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JOURNAL ARTICLE

Changes in the expression of junctional and nonjunctional complex component genes when inter-Sertoli tight junctions are formed in vitro

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Throughout spermatogenesis, germ cells move progressively from the basal to the adluminal compartment, which is accompanied by continual disassembly and reassembly of intercellular junctions suggesting germ cell movement is composed of intermittent phases of junction disassembly and reassembly. A study was performed to correlate the expression of junctional-complex components (such as zonula occludens-1 [ZO-1], a tight-junction component protein) and nonjunctional complex components (such as urokinase-type plasminogen activator [uPA], a serine protease; cathepsin L, a cysteine protease; alpha2-macroglobulin, a nonspecific protease inhibitor; and cystatin C, a cysteine protease inhibitor) at the time when inter-Sertoli tight junctions were established in vitro. This is an attempt to investigate whether the expression of nonjunctional component genes also correlates with the formation of inter-Sertoli tight junctions in vitro. This is part of an effort to understand the physiologic elements of germ cell movement in the epithelium. Sertoli cells cultured in vitro are known to undergo programmed cell death. To ensure that the changes in target gene expression were not the result of apoptosis, Sertoli cells were cultured in vitro at densities of 0.25, 0.75, and 3 x 10(6) cells/cm2 for up to 7 days on bicameral culture units coated with Matrigel (Collaborative Research) and were assessed by morphologic analysis and agarose gel electrophoresis. It was noted that many of the Sertoli cells cultured at 3 x 10(6) cells/cm2 underwent apoptosis by day 7, in contrast to cultures at 0.25 and 0.75 x 10(6) cells/cm2 illustrating the Sertoli cell number per unit of area may be an important parameter to be considered when studying Sertoli cell function in vitro. Also, it was shown that the expression of ZO-1 increased significantly between days 2 and 3 prior to the establishment of inter-Sertoli tight junctions assessed by transepithelial resistance measurement (TER), which illustrates that ZO-1 can be used as a marker to monitor this cellular event. More interestingly, there was also a transient increase in the expression of uPA and cathepsin L between days 2 and 3 at the time preceding the formation of tight junctions. In Sertoli cells cultured at low density (2 x 10(4) cells/cm2), when a confluent monolayer of cells could not form, there were no changes in the expression of either ZO-1, uPA, or cathepsin L throughout the 7-day culture period. These results show that the establishment of specialized junctions, such as tight junctions between Sertoli cells in vitro, may require the participation of both junctional and nonjunctional complex components.

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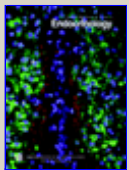
D. D. Mruk, B. Silvestrini, and C. Y. Cheng
Anchoring Junctions As Drug Targets: Role in Contraceptive Development
Pharmacol. Rev., June 1, 2008; 60(2): 146 - 180.
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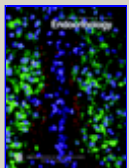
G. A. Tarulli, P. G. Stanton, A. Lerchl, and S. J. Meachem
Adult Sertoli Cells Are Not Terminally Differentiated in the Djungarian Hamster: Effect of FSH on Proliferation and Junction Protein Organization
Biol Reprod, May 1, 2006; 74(5): 798 - 806.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



Endocrinology

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C.-h. Wong, D. D. Mruk, M. K. Y. Siu, and C. Y. Cheng
Blood-Testis Barrier Dynamics Are Regulated by α 2-Macroglobulin via the c-Jun N-Terminal Protein Kinase Pathway
Endocrinology, April 1, 2005; 146(4): 1893 - 1908.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



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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- β -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.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



ENDOCRINE REVIEWS

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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

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



M. K.Y. Siu and C. Y. Cheng

Interactions of Proteases, Protease Inhibitors, and the β 1 Integrin/Laminin γ 3 Protein Complex in the Regulation of Ectoplasmic Specialization Dynamics in the Rat Testis

Biol Reprod, April 1, 2004; 70(4): 945 - 964.

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



D. D. Mruk, M. K.Y. Siu, A. M. Conway, N. P.Y. Lee, A. S.N. Lau, and C. Y. Cheng

Role of Tissue Inhibitor of Metalloproteases-1 in Junction Dynamics in the Testis

J Androl, July 1, 2003; 24(4): 510 - 523.

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

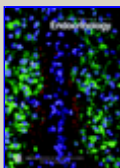


W.-y. Lui, W. M. Lee, and C. Y. Cheng

Sertoli-Germ Cell Adherens Junction Dynamics in the Testis Are Regulated by RhoB GTPase via the ROCK/LIMK Signaling Pathway

Biol Reprod, June 1, 2003; 68(6): 2189 - 2206.

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



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 β 1-Integrin and Focal Adhesion Complex-Associated Proteins

Endocrinology, May 1, 2003; 144(5): 2141 - 2163.

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



W.-y. Lui, W. M. Lee, and C. Y. Cheng

Transforming Growth Factor β 3 Regulates the Dynamics of Sertoli Cell Tight Junctions Via the p38 Mitogen-Activated Protein Kinase Pathway

Biol Reprod, May 1, 2003; 68(5): 1597 - 1612.

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



W.-Y. Lui, D. Mruk, W. M Lee, and C. Y. Cheng

Sertoli Cell Tight Junction Dynamics: Their Regulation During Spermatogenesis

Biol Reprod, April 1, 2003; 68(4): 1087 - 1097.

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



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.

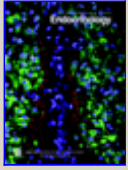
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W. W. Wright, L. Smith, C. Kerr, and M. Charron
Mice That Express Enzymatically Inactive Cathepsin L Exhibit
Abnormal Spermatogenesis
Biol Reprod, February 1, 2003; 68(2): 680 - 687.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



Endocrinology

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M. K. Y. Siu, W. M. Lee, and C. Y. Cheng
The Interplay of Collagen IV, Tumor Necrosis Factor- α ,
Gelatinase B (Matrix Metalloprotease-9), and Tissue Inhibitor of
Metalloproteases-1 in the Basal Lamina Regulates Sertoli Cell-Tight
Junction Dynamics in the Rat Testis
Endocrinology, January 1, 2003; 144(1): 371 - 387.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



Physiological Reviews

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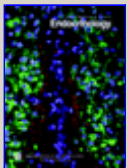
C. Y. Cheng and D. D. Mruk
Cell Junction Dynamics in the Testis: Sertoli-Germ Cell Interactions
and Male Contraceptive Development
Physiol Rev, October 1, 2002; 82(4): 825 - 874.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



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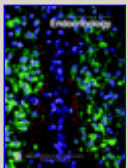
N. P.Y. Chung, D. Mruk, M.-y. Mo, W. M. Lee, and C. Y. Cheng
A 22-Amino Acid Synthetic Peptide Corresponding to the Second
Extracellular Loop of Rat Occludin Perturbs the Blood-Testis Barrier
and Disrupts Spermatogenesis Reversibly In Vivo
Biol Reprod, November 1, 2001; 65(5): 1340 - 1351.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



Endocrinology

▶ HOME

W.-Y. Lui, W. M. Lee, and C. Y. Cheng
Transforming Growth Factor- β 3 Perturbs the Inter-Sertoli Tight
Junction Permeability Barrier In Vitro Possibly Mediated via Its
Effects on Occludin, Zonula Occludens-1, and Claudin-11
Endocrinology, May 1, 2001; 142(5): 1865 - 1877.
[\[Abstract\]](#) [\[Full Text\]](#)



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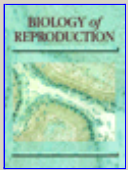
N. P. Y. Chung and C. Y. Cheng
Is Cadmium Chloride-Induced Inter-Sertoli Tight Junction
Permeability Barrier Disruption a Suitable In Vitro Model to Study the
Events of Junction Disassembly during Spermatogenesis in the Rat
Testis?
Endocrinology, May 1, 2001; 142(5): 1878 - 1888.
[\[Abstract\]](#) [\[Full Text\]](#)



Journal of Cell Science

▶ HOME

J. Longin, P. Guillaumot, M.-A. Chauvin, A.-M. Morera, and B. Le
Magueresse-Battistoni
MT1-MMP in rat testicular development and the control of Sertoli cell
proMMP-2 activation
J. Cell Sci., January 6, 2001; 114(11): 2125 - 2134.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



J. Grima and C. Y. Cheng

Testin Induction: The Role of Cyclic 3',5'-Adenosine Monophosphate/Protein Kinase A Signaling in the Regulation of Basal and Lonidamine-Induced Testin Expression by Rat Sertoli Cells
Biol Reprod, December 1, 2000; 63(6): 1648 - 1660.

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