Different Techniques for the Encapsulation of Probiotics

Ghorbani M., Jafari S. M.
Gorgan Univ of Agricult Sc & Nat Res, Gorgan, Iran, (Mahmoud.ghorbani@live.com)

INTRODUCTION AND OBJECTIVE

Probiotics are defined A preparation of a product containing viable, defined microorganism s in sufficient numbers, which alter the micro flora (by implantation or colonization) in a compartment of the host and by that exert beneficial health effects in this host(Schrezenmeir and d e Vrese in 2001). Presentence of Probiotics in food products significantly increase nutritional value of Foods. The some potential health benefits of probiotic bacteria are:

1. Prevention/reduction of symptoms of hypercholesterolaemia, diarrhea, inflammatory bowel disease (ulcerative colitis ± Crohn), Helicobacter pylori infection, coronary heart disease, …
2. Improvement of lactose assimilation, food digestibility, food digestibility, blood pressure and oral health.

Consumers prefer food products that are tasty, healthy and convenient. Encapsulation, a process to entrap active agents into particles, is an important way to meet these demands by delivering food ingredients at the right time and place. Microencapsulation (ME) is a technology used to `package' various materials, Principally solids or liquids, in miniature capsules which release their contents at Controlled rates. There are many instances where it is useful to encapsulate ingredients for functional foods or nutraceuticals (FFN). Controlled release of compounds is a critical benefit of ME. However, there are many other advantages of ME for bioactive ingredients in the food matrices: taste or colour masking, increased stability of the bioactive ingredient during processing and storage, and reduced interactions between the ingredient and the environment. For these reasons, numerous vitamins, minerals or antioxidants destined for the FFN markets are encapsulated (Schrooyen et al., 2001). The encapsulation technologies for probiotics are gel particles, spray-coating, spray-drying, extrusion and emulsions. The study Focus on methods of encapsulation of probiotics in the food products by Gel particles and explain the advantages and problems of them.

MATERIAL AND METHODS

Microentrapment in Gel particles

Microentrapment in gel beads is probably the most widely studied ME technology for probiotics. It basically consists in the production of solid matrices which contain the cells. It could be argued that this process is not true microencapsulation because some particle sizes can reach 2 mm in diameter, and because we do not obtain a capsule with a membrane coating. Thus, bio-encapsulation (when applied to probiotics), matrix encapsulation or micro-entrapment could also be used to describe this process. Nevertheless, the particles obtained can often achieve the delayed release and protection properties required. Probiotic bacteria (1±3 m in size) are well retained in the alginate hydrogel matrix which is estimated to have a pore size of less than17nm (Klein et al., 1983).

Extrusion and emulsion methods for probiotics

Various polymers are used to prepare ionic gel particles (Doleyres and Lacroix, 2005, but alginate, carrageenan, gallen and pectin are the most frequently used. the technique relies on the ability of these polymers to form gels in the presence of materials, principally Calcium and potassium.

The methods of producing alginate beads which carry probiotics are:

1. ***The alginate extrusion process in a calcium chloride solution*** In some cases, starch (Sultana et al., 2000; Dembczynski and Jankowski, 2002; Muthukumarasamy et al., 2006), pectin and whey proteins (Guerin et al., 2003) have been blended with alginate in order to improve the matrix for subsequent applications.
2. ***The oil emulsion processes*** The advantage of this method is enabling the production of smaller beads (Gouin, 2004) which can be critical in preventing

sensory change in the functional food enriched with the probiotic-containing beads.

3. ***Coating of the alginate beads*** It can also be carried out to improve their protective properties. The beads are simply dipped in a solution containing a cationic polymer, such as chitosan, gelatin or poly - L – lysine (Groboil lot et al., 1993; Krasae koopt et al., 2004).

Spray-chilling technologies

This technology is considered the least expensive encapsulation for production of gel beads (Gouin, 2004). In spray-chilling, a molten matrix of hydrogenated or fractionated vegetable oils with low melting point (32 to 42 C) containing the bioactive compound is atomized through a nozzle into a vessel.

Starch granules: It has long been recognized that bacteria adhere to starch particles (Andersonand Salyers, 1989), and this property has been specifically used for ME of probiotics in native maize (corn) potato, oat or barley (Myllarinen et al., 2000; Crittenden et al., 2001; Myllarinen 2002) so cells can adhere to the granules or grow inside the matrix and probiotic-containing starch granules could constitute carries for probiotics in the development of functional foods. Viability of probiotic organisms in food and in gastrointestinal tract relies on resistance of starch.

RESULTS AND DISCUSSION

In fact, it explains that the gel particles technique containing characteristics such as:

1. Cells entrapped in a gel matrix.
2. Gel particle coatings can be applied (chitosan).
3. High cell load (> 10^{11}cfu/g) in pectin or alginate beads, but lower for starch granules.
   The described methods at above demonstrate that gel particles technique has Benefits and problems for encapsulation of probiotics in the food products. The most important of it Benefit demonstrated protection against of freezing, oxygen and GI[1]environment and the most important of it problem is particles can affect food texture and particles may dissolve in environments having chelating compounds(phosphate, citrate).

CONCLUSIONS

Application of Encapsulation of probiotics is in nutraceutical and in functional foods. Nutraceutical is defined as a product isolated or purified from foods that is generally sold in medicinal forms not usually associated with food. For Nutraceutical, encapsulation process is carried out by spray-coating.

In functional food, during processing and storage of foods, many situations can be detrimental to the viability of probiotics:

- Inhibitory compounds produced by starter cultures (fermented milks).
- Heating ± pasteurization (most products).
- Freezing (ice cream, frozen products).
- Oxygen (during blending in processing or during storage in many packaged products).
- Ingredients (salt, spices, flavors).
- Drying (powders). encapsulation offers the opportunity to enhance the survival of probiotics in some situations, thus with respect to functional food, gel particles technique is used so much for incorporation and protection of viable cells into the products.

The method of encapsulation of probiotics in functional foods by gel particles technique must be proportional to type of food product for the particles may have undesirable effects on food texture.

REFERENCES

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[1] In-vitro gastrointestinal conditions.