Squalene-based nanomedicine for cerebral ischemia, spinal cord injury and pain

Dr. Sinda Lepetre-Mouelhi
Institut Galien, Paris-Sud University, France

The "squalenoylation" approach is based on the covalent linkage between squalene, a natural and biocompatible lipid, and a drug molecule displaying serious limitations such as short biological half-life due to rapid blood metabolization and poor intracellular diffusion. Fundamentally, the dynamically folded conformation of squalene triggers the resulting squalene-drug bioconjugates to self-assemble as nanoparticles of 100–300 nm in aqueous solutions. In general, these nanoparticles showed long blood circulation times after intravenous administration and improved pharmacological activity with reduced side effects and toxicity. This squalenolytion approach has proven to be very effective against numerous diseases, including cancer, brain ischemia, spinal cord injury[1] and pain[2]. The originality of the squalene-based nanoparticles arises from the fact that they could act on the central nervous system by operating peripherally without any need to cross the blood-brain barrier.

1- A. Gaudin et al., Squalenoyl adenosine nanoparticles provide neuroprotection after stroke and spinal cord injury. Nat. Nanotechnol. 9, 1054–1062 (2014).

2- J. Feng, et al.,, A new painkiller nanomedicine to bypass the blood-brain barrier and the use of morphine. Sci. Adv. 5, eaau5148 (2019).

Curriculum Vitae

Dr. Sinda Lepetre-Mouelhi is Associate Professor at Institut Galien at Paris-Sud University in Châtenay-Malabry in France. She has been working in the team of Prof. Patrick Couvreur since 2005. Her current research activity lies in the synthesis of squalene-based bioconjugates and their formulation into nanoparticles. The main fields of application include cancer, HIV, and more recently, cerebral and hepatic ischemia, as well as pain.