The oral drug delivery biology essay

Science, Biology

Oral drug delivery is most convenient and acceptable method for administration of drugs however it is possible that at least 90% of all drugs used to provide systemic effect is administered through oral route. If a new drug is discovered, one of the first questions a drug company asks is whether or not the drug can be effectively administered for its purposeful effect by oral route of drug that is administered orally; solid oral dosage forms represent the preferred class of product. Tablet and capsules represent unit dosage forms in which usual dose of drug has been accurately placed. Why the oral route has this much advantage isMost acceptance routeEasy for administrationLow costEasy for transportationThe conventional immediate release formulations provide efficient treatment when maintaining the required balance of pharmacokinetic and pharmacodynamic profiles with an acceptable level of safety to patient.

Tablets:

Definition:

Tablets are tamperproof solid unit dosage forms containing medicament or mixture of medicaments, excipients compressed or molded into a solid cylindrical shape having both flat and convex surfaces. They have been widespread use since the later part of the 19th century, and their popularitycontinues. Tablet remains popular as a dosage form because of the advantage afforded both to the manufacturer and patient.

Advantages and Disadvantages

Advantages:

Offers greatest capability in all oral dosage forms for the greatest dosage precision & least content Uniformity. High patient acceptable. Cheaper than other dosage forms. Easy to handlingEasy to take no need of expert.

Disadvantages:

Drugs with poor bioavailability drugs we can’t give as tablets. We can’t give unconscious patients. The fluctuating drug levels sometimes lead to precipitation of adverse effects especially when a drug with small therapeutic index whenever over medication occurs.

Types of tablets:

Tablets are classified by their route of administration or function, through the type of drug delivery system they represent within that route and by their form and method of manufacture. Tablets ingested orally are1. Compressed tablets (CT)2. Multiple compressed tablets (MCT)a. Layered tablets – Bi-layer tabletsb. Compressed coated tablets3. Repeat action tablets4. Delayed action and enteric coated tablets5. Sugar and chocolate coated tablets6. Film coated tablets7. Air suspension coated tablets8. Chewable tablets9. Dispersible tabletsTablets for oral cavity1. Buccal tablets2. Sublingual tablets3. Troches, Lozenges and dental conesTablets used to prepare solution1. Effervescent tablets2. Dispensing tablets (DT)3. Hypodermic tablets (HT)4. Tablet triturates (TT)

Tablet processing:

Generally tablets are processing by three methods they areWet granulationDry granulationDirect compressionMethod is chosen depend on the ingredients individual characteristics like flow property, compressibility. Choosing a method required through examination of each ingredient in formula, the combination of ingredients, and its work with each other. Then the proper granulation process can applied.

A. Direct compression

Processing steps are:

Raw material →weighing → screening → mixing → compression.

In before days, tablets need granulation of powdered Active Pharmaceutical Ingredient (API) and Excipients. The availability of new or renewed form of old excipients and the invention of new tablet machinery or renewed of old tablet machinery provides an easy in manufacturing of tablets by simple procedure of direct compression. In techniques used to prepare tablets, direct compression is most advanced technology. It involves only blending and compression. Thus offers benefit particularly in terms of quick production. It requires lesser unit operations, less machinery, reduced number of personnel and less processing time along with increased product stability.

B. Wet granulation

Raw materials → Weighing → Screening → wet mass → Sieving/Milling → Drying → screening → Mixing → Compression

Wet granulation consists several objectives. In addition to increasing particle size and flow, compressibility and densification, wet granulation also produces general spherical, uniform-sized particles with hydrophilic surfaces and uniform distribution of the drug and advantage of covering the raw materials in a sea of binder paste. Wet granulation include, AgglomerationAgglomeration breakdownRe-agglomerationPaste formation.

Advantages of wet granulation

Traditional method, works well for many drugs because it imparts compressibility. Useful for fluffy powders that don’t flow well or mix well, thus improving uniformity important for potent (low dose) drugs. Wide range of available excipients.

Disadvantages of wet granulation

Not useful for moisture sensitive or heat sensitive drugs. Need to use a binder in the excipients mix. Extra steps for drying and laborious, material losses, susceptible to contamination, time consuming and expensive.

C. Dry granulation

Processing steps are:

Raw material →weighing → Screen → mixing → slugging →Milling →

Screening → Mixing → Compression

Here this technique it involves, there is no necessity of liquids. This process involves the formation of slugs. Slugs are then screened or milled to produce granules. The granules formed are compressed to form tablets.

Advantages of dry granulation:

Useful for moisture-sensitive drugs. Fewer steps and equipment than wet granulation, less time consuming. Less loss of materials e. g. transfer steps (mixer-granulators).

Disadvantages of dry granulation:

It requires a heavy-duty tablet press to form the slug. It does not permit uniform color distribution as can be achieved with wet granulation, where dye can be incorporated into the binder liquid.

EXTENDED RELEASE TABLETS

An appropriately designed sustained release or extended release drug delivery system has a major advance towards solving problems concerning targeting of drug to a specific organ or tissue and controlling the rate of drug delivery. The drugs with short biological half- lives frequent doses are required to maintain constant state plasma concentrations within the therapeutic range, such drugs the maintenance of therapeutic plasma concentrations is particularly susceptible to consequence of forgotten doses and the overnight no-dose period. Lack of patient compliance, that is more likely in the case of regimens requiring frequent administrations of

conventional dosage forms, is often an important reason for therapeutic inefficiency or failure. These limitations and requirements led pharmaceutical scientists to consider presenting therapeutically active molecules in the extended release preparations. Each delivery system was aimed at cyclic changes in plasma concentration after the administration of a conventional delivery system.

Terms used to describe these systems:

Delayed release:

Indicates the drug is not being released immediately following administration but at a later time, e. g. enteric coated tablets, pulsatile-release capsules. Repeat action Indicates that an individual dose is released fairly soon after administration, and second or third doses are subsequently released at intermittent intervals.

Prolonged release:

It indicates that drug is provided for absorption over a longer period of time than from a conventional dosage form. However, there is an implication that onset is delayed because of an overall slow release rate from the dosage form.

Sustained release:

It Indicates an initial release of drug sufficient to provide a therapeutic dose soon after administration, and then a gradual release over an extended period.

Extended release:

Dosage forms releases the drug slowly, so that plasma concentrations are maintained at a therapeutic level for a prolonged period of time (usually between 8 and 12 hours).

Controlled release:

These dosage forms release drug at a constant rate and provide plasma concentrations that remain invariant with time. Schematic drawing of plasma concentration-versus-time profiles following administration of three immediate-release dosage forms versus one single controlled-release dosage form.

Retro virus

It is the RNA virus which replicates in the host cell. It uses its own reverse transcriptase enzyme to produce DNA from its RNA genome, reverse of the usual pattern, therefore retro (backwards). This new DNA is incorporated into the host's genome by integrase enzyme. The cell treats the viral DNA as a part of its own instructions, which it follows blindly, making the proteins required to assemble new copies of the virus.

Anti retroviral drug

Antiretroviral drugs are the medicines for the treatment of infection caused by retroviruses, primarily HIV. Various classes of antiretroviral drugs act in different stages of HIV life cycle. Combination of several (three or four) antiretroviral drugs is known as Highly Active Anti-Retroviral Therapy (HAART). Standard antiretroviral therapy (ART) consists of combination of at least 3 antiretroviral (ARV) drugs to maximally suppress the HIV virus and to

stop the further growth of HIV disease. Huge reductions have been seen in rates of death and suffering when use is made of a potent ARV regimen, particularly in early stages of the disease.

Classes of drugs

Antiretroviral drugs are classified by phase of the retrovirus life-cycle that the drug inhibits. Fusion inhibitors interfere with binding, fusion and entry of HIV-1 to host cell by blocking one of several targets. Antagonists receptor (CCR5) the first antiretroviral drugs which do not target the virus directly. Alternatively, it binds to CCR5 receptor on the surface of the T-Cell and blocks the viral attachment to the cell. Most strains of HIV attach to T-Cells using the CCR5 receptor. When the HIV cannot attach to the cell, it cannot gain entry to replicate. Nucleoside reverse transcriptase inhibitors and nucleotide reverse transcriptase inhibitors are nucleoside and nucleotide analogues that inhibit reverse transcription by being incorporated into new synthesized viral DNA strand as faulty nucleotides; they then both act as a competitive substrate inhibitors. Non-Nucleoside reverse transcriptase inhibitors (NNRTI) inhibit reverse transcriptase through binding to an allosteric site of the enzyme; NNRTIs act as a non-competitive inhibitors of reverse transcriptase. Enzyme integrase are inhibited by the integrase inhibitors which is responsible for integration of viral DNA into the DNA of the infected cell. Maturation inhibitors inhibit the final step in gag processing in which the viral capsid polyprotein is cleaved, from there blocking the conversion of the polyprotein into the mature capsid protein (p24). These viral particles have a defective core; the virions released consist mainly of non-infectious particles.

Drug interactions

Nevirapine activity decreases with the anti-tuberculosis drug, rifampicin. Decreases the levels of many co-administered drugs like anti retrovirals efavirenz, indinavir, lopinavir, nelfinavir and saquinavir, as well as clarithromycin, ketoconazole, forms of hormonal contraception, and methadone.

Preventing mother to child transmission

One single dose of nevirapine administered to both mother and child reduced the degree of HIV transmission by almost 50%.