EXTRACTION OF MEDICINAL PRINCIPLES WITH MILK

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ABSTRACT: In Ayurveda many formulations are described which milk is used as a solvent for extraction of medicinal principles present in the herbs. The rationale of this technique is analysed in this article from the standpoint of pharmaceutical sciences.

INTRODUCTION

In Ayurveda, there are some pharmaceutical formulations which make use of milk as a solvent for extraction of the active principles present in a crude drug. Some of the formulations where the extraction of crude drug is performed with the help of milk are:

- Bhallataka – Ksira
- Swadamstradi – ghrta
- Lasunadyaghrta
- Lasuna Ksira
- Rasnaghrta
- Tryusanadyaghrta
- Snuhiksiraghrta, etc.

In all these preparations, the drug is boiled with a specified quantity of milk. The milk is pharmaceutically an oil-in-water (O/W) type of emulsion. Here, I would like to define an emulsion so that the later explanations would be easily understandable to the readers.

An emulsion is defined as a complex mixture of at least two immiscible liquid phases in which, one of the phases is distributed in the form of fine globules into the other. The phase which is present in form of globules is known as dispersed phase and the phase in which the globules are dispersed is known as dispersion medium. However, such dispersion are thermodynamically unstable due to tremendous increase in the surface free energy (because of increase in the surface area of the dispersed phase) so, the dispersed globules try to come in a thermodynamically stable state; for this they coalesce to form a bigger globule and thus decrease the surface area and the surface free energy. The process of coalescence is continued till the two phases are separated because at this stage the system has minimum free energy due to minimum surface area. But this coalescence is not desirable. Therefore, in order to keep the dispersed globules stable for a considerable period of time a third agent, known as emulsifying agent is added to the emulsions. The emulsifying agents are amphiphilic in nature i.e they contain both, hydro-philic as well as lipophilic group in the molecule; due to their amphiphilic nature they get absorbed at the oil-water interface and thus lower the interfacial tension and hence facilitate the dispersion and form a mechanical barrier.
around the globule thus prevents coalescence.

In most of the emulsions, one of the phase is water and the other is given a generic title “oil”. Based on this, if water is dispersed phase and oil is the dispersion medium then the emulsion is of water-in-oil (W/O) type and conversely, if oil is dispersed in water then it will be of oil-in-water (O/W) type of emulsion.

So, from definition, it is clear that milk is an oil-in-water (O/W) type of emulsion in which oily, fatty or lipophilic substances are dispersed in water (See diagram). Now, when a crude drug or formulation is boiled with milk then it is expected that the active principles present in it, which may be either lipophilic (soluble in oil) or hydrophilic (soluble in water) get partitioned between oil and water phase of milk. The lipophilic constituents will concentrate in oil phase and hydrophilic constituents in water phase respectively. This results in an uniform distribution of both, lipophilic and hydrophilic constituents.

Since, the lipophilic phase is the dispersed phase and having a very large surface area hence, the release of lipophilic constituents from the globules would be more and also its quantum of absorption from the gastrointestinal tract will be more and the extent of absorption will be more. Therefore, the bioavailability will be more. Also, the common problem associated with some drugs like, vomiting, g.i.t. irritation etc. are overcome because a very small amount of drug in the contact of g.i.t. due to uniform and fine distribution of the dispersed phase. Also, the drug in this form is not available at the site of absorption at once but diffuses slowly from the dispersed globules therefore avoids the problem of gastrointestinal irritation.

Due to large surface area of the dispersed globules, the larger surface of the drug is exposed to the milk and therefore, the extraction would be efficient, fast and complete. This may be one of the reasons, why milk has been chosen for the extraction of certain drugs. However, this idea needs a clinical support.

Finally, milk does not act as a solvent only in such preparations but also acts as a source of nutrition, essential vitamins, minerals in the formulation and therefore improves the overall quality and therapeutic efficacy of the formulation.
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