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Semen biochemistry

Biochemical analyses of the semen could also be used for the study of the secretary capacity of the accessory genital glands. In such a study, we instructed volunteers to present semen samples to the laboratory at regular intervals.7 From these experiments it became evident that the mean relative concentration or activity of the various factors is constant despite a marked decrease in volume, when semen specimens are produced at 24- hr. intervals. The mean decrease in volume and total content of the various constituents was about 60%. It should be noted that a 3-day interval is sufficient for the semen volume and the total content of various constituents to return to normal. The same pattern was found in specimens obtained at 12- or 8-hr. intervals. The rather constant composition of semen from healthy individuals, despite a marked reduction in volume at frequent ejaculations, shows that the relative proportion between the secretion from the different glands, as well as the composition of these various secretions, must be kept almost constant. Thus, it appears that both the secretory activity and the emptying of the various glands are well controlled. Further studies of the mechanisms regulating these different functions appear to be of great interest.

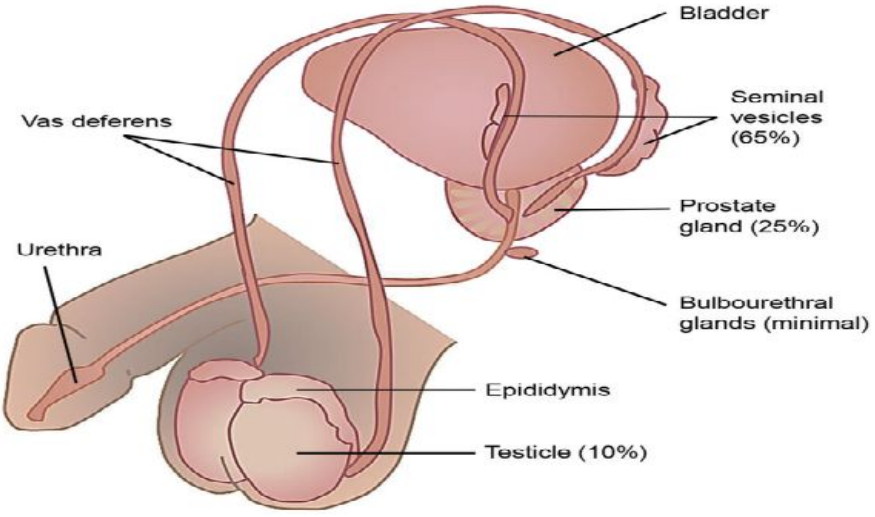

Figure : Male reproductive anatomy and relative contributions of individual organs to the total ejaculate volume.

Chemical components of semen and its source of generation

Source	Chemical substance
Testes and excurrent ducts	Testosterone Inhibin B Transferrin Ceruloplasmin L-carnitine Glycerophosphorylcholine Inositol Lactic dehydrogenase C_4
Seminal vesicles	Fructose Prostaglandins (PGE_2) Seminogelin I and II Nitric oxide synthase
Prostate gland	Prostatic acid phosphatase Prostate-specific antigen Vesiculase Spermine Citric acid and citrates Zinc, calcium, and magnesium

LACTATE DEHYDROGENASE IN SEMEN

Lactate dehydrogenase (LDH) plays an important role in the cell metabolism. By electrophoresis it is possible to separate this enzyme into distinct fractions, called isoenzymes. Most human tissues contain 5 LDH iso-'enzymes (LDHl' LDH2, etc.). The testes and seminal fluid have, however, an additional band, LDHx , which appears between LDH3 and LDH4 in agar-gel electrophoresis. Two of the isoenzymes are of special interest-LDHx and LDH5 the former is closely associated with the spermatozoa, and there is a good correlation between the LDHx activity of the seminal plasma and sperm density. It is a possibility that the determination of the ratio LDHx:sperm concentration can provide valuable information on some functional properties of the spermatozoa, e.g., the degree of enzyme leakage. It is known that LDH5 is increased both absolutely and relatively in malignant tissue, including prostate cancer. On the other hand, inflammatory changes in a tissue normally do not change the relative distribution of the LDH isoenzymes. For these reasons it is of interest that an elevation of the LDH fraction has been noted in seminal plasma from many patients with symptoms of prostate dysfunctions.

PROSTAGLANDINS

The prostaglandins are a group of fatty acids responsible for the strong pharmacodynamic activity in human semen. The physiologic significance of seminal prostaglandins is not known, but the high

concentration normally present in human semen, their biologic properties, and their influence. On the motility of the human uterus strongly suggest that they are of importance for human fertility, for example, by facilitating sperm migration from the vagina into the uterine cavity. It has been noticed that semen from men in infertile marriages had lower prostaglandin content, on the average, than semen from fertile men. The Significance of this observation could not, however, be appraised without information on the over-all biochemical properties of the seminal fluid. A low prostaglandin activity could be only a reflection of a general disturbance of the secretary function of the seminal vesicles. This appears, however, not to be the case, since the prostaglandin content of the semen has been recently found to be independent of the fructose content and the various secretary products of the prostate gland. This is of particular interest with regard to the known relation between androgen activity and fructose production. Since prostaglandin content can be low without concomitant decreases in fructose and acid phosphatase, it seems important to include semen prostaglandin analyses in all cases of unexplained infertility.

SUMMARY

Biochemical analyses of human seminal plasma can provide valuable information about the secretary pattern and secretary capacity of the accessory genital glands. Furthermore, such analyses are of great help in assessment of the androgen activity and the functional status of the genital glands. Infections of the prostate gland markedly decrease the acid phosphatise activity and the concentration of zinc, cholesterol, and citric acid in semen. Many· patients with unexplained symptoms from the genital tract ("functional prostatitis") have shown changes in the biochemical pattern of their seminal plasma. Biochemical analyses seem to be of value in the study of these common but (from many aspects) problematic disorders.