Targeted drug delivery into reversibly injured myocardium with silica nanoparticles: A program of translational studies

Eugene Shlyakhto
V.A. Almazov Federal Heart, Blood and Endocrinology Centre, Russian Federation

Pharmacological agents suggested for infarct size limitation have serious side effects when used at the cardioprotective doses which hinders their translation to the clinical practice. The solution to the problem might be direct delivery of cardioprotective drugs into the ischemic-reperfused myocardium. In this paper, we present our original findings relevant to the problem of therapeutic heart targeting with use of nanoparticles. Experimental approaches included fabrication of silica nanoparticles (SNP), their characterization and surface modification. The acute hemodynamic effects of nanoparticle formulation as well as nanoparticle biodistribution were studied in male Wistar rats. Further, the potential of SNP for passive delivery of prototype cardioprotective agent adenosine into ischemic-reperfused heart is explored. Besides, SNP biodegradation is studied both in vitro and in vivo. We conclude that SNP are biocompatible materials that might be potentially used as carriers for heart-targeted drug delivery. Immobilization of adenosine on the surface of SNP resulted in enhancement of adenosine-mediated infarct size limitation in the rat model. Furthermore, hypotensive effect of adenosine was attenuated after its adsorption on SNP. Concepts of passive and active targeting can be applied to the development of targeted drug delivery to the ischemic myocardial cells. Provided that ischemic heart-targeted drug delivery can be proved to be safe and efficient, the results of this research may contribute to the development of new technologies in pharmaceutical industry.

Biography
Eugene Shlyakhto graduated from St-Petersburg I.P. Pavlov State Medical University and earned his doctoral degree at the Department of Internal Medicine in 1992. Currently he is the director of V.A. Almazov Federal Heart, Blood and Endocrinology Centre, a Chairman of the Russian National Society of Cardiology. He has published more than 40 papers in reputed journals and serving as an editorial board member of several internationally recognized journals.

shlyakhto@inbox.ru