Multi Unit Drug Delivery System – A Brief Review of Pelletization Technique

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Abstract: At present time pharmaceutical research and development showing its interest on drug delivery. Which enhances therapeutic action while minimising side effect. Use of multi-particulate is the gift of that research which achieve delayed or controlled release with low risk of dose dumping, flexibility of blending to attain different release pattern as well as reproducible and short gastric residence time. Pelletization is a novel approach for the formation of spherical beads or pellets from fine powder or blend in order to develop site specific drug delivery system. Different techniques of pelletization such as suspension/solution layering, extrusion and spheronisation, cryopelletization etc. can be used for the formation of multi particulate drug delivery system. In order to provide extended or delayed release formulation, thus extending the frontier of future pharmaceutical development.

Key words: Multi particulate drug delivery system • Pelletization and dose dumping

INTRODUCTION

Multiunit drug delivery system (mudds)- the evolution of concept of multi unit dosage form was introduced in early 1950s these are mainly oral solid dosage form that consist of multiplicity of small discrete subunit of diameter (0.5-2 mm) and each exhibit some desired characteristic if necessary, they offers numerous advantages over single unit dosage form ex- reduce chances of dose dumping, greater bioavailability as the surface area increases and size decreases, less dependency on gastric emptying resulting in less inter and intra-subject variability in gastro intestinal transit time and less likely to cause local irritation that’s why more emphasis is being laid on the development of multiparticulate drug delivery system [1].

Multiparticulate drug delivery system may increases drug safety as the film of enteric coating on single unit or monolithic is damaged it will release whole drug in stomach and will cause ulceration or irritation and will cause loss of complete dose or dose dumping but equally if the damage of film coating of multi unit dosage form occur it will release drug of that small subunit and affect the release behaviour of that specific sub unit which represent small part of total dose [2].

Pelletization [3, 4]: Pelletization is a novel drug delivery system; a technique which converts fine powder particles into pellets. These oral multiparticulate drug-delivery systems offer biopharmaceutical advantages with respect to predictable and even distribution and transportation in the gastro-intestinal tract. Pelletization can be referred as the conversion of fine powder, granules of drug and excipient by the means of agglomeration to small, free flowing spherical subunit referred as pellets. Which are smaller in size (0.5-1.5mm) and intended mostly for oral administration. It has been used to describe a variety of systematically produced, geometrically defined agglomerate obtained from different starting material utilizing different processing condition.

Requirements of Pellets:

- Pellets should be of spherical shape and the surface should be smooth so that desired uniform film coating can be done.
- Particle size of pellets should be in range 0.5-1.5 mm.
Advantages of Multiparticulate Drug Delivery System:

- Gastric emptying is faster as the particles small in size and passes even if pylorus is closed.
- Avoidance of dose dumping.
- Better distributed and less likely to cause local irritation.
- Increased bioavailability as the surface area increases.
- Pellets are recommended for paediatrics and geriatric patient with difficulty in swallowing and dysphagia problem.
- Increased in flow property (smooth surface).
- Disperse freely in GIT and increase absorption of active drug.
- Incompatible drug and drugs with different property can be processed individually and later combined to form a modified drug delivery.

Extrusion and Spheronisation [6-8]: It is a most commonly used technique in pharmaceutical industry to make uniform sized spheroids. Development of this pelletization technique was started in 1960s. It is a multi-step compaction process comprising of following step-

Dry Mixing: Formation of blend by mixing ingredient to get homogeneous powder

Wet Massing: In this process powder are sufficiently wet to form a plastic mass (commonly used granulator are planetary mixer, sigma blade mixer or high shear mixer)

Extrusion: It is a compaction process where pressure is applied to wet mass until it passes through the calibrated openings of extruder to form rod shaped particle of uniform diameter spaghetti-like extrudate.

Spheronisation Stage: This process is used to give a proper spheroid shape with narrow size distribution to the extrudate (rod shaped particle) formed previously instrument called spheronizer.

Drying: Drying of spheroid is an important step to achieve desired final moisture content (tray dryer or fluidised bed dryer)

Screening: To achieve desired size distribution.

Extrusion: Is a process comprising of applying pressure to a wet metered mass until it passes through a calibrated openings of a screen or die plate of extruder and further shaped into small extrudate segment. Amount of granulating fluid and uniform dispersion of fluid plays an important role in preparation of wet mass because optimum cohesiveness and plasticity is required which affect the final mass because excessive plasticity may lead to extrudate which stick to each other. final size of spheroid depend on the diameter of opening in the extruder screen.

Spheronisation: Refers to formation of spherical particle from the small rod produced by extrusion. it is rotated at higher speed by friction plate that break the rod shaped particle into smaller particle and round them to form sphere.

Solution/ Suspension Layering [9, 10]: Drug particles and excipient are suspended or disperse in liquid medium. And a growth of pellets involve deposition of successive layer of solution and/or suspension of drug and binder.
on existing nuclei which may be either (inert seed or non pariel seeds, crystal or granules) this process can be
done for controlled release, extended release or
delayed release. Equipment employed for this kind of
coating consist of modified conventional coating pans
(perforated pans) and fluid bed granulator. The technique is widely used. During drying liquid evaporates and the dissolved substance crystallizes out in suspension layering, particles have low solubility and are
bound by solid bridges (higher concentration of binder
is required).

**CONCLUSION**

Development of pelletization has acquired the market
of novel drug delivery involving both the controlled as
well as immediate release. Due to its simple design, high
efficiency of producing spherical pellets, flexibility and
robustness. It has acquired a special place in
pharmaceutical industry.

It can be concluded that due to their good
technological and biopharmaceutical advantages,
pelletization has gained an importance in modern
pharmaceutical science.

**REFERENCES**
