Journal of Andrology, Vol 23, Issue 1 92-97, Copyright © 2002 by The American Society of Andrology

JOURNAL ARTICLE

Noncholinergic penile erection in mice lacking the gene for endothelial nitric oxide synthase

A. L. Burnett, A. G. Chang, J. K. Crone, P. L. Huang and S. E. Sezen

Department of Urology, The James Buchanan Brady Urological Institute, The Johns Hopkins Hospital and The Johns Hopkins University School of Medicine, Baltimore, Maryland 21287-2411, USA. aburnett@jhmi.edu

With the current understanding that nitric oxide (NO) mediates penile erection, the endothelial isoform of NO synthase (eNOS) has been implicated in this function. We undertook this study applying transgenic mice with targeted deletion of the eNOS gene (eNOS-/- mice) as an experimental approach to evaluate the importance of eNOS in cholinergically stimulated erectile function in vivo. Combined pharmacostimulation with intracavernosal carbachol (3 ng) administration and submaximal cavernous nerve (CN) electrical stimulation (16 Hz, 5 millisecond, 1 V) simultaneous with intracavernosal pressure (ICP) monitoring, and both biochemical assay of NO synthase activity and Western blot analysis of eNOS protein content in penile tissue, were performed on eNOS-/- mice and wild-type controls. Combined intracavernosal carbachol administration and submaximal CN electrical stimulation raised the recorded ICP, elicited by CN electrical stimulation alone in wild-type mice (from 35.7 +/- 2.7 to 48.1 +/- 5.5 mm Hg, P < .05) but not in eNOS-/ - mice (from 54.9 +/- 6.3 to 51.0 +/- 9.5 mm Hg, not significant [NS]). Pretreatment with the nonselective nitric oxide synthase inhibitor nitro-L-arginine methyl ester (L-NAME; 100 mg intracavernosally) blocked electrically stimulated ICP responses in eNOS-/- mice to baseline levels (37.8 +/- 4.4 vs 12.7 +/- 4.0 mm Hg, P < .05). In penes of eNOS-/- mice, approximately 60% NO synthase activity of wild-type penis levels was retained (NS), and eNOS protein was absent. We concluded that eNOS-/- mice preserve erectile function on the basis of a noncholinergic but NO-dependent mechanism and that eNOS physiologically mediates penile erection under cholinergic stimulation.

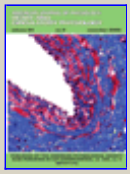
This article has been cited by other articles:

B. Lu, C. Poirier, T. Gaspar, C. Gratzke, W. Harrison, D. Busija, M. M. Matzuk, K.-E. Andersson, P. A. Overbeek, and C. E. Bishop
A Mutation in the Inner Mitochondrial Membrane Peptidase 2-Like Gene (Immp2l) Affects Mitochondrial Function and Impairs Fertility in Mice

Biol Reprod, April 1, 2008; 78(4): 601 - 610.
[Abstract] [Full Text] [PDF]

Journal of ANDROLOGY HOME

A. L. Burnett
Molecular Pharmacotherapeutic Targeting of PDE5 for Preservation of Penile Health
J Androl, January 1, 2008; 29(1): 3 - 14.
[Abstract] [Full Text] [PDF]



Am. J. Physiol: Heart and Circulatory Physiology HOME

T. J. Bivalacqua, A. L. Burnett, W. J. G. Hellstrom, and H. C. Champion
Overexpression of arginase in the aged mouse penis impairs erectile function and decreases eNOS activity: influence of in vivo gene therapy of anti-arginase
Am J Physiol Heart Circ Physiol, March 1, 2007; 292(3): H1340 - H1351.
[Abstract] [Full Text] [PDF]

Proceedings of the National Academy of Sciences HOME

K. J. Hurt, S. F. Sezen, H. C. Champion, J. K. Crone, M. A. Palese, P. L. Huang, A. Sawa, X. Luo, B. Musicki, S. H. Snyder, *et al.*
Alternatively spliced neuronal nitric oxide synthase mediates penile erection
PNAS, February 28, 2006; 103(9): 3440 - 3443.
[Abstract] [Full Text] [PDF]

Proceedings of the National Academy of Sciences HOME

H. C. Champion, T. J. Bivalacqua, E. Takimoto, D. A. Kass, and A. L. Burnett
Phosphodiesterase-5A dysregulation in penile erectile tissue is a mechanism of priapism
PNAS, February 1, 2005; 102(5): 1661 - 1666.
[Abstract] [Full Text] [PDF]

BIOLOGY *of* REPRODUCTION HOME

B. Musicki, M. A. Palese, J. K. Crone, and A. L. Burnett
Phosphorylated Endothelial Nitric Oxide Synthase Mediates Vascular Endothelial Growth Factor-Induced Penile Erection
Biol Reprod, February 1, 2004; 70(2): 282 - 289.
[Abstract] [Full Text] [PDF]

Journal of ANDROLOGY HOME

T. J. Bivalacqua, M. F. Usta, H. C. Champion, P. J. Kadowitz, and W. J. G. Hellstrom
Endothelial Dysfunction in Erectile Dysfunction: Role of the Endothelium in Erectile Physiology and Disease
J Androl, November 1, 2003; 24(6_suppl): S17 - S37.
[Full Text] [PDF]

Journal of ANDROLOGY HOME

A. L. Burnett
Nitric Oxide Regulation of Penile Erection: Biology and Therapeutic Implications
J Androl, September 1, 2002; 23(5): S20 - S26.

[Full Text] [PDF]

Vascular Medicine HOME

R. Maas, E. Schwedhelm, J. Albsmeier, and R. H Boger
The pathophysiology of erectile dysfunction related to endothelial dysfunction and mediators of vascular function
Vascular Medicine, August 1, 2002; 7(3): 213 - 225.
[Abstract] [PDF]

Proceedings of the National Academy of Sciences HOME

K. J. Hurt, B. Musicki, M. A. Palese, J. K. Crone, R. E. Becker, J. L. Moriarity, S. H. Snyder, and A. L. Burnett
Akt-dependent phosphorylation of endothelial nitric-oxide synthase mediates penile erection
PNAS, March 19, 2002; 99(6): 4061 - 4066.
[Abstract] [Full Text] [PDF]