



Journal of Andrology, Vol 18, Issue 1 80-87, Copyright © 1997 by The American Society of Andrology

JOURNAL ARTICLE

Hormone treatment after irradiation stimulates recovery of rat spermatogenesis from surviving spermatogonia

M. L. Meistrich and M. Kangasniemi

Department of Experimental Radiation Oncology, University of Texas M.D. Anderson Cancer Center, Houston 77030, USA.

The possibility of stimulating the recovery of spermatogenesis after irradiation using hormone treatment was tested in LBNF, rats. At 10 weeks after irradiation with 3.5 Gy, the percentage of tubules showing recovery of spermatogenesis (repopulation index) was 37% in rats that received no hormone treatment. GnRH agonist (GnRH-Ag) treatment with Zoladex or continuous treatment with testosterone markedly stimulated the recovery of spermatogenesis. When GnRH-Ag treatment was started immediately after 3.5-Gy irradiation and maintained for 10 weeks, the repopulation index was 91%. When an additional 6.5 weeks without further treatment was allowed between the 10-week GnRH treatment and killing the rats, the repopulation index recovered to 100% and sperm counts to 83×10^6 . These sperm counts were more than 100-fold higher than those in rats not given hormone treatment and 50% of normal nonirradiated control levels. GnRH-Ag for 10 weeks also stimulated spermatogenic recovery in rats irradiated with 6 Gy, even when the start of treatment was delayed until 18 weeks after irradiation. Without GnRH-Ag, the repopulation index was 0, but in GnRH-Ag-treated rats it was 14.5%. Since all of the hormone treatments suppress intratesticular testosterone, high levels of testosterone may be inhibiting differentiation and their suppression may stimulate recovery. Even though the exact mechanism is not yet known, this method may still be applicable for clinical use to activate spermatogenesis in patients rendered azoospermic by irradiation or possibly by other cytotoxic treatments.

This article has been cited by other articles:



Reproduction

▶ HOME

M. L. Meistrich and G. Shetty

Hormonal suppression for fertility preservation in males and females
Reproduction, December 1, 2008; 136(6): 691 - 701.

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

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 Meistrich, M. L.](#)
- ▶ [Articles by Kangasniemi, M.](#)
- ▶ [Search for Related Content](#)

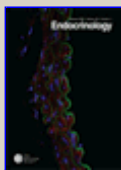
PubMed

- ▶ [PubMed Citation](#)
- ▶ [Articles by Meistrich, M. L.](#)
- ▶ [Articles by Kangasniemi, M.](#)



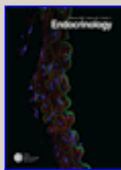
Z. Zhang, S. Shao, and M. L. Meistrich
Irradiated Mouse Testes Efficiently Support Spermatogenesis
Derived From Donor Germ Cells of Mice and Rats
J Androl, May 1, 2006; 27(3): 365 - 375.

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



K. L. Porter, G. Shetty, and M. L. Meistrich
Testicular Edema Is Associated with Spermatogonial Arrest in
Irradiated Rats
Endocrinology, March 1, 2006; 147(3): 1297 - 1305.

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



G. Shetty, C. C. Y. Weng, S. J. Meachem, O. U. Bolden-Tiller, Z. Zhang, P.
Pakarinen, I. Huhtaniemi, and M. L. Meistrich
Both Testosterone and Follicle-Stimulating Hormone Independently
Inhibit Spermatogonial Differentiation in Irradiated Rats
Endocrinology, January 1, 2006; 147(1): 472 - 482.

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



S. Solakidi, A-M.G. Psarra, S. Nikolaropoulos, and C.E. Sekeris
Estrogen receptors {alpha} and {beta} (ER{alpha} and ER{beta})
and androgen receptor (AR) in human sperm: localization of ER
{beta} and AR in mitochondria of the midpiece
Hum. Reprod., December 1, 2005; 20(12): 3481 - 3487.

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



K. L. Matthiesson, P. G. Stanton, L. O'Donnell, S. J. Meachem, J. K. Amory,
R. Berger, W. J. Bremner, and R. I. McLachlan
Effects of Testosterone and Levonorgestrel Combined with a 5
{alpha}-Reductase Inhibitor or Gonadotropin-Releasing Hormone
Antagonist on Spermatogenesis and Intratesticular Steroid Levels in
Normal Men
J. Clin. Endocrinol. Metab., October 1, 2005; 90(10): 5647 - 5655.

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



S. J Meachem, D. M Robertson, N. G Wreford, R. I McLachlan, and P. G
Stanton
Oestrogen does not affect the restoration of spermatogenesis in the
gonadotrophin-releasing hormone-immunised adult rat
J. Endocrinol., June 1, 2005; 185(3): 529 - 538.

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



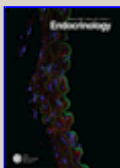
K. Boekelheide, H. A. Schoenfeld, S. J. Hall, C. C. Weng, G. Shetty, J.
Leith, J. Harper, M. Sigman, D. L. Hess, and M. L. Meistrich
Gonadotropin-Releasing Hormone Antagonist (Cetrorelix) Therapy
Fails to Protect Nonhuman Primates (*Macaca arctoides*) From
Radiation-Induced Spermatogenic Failure
J Androl, March 1, 2005; 26(2): 222 - 234.



MONOGRAPHS

▶ HOME

G. Shetty and M. L. Meistrich
Hormonal Approaches to Preservation and Restoration of Male Fertility After Cancer Treatment
J Natl Cancer Inst Monographs, March 1, 2005; 2005(34): 36 - 39.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



Endocrinology

▶ HOME

G. Shetty, C. C. Y. Weng, O. U. Bolden-Tiller, I. Huhtaniemi, D. J. Handelsman, and M. L. Meistrich
Effects of Medroxyprogesterone and Estradiol on the Recovery of Spermatogenesis in Irradiated Rats
Endocrinology, October 1, 2004; 145(10): 4461 - 4469.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



BIOLOGY of REPRODUCTION

▶ HOME

M. Kanatsu-Shinohara, T. Morimoto, S. Toyokuni, and T. Shinohara
Regulation of Mouse Spermatogonial Stem Cell Self-Renewing Division by the Pituitary Gland
Biol Reprod, June 1, 2004; 70(6): 1731 - 1737.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



TOXICOLOGICAL SCIENCES

▶ HOME

M. L. Meistrich, G. Wilson, K. L. Porter, I. Huhtaniemi, G. Shetty, and G. A. Shuttlesworth
Restoration of Spermatogenesis in Dibromochloropropane (DBCP)-Treated Rats by Hormone Suppression
Toxicol. Sci., December 1, 2003; 76(2): 418 - 426.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



BIOLOGY of REPRODUCTION

▶ HOME

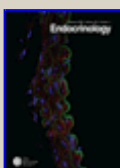
M. Ohmura, T. Ogawa, M. Ono, M. Dezawa, M. Hosaka, Y. Kubota, and H. Sawada
Increment of Murine Spermatogonial Cell Number by Gonadotropin-Releasing Hormone Analogue Is Independent of Stem Cell Factor c-kit Signal
Biol Reprod, June 1, 2003; 68(6): 2304 - 2313.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



Journal of ANDROLOGY

▶ HOME

M. L. Meistrich and G. Shetty
Inhibition of Spermatogonial Differentiation by Testosterone
J Androl, March 1, 2003; 24(2): 135 - 148.
[\[Full Text\]](#) [\[PDF\]](#)



Endocrinology

▶ HOME

G. Shetty, G. Wilson, M. P. Hardy, E. Niu, I. Huhtaniemi, and M. L. Meistrich
Inhibition of Recovery of Spermatogenesis in Irradiated Rats by Different Androgens
Endocrinology, September 1, 2002; 143(9): 3385 - 3396.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



HUMAN REPRODUCTION

▶ HOME

A.B. Thomson, R.A. Anderson, D.S. Irvine, C.J.H. Kelnar, R.M. Sharpe, and W.H.B. Wallace

Investigation of suppression of the hypothalamic-pituitary-gonadal axis to restore spermatogenesis in azoospermic men treated for childhood cancer

Hum. Reprod., July 1, 2002; 17(7): 1715 - 1723.

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



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

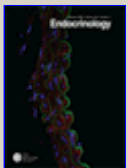
▶ HOME

A. Tohda, K. Matsumiya, Y. Tadokoro, K. Yomogida, Y. Miyagawa, K. Dohmae, A. Okuyama, and Y. Nishimune

Testosterone Suppresses Spermatogenesis in Juvenile Spermatogonial Depletion (jsd) Mice

Biol Reprod, August 1, 2001; 65(2): 532 - 537.

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



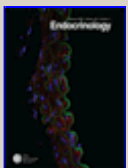
Endocrinology

▶ HOME

G. Shetty, G. Wilson, I. Huhtaniemi, H. Boettger-Tong, and M. L. Meistrich
Testosterone Inhibits Spermatogonial Differentiation in Juvenile Spermatogonial Depletion Mice

Endocrinology, July 1, 2001; 142(7): 2789 - 2795.

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



Endocrinology

▶ HOME

S. Maiti, M. L. Meistrich, G. Wilson, G. Shetty, M. Marcelli, M. J. McPhaul, P. L. Morris, and M. F. Wilkinson

Irradiation Selectively Inhibits Expression from the Androgen-Dependent Pcm Homeobox Gene Promoter in Sertoli Cells

Endocrinology, April 1, 2001; 142(4): 1567 - 1577.

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



BIOLOGY of REPRODUCTION

▶ HOME

H. A. Schoenfeld, S. J. Hall, and K. Boekelheide

Continuously Proliferative Stem Germ Cells Partially Repopulate the Aged, Atrophic Rat Testis after Gonadotropin-Releasing Hormone Agonist Therapy

Biol Reprod, April 1, 2001; 64(4): 1273 - 1282.

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



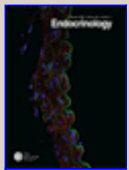
Endocrinology

▶ HOME

G. Shetty, G. Wilson, I. Huhtaniemi, G. A. Shuttlesworth, T. Reissmann, and M. L. Meistrich

Gonadotropin-Releasing Hormone Analogs Stimulate and Testosterone Inhibits the Recovery of Spermatogenesis in Irradiated

Rats
Endocrinology, May 1, 2000; 141(5): 1735 - 1745.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



Endocrinology

[▶ HOME](#)

G. A. Shuttlesworth, D. G. De Rooij, I. Huhtaniemi, T. Reissmann, L. D. Russell, G. Shetty, G. Wilson, and M. L. Meistrich
Enhancement of A Spermatogonial Proliferation and Differentiation in Irradiated Rats by Gonadotropin-Releasing Hormone Antagonist Administration
Endocrinology, January 1, 2000; 141(1): 37 - 49.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



BIOLOGY of REPRODUCTION

[▶ HOME](#)

D. G. de Rooij, M. Okabe, and Y. Nishimune
Arrest of Spermatogonial Differentiation in jsd/jsd, SI17H/SI17H, and Cryptorchid Mice
Biol Reprod, September 1, 1999; 61(3): 842 - 847.
[\[Abstract\]](#) [\[Full Text\]](#)



Cancer Research

[▶ HOME](#)

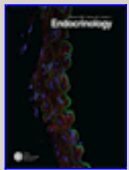
M. L. Meistrich, G. Wilson, and I. Huhtaniemi
Hormonal Treatment after Cytotoxic Therapy Stimulates Recovery of Spermatogenesis
Cancer Res., August 1, 1999; 59(15): 3557 - 3560.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



HUMAN REPRODUCTION

[▶ HOME](#)

S. Schlatt, G. Rosiepen, G.F. Weinbauer, C. Rolf, P.F. Brook, and E. Nieschlag
Germ cell transfer into rat, bovine, monkey and human testes
Hum. Reprod., January 1, 1999; 14(1): 144 - 150.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



Endocrinology

[▶ HOME](#)

K. T. Blanchard, J. Lee, and K. Boekelheide
Leuprolide, a Gonadotropin-Releasing Hormone Agonist, Reestablishes Spermatogenesis After 2,5-Hexanedione-Induced Irreversible Testicular Injury in the Rat, Resulting in Normalized Stem Cell Factor Expression
Endocrinology, January 1, 1998; 139(1): 236 - 244.
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)

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

Copyright © 1997 by The American Society of Andrology.