Chapter 60
What is an andrologist now? What does an andrologist do? What will an andrologist do in the future?

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An andrologist is a physician or scientist involved in the study of diseases affecting the male reproductive tract, including the prostate, an individual who seeks to understand how the male reproductive system works, or an individual who provides clinical evaluation and/or intervention for male fertility or sexual function. An andrologist can have a variety of different backgrounds, ranging from standard college training in a scientific discipline that is supplemented by laboratory training to college, doctoral, and postdoctoral education for researchers or advanced laboratory directors, or clinical training including medical school as well as residency and fellowship training for physician who work as clinical andrologists.

The laboratory-based andrologist often works with clinical samples, performing semen analyses including sperm concentration, motility, morphology and parallel studies on the semen sample. They may also process or prepare semen samples using simple or advanced sperm washing and selection techniques that help to identify the best sperm for intrauterine insemination, IVF or ICSI. Additional tests on sperm may look at characteristics of sperm DNA including DNA damage or chromosomal assessments as well as functional assessments of sperm.

Andrologists may also qualify as laboratory directors if they have doctoral level training. Laboratory directors are responsible for overall andrology laboratory operations, manage laboratory staff and have a critical role in establishing and maintaining quality control, human resources and even development and/or validation of new tests for sperm or semen assessment. They often perform the procedure of intracytoplasmic sperm injection, including preparation and assessment of eggs as part of that procedure if the andrology laboratory is linked to an IVF (in vitro fertilization) or embryology laboratory. Andrologists in this setting are often trained as embryologists as well.

Investigative andrologists are researchers who study the underlying processes of regulation of the hypothalamic-pituitary-testicular axis, sexual development, puberty, reproductive aging, steroidogenesis, spermatogenesis, and the effects of drugs and environmental conditions/toxicants on every aspect of the male reproductive system. These andrologists typically work in a university or non-profit setting oriented toward research.

Andrologists play an important role in veterinary schools and large animal facilities such as zoos where they seek to understand the wide range of male reproduction processes and practices within the animal kingdom, preserve male germ cells and treat pathological conditions in animals, whether as pets, on farms or in zoos.

Clinical andrologists may be physicians with a background in internal medicine/endocrinology, urology, or related fields. As such, they perform evaluation and management of male infertility patients. This may include microsurgery or other surgical interventions for patients. Residency training may require 3-8 years, including fellowships after medical school to reach this level of subspecialty expertise. Since andrology also includes study and treatment of prostate problems and/or sexual medicine, some urologists function as andrologists. Clinical andrologists also can be actively involved in sexual medicine practice.

The future of andrology is strong and broad. We increasingly understand how genetic variants derived from the male may affect reproduction, including fertilization, embryo development and the health of a child. The condition of male infertility has also been recognized as a marker for the overall health of a man, and the mechanisms by which impaired sperm production affects a man's future health are increasingly being elucidated (Chapter 64).

Sperm are recognized as providing the microtubules that direct embryo development, and sperm-related factors such as sperm DNA fragmentation can affect maintenance of a fetus even after embryo implantation. Sperm factors affecting the health of the offspring include paternally-derived genetic and/or epigenetic variations that increase the risk of conditions such as autism, schizophrenia and other developmental disorders as well as neoplastic risk.

Each of these andrological conditions and their contributions to reproduction will expand as further insight into the mechanisms by which sperm and male factors affect subsequent reproductive action are elucidated. The mounting research efforts to develop safe and effective male contraceptive will allow the male partner to play an active role in the contraceptive practice in couples. New insights will

allow for further interventions to ameliorate such male factors. The ongoing capability of scientists to make observations of sperm contributions during assisted reproductive treatments further increase the recognition of male factors in reproduction. The ability of regenerative technologies to enhance development of the male gamete outside of the testis will both enhance our understanding of spermatogenesis and the ability to treat infertile men with no current options for therapeutic intervention. The future of andrology is indeed rich with opportunities for scientific advances.