

# **Biochemistry of biological fluids (BIOCH 472)**

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**Class 8:**

# Synovial Fluid

# Objectives for this lecture

- Describe the formation and function of synovial fluid.
- State the most diagnostic tests performed on synovial fluid.
- Discuss the normal and abnormal cellular composition of synovial fluid.

# Synovial Fluid

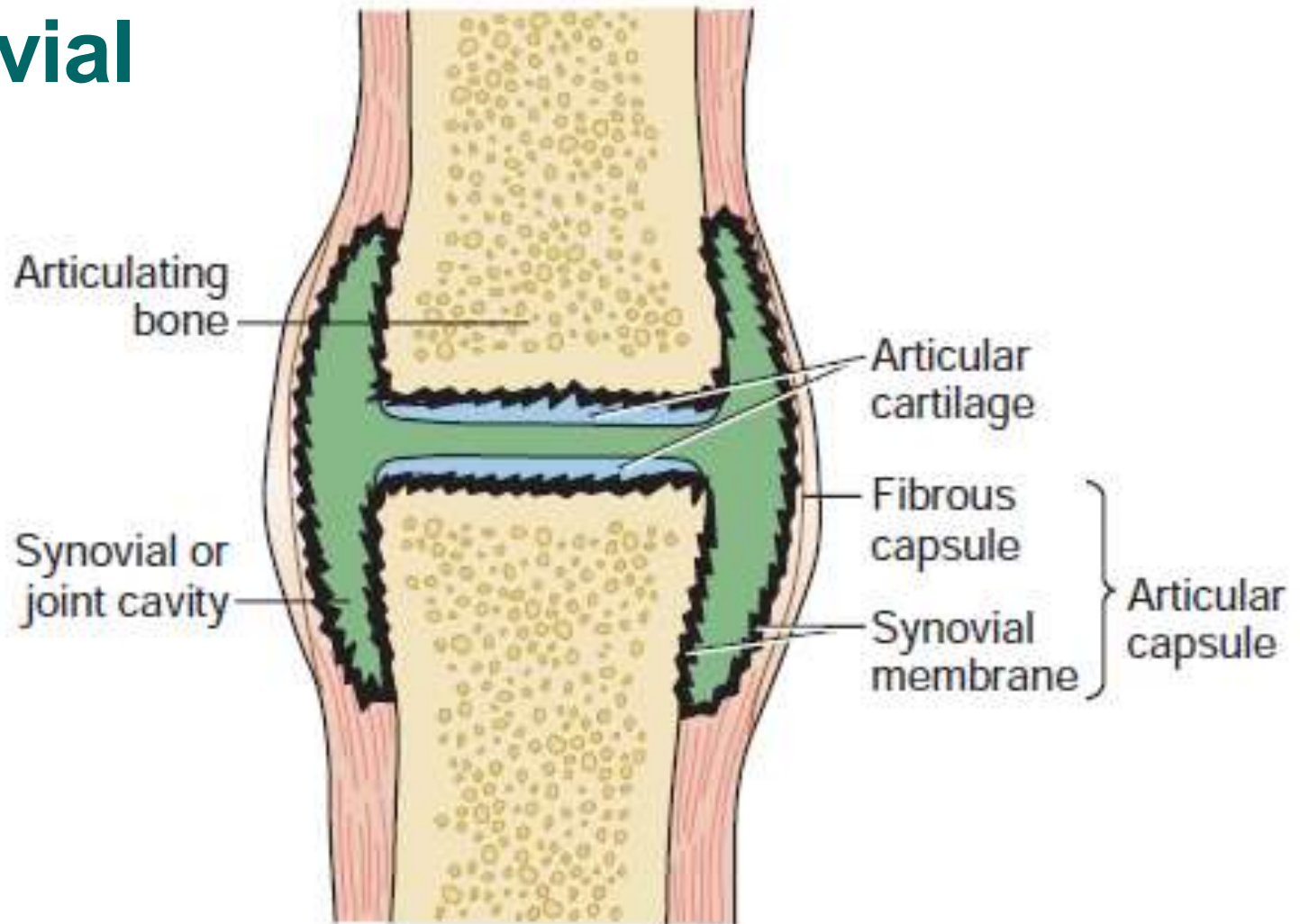


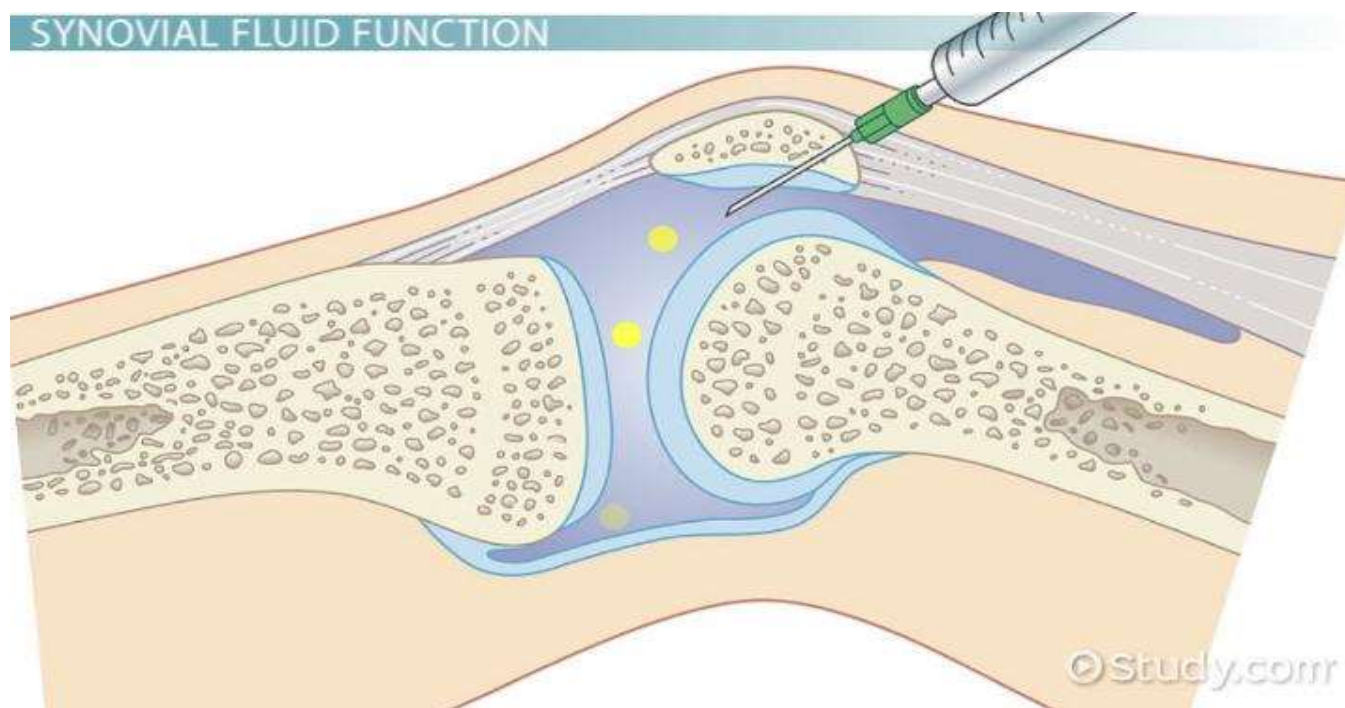
Figure 12-1 Diagram of a synovial joint.

# Synovial Fluid

- Reduce friction between the bones during joint movement.
- Provide lubrication in the joints.
- Provides nutrients to the articular cartilage.
- Lessens the shock of joint compression during activities such as walking and jogging.
- **Formed** by ultrafiltrate of plasma across the synovial membrane.

# Specimen Collection and Handling

- Synovial fluid is collected by needle aspiration (*3.5 mL or 25 mL in inflammation*).



# Specimen Collection and Handling

- **Normal** synovial fluid does **not clot**, diseased joint fluid may contain fibrinogen and will clot.
- Testing is done soon to prevent cellular lysis and possible changes in crystals.
- Collected fluid is distributed into tubes according to the required test.

# Color and Clarity

- Normal is colorless to pale yellow.
- Viscosity resembles egg white.
- Color change:
  - *deeper yellow* in *effusions (infl./noninfl.)*.
  - *greenish tinge* with bacterial infection.
  - *Turbidity* in presence of WBCs.
  - *milky* when crystals are present.



# Viscosity

- Comes from the polymerization of the hyaluronic acid.
- **measurement:**
  - Form a string from the tip of a syringe (4 cm).
  - Addition of 2% to 5% acetic acid forms a solid clot surrounded by clear fluid.

# Cell Counts

- **Dilution** is necessary when fluid is **turbid** or bloody.
- **Very viscous** fluid is pretreated by a pinch of **hyaluronidase**.
- Lipid droplets are present in crush injuries.
- <200 WBCs is normal.
- >100,000 WBCs in severe infections.

# Microscopic examination for Crystal Identification

- Diagnostic test for arthritis.
- Crystal formation in a joint results in an acute, painful inflammation.
- *Causes of crystal formation:*
  - Metabolic disorders.
  - Decreased renal excretion.
  - Degeneration of cartilage and bone.
  - Injection of medications, such as corticosteroids.

# Microscopic examination for Crystal Identification

- Type of Crystals:

- ✓ *Monosodium urate (uric acid):*

Gout: impaired metabolism of purines, high-purine-content foods, alcohol, and fructose, decreased renal excretion.

- ✓ *Calcium pyrophosphate:*

Pseudogout: degenerative arthritis, endocrine disorders

- ✓ *Cholesterol:*

chronic inflammation.

## Type of Crystals:....cont.

✓ *Corticosteroid:*

following injections.

✓ *Calcium oxalate:*

in renal dialysis patients.

✓ *Apatite (Ca phosphate):*

Osteoarthritis.

# Chemistry Tests

- *Glucose*: decrease in inflammation.
- *Protein*: normal is 3 g/dL.  
increase in inflammatory and hemorrhagic disorders.
- *Uric acid*: gout.

# Microbiologic Tests

- Special culturing procedures should be used.
- Gram stains performed on synovial fluid.

# Serologic Tests

- Serving as a **confirmatory** measure in cases that are difficult to diagnose.
- Autoimmune diseases rheumatoid arthritis and lupus erythematosus cause very serious inflammation of the joints.
- Inflammation is determined by **measuring fibrinogen** and **C-reactive protein**.