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Nanotechnology against malaria

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Malaria is arguably one of the main medical concerns worldwide because of the numbers of people affected, the severity of the disease and the complexity of the life cycle of its causative agent, the protist *Plasmodium sp.* The clinical, social and economic burden of malaria has led for the last 100 years to several waves of serious efforts to reach its control and eventual eradication, without success to this day. With the advent of nanoscience, renewed hopes have appeared of finally obtaining the long sought-after *magic bullet* against malaria in the form of a nanovector for the targeted delivery of antimalarial compounds exclusively to *Plasmodium*-infected cells, thus increasing drug efficacy and minimizing the induction of resistance to newly developed therapeutic agents. Different types of liposomal and polymeric encapsulating structures and of targeting molecules based on proteins, polysaccharides and nucleic acids will be discussed for the assembly of nanocapsules capable of specifically delivering to diseased cells their antimalarial cargo. LEGO-like exchange of the nanovector parts can allow for the targeting of different cell stages in the life cycle of *Plasmodium*. Nanotechnology can also be applied to the discovery of new antimalarials through single-molecule manipulation approaches for the identification of novel drugs blocking essential metabolic pathways of the pathogen. The benefits and drawbacks of these nanosystems will be considered in different possible scenarios, including cost-related issues that might be hampering the development of nanotechnology-based medicines against malaria with the dubious argument that they are too expensive to be used in developing areas.

Biography

Xavier Fernández-Busquets started his undergraduate research career as a trainee student in Organic Chemistry and Enzymology at the CIBA-GEIGY Zentrale Forschungslaboratorien in Basel. He graduated in Biochemistry at the Universitat Autònoma de Barcelona, where he also obtained his PhD in the field of Molecular Biology. Between 1992 and 2001 he held several postdoctoral positions, among which those at the Friedrich Miescher Institut (Novartis AG, Basel) and at the Woods Hole Marine Biological Laboratory, where he worked on the evolutionary origins of specific cell adhesion and started his training in Nanotechnology. In 2001 he obtained a 5-year tenure track Ramón y Cajal position at the Universitat de Barcelona where he led a group focused on nanotechnological approaches to amyloid diseases and malaria. In 2006 he became Senior Researcher at the Institute for Bioengineering of Catalonia (IBEC) and since 2010 he is Head of the Nanomalaria Joint Unit (IBEC/Barcelona Centre for International Health Research).

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