

Introduction to aerosol packaging

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AEROSOL:

- A system that depends on the power of a compressed gas or liquefied gas to expel the contents from the container.

PHARMACEUTICAL AEROSOL:

- Pharmaceutical Aerosol is defined as aerosol product containing active ingredients dissolved, suspended or emulsified in a propellant or a mixture of solvent and propellant and intended for oral or topical administration or for administration into the eye, nose, ear, rectum and vagina.

- Absence of air prevents oxidation of the product.

Advantages: The hydrolysis of medicaments can be prevented.

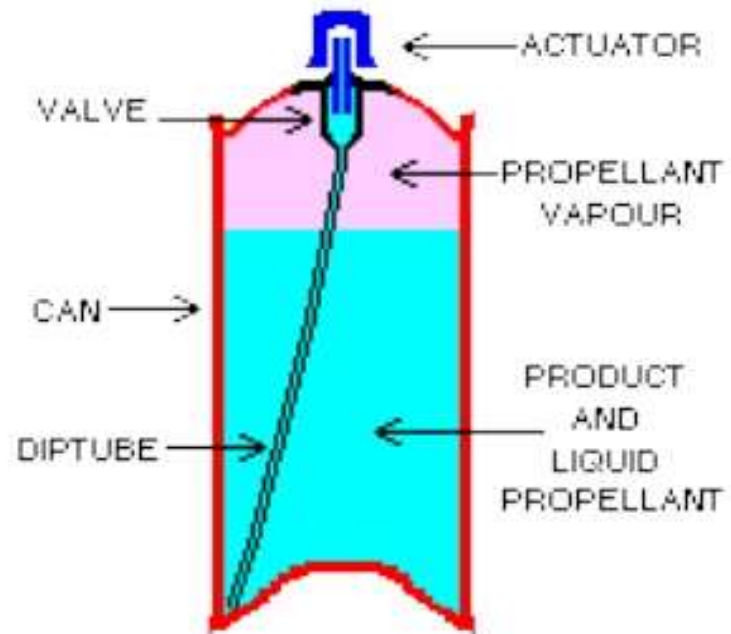
- Drugs can be given by oral inhalation.
- The sterility products can be maintained.
- The application of medicament can be easier.
- A fine mist is easily formed for inhalation purpose.
- Manual contacts with medicaments can be avoided.
- Drug given by oral inhalation do not pass through G.I.T. hence its chances of decomposition are less.

Disadvantages:

- Aerosols are costly preparations.
- Some of the propellants are very toxic.
- The cooling effect of highly volatile propellants may cause discomfort on injured skin.
- Lot of difficulties are faced in aerosol formulation when the drug is not soluble in propellant.

COMPONENTS OF AEROSOLS

- Propellant
- Container
- Valve and actuator
- Product concentrate



PROPELLANTS:

A propellant is a chemical with a vapor pressure greater than atmospheric pressure at 40°C (105°F).

Function:

- 1) It is responsible for developing the vapor pressure
- 2) within the container Expel the product when the valve is opened and in the atomization or foam production of the product.

1. Compressed Gas Propellants	Inert gases	Carbon Dioxide Nitrous Oxide Nitrogen
2. Liquefied gas propellants	Hydrocarbons(HC)	Liquefied Petroleum Gases(Propane, Isobutane, n-Butane) Isopentane, n-Pentane.
	Chloroflourocarbon (CFC)	Trichloro-mono-flouro methane (11), Di-chloro-diflouro-methane (12) , Di-chloro-tetra-flouro-methane (114)
	Fluorinated hydrocarbons(FHC)	1,1 Diflouroethane (152a)
	Ethers	Dimethyl ether

CONTAINERS:

CONTAINERS

They must be able to withstand pressures as high as 140 to 180 psig (pounds per sq. inch gauge) at 130 ° F.

AEROSOL CONTAINERS

A. Metals

1. Tinplated steel
2. Aluminum
3. Stainless steel

B. Glass

1. Uncoated glass
2. Plastic coated glass

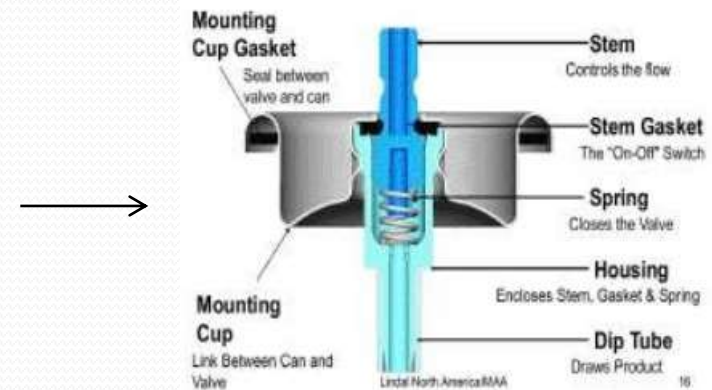


VALVES:

- Easy to open and close .
- Capable of delivering the content in the desired form such as spray, foam, solid stream etc.
- It can deliver a given amount of medicament .

TYPES OF VALVES :

1. Continuous spray valve
2. Metering valves



1. Continuous spray valve:

a. Ferrule/ mounting cup

- Use to Attach the valve in proper position in container.
- Coated with epoxy resin.



b. Valve body / housing

- Made of nylon/ derlin
- Connect dip tube, stem & actuator
- Determines rate of delivery



c. Stem

- It is made of nylon /derlin /s.steel
- One or more orifice (0.013 to 0.030 inch) 33

d. Gasket

- It is made of Buna –N, Neoprene rubber



e. Spring

- Use to Hold the gasket in its place
- Made of stainless steel

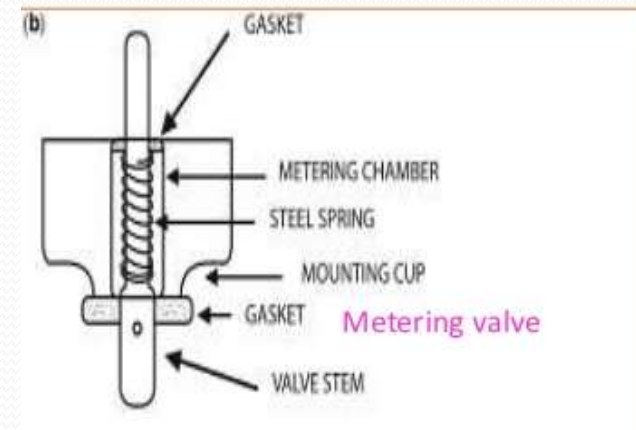


f. Dip tube

- Made of poly propylene material / poly ethylene
- Inner diameter 0.120 –0.125 inch for less viscous
- Viscous product - 0.195 inch.
- It convey the liquid from the bottom of the container to the valve at the top.

2. Metering valves:

- Used for dispensing of potent medication.
- Operates on the principle of a chamber whose size determines the amount of medication dispensed.
- Approximately 50 to 150 mg \pm 10 % of liquid material scan be dispensed at one time with the use of such valve.



ACTUATORS:

These are specially designed buttons which helps in delivering the drug in desired form i.e., spray, wet stream , foam or solid stream .

TYPES OF ACTUATORS :

- Spray actuators
- Foam actuators
- Solid steam actuators
- Special actuators



SPRAY ACTUATORS:

- It can be used for topical preparation, such as antiseptics , local anesthetics and spray on bandages etc.

- It allows the stream of product concentrate and propellant to pass through various openings and dispense as spray.



FOAM ACTUATORS :

- It consist of large orifice which ranges from 0.070—0.125inch .



SOLID STREAM ACTUATORS :

- These actuators are required for dispensing semi solid products such as ointments .

SPECIAL ACTUATORS :

- These are used for a specific purpose.
- It delivers the medicament to the appropriate site of action such as throat, nose, dental and eyes etc.

Packaging of aerosol:

It can be filled in two types :

1. Cold-fill process:

- This process is used to fill metered aerosol products using a fluoro-carbon propellant.
- The propellant becomes liquid at atmospheric pressure.
- The active ingredients or concentrate and propellants are cooled to a low temperature of about -30° to -40°F .
- The concentrate is generally cooled to below 0° in order to reduce loss of propellant during the filling operation.
- The chilled concentrate is poured into the chilled container and propellant is added.
- Sufficient time is given for the propellant to partially vaporize.
- In order to expel the air present in the container. The valve is fitted on the container which is placed into a water bath so that the contents are heated to 130°F (54°C) in order to check any leakage and strength of container.
- A dry ice-acetone bath is used to obtain the desired low temp. for laboratory scale preparation whereas refrigeration equipment is used for the large scale production of aerosols

2. Pressure-fill process:

- This process is used for filling aerosols containing hydrocarbon propellant.
- The product concentrate is placed into the container and the valve is sealed.
- The propellant is forced through the valve under pressure.
- After this the container is immersed in water bath at 130°F (or 54°C) in order to check any leakage and strength of the container.
- It is essential that the air present in the container must be expelled before filling the contents into the aerosol container.

Applications of aerosol

packaging:

- They are used for spray bandages and for application of drugs meant for topical use.
- They are used for spray administration of drugs into various body cavities.
- They are use for administration of drug such as local anesthetics, local antiseptic, local analgesics and anti-inflammatory drugs.
- They are used to spray cosmetic preparation such as perfumes.
- They are used to spray disinfectants, deodorizers and air sanitizers.