

# Pharmaceutical Technology I

Lecture 16-17

Extracted Products

Assist. Prof. Dr. Wedad K. Ali

# Extracted Products

- Extracted products are those products prepared by extraction process.
- Extracted products include many products which are: Tinctures, Fluidextracts, Extracts, Resins and Oleoresins.

# Extraction

- Extraction is an old process which derived because
- 1. plant and animal tissues contain chemical substances which provide relief and treatment for a variety of disease states and
- 2. it was found that extracted products are superior to crude tissue.
- By means of efficient extraction:
- 1. it could eliminate a variety of inert materials
- 2. obtain a more potent and more conveniently administered dosage form.

# Extraction process

- Basically, the process of extraction requires that a solvent system penetrate into cellular material and dissolve the desired constituents with a minimum of undesired material.
- The rate of solvent penetration is effected by many factors:
  - 1. It is enhanced by an increased amount of exposed surface area.
  - 2. pre-extractive soaking of the crude drug with solvent, will increase the rate of solvent penetration.

# Extraction process

- 3. surface tension of the liquid and its wetting properties, effect the movement of liquid through the pores and capillaries.
- 4. air bubbles entrapped in capillaries will retard the flow.
- 5. agitation and replacement of fresh solvent.
- This affects the rate at which active constituents are dissolved and diffuse away from the site of dissolution.
- In absence of agitation a significant stagnant diffusion layer exists. This layer, which contains a saturated solution of principles, acts as a barrier to diffusion away from the site.

# Why pre-extractive soaking is required?

- This process is done since crude drugs undergo a drying process in the initial steps of collection, storage, and shipment; all this result in slow penetration rate.

# Major extracted process

- Two major process are officially recognized for the extraction of pharmaceuticals: maceration, and percolation.

# Maceration

- With maceration, the crud drug is generally placed into a solvent system, with or without the application of heat, and the mixture allowed to stand with occasional agitation for an extended period, then the system is filtered to remove undissolved material, and a sufficient quantity of solvent is added to the filtrate to bring the product to a desired volume.
- The solvent used is called menstruum and the undissolved portion is called marc.
- Marc is the remaining portion which exhausted its active principle



- The process of maceration is well suited for the extraction of crude drugs containing little or no soft cellular tissue, such as Benzoin, Tolu, Aloe.

- Maceration is less efficient than percolation because, there is no agitation and replacement of fresh solvent. So it is not possible to obtain complete exhaustion of active principles.
- One approach suggested to overcome this difficulty is to enclose the crude drug in a permeable membrane or sack as in tea bag.
- When the sack is suspended in the solvent, dissolved material falls away from the region near the crude drug because of its greater specific gravity, and fresh solvent take its place.

# Percolation

- The process of percolation is the most popular means of extraction in U.S.A. for the preparation of tincture, fluidextract, and extracts.
- In general, the procedure involves packing the drug into a column, known as a percolator.
- Slow passing solvent through the column, and then collecting the extracted material dissolved in the solvent.
- Percolation offers the opportunity to extract principles exhaustively with minimum of solvent.

# Percolation

- This is important, because it is easier to bring a product to proper volume by adding solvent than by removing excess solvent.
- The shape and size of percolator will effect on percolating process, so we can use either long-narrow percolator or use short-wide percolator, depending on the nature of the crude drug and the viscosity of the menstruum.

- For viscous solvent and hard packed material, the short-wide percolator is preferred because of greater column cross-sectional area.
- The amount of crude drug in the percolator determines the size of percolator, as do the possible changes of column because of cellular swelling.
- The goal of percolator is to extract all of the active principles of a crude drug with a minimum of solvent.

# Exhaustive extraction can be monitored by

- 1. the loss of colour in the extracted solvent system.
- 2. the loss of bitter taste.
- 3. the absence of principles as determined by spot tests with specific reagents.
- For most extractions of potent medication, the extract is quantitatively assayed so that the final adjustment of concentration may be made as exactly as possible.

# Minor processes for extraction

- 1. Decoction
- 2. Digestion
- 3. Infusion
- **Decoction** involves placing plant material in water, bringing the water to boil for about 15 minutes, and expressing and straining the remaining marc to obtain a maximum amount of water-soluble principles.
- At one time this was a widely used procedure for brewing tea and coffee.

- **Digestion** is actually maceration with continued heating during the maceration period.
- The temperature is usually maintained between 40 and 60°
- **Infusion** involves first macerating the drug with cold water followed by the addition of boiling water in an amount equal to 90 percent of the desired volume.
- These processes are most applicable in obtaining water-soluble principles from plants, and this limitation is one reason for their general disuse today.



# Extracted Products

- **Tinctures:** are alcoholic or hydroalcoholic solutions of principles extracted from natural sources or of pure chemicals merely dissolved in these solvent systems.
- The amount of active ingredient in tincture varies for different products.
- Rules
  1. Tincture of potent medication obtained by extraction are adjusted so that each ml of tincture contains the potency equivalent of 0.1 gm of active crude drug constituents or 10 percent of activity.

- 2. less potent drugs are prepared as tinctures with higher levels of potency equivalents, usually around 20 to 50 percent of activity.

# Methods of preparation

- 1. Maceration  
a number of tinctures are prepared by maceration of crud drug as describe in the official procedure known as **Process M**.
- This process is preferred for substances containing a high proportion of soluble constituents.
- In process M maceration takes place over a period of three days.

# Official tinctures prepared by maceration

- Compound Benzoin Tincture, USP (used as topical protective agent)
- Sweet Orange Peel Tincture, USP (used as flavouring agent).
- Lemon Tincture, USP (used as flavouring agent).
- Compound Cardamom Tincture, NF (used as flavouring agent). This tincture is known as 4Cs Tincture because it contains extract of cardamom, caraway and cinnamon seeds, and cochineal (purified insects) with glycerin and alcohol (60%).

- Seeds and cochineal reduce to moderately coarse powder.
- Cochineal is used to give deep red colour when boiled with water so its solution used as colouring agent for tincture , and the pink to red colour of the tincture is belong to its solution.



- 5. Tolu balsam Tincture, NF (used as expectorant and flavour). Tolu balsam is the resinous secretion *Myroxylon balsamum*.



# Methods of preparation of tincture

- 2. Percolation

The USP and NF also recognize the process of percolation for extraction when preparing tinctures.

- This is known as **Process P**.
- The most widely used tincture, Belladonna Tincture, USP, is prepared by process p using 10 g of belladonna leaf for each 100ml of final product.
- This product is used widely as an anticholinergic agent (antispasmodic) because of atropine and other atropine like alkaloid extracted from the leaf.

- 3. Mixed techniques
- Is used to prepare Vanilla Tincture, NF, which is used as a flavor.
- First macerating the vanilla bean in water for 12 hrs followed by three days of maceration with an additional equal volume of alcohol.
- the mixture is then added to percolator which already contains a specified amount of sucrose.
- Percolation is then carried out with diluted alcohol.



- 4. Simple solution
- The remaining official tinctures are prepared by simple solution of various chemicals.
- Examples:
  - 1. Green soap Tincture used as detergent solution, generally applied to the skin. This tincture is prepared by dissolving green soap in alcohol.
  - Green soap is prepared by a reaction of KOH with oleic acid to get potassium oleate, we add glycerin and H<sub>2</sub>O to get green soap.

- 2. Iodine tincture, USP
- Used as disinfectant.
- It is prepared by dissolving 20 g of iodine with 24 gm of sodium iodide or potassium iodide in 1 liter of alcohol.
- Apparently the following reaction occurs
- $I_2 + I^{-1} = I_3^{-}$
- In this way the product is greatly stabilized against reaction between  $I_2$  and ethyl alcohol.
- Since the  $I_3^{-}$  is quite water soluble, this product can be diluted with water to a considerable extent.

# Fluidextracts

- Fluidextracts are liquid preparations containing extracted principles from vegetable drugs prepared in such a way that each ml contains the therapeutic constituents of 1 g, or 100 percent.
- Because of their concentrated nature, many fluidextracts are considered too potent to be taken safely in self administration by patient and their use per se (as such) is almost nonexistent in medical practice.

- Also, many fluid extracts are simply too bitter tasting or otherwise unpalatable to be accepted by the patient.
- Therefore most fluid extracts today are either modified by the addition of flavoring or sweetening agent before use, or
- Are used pharmaceutically as the drug source component of other liquid dosage forms, such as syrups.

# Methods of preparation of fluidextracts

- A number of processes involving percolation have been officially recognized.
- Percolation is preferred in all cases of exhaustive extraction required.
- The NF recognizes five processes labelled A, B, C, D, and E.

# Official Fluidextracts (USP and NF)

- 1. Those prepared by process A include;
- Eriodictyon Fluidextract, NF, used as flavor.
- Senna Fluidextract, NF, used as cathartic.
- Belladonna Leaf fluidextract, NF, used as anticholinergic agent. this may also be made by process E.
- No official products are prepared by process B or C.
- 2. Three are prepared with boiling water as in process D, these include:

- Glycyrrhiza Fluidextract, USP, used as a flavor
- Cascara sagrada Fluidextract, NF
- Aromatic cascara sagrada fluidextract, USP
- The last two use as cathartics.
- The latter product contains, in addition to the principles of cascara sagrada, pure glycyrrhiza extract, saccharin, anise oil, coriander oil, methyl salicylate, alcohol, and water.
  
- Ipecac syrup, USP, although categorized as a syrup, but we take it in fluidextract because it is prepared by percolation of powdered ipecac.
  
- Fluidextracts in BP are called liquid extracts

# Extracts

- Extracts are concentrated preparations of animal or vegetable drugs which first have been extracted with suitable menstrua, evaporation of all or nearly all of the solvent, and adjustment of the residual masses.
- Percolation is used for extraction.
- Extracts are potent preparations, usually between two and six times as potent on a weight basis as the starting material.



# Types of extracts

- Three types of extracts have been prepared on the basis of consistency these are:
- 1. Semiliquid extracts or those of a syrupy consistency prepared without the intent of removing all or even most of the menstruum.
- 2. Pilular or solid extracts of a plastic consistency prepared with nearly all of the menstruum removed, and
- Powdered extracts prepared to be dry by the removal of all of the menstruum in so far as is feasible or practical.

- Pilular and powdered extracts differ only by the slight amount of remaining solvent in the former preparation, but each has its pharmaceutical advantage because of its physical form.
- For instance, the pilular extract is preferred in compounding a semisolid dosage forms such as an ointment or paste, suppository, and in formation of pills.
- Whereas the powdered form is preferred in the compounding of such dosage forms as powders, capsules, and tablets.
- For potent products, adjustment of potency is accomplished by the addition of inert diluents. Liquid glucose is often used for pilular extracts; starch is added to powdered extracts.

# Official Extracts

- Three plant extracts are officially recognized , these are:
  - 1. pure glycyrrhia extract, USP; is prepared in the pilular state.
  - 2. cascara sagrada extract, NF, is made as the powdered extract
  - 3. belladonna extract, NF, prepared in both pilular and powdered forms.

- The USP recognizes one extract from an animal source, namely Trichinella Extract, USP, an aqueous extract of killed, washed, defatted, and powdered larvae of trichinella spiralis.
- It consists of antigens of the larvae and is used as a dermal reactivity indicator. (skin test for trichinella infection).

# Resins

- Natural resins are solid or semisolid exudations from plants or from insects that feed on plants.
- Chemically these exudations are the oxidized terpenes of the volatile oils of plants.
- Prepared resins are produced by exhaustively percolating a plant having a resin as the major ingredient.
- Percolation is usually carried out with alcohol as menstruum.

# Examples of Resins

- 1. Podophyllum, Resin, USP; is obtained by percolation of dried rhizome and roots of Podophyllum Peltatum.
- Prepared as a dispersion in alcohol in compound Benzoin Tincture, USP; it is used as topical caustic for the treatment of certain papillomas.
- 2. Example of natural resin obtained as exudation Colophony Resin.
- Rosin, NF, is a solid resin which remains after the distillation of turpentine. It has many traditional uses; pharmaceutically it is widely used as an adhesive.

# Oleoresins

- Oleoresins contain a mixture of volatile oils and resins either naturally or synthetic.
- Naturally extract from trunk of trees that contain e.g. turpentine.
- Synthetic oleoresin e.g. ginger oleoresin is prepared by extracting oleoresin from ginger as coarse powder by percolation with suitable solvent (alcohol, ether, acetone)

# Glycerits

- It is not extract fluid, or product.
- It is preparation that contains not less 50% by weight of glycerin and medicinally agent.
- It is very viscose either used such as or diluted in other preparation.
- Some times it is called glycerines



# Examples

1. glycerin otic solution contain phenazon and benzocaine (local anesthetic) in glycerol

Used as ear drop. It should be stored in air tight container and protected from light.

2. phenol glycerin (BP) contains

Phenol 160 gm

Glycerin 84 gm

If 40 ml of it is diluted to 100ml with glycerin we will get what we called phenol ear drop.

- Phenol ear drop should not diluted with water because phenol crystal will precipitate in otic tissue and form caustics in otic preparation.
- Benefit of glycerin in otic preparation;
  1. Preservative
  2. Increase the viscosity to prolong the contact of active substance to infected area
  3. Dissolving the insoluble substance
  4. Reduce pain, swelling, oedema.

# References

- Lewis W. Dittert, “American pharmacy”, Lippincott. company, 1974.
- Ansel's Pharmaceutical dosage forms and drug delivery systems, 10<sup>th</sup> edition. Lyod V. Allen, Howard C. Ansel, Sinko, by Lippincott Williams & Wilkins, a Wolters Kluwer business, Lippincott Williams & Wilkins. Philadelphia. 2014.