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Targeted delivery of paclitaxel to injured blood vessels with magnetically responsive nanoparticles for preventing in-stent restenosis

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Targeted delivery strategies are emerging as a means for improving the efficacy and safety of both existing and experimental therapies. Magnetic guidance provides the basis for an active targeting approach capable of directly affecting and controlling the biodistribution of therapeutic agents formulated in magnetically responsive carriers. Despite significant potential benefits and proven safety of all its essential components, magnetic guidance remains unrealized in clinical practice due to intrinsic limitations of traditional magnetic targeting schemes. The introduction of magnetic site-specific delivery strategies into clinical use is thus dependent on designing fully biocompatible magnetic carriers and identifying efficient ways to target non-superficially located sites in the body. A novel two-source magnetic targeting approach based on deep-penetrating uniform magnetic fields and applied in combination with biodegradable, magnetically responsive nanoparticulate carriers can enable a clinically viable therapy of proliferative vascular disease. The feasibility of this approach has been demonstrated in vitro and in the rat carotid stenting model of restenosis for arterial targeting of a small molecule pharmaceutical with established antirestenotic efficacy (paclitaxel), gene vectors and cells. Uniform field-controlled magnetic targeting has potential to provide a conceptually novel, safe and efficient strategy for treating vessel renarrowing after stent angioplasty.

Biography

Michael Chorny finished his PhD in School of Pharmacy of the Hebrew University of Jerusalem. Since 2009 he is a Research Assistant Professor at the Children's Hospital of Philadelphia. His research is focused on biodegradable nanoparticles for targeted delivery of drugs, gene vectors and cells for cardiovascular disease applications and cancer therapy, and he has been published several papers describing novel magnetic carrier formulations for site-specific therapy of injured blood vessels.

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