Introduction of Pharmaceutics & Various Branches

Historical Perspective: At a glance

•Lord brahma was the first teacher of universe who wrote "Ayurveda" (Science of life) in 5000 BC. Lord dhanwantris eas worshipped as "God of Health" holding the amrut (nector) in his hand. Righveda described the various herbs used in treating numerous diseases. Charaka and sushrata spread the message of Ayurveda in ancient India. In BC 226 Hospital concept in the period of Great Ashoka was well developed and practiced in India. In 900 ADTamilnadu (Tirumakku dal village) discovered organized hospital activity in India treating diseases like piles, jaundice, dropsy, TB, hemorrhage, etc. In 1000 AD. All the medical works were medaled on the Charaka pattern of treatment of diseases Europe was influenced by

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Pharmaceutical Programs

Recently, the D.Pharm or B.Pharm(Kulkarni,2009) intake capaci ty is 60 or 120 per year as per PCI & AICTE norms. The animal house, library, pharmacy museum, auditorium / multipurpose hall, seminar hall, herbal garden are required for both D.Pharm & B.Phar m courses in the final year for any Indian Pharmacy Institutions. The laboratory requirements for B.Pharm are 03 Pharmaceutucs laboratory, 02 Pharmaceutical Chemistry Laboratory, 01 Pharmaceutical Analysis laboratory, 02 Pharmacology laboratory, 01 Pharmacognosy laboratory, 01 Pharmaceutical Biochemistry laboratory & for D.Pharm are 01 Pharmaceuticals laboratory, 01 Pharmaceutical Chemistry laboratory, 01 Physiology and Pharmacology laboratory, 01 Pharmacy Practice laboratory, 01 Pharmacognosy laboratory and for both courses 01 computer room, 01 machine room, 01 central instrumentation room, 05 preparation room, 01 store room (I), 01 store room (II) for inflammable chemicals are required.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
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3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

DRUG – MEDICINE French drogue, German Droge. In its restricted sense the word has been used to designate so-called „crude" drugs of mineral, vegetable or animal origin, in contrast with galenic preparations or chemicals. In its wider sense, as defined in state and national laws, the term includes all prevetive and therapeutic agents. The word „drug" has historically a positive connotation. In recent times however, the word has become associated with products and activities that are societally suspest. In a pilot study of six major U.S.A. daily newspaper, 62 % of the use of the word „drug" was in a pejorative sense. It is important to make efforts to differentiate the words „drug" and „medicine". Medicine (drugs in original meating) help to preserve restore, or maintain our health and qualitiy of life.

PHARMAKON The Greek word from which many modern terms pertaining to pharmacy, have been derived. The meaning of the Greek word developed from that of charm or magic agency, exerted by means of plants with healing but also with poisoning effect, to that of remedy without any collateral significance. Often the designation was restricted to purgatives in a real as well as figurative sense.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Content of history of pharmacy lectures

1. History of phamracy from the prehistoric men, through ancient prelude Babylonia – Assyria Egypt Greece and Rome
2. The Arabs and the European Middle Ages The Arabs – Transit ways of knowledge The birth of professional pharmacy in Europe
3. The rise of professional pharmacy in Europe – and in Hungary
4. Foundation of universities
5. Start of medicinal chemistry
6. History of the international trends (international commerce, patents, trademarks, social trends, professional trends)
7. Development of professional literature
8. Scientific contributions

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Need for dosage forms

1. Accurate dose (for smaller dose drugs e.g. Alprazolam 25 mg, Telmisartan 50 mg).
2. Easy to handle, easy to administer (Because of definite size, shape, strength) Example- Tablets are easy to handle, Liquids are easy to swallow.
3. Greater accuracy when we compare tablet with powder/liquids
4. Less microbial contamination (Tablet is less prone as compared to liquids)
5. Protection from gastric degradation (Insulin administered as Subcutaneous route).
6. For rapid onset of action (comparison of i.v injection with tablet)
7. For local or systemic effects through body cavities. E.g. eye drops, enemas, nasal drops
8. For local or systemic effects through topical application e.g. ointment, creams, jellies .
7. To modify duration of action e.g dispersable tablets, sustain release medication, Controlled release medication.
9. Optimal drug action.
10. Insertion of drugs into body cavities (e.g rectal, vaginal)
11. To improve palatability (colour, odour, taste)

References

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3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Types of Dosage Forms

I) According to Physical Form and Route of Administration

A) Route of administration	B) Physical form
Oral	Solid
Topical	Semisolid
Rectal	liquid
Parenteral	
Vaginal, Inhaled, Ophthalmic	

II) According to Sterility

a) Sterile Dosage forms- e.g. injections

b) Non-sterile Dosage forms- e.g. tablets, capsules, liquids

III) According to Dose Accuracy-

a) Unit: Tab, Cap, Pow, Pills, Lozenges, Cachets

b) Bulk/Multidose : Bulk Pow, Granules, Liq, Semisolid Prep.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Classification of Dosage Forms according to Route of Administration

Route of Administration	*Dosage Forms*
Oral	Powders, Tablets, Capsules, Solutions, Emulsions, Syrups, Elixirs, Magmas, Gels, Cachets, Pills
Parenteral	Solutions, Suspensions, Emulsions
Transdermal	Ointments, Creams, Powders, Pastes, Lotions, Plasters
Rectal	Suppositories, Enemas, Ointments
Vaginal	Suppositories, Tablets, Ointments, Creams, Douches, Foams
Urethral	Suppositories
Sublingual	Lozenges, Tablets
Intranasal	Solutions, Sprays, Inhalations
Conjunctival	Ointments
Intraocular	Solutions, Suspensions, Ointments
Intrarespiratory	Aerosols

References

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2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.

3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

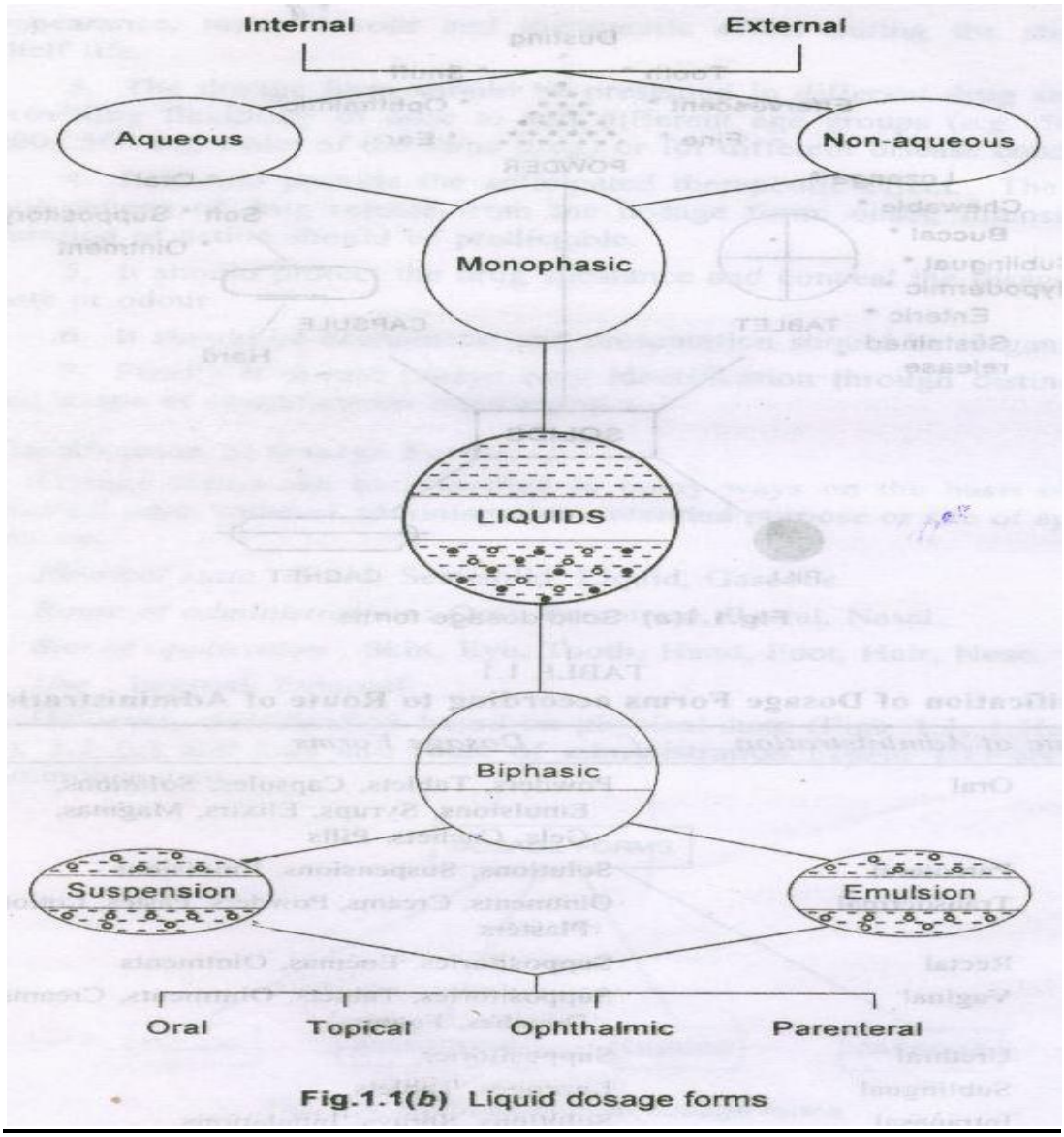

Fig.1.1(*b*) Liquid dosage forms

References

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3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

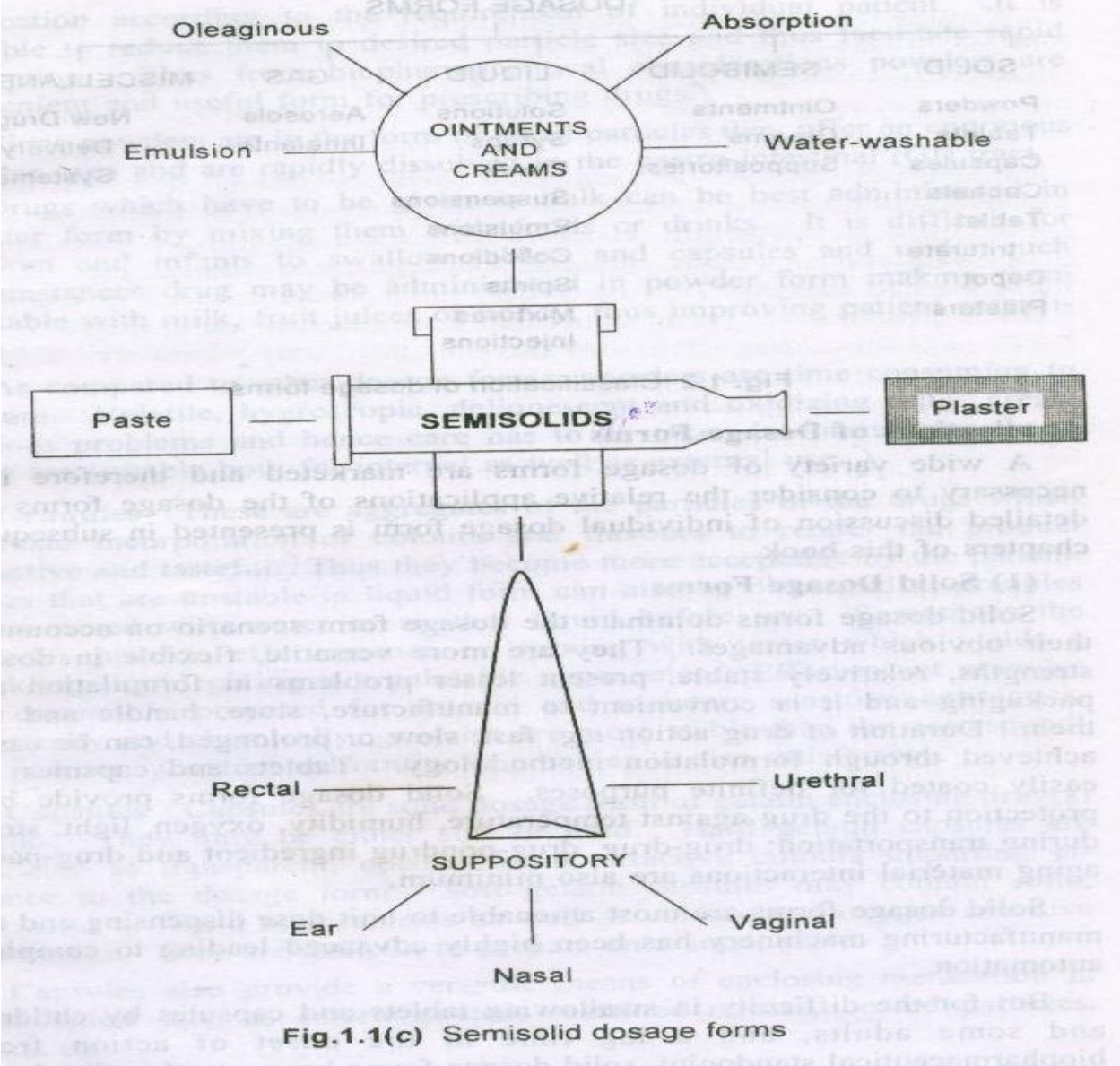

Fig.1.1(c) Semisolid dosage forms

References

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Definition: Excipients

- **Excipients** are pharmaceutical additives,the inactive ingredients used to make up a medication. they includes dyes, flavors, binders, emollients, fillers, lubricants, preservatives & many more classification.
- **Common Excipients** include cornstarch, lactose, talc, magnesium sterate, sucrose, gelatin, calcium stearate, silicon dioxide, shellac & glaze.
- The US food & drug administration approves excipients used in new medication on a - case basis, among other things, a pharmaceutical additive must be……
- Safe in the amount used in the drug

References

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Additives Used in Formulations

Inert substances that are added to the formulation to enhance the performance & stability of formulation.

- ✓ Should not have any pharmacological effect
- ✓ Should be non-toxic, non-irritating & compatible with active drug substances.
- ✓ Should not have their own colour or odour (except for colours & flavour).
- ✓ Should have properties useful for the purpose intended
- Example: some excipients help a drug to a disintegrate into particles small enough to reach the blood stream more quickly. **(Disintegrating Agent), Stabilizer**
- Excipients may prevent a drug from dissolving too early, protecting againts stomach upset **(Coating Agents)**

References

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3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Some of the commonly used excipients are listed below-

Category	Description	Examples
Acidifying agent	Used in liquid preparation to provide acidic medium for product stability.	• Citric acid • Acetic acid • Fumaric acid • Nitric acid
Alkalinizing agent	Used in liquid preparation to provide alkaline medium for product stability	• Ammonia solution • Ammonium carbonate • Diethanol amine • Monoethanol amine • Potassium hydroxide
Adsorbent	An agent capable of holding other molecules onto its surface by physical or chemical (chemisorption) means.	• Powdered cellulose • Activated charcoal
Antifungal preservative	Used in liquid and semisolid preparations to prevent growth of fungi. Effectiveness of parabens is usually enhanced by use in combination.	• Butylparaben • Ethylparaben • Methylparaben • Benzoic acid • Propylparaben • Sodium benzoate • Sodium propionate
Antimicrobial preservative	Used in liquid and semisolid preparations to prevent growth of microorganisms.	• Benzalkonium chloride • Benzethonium chloride • Benzyl alcohol • Cetylpyridinium chloride • Phenylmercuric nitrate
Antioxidant	Used to prevent deterioration of preparations by oxidation.	• Ascorbic acid • Ascorbyl palmitate • Butylated hydroxyanisole • Butylated hydroxytoulene • Propyl gallate • Sodium ascorbate • Sodium bisulfite • Sodium metabisulfite

References

1. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

What is a Prescription?

- A prescription order is written for diagnosis, prevention or treatment of a specific patient's disease
- Is written by a licensed practitioner
- Is written as part of a proper physician-patient relationship
- Is a legal document, **"prima facie" evidence** in a court of law.
    - (side note…A prima-facie case is a lawsuit that alleges facts adequate to prove the underlying conduct supporting the cause of action and thereby prevail.)
- Literally, "Recipe" means simply "Take...." and when a medical practitioner writes a prescription beginning with "℞", he or she is completing the command.
- Was probably originally directed at the pharmacist who needed to *take* a certain amount of each ingredient to compound the medicine (rather than at the patient who must "take/consume" it).

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

What is a Prescription?

Objectives

- Understand what "makes" a prescription
- Intro to Latin abbreviations
- Intro to DEA
- Practice writing prescriptions

The word "prescription" can be decomposed into "pre" and "script" and literally means, "to write before" a drug can be prepared.

a. Another theory exists that the "℞" may have originally been a "Px", where the "P" is short for "pre", and the "x" is short for "script".

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Parts of the Prescription

- Patient Information
- Superscription
- Inscription
- Subscription
- Signa
- Date
- Signature lines, signature, degree, brand name indication
- Prescriber information
- DEA# if required
- Refills
- Warnings/label

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

POSOLOGY

POSOLOGY is derived from the Greek word *posos* meaning *how much* and *logos*meaning *science*. So *posology* is the branch of medicine dealing with doses.

The optimum dose of a drug varies from patient to patient. The following are some of the factors that influence the dose of a drug.

1. Age: Human beings can be categorized into the following age groups:

1. *Neonate*: From birth up to 30days.
2. *Infant*: Up to 1 year age
3. *Child in between 1 to 4 years*
4. *Child in between 5 to 12 years.*
5. *Adult*
6. *Geriatric (elderly) patients*

References

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In children the enzyme systems in the liver and renal excretion remain less developed. So all the dose should be less than that of an adult. In elderly patients the renal functions decline. Metabolism rate in the liver also decreases. Drug absorption from the intestine becomes slower in elderly patients. So in geriatric patients the dose is less and should be judiciously administered.

2. Sex: Special care should be taken while administering any drug to a women during menstruation, pregnancy and lactation. Strong purgatives should not be given in menstruation and pregnancy. Antimalarials, ergot alkaloids should not be taken during pregnancy to avoid deformation of foetus. Antihistaminic and sedative drugs are not taken during breast feeding because these drugs are secreted in the milk and the child may consume them.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

3. Body size: It influences the concentration of drug in the body. The average adult dose is calculated for a person with 70kg body weight (BW). For exceptionally obese (fat) or lean (thin) patient the dose may be calculated on body weight basis.

Another method of dose calculation is according to the *body surface area* (BSA). This method is more accurate than the body weight method.

The body surface area (BSA) of an individual can be obtained from the following formula:

$BSA\ (m^2) = BW(kg)^{0.425} \times Height\ (cm)^{0.725} \times 0.007184$

4. Route of administration

In case of intravenous injection the total drugs reaches immediately to the systemic circulation hence the dose is less in i.v. injection than through oral route or any other route.

5. Time of administration

The drugs are most quickly absorbed from empty stomach. The presence of food in the stomach delays the absorption of drugs. Hence a potent drug is given before meal. An irritant drug is given after meal so that the drug is diluted with food and thus produce less irritation.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
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6. **Environmental factors**
   Stimulant types of drug are taken at day time and sedative types of drugs are taken at night. So the dose of a sedative required in day time will be much higher than at night.
   Alcohol is better tolerated in winter than in summer.
7. **Psychological state**
   Psychological state of mind can affect the response of a drug, e.g. a nervous and anxious patient requires more general anaesthetics. *Placebo* is an inert substance that does not contain any drug. Commonly used placebos are *lactose tablets and distilled water injections.* Some time patients often get some psychological effects from this *placebo*. Placebos are more often used in clinical trials of drugs.
8. **Pathological states (i.e. Presence of disease)**
   Several diseases may affect the dose of drugs:
   In *gastrointestinal disease* like *achlorhydria* (reduced secretion of HCl acid in the stomach) the absorption of aspirin decreases.
   In *liver disease* (like liver cirrhosis) metabolism of some drugs (like morphine, pentobarbitone etc.) decreases.
   In *kidney diseases* excretion of drugs (like aminoglycosides, digoxin, phenobarbitone) are reduced, so less dose of the drugs should be administered.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

9. Accumulation

Any drug will accumulate in the body if the rate of absorption is more than the rate of elimination. Slowly eliminated drugs are often accumulated in the body and often causes toxicity e.g. prolonged use of chloroquin causes damage to retina.

10. Drug interactions

Simultaneous administration of two drugs may result in same or increased or decrease effects.

Drug administration with dose	Pharmacological effect
Drug A	Effect A
Drug B	Effect B
Drug A + Drug B	Effect AB

Relationship	Name of the effect	Examples
Effect AB = Effect A + Effect B	Additive effect	Aspirin + Paracetamol
Effect AB > Effect A + Effect B	Synergistic (or potentiation)	Sulfamethaxazole + Trimethoprim
Effect AB < Effect A + Effect B	Antagonism	Histamine + Adrenaline

References

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2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

11. Idiosyncrasy

This an exceptional response to a drug in few individual patients. For example, in some patients, aspirin may cause asthma, penicillin causes irritating rashes on the skin etc.

12. Genetic diseases

Some patients may have genetic defects. They lack some enzymes. In those cases some drugs are contraindicated.

e.g. Patients lacking *Glucose-6-phosphate dehydrogenase* enzyme should not be given *primaquin* (an antimalarial drug) because it will cause hemolysis.

13. Tolerance

Some time higher dose of a drug is required to produce a given response (*previously less dose was required*).

References

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3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Natural Tolerance: Some races are inherently less sensitive to some drugs, e.g. rabbits and black race (Africans) are more tolerant to atropine.

Acquired Tolerance: By repeated use of a drug in an individual for a long time require larger dose to produce the same effect that was obtained with normal dose previously.

Cross tolerance: It is the development of tolerance to pharmacologically related drugs e.g. alcoholics are relatively more tolerant to sedative drugs.

Tachyphylaxis: (*Tachy* = fast, *phylaxis* = protection) is rapid development of tolerance. When doses of a drug is repeated in quick succession an reduction in response occurs – this is called *tachyphylaxis*. This is usually seen in ephedrine, nicotine.

Drug resistance: It refers to tolerance of microorganisms to inhibitory action of antimicrobials e.g. *Staphylococci* to penicillin.

References

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2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Patient Parameters

Geriatric medicine or geriatrics: is the field that encompasses the management of illness in the elderly.

Pediatrics: is the branch of medicine that deals with disease in children from birth through adolescence.

Neonate (newborn): from birth to 1 month, neonate is considered **premature** if born less than 37 weeks' gestation

Infant: 1 month to 1 year

Early childhood: 1 year through 5 years

Late childhood: 6 years through 12 years

Adolescence: 13 years through 17 years of age

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Calculation of doses

- **Patient Parameters**
- **According to age**
- **Child and infant doses**
- **Young's rule**

$$Dose\ for\ Child = \left[Age\ of\ child\ (years) \Big/ age\ (years) + 12 \right] X\ adult\ dose$$

- **Cowling's rule**

$$Dose\ for\ Child = \left[Age\ at\ next\ birthday\ (years) \Big/ 24 \right] X\ adult\ dose$$

- **Fried's rule for infants**

$$Dose\ for\ Infant = \left[Age\ (months) \Big/ 150 \right] X\ adult\ dose$$

References

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2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Calculation of doses

- **Patient Parameters**
- **According to body weight**
- **Clark's rule**

$$Child\ dose = \left[{weight\ (lb)}/{150} \right] X\ adult\ dose$$

- **According to body surface area (BSA)**

$$Child\ dose = \left[{BSA\ of\ the\ child\ (m^2)}/{1.73\,m^2} \right] X\ adult\ dose$$

$$Child\ dose = BSA\ of\ the\ child\ (m^2)\ X\ dose\ per\ m^2$$

- To determine patient's BSA, use standard Nomogram or this equation

$$Patient's\ BSA(m^2) = \sqrt{\frac{Patient's\ height\ (cm) \times Patient's\ weight\ (kg)}{3600}}$$

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Calculation of doses

- If the adult dose of phenobarbital is 15 mg, what will be the dose for an 8 year-old child?
- **Young's rule**

$$Dose\ for\ Child = \left[Age\ of\ child\ (years) \Big/ age\ (years) + 12 \right] X\ adult\ dose$$

- = (8/8+12)X 15 = 6 mg
- **Cowling's rule**

$$Dose\ for\ Child = \left[Age\ at\ next\ birthday\ (years) \Big/ 24 \right] X\ adult\ dose$$

- = (9/24)X 15 = 5.625

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Ratio strengths

Ratio strength is expressed as a ratio in the form 1 in r. The corresponding fraction would have a numerator of 1. The agreed convention states that, when ratio strength represents a solid in a liquid involving units of weight and volume, the weight is expressed in grams and the volume in millilitres. 1 in 500 potassium permanganate in water is a solid in a liquid and is therefore a weight in volume (w/v) ratio strength. This means that the solution contains 1 g of potassium permanganate made up to 500 mL with water.

Percentage concentration: In terms of parts, a percentage is the amount of ingredient in 100 parts of the product. In the w/v and v/w cases, using the convention, the units are grams per 100 mL and millilitres per 100 g.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Systems of Measurement

THREE SYSTEMS

–Avoirdupois -(household system) –Metric –Apothecary -(rarely used)

Metric System

Micro – one millionth, Milli – one thousandth, Centi – one hundredth Deci – one tenth, Kilo – one thousand

Metric System

1000mcg = 1mg 1000mg = 1g 1000g = 1kg 1000ml = 1L Metrics are expressed in the form of decimals ie.) 300ml = 0.3L

Avoirdupois Conversion

Factors 3 tsp = 1 tbsp 2 tbsp = 1 oz 16 oz = 1 pt 2 pt = 1 qt 4 qt = 1 G 16oz = 1 lb

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Conversion Factors Between Systems

1 tsp = 5 ml

1 tbsp = 15 ml

1 oz = 30 ml (29.57ml)

1 pt = 480 ml (473ml)

1 G = 3840 ml(3784ml)

1 g = 15.4 gr

1 gr = 60 mg (64.8mg)

1 kg = 2.2 lb

1 lb = 454 g

1 oz = 30 gm

References

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2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

POWDERS

A Pharmaceutical powder is a mixture of finely divided drugs or chemicals in a dry form meant for internal or external use.

Advantages of powders :

1-flexibility of compounding.

2-Good chemical stability

3-Rapid dispersion of ingredients (because of small particle size

Disadvantages of powders :

1-Time-consuming preparation

2-Inaccuracy of dose(size of measuring spoon, density of powder, humidity, degree of settling , fluffiness.

3-Unsuitability for many unpleasant tasting, hygroscopic and deliquescent drugs

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Large-Scale Mixing Equipment

The ideal mixer should

1- Produce a complete blend rapidly to avoid product damage.

2- It should be cleaned and discharged easily

3- be dust-tight

4 require low maintenance and low power consumption.

Extemporaneous Techniques

The manually operated procedures are

- **Trituration,**
- **Pulverization By Intervention And**
- **Levigation.**

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Small-Scale Mixing Equipment

1- Mortar and pestle

* The pharmacist most generally employs the mortar and pestle for the small-scale mixing.The mortar and pestle method is a single operation. Thus, it is particularly useful where some degree of particle-size reduction as well as mixing is required as in the case of mixtures of crystalline material.

2. Spatulations:

The blending of powders with a spatula on a tile or paper used sometimes for small quantities or when the mortar and pestle technique is undesirable. It is not suitable for large quantities of powders or for powders containing one or more potent substance because homogenous blending may not occur.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Bulk Powders

May be classified as oral powders, dentifrices, douche powders, dusting powders, insuffiations and triturations.

Oral Powders - These generally are supplied as finely divided powders or effervescent granules.The finely divided powders are intended to be suspended or dissolved in water or mixed with soft foods, e.g, applesauce, prior to administration.

Antacids and laxative powders frequently are administered in this form

* Contain sodium bicarbonate and either citric acid, tartaric acid or sodium biphosphate in addition to the active ingredients.

* On solution in water, carbon dioxide is released as a result of the acid-base reaction. The effervescence from the release of the carbon dioxide serves to mask the taste of salty or bitter medications.

* The completed product must be dispensed in tightly closed glass containers to protect it against the humidity of the air.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Dusting Powders

- These are locally applied nontoxic preparations that are intended to have no systemic action.
- They always should be dispensed in a very fine state to enhance effectiveness and minimize irritation.

- Extemporaneously prepared should be dispensed in sifter-top packages. Commercial powders are available in sifter-top containers or pressure aerosols. The latter, more expensive than the other containers, offer the advantage of protection from air, moisture and contamination, as well as convenience of application.

Insufflations

These are finely divided powders introduced into body cavities such as the ears, nose, throat, tooth sockets and vagina. An insufflator (powder blower) usually is employed to administer these products.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Advantages of liquid dosage forms

1. Used for patients who can not swallow.
2. Has fast absorption rate.
3. Is more flexible in achieving the proper dosing.
4. Best choice for young children and elders.

Disadvantages of liquid dosage forms

1. Has short shelf life due to low stability.
2. Has less accuracy.
3. Needs special storage and transferring conditions.
4. Is easily infected by microorganisms.
5. Has special storage requirements

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Types of liquid dosage forms

1.Solutions

2.Suspensions

3.Syrups

4.Lotions

5.Tinctures

6.Spirits

7.Elixirs

8.Fluid extracts

9.Liniments

10. Aromatic water

11. Decoctions

12. Collodion

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Preparation of Liquid dosage forms

•Liquid dosage forms are prepared:

(1) by dissolving the active drug substance(s) in an aqueous or nonaqueous (e.g. alcohol, ether, glycerin) solvent.

(2) by suspending the drug in appropriate medium.

(3) by incorporating the drug substance into an oil or water phases.

•Additives:

1. Antimicrobial agent
2. Coloring agent
3. Stabilizer
4. Viscosity builder
5. Flavoring agent
6. Coloring agent
7. Substances to keep the dose uniformity
8. Substances to enlarge the total volume of the preparation

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Liquid dosage forms

•**Solutions:** solutions are clear liquid preparations containing one or more active ingredients dissolved in a suitable vehicle.

•**Suspensions (Solid in liquid dispersion):** liquid preparations containing one or more active ingredients suspended in a suitable vehicle.

•**Emulsions (liquid in liquid dispersion):** emulsions are two phase system in which one liquid is dispersed throughout another liquid in the form of small particles.

•**Colloids:** A system in which finely divided particles, which are approximately less than 1 m in size, are dispersed within a continuous medium in a manner that prevents them from being filtered easily or settled rapidly.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

SOLUBILITY

The solubility of an agent in a particular solvent indicates the maximum concentration to which a solution may be prepared with that agent and that solvent. When a solvent at a given temperature has dissolved all of the solute it can, it is said to be saturated.

•The solubility of a solute is the maximum quantity of solute that can dissolve in a certain quantity of solvent or quantity of solution at a specified temperature. •How do substances dissolve? Solvation - there is an interaction between the solute and the solvent. •The solute particles are usually surrounded by the solvent particles. This process is called solvation.

Different substances have different solubility

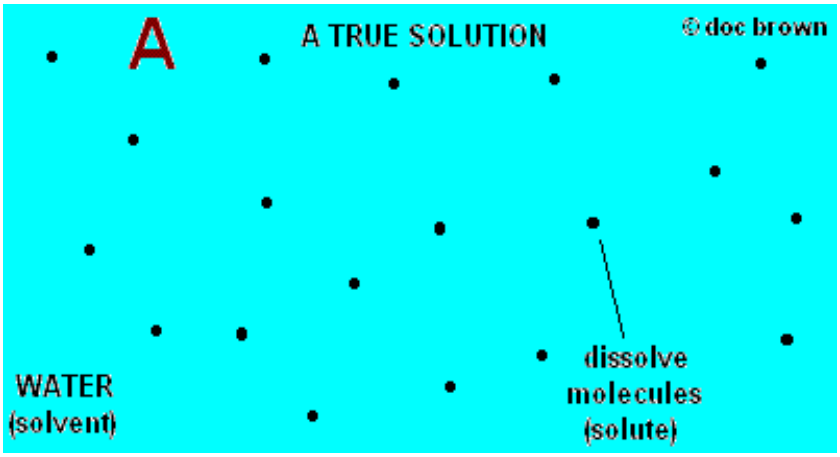
•Solubility refers to the maximum amount of a solute that can be dissolved in an amount of solvent under specific temperature and pressure conditions. •A substance that cannot be dissolved in another (or does so to a very limited extent) is said to be insoluble.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Introduction

- Monophasic dosage form refers to liquid preparation containing two or more components in one phase system, it is represent by true solution.



- A true solution is a clear homogenous mixture that is prepared by dissolving solute in a suitable solvent.
- The component of the solution which is present in a large quantity is known as "SOLVENT" where as the component present in small quantity is termed as "SOLUTE".

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Advantage

- It is easier to swallow, therefore easier for children and old age people.
- Facilitate absorption of drug faster than solid dosage form as drug is already in solution form.
- It is homogenous therefore give uniform dose than suspension or emulsion which need shaking.
- Simple and fast to formulate -It can be administered

By various routes : Oral, Parenteral (injection),enema for rectal use, otic(ear), nasal and ophthalmic preparation.

Disadvantage

- They are bulky, so difficult to transport and store.
- Water is commonly use vehicle, which is prone to microbial growth. So addition of preservative is needed.
- When expose to direct sunlight it may undergo hydrolysis, so need to store in cool and dark place.
- Drug stability reduce by hydrolysis or oxidation. So, they have shorter
- expire date than solid dosage form.
- Other major sign of drug instability are color change, Precipitation, microbial growth etc.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Liquids meant for internal administrations

Syrup : Aqueous preparations of 60% to 85% sucrose with or without flavoring agents and medicinal substances. e.g. Chlorpheniramine maleate syrup, Chloral hydrate .

Elixirs : Clear, aromatic, sweetened hydro alcoholic solutions with or without medicinal substances, intended for oral use. Eg: Dexamethasone elixir .

Linctuses : Viscous, liquid and oral preparations that are generally prescribed for the relief of cough. Eg: Codeine Linctus.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Liquids meant for external administration

Liquids used in the mouth

Gargles : Aqueous solutions containing antiseptics or antibiotics used to treat throat infections. Available in concentrated form with direction for dilution with warm water before use. eg: Povidone Iodine gargle.

Mouthwash: Aqueous solution with a pleasant taste and odor used to clean and deodorize the buccal cavity. Have antiseptic and astringent activity.eg: Antiseptics-phenol derivatives.

Throat paints : Viscous liquid preparation used for mouth and throat infections. Eg: Phenol glycerine, Compound Iodine.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Recent Advance in Monophasic Liquid

Recently developed method for the enhancement of solubility of drugs.

- Nanocrystal
- Nanomorph
- Sonocrystallization
- Supercritical Fluid Process

Recent advances for the delivery of liquid dosage form

- Novel Parenteral drug delivery
- Novel ophthalmic drug delivery

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Biphasic Liquids: Suspension

- Suspension: is a disperse system in which one substance (the disperse phase) is distributed in particulate form throughout another (the continuous phase) (i.e. at least 2 phases).
- According to the particle size of the dispersed phase, suspensions are divided into:
  - ✓ Coarse suspension: which is a dispersion of particles with a mean diameter greater than 1 μm.
  - ✓ Colloidal suspension is a dispersion of particles with a mean diameter less than 1 μm.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Why Suspension?

Against solid dosage forms:

If patient has a difficulty of swallowing solid dosage forms (a need for oral liquid dosage form).

Faster rate of dissolution and oral absorption than solid dosage forms, yet slower than solutions.

Bulky insoluble powders as kaolin or chalk are better formulated as suspensions so that they are easier to take.

Against solutions:

Drugs that have very low solubility are usefully formulated as suspensions.

Drugs that have an unpleasant taste in their soluble forms (e.g., chloramphenicol (soluble) vs. chloramphenicol palmitate (insoluble)).

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

FLOCCULATION

The natural tendency of particles towards aggregation will determine the properties of a suspension. Whether or not a suspension is flocculated or deflocculated depends on the relative magnitude of repulsive/attractive forces between particles.

Deflocculated suspension: the dispersed solid particles remain separate and settle slowly. However, the sediment that eventually forms is hard to redisperse and is described as a 'cake' or clay.

Flocculated suspension: individual particles aggregate into clumps or floccules in suspension. Because these flocs are larger than individual particles, sedimentation is more rapid, but the sediment is loose and easily redispersible. Excess flocculation may prevent 'pourability' due to its effect on rheological properties.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Secod6tgf nd Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Introduction to Ayurvedic Medicine.

- ✓ Broad system of medical doctrine and practices
- ✓ Preventative and Curative Aspects
- ✓ Advice on aspects of daily life

  a. Cleaning teeth b. Diet c. Exercise and regimen
- ✓ Ayurveda can be translated from Sanskrit as the "knowledge or science of life." It is called 'ayurveda' because it tells us (vedayati) which substances,qualities, and actions are life enhancing and (aursuya) which are not Ayurvedic medicine focuses on achieving optimal health through the integration of mind and body with nature
  - ✓ Ayurveda is possibly the oldest medical system in the world
  - ✓ It originated in the Indus River Valley approximately 5,000 years ago.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Suspending agents

Suspending agents increase the viscosity of the vehicle, thereby slowing down sedimentation. Most agents can form thixotropic gels which are semisolid on standing, but flow readily after shaking. Care must be taken when selecting a suspending agent for oral preparations. Suspending agents can be divided into five broad categories: natural polysaccharides, semi-synthetic polysaccharides, clays, synthetic thickeners and miscellaneous compounds.

The main problem with these agents is their natural variability between batches and microbial contamination.

These materials should not be used externally as they leave a sticky feel on the skin.

They include tragacanth, acacia gum, starch, agar, guar gum, carrageenan and sodium alginate.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Preservation of a suspension

- Water is the most common source of microbial contamination.
- Also the naturally occurring additives such as acacia and tragacanth may be sources of microbes and spores.
- Preservative action may be diminished because of adsorption of the preservative onto solid particles of drug, or interaction with suspending agents.
- Useful preservatives in extemporaneous preparations include chloroform water, benzoic acid and hydroxybenzoates.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

DISPENSING OF SUSPENSIONS

Method of preparation

A. Crystalline and granular solids are finely powdered in the mortar. The suspending agent should then be added and mixed thoroughly in the mortar. Avoid gumming or caking.

B. Gradual addition of vehicle, make a paste then continue till become smooth and pourable, rinse and up to volume in a tared bottle.

Variations:

If wetting agents are included in the formulation, add them before forming the paste. If syrup and/or glycerol are in the formulation, use this rather than water to form the initial paste.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Preparation of suspension from oral solid dosage form

- The tablet will be crushed or capsule contents emptied into the mortar and a suspending agent added.
- A paste is formed with the vehicle and then diluted to a suitable volume, with the addition any other desired ingredients such as preservative or flavour.
- A short expiry of no more than 2 weeks (more likely to be 7 days) should be given owing to the lack of knowledge about the stability of the formulation.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Emulsions are dispersions made up of two immiscible liquid phases which are mixed using mechanical shear and surfactant. Particle size of this conventional emulsion grows continuously with time and hence finally separation occurs at gravitational force thus these emulsions are thermodynamically unstable.

Theories: According to the surface-tension theory of emulsification, the emulsifiers or stabilizers lower the interfacial tension between the two immiscible liquids, reducing the repellent force between the two liquids and diminishing the attraction between the molecules of the same liquid2 The oriented-wedge theory assumes the formation of mono-molecular layers of the emulsifying agent which are curved around the droplet of the internal phase of an emulsion. This theory is based on the presumption that certain emulsifying agents orient themselves around a liquid droplet in a manner reflective of their solubility in that particular liquid.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Types

Water-in-oil (w/o), Oil-in-water (o/w), Water-in-oil-in-water (w/o/w) Oil-in-water-in-oil (o/w/o**),**

Methods of preparations:

Dry Gum Method: Triturate mixture of emulsifier and oil with addition of water which will form primary emulsion. Further add water to dilute and mix continuously to form emulsion.

Wet Gum Method: Initially triturate oil with water and then with emulsifier to form primary emulsion. Further add water, dilute and mix to form emulsion.

***In Situ* Soap Method**: Take oil and lime water (calcium hydroxide solution). Mix with stirring to form emulsion.

Mechanical Method: Take oil, water and emulsifier together, mix well and stir by machine to form emulsion

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Advantages

- To solubilise hydrophobic or oil soluble drugs
- To enhance drug absorption through
- To enhance topical absorption of drugs
- To mask the disagree able taste and odour of drugs
- To enhance palatability of nutrient oils

Disadvantages

- Less stable as compared to other dosage forms
- Possesses short shelf-life
- Creaming, cracking (breaking), flocculation and phase inversion are common problems observed during storage of emulsions

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Theory of emulsification

Droplets can be stabilized by three methods

i. By reducing interfacial tension

ii. By preventing the coalescence of droplets.

- a. By formation of rigid interfacial film
- Mono molecular
- Multimolecular
- Solid particle films

b. By forming electrical double layer.

- Emulsion made with sodium soap.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Formulation of emulsions

- Selection of liquid phase
- Phase ratio
- Selection of emulsifying agent
- Selection of preservative
- Selection of antioxidant

Selection of liquid phase:

- Choose from Lipids of natural or synthetic origin depends upon the release rate needed
- For topical pre[arations – feel of the product

Phase ratio:

- Depends upon the solubility of the active ingredient
- Desired consistency

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Extemporaneous (Laboratory scale) method of preparation

- **Continental or dry gum method**
- Wet gum method
- Bottle or Forbes bottle method
- Auxiliary method
- In situ soap method

The continental method is used to prepare the initial or primary emulsion from oil , water and a hydrocolloid or "gum" type emulsifier (usually acacia). The primary emulsion or emulsion nucleus is formed from 4 parts of oil, 2 parts of water and one part of gum. The 4 parts of oil and 1 part of gum represent their total amount for the final emulsion.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

INTRODUCTION

In ancient era, drugs inducing unconsciousness, haemorrhoedal, vermicidel and purgative actions was inserted though rectal route in the form of suppository. In modern days most of the remedial medicines are prepared for rectal delivery to gain therapeutic blood concentration of the medicine and thereby enhancing the bio-availability. By inserting the drug through rectal route the presystemic effect in hepatic region and in GIT can be prohibited. Anal drug delivery systems, used as controlled release dosage form for treating the ailments like arthritis, increase blood pressure, asthma, AIDS and diabetes. Moreover, there is a rising interest that the suppositories can be used in the treatment of post operative pain and pain related with malignancy. Rectal drug delivery system is the area of enthusiasm for many researcher's to evaluate consumption of drug from the rectal region for drug which are currently inserted through parental route. Viz., antibiotic and polypeptides

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

ADVANTAGES

a) **Improved enzymatic drug stability**: Many proteolytic and other enzymes in the GIT(Gastro Intestinal Tract) result in drug degradation, which prevents effective absorption following oral administration.

b) **Partial avoidance of hepatic first pass**: The rectum is extensively supplied with blood from the various rectal arteries. It is drained by at least three veins and drug absorption occurs through this venous network. It is usually reported that inferior and the inferior venacava is connected to the middle rectal veins. This allows bypassing the portal system and the associated first pass metabolism in the liver.

c) **Higher drug load**: Suppositories allow for two to three times higher drug loads to be administered, depending on the amounts of other excipients necessary in their formulation.

d) **Lymphatic delivery**: many researcher have studied and suggested that some of the drugs after rectal administration enters in to the lymphatic system thus bypassing the first pass effect.

e) **Constant and static environment**: Compared to the oral route of administration, the rectal route provides a much more constant environment for the drug as it is absorbed.

f) **Patients with swallowing difficulty**: Children, elderly people facing problems in swallowing can be largely obviated by the rectal administration.

g) **Avoidance of overdosing**: Certain drugs, viz., sedative oral administration may raise a concern with respect to the possibility of severe accidental or intentional overdosing. This danger is particularly eliminated by rectal administration.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Disadvantages

a) Patient acceptance and compliance: In many cultures reluctance to consider rectal administration as dosage form has resulted in a tendency by pharmaceutical company to avoid rectal dosage forms, except for most obvious indications and situations.

b) Potential for non-specific drug loss: Ineffective absorption due to premature loss from rectum and interaction of fecal matter with the drug or excipient may reduce absorption and diminish effectiveness.

c) Limited fluid in rectum: Small volume (3 ml) may limit dissolution of drug particularly with low aqueous solubility.

d) Formulation: Melting, liquefaction, solubility, particle size, etc. can lead to formulation difficulties.

e) Expensive: These are more expensive as compared to tablets.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

SPECIFIC PROBLEMS IN FORMULATING SUPPOSITORIES:

During the formulation of suppositories various problems arises which are as follows.

1) Water in suppositories

2) Hygroscopicity

3) Incompatibilities

4) Viscosity

5) Brittleness

6) Density

7) Volume contraction

8) Lubricant or mould release agent

9) Weight and volume control

10) Rancidity and antioxidant.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

EVALUATION

Physical Parameters:

Visual Evaluation: Surface appearance and color can be verified visually to assess the absence of fissure, pit, blooming, exudates and transfer of drug.

a) Melting Range : Melting range test are performed to check the physical and absorption characteristics of each manufactured batch

b) Liquefaction Time: It detemines the period required for a suppository to liquefy under simulated conditions of rectal mucosa in presence of water at body temperature. This signifies the physical nature of suppository subjected to highest degree of temperature (37°C). Liquefaction time should be no longer than 30 minutes.

c) Mechanical Strength: This is the determination of the mechanical force necessary to break a suppository and indicates whether a suppository is brittle or elastic. The Erweka method is used for this test.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Chemical testing:

Analytical Testing:

Investigation of the determination of assay, content uniformity and dissolution parameters of suppository formulation.

a) Assay: Four steps are involved in the analysis of active ingredients in a unit dose formulation.

· Preparation of uniform composite.

· Extraction of the drug from the excipients.

· Separation of excipients from the mixture

· Analysis that selectively quantitates the active components.

b) Content Uniformity:

The dose to dose variation can be accomplished by content uniformity in which suppository are randomly chosen to check drug content uniformity as per USP/BP specification.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

c) Dissolution Testing:

The in vitro assessment of product efficacy can be determined by dissolution studies. Under FDA guidelines, dissolution testing is also a requirement for suppository to test for hardness and polymorphic changes of drug substance and base in both control and stability testing. The following methods are used in dissolution testing of suppositories:

· Basket method

· Paddle method

· Beaker method

· Diffusion method

· Dialysis method

· Continuous flow method.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Drug Incompatibility

Definition of Drug Incompatibility: Drug Incompatibility refers to interactions between two or more substances which lead to changes in chemical, physical, therapeutic properties of the pharmaceutical dosage form.

- **Types of Drug Incompatibility**

    1. Therapeutic incompatibility
    2. Physical incompatibility
    3. Chemical incompatibility

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Therapeutic incompatibility

It is the modification of the therapeutic effect of one drug by the prior concomitant administration ofanother. (It is also called drug interactions)

• Mechanisms of therapeutic incompatibility; They are divided into two groups:

1. Pharmacokinetics: involve the effect of a drug on another from the point of view that includes absorption ,distribution , metabolism and excretion.

2. Pharmacodynamics are related to the pharmacological activity of the interacting drugs e.g synergism.antagonism, altered cellular transport, effect on the receptor site.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Physical Incompatibility

Physical incompatibilities are often called pharmaceutical incompatibilities.

Def.: Interaction between two or more substances which lead to change in color, odor, taste, viscosity and morphology.

Chemical Incompatibility

Def.: Reaction between two or more substances which lead to change in chemical properties of pharmaceutical dosage form.

Types of chemical changes: *1.* Oxidation, 2. Hydrolysis 3. Polymerization 4. Isomerization 5. Decarboxylation 6. Absorption of Co2 7. Combination 8. Formation of insoluble complexes.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Semisolid Dosage Forms

Ointments, creams and gels Ointments, creams and gels are semisolid dosage forms intended for topical application. They may be applied to the skin, placed onto the surface of the eye or used nasally, vaginally or rectally. The majority of these preparations are used for the effects of the therapeutic agents they contain. Those which are non-medicated are used for their physical effects as protectants or lubricants. Topical preparations are used for the localised effects produced at the site of their application, although some unintended systemic drug absorption may occur, it is usually in sub-therapeutic quantities. However, systemic drug absorption can be an important consideration in certain instances, as when the patient is pregnant or nursing because drugs can enter the fetal blood supply and breast milk and be transferred to the fetus or nursing infant.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.

Official requirements for semisolids Ointments and other semisolid dosage forms must meet the USP tests for microbial content, minimum fill, packaging, storage and labelling. Ophthalmic ointments must meet tests for sterility and metal particle content. Microbial content With the exception of ophthalmic preparations, topical applications are not required to be sterile, they must however meet acceptable standards for microbial content and preparations which are prone to microbial growth must be preserved with antimicrobial preservatives. e.g. methyl and propyl parabens and quaternary ammonium salts.

Minimum fill The USP minimum fill test involves the determination of the net weight or volume of the contents of the filled containers to assure proper contents compared with the labelled amount. Packaging and storage Ointments and other semisolid preparations are packaged in metal or plastic tubes. The tubes are first tested for compatibility and stability for the intended product.

References

1. Pharmaceutics,The Design & Manufacture of Medicines, Third Edition, P.M. Taylor.
2. Introduction to Pharmaceutics, Second Edition, A. P. Pawar.
3. Pharmaceutics-I, Dr. A. R. Madgulkar, Dr. M. R. Bhalekar.