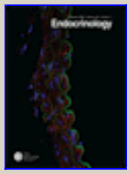
L. O'Donnell, A. Narula, G. Balourdos, Y.-Q. Gu, N. G. Wreford, D. M. Robertson, W. J. Bremner, and R. I. McLachlan
Impairment of Spermatogonial Development and Spermiation after Testosterone-Induced Gonadotropin Suppression in Adult Monkeys (Macaca fascicularis)
J. Clin. Endocrinol. Metab., April 1, 2001; 86(4): 1814 - 1822.
[Abstract] [Full Text]

Toxicologic Pathology HOME

D. M. Creasy
Pathogenesis of Male Reproductive Toxicity
Toxicol Pathol, January 1, 2001; 29(1): 64 - 76.
[Abstract] [PDF]

BIOLOGY *of* REPRODUCTION HOME

D. J. Mulholland, S. Dedhar, and A. Wayne Vogl
Rat Seminiferous Epithelium Contains a Unique Junction (Ectoplasmic Specialization) with Signaling Properties Both of Cell/Cell and Cell/Matrix Junctions
Biol Reprod, January 1, 2001; 64(1): 396 - 407.
[Abstract] [Full Text]

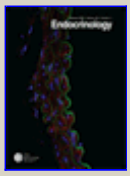


Endocrinology HOME

K. Saito, L. O'Donnell, R. I. McLachlan, and D. M. Robertson
Spermiation Failure Is a Major Contributor to Early Spermatogenic Suppression Caused by Hormone Withdrawal in Adult Rats
Endocrinology, August 1, 2000; 141(8): 2779 - 2785.
[Abstract] [Full Text] [PDF]

BIOLOGY *of* REPRODUCTION HOME

L. O'Donnell, P. G. Stanton, J. R. Bartles, and D. M. Robertson
Sertoli Cell Ectoplasmic Specializations in the Seminiferous Epithelium of the Testosterone-Suppressed Adult Rat
Biol Reprod, July 1, 2000; 63(1): 99 - 108.
[Abstract] [Full Text]



Endocrinology HOME

K. J. Johnson, S. R. Patel, and K. Boekelheide
Multiple Cadherin Superfamily Members with Unique Expression Profiles Are Produced in Rat Testis
Endocrinology, February 1, 2000; 141(2): 675 - 683.
[Abstract] [Full Text] [PDF]
