In this issue

Luciana M. Herda, Ester Polo, Philip M. Kelly, Louise Rocks, Diána Hudecz and Kenneth A. Dawson
**Designing the future of nanomedicine: current barriers to targeted brain therapeutics**

Review article: The challenges facing nanosystem designs for crossing the blood-brain barrier through receptor-mediated transcytosis range from affinity modulation of targeting moieties for selectivity and efficacy, to behaviour in biological media.

Keywords: apoE; blood-brain barrier; drug targeting; nanoparticles; receptor-mediated transcytosis; transferrin.
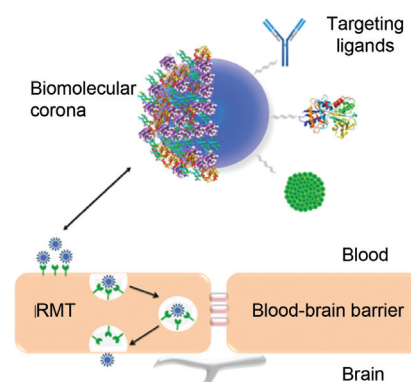

Cinzia Casella, Martina Tuttolomondo, Poul Flemming Høilund-Carlsen and Jan Mollenhauer
Natural pattern recognition mechanisms at epithelial barriers and potential use in nanomedicine

Review article: Molecular pattern recognition is a generic mechanism in defense and extracellular matrix interactions. Understanding its molecular basis may substantially assist rational design of novel nanomedical principles for drug delivery.

Keywords: DMBT1; drug delivery; epithelial barrier; innate immunity; pattern recognition.
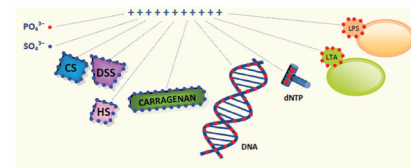

Xabi Murgia, Cristiane de Souza Carvalho and Claus-Michael Lehr
Overcoming the pulmonary barrier: new insights to improve the efficiency of inhaled therapeutics

Review article: After successful lung deposition therapeutic nanoparticles must overcome the pulmonary barriers in order to carry out their therapeutic effect. In the conducting airways the mucus layer (8 µm thick) on top of the epithelial cells (58 µm thick) creates a heterogeneous mesh that poses a significant barrier to inhaled nanoparticles. In the deep lung, the pulmonary surfactant (0.07 µm thick), the macrophages, and the alveolar epithelium (0.1–0.2 µm thick) are the main barriers for therapeutic nanoparticles.

Keywords: mucus; nanoparticles; pulmonary barriers; respiratory epithelium; surfactant.
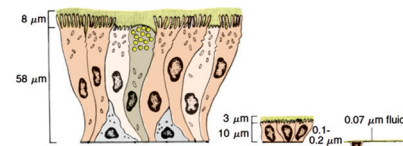
Maria Rita Fabbrizi, Tracey Duff, Jo Oliver and Colin Wilde
Advanced in vitro systems for efficacy and toxicity testing in nanomedicine

Review article: Novel cell-based models incorporating physiologically-relevant cells cultured in tissue-reflective 3D environments deliver the means for predictive preclinical testing of nano-therapies and the prospect of accelerating the development of nanomedicines.

Keywords: cell-based systems; commercial platforms; nanosafety.

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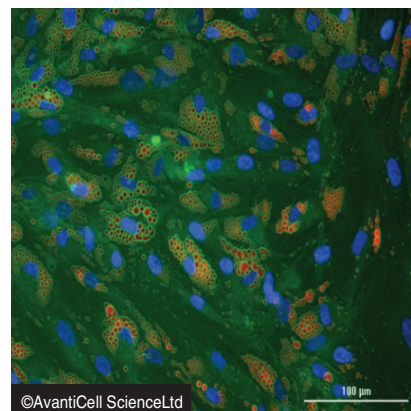
Diána Hudecz, Louise Rocks, Laurence W. Fitzpatrick, Luciana-Maria Herda and Kenneth A. Dawson
Reproducibility in biological models of the blood-brain barrier

Mini Review: Alternative approaches to traditional in vitro blood-brain barrier models may be required to improve experimental reproducibility.

Keywords: blood-brain barrier; in vitro; live cell imaging; nanoparticle; reproducibility; transcytosis.

Monolayer

Holes

Multilayers