

Journal of Andrology, Vol 19, Issue 5 625-630, Copyright © 1998 by The American Society of Andrology

JOURNAL ARTICLE

Does age-associated reduced Leydig cell testosterone production in Brown Norway rats result from under-stimulation by luteinizing hormone?

F. W. Grzywacz, H. Chen, J. Allegretti and B. R. Zirkin
Division of Reproductive Biology, Johns Hopkins University, School of Hygiene and Public Health, Baltimore, MD 21205, USA.

Previous studies have shown that reductions in Leydig cell testosterone production occur with aging in the Brown Norway rat. The recent observation that changes in luteinizing hormone (LH) pulse interval and amplitude also occur with aging suggests the possibility that age-related reduced Leydig cell steroidogenesis might be related to changes in LH. We reasoned that, if this is the case, exogenously administered LH should restore testosterone production by aged rat Leydig cells to the higher levels produced by Leydig cells of young rats. To test this hypothesis, young (4-month-old) and aged (21-month-old) rats received testosterone- and estradiol-containing Silastic implants designed to suppress LH and, thus, endogenous Leydig cell testosterone production. At the same time, the rats received miniosmotic pumps programmed to deliver pulsatile ovine LH at a predetermined daily dose. In some experiments, treatment effects were determined by measuring testosterone production by testes perfused in vitro with maximally stimulating ovine LH. In others, Leydig cells were isolated by centrifugal elutriation and Percoll density gradient centrifugation, and their in vitro ability to produce testosterone in response to maximally stimulating LH was determined. Testes or isolated Leydig cells from untreated young rats produced about twice as much testosterone as that produced by Leydig cells from aged rats. The administration of testosterone- and estradiol-filled implants for 5 days reduced testosterone production significantly at both ages. In young rats administered 24 microg LH/day for 5 days, along with the implants, testosterone production was maintained at the high level of the young controls. Comparable treatment of aged rats resulted in testosterone production only at the low level of the aged controls. Indeed, even with higher LH doses (36 microg/day), testosterone production by the aged rat Leydig cells did not rise above the aged-control level. The inability of exogenously administered LH to increase testosterone production by testes and Leydig cells of aged rats suggests that Leydig cell steroidogenic deficits in the aged Brown Norway rat are unlikely to be the result of age-related changes in LH.

This article has been cited by other articles:

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 Grzywacz, F. W.](#)
- ▶ [Articles by Zirkin, B. R.](#)
- ▶ [Search for Related Content](#)

PubMed

- ▶ [PubMed Citation](#)
- ▶ [Articles by Grzywacz, F. W.](#)
- ▶ [Articles by Zirkin, B. R.](#)



A. Lacombe, V. Lelievre, C. E. Roselli, W. Salameh, Y.-h. Lue, G. Lawson, J.-M. Muller, J. A. Waschek, and E. Vilain

Delayed testicular aging in pituitary adenylate cyclase-activating peptide (PACAP) null mice

PNAS, March 7, 2006; 103(10): 3793 - 3798.

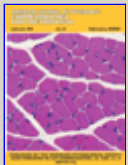
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



L. Luo, H. Chen, M. A. Trush, M. D. Show, M. D. Anway, and B. R. Zirkin
Aging and the Brown Norway Rat Leydig Cell Antioxidant Defense System

J Androl, March 1, 2006; 27(2): 240 - 247.

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



P. Y. Liu, S. M. Pincus, P. Y. Takahashi, P. D. Roebuck, A. Iranmanesh, D. M. Keenan, and J. D. Veldhuis

Aging attenuates both the regularity and joint synchrony of LH and testosterone secretion in normal men: analyses via a model of graded GnRH receptor blockade

Am J Physiol Endocrinol Metab, January 1, 2006; 290(1): E34 - E41.

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



P. Y. Liu, P. Y. Takahashi, P. D. Roebuck, A. Iranmanesh, and J. D. Veldhuis

Age-specific changes in the regulation of LH-dependent testosterone secretion: assessing responsiveness to varying endogenous gonadotropin output in normal men

Am J Physiol Regulatory Integrative Comp Physiol, September 1, 2005; 289(3): R721 - R728.

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



L. Luo, H. Chen, and B. R. Zirkin

Temporal Relationships Among Testosterone Production, Steroidogenic Acute Regulatory Protein (StAR), and P450 Side-Chain Cleavage Enzyme (P450scc) During Leydig Cell Aging

J Androl, January 1, 2005; 26(1): 25 - 31.

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



H. Chen, J. Liu, L. Luo, and B. R. Zirkin

Dibutyryl Cyclic Adenosine Monophosphate Restores the Ability of Aged Leydig Cells to Produce Testosterone at the High Levels Characteristic of Young Cells

Endocrinology, October 1, 2004; 145(10): 4441 - 4446.

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



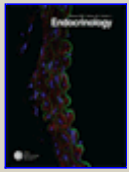
D. M. Keenan and J. D. Veldhuis

Divergent gonadotropin-gonadal dose-responsive coupling in healthy young and aging men

Am J Physiol Regulatory Integrative Comp Physiol, February 1, 2004; 286

(2): R381 - R389.

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

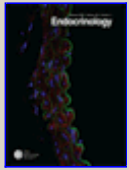


Endocrinology

▶ HOME

H. Chen, M. P. Hardy, and B. R. Zirkin
Age-Related Decreases in Leydig Cell Testosterone Production Are Not Restored by Exposure to LH in Vitro
Endocrinology, May 1, 2002; 143(5): 1637 - 1642.

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



Endocrinology

▶ HOME

P. Syntin, H. Chen, B. R. Zirkin, and B. Robaire
Gene Expression in Brown Norway Rat Leydig Cells: Effects of Age and of Age-Related Germ Cell Loss
Endocrinology, December 1, 2001; 142(12): 5277 - 5285.

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



Proceedings of the National Academy of Sciences

▶ HOME

H. Chen and B. R. Zirkin
Long-term suppression of Leydig cell steroidogenesis prevents Leydig cell aging
PNAS, December 21, 1999; 96(26): 14877 - 14881.

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

[HOME](#) [HELP](#) [FEEDBACK](#) [SUBSCRIPTIONS](#) [ARCHIVE](#) [SEARCH](#) [TABLE OF CONTENTS](#)

[Copyright © 1998 by The American Society of Andrology.](#)