

Macroscopic Assessment

Liquefaction

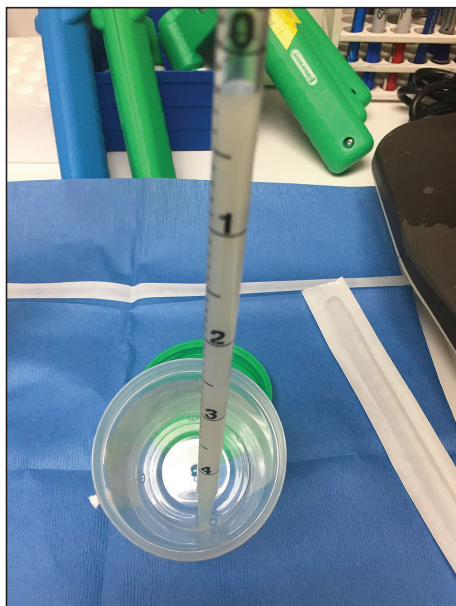
Following ejaculation, the semen sample should first transform into a semisolid gel state (a process called *coagulation*) and then liquefy within 15 to 30 minutes (a process called *liquefaction*). Failure to form a gel or failure to liquefy may indicate dysfunction with either the seminal vesicles or prostate. See images on opposite page.

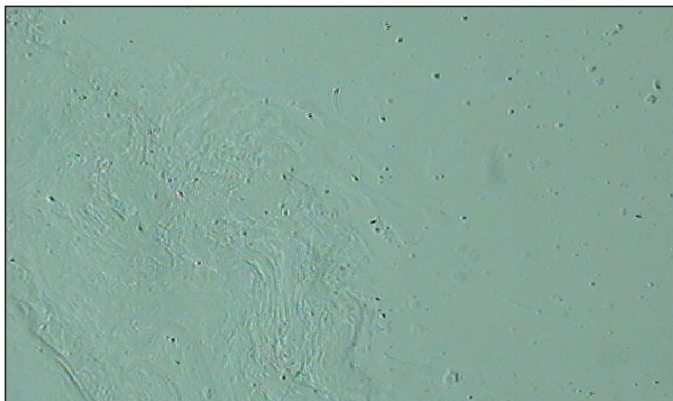
If the semen sample does not readily liquefy within a 30-minute interval, this may also indicate an underlying genital infection. The length of time required for liquefaction is noted on the semen analysis report. The presence of the gel state and the liquefaction time may not be possible to determine if the specimen is collected at home and then transported to the laboratory. In these cases, it is only possible to note if liquefaction is delayed or absent.

Volume

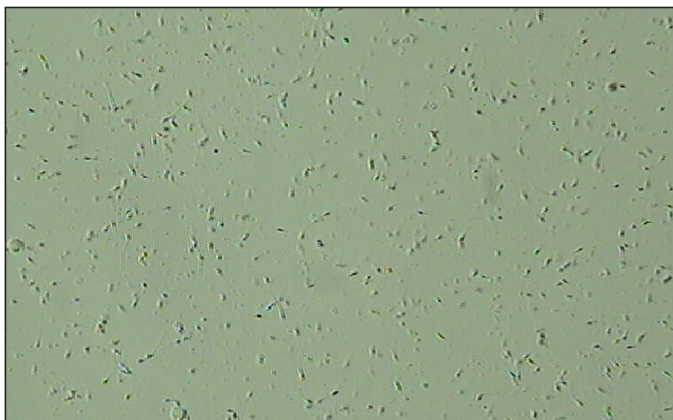
The typical ejaculate ranges from 1.0 mL to 5.0 mL. A low ejaculate volume may indicate the seminal vesicles and/or prostate are not producing sufficient fluid, or the ducts within these organs may be blocked. A low ejaculate volume may also signify a congenital anomaly/absence of a genital organ.

Volume is most commonly measured by drawing up the ejaculate into a sterile plastic serological pipette (1-10 mL depending on the sample). A more accurate determination of volume can be made by using the sample weight or using calibrated measurement devices like a volumetric pipette. However, such precise determinations are not usually warranted in most semen analyses.





Preliquefaction



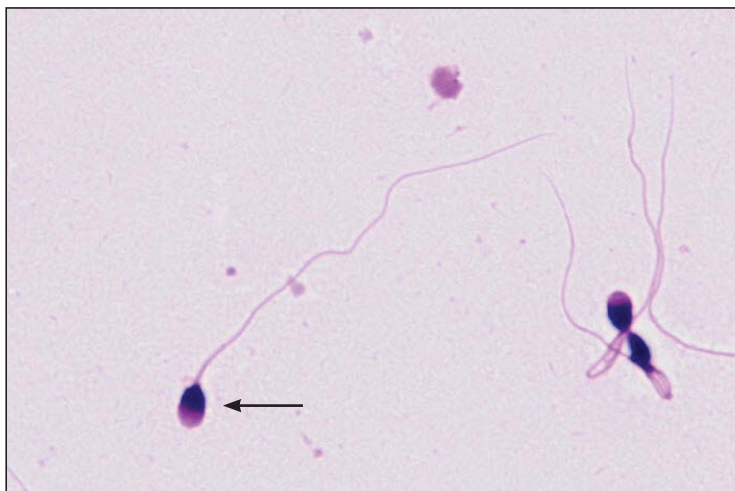
Postliquefaction

Sperm Morphology Images

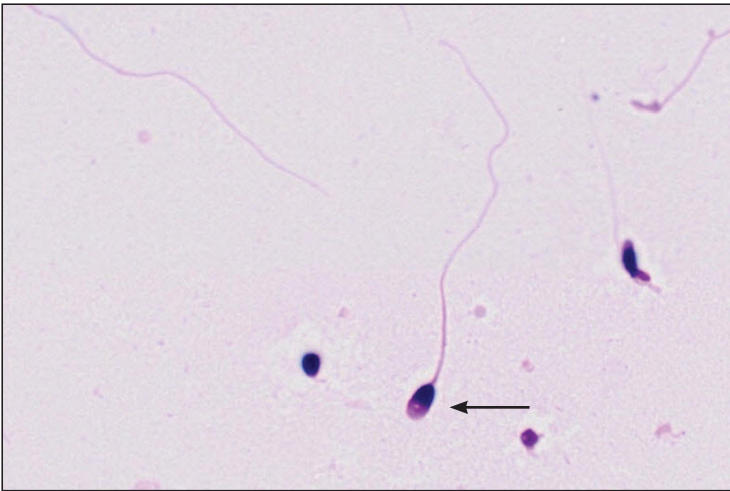
The following examples of normal and abnormal spermatozoa, as assessed by Strict criteria, were taken at various magnifications. Optimal assessment of morphology should be performed on an appropriately stained slide at 1000X magnification with oil immersion and using a micrometer for size assessment. The cells should not overlap excessively, with 5 to 10 spermatozoa present in a high-power field. The background must be relatively free of debris for accurate assessment of at least 200 sperm. The most common stain, used by 60% of the laboratories in a recent CAP survey, is the modified Wright-Giemsa or Diff-Quik stain, further discussed in Appendix B.

Normal Sperm

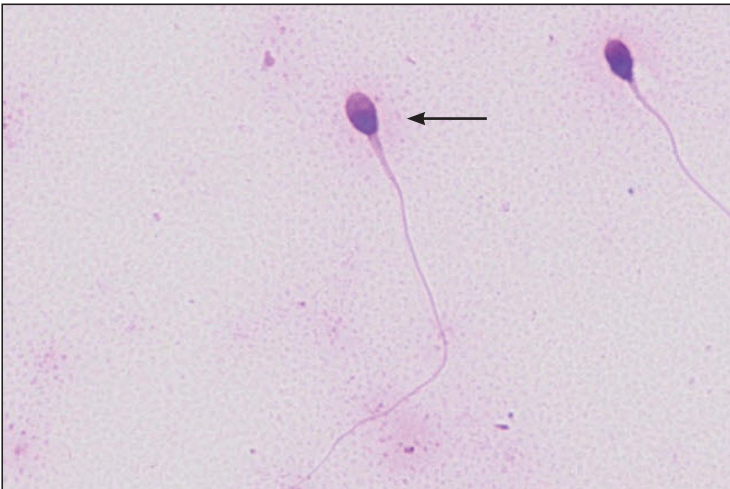
Normal sperm, chosen by the CAP Reproductive Medicine Committee and reviewed by Dr. Thinus Kruger, demonstrate optimal size and shape characteristics. Abnormal forms, almost always representing greater than 75% of the cells assessed, may be subdivided by type of abnormality (head, acrosome, neck/midpiece, or tail) if so desired.



Normal



Normal



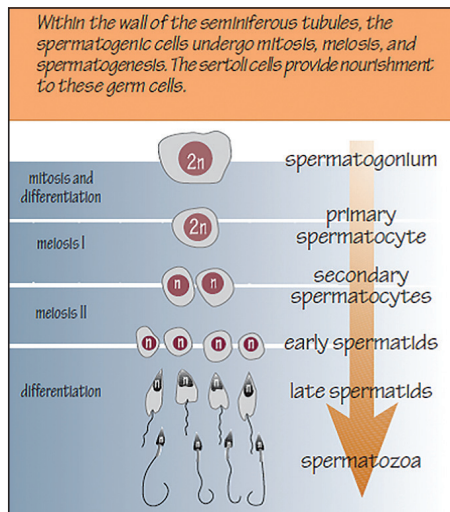
Normal

Nonsperm Cells

Nonsperm cells are also present in seminal fluid and include epithelial cells, leukocytes, immature germ cells, and other somatic cells. Leukocytes and immature sperm precursor cells are collectively known as *round cells*. The concentration of round cells to that of spermatozoa is calculated from stained semen smears prepared from undiluted semen. In general, nonsperm cells comprise approximately 5% of cells in semen. The presence of nonsperm cells in seminal fluid can be a challenge for precise classification.

Spermatogenesis

Spermatogenesis is the process of sperm development. In spermatogenesis, germ cells (spermatogonia) divide and develop into sperm precursor cells (spermatocytes and spermatids) and eventually develop into mature spermatozoa. Immature germ cells are usually primary spermatocytes, which are identified by their relatively large size and large nucleus with evenly distributed chromatin. Immature germ cells are larger in size compared to the typical lymphocyte and do not have an eccentrically located nucleus as found in plasma cells. Furthermore, immature germ cells do not show the typical multilobulation and segmentation of an acute inflammatory leukocyte (neutrophil). Spermatids are also found in semen and are usually smaller compared to immature germ cells. An occasional secondary spermatocyte can also be found, and these cells are frequently binucleated. Immature germ cells should be distinguished from inflammatory cells when “round” cells are detected in semen analysis.



Round Cells

When performing semen analysis, the seminal fluid specimen is most commonly stained using Giemsa and Papanicolaou methods. Frequently, round cells are simply reported as “round cells” in semen analysis, with no effort to further differentiate them into germ cells and nonsperm cells, such as inflammatory cells (leukocytes, lymphocytes, and plasma cells). The *WHO Laboratory Manual for the Examination and Processing of Human Semen*, 5th edition, recommends that when the round cell concentration exceeds $1 \times 10^6/\text{mL}$, an attempt to further classify the round cells should be made.

The distinction can be important in classifying male infertility factors into inflammatory and noninflammatory subtypes. Round cells at this level may be leukocytes and could indicate an inflammatory and/or infectious etiology as a cause of male infertility. Recent studies have shown that there is a negative correlation between the number of immature germ cells and sperm motility (ie, as the concentration of immature germ cells increases, the motility of the sperm decreases).

These studies also show a positive correlation between the number of immature germ cells and teratozoospermia (abnormal sperm morphology). These findings could account for those cases in which the sperm count is normal but the motility is low, resulting in male subfertility. A determination of the concentration of immature germ cells in semen is a way in which to evaluate cases for possible sperm maturation arrest.