**PHARMACEUTICAL PREPARATIONS AND DRUG DELIVERY**

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**ABSTRACT:**

In present chapter we have focused on different pharmaceutical dosage form and classified them on basis of their physical appearance and route of administration as well.Objectives of converting drug in to dosage form and there merits are highlighted.AProaches of formulating different dosage form and there stability is focused in current chapter. Development of pharmaceutical dosage form is art and science of inventing new dosage form by Pharmacists and pharmaceutical scientists.In this chapter we are going to introduce different concepts related to pharmaceutical prepartions and drug delivery. While the formulating dosage form both physical and chemical factors of ingredients and drug are considered ,calculations are applied to make sure quantity of drug and excipients in formulationFormulation of Syrups,emulsion,suspension,oral solutions,tablet and ointment is reviewd in current chapter.Ideal properties of dosage form are highlighted.different drug deliveries like transdermal drug delivery,ocular drug delivery,gastrointestinal drug delivery and intra uterine drug delivery are discussed along with there basic components and as novel drug delivery system.

**Key words**:Pharmaceutical preparations,dosage form and drug deliveries.

**Introduction to Pharmaceutical Preparations**

Formulating a dosage form is multistep process in which active drug is mixed with different excipients with respect to particle size, polymorphism, ph, and solubility like different parameters and final formulation is developed.While developing any formulation we took in consideration drug excipient interaction,synergistic and other benifites from excipients,preformulation study and manufacturing procedure for pharmaceutical dosage form in different ways.Depending upon its utility and patients compliance formulation can be developed in dosage form and promoted in market with specific blend of active pharmaceutical ingredients and excipients. Numerous formulation has flooded nowdays into market,huge amount of time and money has invested in developing this formulation and are significante for clinicians to prescribe and for patients to utilize them.there is scope for development in this already formulated dosage form by overcoming the challenge of drugs to target the different protiens in our body. As of developed drug are able to target few protiens and show the activites. Development of pharmaceutical dosage form is art and science of inventing new dosage form by Pharmacists and pharmaceutical scientists.In this chapter we are going to introduce different concepts related to pharmaceutical prepartions and drug delivery. While the formulating dosage form both physical and chemical factors of ingredients and drug are considered ,calculations are applied to make sure q**uantity of** drug and excipients in formulation. Qunatity of drug is ensured for saftety and therapeutics response needed to be obtained from specific formulation.It also deals with study of pharmacokinetics and pharmacodynamics which is responsible for drug response to patients compliance1

**Merits of converting drug to dosage form**

1-Accurate dose can be maintained

2 coated tablets and sealed ampoules can protect the drugs easily

3 Bitter drugs can be converted into palatable dosage form by masking taste and odor

4 Drug degradation can be avoided from gastric juice

5 sustained drug release can be obtained

6 drug solubility can be increased by choosing different solvents

7 different design of drug can be produced to fit in body cavities.

Mouth washes

Gargles

Syrups

Elixirs

Snuff

Dusting powder

Finepowders

Granules

Ointment

Creams

Suppository

Pessaries

Emulsion

Suspension

External

Tablet

Capsule

Powder

Pills

External

Internal

Internal

External

Monophasic

Unit dosage

Internal

Biphasic

Bulk dosage

Semi solid dosage form

 Liquid dosage form

 Solid Dosage Form

Classification

 **Fig no 1 Classification of dosage form depending on physical state of matter.**

**Ideal Properties Of Dosage Form**

1. It should to be convenient to handle and use
2. It should be convient and esay to store
3. Should not cause instability while storing and use
4. It should have enough drug strength and flexibility
5. Drug should have good drug release and onset of action
6. Should meet therapeutic effect
7. Should not be too costly2

Site of Application

Nasal

Hair

Skin

Foot

Hand

Tooth

Eye

Hair cream, Hair lotions, Shampoos, Hair fixing.

Solutions, Ointments, Creams.

Toothpowder, Tooth paste.

Solutions, Sprays, Inhalation

Creams, Ointments, Dusting powders.

Hand creams, Lotions,

Hand washings

OintmentsCreams, Lotions, Liniments.

**Fig no 2 Classification of dosage form on basis of route of administration.**

**Different Dosage Form**

**Oral Solutions :**Oral solutions are most suitable type of dosage form as it is covientient to be swallowed by padeiatric and gediatric patients.Oral solutions are blend of drug,colouring and flaouring agent together with stabilizers and preservatives.They are termed as liquid preparations of molecular dispersion type containing soluble ingredients in water.They can be prepared by different methods like chemical reaction or extraction,for an example formulation like syrup is prepared by dissolving sugar in water or other aqueous liquids.Syrup are concentrated solutions,can be prepared in two different categories as medicated and flavored. Different methods are used for preparation of syrups such as agitation by continuous stirring,by supplying heat to dissolve solute easily and prepare concentrated solutions.whenever concentration of sugar is higher there is no need of preservative as syrup itself act as preservative

**Elixirs:**Elixirs have pleasant and sweet flavor, observed as a clear liquids.This preparations are used for oral administration.Main ingredients involved are water and alcohol.Hence they are termed as hydro-alcoholic preparations.Such type of dosage forms are widely used for formulation containing soluble medicinal components.Other excipients like flavouring and solubilizing agents are added to enhance the effect of formulation.

**Suspensions:**Suspension are categorized into coarse type of dispersion as they are biphasic dosage form in which one phase is dispersed into another continuous phase such as solid particles are dispersed into liquid phase.They are easy to admininster.They provide sustained released effect due to dispersed phase as compared to simple solutions.Major challenge is to develop flocculated suspension with proper balance of zeta potential and brownian movement.Deflocullated suspension dosent allows rapid settling of particles but cacke formation is observed after settling of particles and resuspenion is difficult in this case,hence floculted suspension is mostly favoured as rapid settling takes place but redispersion is easy in flocullated type of suspension.Hence suspension are directed as shake well before use.Physical characteristics of suspensions is determined by two parameters such as sedimentation volume (F) and the degree of flocculation.3

**Emulsions**:Emulsions are also part of coarse dispersion but they differe from suspension in term of disperse phase and continuous phase,emulsion has both phase in liquid form.One is oil phase and another is water phase,to make one pahse soluble in another emulsifying agents are used and stable type of emulsion is formulated.Depending upon concentration of oil and phase they are classified as o/w type of emulsion or w/o type of emulsion,as continuous phase is made of maximum concentration of component.Active pharmaceutical ingredient or drug can be added into continuous phase or dispersed phase and by adding emulsifying agent one stable emulsion is formulated. They are categorised into five categories, carbohydrate materials, protein substances, high molecular weight alcohols, surfactants, and finely divided solids.Hydrophillic lipohillic balance scale is used while preparing emulsion to make a proper balance of both the phases.Different methods used for preparing emulsion includes continental or dry gum method, the English or wet gum method, the bottle of Forbes or bottle method, and the fusion method.Instability can occur in emulsion as cream formation which is reversible type of instability and flocculation ones occur it is irreversible type of instability.Emulsion are also labelled as shake well before use.

**Tablets:**Tablets are solid dosage form containing drug and other excipient compressed together to develop unit dosage form.Granulation is important stage in developmet of tablets which can be done by wet granulation or dry granulation.Other excipients such as binders for good binding effect,for proper flow of granules glidants and disintegrants for proper dissolution is added.Bitter taste of tablet can be masked by adding flavoring agent and colouring agents are used to enhance the appearance of tablets.Different evaluation test are performed to evaluate the performance of tablet prepared by adding different exicipents as disintegration test, dissolution, weight variation, and content uniformity test.

**Ointments:**Ointments are of generally two types medicated and non medicated used for external purpose. Various bases are utilized in the preparation of ointments. Different type of bases such as hydrocarbon, absorption, water-removable, and water-soluble bases are utilized. Ointments are prepared by using ointment pad or a mortar and pestle. By using levigation methods drugs is mixed into ointment base. The fusion method is also used for preparation of ointment when solid materials are not able to mix easily in and form uniform Ointments.

**Introduction To Different Drug Drug Delivery**

**TRANSDERMAL DRUG DELIVERY SYSTEM (TDDS)**

Transdermal drug delivery system (TDDS) is one of the systems lying under the category of controlled drug delivery, in which the aim is to deliver the drug through the skin in a predetermined and controlled rate. TDDS are adhesive drug-containing devices of defined surface area that deliver a predetermined amount of drug to the surface of intact skin at a programmed rate to reach the systemic circulation.4

**BASIC COMPONENTS OF TDDS**

**Polymer Matrix**:Polymers used in TDDS should have biocompatibility and chemical compatibility with the drug and other components of the system, such as penetration enhancers and PSAS. Additionally, they should provide consistent and effective delivery of a drug throughout the product’s intended shelf-life, and should be safe.

**Membrane**:A membrane may be sealed to the backing to form a pocket to enclose the drug containing matrix or used as a single layer in the patch construction. The diffusion properties of the membrane are used to control availability of the drug and/or excipients to the skin. For example, ethylene vinyl acetate, silicone rubber, polyurethane, etc. are used as a rate controlling membrane.

**Drug :**For successfully developing a TDDS, the drug should be chosen with great care. Transdermal patches offer many advantages to drugs that undergo extensive first-pass metabolism, drugs with narrow therapeutic window or drugs with a short half-life, which cause non-compliance due to frequent dosing.

**Permeation Enhancers:** Permeation enhancers are defined as substances that are capable of promoting penetration of drugs into skin and transdermal therapeutic systems offers a more reliable mean of administering drug through the skin.

**Backing laminates:** Backings are chosen for appearance, flexibility and need for occlusion; hence, while designing a backing layer, the consideration of chemical resistance of the material is most important. Excipient compatibility should also be considered because the prolonged contact between the backing layer and the excipients may cause the additives to leach out of the backing layer or may lead to diffusion of excipients, drug or penetration enhancer through the layer.

**Release liner:** Before applying the patch protective liner which is applied while storage for safety is remove and patch is utilized on the skin.Liner should be developed with non toxic and non irritant propert having inert nature to avoid reaction with skin.It is made up of paper fabric like non occlusive material and polyethylene or polyvinyl chloride like occlusive material, silicon or teflon like material is used in release coating layer.Other materials used for TDDS release liner are polyester foil and metalized laminates.5

**OCULAR DRUG DELIVERY SYSTEM**

* EYE is the most accesible site for topical administration.Organs includes in accessory organs of the eye are- [eyebrows,eyelids,eyelashes,the lacrimal apparatus,the extrinsic muscles] hence eyes is most delicate organ with an unique anatomy and physiology. O/W emulsion is mostly preffered in ODDS and PH is maintained at 7.4 while developing the eye drop.To cur the eye infection or to treat eye disorder instillation of eye drop is needed.The major focus is to formulate eye drop which can sustain the drug release and remain in eye for longer time.

Ocular administration of drug is primarily associated with the need to treat ophthalmic disease.The main objective of ophthalmic drug delivery is that , it should sustain the drug release and to remain in the vicinity of front of the eye for prolonged period of time .The novel approach of drug delivery in which the drug is instilled on the cul de sac cavity of the eye ( the space between eye lids and eye balls ) is known as ocular drug delivery system.The recent development in dosage forms are the gels , gel forming solutions , suspensions , ocular inserts , intravitreal injections and implants.

**Advantages of ODDS are-**

 1.They are easy to administer

 2.Low systemic side effect is osbserved in ODDS

 3.Benfit of accurate dosing can be achieved.

 4.They are not to much expensive6

**INTRA UTERINE DRUG DELIVERY SYSTEM**

Nowdays IUD is one of the most effective, safe and economical methods of contraception. IUD helps is preventing pregnancy for period os 3 to 12 years approximatelys and hence used as long-acting reversible contraception .IUD stands for intra uterine device which is a small T-shaped device that is used as a method of birth control designed for insertion through the cervix and placed in the uterus to prevent pregnancy.IUDs have been shown to be over 99% effective in preventing pregnancy.IUD is attached with thread or tail, which projects into vaginal after insertion.

Few side effects of using IUD are

* IUD cause localinflammation in uteruswall that begins about 24 hrs after insert. This inflammationattacks WBC. Then, this WBC produce antibodywhich is toxic substances for sperm.
* Not used due to highfailure rate.
* Sides effects like Anaemia, Backaches, Spotting betweenperiods and Vaginal discharge.
* Pain during sexSide effect of hormonalBreast cancer Breast tenderness, Headaches,Nausea, Mood changes,Weight gain.
* This hormone increase the viscosity of the cervical mucus.Prevent sperm from entering the cervix.7

**GASTRORETENTIVE DRUG DELIVERY**

Gastroretentive drug delivery is an approach to prolong gastric residence time, thereby targeting site-specific drug release in the upper gastrointestinal tract (GIT) for local or systemic effects.The diagnosis of gastroparesis is based on the combination of symptoms of gastroparesis,absence of gastric outlet obstruction or ulceration (documneted on UGIE or Barium swallow) and documentation of delay in gastric emptying.

* **Advantages**
* Improved drug absorption, because of increased GRT and more time spent by the dosage form at its absorption site***.*** Minimizing mucosal irritation by releasing drugs slowly at a controlled rate.
Treatment of gastrointestinal disorders such as gastro esophageal reflux, providing local action.
 Ease of administration and better patient compliance.
* **Limitations**
* Retention in the stomach is not desirable for drugs that cause gastric lesions (e.g. Non- steroidal anti-inflammatory drugs NSAIDs).
* Drugs that are degraded in acidic environment of stomach (e.g. Insulin).
 Drugs that undergo a significant first-pass metabolism (e.g. Nifedipine).
Drugs that have very limited acid solubility (e.g. Phenytoin).8

**Future Prospect Of Drug Delivery System**

Overcomning the traditional drug delivery system we should focus on Novel drug delivery system now days,major focus is on overcoming the disadvantges of novel drug delivery,there challenges and barriers.Development of Inta uterine drug delivery system without side effect and to overcome barriers in ocular drug delivery is major future aspect.Another are to focus is developing the drug delivery for overcoming resistance developed by different dosage form.

**CONCLUSION**

From above chapter it can be concluded that development of drug into various different dosage form has great scope and significant outputs can be obtained in market.Overcoming the traditional drug delivery and focusing on novel drug delivery has become need for current market.Varoius new diseases are rasing there head now days into community which can be controlled by the help of different dosage form and new drug delivery system.

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