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Cell source determines the immunological impact of biomimetic nanoparticles

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Recently, engineering the surface of nanotherapeutics with biologics to provide them with superior biocompatibility and targeting towards pathological tissues has gained significant popularity. Although the functionalization of drug delivery vectors with cellular materials has been shown to provide synthetic particles with unique biological properties, these approaches may have undesirable immunological repercussions upon systemic administration. Herein, we comparatively analyzed unmodified multistage nanovectors and particles functionalized with murine and human leukocyte cellular membrane, dubbed Leukolike Vectors (LLV), and the immunological effects that may arise in vitro and in vivo. Previously, LLV demonstrated an avoidance of opsonization and phagocytosis, in addition to superior targeting of inflammation and prolonged circulation. In this work, we performed a comprehensive evaluation of the importance of the source of cellular membrane in increasing their systemic tolerance and minimizing an inflammatory response. Time-lapse microscopy revealed LLV developed using a cellular coating derived from a murine (i.e., syngeneic) source resulted in an active avoidance of uptake by macrophage cells. Additionally, LLV composed of a murine membrane were found to have decreased uptake in the liver with no significant effect on hepatic function. As biomimicry continues to develop, this work demonstrates the necessity to consider the source of biological material in the development of future drug delivery carriers. © 2015.

SciVal Topic Prominence
Topic: Porous silicon | Silicon | mesoporous silicon
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Reaxys Database Information

View Compounds

Author keywords
Biomimicry; Drug delivery; Immunobiology; Leukolike Vector; Multistage nanovector; Nanoparticles

Indexed keywords

Engineering controlled terms:	Antigen-antibody reactions; Biocompatibility; Biomimetics; Cell membranes; Drug delivery; Drug products; Immunology; Nanoparticles

Engineering uncontrolled terms	Biomimetic nanoparticles; Biomimicry; Comprehensive evaluation; Immunobiology; Immunological effects; Nanovector; Systemic administration; Time-lapse microscopy
Engineering main heading:	Biological materials
EMTREE drug terms:	alanine aminotransferase; aspartate aminotransferase; biomimetic material; creatinine; gamma interferon; interleukin 10; interleukin 12; interleukin 1; alphainterleukin 1; betainterleukin 2; interleukin 3; interleukin 6; leukolike vector; multistage nanovector; nanocarrier; nanoparticle; reactive oxygen metabolite; transcription factor RelA; tumor necrosis factor alpha; unclassified drug; biomaterial; biomimetic material; nanocapsule
EMTREE medical terms:	animal cell; animal experiment; animal tissue; Article; biocompatibility; cell interaction; controlled study; cytokine release; rug delivery system; human; human cell; in vitro study; in vivo study; internalizationleukocyte membraneliver function; macrophage; mononuclear phagocyte; mouse; nonhuman; opsonization; phagocytosis; priority journal; protein expression; static electricity; surface charge; time lapse imaging; zeta potential; animal; Bagg albino mouse; cell culture; comparative studyd; rug effects; evaluation study; immunology; innate immunity; leukocyte
MeSH:	Animals; Biocompatible Materials; Biomimetic Materials; Cells, Cultured; Immunity, Innate; Leukocytes; Mice; Mice, Inbred BALB C; Nanocapsules

Chemicals and CAS Registry Numbers:

alanine aminotransferase, 9000-86-6, 9014-30-6; aspartate aminotransferase, 9000-97-9; creatinine, 19230-81-0, 60-27-5; gamma interferon, 82115-62-6; interleukin 12, 138415-13-1; interleukin 2, 85898-30-2;

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