



Journal of Andrology, Vol 20, Issue 1 94-101, Copyright © 1999 by The American Society of Andrology

JOURNAL ARTICLE

Inhibin B levels in plasma of the male rat from birth to adulthood: effect of experimental manipulation of Sertoli cell number

R. M. Sharpe, K. J. Turner, C. McKinnell, N. P. Groome, N. Atanassova, M. R. Millar, D. L. Buchanan and P. S. Cooke
MRC Reproductive Biology Unit, Centre for Reproductive Biology, Edinburgh, Scotland, United Kingdom. r.sharpe@ed-rbu.mrc.ac.uk

Sertoli cells undergo important changes in their number and function at different ages in the rat and may be the primary source of circulating inhibin B. The aims of this study were 1) to establish the profile of inhibin B levels from birth to adulthood in normal rats and 2) to identify whether experimental manipulation of Sertoli cell numbers was able to alter this profile. Levels of inhibin B, measured by a specific two-site assay, increased fivefold in normal Wistar rats between day 3 and days 10-15, plateaued, and then declined in late puberty to reach adult levels which were approximately 60% of those observed on days 10-15. The increase in inhibin B levels in the neonatal period coincided with the period of Sertoli cell multiplication as indicated by incorporation of bromodeoxyuridine. Neonatal treatment of rats with a GnRH antagonist (GnRHa) reduced Sertoli cell number and adult testis weight by 48% and significantly reduced plasma levels of inhibin B at all ages through to adulthood. Induction of neonatal hypothyroidism in Sprague-Dawley rats by administration of propylthiouracil (PTU) up to day 25 of age increased final testis weight by 41% (indicative of increased Sertoli cell numbers) and resulted in elevation of plasma levels of inhibin B at all ages beyond 7 days of age. The degree of change in inhibin B levels in adult rats in the two experimental treatment groups was approximately proportional to the change in final testis weight. Plasma follicle-stimulating hormone (FSH) showed changes opposite to inhibin B, with levels being lowered in PTU-treated rats and elevated (beyond day 25) in GnRHa-treated animals. The present results suggest that final Sertoli cell number per testis exerts an important effect on the circulating level of inhibin B (and FSH) in the rat. These findings are compared to the emerging data for the human male.

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

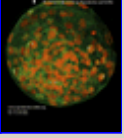
- ▶ [Citing Articles via HighWire](#)
- ▶ [Citing Articles via Google Scholar](#)

Google Scholar

- ▶ [Articles by Sharpe, R. M.](#)
- ▶ [Articles by Cooke, P. S.](#)
- ▶ [Search for Related Content](#)

PubMed

- ▶ [PubMed Citation](#)
- ▶ [Articles by Sharpe, R. M.](#)
- ▶ [Articles by Cooke, P. S.](#)



B. Barakat, A. E O'Connor, E. Gold, D. M de Kretser, and K. L Loveland
Inhibin, activin, follistatin and FSH serum levels and testicular
production are highly modulated during the first spermatogenic
wave in mice

Reproduction, September 1, 2008; 136(3): 345 - 359.

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



J. P. Moore ,Jr. and S. J. Winters

Weaning and the Developmental Changes in Follicle-Stimulating
Hormone, Pituitary Adenylate Cyclase-Activating Polypeptide, and
Inhibin B in the Male Rat

Biol Reprod, April 1, 2008; 78(4): 752 - 760.

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



G. R Hutchison, H. M Scott, M. Walker, C. McKinnell, D. Ferrara, I. K.
Mahood, and R. M Sharpe

Sertoli Cell Development and Function in an Animal Model of
Testicular Dysgenesis Syndrome

Biol Reprod, February 1, 2008; 78(2): 352 - 360.

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



S. Mhaouty-Kodja, A. Lozach, R. Habert, M. Tanneux, C. Guigon, S.
Brailly-Tabard, J.-P. Maltier, and C. Legrand-Maltier

Fertility and spermatogenesis are altered in { alpha } 1b-adrenergic
receptor knockout male mice

J. Endocrinol., November 1, 2007; 195(2): 281 - 292.

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

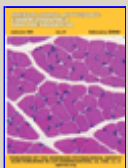


D. Ferrara, N. Hallmark, H. Scott, R. Brown, C. McKinnell, I. K. Mahood,
and R. M. Sharpe

Acute and Long-Term Effects of in Utero Exposure of Rats to Di(n-
Butyl) Phthalate on Testicular Germ Cell Development and
Proliferation

Endocrinology, November 1, 2006; 147(11): 5352 - 5362.

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



E. L. Thompson, K. G. Murphy, M. Patterson, G. A. Bewick, G. W. H.
Stamp, A. E. Curtis, J. H. Cooke, P. H. Jethwa, J. F. Todd, M. A. Gatei, *et*
al.

Chronic subcutaneous administration of kisspeptin-54 causes
testicular degeneration in adult male rats

Am J Physiol Endocrinol Metab, November 1, 2006; 291(5): E1074 - E1082.

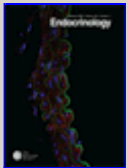
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



C.L. Kennedy, A.E. O'Connor, L.G. Sanchez-Partida, M.K. Holland, C.C. Goodnow, D.M. de Kretser, and M.K. O'Bryan
A repository of ENU mutant mouse lines and their potential for male fertility research
Mol. Hum. Reprod., December 1, 2005; 11(12): 871 - 880.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



S. Ramaswamy
Pubertal Augmentation in Juvenile Rhesus Monkey Testosterone Production Induced by Invariant Gonadotropin Stimulation Is Inhibited by Estrogen
J. Clin. Endocrinol. Metab., October 1, 2005; 90(10): 5866 - 5875.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



C. J. Guigon, N. Coudouel, S. Mazaud-Guittot, M. G. Forest, and S. Magre
Follicular Cells Acquire Sertoli Cell Characteristics after Oocyte Loss
Endocrinology, July 1, 2005; 146(7): 2992 - 3004.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



N. N Atanassova, M. Walker, C. McKinnell, J. S Fisher, and R. M Sharpe
Evidence that androgens and oestrogens, as well as follicle-stimulating hormone, can alter Sertoli cell number in the neonatal rat
J. Endocrinol., January 1, 2005; 184(1): 107 - 117.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



S. J Winters and J. P Moore
Intra-pituitary regulation of gonadotrophs in male rodents and primates
Reproduction, July 1, 2004; 128(1): 13 - 23.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



J. J. Buzzard, K. L. Loveland, M. K. O'Bryan, A. E. O'Connor, M. Bakker, T. Hayashi, N. G. Wreford, J. R. Morrison, and D. M. de Kretser
Changes in Circulating and Testicular Levels of Inhibin A and B and Activin A During Postnatal Development in the Rat
Endocrinology, July 1, 2004; 145(7): 3532 - 3541.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



Z. Zhang, R.V. Short, T. Meehan, D.M. de Kretser, M.B. Renfree, and K.L. Loveland
Functional Analysis of the Cooled Rat Testis
J Androl, January 1, 2004; 25(1): 57 - 68.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



Endocrinology

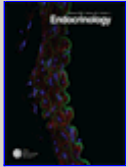
▶ HOME

C. J. Guigon, S. Mazaud, M. G. Forest, S. Brailly-Tabard, N. Coudouel, and S. Magre

Unaltered Development of the Initial Follicular Waves and Normal Pubertal Onset in Female Rats after Neonatal Deletion of the Follicular Reserve

Endocrinology, August 1, 2003; 144(8): 3651 - 3662.

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



Endocrinology

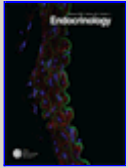
▶ HOME

G. C. Harris and J. E. Levine

Pubertal Acceleration of Pulsatile Gonadotropin-Releasing Hormone Release in Male Rats as Revealed by Microdialysis

Endocrinology, January 1, 2003; 144(1): 163 - 171.

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



Endocrinology

▶ HOME

S. Mazaud, C. J. Guigon, A. Lozach, N. Coudouel, M. G. Forest, H. Coffigny, and S. Magre

Establishment of the Reproductive Function and Transient Fertility of Female Rats Lacking Primordial Follicle Stock after Fetal γ -Irradiation

Endocrinology, December 1, 2002; 143(12): 4775 - 4787.

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



Journal of ANDROLOGY

▶ HOME

Y.-H. Lue, B. L. Lasley, L. S. Laughlin, R. S. Swerdloff, A. P. S. Hikim, A. Leung, J. W. Overstreet, and C. Wang

Mild Testicular Hyperthermia Induces Profound Transitional Spermatogenic Suppression Through Increased Germ Cell Apoptosis in Adult Cynomolgus Monkeys (*Macaca fascicularis*)

J Androl, November 1, 2002; 23(6): 799 - 805.

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



Journal of ANDROLOGY

▶ HOME

W. Jin, C. B. Herath, M. Yoshida, K. Y. Arai, E. Saita, S. Zhanquan, L. Ren, G. Watanabe, N. P. Groome, and K. Taya

Inhibin B Regulating Follicle-Stimulating Hormone Secretion During Testicular Recrudescence in the Male Golden Hamster

J Androl, November 1, 2002; 23(6): 845 - 853.

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



EXPERIMENTAL BIOLOGY AND MEDICINE

▶ HOME

C. Welt, Y. Sidis, H. Keutmann, and A. Schneyer

Activins, Inhibins, and Follistatins: From Endocrinology to Signaling. A Paradigm for the New Millennium

Experimental Biology and Medicine, October 1, 2002; 227(9): 724 - 752.

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



BIOLOGY of REPRODUCTION

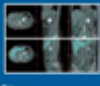
▶ HOME

J. S. Fisher, N. Pastor-Soler, R. M. Sharpe, and S. Breton

Modulation of the Onset of Postnatal Development of H⁺-ATPase-Rich Cells by Steroid Hormones in Rat Epididymis

Biol Reprod, October 1, 2002; 67(4): 1106 - 1114.

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



N. Pitteloud, F. J. Hayes, A. Dwyer, P. A. Boepple, H. Lee, and W. F. Crowley Jr.

Predictors of Outcome of Long-Term GnRH Therapy in Men with Idiopathic Hypogonadotropic Hypogonadism

J. Clin. Endocrinol. Metab., September 1, 2002; 87(9): 4128 - 4136.

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



C.J.H. Kelnar, C. McKinnell, M. Walker, K.D. Morris, W.H.B. Wallace, P.T.K. Saunders, H.M. Fraser, and R.M. Sharpe

Testicular changes during infantile 'quiescence' in the marmoset and their gonadotrophin dependence: a model for investigating susceptibility of the prepubertal human testis to cancer therapy?

Hum. Reprod., May 1, 2002; 17(5): 1367 - 1378.

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

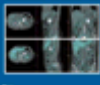


S. J. Winters, S. Kawakami, A. Sahu, and T. M. Plant

Pituitary Follistatin and Activin Gene Expression, and the Testicular Regulation of FSH in the Adult Rhesus Monkey (*Macaca mulatta*)

Endocrinology, July 1, 2001; 142(7): 2874 - 2878.

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

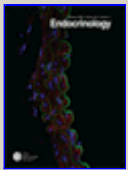


C. K. Welt and A. L. Schneyer

Differential Regulation of Inhibin B and Inhibin A by Follicle-Stimulating Hormone and Local Growth Factors in Human Granulosa Cells from Small Antral Follicles

J. Clin. Endocrinol. Metab., January 1, 2001; 86(1): 330 - 336.

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



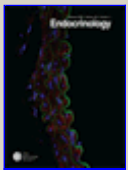
N. Atanassova, C. McKinnell, K. J. Turner, M. Walker, J. S. Fisher, M. Morley, M. R. Millar, N. P. Groome, and R. M. Sharpe

Comparative Effects of Neonatal Exposure of Male Rats to Potent and Weak (Environmental) Estrogens on Spermatogenesis at Puberty and the Relationship to Adult Testis Size and Fertility:

Evidence for Stimulatory Effects of Low Estrogen Levels

Endocrinology, October 1, 2000; 141(10): 3898 - 3907.

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



N. Atanassova, C. McKinnell, M. Walker, K. J. Turner, J. S. Fisher, M. Morley, M. R. Millar, N. P. Groome, and R. M. Sharpe

Permanent Effects of Neonatal Estrogen Exposure in Rats on Reproductive Hormone Levels, Sertoli Cell Number, and the Efficiency of Spermatogenesis in Adulthood

Endocrinology, November 1, 1999; 140(11): 5364 - 5373.

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



J. M. Collinson, J. C. Quinn, M. A. Buchanan, M. H. Kaufman, S. E. Wedden, J. D. West, and R. E. Hill

Primary defects in the lens underlie complex anterior segment abnormalities of the Pax6 heterozygous eye

PNAS, August 14, 2001; 98(17): 9688 - 9693.

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