

# Nano delivery systems for imaging and treating pathological disorders overexpressing TSPO

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Decades of studies on the 18-kDa mitochondrial translocator protein (TSPO) have revealed that this protein participates in a variety of cellular functions. As a result of these diverse functions, changes in TSPO expression have been related to different diseases, from cancer to endocrine and neurological diseases as well. TSPO has therefore become an attractive subcellular target for both the early detection of disease states involving its overexpression and the selective mitochondrial drug delivery. Investigation of the functions of this protein, both in vitro and in vivo, has been mainly carried out using high-affinity ligands. Among them, alpidem has been shown to act on both TSPO and the central benzodiazepine receptor, with a preference toward TSPO. In an effort to improve the TSPO-selectivity of alpidem analogs, we have developed many imidazo[1,2-a]pyridine-based compounds and one of them has reached the clinical trial as PET tracer monitoring the neuroinflammation [1]. However, all these diagnostic and therapeutic TSPO ligands have many pharmacokinetics limitations due to their not selective biodistribution and to the subcellular localization of the target protein. Hence, to overcome these limitations nano delivery systems have been explored. In fact, to be effective the nanoparticles have to unload their payloads at the site of disease, more specifically, the encapsulated drug, in some cases, must successfully reach its sub-cellular target [2]. Therefore, the drug loaded nanocarriers have to overcome systemic, extracellular and intracellular barriers to deliver the drug to the specific organelles for effective therapeutic benefit. For example, recently developed nanoparticles, now being investigated for cancer therapy, have been designed with multifunctional capabilities such as long systemic circulation, tumor targeting, cytosolic translocation, organelle-specific targeting for effective cytotoxic effect. The aim of this speech is to describe various strategies that have been adopted so far to enhance the drug's targetability, intracellular drug delivery for nanotherapeutics-based applications.

## References

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