

Les mardis de
L'IAB

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**ENGINEERING LIGHT-ACTIVATABLE
NANOTECHNOLOGIES FOR CANCER
THERAPY, PRIMING, AND IMAGE-GUIDED
TREATMENT**

21.OCTOBER 2025 – 11 AM – LECTURE HALL

Photodynamic therapy (PDT) is a clinically approved, light-based treatment that uses red-light activation of photosensitizers to generate reactive oxygen species for selective tumor destruction. In addition to their cytotoxic potential, activated photosensitizers emit fluorescence, enabling real-time imaging and treatment monitoring. This presentation will highlight the mechanistic foundations of PDT and its evolution into a precision, image-guided modality. We will discuss how photodynamic activation can be engineered for multiple therapeutic goals, including fluorescence-guided tumor resection, vascular permeabilization, disruption of multidrug resistance, and photochemical drug release. Advances in nano- and molecular-engineering have expanded PDT's versatility by improving photosensitizer pharmacokinetics, biodistribution, and tumor-targeting specificity—particularly in glioblastoma and ovarian cancer models. Recent work from our laboratory includes a surfactant-free approach to produce amorphous nanosuspensions of photosensitizers for glioblastoma treatment. These formulations remain quenched in circulation and become photoactive only after internalization by tumor cells, enabling simultaneous imaging and therapy. In preclinical models, this strategy enhanced antitumor efficacy by up to tenfold compared to conventional photosensitizer formulations. For peritoneal ovarian carcinomatosis, we developed a targeted nanoplatfrom that co-delivers photosensitizers and chemotherapeutic agents, leveraging fluid shear stress-induced molecular signatures to optimize tumor selectivity and cellular uptake. This multi-tiered targeting approach significantly improved therapeutic precision and safety in vivo.

Together, these studies demonstrate how light-activatable nanotechnologies can transform PDT into a multimodal platform that integrates cancer treatment, priming, and real-time imaging to improve outcomes in both primary and metastatic disease.

Invited by : Anne-Laure Bulin

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