ECRONICON OPEN ACCESS
EC MICROBIOLOGY
Editorial

Microencapsulation Of Probiotic Bacteria

João M. Rocha*

Centre of Biological Engineering (CEB), University of Minho, Campus Gualtar, Portugal

***Corresponding Author**: João M. Rocha, Centre of Biological Engineering (CEB), University of Minho, Campus Gualtar, P-4710-057 Braga, Portugal.

Received: August 22, 2016; **Published:** August 23, 2016

Abstract

This manuscript describes some general reflections on the research around the microencapsulation and its application in the preparation of stable consortia of probiotic bacteria. Its predominant application focuses on the agro-food, nutraceutical and pharmaceutical industry but despite the highest industrial interest, the wide diversity of applications and the existence of a broad and diversified consumer market yet to be explored, there is still a quite long way to go to improve the bioactivity, functionality and applicability of these innovative (bio) technological products.

Keywords: *Microencapsulation; Probiotics; Lactic Acid Bacteria (LAB); Bioactivity; Agri-food industry*

A major challenge of the food industry in the world today is to make their products more competitive and appealing from the standpoint of improving the health of consumers. Accordingly, among those technologies with great potential is the microencapsulation of components with biological activity, which can provide "smart" properties - such as the release and action of these materials under controlled conditions into specific environments - to foods, nutraceuticals, pharmaceuticals and others designed for human and animal consumption or application.

Regarding the microencapsulation in the food area, studies were initiated in the 60's of the twentieth century in USA with the microencapsulation of essential oils to prevent oxidation and loss of volatiles and to control the release of flavours in foods. In addition to the aromas, the application of this technology was extended to the incorporation of natural additives and other ingredients (colorants, spices, acidifiers, vitamins and minerals) that modify the texture, improve nutritional quality, increase shelf-life and control the properties of some processed foods. The microencapsulation technique protects or masks the colour and flavours, inhibiting reactions with other materials, and incorporates in food products mechanisms of controlling the release of certain constituents.

One promising approach in the food and nutraceutical industry consists in microencapsulating consortia of synergetic lactic acid bacteria (LAB) with probiotic (and bacteriocinogenic) properties and integrate them into foods such as cheese, yogurt, butter, margarine and milk, so as to significantly increase their nutritional and therapeutic value and control the release of these consortia of beneficial bacteria in the distal areas of the gastrointestinal tract with the aim of better enable their efficient colonization.

The term of Greek origin "probiotics" means "for life" and has been employed in various forms over the past few years. The definition of probiotics has been extended further, bearing undergone no significant change so far: probiotic agents are thus defined as "viable microorganisms (which includes lactic acid bacteria in the form of lyophilized cells or fermented products), that exhibit a beneficial effect on the health of the host after ingestion, due to the resulting improvement of the properties in indigenous intestinal microflora".

Probiotic cultures are microbial supplements that increase the nutritional and therapeutic value of food. Examples of probiotic lactic acid bacteria are the *Bifidobacterium, Lactobacillus casei* and *Lactobacillus acidophilus*. Its use as an additive in various dairy products has undergone remarkable progress during the last decades, as a consequence of a diverse set of scientific works all over the world in the fields of taxonomy, ecology and therapy of these species. Besides to the benefits provided in terms of health and nutrition, probiotic cultures may also contribute to an improvement of the end product, having the advantage of promoting a reduced acidification during the post-processing storage.

The most common target food in the assessment of the nutraceutical value of probiotic strains are the dairy products fermented by *Bifidobacterium* and lactobacilli. In general, these microorganisms increase the digestibility of protein and fat, reduced content of lactose (which is particularly important for individuals with lactose intolerance), increases the calcium and iron absorption and balances the content of various vitamins. One of the therapeutic values assigned to the probiotic bacteria – which is founded on mechanisms of action well established – is the beneficial effect on disorders and intestinal infections. The microencapsulation of these probiotic lactic acid bacteria enables that the beneficial effects described above can be more effective, given that they are released only at the target site of absorption (i.e. in the intestine), using for such an encapsulating agent which only dissolves in alkaline media (such as intestinal).

The interest of the food industry by microencapsulation technology has grown rapidly and this trend persists, because it leads to different food products with new functional and "smart" properties - ultimately aimed at consumer's health. Currently it has been noted a strong research effort on systematic search and evaluation of different types of support material biocompatible with the human gastrointestinal tract - which are, subsequently, tested in the microencapsulation of various consortia of probiotic lactic acid bacteria. Once microencapsulated in different support materials, these microorganisms are tested for their viability and, afterwards, microcapsules containing those bacteria (single or as a consortium) are incorporated in various foods and their viability is tested again.

Numerous methods allow the microencapsulation of an active material into a matrix, but the choice of the method depends on the type of the material to be encapsulated, the application and the desired release mechanism for its action. The essential difference between the microencapsulation methods is the involvement or trapping of the active material by encapsulating agent – wherein the combination of the material and the agent can be of physical, chemical or physicochemical nature. Among the physical methods are the spray drying (drying micro droplets), spray cooling (micro droplets solidification by cooling) and extrusion (forming microspheres by mechanical means). With respect to the chemical methods, include the molecular inclusion (encapsulation of certain other molecules), and interfacial polymerization (polymerization reaction at the boundary between two solutions, one of which containing the active material in suspension). The physicochemical methods most studied encompass the coacervation or separation of phases (separation of the encapsulating polymer in a liquid medium and their precipitation on the surface of the dispersed active material in the same medium) and liposomal engagement (encapsulation by lipid membranes, the liposome).

Microencapsulation is a potentially powerful technique involving complex processes that can be employed in the incorporation of biologically active materials into certain foods, giving them new functional and "smart" properties and making more effective the final food product in which the biologically active materials were incorporated. Potential markets for microencapsulated probiotic bacteria remain the Agri-food, nutraceutical and pharmaceutical industries. Growth prospects are quite optimistic, since in the current global context where industrial competitiveness is increasing, the domain and application of new technologies (i.e. application of principles, methods, tools and processes to develop and improve processes and products) is essential for companies to offer products with higher added value - which is an advantage in the competition of markets on a global scale.

Acknowledgement

Author gratefully acknowledges the Centre of Biological Engineering (CEB) and the University of Minho (UM), Portugal, for the research grants (Ref. # uminho/bpd/49/2014 and Ref. # uminho/bpd/53/2015) under the Integrated Framework Program ON.2 BIO2Norte – Biotechnology and Bioengineering for the Quality of Life and Sustainable Development (N-01-07-01-24-01-09). The above research was developed at the Department of Chemical Engineering (DEQ), Faculty of Engineering, University of Porto (FEUP), Portugal, therefore author acknowledges the utilization of laboratory premises to perform this project. Finally, the author also thanks the FCT Strategic Project of UID/BIO/04469/2013 unit, the project RECI/BBB-EBI/0179/2012 (FCOMP-01-0124-FEDER-027462) and the project "BioInd – Biotechnology and Bioengineering for improved Industrial and Agro-Food processes", REF. NORTE-07-0124-FEDER-000028, co-funded by the Programa Operacional Regional do Norte (ON.2 – O Novo Norte) [Northern Regional Operational Framework Program, ON.2], QREN, FEDER

Volume 3 Issue 4 August 2016