MSC BOTANY

ANATOMY

CAMBIUM -3

CORK CAMBIUM

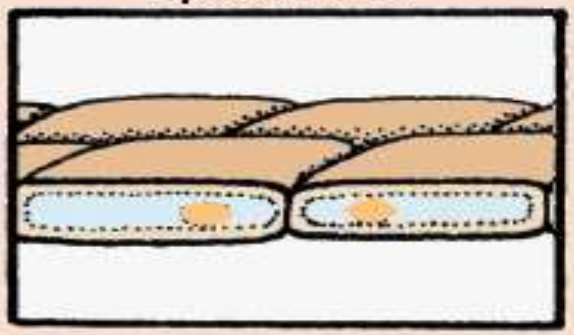
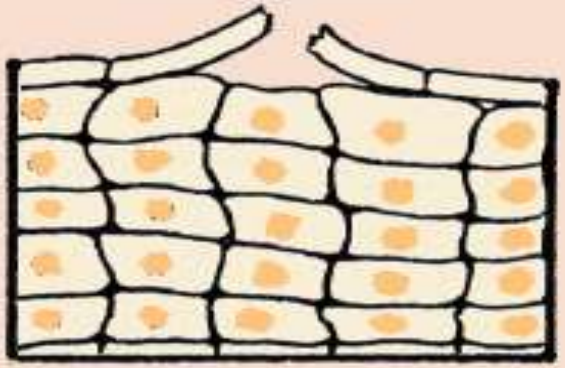
PREPARED BY
RAMYA.M
DEPT OF BOTANY,LF COLLEGE
,GURUVAYOOR

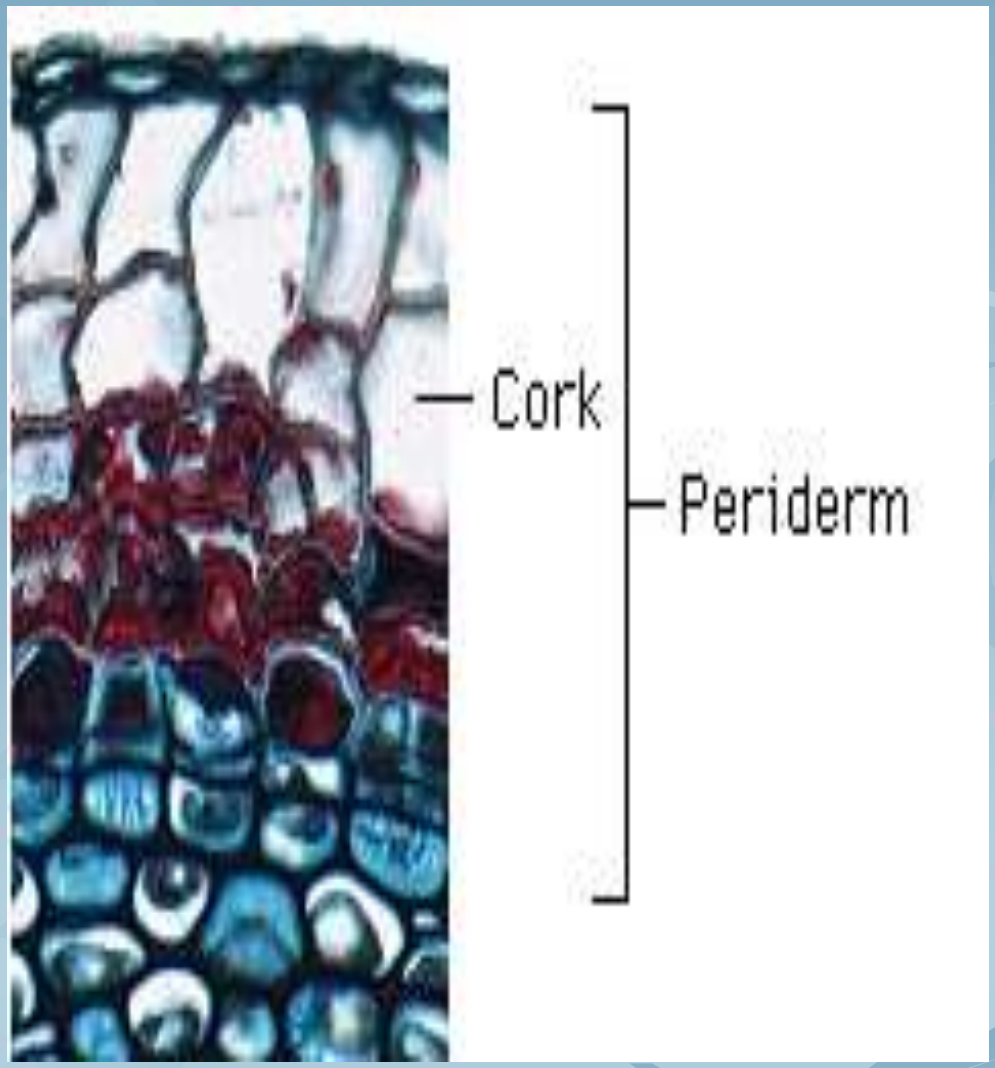
There are two types of cambium

- Cork cambium
- Vascular cambium

- Cork cambium is a tissue found in many vascular plants as part of the periderm.
- The cork cambium is a lateral meristem and is responsible for secondary growth that replaces the epidermis in roots and stems.
- It is not found in many herbaceous dicots and some monocots, which usually lack secondary growth.
- It is a secondary meristem . It is simple than vascular cambium
- It consists of only one type of initials
- There is no intercellular spaces in phellogen except at lenticels

- The function of cork cambium is to produce the cork, a tough protective material.
- Synonyms for cork cambium are **bark cambium, pericambium or phellogen**.
- Phellogen is defined as the meristematic cell layer responsible for the development of the periderm.

	Characteristics:	Function:
Epidermis 	Flat cells, often with thick outer walls Aerial parts often covered with waxy cuticle	Protection in young plants
Periderm 	Waterproof cells with thick cell walls Dead at maturity	Forms outer bark in trees


Cork
Periderm

Origin of cork cambium

- During secondary growth of a plant ,the cork cambium is periodically replaced by a new one
- The development of first phellogen may take place in different cell layers external to vascular cambium

1. In many stem phellogen is formed in the epidermis eg: Quercus suber
2. In Aristolochia ,Pinus etc phellogen forms in 2nd or 3rd cortical layer
3. In Thuja ,Vitis the first phellogen develops near the phloem or in the phloem itself

4. In roots of gymnosperms, and dicots the first phellogen is formed usually in the pericycle

5. In roots of monocots,phellogen develops from outer layer of cortex

The cork cambium exhibits periods of activity or inactivity. In some plants, the periods of the activity of the cork cambium and vascular cambium coincides.in other plants their activity do not coincide

Factors that affect phellogen activity and initiation

- In certain plants ,phellogen was found to be active under combination of short day and high temperature or long day and low temp.
- Gibberlic acid and Naphthalene Acetic acid were reported to have retarding effect on phellogen initiation
- In Eucalyptus ,high humidity and continuous flush of oxygen were found to cause initiation of phellogen

Periderm:during the sec. growth ,primary protective tissue (epidermis and cortex) rupture . It is replaced by the secondary protective tissue called the periderm . The function of cork cambium is to produce periderm

The periderm consists of three different layers:

- Phelloderm
- Phellogen (cork cambium) and
- Phellem.

- Cells that grow inwards from the phellogen are termed *phelloderm*,
- cells that develop outwards are termed *phellem* or cork (similar with vascular cambium).

Phellum(cork):

The cells of phellogen undergo periclinal division to produce cells towards the periphery(outerside).they constitute the phellum. The cells on maturation become dead. Their primary walls are suberised and often contain thick suberin layer interior to primary wall. This makes the phellem cells extremely resistant to chemical and enzymatic attack . In some plants nonsuberised cells occur in phellum called phelloids. The cells of phellum are arranged in radial rows without intercellular spaces.

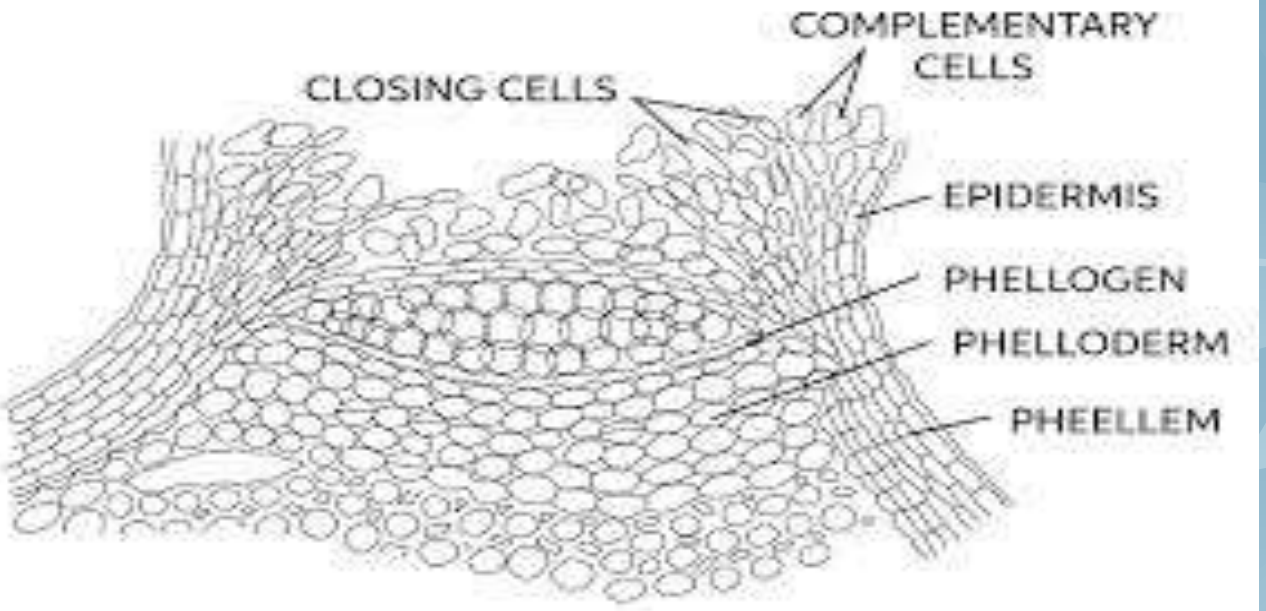
Phelloderm or secondary cortex

- The cells produced by the phellogen towards the inner side constitute the phelloderm. They are living parenchyma cells with non suberised walls . One single layer is most common , and 3-4 are usually the maximum amount

Lenticel

- The periderm will not allow the movement of carbondioxide and oxygen through it, because of the compactly packed ,suberised cells of the phellum . So at certain regions of periderm , the phellogen produces loosely arranged cells with intercellular spaces (instead of phellum). These cells are called complimentary cells. **This region is called lenticel** .since complimentary cells are more loosely packed than the surrounding phellum cells , they form protuding regions in the bark . The complimentary cells push the overlying epidermis and cortex outward and finally rupture them ,permitting gaseous exchange

- The complimentary cells can easily weather off . To hold them in place ,phellogen periodically produces a layer of cells that are smaller ,compact and firmly interconnected. This is a closing layer.it holds complimentary cells intact and also checks gaseous exchange during unfavourable seasons



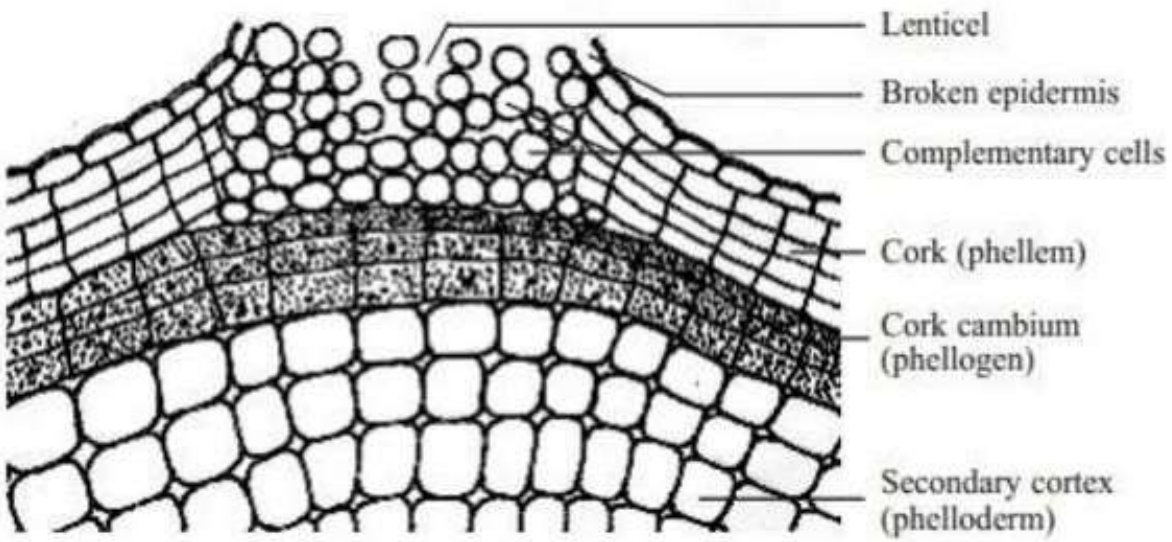


Fig. . Structure of a lenticel

Periderm of monocot

- Most monocots undergo no secondary growth , but many of them have bodies that persist or many years
- In most of these ,epidermis is the only protective tissue. To be effective for such a long time the cells usually become sclerified
- Some monocots ,such as many palms ,become very large even though they donot have a vascular cambium

- Two types of periderm have been found in monocots.
- The first is identical to that of dicots and second type is called storied cork
- Bands of parenchyma cells in the ground tissue become active and undergo divisions.the divisions are periclinal and are repeated for several times until a linear series of about 4-8 rows of cells are formed . The daughter cells becomes suberised to form storied cork and some can develop into sclereids. This process may be repeated in deeper layers of parenchyma

Wound periderm

- Whenever a plant is wounded , the removal of the protective epidermis or periderm leaves the plant exposed to desiccation and attack by fungi ,bacteria and insects. The wound must be sealed quickly and effectively if the plant is to survive . In most dicots and monocots the wound is closed by two step process

1. The formation of a closing layer and
2. The subsequent formation of a wound periderm

- The closing layer is formed as the broken cells die and the adjacent cells react by depositing suberin and lignin in their walls . The closing layer provides immediate temporary protection
- Just interior to it ,other living cells are converted to a new phellogen
- This initiates the production of phellum ,forming a wound periderm
- This periderm isolates and kills the closing layer,which may soon peel away and fall off
- Many monocots and small number of dicots donot form a wound periderm

BARK

- All the tissues **external to the vascular cambium** are referred by the **term bark**. That is the periderm , the remaining primary tissues and secondary phloem . With the formation of each subsequent layers of periderm , the exterior to the youngest layer become cut off from nutrient and water supply and so dies.
- As a result of this a hard outer crust develops on the surface of the stem

- This crust increases in thickness due to the addition of further cork layers
- All the tissues external to the innermost phellogen are termed rhytidome or outer bark
- The living part of the bark inside the rhytidome is often termed inner bark
- With increase in diameter of secondary xylem ,the circumference of cambial cylinder enlarges
- So the inner bark is brought under a strain .this strain is accomodated by the production of expansion tissue and proliferation tissue

POLYDERM

- In certain species of Rosaceae ,Myrtaceae etc. a special phellogen is formed in the pericycle of root and underground stem
- This phellogen produces a few layers of thin walled non suberised cells which alternate with a layer of endodermal like cells. Casparian thickening appear on the wall of these endodermal cells which by further devpt form a suberised layer.this type of complex tissue is called polyderm


Thank you.