

DELIVERING BIOPHARMACEUTICALS ACROSS BIOBARRIERS: OPPORTUNITIES AND CHALLENGES IN DRUG DEVELOPMENT



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Dr. Leberer received his PhD in Biology at the University of Konstanz, Germany. He conducted Post-doctoral training in molecular biology at the Banting and Best Institute of the University of Toronto, Canada, and then he became a Professor of Biochemistry at the University of Konstanz, Germany. He currently has responsibilities for R&D Alliance Management at Sanofi, and is the Scientific Managing Director of the Innovative Medicines Initiative COMPACT Consortium on the delivery of biopharmaceuticals across biological barriers and cellular membranes (compact-research.org).

What's the most exciting thing that you're currently involved in? What are your current interests in the field?

My interests revolve around oligonucleotides, mRNA and the delivery of proteins; that's something of high interest to us because we are able to deliver antibodies, fragments of antibodies and nanobodies to intracellular targets. This would really open another target space for us. It's restricted to small molecules to get into the cell and it's difficult to do that with oligonucleotides.

What are the major challenges with that?

These are large molecules and they can't fit into the cells. Nature has spent millions of years protecting cells against large molecules. Our task is to overcome those barriers of cellular memory but also tissue barriers, like getting into the brain, getting into the lung, into the skin and over the intestinal barrier for all types of peptides or proteins.

What are the key developments that are enabling that?

What you need are functionalised nanocarriers. Currently there aren't many new materials, but to functionalise them to get them to specific tissues, that's something that would enable us to improve delivery of large molecules.

It is about overcoming the targeting challenge and nano vectors, correct?

Nano vectors containing and delivering ligands that bind to cell surface receptors and are getting internalized into the cells - that's probably a viable approach. The

challenge is to find the right receptors of the cells because they need to be endocytosed and need to be expressed at a high level. The challenge is to find the right receptors and the next challenge is to find the right ligands targeting drug delivery systems to those receptors.

This is the first time we're having this RNA-based stream in the Formulation Congress; how do you feel that fits in with the rest of the content of the congress?

I think it fits in very well because to resolve the issue of delivery of RNA, small RNAs, towards the large mRNAs, you need expertise from material scientists, and you need expertise from analytical people. You'd need a cross functional approach. You have a lot of those experts here at the conference. They may be able to help those people working on RNA delivery. Personally, I want to see oligonucleotides, mRNAs. I think this conference would benefit from more of those as well as from the new technologies like CRISPR Cas9, where you have a big delivery issue. Gene therapies are also coming back, so they would be worth considering.

What are you looking to get out of the conference? What are you most looking forward to when you attend these events?

I am looking for new ideas, and networking, finding people with the right expertise who could help in the future and with whom we could collaborate. Since certain problems cannot be resolved in isolation, you need cross functional expertise. You need people from other areas, and those people you can meet at the event.