IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Review On Microsponge Gel For Topical Delivery

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Abstract: Microsponges are small, porous drug delivery devices. These are small sponge-like spheres with large pores and can alter the release of the drug, increasing stability and reducing side effects. Microsponges were developed using the semi-emulsion solvent diffusion technique as it has a better microsponge formation mechanism. They can also increase stability, reduce side effects, and alter the release process of the drug.

Index Terms **-** Microsponges**,** stability**,** solvent diffusion technique**,** reduce side effects and release process

I. INTRODUCTION

Drug delivery systems are designed to enter the body, where the skin is the gateway to the drug. There are creams, ointments, lotions, TDS, etc. available in the market. Various preparations are available, including: Prasad M.Sc., 2011).
components that control the release of active substances. Effective treatment of this disease is often associated with active drugs, causing skin irritation reported in some studies, as well as uncontrolled evaporation of the active substance and potential conflicts between drugs and carriers. (Prasad MSC, 2011).

For this reason, microsponges must remain under the skin and epidermis for the longest time and release the drug slowly. For these reasons, microsponges must meet the following characteristics (Prasad MSC, 2011):

- Non-collapsible structure, consisting of empty space in many cases Has high shear strength in the void space trapping many components, used mainly in lotions, creams and powders, maximum load (50% ~ 60%)) and is the particle size of the link. The gap area is 5-500 microns.
- It should not be irritating, mutagenic, toxic or oily.
- It must be resistant to high temperature and shear stress.
- We need to make security better.
- It must be able to withstand high oil pressure, that is, it must be able to absorb without drying out upto six times of its weight without drying out..
- Must be exposed continuously for up to 12 hours.

Microsponges have advantages over pharmaceutical models in which the BPO form localizes the active chemical to the skin, causing toxicity and skin irritation. This is avoided by using microsponges, which must associate with the following rules: (Prasad MSC, 2011)

- If the drug is essentially non-polar, it will form a porous structure called a porogen.
- Contain water or generally be very slightly soluble.
- Inert towards monomers and polymers.
- Stable in connection with the polymerization catalyst and polymerization conditions.
- Release can be controlled by exposure or other factors such as humidity, pH, friction, or temperature.

1.1 Advantages of Microsponge Technology (Gupta A, 2016)

- Product performance.
- Continuous release.
- Reduces irritation, thus increasing patient compliance.
- Increase the elegance of your products.
- It improves oil control by absorbing more than six times its weight in oil without drying out.
- Simplifying the formulation.
- Improved thermal, physical and chemical stability.

1.2 Product (Gupta A, 2016)

- It is adhered with microsponges.
- Many liquids or water-soluble substances may remain in the product. Active substances that can be put into microsponges should be meet the following requirements.
- It must be completely miscible with the monomer or soluble by mixing a little amount of water-immiscible solvent.
- There should be no water or no water. It is generally slightly soluble.
- It must be inert towards the monomer.
- It must be stable in contact with the polymerization catalyst and polymerization conditions.

1.3 Advantages of Microsponge (Gupta A, 2016)

- Microcapsules generally cannot control the release of APIs. When the walls are broken, the API contained in the microcapsules is released. Can MDS do this? That's the real question.
- Liposomes have low payload capacity, complex design, lack of chemical stability and microbial instability. MDS is chemically stable and easy to produce
- MDS is stable in the pH range of 1 - 11.
- Microsponges are stable at temperatures up to 130°C.
- The efficiency of micro sponges is between 1 and 11. 50-60%.
- They are free flowing and cost effective.
- Microsponges are small particles that absorb skin secretions, thus reducing the oiliness and shine of the skin.

1.4 Properties of active ingredients capture micro sponges (Gupta A, 2016)

- It must be completely miscible in monomer or miscible by adding a small amount of water-immiscible Solvent.
- It should not contain water or should generally be very slightly soluble.
- It should be inert towards monomers and should not increase the viscosity of the mixture during formulation.
- When used, it must be stable in contact with the polymerization catalyst and polymerization conditions.
- The spherical structure of the microsponge should not be damaged.

Drug Enter into the stratum corneum in three ways.

- Transfollicular method.
- Intercellular pathways.
- Intercellular pathways.

Delivery systems for TDDS delivery of drugs are vital to the safety and efficiency of active drug delivery.

MICROSPONGE: AN NOVEL APPROACH FOR DRUG DELIVERY

Microsponge Technology

Microspecific drug delivery technology has attracted great attention from the medical community. The new drug is made from micro sponges and replaces drug release by binding the worm. This may improve drug dosage, duration of action, and clinical outcomes and reduce side effects. Technology is utilized in certain processes to solve problems related to the above issues to achieve drug development goals. Each micro sponge is made of a non-collapsible structure and a macroporous surface. Microsponge is a polymer material made of porous microspheres that can provide protection by encapsulating anti-inflammatory, antibacterial, antibacterial and other ingredients. Microsponge technology was developed by Won, who filed the first patent for an advanced polymer device in 1987. (Barry BW et al., 2001) The pores create a larger area for the drug to diffuse through each microsponge. Microsponge particles are larger than skin pores because they cannot penetrate the skin, but they remain on the skin by closing into small hooks. The drug is released slowly, ensuring the safety of microsponges by preventing contamination and preventing bacteria from entering the pores of the microsponges. (Batiame et al., 2018)

Formulation of micro sponges

As per the preparation, these are categorised into two methods for Micro sponges:

1) one-step method or liquid-liquid suspension polymerization
2) two-step method or emulsion-like diffusion and its effects

The size of microsponges is directly proportional to the viscosity of the dispersed phase. The greater the difference between the viscosity of the dispersed phase (internal phase) and the continuous phase (external phase), the higher the viscosity of the internal phase, which will affect the size of the spheres formed by the average increase. . size of the granule. The growth of microsponges is affected by the volume of the internal phase; The produced micro sponges can be produced with an internal volume of 3 to 5 ml. The effect of the micro sponge gradually weakens when the liquid inside is 5 to 15 ml. Since microsponges have larger volumes and lower drug content, their effectiveness and drug content decrease. (Panday P et al., 2015), the proportion of polymer is not important, but the results of microsponges can vary from the smallest to the largest. Another parameter obtained by changing the ratio of drug to polymer is particle size. As the dose increases, the size of the microsponges also increases. (Pankaj S et al., 2019).

The effect of whisking speed on the physical strength of microsponges

Because whisking speed is related to the size of microsponges. Increasing the mixing speed reduces the efficiency, but the chemical content increases according to the mixing speed. The reason for this is that turbulence occurs in the external phase that sees the polymer in the wing area, resulting in reduced efficiency. (Patel S *et al*., 2017).

Applications of Microsponge Systems

Microsponges are porous polymer microspheres widely used in oral care. It shows another way to create beautiful things. Microsponges are designed to deliver the drug, be effective in the least amount of drug, and reduce side effects by increasing stability. (Hewlett S, et al., 2005)

Advantages of drug formulations

In addition, the drug is intended to have an effect on the skin layer. This type of finished product releases the drug as soon as it is formed, which makes it very potent and absorbs the drug quickly. Microsponges prevent unnecessary accumulation of active substances in the skin compared to modified release systems. In fact, microsponge bacteria can reduce the irritation of medication without reducing treatment. (Pruzanski W et al., 1985)

Advantages of microencapsulation and liposomes

The disadvantages of liposomes are low processability, complex design, and lack of chemical and microbial stability. It is stable at pH 1 to 11, can withstand temperatures up to 130 °C, is compatible with most, and is itself non-toxic because it does not allow pores into objects smaller than the body's medium pore size. 0.25 µm entry system operator. (Zaman M et al., 2018)

Advantages of cosmetics

Cream is often ugly, oily, sticky, often painful, and not good. These advanced stages (carriers) require strong medications to treat due to their low transmission rate and eventually cause an allergic reaction. In addition, cosmetics have disadvantages such as uncontrolled evaporation of active ingredients and potential conflicts between continuous phases and drugs. Microsponge systems can optimize the retention of active ingredients on the surface or in the skin, while limiting their penetration into the body (Rastogi V et al., 2014).

The latest microsponge drug delivery technology has been developed to produce β-CD microsponges that can be used for hydrophobic oral delivery of BCS class II drugs. Future Forecast of Microsponge Drug Delivery Systems holds a unique opportunity in various medical applications in the future due to its unique features for the development of new products. **(Ravi G *et al.*, 2019).**

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