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A Review On Liquid Dosage Form

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Abstract

Formulations used for oral, parenteral, and topical administration are known as liquid dosage forms. Liquid dosage forms are mostly used for pediatric patients since they have higher patient compliance than other dosage forms. Additionally, the medications are consistently administered in liquid dosage form during formation. It covers up the bitter, salty, and queasy taste of medications. Drug absorption and, hence, drug bioavailability are improved by this dosage form. In order to improve compliance, certain non-therapeutic substances (additives) that have no pharmacological potential are added during formulation to improve the stability, appearance, and effectiveness of the dosage form.

Keywords: Emulsion, Suspension, Advantages & Disadvantages

Introduction[1-5]

Since ancient times, liquid dose forms have been utilized to ensure that medications are absorbed quickly. Patients who have trouble taking solid dosage forms, such as children and the elderly, can benefit from this formulation. Aqueous or non-aqueous solvents, such as solutions, suspensions, emulsions, etc., are used to dissolve active pharmaceutical ingredients (A.P.I.) to create liquid dosage forms. The ease of self-administration makes the oral mode of administration popular.

A variety of excipients, including coloring agents, flavorings, sweeteners, antioxidants, and preservatives, can be combined with an API or collection of APIs. For long-term stability during storage and usage, suspending agents and emulsifying agents are added to suspensions and emulsions, respectively. On the other hand, liquid dose forms are superior to solid ones since they dissolve instantly and are quickly and effectively absorbed by the gastrointestinal tract.

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A variety of excipients, including sweeteners, coloring agents, flavoring agents, antioxidants, and preservatives, can be combined with an API or collection of APIs. For long-term stability during storage and usage, suspending agents and emulsifying agents are added to suspensions and emulsions, respectively. Liquid dose forms, on the other hand, have a benefit over solid ones since they dissolve instantly and are quickly and effectively absorbed by the GIT.

Advantages of Liquid Dosage Forms[6]

• The formulation's A.P.I. is evenly distributed.

• By measuring a certain volume, the dosage can be changed.

• Patients who have trouble swallowing tablets and capsules can consume solutions or syrups, such as cough syrup, with ease.

• Sweeteners and flavoring chemicals can easily cover up the taste of unpleasant medications.

• When taken in tablet form, medications like potassium chloride can cause peptic ulcers; however, when taken in liquid form, this adverse effect is avoided.

• Liquid dosage forms make it simple to deliver absorbent substances and antacids.

• Liquid dosage forms are an easy way to provide certain hygroscopic and deliquescent chemicals that release water during solid formulations.

• Compared to solid dose forms, the therapeutic response is quicker.

Disadvantages of Liquid Dosage Forms[7]

• Managing and storing liquid is relatively challenging.

• Liquid dose versions have a shorter shelf life.

• Ingredients are typically more prone to deterioration.

• Unlike solid dosage forms, two incompatible components cannot be administered together.

• Because of the spillage issue, it is inconvenient for travel.

• Since microbes quickly break down solutions, preservatives are meant to be added to formulations.

Types of Liquid Dosage Forms[8-25]

[A] Monophasic Liquid Dosage Forms

Monophasic liquid dosage forms has only one phase.

1. Syrups

Syrups are concentrated solutions made by dissolving sugar in purified water. They are very viscous and have a sweet flavor. The sugar content of simple syrups is 66.7% (w/w).

Figure: Cough Syrup

2. Non-Medicated Syrups

Syrups that are made only for flavoring purpose.

Figure: Non-Medicated Syrups

3. Elixirs

Elixirs are hydroalcoholic, colorful, and scented mixtures that taste sweet but are less viscous. Ethyl alcohol, water, flavorings, syrups, and preservatives are added to create these solutions. There are many pharmaceutical formulations on the market that contain extremely powerful therapeutic ingredients, such as sedative, antihistaminic, and antibacterial elixirs. Working elixirs are occasionally employed as vehicles for other formulations as well as tastes.

Figure: Elixirs

4. Linctus's

Concentrated oral medicines called lictus are used to treat coughs. Demulcents, sedatives, and expectorants are the API used to make linctus. To have the greatest and longest-lasting benefit, licorice is ingested in its concentrated form rather than diluted. Simple syrups are typically employed as a vehicle for linctus production, while tolu syrup is used for flavor and aromatic odor.

Figure: Linctus's

5. Drops

Drops are a type of liquid medication that is administered orally. For easier administration, some vitamins, including vitamin A and vitamin D, which are soluble in oil but insoluble in water, are administered as drops. The dose can be precisely measured during administration, which is why pediatric formulations frequently employ it.

Figure: various types of Drops

6. Lotions

Lotions are topical liquid medicines that are administered to the skin without causing any friction. Cotton, gauze, and other materials can be used to apply them. They are used to treat conditions pertaining to the skin. Anti-fungal medications such as clotrimazole, eberconazole, etc. can be found in lotions. It has calming, cooling, protecting, and other benefits.

Figure: Lotion

7. Nasal Drops

With the aid of a dropper, sterile liquid preparations called nasal drops—which contain solutions or suspensions—are applied to the nasal cavity. It is better to use aqueous drops rather than greasy ones. It should ideally be isotonic, have a pH of neutral, and have a viscosity comparable to nasal secretions.

Figure: Nasal Drops

8. Eye Lotions

Monophasic aqueous formulations used for eye washing are called eye lotions. They are prepared in a concentrated form and diluted with warm water before being used. To prevent unwelcome eye irritation, it should be isotonic and clear of extraneous objects.

Figure: Eye Lotion

9. Eye Drops

Eye drops are sterile preparations that are applied to the eye using a dropper and contain API suspensions or solutions. To avoid unneeded irritation, it is made with an aqueous medium, isotonic with lachrymal gland secretions, and free of any foreign objects.

Figure: Eye drops

[B] Biphasic Liquid Dosage Forms

It consists of two phases:

For example: Suspension and Emulsions

1. Suspensions

Suspensions are a type of biphasic liquid dose form where a medication is carefully split into tiny solid particles that readily disperse in a liquid medium. There are two phases in it: a dispersed phase and a continuous phase. Vehicles behave as continuous phases, whereas solid particles behave as dispersed phases. Suspensions can be applied externally or given orally or parenterally.

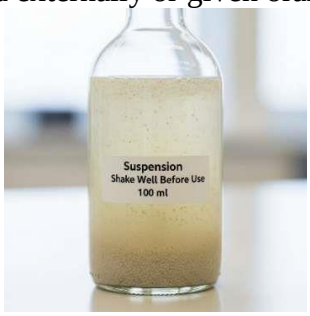

Figure: Suspension

Example: Amoxicillin oral suspension, Insulin Zinc suspension.

2. Emulsions

Emulsions are a type of biphasic liquid dosage form made up of two non-miscible liquids, such as water and oil. There are two phases in an emulsion: a scattered phase and a continuous phase. The liquid is transformed into globules, which are referred to as the dispersed phase. The liquid into which the globules are dispersed is referred to as the continuous phase. Emulsifying agents are added to the emulsion system for stability because, under normal circumstances, immiscible liquids cannot be dispersed for an extended period of time. In order to combine the two phases for an extended amount of time, the emulsifying agent creates a film around the globules.

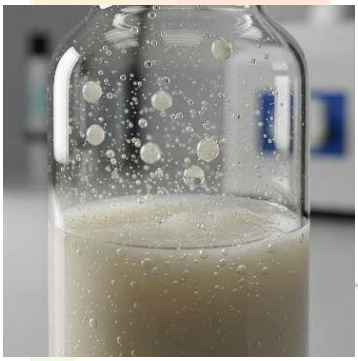

Figure: Emulsion

Emulsions are Classified as given below

a. Oil in Water type (O/W)

b. Water in Oil type (W/O).

Formulation of Liquid Dosage Forms[26-49]

1. Excipients

The substances utilized in the formulation of any dosage form that are not active ingredients are known as excipients. Excipients are required for the formulation of dosage forms even though they are typically inactive and have no therapeutic benefit. They have no pharmacological or therapeutic effects and are inert by nature. They can come from synthetic or natural sources and are incorporated into a formulation for the following prospects:

• It increases the stability of the dosage form

• Mask the bitter taste of drugs

• Provides flavor and color to the formulation etc.

Solutions, suspensions, and emulsions are examples of liquid dosage forms that are created based on the solubility and stability of the active component. Additionally, they are made to be ready-to-use liquids, such as syrup, solution, suspension, and emulsions, following reconstitution. A variety of excipients, including stabilizers, sweeteners, and flavoring ingredients, are added to the liquid formulation. Its choice is crucial for creating flavorings and efficient dosage forms.

a. Selection of Excipients

Physical and chemical features, medication constituent characteristics, dose forms, and administration method all play a major role in the selection of excipients. The active pharmaceutical components are the main focus of the development of oral liquid dosage forms. The following are some significant obstacles that arise while developing liquid dosage forms:

• Drug stability in solution.

• Drug solubility at a required level.

• Effective taste.

The compatibility of recipients with a solid-state medication is equivalent to the compatibility of excipients in solution. The procedure of choosing an appropriate excipient will be simpler if the mechanism of degradation is understood. Drugs' physicochemical characteristics, such as pH stability and PKA value, should be understood in order to select an appropriate excipient.
Ideal Properties of Excipients are as Follows

• It should have efficient functionality.

• It must be inert and non-toxic in nature.

• It should not be sensitive with equipment’s and machineries.

• It should be easily available and economically effective.

b. Functions of Excipients

• For the maintenance of integrity in the dosage form excipients are added.

• Excipients make up the enough volume of the formulation for its proper handling and administration.

• Excipients provide acceptance to the patient, for example by including flavoring agent.

• It enhances the bioavailability of the drug.

• It provides assistance to the patients.

c. Excipients Used in Formulation of Liquid Dosage Forms

A combination of substances in varying quantities is required for an oral liquid dosage form in order to accomplish a number of tasks, including solubilization, providing appropriate colors, taste, and viscosity. Excipients need to be stable for the intended amount of time, compatible, and inert. Common excipients used in preparations include base (vehicle), which can be either aqueous or non-aqueous; viscosity builders, which increase viscosity; preservatives, which stop microbial growth; coloring agents, which give the formulation an elegant appearance; flavoring agents, which add flavor, such as orange tincture; suspending agents, which are used to form suspensions; and emulsifying agents, which are used in emulsions.

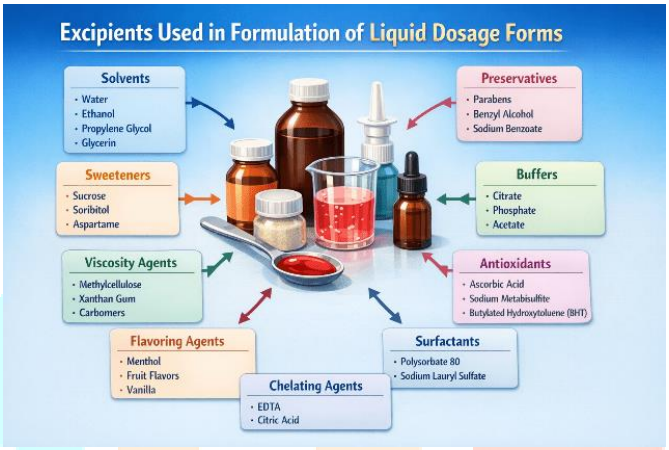

Figure: Various types of excipients

2. Water

The formulation uses distilled water and purified water acquired through distillation or any other appropriate procedure. There are a lot of dissolved contaminants in the water that comes from nature. Potassium, calcium, magnesium, sulfates, and bicarbonates are among the inorganic contaminants that dissolve in natural water, although other organic substances are hardly soluble or may be present in an insoluble state. Natural water also contains microorganisms; this microbial load is referred to as the "bio-burden." Drinking water typically has fewer than 0.1% solids in it. For the manufacture of pharmaceuticals, drinking water is not recommended Purified water may be used as a vehicle or component of aqueous formulations in place of parenteral preparations (injections) according to USP. Appropriate procedures including distillation and ionexchangers (reverse osmosis) are employed to produce cleaned water.

Figure: Water

3. Alcohol (Ethyl Alcohol)

It is a well-known solvent for creating dosage forms or pharmaceutical items. Alcohol is the second most useful solvent in the pharmaceutical industry, after water.

Figure: Alcohol

4. Glycerol

Another name for it is glycerin. It is a viscous, clear, colorless liquid that feels greasy to the touch. It has a sweet flavor and is hygroscopic—that is, it absorbs moisture when exposed to air. It includes about 95% absolute glycerin and is made by breaking down plants and animal fats. It dissolves in water and all concentrations of alcohol, but not in ether, chloroform, or benzene. It is used to make syrups, tinctures, and phosphoric acid elixir, among other therapeutic items.

Figure: Glycerol

5. Preservatives

Contamination of pharmaceutical products by microorganisms is a major problem in aqueous based liquid dosage forms. Microorganisms are prevented from growing by preservatives. Preservatives should ideally be non-toxic, non-reactive with other formulation ingredients, compatible, and effective against potential bacteria at lower concentrations. Throughout the preparations' shelf life, they ought to remain stable.

Figure: Various preservatives

6. Suspending Agents

A crucial consideration in the formulation of a suspension is the choice of the best suspending agent, which is determined by the particles' settling time and viscosity. Rheological characteristics, suspending capacity in the formulation, compatibility with other excipients, and cost-effectiveness are other aspects taken into account when choosing the best suspending agent. Gums, both synthetic and natural, are examples of suspending agents.

Figure: Various suspending agents

7. Flocculating Agents

A flocculating agent keeps suspension from caking. Flocculating agents are used to prevent the solid particles that are scattered in the formulation from setting down and forming a solid cake of substance in the bottom of the container. Sodium alginate and starch are a few types of flocculating agents.

Figure: Various Flocculating Agents

8. Chelating Agents

Chelating substances activate their catalytic property in oxidation by forming chelates with metal ions. These substances have the ability to form complexes with medications that are part of complex compounds with two or more bonds and rings in their structure. It shields the API from catalysts that speed up oxidation reactions.

Figure: Different Chelating agents

9. Emulsifiers

Emulsifiers are substances that create a barrier around both of the immiscible liquid droplets and lower the interfacial tension between the two immiscible liquids, often water and oil. Both hydrophilic and lipophilic components are included in emulsifiers.

The following are the ideal characteristics of emulsifying agents: they should be stable against chemical degradation, nontoxic, economically effective, and free of any negative physiological or therapeutic consequences. Emulsifiers include things like lanolin alcohols, lecithin, stearic acid, and acacia.

Figure: Various emulsifiers

Conclusion

Since liquid dosage forms are more compliant, patients typically accept them. To address the shortcomings of the liquid dosage forms now available on the market, numerous additives have been discovered and developed. However, more effective and efficient liquid dosage forms still need to be developed in order to increase bioavailability and patient compliance.

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