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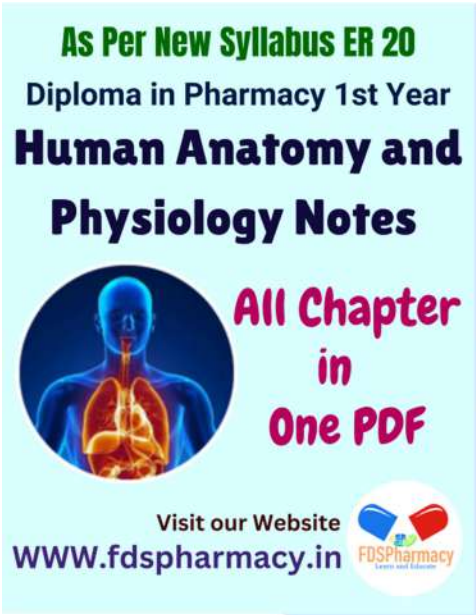
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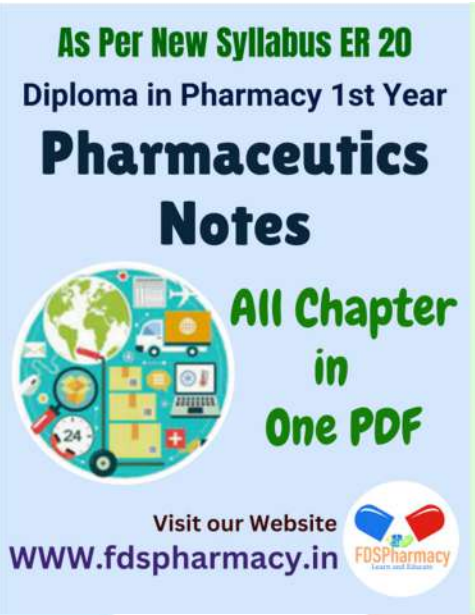
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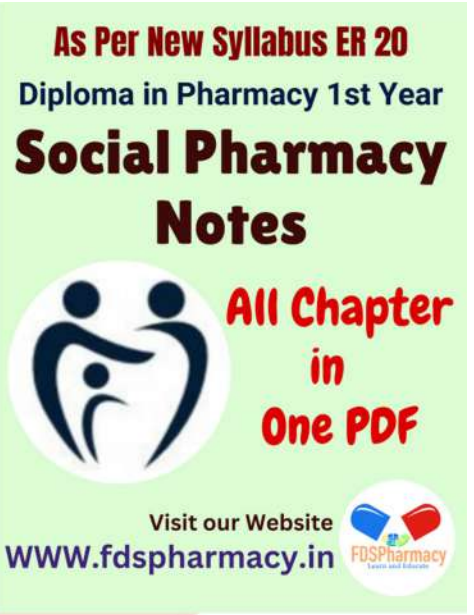
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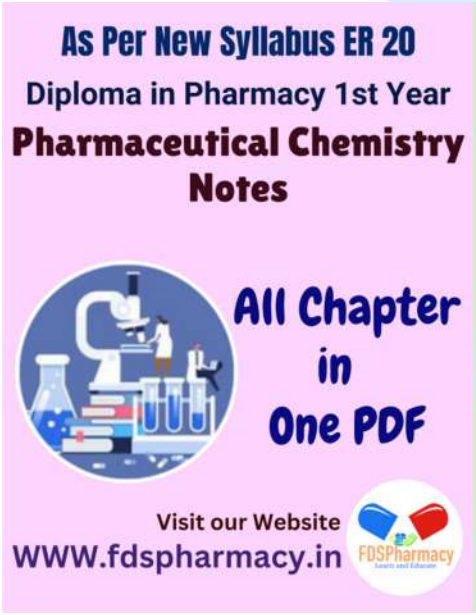
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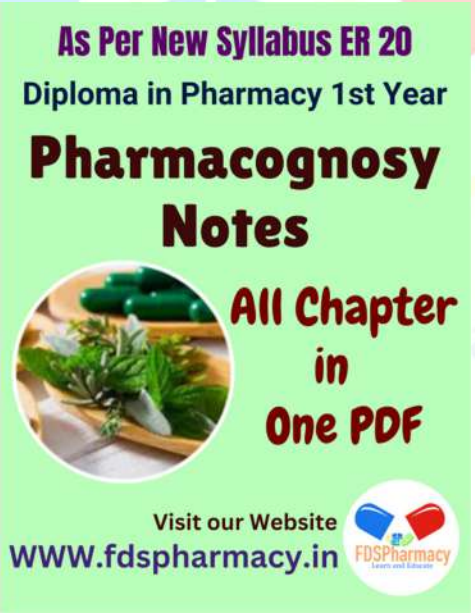
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Link in Description

Diploma in Pharmacy 1st Year
Pharmacognosy
Chapter 6 : Plant Fibres used as surgical dressings

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Chapter 6

Plant Fibres used as surgical dressings

- Fibres are elongated cells having thick walls and pointed ends.
- The cell walls consist of cellulose but the presence of lignin is not confirmed, i.e., it may or may not be present.
- They can be obtained from different parts of plants like leaf which is fibrous, pliable, strong, and green.
- Fibrous, pliable, and green leaves are the source of fibres.
- A leaf which can be curled around a finger without breaking is a potential source of fibres.
- The natural fibre-reinforced polymer composite materials are rapidly being used in industries as well as in fundamental researches.
- Fibres are also chemically synthesised from various materials.

Classification

Fibres are classified based on their source

Source	Fibres
Plant Fibres	Jute, Flax, banana, Cotton, and Hemp
Animal Fibres	Silk and Wool
Regenerated and Synthesis fibres	Nylon, terylene, and orlon
Mineral Fibres	Glass, and Asbestos

Uses

- They are used for making ligatures, oiled silk, surgical dressinges
- They are used for making lint and gauza.
- They are used in textile industries for weaving clothes
- They are used as filtering medium and straining medium
- They are used for insulation purpose.

Study of Fibres

→ Few examples of fibres which are used in pharmacy for different purposes :

- Cotton
- Silk
- Wool
- Regenerated fibre (rayon)

Cotton

→ Cotton fibres are soft, fluffy, and staple.
→ Cotton grows in a ball, or protective case, around the seeds of cotton plants.
→ It is one of the world's leading agricultural crops which are produced economically in huge quantities.
→ Large scale production of cotton is also making cotton products inexpensive.

Synonyms

- Raw cotton,
- Cotton wool,
- Purified cotton,
- Absorbent cotton, and
- Surgical cotton.

Source

➢ Cotton is the epidermal trichomes or hair of the seeds of cultivated species of Gossypium (Gossypium herbaceurre, and Gossypium barbadense).

Family

▪ Malvaceae

Cultivation and Collection Cotton

- Cotton plant is found as a perennial in tree-like plants. These plants grow well in tropical climates

Preparation

❖ After the cotton plant has reached its flowering stage, it bears fruits known as capsules or balls. The fruits contain 3-5 cells. The ripe fruits containing a number of seeds in each loculus open up widely. The seeds are brown coloured and are encircled with a thick mass of white hairs (cotton fibres). The long-lint hairs are staple or floss, while the short-fuzz hairs are linters. The cotton fibres and their seeds are collected by hand.
❖ The collected raw cotton is mechanically processed by ginning in which the hairy substance is separated from the undesired substances (dirt, leaf-fragments, and other foreign materials).
❖ Cotton is also subjected to delintering process in which the short hairs which pass along with the cotton fibres obtained from the ginning process are removed.
❖ From the raw long-sized cotton hairs obtained by separation, colouring matters and traces of wax and oil coating the hairs (making them non-absorbent) are removed.
❖ The so treated absorbent cotton is passed through the carding machine which arranges the fibres in parallel direction and also frees them from immature fibres completely.
❖ Short fibres are again removed mechanically by the process of combing.
❖ In the final step, the processed cotton fibres are defatted with alkali, washed, bleached with chlorinated soda, washed again with diluted mineral acid, dried, and sterilised.

Organoleptic Evaluation

- **Colour :** White due to bleaching; off-white when sterilised.
- **Odour :** Odourless
- **Taste :** Tasteless
- **Size :** Cotton fibres are 2.5-4.5 cm in length and 25 – 35 micron in diameter

Chemical Constituents

- Raw cotton contains cellulose (about 90%), moisture (7- 8%), and natural impurities (4-6%) such as wax, fat, and protoplasm remnants.

Uses

- ✓ They are used as a filtering medium.
- ✓ They are also used as an insulating material.
- ✓ Absorbent cotton is used in surgical dressings to absorb blood, mucus, pus and prevent the wounds from infections.

Silk

→ Silk is a natural protein fibre which can be woven intoo textiles. The protein present in silk is fibroin and is produced by certain insect larvae to form cocoons.

Synonyms

- Mantua,
- Pongee,
- Samite, and
- Sendal.

Source

- ➢ Silk is the fibre obtained from the cocoons of Bombyx mori (Mulberry silkworm) and other species of Bombyx and also from Antheraea species.

Family

- ▪ Bombycidae

Preparation

Cultivation of Silkworms
Hatching
Moulting
Spinning the cocoon
Sorting cocoon
Softening the Sericin
Reeling the filament

Steps	Description
Cultivation of Silkworms	Silkworm is the caterpillar of small half moths belonging to “bombyx" which lives only on leaves of mulberry tree. The silkworm spent their entire life in eating these leaves,
Hatching	Eggs of silkworm are warmed up for hatching in winter by spreading them over the trays in the hatching shed and chopped leaves of mulberry trees are spread on the perforated paper. For eating the leaves, the worm climbs through the holes.
Moulting	After 35 days of hatching, worm Is 10,000 times iis heavy as it was bom. Worm becomes greenish white caterpillar, and starts spinning; and the silkworm built its cocoon to settle down in it.
Spinning the Cocoon	The liquid silk comes from two glands called spinneret in the silkworm head. As the liquid comes out, it is hardened into very fine filaments which are coated by a gummy substance called sericin which comes from other two glands nearly.
Sorting Cocoons	The cocoons are sorted according to colour, size, shape, and texture, as all these affect the final quality of the silk.
Softening the Sericin	The cocoons are put through a series of hot and cold immersions, as the sericin must be softened to permit unwinding of the filament as a continuous filament.
Reeling the Filament	The process of unwinding of the filament from cocoon is called reeling.

Organoleptic Evaluation

- **Form :** Very fine, solid, and smoot.
- **Colour :** Yellow.
- **Length :** About 1200m long.
- **Diameter :** 5-25u.
- **Solubility :** Soluble in cuoxam solution sulphuric acid, and concentrated hydrochloric acid.

Chemical Constituents

- Natural silk consists of fibroin protein which hydrolyses into glycine (44%), alanine (27%), serine (11%), tyrosine (5%), and other amino acids.

Uses

- ✓ Silk fibres are used for preparing special types of sutures, sieves, and ligatures.

Wool

→ Wool is a specific type of hairs of some mammals.

→ It is mainly obtained from sheep and goats and sometimes also comes from other animals like qiviut from musk oxen, angora from rabbits and other types of wool from camelids.

Synonym

- Sheep wool

Source

➢ Wool is obtained from the fleece of sheep Ovis aries

Family

▪ Bovidae, (Order Ungulata)

Preparation

❖ Wool is removed from the body of sheep.,
❖ The dust and dirt is removed by beating the wool over the netting.
❖ The dirt passes through netting and the burrs and pieces of straws, etc. are picked up.
❖ The wool is washed in tanks with warm soapy water.
❖ It is then squeezed between rollers.
❖ After washing he wool is dried and the fibres are mechanically loosened.
❖ These are then carded and spun into yarn.

Organoleptic Evaluation

- **Appearance:** Wool hairs are smooth, elastic, lustrous, curly, hygroscopic, and slippery; they have the tendency to cling together.
- **Solubility:** Insoluble in 66% sulphuric acid, acid, concentrated hydrochloric acid, and cuoxam solution.
- **Size:** Wool hairs are 2-50cm long, 5-100um wide, and 13-40um in diameter

Chemical Constituents

○ Wool fibres are made up of keratin protein. They show elasticity, in contrast to the cellulose and silk fibres.

Uses

✓ It is used in manufacturing dressings like domette and crepe bandages and flannel.
✓ It is used as a filtering and straining medium.

Regenerated fibre (Rayon)

→ Regenerated fibre is made by dissolving the cellulose fraction of plant fibre in chemicals and then again making it a fibre by viscose method. It is also termed as regenerated cellulose fibre as it consists of cellulose like cotton and hemp.

Synonyms

- Regenerated cellulose and viscose rayon.

Source

➢ Rayon is an artificial fibre, composed of regenerated cellulose

Preparation

❖ The pulp form of cellulose of coniferous wood is processed into viscose rayon. The pulp contains about 80-90% of cellulose and hemicellulose.

❖ Cellulose is treated with sodium hydroxide to yield Sodium cellulosate, and further treated with carbon disulphide and sodium hydroxide to yield a viscous solution of sodium cellulose xanthate.

❖ These filaments are drawn together to form yam, which is de-sulphurised, bleached, washed, twisted, and then dried.

Features

- It has a smooth texture, unique gloss, moisture absorption and desorption properties, and superior staining property.
- It is commonly used because it does not get soft and melt with heat.

Uses

✓ It is used for making fabrics, surgical dressings, and viscose rayon absorbent wool.

Sutures and Ligatures

→ Sutures, commonly called stitches, are sterile surgical threads that are used to repair cuts (lacerations).

→ They also are used to close incisions from surgery.

→ Some wounds (from trauma or from surgery) are closed with metal staples instead of sutures.

→ A ligature is a thread or string without a needle which is used to tie blood vessels and other tissues together.

Classification of Sutures and Ligatures

→ **Types of Absorbable Sutures**

- Gut
- Polydioxanone (PDS)
- Poliglecaprone (MONOCRYL)
- Polyglactin (Vicryl)

→ **Types of Non-absorbable sutures/Ligatures**

- These types of sutures can all be used generally for soft tissue repair, including for both cardiovascular and neurological procedures. Nonabsorbable sutures are not affected by the body fluid and remained unchanged for a long period. They are removed after healing of the wounds. Silk, cotton, nylon, and metallic sutures are classified as nonabsorbable sutures.
    - Silk Sutures
    - Cotton Sutures
    - Nylon Sutures
    - Linen Sutures
    - Metallic sutures

Essential Properties of Sutures and Ligatures

- They must be sterile.
- Their strengths must be adequate for the purpose for which they are used.
- They must not cause any imitation as far as practicable.
- Their gauge should be as fine as possible.
- If absorbable, approximate time of absorption should be known.

Suture Selection and Techniques

- **Continuous Suture :** A continuous Suture is a surgical technique which involves several stitches wherein the doctor uses a single strand of the suture thread material
- **Interrupted Sutures :** The interrupted suture is a technique that uses many strands of the suture material in order to close a wound
- **Deep Sutures :** Yet another type of surgical suture technique is the deep suture technique. Here, the doctor places the suture under the tissue layers. which are deep below the skin.
- **Buried Sutures :** The buried suture technique is applied by doctors such that the suture knot is found inside, i.e. within or under the area that has to be closed off
- **Purse String Sutures :** A type of continuous suture the purse-string suture is placed around the infected area
- **Subcuticular Suture :** The suture that is usually placed in the patient's dermis, 1.e. the layer of tissue which lies below the skin's upper layer, is known as the subcutaneous suture In this type of suture, the doctor places short stitches in a line, parallel to the wound. The doctor also anchors the stitches on either end of the wound.

Surgical Catgut

→ Catgut is best used for wounds in areas where the tissue regenerates rapidly.

→ A disadvantage to Using this suture material is that a higher level of tissue reaction is incited in the surrounding tissue due to the foreign protein nature of the catgut suture.

Synonyms

- Kit gut,
- Violin gut,
- Surgical gut,
- collagen fibre

Source

➢ Catgut suture is made by twisting together strands of purified collagen taken from the serosal or submucosal layer of the small intestine of healthy ruminants (cattle, sheep, and goats) or from beef tendon.

Properties

❖ It allows for smooth passage through tissue.

❖ It is packed in IPA to retain memory & increase pliability.

❖ Its uniform chrome content provides required wound support and absorption.

❖ It is available from U.S.P Sizes 5-0 to 2

Types

- **Boilable Catguts:** If tubing is anhydrous then it is boilable
- **Non-Boilable Catguts:** If tubing contains alcohol and small water which avoids heat sterilization is non-boilbale

Preparation

❖ **Raw Material:** When sheep are slaughtered the intestine are roughly washed and placed in cold brine for transport

❖ **Selection and Washing:** The intestines are washed thoroughly with water. Poor samples are rejected.

❖ **Splitting:** The intestinal tube is fitted over the end of a flat curved peg and then splitted longitudinally with knife into "smooth" ribbons.

❖ **Removal of Unwanted Layers:** The gut consists of 4 layers-mesentric, muscular, submucous and mucous layers. All submucous layer are scraped away mechanically by blunt knife

❖ **Orientation of Fibres:** During above scrapping process the constituent fibres of gut become arranged in more parallel way.

❖ **Hardening:** At this stage the ribbon may be tanned or hardened by soaking in the solution of chromic salts.

❖ **Spinning:** The ribbons are next tied at the ends in group of two, three or more, depending on the gauge of thread to be prepared, pulled to an even tension and spun, Chromicising can be done.

- **Drying:** This is done in an atmospheric condition with regard to temperature and humidity.
- **Finishing:** The dried strings are rubbed against an abrasive surface to produce a smooth, uniform string of circular section.

Sterilisation

- **Heat Process**
  - i) Tubing
  - ii) Drying
- **Chemical Process:** Guts are sterilised by immersing them in iodine solution.
- **lonising Radiation Process:** Guts are packed in aluminium foils containing 90% isopropyl alcohol and Passed through gamma irradiation.

Advantages

- ✓ It is less likely to form sinuses if the wound turns septic.
- ✓ It is used for suturing the mucosa of gastrointestinal tract where a non-absorbable suture might cause chronic ulceration or haemorrage.
- ✓ In certain situations it might be used as a skin suture,

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