Tissues are groups of cells that share common function. Histology is the study of tissues. Tissues are roughly categorised into four major categories in multicellular organisms, demonstrating division of labour. We categorise tissue into two categories: animals tissue and plants tissue.

**Animal Tissue:**

Four primary types of animal tissue are-

1. Epithelial Tissue

2. Connective Tissue

3. Muscle Tissue

4. Nervous Tissue

**Epithelial tissues**:

These tissue cells produce a sheet-like structure that either covers the exterior surface or lines the internal processes. These tissues are classified as

1. simple (one layer thick, like the epidermis of skin),
2. stratified (two or more layers, like the lining of the oesophagus),
3. ciliated (like lung alveoli),
4. pseudostratified (only a single layer of cells, but it appears to have multiple layers because the cell nuclei lie at different levels and not all cells reach the apical surface).

Simple and stratified epithelial tissues are also categorised into the following kinds based on shape:

* Squamous—These are thin plate-like cells arrayed like tiles on the floor, such as the lining of the mouth, nose, blood vessels, and so on.
* Cuboidal—These cells have a cube shape, such as kidney tubules or thyroid vesicles.
* Columnar—These are cylindrical in shape, such as the lining of the intestine.
* Transitional—These cells alter shape as organs, such as the urinary bladder, stretch and relax.

These tissues' functions include protection, transport secretion, sensory reception, and so forth.

**CONNECTIVE TISSUE**

Connective tissues unite and connect parts of the body and organs. It is made up of three components:

* Cells
* fibres
* matrix (ground substance)

The following are the numerous forms of connective tissue:

(i) Areolar (ii) Adipose (iii) Reticular connective tissue

**(i) Areolar connective tissue**

These are composed of yellow and white fibres and cells, and (b) they serve as supporting and packing material, a passage for blood vessels, and a means of attaching the skin to the muscles.

**(ii) Adipose connective tissue**

It is made up of fat cells and

It offers insulation, stores body reserves, and acts as a shock absorber.

**(iii) Reticular connective tissue (Network)**

It is made up of branched fibres

It forms the foundation for a variety of vital organs such as the liver, spleen, tonsils, and so on.

In addition from these fundamental categories, bone and cartilage are supportive connective tissues, whereas blood is a fluid connective tissue.

**Bone**

It is a type of connective tissue that is both strong and flexible. It is composed of three primary connective tissue components.

(i) Matrix—A protein matrix that is extensively coated with calcium and magnesium salts such as phosphates and carbonates. Because of the presence of mineral salts, bones persist a long time, even after death.

(ii) Cells—Bone cells are known as oesteoblasts and osteocytes ("osteon"—bone, "cytes" cells), and they are organised in concentric lamellae around the Haversian canal. These cells are found in fluid-filled areas known as lacunae. Adjacent lacunae communicate with one another via a network of fine channels known as canaliculi.

(iii) Fibres—These are collagen fibres.

**Cartilage**

It is a flexible but less vascularised connective tissue than bone. Its structure is similar to bone, with a protein matrix and cells suspended in the matrix known as chondrocytes (chondroitin —cartilage, "cytes" —cells). Cartilage cells are found in groups of two or three in lacunae. It is found in flexible regions of the body such as the ear pinna, epiglottis, trachea rings, and so on.

|  |
| --- |
| **NERVOUS TISSUE OR NEURON**  Nervous tissue is made up of three main components: |

(1) Cell body with a conspicuous nucleus as well as strongly pigmented particles known as Nissl granules (ribosomes) and other cellular organelles.

(2) Many short processes known as dendrites accept information or impulses.

(3) An axon is a single, long process with fine branching at the ends. Axons of myelinated nerve fibres are lined by a lipid layer called the myelein sheath, which is interrupted at certain sites called Nodes of Ranvier.

**Plants Tissues:**

Plant tissues can be divided into plant tissue systems, each of which performs a specific purpose. A plant tissue system is a functional unit that connects all of a plant's organs. The plant tissue system is also divided into different tissues based on their functions. Plant tissues are divided into Meristematic tissue and Permanent tissues based on their ability to divide.

**Types of plant tissue**

**1. Meristematic tissue**

It is made up of a group of cells with the ability to divide. These tissues are made up of small, cuboidal, densely packed cells that divide to generate new ones. As they age, these tissues can stretch, enlarge, and differentiate into other types of tissues. Permanent tissues develop from meristematic tissues. Meristematic tissues are classified into three groups based on their location:

Apical meristems

Lateral meristems

Intercalary meristems

**2. Permanent tissue-**

These tissues have lost their ability to divide and are produced from meristematic tissues. They have reached their mature state. They are further classified into two types:

Simple

complex

**Simple permanent tissue**

**Parenchyma-** Tissues found in the soft sections of plants such as roots, stems, leaves, and flowers. This tissue's cells are loosely packed and have wide intercellular spaces between them. A vacuole is located in the centre of each cell. Storage, photosynthesis, and helping the plant float on water are all activities of parenchyma tissues.

**Collenchyma**- cells have stronger cell walls than parenchyma cells. They are intended to offer mechanical support to the plant structure in areas such as the leaf's petiole.

**Sclerechyma-** This tissue's cells are dead. They are stiff and have thick, lignified secondary walls. Their primary role is to offer strength and support to plant sections.

**Complex permanent tissue**

* Complex permanent tissues are made up of several types of cells, as opposed to simple permanent cells, which all appear the same and are made up of the same type of cell. These several types of cells collaborate to complete a task.
* Plant vascular bundles contain complicated permanent tissues called xylem and phloem.
* Xylem was created by tracheids, vessels, xylem parenchyma, and xylem fibres.
* Tracheids and vessels are hollow tube-like structures that let water and minerals move.

**Xylem:**

* The xylem only conducts in one direction, namely vertically.
* The xylem parenchyma is in charge of storing prepared meals and assisting in water conduction. The function of xylem fibres is supporting.

**Phloem**:

* It is made up of four components: sieve tubes, companion cells, phloem fibres, and phloem parenchyma.
* Unlike xylem, phloem flows in both directions.
* It is in charge of delivering food from the leaves to the rest of the plant. Except for the fibres, which are dead tissues, phloem contains living tissues.

**Protective tissue**

**Epidermis:**

* It is present in the outermost layer of the plant body such as leaves, flowers, stem and roots.
* It is one cell thick and covered with cuticle. Cuticle is a water proof layer of a waxy substance called cutin which is secreted by epidermal cells. Cuticle possess variable thickness in plants such as it is more thicker in Xerophytic plants.
* These cells are elongated and flattened and do not contain any intercellular space between them. There inner content are similar to parenchyma cells.
* Main function of epidermis is to protect the plant from desiccation and infection.
* Cuticle of epidermis helps to reduce water loss by evaporation from the plants surface as well as helping in preventing the entry of pathogens.

**Cork (phellem):**

* A strip of secondary meristem, calle phellogen or cork cambium replaces epidermis of stem.
* Cork cambium is a simple tissue having only one type of cells.
* The cells are rectangular and their protoplasts are vacuolated and contain tannins and chloroplasts.
* Cork is protective in function and prevents desiccation, infection and mechanical injury.

**Functions of plant tissues**

Plant tissues perform various tasks based on their structure and location.

• Contributes to the mechanical strength of organs.

• They aid in the suppleness and flexibility of the organs.

• They allow the tissues in various portions of a plant, such as the leaf, stem, and branches, to bend freely without hurting the plant.

• The xylem and phloem tissues aid in material transfer throughout the plant.

• They divide to make new cells and aid in plant growth.

• They aid in cellular metabolisms such as photosynthesis, regeneration, and respiration.

TIssuee:

Tissues are like the fabric of your body. In fact, the term literally means “woven.” When two or more tissues combine, they form our organs. Our kidneys, lungs, and liver, and other organs are all made of different types of tissues. But what function a certain part of your organ performs, depends on what kind of tissue it’s made of. This is the tissue that lines, and covers, and generally organizes your body, creating order during the disturbance in the body.

**Definition of Tissue**

Tissue are the groups of similar cells work together to perform their designated function and in doing so they form tissues which essentially are the very fabric of our body which holds us together, gives a shape to our organs. The study of human and animal tissues is known as histology. Xavier Bichat coined the term "tissue" in 1801.

**What are Tissues?**

* Tissues are clusters of cells that perform the same purpose. They can also be considered the building blocks of an organ. Tissue contributes to the formation of organs in a body.
* Each tissue carries out a specific function, such organisms with many tissues are called multicellular organisms. Multicellular organisms have tissues in their bodies which are placed at specific places to carry out specific functions, this is called **division of labor in the organism's body.**
* Each tissue has two components- cells and matrix. cluster of cells make tissue and matrix is a substance found between the cell. It is also called the extra cellular substance.
* Tissues are regarded as the most important component of human anatomy. Tissues in multicellular organisms are loosely classified into four basic types epithelial, connective, muscle and nervous tissue.

**Types of Animal Tissues**

* Animals require tissues for more than just physical reasons since they travel from place to place. Almost all tissues in animals are living tissues. These tissues require nutrition, which they obtain from the organism's body.
* Because animals have homogeneous growth throughout their bodies, tissues split and disseminate throughout their body parts. Blood is a connective tissue in the human body that helps carry nutrients, hormones, and waste products.

**Functions of animal tissue:**

* These tissues functions include protection, transport secretion, sensory reception.
* Provide the Maintenance of posture, Generation of heat (thermogenesis) etc.
* Provide movement of the internal organs.

Four primary types of animal tissue are-

1. Epithelial Tissue
2. Connective Tissue
3. Muscle Tissue
4. Nervous Tissue

**1. Epithelial tissues:**

These tissue cells produce a sheet-like structure that either covers the exterior surface or lines the internal processes. These tissues are classified as-

* **simple** (one layer thick, like the epidermis of skin)
* **stratified** (two or more layers, like the lining of the oesophagus
* **ciliated** (like lung alveoli)
* **pseudostratified** (only a single layer of cells, but it appears to have multiple layers because the cell nuclei lie at different levels and not all cells reach the apical surface).

**Functions:**

To provide-

* protection
* secretion
* absorption

Simple and stratified epithelial tissues are also categorised into the following kinds based on shape:

* **Squamous**—These are thin plate-like cells arrayed like tiles on the floor, such as the lining of the mouth, nose, blood vessels, and so on.
* **Cuboidal**—These cells have a cube shape, such as kidney tubules or thyroid vesicles.
* **Columnar**—These are cylindrical in shape, such as the lining of the intestine.
* **Transitional**—These cells alter shape as organs, such as the urinary bladder, stretch and relax.

**2. Connective Tissues:**

Connective tissues unite and connect parts of the body and organs. It is made up of three components:

* Cells
* fibres
* matrix (ground substance)

**Functions:**

* To provide binding and structural support.
* To provide protection.
* To provide Transport.
* To provide Insulation.

The following are the numerous forms of connective tissue:

**(i) Areolar (ii) Adipose (iii) Reticular connective tissue**

**Areolar connective tissue**

* These are composed of yellow and white fibres and cells
* They serve as supporting and packing material, a passage for blood vessels, and a means of attaching the skin to the muscles.

**Adipose connective tissue**

* It is made up of fat cells.
* It offers insulation, stores body reserves, and acts as a shock absorber.

**Reticular connective tissue**

* Made up of branched fibres
* Forms the foundation for a variety of vital organs such as the liver, spleen, tonsils.

Bone and cartilage are supportive connective tissues, whereas blood is a fluid connective tissue.

**Bone (Osseous Tissue)**

It is a type of connective tissue that is both strong and flexible. It is composed of three primary connective tissue components.

1. **Solid Matrix**
   * A protein matrix coated with calcium and magnesium salts such as phosphates and carbonates.
2. **Cells**
   * Bone cells are known as oesteoblasts and osteocytes. These cells are found in fluid-filled areas known as lacunae.
3. **Fibres**
   * These are collagen fibres.

**Cartilage**

* It is a flexible but less vascularised connective tissue than bone.
* Its structure is similar to bone, with a protein matrix and cells suspended in the matrix known as chondrocytes.
* Cartilage cells are found in groups of two or three in lacunae. It is found in flexible regions such as the ear pinna, epiglottis, trachea rings.

**3. Muscular Tissue:**

**Functions:**

* Movement
* Body Posture
* Contraction
* Relaxation

These are of 3 types-

**Skeletal or Striated Muscle Fibres**

* Alternate light and dark bands aer present in these fibres.
* The fibres are cylindrical, multinucleate with peripheral nuclei.
* They are voluntary and attached to the skeleton.

**Smooth Muscle Fibres**

* There fibres have no stripes.
* These are spindle-shaped, pointed at both the ends, bear a single nucleus which is central.
* They are involuntary and present in internal organs.

**Cardiac Muscle Fibres**

* These are striped muscular fibres as well. There form branch like structure. The existence of "tight junctions" suggests that these are multinucleate with central nuclei. They are found in the heart and are involuntary.
* Their primary purpose is to contract the heart.

**4. Nervous Tissues (Neuron):**

Nervous tissue is made up of three main components:

1. **Cell body-** with a conspicuous nucleus as well as strongly pigmented particles known as Nissl granules (ribosomes) and other cellular organelles.
2. **Dendrite-** Many short processes known as dendrites accept information or impulses.
3. **An axon-** a single, long process with fine branching at the ends. Axons of myelinated nerve fibres are lined by a lipid layer called the myelein sheath, which is interrupted at certain sites called Nodes of Ranvier.

**Types of Plant Tissues**

* Plants do not have the same tissues as humans, and their movement is limited. Plants require dead tissues for mechanical support, hence they do not require living tissues.
* Plants have two types of tissues: those that divide and those that do not divide. Plants do not grow uniformly throughout their bodies; instead, growth is restricted to some areas, which contain tissues that can divide.
* Plant tissues can be divided into plant tissue systems, each of which performs a specific purpose.
* A plant tissue system is a functional unit that connects all of a plant's organs. The plant tissue system is also divided into different tissues based on their functions.
* Plant tissues are divided into Meristematic tissue and Permanent tissues based on their ability to divide.

**1. Meristematic tissue**

* Made up of a group of cells with the ability to divide.
* They are small, cuboidal, densely packed cells that divide to generate new ones.
* These tissues can stretch, enlarge, and differentiate into other types of tissues.
* Meristematic tissues are classified into three groups based on their location:
  + Apical meristems
  + Lateral meristems
  + Intercalary meristems

**Functions:**

* Provide photosynthesis, storage and secretion.
* provide mechanical support to the growing parts of the plant.
* Help in the mechanical strength of organs, flexibility of the organs.

**2. Permanent tissue**

These tissues have lost their ability to divide and are produced from meristematic tissues. They have reached their mature state. They are further classified into two types:

* Simple
* complex

**Functions:**

* The xylem and phloem tissues help in material transfer throughout the plant.
* They divide to make new cells and aid in plant growth.
* They aid in cellular metabolisms such as photosynthesis, regeneration, and respiration.

**Simple permanent tissue**

These are made from Parenchyma, Collenchyma and Sclerechyma.

* **Parenchyma**
  + Found in the soft sections of plants such as roots, stems, leaves, and flowers.
  + Tissue cells are loosely packed and have wide intercellular spaces between them.
  + A vacuole is located in the centre of each cell.
  + Storage, photosynthesis, and helping the plant float on water are all activities of parenchyma tissues.
* **Collenchyma**
  + cells have stronger cell walls than parenchyma cells.
  + They are intended to offer mechanical support to the plant structure in areas such as the leaf's petiole.
* **Sclerechyma**
  + This tissue's cells are dead.
  + They are stiff and have thick, lignified secondary walls.
  + Their primary role is to offer strength and support to plant sections.

**Complex permanent tissue**

* Made up of several types of cells, as opposed to simple permanent cells.
* Plant vascular bundles contain complicated permanent tissues called xylem and phloem.
  + Xylem was created by tracheids, vessels, xylem parenchyma, and xylem fibres.
  + Tracheids and vessels are hollow tube-like structures that let water and minerals move.

**FAQs on Tissue:**

**Q1: What are tissues?**

There are 4 basic types of tissue: connective tissue, epithelial tissue, muscle tissue, and nervous tissue. Connective tissue supports other tissues and binds them together (bone, blood, and lymph tissues.

**Q2: What is the function of tissue?**

A group of cells that have similar structure and function together as one unit is known as tissue. Tissues provide shape to the body and help body to conserve heat and store energy. There are four types of tissues: Connective tissue, Epithelial tissue, Muscle tissue and Nervous tissue.

**Q3: What is permanent tissue?**

Permanent tissues are a group of living or dead cells which are formed by meristematic tissues that have lost their ability to divide. That is, these tissues have undergone differentiation and are incapable of meristematic activities.

**Q4: What is human tissue?**

Human body tissue makes up organs and other body parts. There are four types of tissue: muscle, epithelial, connective and nervous. All tissues are made up of specialized cells that are grouped together according to structure and function. Muscle is found throughout the body and even includes organs such as the heart.

**Q5: Who discovered tissue?**

The concept of tissues can be traced back to 1801 when it was introduced by Xavier Bichat, a French anatomist and pathologist. He had proposed that tissues are a central element in human anatomy, concluding that organs are essentially a collection of distinct tissues.