PEGylated Nanoemulsions as immune-PET imaging agents for early Glioblastoma diagnosis

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Glioblastoma is the most common and lethal type of brain cancer, with 12-15 months median survival. The current treatment relies on surgical removal and chemotherapy.[1, 2] However, chemotherapy is limited by the challenge of crossing the blood-brain barrier (BBB), which prevents more than 98% of chemotherapeutic drugs from reaching the brain. [3] Nanoparticles (NPs) can be tailored to facilitate penetration through the BBB, thereby enabling encapsulated drugs to get to the tumor, making nanotechnology-based drug delivery a promising strategy to reach glioblastoma. [4]

Different types of nanoparticles are investigated as imaging agents (Figure 1) since molecular imaging techniques allow to monitor their pharmacokinetics and biodistribution. [5,6,7] Due to their biodegradable and biocompatible composition, the organic NPs are still the most demanded ones. Nevertheless, the use of nanoemulsions (NEs) in nuclear imaging is still recent and there are only few reports describing radiolabeled NEs. [5, 6]

In this work, we present the rational design of nanoemulsions as imaging agents for the detection of glioblastoma using positron emission tomography (PET). The design takes into consideration the different barriers to overcome from the intravenous injection to the tumor, including crossing the BBB (Figure 2). Apart from the composition needed for reaching the tumor, the nanoemulsions would be marked with ^{89}Zr for PET imaging. PET is a very sensitive and versatile technique that provides a full and quantitative characterization of the NPs biodistribution. [6, 8] To best of our knowledge, this is the first example of combining the NEs and PET technologies for the diagnosis of glioblastoma.

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Figures

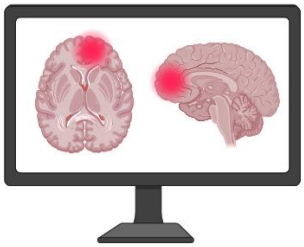

Figure 1. Simplified example of an image obtained using radionuclides by PET.

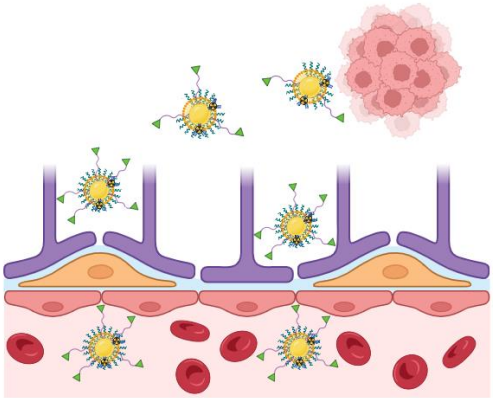

Figure 2. Representative scheme of the NEs crossing the BBB and reaching the tumor.