POLYELECTROLYTE MICROCAPSULES: A BRIDGE TO IMPROVED DIABETES TREATMENT

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This contribution describes our work towards the diabetes treatment by transplantation of insulin-producing cells that are protected from the immune system by encapsulation in polymeric microcapsules. This principle is considered as the next generation treatment for diabetes, since it aims at a continuous glucose control in the absence of immunosuppression drugs. Polymeric microcapsules have to fulfill a number of specifications, such as the absence of fibrotic overgrowth, stability under *in vivo* environment, and free diffusion of glucose, insulin, oxygen, and vital nutrients, in order to provide the conditions for long-term viability and function of encapsulated islets.

We work on a multicomponent polyelectrolyte complex-based microcapsule composed of sodium alginate, sodium cellulose sulfate and poly(methylene-co-cyanoguanidine). This microcapsule is biotolerated after intraperitoneal implantation into non-human primate animal model [1] and has been further optimized for the pre-clinical studies. In order to advance this concept to clinics, we need to understand the correlation between the microcapsule properties and the *in vivo* performance [2].

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[1] Qi M., McGarrigle J.J., Wang Y., et al. Transplantation of pancreatic islets immobilized in alginate-based microcapsules: from animal studies to clinical trials. *Micro and Nanosystems* **5**, 186-193 (2013)

[2] Rokstad A.M., Lacik I., de Vos P., Strand, B.L. Advances in biocompatibility and physico-chemical characterization of microspheres for cell encapsulation. Adv Drug Deliv Rev 67-68, 111-130 (2014)