# A starch-based microparticulate system dedicated to diagnostic and therapeutic nuclear medicine applications



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| Résumé en anglais | The aim of this work was to develop a new microparticulate system able to form a complex with radionuclides with a high yield of purity for diagnostic or therapeutic applications. Owing to its properties potato starch was chosen as starting material and modified by oxidization and coupling of a ligand (polyamine) enabling modified starch to chelate radionuclides. The choice of suitable experiments was based on a combination of a Rechtschaffner experimental design and a surface response design to determine the influence of experimental parameters and to optimize the final product. Starch-based microparticle formulations from the experimental plans were compared and characterized through particle size analysis, scanning electron microscopy, elemental analysis and, for the most promising formulations, by in vitro labeling stability studies and determination of free polyamine content or in vivo imaging studies. The mechanism of starch-based microparticle degradation was identified by means of size measurements. The results of the Rechtschaffner design showed the positive qualitative effect of the temperature and the duration of coupling reaction whereas surface response analysis clearly showed that, by increasing the oxidization level and starch concentration, the nitrogen content in the final product is increased. In vitro and in vivo characterization led to identification of the best formulation. With a size around 30 mum, high radiochemical purity (over 95%) and a high signal-to-noise ratio (over 600), the new starch-based microparticulate system could be prepared as ready-to-use kits and sterilized without modification of its characteristics, and thus meet the requirement for in vivo diagnostic and therapeutic applications. |

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