

## **Effects of starch filler on the physical properties of lyophilized calcium–alginate beads and the viability of encapsulated cells**

### **Abstract**

The main objective of this work is to improve the physical properties of lyophilized calcium (Ca)–alginate beads as a carrier material for the stabilization of encapsulated living cells. Improvements in the sphericity, flowability and mechanical strength of the dried beads were attributed to the filler, which provided structure and reinforcement to the Ca–alginate hydrogel networks, as verified by X-ray microtomography and scanning electron microscopy. A quantitative analysis of the micro-images revealed the less porous nature of the alginate–starch beads compared to the control. The beads with filler were also found to be less hygroscopic. The results also show that the cells encapsulated within the beads with reduced porosity and hygroscopicity were clearly more stable during lyophilization and storage than the control. In conclusion, the qualities of the alginate beads were improved by incorporating the solid filler, and the filler had a significant influence on cell viability during lyophilization and storage.