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Microencapsulation of Probiotic Bacteria Especially Designed for Infant Formula (IF)

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Overview: According to the new World Health Organization (WHO) guidelines, powdered infant formula (PIF) should be reconstituted at 70°C in order to destroy any contaminant which may exist in PIF. However, at this temperature, probiotic bacteria (PB) which may be contained in PIF may also be destroyed thus the advantages of probiotics will not be manifested. A new PB delivery system based on a unique microencapsulation technology, which has been developed by PolyCaps company, could perfectly protect PB against hot water (70°C) during the reconstitution of PIF. The microcapsules dissolve immediately after cooling the liquid to the feeding temperature and the alive PB were finally released in the baby milk bottle. Additionally, the microencapsulation system could provide the PB with a low water activity (aw) environment which allowed a high viability and an extended shelf life of the final product for at least two years.

Introduction: Recently, WHO has issued new guidelines for reconstituting PIF (World Health Organization, 2007). The new guidelines are largely based on the findings which showed that PIF is not a sterile product and may often be contaminated with pathogens such as E. Sakazakii and Salmonella, which can cause serious illness and sometimes death. According to the new WHO guidelines, PIF should be reconstituted in water at 70°C to prevent any risk of contamination. However, under the new WHO preparation guidelines, the probiotic bacteria which may be included in PIF may die or may be seriously harmed. PolyCaps has developed a unique microencapsulation technology which protects probiotic (PB) against hot water (70°C) during reconstitution of PIF in accordance with the new WHO guidelines where the harmful pathogens will be destroyed or disactivated. The microcapsules are designed to dissolve immediately after cooling the liquid to the feeding temperature releasing the alive PB. The structure of the microcapsule is schematically illustrated in Fig. 1.

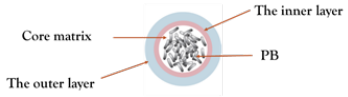

Fig. 1. A schematic illustration of the microcapsules structure comprising a core containing the bacteria and the coating layers comprising “smart” polymers.

Methods: Microencapsulation of PB (Bifidobacterium breve) was carried out using an Innojet Ventilus 2.5 coater machine (Romaco Innojet Herbert Huttlin, Steinen, Germany). The test method for the survival rate of PB in PIF during the reconstitution at 70°C, was adapted from the new guidelines issued by WHO in collaboration with FAO of the United Nations (World Health Organization, 2007).

Conclusion: The PolyCaps microencapsulation technology provides the bacteria with superior stability during reconstitution at 70°C (according to new WHO guidelines) as compared to the pure PB. Likewise, the technology provides the bacteria with superior stability during the shelf life, at least for 2 years, even in a not totally-sealed packaging.

Biography

Adel Penhasi, whose expertise spans the fields of polymer science and biomaterials, is currently Chief Science and Technology Officer of PolyCaps. Previously, he served as Vice President Innovative Research and Development at Dexcel Pharma where he managed the innovative research group for more than a decade. He has published over 50 scientific papers, and he is the inventor of more than 55 patents and patent applications in different industrial applications such as drug delivery systems, medical devices and micro-encapsulations. He is a senior lecturer at The Azrieli College of Engineering Jerusalem - Pharmaceutical Engineering. Penhasi earned his PhD in Applied Chemistry form Hebrew University of Jerusalem.

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