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Optimization of the encapsulation process for the production of compartmentalized artificial garlic particles

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Garlic (*Allium sativum*) is well known for its antibacterial, antiviral and antifungal properties for thousands of years and is one of the most studied plants in human history. There was a number of studies focused on garlic chemistry and utilization of active organosulfur compounds. Nowadays, a wide range of commercial garlic-derived products promising broad spectrum of beneficial properties (e.g., reduction of the risk factors for cardiovascular disease, blood pressure reduction or antibacterial effect). However, the activity of the products is very questionable, since the most potent active substance, allicin, is highly unstable and thus inappropriate for a long-term storage. Based on these findings, the only option is to produce allicin in-situ. We propose to mimic the architecture of a garlic cell having two types of separated compartments, one containing a stable substrate (alliin) and the other one with a stabilized enzyme (alliinase). Another approach is to produce two types of carriers which will be mixed upon preparation. In order to produce biocompatible micro-carriers, two different techniques suitable for scale-up were employed, i.e. spray drying (Spray drier Buchi B-290) and encapsulation by coaxial nozzles (Encapsulator B-390). Both techniques are suitable for work with enzyme and biodegradable polymers (e.g., chitosan, alginate) without the necessity of excessive thermal and mechanical stress. The products of spray drying and encapsulation technique are fine micron-sized powder particles and crosslinked polymer beads, respectively. The aim of this work is to is to optimize a composition and effect of materials, additives (salts, cofactors) and operation parameters (temperature, type of drying media, ionic strength) to preserve the activity of the immobilized enzyme and to prevent premature mixing of compartmentalized precursors.

Biography

Ondrej Kaspar is an Assistant Professor at the University of Chemistry and Technology (UCT) Prague. He spent two years as a post-doc at McGill University in the research group of Prof. Dan V. Nicolau involved in the newly emerging field of bio-computation and bio-simulation research. After his return to the Czech Republic, he joined the Laboratory of Biomimetic Engineering at UCT Prague. Nowadays, he is involved in research topics focused on mimicking of natural antibacterial solutions, encapsulation of active substances and preparation of nanoparticles via microfluidics.

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