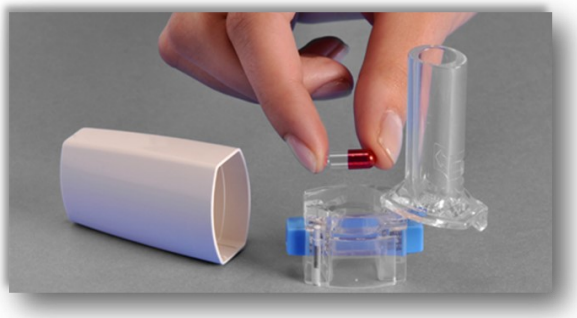

PHARMSOL NEWS

DRY POWDER INHALERS – A PREFERRED FORM OF INHALATION THERAPEUTIC SEGMENT FOR RESPIRATORY DISEASES

SEPTEMBER 2021 EDITION PSNL/0026/07/2021

Pulmonary drug delivery is currently the focus of research and development because of the potential to produce maximum therapeutic benefit to patients by directly targeting the drug to the site of action in the lungs. It is the most important and preferred route of drug administration for the treatment of several lung diseases, such as asthma, Chronic obstructive pulmonary disease, pneumonia, respiratory distress syndrome etc., It also reduces the adverse systemic toxicities and avoids the first-pass metabolism in the liver.

In comparison with oral or parenteral formulations, therapeutic doses of drug in this system are delivered topically into the airways where the active drug exerts its beneficial effects locally within the lungs.

Numerous inhalation delivery systems have been developed. Among them, three approaches, that is, nebulizers, pressurized metered-dose inhalers (pMDIs), and dry powder inhalers (DPI), are extensively utilized. Each type of delivery has advantages and disadvantages in view of the class of drugs that can be applied, type of formulation that can be utilized, and the sum of delivery dose that can be delivered from device.

1) Nebulizers requires bulky compressors or a source of compressed air.

2) pMDIs requires selection of appropriate propellant and they emit dosages at high velocity and enhance the risk of systemic absorption.

3) DPI were introduced to overcome some of the weaknesses associated with nebulizers and pMDIs as they provide better physicochemical stability, deep lungs deposition using the patient's respiration and also, they do not require cold chain storage or reconstitution of powders into solutions.

The main types of DPI systems are:

1) **Unit dose pre-metered device**, which requires the patient to load a single hard gelatin capsule containing the powder formulation into the device before each use. This is a very common type of DPI device currently available. **(Handihaler)**

2) **Multi-dose pre-metered devices**, deliver individual doses from blisters, disks, dimples or tubes. **(DisKus)**

3) **Multi-dose reservoir inhalers** contain a bulk amount of drug powder in the device with a built-in mechanism to meter a single dose delivered with actuation **(Twisthaler).**

Basic Mechanism for DPI

DPI contain micronized drug loosely adhered to larger carrier particles (i.e. lactose) by ordered or interactive mixing or micronized drug particles agglomerated into soft pellets.

During inhalation which generates air stream, the drug particles detach from the carrier and get deposited into the lungs while the carrier particles normally impact the oropharyngeal region

Efficiency of a DPI formulation is greatly dependent on the particle size distribution, fine-lactose content, lactose source, the inhalation flowrate, and dispersion capacity of the respective DPI device

Key Formulation considerations include Physico-chemical properties of drug and excipient(s) particles like Particle size and shape, Density, Surface properties, Solid (polymorphic) form including drug-excipient particle interactions

Key Device consideration depends on the internal geometry and dimension along with flow rates through the device. Material used should be compatible with the formulation and user friendly.

The most important sources of variability in DPIs development and production can be categorized as:
1) Quality characteristics of drug substance and excipients.
2) Microparticle production process (milling, spray drying, etc)
3) Powder manufacturing process (API-carrier blending, soft pellets production, etc)
4) Device filling process
5) Environmental conditions
6) Design of the delivery device
7) Primary packaging materials

Considering the above variables, it is essential to proceed with a Quality by design (QbD) based approach for development of robust formulations of DPIs in order to meet the timelines and avoid risk of expensive and time-consuming changes later in development.

Conclusion

The successful delivery of any therapeutic agent to the pulmonary region via a DPI depends on four mutually dependent parameters: the formulation, the metering system, the inhaler device, and the patient's understanding/training.

How PharmSol can help you?

⇒ ***PharmSol provides the required training on how to develop generic products using DPIs***

⇒ ***PharmSol help in setting up the R&D laboratory along with development and tech transfer of generic products for DPIs***

⇒ ***PharmSol help in setting of manufacturing facility with required Regulatory certification (EU, US, etc., for DPI***

Get in touch with our experts, please email info@pharm-sol.com