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REVIEW ARTICLE

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Microencapsulation Technique for Sustained Systemic Delivery of Pharmaceuticals and Drugs and its Use in Fishery Post Harvest Technology Sector: A Review

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ABSTRACT

The process by which tiny particles or droplets are surrounded by a coating to give small capsules of many useful properties is known as Microencapsulation technique. The technique finds its wide application in the field of food science and technology for incorporating food ingredients, enzymes, flavors etc. in micrometric level. Poly vinyl alcohol, gelatin, ethyl cellulose and sodium alginate are used as coating materials. Most microcapsules are porous with dimension ranging from between a few micrometers and a few millimeters.

Keywords: Food processing, Microencapsulation and Pharmaceutical chemistry.

INTRODUCTION

In microencapsulation technique the solids, liquids, or gases are enclosed inside a micrometric wall made of hard or soft soluble film to prevent the degradation of pharmaceuticals and in order to reduce dosing frequency (López, C. Ano *et al*., 2012). In other words, microcapsule is a relatively small sphere with a uniform wall around it. The microcapsule wall is sometimes called a shell, coating, or membrane whereas the material inside the microcapsule is referred to as the core, internal phase or fills. Lipids and polymer like materials, such as alginate, may be used as a mixture to trap the material of interest inside (Aldana *et al*., 2004). The physical and chemical

properties of the material to be encapsulated determine the technique of microencapsulation (Jackson and Lee, 1991).

Need for Microencapsulation

The reasons for microencapsulation are countless. Microencapsulation helps to enhance the stability and life of the product being encapsulated, control its liberation in an adequate time and space and facilitating the manipulation of the product (Élida, 2008). In some cases, it is needed to isolate the core from its surroundings, as in isolating vitamins from the deteriorating effects of oxygen, retarding evaporation of a volatile core, improving the handling properties of a sticky material, or to isolate a reactive core from chemical decomposition. Capsule contents may be released by solvent action, enzyme attack, chemical reaction, hydrolysis, or slow disintegration. In some other instances it is the requirement to control the rate at which the inner fill leaves the microcapsule, as in the controlled release of drugs or pesticides.

Microencapsulation technique is used for sustained or regulated release of a drug into the body. This also prevents and decreases the toxic side effects for some drugs by preventing high initial concentrations in the blood. There is usually a certain desired release pattern. In some cases, it is zero-order, i.e. the release rate is constant. In this case, the microcapsules deliver a fixed amount of drug per minute or hour during the period of their effectiveness. This can occur as long as a solid reservoir or dissolving drug is maintained in the microcapsule. The first order release pattern is more probable in which the rate decreases exponentially with time until the drug source is exhausted. In this situation, a fixed amount of drug is in solution inside the microcapsule. The concentration difference between the inside and the outside of the capsule decreases continually as the drug diffuses.

Microencapsulation technique for prevention of oxidation of fish oils

(N-3)-Polyunsaturated fatty acids (PUFAs) which reduce the risk of coronary heart disease. Cold sea water plankton and plankton-consuming fish are known sources of (n-3)-PUFAs. Enriching normal food components with fish oil is a tool for increasing the intake of (n-3)-PUFAs. Due to the high sensitivity of fish oil with respect to oxidation, it has to be protected from oxygen and light. Heinzelmann *et al.* (2000) demonstrated on the microencapsulation of fish oil using freeze-drying techniques. Emulsions containing 10% fish oil, 10% sodium caseinate, 10% carbohydrate and 70% water were frozen using different freezing techniques and subsequently freeze-dried. Several parameters regarding formulation and process (addition of antioxidants to the fish oil, use of carbohydrates, homogenization and freezing conditions, initial freeze-drying temperature, grinding) were varied to evaluate their influence on the oxidative stability of dried microencapsulated fish oil. The shelf life of the produced samples was determined by measuring the development of volatile oxidation products vs. storage time. It could be shown that the addition of antioxidants to fish oil was necessary to produce dried microencapsulated fish oil with an adequate shelf life. The best shelf life was achieved for the dried product which was frozen with a slow freezing rate.

CONCLUSION

There are certain other mechanisms which are involved in the liberation of the encapsulated material. These include biodegradation, osmotic pressure, diffusion, etc. Each mechanism involves

the composition of the capsule and the environment it is in. Therefore, the liberation of the material may be affected with various mechanisms that act simultaneously (Barba *et al*., 2009).

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