**New sensitizers for Photodynamic Therapy (PDT)**

in collaboration with Prof. S. Visentin (Biotecnology), Dr. R. Canaparo (Pharmacy)

**Context**
The photodynamic therapy offers innovative non-invasive therapeutic opportunities for the treatment of surface cancer. It is based on the generation of singlet oxygen by photocatalysis (using laser light) applied on a dye, which accumulation is selective for the cancer cells.

**Methods**
Photochemical characterization of dyes by UV-Vis, static, time-resolved and anisotropy fluorescence spectroscopy. The interactions are studied from the kinetic point of view, through stopped-flow, to determine the kinetic and thermodynamic constants.

**Scientific goals**
Synthesis of polymethinic dyes, study of their photochemical properties and of their interaction with model proteins.

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**Dyes and Intermediates for the modification/functionailization of nanomaterials (silica NPs, CNT, gold nanoparticles, halloysite, MOF) for diagnostics and drug delivery**

in collaboration with Prof. G. Martra (Dip. Chimica), Prof. S. Visentin (Biotecnology), Dr. V. Mussi (CNR Roma)

**Scientific goals**
Synthesis of the dyes. Functionalization of the nanomaterials and study of their interaction with proteins and/or drugs.

**Methods**
Photochemical characterization of dyes by UV-Vis, static, time-resolved and anisotropy fluorescence spectroscopy. Characterization of the nanomaterial/dye complexes through SEM, TEM, TGA, AFM, Raman (collaboration with CNR Roma), FT-IR.

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**Drug-Protein and Protein-Protein Interaction**

in collaboration with Prof. S. Visentin (Biotecnology)

**Scientific goals.**
Study of the interaction by UV-Vis, static, time-resolved and anisotropy fluorescence spectroscopy.

**Context.**
Determination of the interaction constants between drugs and transport proteins or proteins involved in particular pathologies. Study of the protein-protein interaction to investigate cellular pathways.

**Methods.**
Stopped-flow kinetic study to determine kinetic constants for the association/dissociation reactions.

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**Synthesis of Fluorinated Gemini Surfactants for Gene Therapy**

in collaboration with Prof. E. Fisicaro (Univ. Parma)

**Scientific goals.**
Synthesis of fluorinated gemini surfactants able to transfer efficiently a gene into a cell. Starting from an active compound of the surfactant series, the research aim is to find better active compounds, through structural modifications.

**Context.**
Cationic surfactants are prone to transfer genes to a cell. It is possible to modulate the gemini surfactant characteristics by modifying the spacer and the chain length.

**Methods.**
Synthesis of the surfactants in anhydrous conditions. Structural characterization through UV, IR, NMR, Mass spectrometry. Biological tests are performed at the University of Parma.