PACKAGING TYPES

PACKAGING

- Packaging is the science, art and technology of enclosing or protecting products for distribution, storage, sale, and use.
- It refers to the process of design, evaluation, and production of packages
- Packaging can be described as a coordinated system of preparing goods for transport, warehousing, logistics, sale, and end use

OBJECTIVES OF PACKAGING

- Physical protection
- Barrier protection
- Containment or agglomeration
- Security
- Convenience
- Portion control

PACKAGING TYPES

- **Primary packaging** is the material that first envelops the product and holds it. This usually is the smallest unit of distribution or use and is the package which is in direct contact with the contents.

Secondary packaging is outside the primary packaging – perhaps used to group primary packages together

Tertiary packaging is used for bulk handling , warehouse storage and transport shipping. The most common form is a palletized unit load that packs tightly into containers.

Different types of primary packaging

- Ampoules
- Vials
- Containers
- Dosing dropper
- Closures (plastic, metal)
- Syringe
- Strip package
- Blister packaging

DIFFERENT TYPES OF SECONDARY PACKAGING

- Paper and boards
- Cartons
- Corrugated fibers
- Box manufacture

PRIMARY PACKAGING MATERIALS

GLASS :

Glass has been widely used as a drug packaging material.

Advantages of glass:

- It allows easy inspection of the containers contents.
- It is available in variously shaped containers.

Disadvantages of Glass: -

- It is fragile
- It is expensive when compared to the price of plastic.

TYPE I GLASS

- It is widely used as glass ampoules and vials to package fluids for injection.

AMPOULES

- One point cut ampoules.
- Flat Based and Constricted Neck ampoules
- Flame cut ampoules.
- Closed ampoules
- Ampoules with colour break band and identification bands

TUBULAR VIALS

TYPES OF GLASS CONTAINERS

BOTTLES:-

Used in the dispensary as either amber metric medical bottles or ribbed(fluted)oval bottles.

Available in sizes from 50ml to 500ml.

- Amber metric medical bottles are used for packaging a wide range of oral medicines. .
- Ribbed oval bottles attached are used to package various product that should not be taken orally.
- This includes liniments, lotions, inhalations and antiseptic solutions.

DROPPER BOTTLES:-

- Eye drop and dropper bottles for ear and nasal use are hexagonal-shaped amber glass container fluted on three sides.
- They are fitted with a cap, rubber teat and dropper as the closure. The bottles are used at a capacity of 10ml or 20ml.

JARS

- Powders and semi-solid preparations are generally packed in wide-mouthed cylindrical jars made of clear or amber glass.
- Jars varies from 15ml to 500ml.
- Jars are used for packing prepared ointments and pastes.

PLASTICS

- Used as container for the product and as secondary packaging
- Two classes of plastics are used and these are known as thermosets and thermoplastics.

ADVANTAGES OF PLASTICS:-

- Flexible and not easily broken.
- Low density and light in weight.
- Are cheap

DISADVANTAGES OF PLASTICS:-

- They are not as chemically inert as Type -I glass.
- They are not as impermeable to gas and vapour as glass.
- They may possess an electrostatic charge which will attract particles.
- Used for many types of pack including rigid bottles for tablets and capsules, squeezable bottles for eye drops and nasal sprays, jars, flexible tubes and strip and blister packs.

PLASTIC CONTAINERS

METALS

- Metals used such as tin-plated steel, mild steel, stainless steel, tin-free steel, and aluminum and its various alloys.
- Metal is strong, opaque, and impermeable to moisture, gases, odors, light, bacteria, etc. It is resistant to high and low temperatures

TIN:-

Tin is the most chemically inert of all tube metals. It offers good appearance and compatibility with a wide range of products

TINPLATE:-

- Tinplate is basically a steel structure with a thin layer of tin deposited on either one side or both sides, gives the steel some protection from corrosion .

ALUMINIUM:-

- Aluminium lighter in weight and can be easier to shape.
- The thick rigid closures are used mainly for cans or aerosol containers, while the thin flexible material is used primarily for the closure of ,bottles or thermoforms

- Blister packs use a hard temper (so that the tablet can be pushed through the material).

Tubes can be supplied internally by

- Lacquered
- Wax coated
- Latex line

PLASTIC TUBES

Flexible plastic tubes in a range of sizes dia. 19 mm, to 50 mm dia. and volume up to 300 ml.

- Orifice 2 mm to 8 mm (3 mm Standard) Tube wall thickness with 400 - 500 micron.

LAMINATED TUBES

Multilayer tubes with Aluminum foil / nylon / polyester act as barrier against oxygen, moisture, aroma loss and provide a glossy surface enhancing printing quality.

- Transparent stretch polypropylene and PET tubes with dispenser caps are designed
- Different caps such as conical, flip-top, can be custom designed for an aesthetic look.

BULK CONTAINERS

- For bulk drug and active pharmaceutical ingredient packaging, bags and drum liners manufactured in a cGMP-compliant environment. LDPE and foil laminate bags and drum liners are custom-produced in a wide range of sizes and constructions .

- cGMP-compliant with respect to quality systems, complete traceability, change control, SOPs and pharmaceutical grade housekeeping, and are registered in Drug Master File .

BULK CONTAINER

BLISTER PACK:-

Blister packs are commonly used as unit dose packaging for pharmaceutical tablets, capsules or lozenges

- Blister packs consist of two principal components : 1) a formed base web creating the cavity inside which the product fits and 2) the lidding foil for dispensing the product out of the pack.

- There are two types of forming the cavity into a base web sheet: thermoforming and cold forming

- **Thermoforming**
- Inthecaseof thermoforming, aplasticfilmor she t is unwoundfromthereel andguidedthoughapre-heating stationontheblister line
- Thetemperatureof thepre-heatingplates(upper andlower plates) issuchthat theplasticwill softenandbecome moldable.

COLD FORMING

- In the case of cold forming, an aluminum-based laminate film is simply pressed into a mold by means of a stamp.
- The aluminum will be elongated and maintain the formed shape.
- Advantage of cold form foil blisters is that the use of aluminum is offering a near complete barrier for water and oxygen, allowing an extended product expiry date.
- The disadvantages of cold form foil blisters are the slower speed of production compared to thermoforming and the lack of transparency of the package and the larger size of the blister card

Example for cold forming method

- Aluminium Foils for Blister Packing
- Aluminium Foil suitable for blister packing of Pharmaceutical Products such as Tablet, Capsules, etc.

STRIP PACKAGE:-

- It is commonly used for the packaging of tablets and capsules. A strip package is formed by feeding two webs of a heat sealable flexible film through a heated crimping roller .The product is dropped into the pocket formed before forming the final set of seals. A continuous strip of packets is formed which is cut to the desired number of packets in length.
- The materials used for strip package are cellophane, polyester, polyethylene, polypropylene, polyvinylchloride.

Example for strip package

CLOSURES :-

- Closures are the devices by means of which containers can be opened and closed. Proper closing of the container is necessary because
  - It prevents loss of material by spilling or volatilization.
  - It avoids contamination of the product from dirt, microorganisms or insects.
  - It prevents deterioration of the product from the effect of the environment such as moisture , oxygen or carbon dioxide.

MATERIALS USED FOR MAKING OF CLOSURES

The closures for containers meant for storage of pharmaceutical products are generally made from the following basic materials.

- Cork
- Glass
- Plastic
- Metal
- Rubber

SECONDARY PACKAGING MATERIALS

***PAPER*:-**

This can be used as a flexible wrap for products, or as a closure material for jars. Most paper materials are used with a liner applied either as a laminate or as a coating.

PHARMACEUTICAL CORRUGATED FIBERBOARD

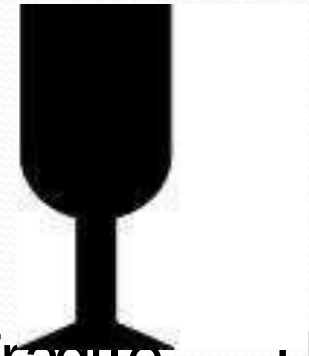
- Corrugated fiberboard is a paper-based construction material consisting of a fluted corrugated sheet and one or two flat linerboards. It is widely used in the manufacture of corrugated boxes

CARTON

A carton is a type of suitable for food, pharmaceuticals, hardware, and many other types of products. Folding cartons are usually combined into a tube at the manufacturer and shipped flat (knocked down) to the packager.

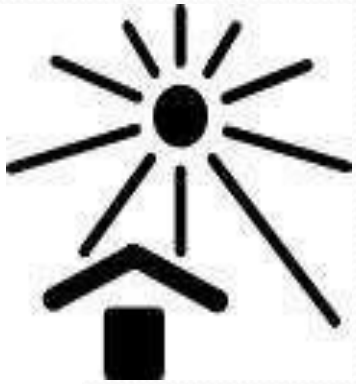
SYMBOLS USED ON PACKAGES AND LABELS

- Many types of symbols for package labelling are nationally and internationally standardized. For product certifications, trademarks, proof of purchase, etc. identification code .



Fragile

This way up



Keep away from sunlight

Ke paway fromwater

Donot usehandhooks

Donot clampasindicated

TRENDS IN PHARMACEUTICAL PACKAGING

- Packaging of oral medicines generally conforms to requirements for easy dispensing, child resistance but senior-friendliness, but packs must also be identifiable, functional and very often hermetically sealed to cut the number of accidental poisonings

Gentle handling is also essential and packs should be hermetically sealed for higher product safety. A solution to achieve hermetically sealed packs for blister, blow-fill-seal pouches, vials and other products is to overwrap them into a horizontal flow wrap.

- . New packaging lines will have to offer high flexibility while maintaining production levels.
- To meet validation requirements, pharmaceutical companies increasingly demand that machinery is modularized and standardized. This includes a standardized operating interface and control systems for all components. Such systems also have monitoring systems for maximum production safety
- Sstandardisation that is sufficient to produce high efficiencies. The entire packaging process needs to be harmonised and there is a huge optimisation potential in this area.

EVALUATION OF PRIMARY PACKAGING MATERIAL:-

- Leakage test
- Hydrolytic resistance
- Collapsibility
- Residue on Ignition
- Buffering Capacity
- Light Transmission
- Water Vapour Permeation
- Heavy Metals & Non Volatile Residue

EVALUATION OF SECONDARY PACKAGING MATERIAL

Testing of paper and board

- **Air permeability**: - Permeability is the mean air flow through unit area under unit pressure difference in unit time, under specific conditions, expressed in $Pa^{-1}s^{-1}$.
- **Tensile strength: -** both wet and dry. The maximum tensile force per unit width that a paper or board will withstand before breaking