



Sylvie Begin-Colin

THERAGET

Dendronized nanoparticles designed for targeted multimodal image guided therapy

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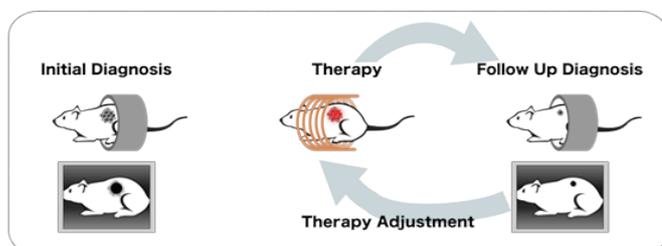
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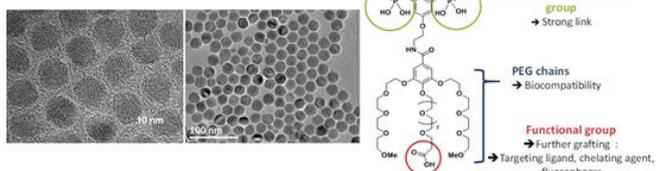
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A major challenge in nanomedicine is to develop targeted multifunctional nanoplatforms that allow diagnosis, therapy, and follow-up by imaging (theranostics) adapted to each patient and disease. Our project aims at validating the innovative design of targeting multimodal imaging (MRI, SPECT & PET) and therapeutic (magnetic hyperthermia) nanoplatforms using already validated targeting ligands for tumours. Nanoplatforms, that we will develop, allow multimodal imaging and therapy and monitoring the effect of treatment by imaging. 10 nm iron oxide nanoparticles coated with dendron molecule were shown through 4 preclinical proof-of-concept studies to be excellent MRI



contrast agents with a capacity to target, after coupling of specific targeting ligands, hypoxia states or melanin granules in a murine melanoma model after intravenous (i.v.) injection. These dendronized nanoparticles with a small hydrodynamic size (<30 nm) form a stable colloidal suspension. Remarkably, upon i.v. injection, dendronized nanoparticles display excellent biodistribution and bioelimination profiles and show no uptake by the reticulo-endothelial system due to the dendron coating. Dendronized nanoparticles can also provide an anticancer therapeutic platform by magnetic hyperthermia. Dendronized nanoparticles platform is being developed towards clinical applications: a patent was filed in 2014 and a start-up (SUPERBRANCHE) created in 2019.

Here we propose i) engineering of two types of dendronized nanoparticles (one for diagnosis and one combining diagnosis and therapy), ii) the functionalization of dendronized nanoparticles with targeting ligands and/or SPECT/PET probes and iii) preclinical proof-of-concept for improved diagnostics and/or therapy of solid tumours. To ensure clinical translation, the consortium includes, besides research labs, two SMEs: CheMatech (chelating agents) and BIOEMTECH (PET&SPECT imaging). Dendronized nanoparticles as diagnostic and theranostic probes are already at the TRL4 and the consortium expertise renders the proposed technology transferrable to the clinics TRL6. The involvement of 2 SMEs will result in the focused and commercially driven generation of translation-ready preclinical data and set the stage for follow-up preclinical and clinical studies expected to contribute to European theranostics industry.