

Tissues – General

in multicellular organisms such as humans the huge size and complexity dictates that individual cells **specialize**

rather than performing all tasks each group of cells becomes specialized to do one or a few tasks very well (much more efficiently):

eg. muscle cells → contraction & movement
eg. bone cells → support
eg. blood → circulation

groups of similar cells performing similar functions
= **tissues**

tissue = cells and any secretions (=**matrix**) they produce

matrix = fibrous proteins + ground substance

histology = the study of tissues

all cells in human body can be classified into
4 general (=primary) tissue types

these tissues differ in:

- the shape and **structure** of the cells
- the kinds of **matrix** or secretions
- the nature of any **fibers** within the matrix

1. **epithelial**
2. **muscular**
3. **nervous**
2. **connective**

each of these primary tissue types can be further subdivided into specific subtypes of tissues

A. Epithelial Tissues

line all body and organ surfaces
both outer and internal:

eg. outer portion of skin
eg. outside and inside of stomach and intestine
eg. inner lining of blood vessels and heart

may also form secretory tissue and ducts of **glands**

tend to be arranged in thin sheets

cells tightly packed together
→ tight junctions

little or no matrix or fibers

avascular = no blood vessels directly supply its cells
→ receive nutrients and oxygen and get rid of wastes by diffusion from blood vessels in nearby tissues

typically the underlying connective tissues are richly supplied with blood vessels

Functions of Epithelial Tissues:

1. **protection**
often thickened by being layered or stratified from microbes, physical injury, water loss, etc
2. **absorption**
of food, water etc (intestine)
cells may have minute projections = microvilli which enhance absorption
3. **transport**
sometimes have cilia (tiny hairlike processes) that move things along a tube
eg. oviducts → move egg toward uterus
eg. respiratory tract → move dust and bacteria away from lungs
4. **filtration**
in kidneys
5. **gas exchange**
lungs
6. **secretion**
eg. form glands that secrete various substances
eg. mucous, sweat, digestive juices

B. Muscle Tissues

close to half of body consists of muscle tissue

elongated cells, spindle shaped, up to 1 ft long
= **muscle fibers**

very little matrix, instead embedded in framework of fibrous connective tissue

highly contractile and elastic

all cells contract to some degree, but muscle cells are much stronger and contract much more efficiently

eg. calf muscles can support 1 ton

muscle cells generally stop dividing at birth
(# fixed at birth)

but each cell can expand greatly in volume

Functions of Muscle Tissue:

1. **movement**
voluntary – skeletal muscles
involuntary – internal muscles
2. **posture**
3. **heat generation**

C. Nervous Tissues

our perceptions of the world around us and our responses to it are mediated by nervous tissue

nervous tissues are specialized for coordination and

control

they are:

- very sensitive to stimuli
- can conduct an impulse along their length

D. Connective Tissues

the most widespread and abundant type of tissue in the body

the most diverse in structure and function

most connective tissues are heavily vascularized

connective tissues have an abundance of **matrix**

→ the noncellular matrix often comprise the majority of the tissue volume

the nature of the matrix and the fibers it contains identifies the specific kind of connective tissue (the kinds of cells is not as important)

the matrix can be:

fibrous – loaded with protein fibers such as collagen
eg. fibrous connective tissue

gellike – soft and flexible, sometimes almost liquid
eg. loose or areolar connective tissue

hard, rigid – eg. bone

liquid – eg. blood

General Functions of Connective Tissue:

- 1. Glue**
eg. areolar tissue
- 2. Support & movement**
eg. bones & cartilage
- 3. Nutrient Storage**
eg. bones, adipose
- 4. Temperature Homeostasis**
eg. fat for heat production and cold insulation
- 5. Transport**
eg. blood, lymph

Some Diseases of Tissues

Marfan Syndrome

a hereditary defect in elastin fibers; 1 in 20,000 live births
some think Abe Lincoln had it
symptoms: hyperextension of joints, hernias of groin, vision problems; typically tall stature, long limbs, spidery fingers, spinal curvature
some have weakened heart valves and arterial walls; aorta sometimes enormously dilated

Brittle Bone Disease

=osteogenesis imperfecta

hereditary defect of collagen deposition in bones
bone fractures often present at birth
may have hearing impairment due to malformed ear bones
children sometimes mistaken for battered children
require very careful handling, braces and prompt treatment of fractures

Ehlers-Danlos Syndrome

mutation in collagen gene
abnormally long, loose collagen fibers
results in stretchy skin, loose joints, slow wound healing, abnormalities in blood vessels, intestines and urinary bladder