

The Squalenoylation, a new Nanomedicine platform for the treatment of severe diseases

Patrick COUVREUR, University of Paris-Saclay (France)

The “squalenoylation” is a technology that takes advantage of the squalene's dynamically folded molecular conformation, to link this natural and biocompatible lipid with drug molecules to achieve the spontaneous formation of nanoassemblies (100–300 nm) in water, without the aid of surfactants. It was observed that these squalene-based nanoparticles are using the circulating LDL as “indirect” carriers for targeting cancer cells with high expression of LDL receptors. The application of the “squalenoylation” concept for the treatment of brain ischemia and spinal cord injury will be discussed too. It was also discovered that the linkage of squalene to leu-enkephalin (a neuropeptide) (i) prevented rapid plasma degradation of the peptide, (ii) allowed to target the peptide into the body painful area, (iii) conferred to the targeted neuropeptide a significant anti-hyperalgesic effect, (iv) without the morphine side effects (i.e. addiction, tolerance and respiratory depression). Very recently, the construction of multidrug nanoparticles containing both adenosine-squalene and vitamin E, allowed to inhibit the pathological cross-talk between oxidative stress and inflammation, occurring in complex and multifactorial phenomenon of uncontrolled inflammation.

Patrick COUVREUR is an Emeritus Professor of Pharmacy at Paris-Saclay University, member of the Académie des Sciences and holder of the chair of “Innovations Technologiques” (2009-2010) at the prestigious « Collège de France ». Prof COUVREUR's contributions in the field of drug delivery and nanomedicine are highly recognized around the world with over 550 publications (H-index 130 Google Scholar). He obtained 2 ERC Grants (Advanced and Proof of Concept). He co-founded three start-up companies (Bioalliance, entering the stock market in 2005, Medsqual and Squalpharma) and developed an anticancer nanomedicine reaching phase III clinical trial. His scientific contribution is recognized by numerous international and national awards. Apart from the Académie des Sciences, he is also appointed as a member of 3 other academies in France (Engineering, Medicine and Pharmacy) and he is a foreign member of two of the three US National Academies (Engineering and Medicine), of the Royal Academy of Medicine in Belgium and of the Royal Academy of Pharmacy in Spain. By a decree of the President of the French Republic, Patrick Couvreur is appointed as “Chevalier de la Légion d'Honneur” in recognition of his research achievements.