Chapter 13
Semen Fluid
Professor A. S. Alhomida

Male Reproductive System

• Pathway of Spermatozoa
  1. Epididymis
  2. Ductus deferens (Vas deferens)
  3. Ejaculatory duct
Male Reproductive System, Cont’d

- **Accessory organs**
  1. Seminal vesicles
  2. Prostate gland
  3. Bulbourethral (Cowper’s) glands
  4. Scrotal sac encloses testes
  5. Penis

---

Sperm

1. **Sperm** is made in the testes
2. The male gametes
3. The male sex hormone is **testosterone**
4. As sperm enter the urethra, the seminal vesicles, prostate gland, and Cowper’s glands all secrete fluids into the urethra
5. These fluids nourish the sperm and protect them from the acidity of the female reproductive tract.

6. **Semen** is the mixture of sperm and fluids.

7. Involuntary contractions of the muscles force the semen through the **urethra**, and out of the body in a process called **ejaculation**.

---

**Accessory Glands**

- **Seminal Vesicles**
  1. Active secretory gland
  2. Contributes ~ 60% total volume of semen
  3. Secretions contain fructose, prostaglandins, fibrinogen

- **Prostate Gland**
  - Secretes slightly acidic prostate fluid

- **Bulbourethral Glands**
  - Secrete alkaline mucus with lubricating properties
Seminal Fluid

**Formation of Seminal Fluid**

- It is composite solution formed by the testes as well as the accessory organs and consists basically of spermatozoa suspended in seminal plasma
Seminal Fluid, Cont’d

- **Function of Seminal Plasma**
  1. To provide a nutritive medium of proper osmolality and endocervical mucus where upon its contribution to the fertilization process is ended
  2. It activates the spermatozoa to greater mobility

Organs Involved in Seminal Fluid

1. **Testis**
   - Spermatozoa which comprise less than 5% of the semen volume are the only cell type present in normal semen in any appreciable numbers
2. Seminal vesicles
   1. Approximately 60% of the seminal volume is derived from the seminal vesicles. This viscid, neutral, or slightly alkaline fluid as often yellow or even deeply pigmented as a result of its high flavin content which is responsible for the fluoresces of semen in UV light.

2. Testis and seminal vesicle are major source of fructose content of semen which is the major nutritive for the spermatozoa.

3. Testis and seminal vesicle are important in providing the substrate responsible for coagulation of the semen following ejaculation.
3. **Prostate**

1. It contributes about 20% of the volume of semen
2. It is milky fluid is slightly acid, pH 6.5 as a result of its high content of citric acid which constitutes the major anion
3. It is rich in proteolytic enzymes and acid phosphatase which are responsible for the coagulation and liquefaction of semen

---

**Physical Properties of seminal Fluid**

1. Freshly ejaculated semen is a highly viscid, opaque, white or gray-white coagulum which may have a distinct musty or acrid odor
2. Within 10-20 minutes the coagulum will spontaneously liquefy to form a translucent, turbid, viscous fluid which is mildly alkaline, with pH 7.7
3. Semen pH doesn’t greatly vary
General Chemical Components of Seminal Fluid

1. Nitrogen: 416 mg/100 mL
2. Lipids: 286 mg/100 mL
3. Cephalin: 107 mg/100 mL
4. Cholesterol: 80 mg/100 mL
5. Calcium: 60 mEq/L
6. Carbon dioxide: 4.2 mM/L
7. Chloride: 38 mEq/L
8. Potassium: 48 mEq/L

Normal Values for Seminal Fluid

<table>
<thead>
<tr>
<th>TABLE 11–1</th>
<th>Normal Values for Semen Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>3–5 mL</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Tears in droplets</td>
</tr>
<tr>
<td>pH</td>
<td>7.2–8.5</td>
</tr>
<tr>
<td>Sperm count</td>
<td>&gt;40 million/mL</td>
</tr>
<tr>
<td>Motility</td>
<td>&gt;92% within 1 h.</td>
</tr>
<tr>
<td>Quality</td>
<td>&gt;2/2</td>
</tr>
<tr>
<td>Morphology</td>
<td>&gt;12% normal forms (strict criteria)</td>
</tr>
<tr>
<td>White blood cells</td>
<td>&lt;1.0 million/mL</td>
</tr>
</tbody>
</table>
Structure of Sperm

Mechanism of Coagulation and Liquefaction of semen

1. Coagulation results from the action of a prostatic clotting enzyme on a fibrinogen-like precursor formed by the seminal vesicles
2. Liquefaction is initiated by enzymes of prostatic origin
3. The protein fragments and degraded further to free amino acids by proteolytic enzymes
Analysis of seminal Fluid

**General Properties**
1. Volume: 2-6 mL/once
2. Appearance: Color, Clarity, Viscosity
3. Liquefaction time: Room temperature < 60 minutes

Chemical Examination, Cont’d

**Chemical Examination**
1. pH: Normal 7.2-8.0, abnormal: 7.0 < pH > 8.0
2. Fructose is produced by the seminal vesicles, Reference value ≥13 µmol/once
3. The enzyme in seminal plasma
   - PAP: Method Interpretation
   - LD-x: Method Interpretation
   - Acrosomal enzyme: Method Interpretation
Analysis of seminal Fluid, Cont’d

- **Microscopic Examination**
  1. Sperm movement rate ≥ 60%
  2. Sperm motility: a grade > 60%
  3. Sperm count: < 20×10⁹/L (Oligozoospermic); > 40 ×10⁶/once
  4. Sperm forms: dysmorphia sperm < 30%
  5. Spermatogenic cell <1
  6. Other: RBC, WBC, EP, Lecithin
Normal Sperm vs Abnormal

Abnormal Sperm

FIGURE 11-4 Spermatocytes with double head, hematoxylin-eosin (×1000).

FIGURE 11-5 Spermatocytes with amorphous head hematoxylin-eosin (×1000).
Abnormal Sperm, Cont’d

**Figure 11-6** Spermatozoa with double tail, hematoxylin-eosin (×1000).

**Figure 11-8** Immature spermatozoa, hematoxylin-eosin (×1000).

Any questions?

THE END