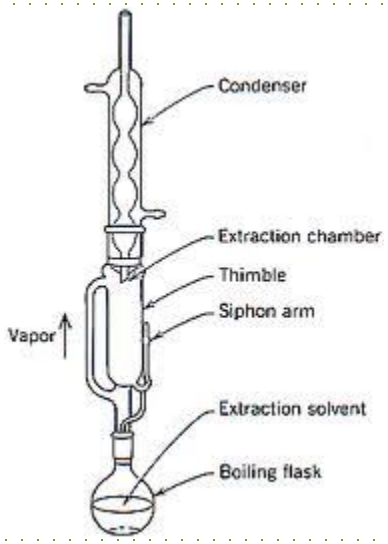
EXTRACTION

EXTRACTION (extractio);

EXTRACTION. *s.* (*extractio*, Latin.) 1. The act of drawing one part out of a compound (*Bacon*). 2. Derivation from an original; lineage; descent (*Clarendon*).

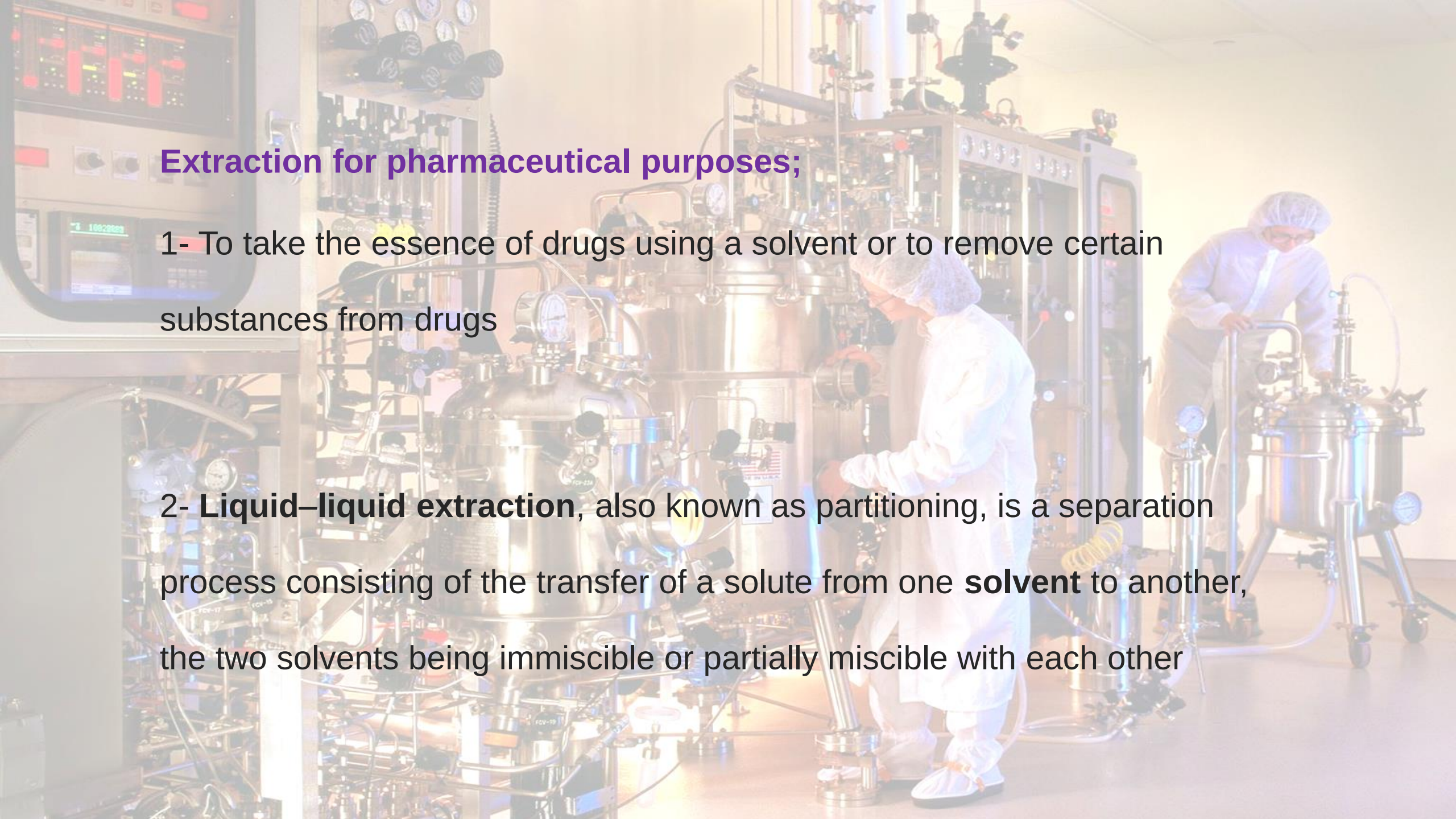


EXTRACTION;

- Extraction, as the term is used pharmaceutically, involves the separation of medicinally active portions of plant or animal tissues from the inactive or inert components by using selective solvents in standard extraction procedures.

- The products obtained from plants are relatively impure liquids, semisolids, or powders intended only for oral or external use.

- Extraction products include classes of preparations known as:
  - Decoctions
  - Infusions
  - fluidextracts,
  - Tinctures
  - pilular (semisolid) extracts
  - powdered extracts.
- Such preparations popularly have been called galenicals, after Galen, the 2nd century Greek physician.



Extraction for pharmaceutical purposes;

1- To take the essence of drugs using a solvent or to remove certain substances from drugs

2- **Liquid–liquid extraction**, also known as partitioning, is a separation process consisting of the transfer of a solute from one **solvent** to another, the two solvents being immiscible or partially miscible with each other

Extraction of Crude Drugs

Extraction of active agents from plants, separate unwanted compounds and concentrate the active compound

Alkaloids, tannins, glycosides, oils, resins, oleoresins, essential oils

Extraction of excipients from plants,

Pectins, mucilages, gums, starches, sugars

Extraction of dissolved substances in liquids

Explained by «Nernst Distribution Law (1891) or Partition Law»

- This law determines the relative distribution of a component that is soluble in two liquids, these liquids being immiscible or miscible to a limited extent.
- The Nernst distribution law states that, “at equilibrium, the ratio of the concentrations of a third component in two liquid phases is constant.”

Extract types according to their consistency

Liquid Extracts

Extracts containing 1 part by weight of the substance in equivalent weight or volume.

Soft Extracts

Extracts having a consistency between liquid and dry extract.

Obtained by partial evaporation of the solvent used.

Dry Extracts

Solid extracts obtained by evaporation of the solvent used.

Extraction methods

- Mechanical extraction
- Extraction by distillation
- Extraction with solvents
- Supercritical fluid extraction

Mechanical extraction

An incision is made on alive plant using a sharp blade allowing a thick fluid to leak out. The product is then scraped off.

Opium, balsam, gum, resin

Herbal samples are crushed with press using pressure.

Almond oil, peanut oil, cottonseed oil, cocoa butter

Black mulberry, lemon fruit juices

Extraction with distillation

Distillation;

The process of physically separating one or more components with a different boiling point in a mixture.

Applied to plants containing volatile and easily evaporable active agents

Essences (essential oils), some aromatic waters

- Plants samples such as leaves, barks, roots, fruits and flowers are used

- Direct distillation
- Distillation with water vapor

Direct Distillation

- Small amount of water is added on the distillation container containing plant pieces.
- The vessel is heated at the bottom.
- Obtained water vapor carries the volatile material.
- The mixture is concentrated by cooling.
- The product is collected in the collection container.

Distillation with water vapor;

- Water is added on the distillation container containing plant pieces.
- Water vapor obtained in a separate place is transfered to this container.
- With the aid of the heat of the water vapor, the volatile material evaporates and drains with water vapor.
- The product is cooled and collected.

Extraction methods using solvents

- Maceration
- Dimaceration
- Decoction
- Infusion
- Digestion
- Percolation

Maceration

- In this process the solid ingredients are placed in a stoppered container with prescribed solvent and allowed to stand for a period of at least 3 days in a warm place with frequent agitation, until soluble matter is dissolved.
- The mixture is filtered and, after most of the liquid has drained, the residue on the filter is washed with sufficient quantity of the prescribed solvent or solvent mixture
- The filtrates are combined

Dimaceration

The solid ingredient is subsequently subjected to maceration twice.

Decoction

- This once popular process extracts water soluble and heat stable constituents from crude drugs, by:
- boiling in water for a certain time,
- cooling,
- Straining and
- passing sufficient cold water through the drug to produce the required volume.

Infusion

- An infusion is a dilute solution of the readily soluble constituents of crude drugs.
- Fresh infusions are prepared by macerating the solids for a short period of time with boiling water.

Digestion

This is a form of maceration in which gentle heat (40-60°C) is used during the process of extraction.

It is used when moderately elevated temperature is not objectionable and the dissolving efficiency of the solvent is increased thereby.

Percolation

It is a continuous extraction method.

«Percolators» are used.

- different shape and size
- glass, porcelain, enamel or stainless steel

The product obtained is called «percolate».

- The crude drug is brought to the appropriate size.
- It is mixed with small amount of solvent and allowed to stand for a while before filling into the percolator.
- Thus, the dry drug is swelled.
- A small piece of cotton is placed on the bottom of the percolator.
- The moistened drug is filled into the percolator without being compressed.
- The filter paper and cotton are placed on top of the drug.
- The solvent is poured from the top and the system is allowed to macerate for a while.
- The product is removed from the bottom by opening the tap of the percolator.

Advanced Extraction Methods

- supercritical fluid extraction (SFE)
- ultrasonic assisted extraction (UAE)
- microwave assisted extraction (MAE)

Supercritical fluid extraction

It is the process of separating the active substances from solid, semi-solid or liquid matrix using supercritical fluids.

- At a certain, material-dependent temperature, the density of the gas phase will be equal to the density of the liquid, so that there will no longer be a phase boundary between the liquid and gas phase, and both are now indistinguishable (this is called a supercritical fluid).
- It can diffuse through solids like a gas, and dissolve materials like a liquid.
- Supercritical CO_2 is the most commonly used liquid.

Pharmaceutical preparations prepared by extraction

Alcoholates

Aromatic fragrant preparations prepared by initial maceration and subsequent distillation of crude drugs in ethyl alcohol for a certain period of time.

Alcohol content is high

Garus alcoolate (Alcoolat de Garus)

Pharmaceutical preparations prepared by extraction

Elixirs

Clear and sweet preparation consisting of a mixture of alcohol and water.

Pharmaceutical preparations prepared by extraction

Tinctures

- Tinctures are defined in the USP as alcoholic or hydroalcoholic solutions prepared from vegetable materials or from chemical substances, an example of the latter being Iodine Tincture.
- The USP, specifically, describes two general processes for preparing tinctures, one by percolation and the other by maceration.
- Belladonna Tincture, USP, is prepared by percolation. Compound Benzoin Tincture, USP, and Sweet Orange Peel Tincture, USP, are prepared by the maceration procedure.