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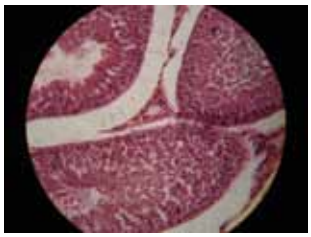
Research Briefs

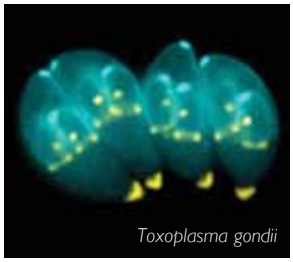
Growth Factor Identified That Stimulates Sperm Stem Cells to Thrive


Leydig cells

Researchers at Penn Vet and Penn State identified a specific "niche factor" in mouse testes called colony stimulating factor 1 (Csf1) that has a direct effect on sperm stem cell self-renewal. The study also shows that the origin of this growth factor is the Leydig cell—located in the testes and stimulated by the pituitary gland to supply testosterone—that secretes Csf1 and enhances self-renewal of stem cells. The finding shows that stem cells are influenced to increase divisions by this growth factor, which provides a powerful new model in the study of stem cells and shows they interact with their micro-environment ("niche"). Future studies can now be performed in a stem cell niche system that provides a quantitative functional end point for assessment.

The joint study involved **Drs. Ralph Brinster, V'60, GR'64, HOM'66**, Richard King Mellon Professor of Reproductive Physiology; Mary R. Avarbock of the Department of Animal Biology; Jon M. Oatley; Melissa J. Oatley; and John W. Tobias of the Penn Bioinformatics Core. The research, published on-line in *Development*, was supported by the National Institute of Child Health and Human Development of the National Institutes of Health, as well as the Robert J. Kleberg Jr. and Helen C. Kleberg Foundation, with additional funding from Penn State.

Brain Structure Assists in Immune Response


Toxoplasma gondii

Penn Vet researchers have imaged in real time the body's immune response to a parasitic infection in the brain. The findings, published in *Immunity*, provide insights into how immune cells are regulated in the brain and have implications for treating inflammatory conditions that affect the brain.

Toxoplasma, a common parasite of humans, is found in the brains of approximately 30 percent of the population. Yet, because the brain lacks its own lymphatic system for localized immune response and the blood–brain barrier limits antibody entry, researchers have found it provides unique challenges for the immune system to control local infection. Therefore, little is known about the processes by which T-cells access the central nervous system during toxoplasma infection or how the immune system keeps this parasite in check.

The study was supported by a grant from the National Institutes of Health and the Commonwealth of Pennsylvania. Penn Vet researchers involved in the study were **Drs.Tajie H. Harris, Beena John, Elia Tait, Marion Pepper** and **Christopher A. Hunter**, professor and chair of the Department of Pathobiology.

Living with Females Extends Reproductive Life of Male Mouse

Living with a female mouse can extend the reproductive life of a male mouse by as much as 20 percent, according to a study by **Dr. Ralph Brinster, V'60, GR'64, HOM'66**, Richard King Mellon Professor of Reproductive Physiology, and colleagues at Penn State. The researchers hypothesize that the female's effect on the environment of the spermatogonial stem cells likely occurs through the male's endocrine and nervous systems, but other systems are likely involved. The change amounts to a reduction of fertility six months earlier in "lonely" mice as opposed to those who have female companionship. The results have significant implications for the maintenance of male fertility in wildlife, livestock and even human populations. The study appears on-line in *Biology of Reproduction*.

This research continues 10 years of study on the relationship between the stem cell environment ("niche") and spermatogonial stem cells (SSCs). Dr. Brinster's team first discovered that the niche in the testis of the newborn male mouse supports the stem cell and its differentiation to produce complete spermatogenesis better than the niche in the mature adult male testis. In subsequent studies, Dr. Brinster determined that when the SSCs of young males were transferred into new young testes every three months, the SSCs survived for more than three years, a greater than 50 percent increase in life of the stem cell. Therefore, in old males the SSC niche in the testis failed long before the SSC, which was relatively long-lived.

The research was supported by the National Institutes of Health and the Robert J. Kleberg Jr. and Helen C. Kleberg Foundation.