Aerosols

Aerosols are dosage forms containing therapeutically active ingredients that are packaged under pressure in a sealed container and are released as a fine mist of spray upon activation of a suitable valve system. The basic components of an aerosol system are the container, the propellant, the concentrate containing the active ingredient(s), the valve and the actuator.

Principle / Mechanism and working of Aerosols

In Aerosol, liquefied gas propellant/drug is sealed within an aerosol container, equilibrium takes place between the portion of propellant that remains liquefied and that propellant which vaporizes and occupies the upper portion of the aerosol container.

So, the vapour phase develops pressure in container, against the walls of the container. This pressure is responsible for actuation of the aerosol valve which forces the liquid phase up to the dip tube and through the opening of the valve contents will be released into the atmosphere.

As the propellant/s released in to the air, it expands and evaporates because of the drop down in pressure, which leaves the product concentrate as airborne liquid droplets or dry particles depending upon the formulation type at applied area.

Upon activation of the valve assembly of the aerosol system, the pressure exerted by the propellant/s forces the contents of the package to outside through the opening of the aerosol valve. The physical form of the contents emitted which depends on the formulation type of the product and the type of valve used. Generally, aerosol products designed as to expel their contents in the form of a fine mist, a coarse, wet, or dry spray; a steady stream; or stable or fast breaking foam.

Active ingredients: For satisfactory bioavailability the active ingredient(s) should have the majority of particles under 10 mm in size in the case of inhalation aerosols.

Propellants: Propellants perform the essential function of expelling the material from the container by supplying the necessary pressure within the aerosol system. They are liquefied gases having vapour pressures exceeding atmospheric pressure.

Classification of propellants:

1) Liquefied gases 2) Chlorofluorocarbons 3) Hydrocarbons 4) Hydrocarbon gases

The commonly used propellants in aerosol systems are hydrocarbons, especially the fluorochloro-derivatives of methane and ethane, the butanes and pentanes and compressed gases such as nitrogen and carbon dioxide. Mixtures of propellants are often employed to obtain the necessary delivery and spray characteristics of the aerosol.

Valves: The valve regulates the flow of the active ingredient(s) and propellant from the container and determines the spray characteristics of the aerosol. It must be manufactured from materials which are inert to the contents of the aerosol. The commonly used materials are rubber, plastic, aluminium and stainless steel.

Actuators: The actuator which is fitted to the aerosol valve stem is a device which on depression or other movement opens the valve and directs the spray to the desired area. The design of the actuator which incorporates an orifice of varying size and shape and expansion chamber is very important in influencing the physical characteristics of the spray or foam.

Containers: Aerosol containers are made of metal (stainless steel, aluminium or tin-plated steel), glass or plastic or a combination of these materials. The containers must be so designed that they provide the maximum in pressure safety and impact resistance.

Aerosols are of two types-

Two-phase system: The two-phase system consisting of gas and liquid. The two-phase aerosol comprises a solution of active ingredient(s) in liquefied propellant and the vaporised. The solvent is usually the propellant or a mixture of the propellant and co-solvents such as ethanol, propylene glycol and polyethylene glycols.

Three-phase system: The three-phase system consisting of gas, liquid and solid or liquid. The three-phase aerosol consists of a suspension or emulsion of the active ingredient(s). In the suspension the ingredient(s) may be dispersed in the propellant system with the aid of suitable pharmaceutical aids such as wetting agents, solubilising agents, emulsifying agents, suspending agents and lubricating agents to prevent clogging of valves. Foam aerosols contain an emulsion of the active ingredient(s), surface-active agents, aqueous or non-aqueous liquids and the propellants.

Advantages

Portable, easy to use and convenient

Drug can be delivered to the affected area

Protection of unstable drugs from light, oxygen and water

Free from contamination, no need to touch the affected area

Onset of action is fast

Disadvantages

Expensive

Limited safety (flammable)

Applications

Local anaesthetics

Wound washing, Antiseptic

In the treatment of Nasal decongestion, Asthma

Painkiller sprays in sports activities

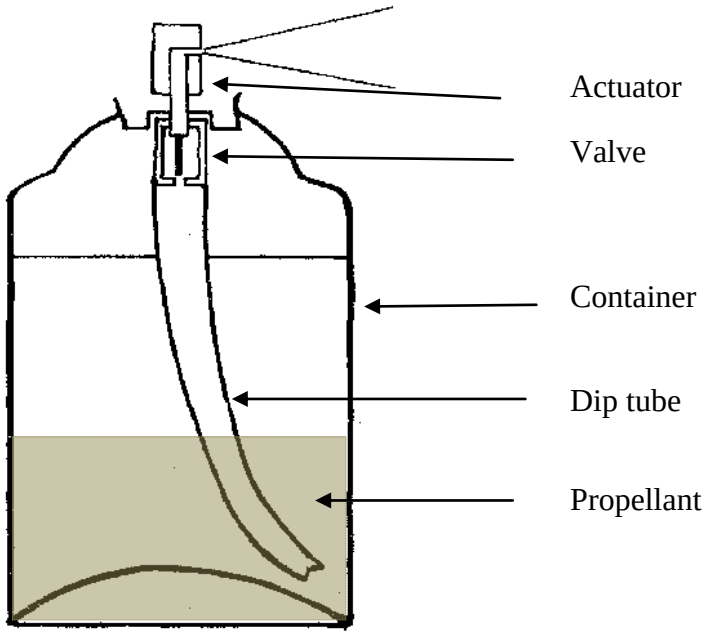

Fig. A typical aerosol system

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