

News

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***Dallas scientist studies sperm
production in stallions to understand
fertility cycles

DALLAS--Family planning for horses--it's big business in the multi-million-dollar livestock industry. And what we know about horse reproductive cycles may point the way to understanding fertility problems in men. Larry Johnson, PhD, assistant professor of Cell Biology at The University of Texas Health Science Center at Dallas, is conducting a study of sperm generation in horses.

"We are interested in sperm production in mammals in general, using stallions as a model," says Johnson. "Stallions, like humans, produce sperm continuously during the year. Stallions produce at a higher rate in the breeding season than at other times, but horses are different from other seasonal breeders in that they don't stop producing outside of their season. We are trying to understand which testicular and hormonal factors are changing in the yearly sperm-producing cycle that would contribute to seasonal changes in sperm production rates."

This seasonal modulation, says Johnson, may parallel age-related changes in man's fertility. And understanding this modulation in stallions may affect the way horse breeding is managed.

Specifically, the study focuses on the changing numbers of three types of cell: mature sperm cells, "germ cells" from which sperm cells grow, and "support cells" that foster this growth. In the horse, high relative proportions of germ cells and support cells precede the seasonal increases in production of mature sperm. "We looked at specimens taken every month throughout the annual reproductive cycle of the stallions," Johnson says. "We evaluated the sperm production process at different developmental stages all along the way to try to figure out which components changed first in the cycle."

"Specifically, we have found that two types of support cell, Sertoli cells and Leydig cells, increase in number during the breeding season when sperm production rates are highest. The Sertoli cells provide an environment for development of the immature germ cells, and changes in their numbers parallel changes in sperm production rates. Leydig cells produce the male sex hormone, testosterone, but, unlike the

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Sertoli cells, the Leydig cells increase in number a month before the seasonally increased sperm production rate rises."

But the production of viable sperm is a two-stage process: even during periods of high germ-cell production, a high rate of germ-cell degeneration can mean low fertility. "This degeneration of germ cells," Johnson says, "is a particularly important factor, but not much is known about the process. Some degeneration is a normal phenomenon, but it can reduce daily sperm production in man or beast by as much as 75 percent. In horses, we have found--much to our surprise--that the degeneration rate increases during the breeding season. But during the season the number of germ cells is sufficiently elevated to override this higher degeneration rate and bring about an elevated production of sperm."

Understanding these processes will help map the mechanisms in the reproductive system that control fertility. "We want to know, first of all," says Johnson, "what factors change when. That may show us which factors have a causative effect, and controlling that cause may be the aim of future research. It may show the way to increasing sperm production in men with low sperm counts or to reducing male fertility as a means of birth control.

"But of course," Johnson cautions, "this study is just a first step. Any future research, especially research on human fertility problems, will have to be based on a clear understanding of the sperm-production process. It's that basic schedule that we're after."

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DIST: AA, AB, AF, AG, AH, AI, AK, Ob/Gyn