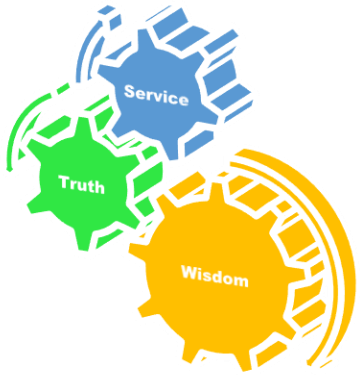
Vision; The Dream/Tomorrow

- **Motto**



- To impart evidence based research oriented medical education
- To provide best possible patient care
- To inculcate the values of mutual respect and ethical practice of medicine

MSK-1 Module(LGIS)
Connective Tissue

Dr. Mohtasham Hina

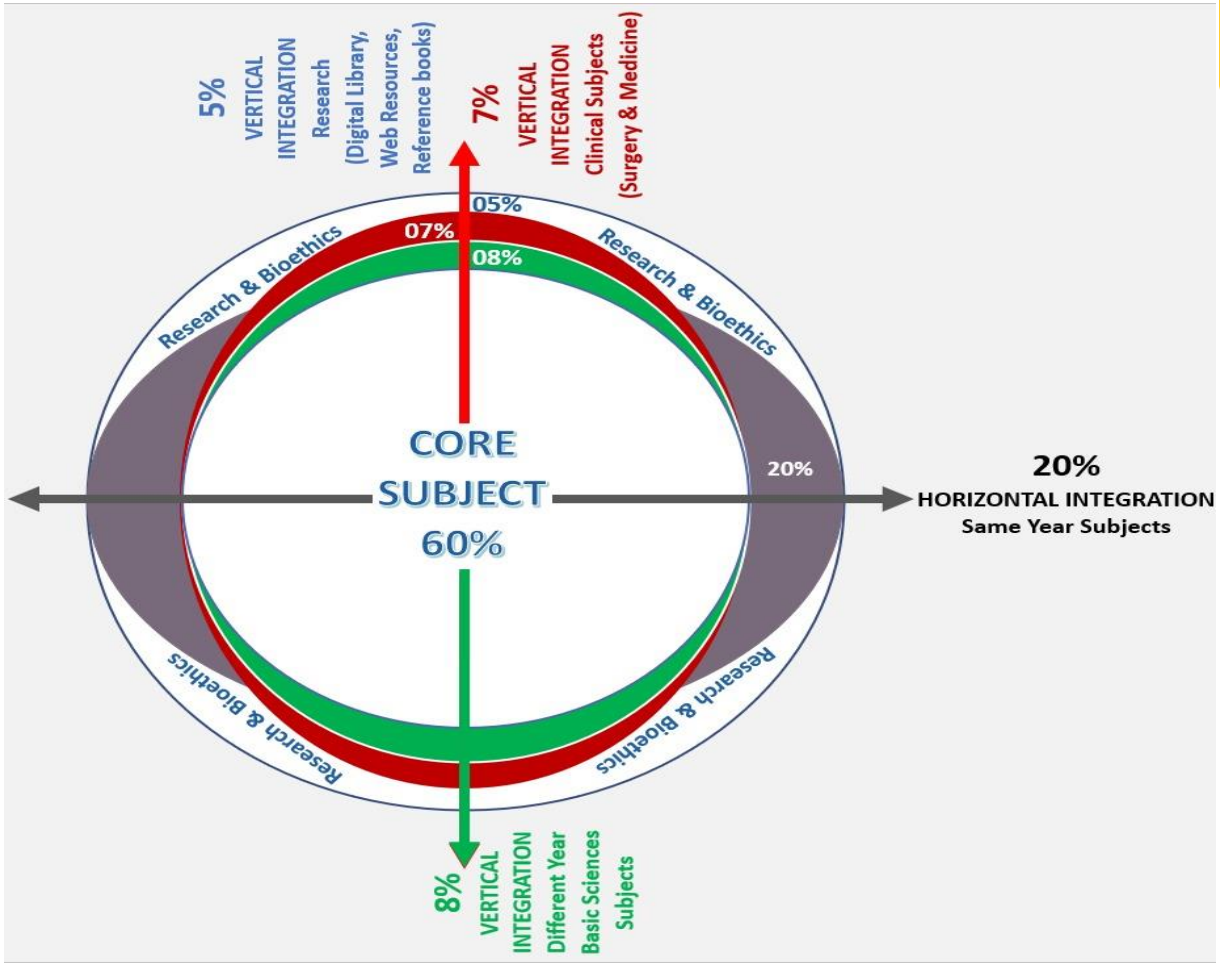
01- 04-2024

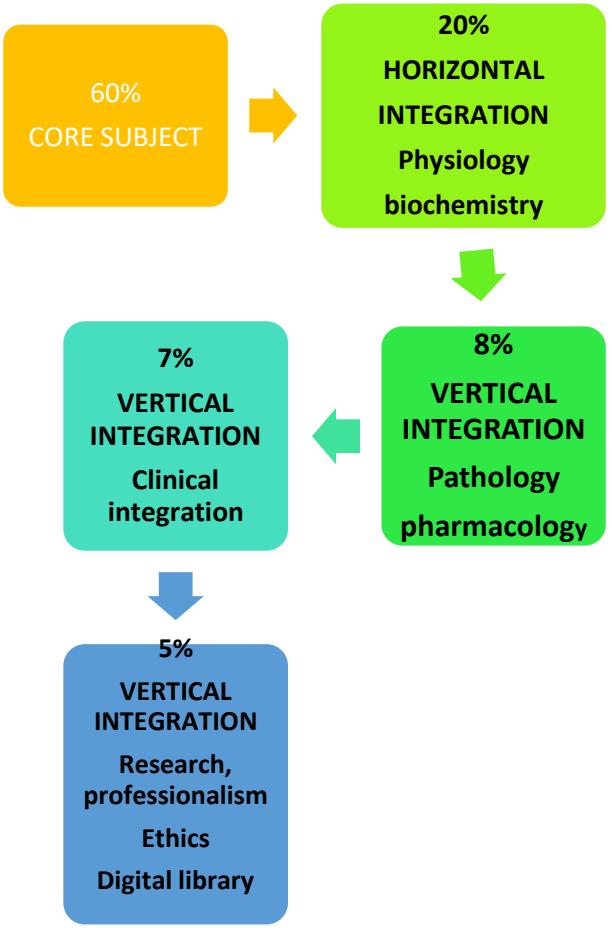
Learning Objectives

At the end of lecture 1st year students should be able to

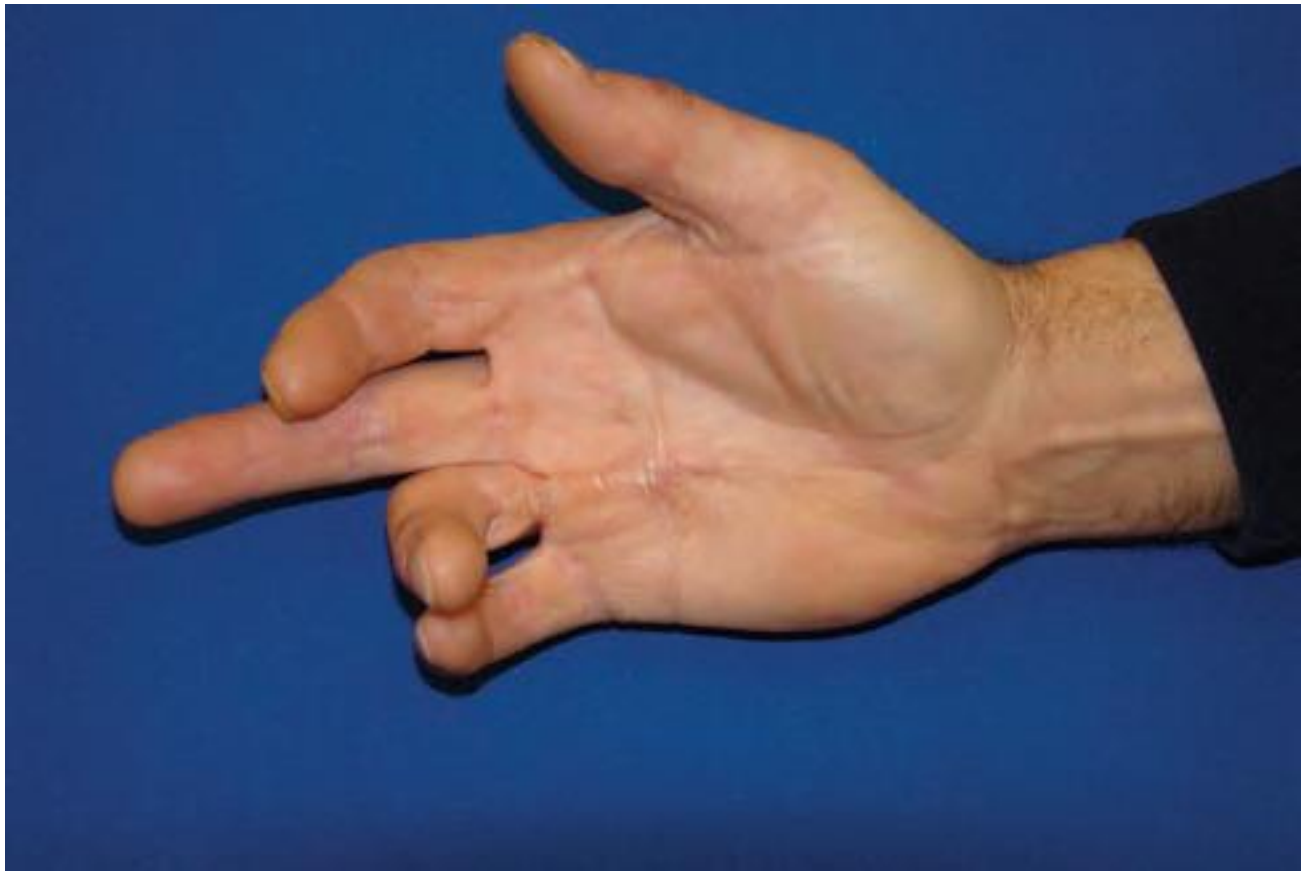
- Understand what is connective tissue
- Different components of connective tissue
- Location and functions of different cells of connective tissue
- correlate clinical aspects
- To understand bio-physiological aspect of connective tissue
- Read a research article
- Use digital library

Professor Umar Model of Integrated Lecture



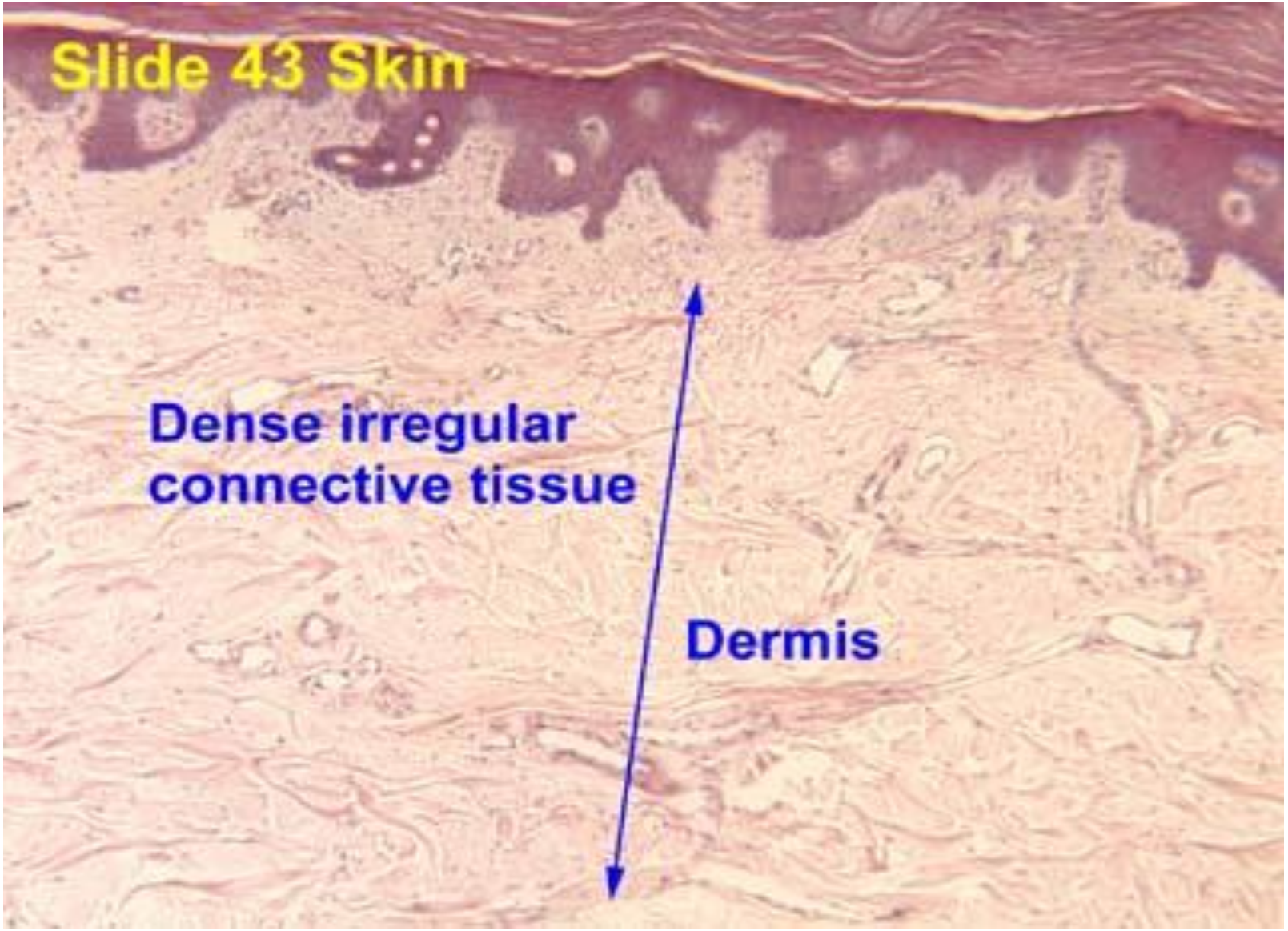


Dupuytren's Contracture



Connective Tissue

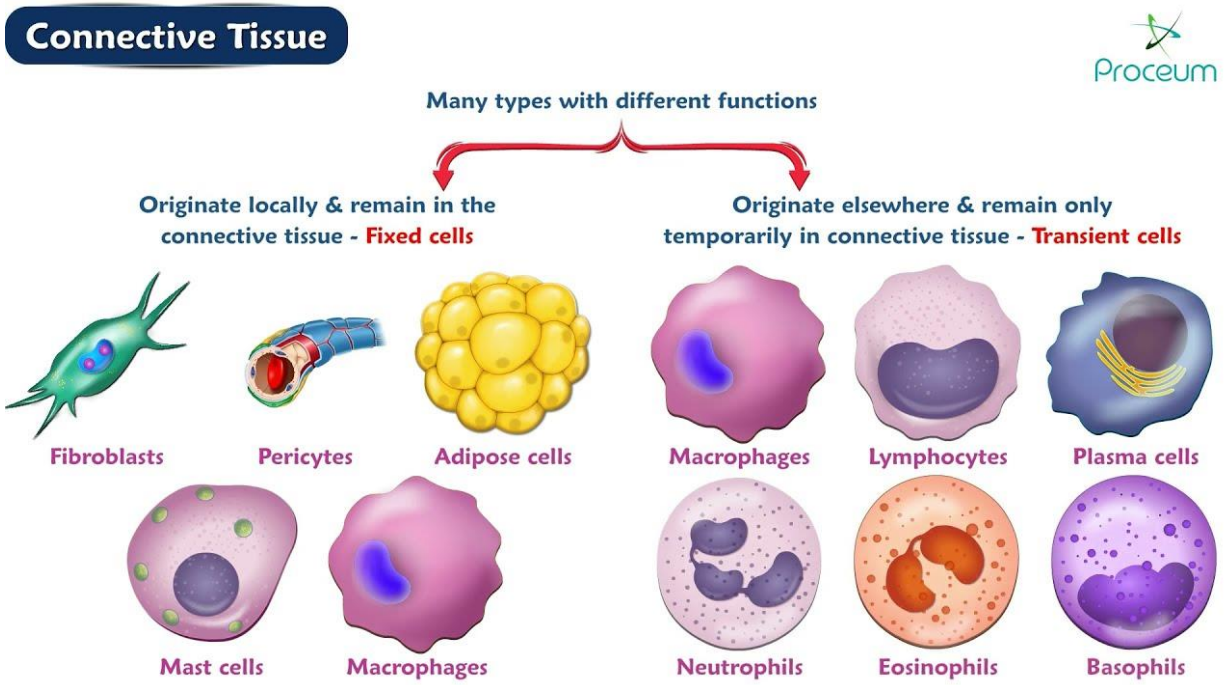
- One of basic tissues of body that contains cells with large amount of intervening extracellular matrix
- Connects other tissues, underlies or surrounds them.
- Produces and maintains many different **intercellular** substances.
- Provides support and nourishment.


Slide 43 Skin
Dense irregular
connective tissue
Dermis

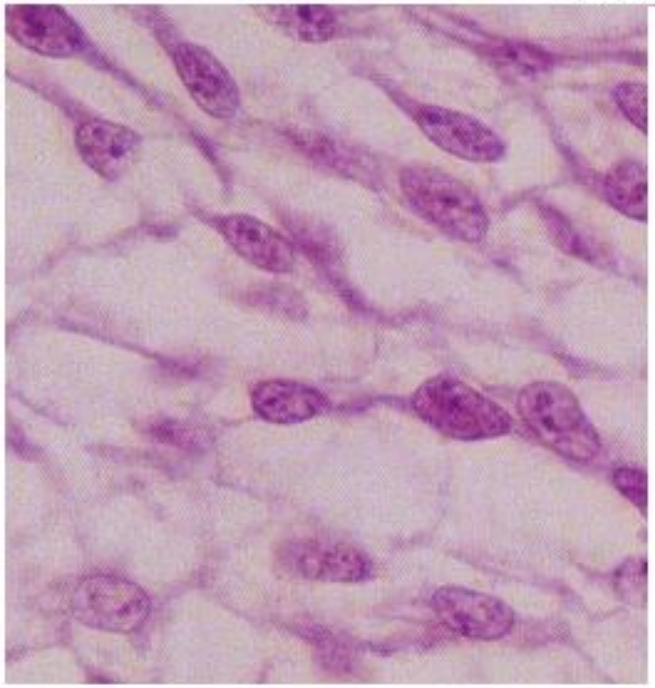
All Connective Tissues have:

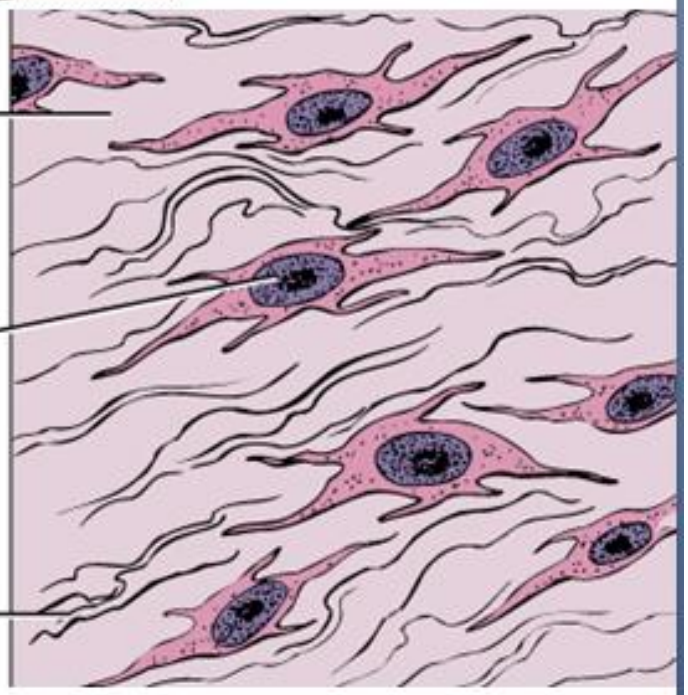
- Common origin - from **mesenchyme**

- Common structure
  Cells +
  Extracellular substance
- Common (similar) functions



Embryonic Connective Tissue
--- Mesenchyme





- *Consists of cells and ground substance with reticular fibers*
- *Gives rise to all types of Connective Tissues*

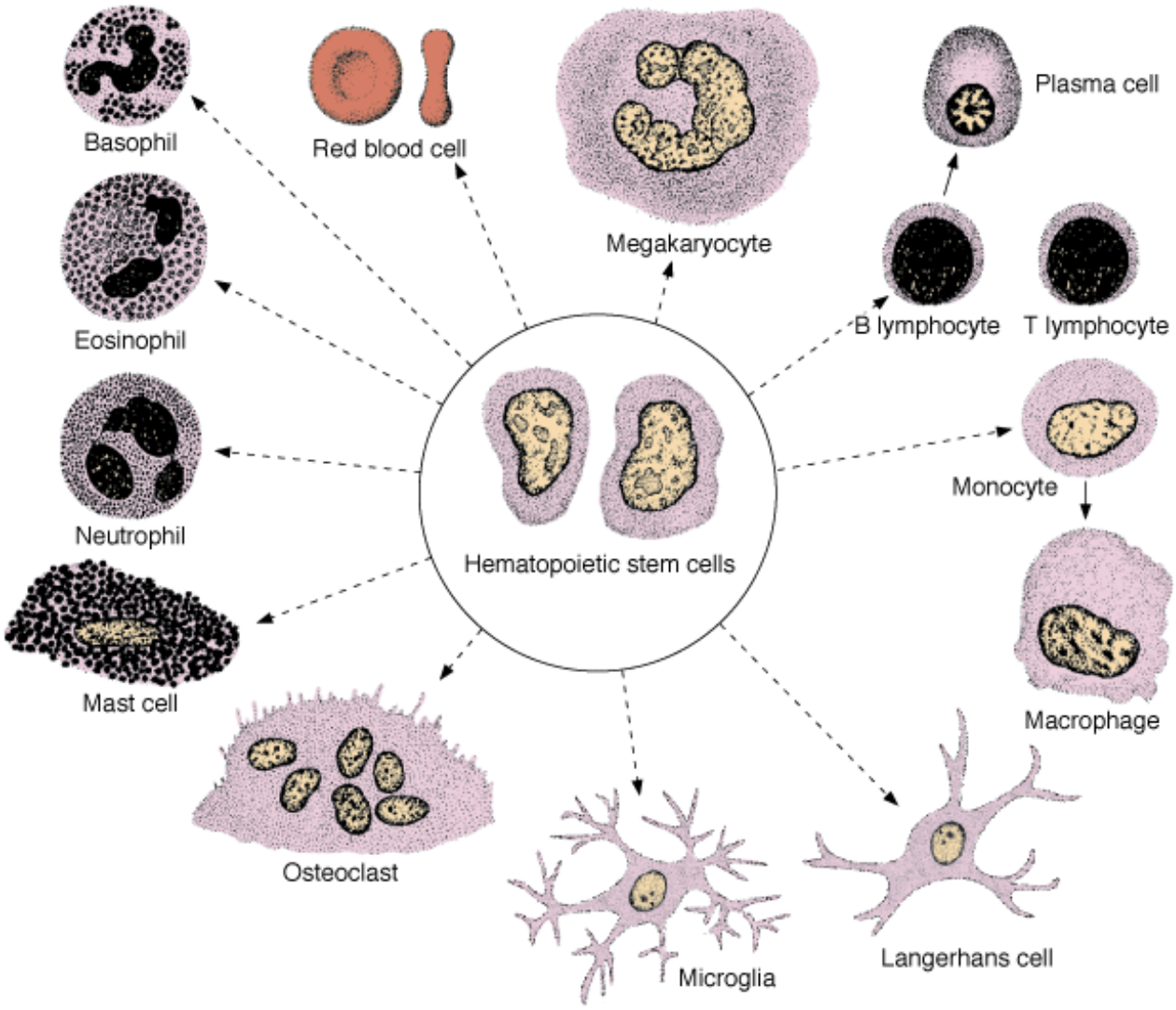
Components of C.T

- **CELLS**
- **EXTRACELLULAR MATRIX**
    - FIBERS
        - COLLAGEN
        - ELASTIC
        - RETICULAR
    - GROUND SUBSTANCE
        - GAGS
        - PROTEOGLYCANS
        - MULTIADHISIVE PROTEINS

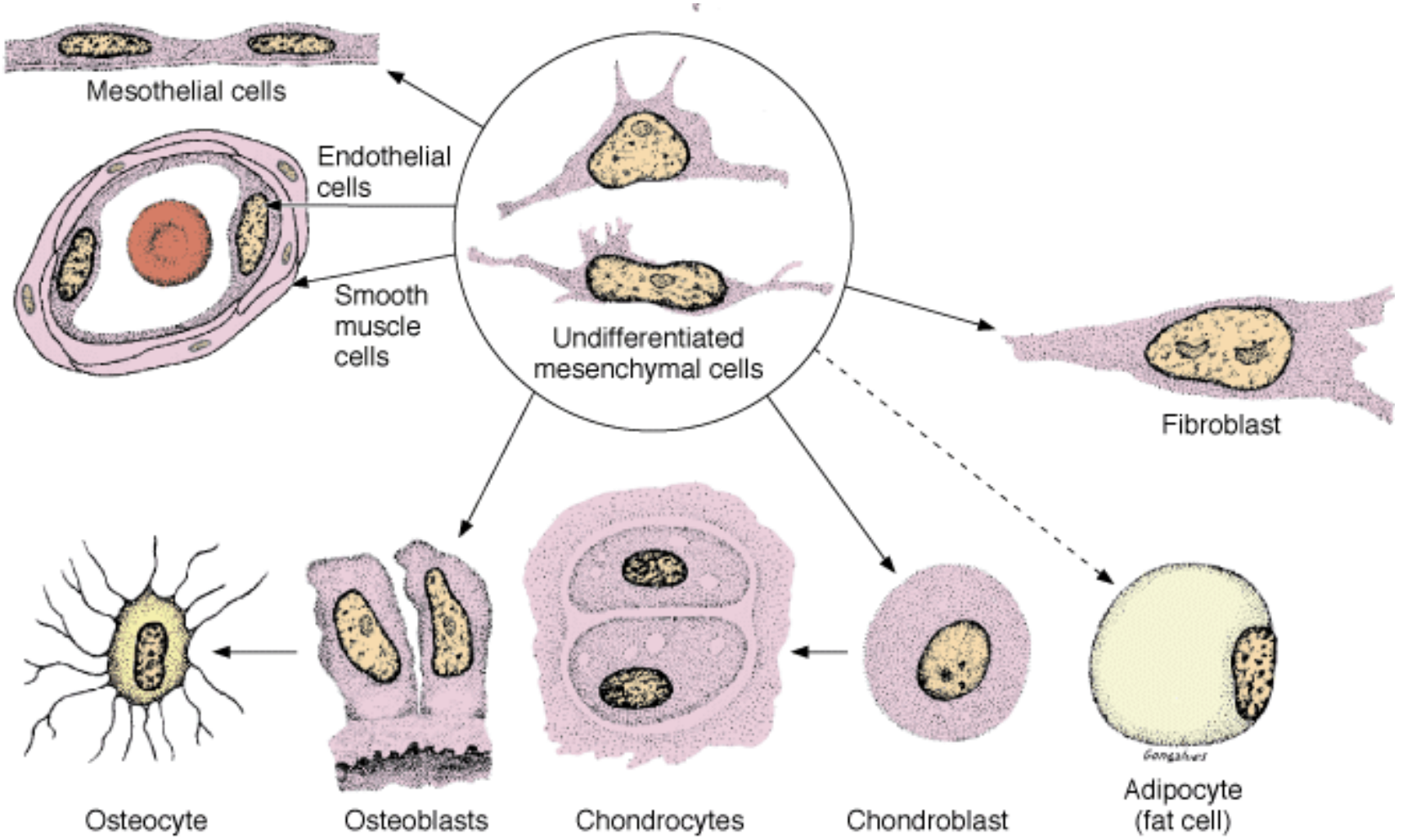
Cells of Connective Tissue

- **Resident Cell Population**
  - Fibroblasts
  - Myofibroblast
  - Macrophages
  - Mast cells
  - Adipocytes
  - Adult stem cells
- **Wandering Cell Population**
  - Lymphocytes
  - Plasma cells
  - Neutrophils
  - Eosinophils
  - Basophils
  - Monocytes

Connective Cell Lineages

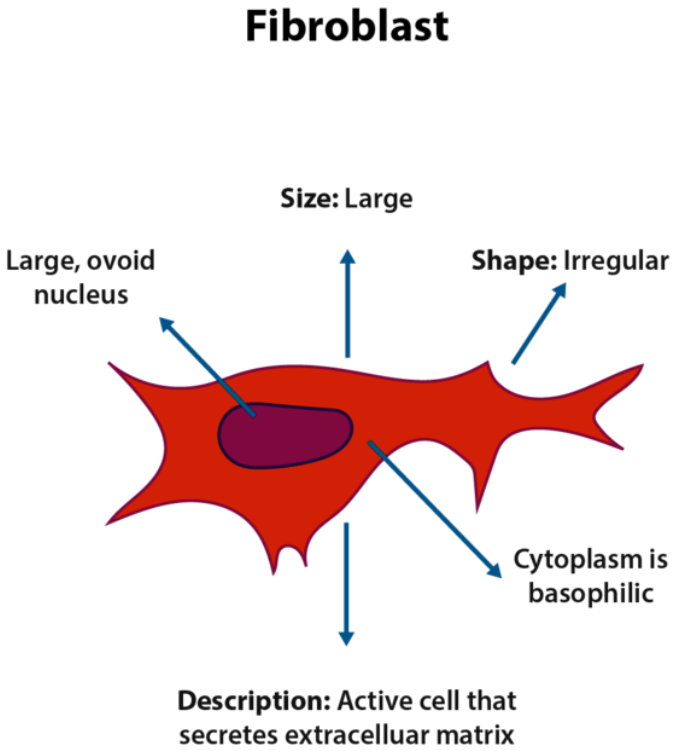


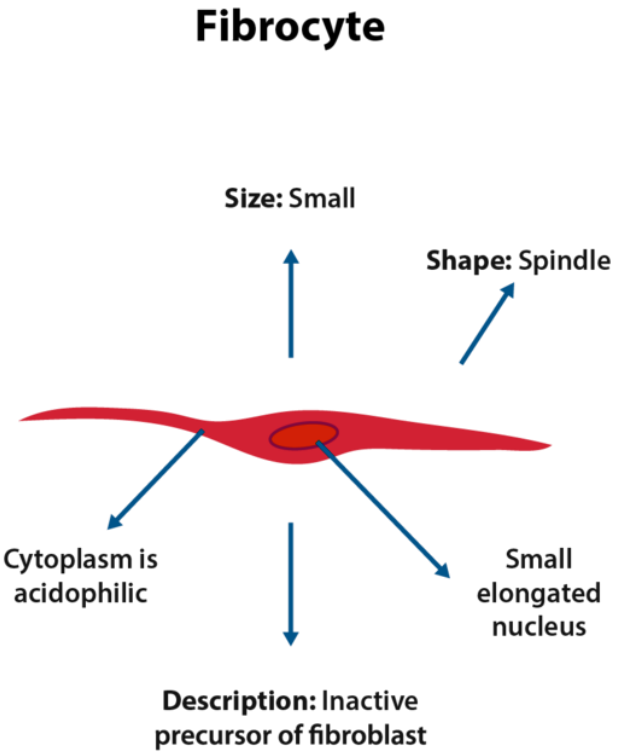
Core Concept



Fibroblasts and Myofibroblasts

- COLLAGEN SYNTHESIS
- ECM SYNTHESIS
- ACTIVE FORM
- QUIECENT FIBROCYT

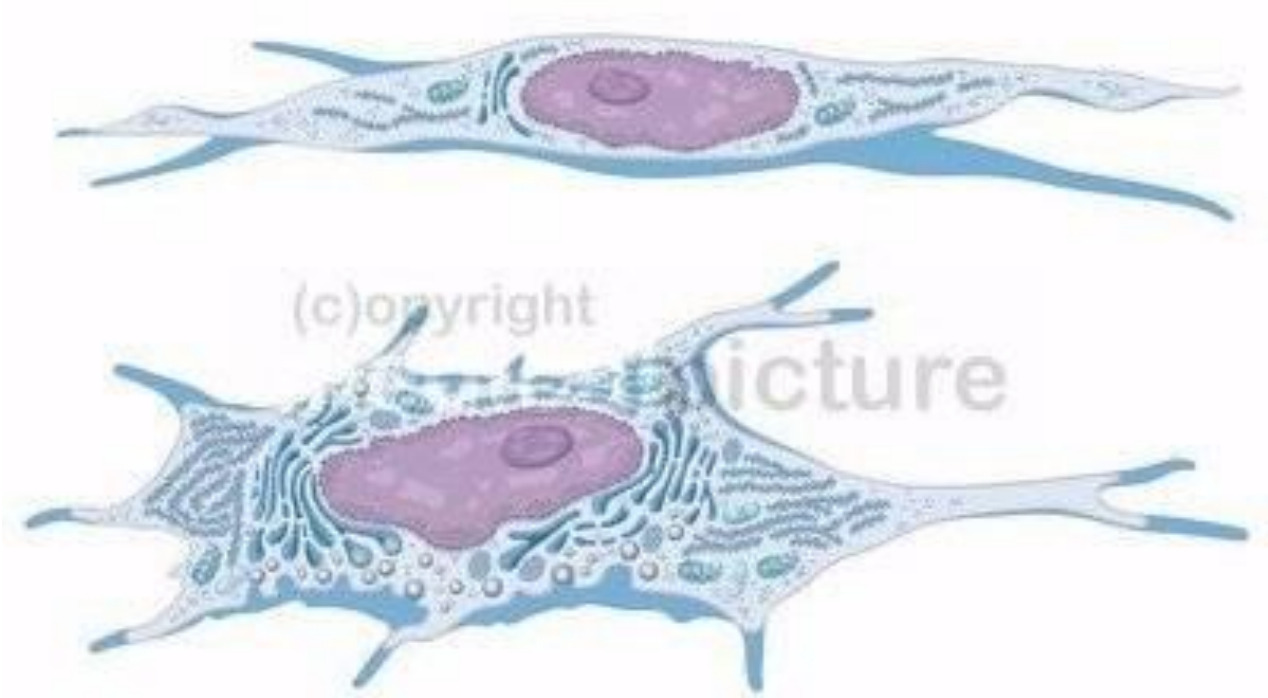




Core Concept

- Synthesize and secrete components of the ECM: fibers and ground substance.
- Active and quiescent stages (when quiescent sometimes called fibrocytes).
- Synthesize growth factors.
- Rarely undergo cell division unless tissue is injured, which activates the quiescent cells.
- Play a major role in the process of wound healing and respond to an injury by proliferating and enhanced fiber formation.

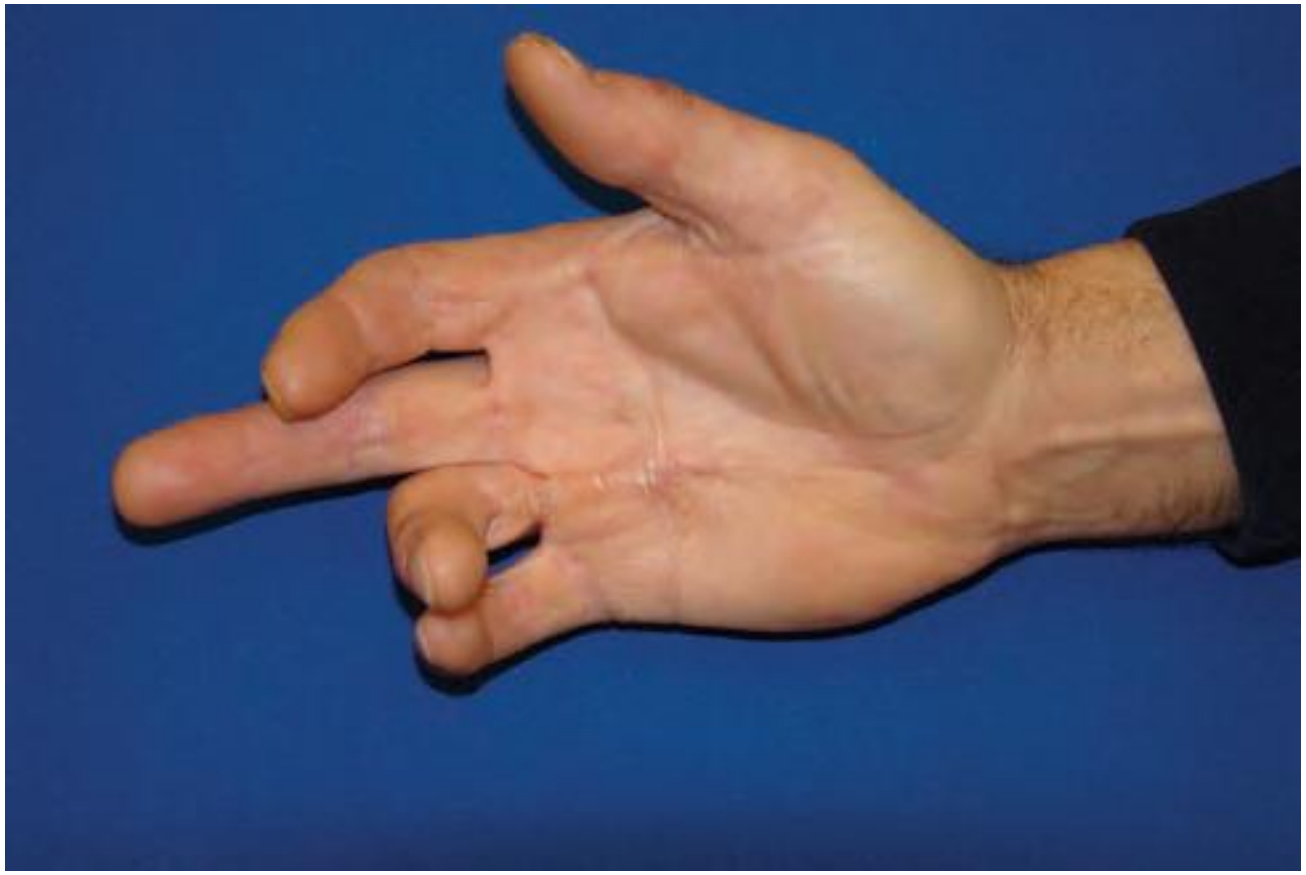
Core Concept



Myofibroblasts

- Myofibroblasts exhibits contractile property
- Longitudnally arranged actin
- Dense body similar to smooth muscles
- Differ from smooth muscles in various aspects
-

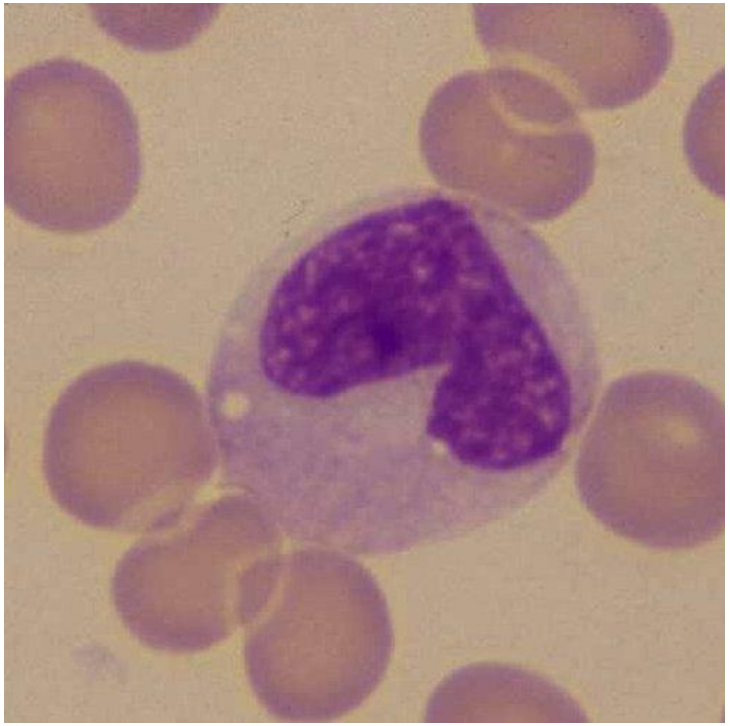
Vertical integration

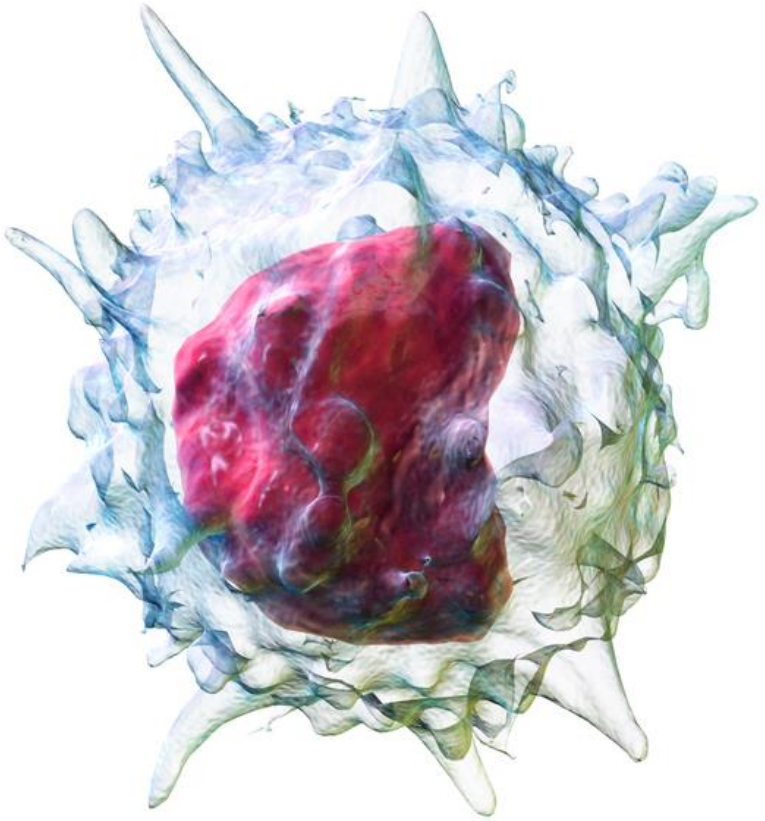


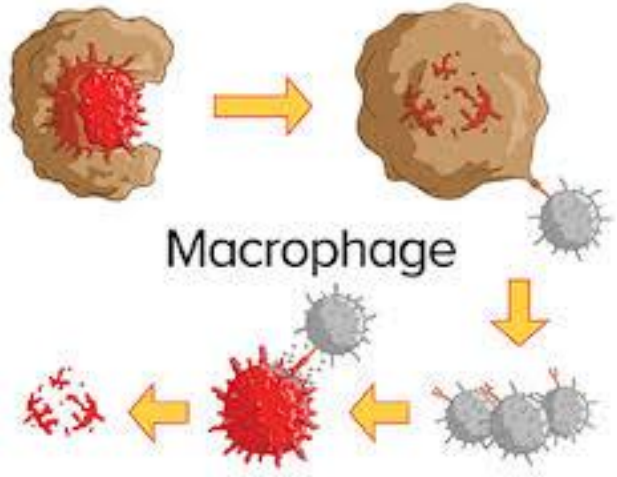
Macrophages & mononuclear phagocyte system

- Derived from monocytes
- Indented kidney shaped nucleus
- Phagocytic activity
- Langerhan cell, microglia, kupffer cells, dust cells, osteoclasts
- Under TEM
    - Fingerlike projections
    - Large golgi apparatus
    - Rer
    - Mitochondria
    - Secretory vesicles
    - Lysosomes

Core Concept







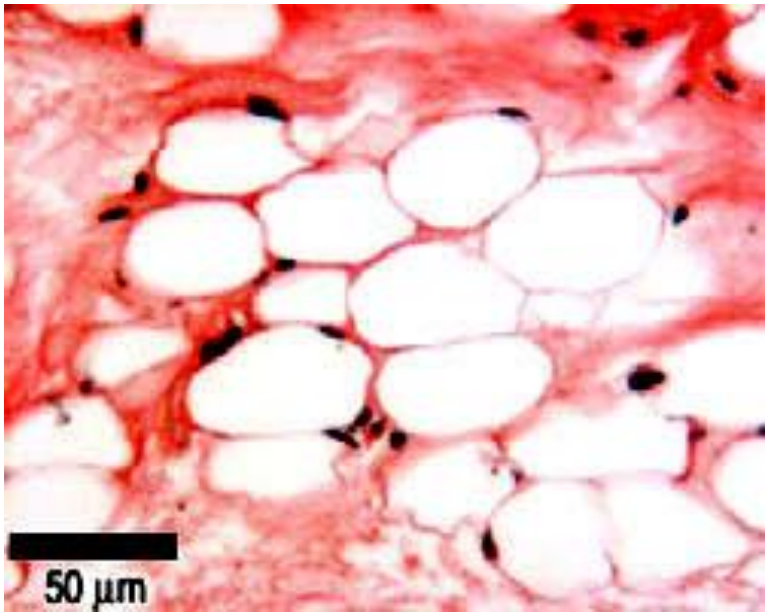
Mononuclear phagocytotic system cells

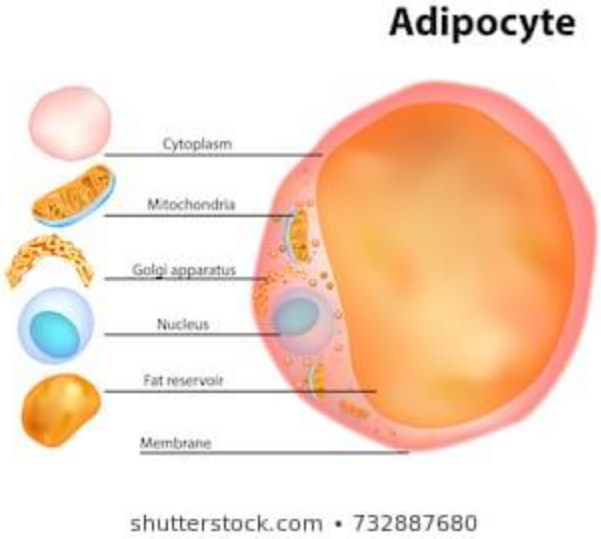
Cells of the Mononuclear Phagocytotic System	
Name of Cell	**Location**
Macrophage (histiocyte)	Connective tissue
Perisinusoidal macrophage (Kupffer cell)	Liver
Alveolar macrophage	Lungs
Fetal placental antigen-presenting cell (Hofbauer cell)	Placenta
Macrophage	Spleen, lymph nodes, bone marrow, and thymus
Pleural and peritoneal macrophage	Serous cavities
Osteoclast	Bone
Microglia	Central nervous system
Langerhans' cell	Epidermis
Fibroblast-derived macrophage	Lamina propria of intestine, endometrium of uterus
Dendritic cell	Lymph nodes, spleen

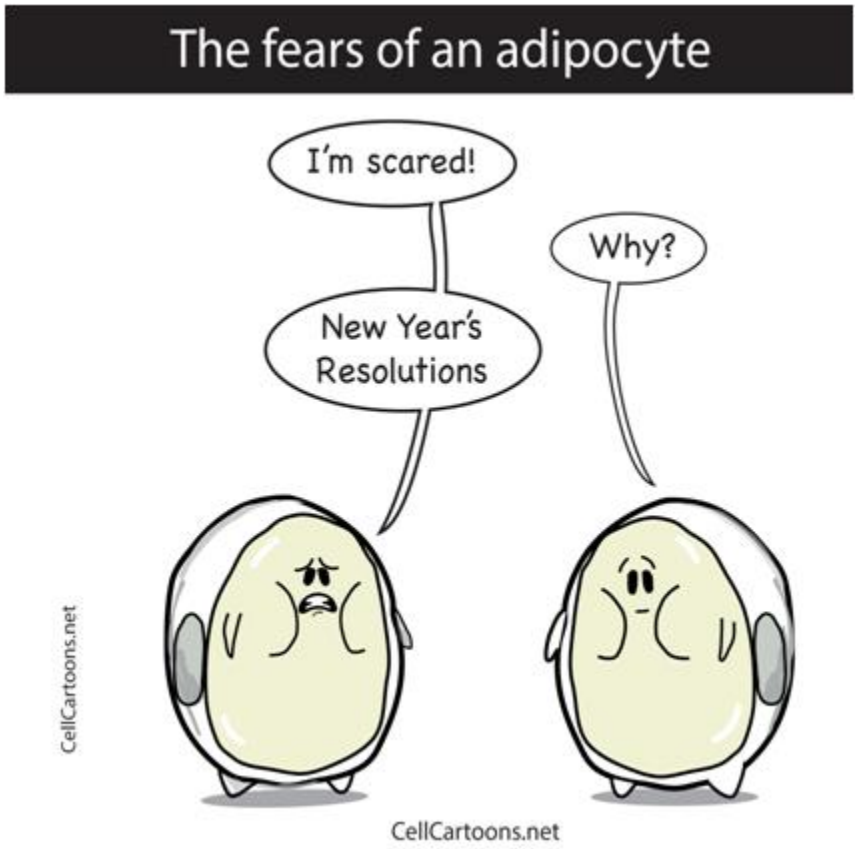
Core Concept

Cell Type	Location	Main Function
Monocyte	Blood	Precursor of macrophages
Macrophage	Connective tissue, lymphoid organs, lungs, bone marrow	Production of cytokines, chemotactic factors, and several other molecules that participate in inflammation (defense), antigen processing and presentation
Kupffer cell	Liver	Same as macrophages
Microglia cell	Nerve tissue of the central nervous system	Same as macrophages
Langerhans cell	Skin	Antigen processing and presentation
Dendritic cell	Lymph nodes	Antigen processing and presentation
Osteoclast	Bone (fusion of several macrophages)	Digestion of bone
Multinuclear giant cell	Connective tissue (fusion of several macrophages)	Segregation and digestion of foreign bodies

Adipocytes


50 µm

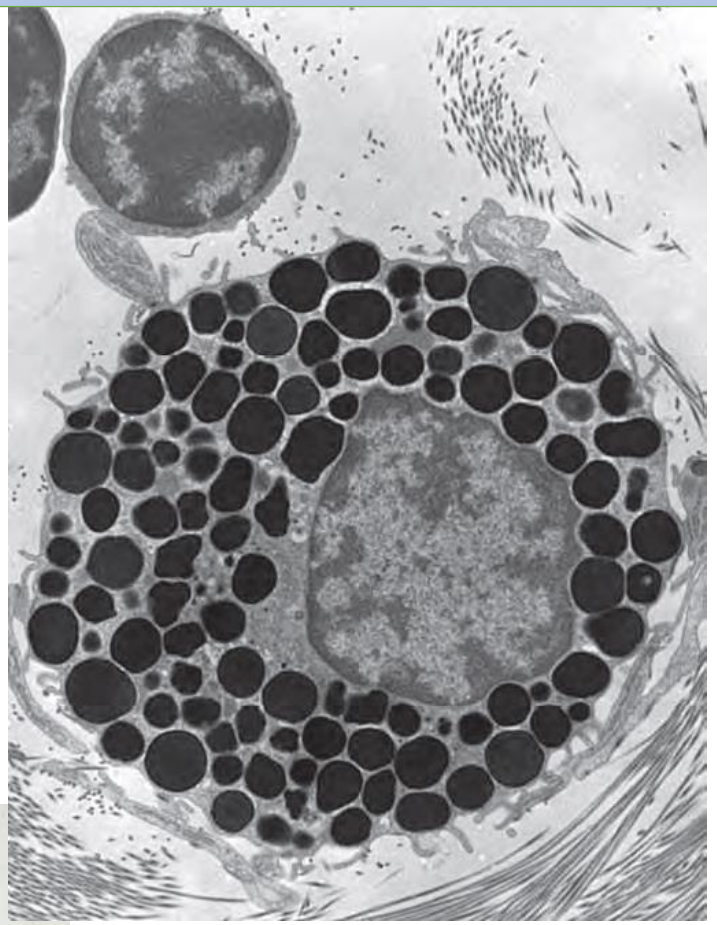

Adipocyte
Cytoplasm
Mitochondria
Golgi apparatus
Nucleus
Fat reservoir
Membrane
shutterstock.com • 732887680

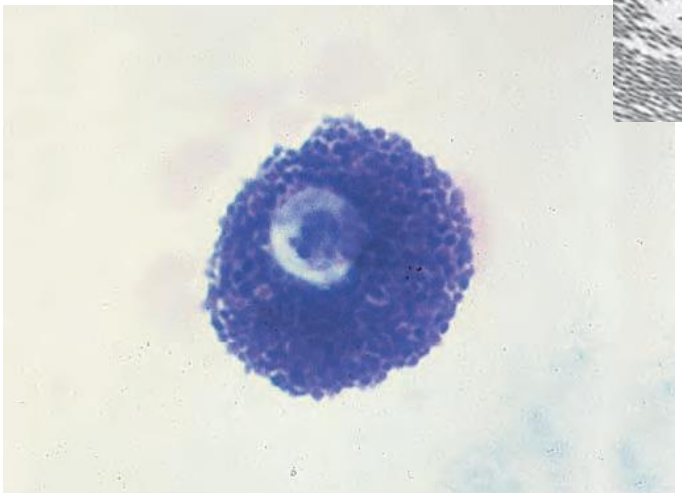

The fears of an adipocyte
I'm scared!
New Year's Resolutions
Why?
CellCartoons.net
CellCartoons.net

Mast Cells

Inflammatory response,and tissue repair
Metachromasia
Secrete

- heparin
- Histamin
- Serine protease
- Chemotactic factor
- Leukoterine c 4 ,d 4, e 4



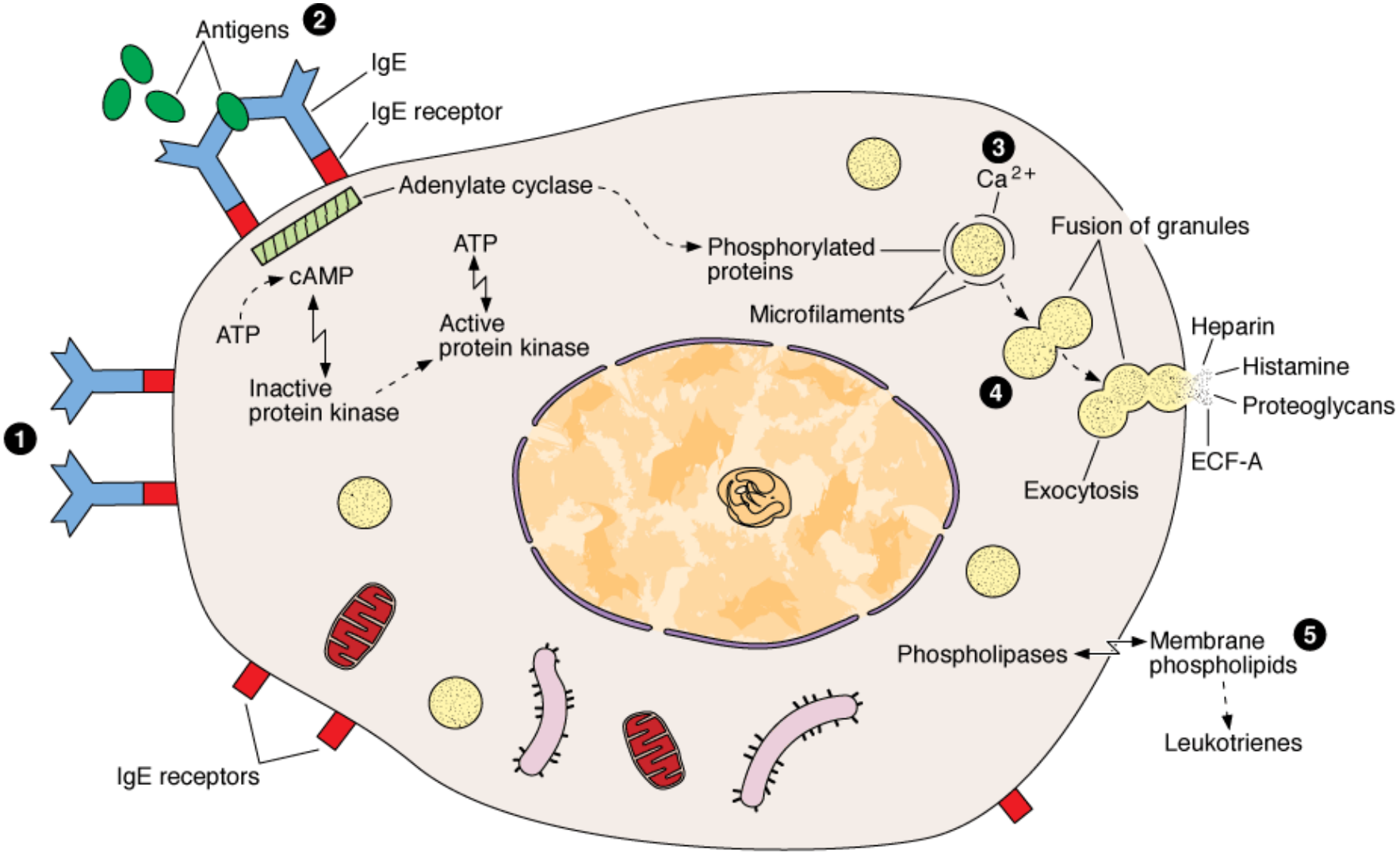


Mast Cells

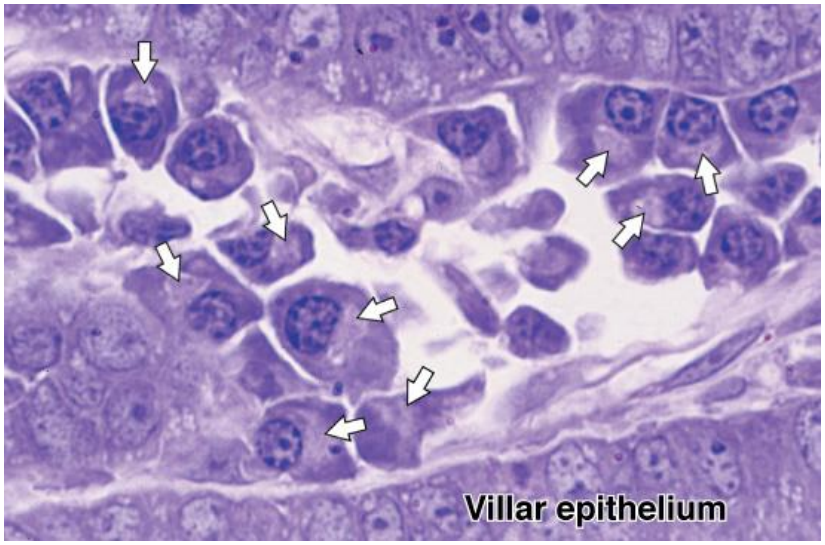
heparin
Histamin
Serine protease
Chemotactic factor
Leukoterine c 4 ,d 4, e 4

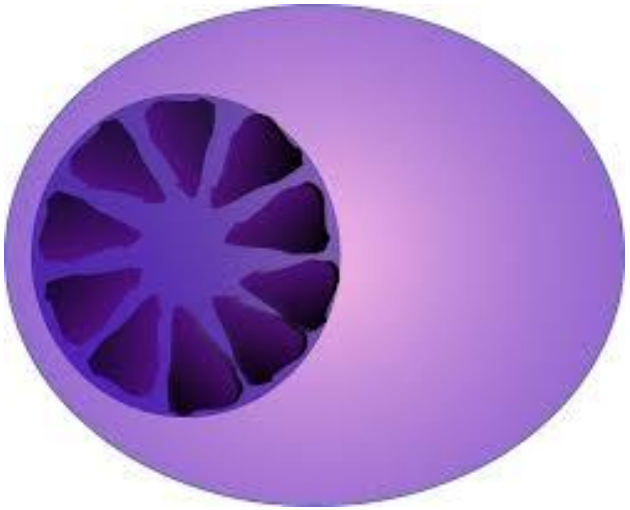
- Heparin
  - Anticoagulant
- Histamine
  - Smooth muscle contraction and increased vascular permeability
- Serine proteases
  - Mediater of inflammation
- Chemotactic factors
  - For eosinophils and neutrophils
- Leukoterine c 4 ,d 4, e 4
  - Slow reacting substances of anaphylaxix

Core Concept

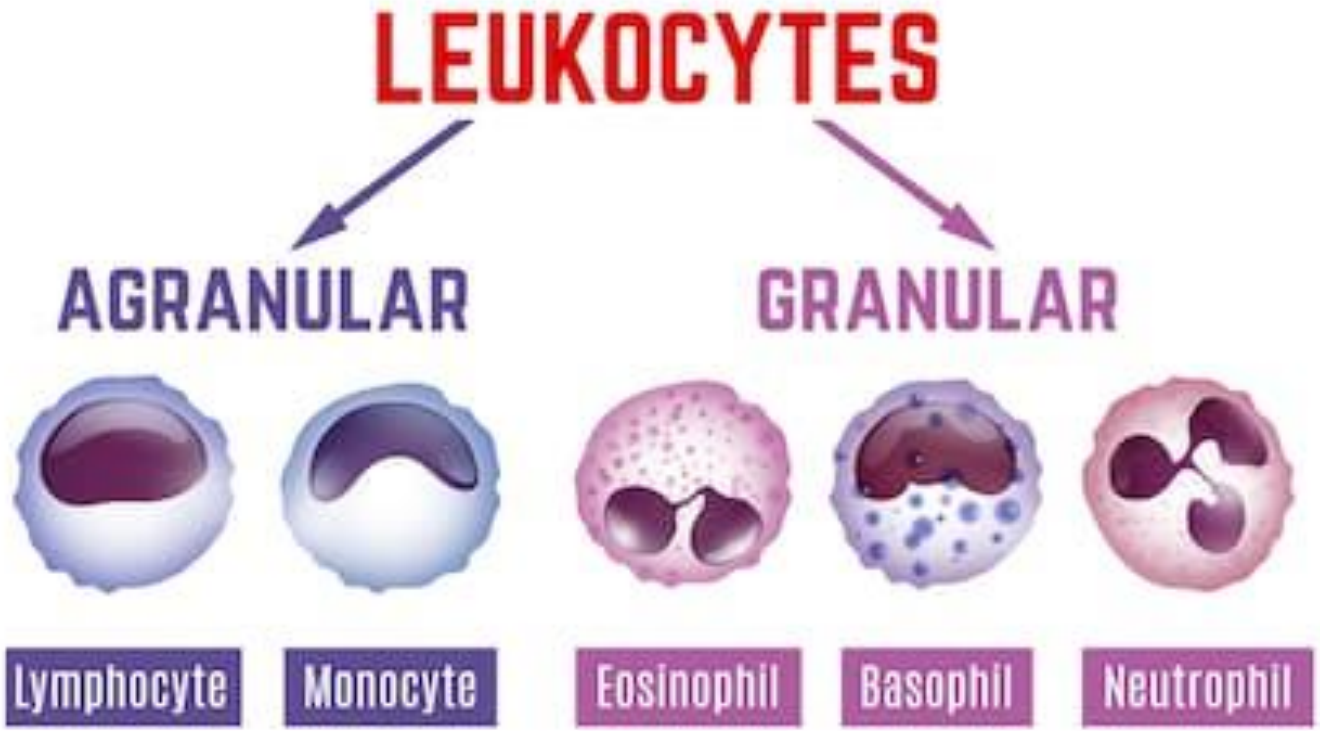


Plasma cells





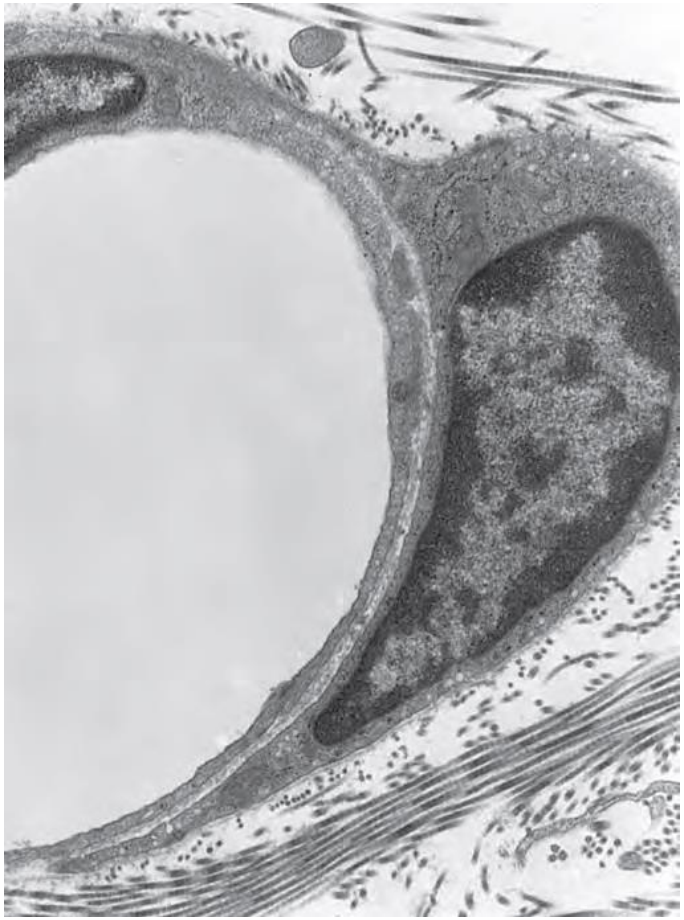
LEUKOCYTES


LEUKOCYTES
AGRANULAR
GRANULAR
Lymphocyte
Monocyte
Eosinophil
Basophil
Neutrophil
shutterstock.com • 1226857036

Adult stem cells

- Tissue stem cells
- Bone marrow stem cells
  - Multi potent adult progenitor stem cells (counterpart of embryonic stem cells)
  - Bone marrow stromal cells(chondrocytes, osteoblat, adipocytes, muscle and endothelial)
- Mesenchymal stem cells
  - Perivascular cells

ADULT STEM CELLS



Bio-Physiological Aspect

- Mast cells release inflammatory mediators
- Plasma cells produce IgE antibodies for immediate hypersensitivity reaction

Clinical Correlation

- Epitheliod cells/multinuclear giant cells (macrophages)
- Anaphylactic shock (mast cells)

Management by Family Physician

- **Diagnosis**: The family physician will start by conducting a thorough medical history and physical examination. They will assess the patient's hand mobility, palpate for nodules or cords in the palm or fingers, and inquire about any family history
- **Education and Counseling**: The physician will educate the patient about Dupuytren's contracture, explaining the condition, its progression, and available treatment options.
- **Monitoring**: In cases of mild Dupuytren's contracture with minimal symptoms, the physician may recommend regular monitoring to track disease progression and assess the need for intervention over time.
- **Referral to Specialists**: Depending on the severity of the condition and the patient's symptoms, the family physician may refer the patient to a hand surgeon, rheumatologist, or orthopedic

Bioethics

- **Informed Consent**
- **Access to Treatment**
- **Quality of Life:**Ethical considerations include weighing the potential benefits of treatment in terms of improving hand function and reducing disability
- **Research Ethics**:
- **Long-Term Care and Support**: Dupuytren's contracture is a chronic condition that may require long-term management and support. Ethical considerations include ensuring access to ongoing care, rehabilitation services, and support networks to help individuals cope with the physical, emotional, and social challenges associated with the condition

Research Article

- **Adult stem cells: hopes and hypes of regenerative medicine**
- Dulak J, Szade K, Szade A, Nowak W, Józkowicz
- Skin stem cells are used to heal severe burns, while limbal stem cells can regenerate the damaged cornea. Pluripotent stem cells, especially the patient-specific iPSC, have a tremendous therapeutic potential, but their clinical application will require overcoming numerous drawbacks. Therefore, the use of adult stem cells, which are multipotent or unipotent, can be at present a more achievable strategy.

How To Access Digital Library

- Go to the website of HEC National Digital Library.
- On Home Page, click on the INSTITUTES.
- A page will appear showing the universities from Public and Private Sector and other Institutes which have access to HEC National Digital Library HNDL.
- Select your desired Institute.
- 5. A page will appear showing the resources of the institution
- 6. Journals and Researches will appear
- 7. You can find a Journal by clicking on JOURNALS AND DATABASE and enter a keyword to search for your desired journal.

Learning Resources

- Junqueira's Basic Histology 12th Edition, Chapter 5
- Histology , A text and Atlas by Michael H.Ross 6th Edition, Chapter 6
- Google scholar
- https://pubmed.ncbi.nlm.nih.gov/?term=J%C3%B3zkowicz+A&cauthor_id=26200199