EXPANSION PROPERTIES OF ALGINATE BEADS AS CELL CARRIER IN THE FLUIDIZED BED BIOARTIFICIAL LIVER

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The homogeneous expansion behaviour of liquid-fluidized beds is exploited in various fields such as minerals engineering and biotechnology. Innovative fluidized bed bioreactor concepts have been also explored for applications as bioartificial organs, particularly the bioartificial liver (1). It has been shown that the fluidized bed bioreactor constituted of alginate beads hosting liver cells is one of the promising solution to a bioartificial liver. Compared to other solutions, fluidization of alginate beads containing the cells does not suffer from the severe limitations to mass transfer between the beads and the perfusion medium.

In the present work, appropriate alginate beads were prepared by the alginate drop gelation in calcium chloride. The beads were characterized in terms of size distribution and density. Sauter mean diameter of 813 □m and density of 1020 kg/m3 were obtained. The latter shows a value very close to usual perfusion fluid, which required also careful evaluation of the liquid properties. Expansion properties were evaluated for free alginate beads (i.e. without hepatic cells) using saline solutions as fluidization medium. Bed expansions have been conducted in a small-size 1-cm diameter column used for perfusion in in vitro experiments as well as in a bigger 10-cm diameter column close to human size bioreactor. Velocity-voidage plots are reported and elaborated in terms of Richardson-Zaki parameters, showing the effect of walls and the different distributor.

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REFERENCES
Gautier A., Carpentier B., Dufresne M., Vu Dinh Q., Paullier P., Legallais C. Impact of alginate type and bead diameter on mass transfers and the metabolic activities of encapsulated C3A cells in bioartificial liver applications. European Cells and Materials 2011, 21:94-106.