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# SPERM ASSESSMENT & MORPHOLOGY

There are many factors that influence fertility and reproductive potential such as age, weight, nutrition, season, stress, and genetics. Assisted reproductive techniques such as transcervical insemination (TCI) provide us with an opportunity to enhance some of these factors, and here we thought we would take the opportunity to discuss sperm!

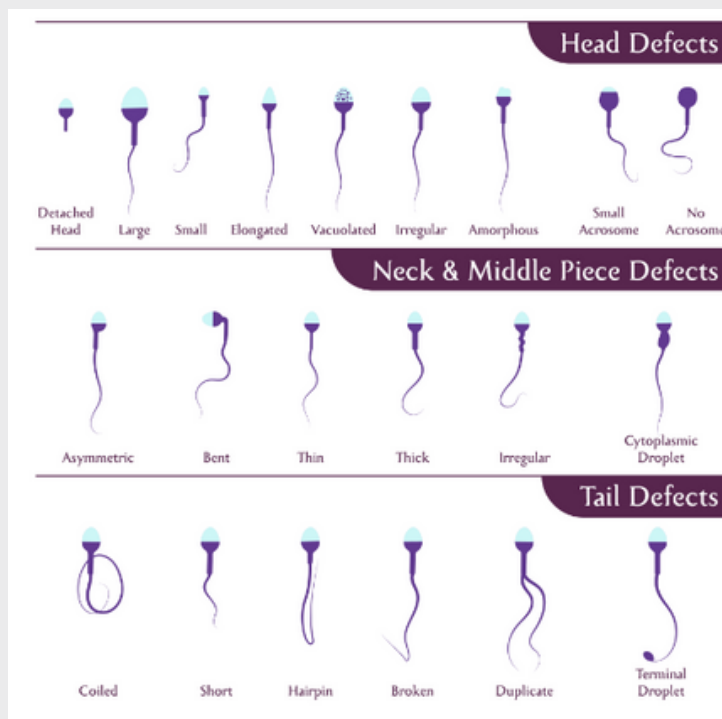
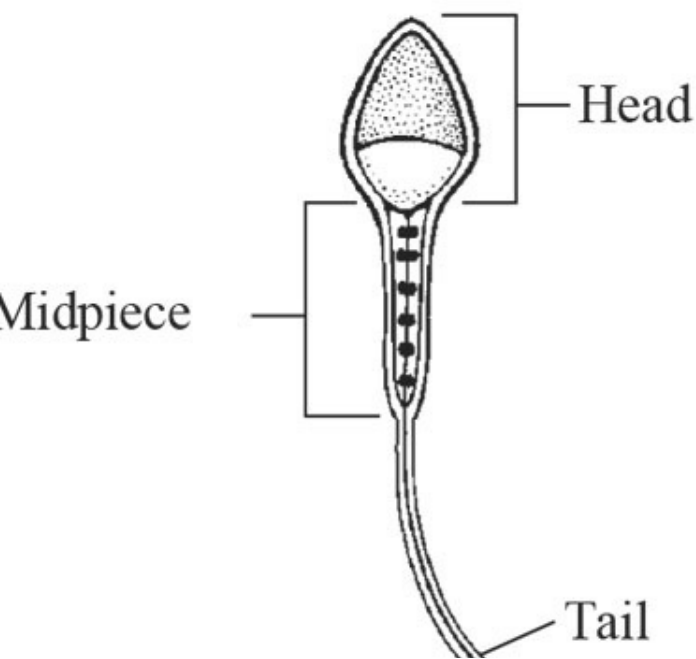
Sperm production (or spermatogenesis) is a process occurring in the testes where a special type of cells called spermatocytes divide and differentiate into the mature sperm (spermatozoa) that are then capable of finding and fertilising the ovum (the female's egg).

In the dog, the process of spermatocytes undergoing biochemical, morphological, and functional changes to become spermatozoa takes approximately 60 days and is a continuous process: with dogs producing millions of sperm cells each day.

Just like fertility itself, spermatogenesis can be influenced by the dog's age, stress levels, nutritional status, hormones, season, and genetics, although this list is not exhaustive. Ultimately, this process leads to the production of the sperm rich part of semen, and that's where we come in!

A routine part of our collection process is to perform a sperm assessment. We consider the quality and quantity of the sperm by assessing volume, motility, forward progression, total count per ejaculate, concentration and sperm morphology. In order to assess the morphology of spermatozoa, we examine the physical features of the individual sperm cells within an ejaculate under a microscope.

**"In the dog, percentages of abnormal sperm up to 30% is considered normal."**



Abnormal sperm: <https://www.lifecell.in/blog/health-check/how-does-sperm-morphology-affect-male-fertility>

The morphological integrity of sperm cells is important for assessing their ability to partake in fertilisation and produce puppies. In the dog, a normal sperm cell is approximately 6.8µm and consists of three sections: the head, midpiece, and tail. Each section performs essential tasks in the process leading up to and including fertilisation.

We expect to see morphologically abnormal sperm within any one ejaculate, however, the percentage of abnormal sperm in the ejaculate can influence the likelihood of puppies being conceived. In the dog, percentages of abnormal sperm up to 30% is considered normal.

Percentages higher than this may indicate the need for further investigation into potential causes.

Abnormalities in sperm can be classified in several ways, and usually a combination of these classifications are used. Abnormalities can be divided into primary defects, occurring in the testes during spermatogenesis; and secondary defects occurring during the storage and maturation of sperm cells in the epididymis, during ejaculation, collection and handling after being collected.

Abnormalities may also be classed as major or minor; with major defects affecting the ability of sperm to fertilise ova, and minor defects not impacting the sperms ability to fertilise ova.

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Finally, the defects may also be classified as compensable or non-compensable. Compensable defects may be overcome using assisted reproductive techniques (ART) that introduce the sperm to the ovum. Non-compensable defects cannot be overcome with ART, regardless of the presence of the ovum.

The type of abnormality can give an indication of where in the process of spermatogenesis and collection the defect arose.

Common defects relate to

- (i) head defects - no head, small head, large head, misshapen head, more than one head
- (ii) acrosomal defects - missing acrosome, damaged acrosome
- (iii) midpiece defects - bent midpiece, missing midpiece, proximal droplets
- (iv) tail defects - no tail, coiled tail, bent tail, more than one tail, distal droplets

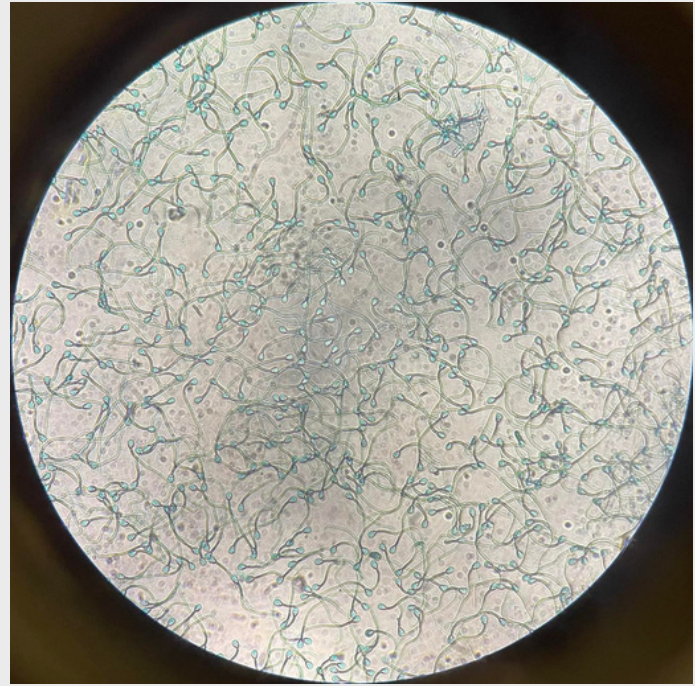
At TCI GlenBred we use Spermac stain which provides excellent differentiation and visualisation between the head, acrosome, midpiece and tail.

Morphological defects may be transient i.e. differ between ejaculates, or permanent which occur in every ejaculate of an individual. Morphological defects may also be higher in older dogs, or young dogs that are not yet sexually mature.

As such, if you would like to freeze semen from a dog, it is best to do this between the age of 18 months and 4 years in order to achieve optimal results. Having said this, collection from older dogs is always an option, but keep in mind that their sperm quality may reduce the older they get.

Morphological assessments aren't just related to the freezing of semen; they can be helpful in assessing a dog's breeding soundness even when you intend to use fresh sperm, and/or use natural mating.

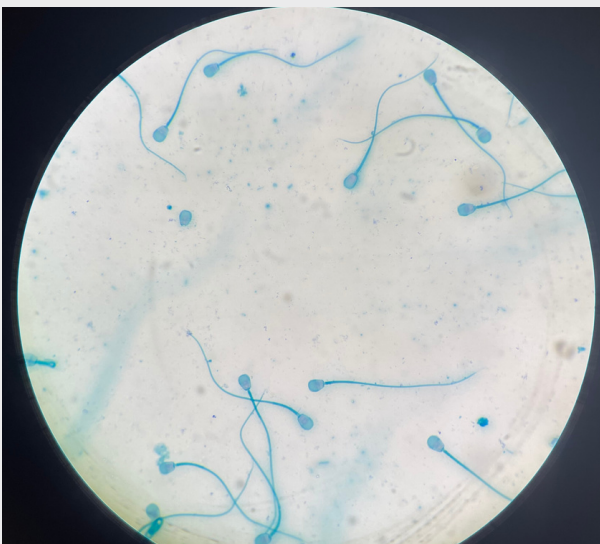
These assessments are helpful for investigating the fertility of a dog who has failed to sire pups or has sired pups in the past but is now struggling to do so. They can also be useful if you want to assess the dog's potential value for siring puppies and monitor sperm production throughout a dog's lifetime.



Spermac stain of dog sperm at 200x magnification



Spermac stain of dog sperm at 1000x magnification showing significant tail defects - , coiled and bent.



Spermac stain of dog sperm at 1000x magnification showing predominantly normal sperm