NEWSLETTER 5

EuroNanoMed II

Joint Transnational Call-2015: Eleven projects chosen for funding

Following the launch of the **2015** transnational call for proposals on October **2014**, **66** applications were submitted involving **337** partners asking for a total budget of about 47 M €. Following the review process, **11** projects were selected for funding involving **53** partners and a total budget of 12.3 M €.

Development of a new in vivo radiotracer for alpha-synuclein

Acronym: DiaSyn

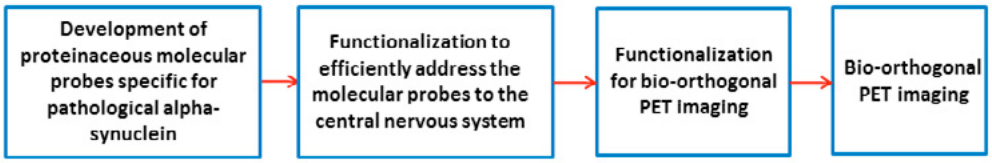
Coordinator: Mireille Dumoulin, Laboratory of Enzymology and Protein folding, Centre of Protein Engineering, University of Liège, Belgium; mdumoulin@ulg.ac.be

Partners: André Luxen, Mathieu Cinier, Maxime Culot, Anne Michel, Prof Rosario Moratalla

Belgium France Spain

"Develop a PET imaging tracer for Parkinson's disease"

One of the pathological hallmarks of Parkinson's disease (PD) is the progressive loss of dopaminergic neurons in the substantia nigra pars compacta of the brain, associated with the formation of intracellular fibrillar inclusions known as Lewy bodies (LB). The aim of the DiaSyn project is to develop a PET imaging tracer for highly specific and sensitive detection and quantification in the brain. Proteinaceous molecular probes that specifically target the pathological species will be developed.



Nanocarriers modified with a protease-resistant BBB shuttle for targeted CNS drug delivery in diffuse intrinsic pontine glioma

Acronym: Cure2DIPG

Coordinator: Angel Montero Carcaboso, Preclinical Therapeutics and Drug Delivery Research Program, Department of Pediatric Hematology and Oncology, Hospital Sant Joan de Déu Barcelona, Spain; amontero@fsjd.org

Partners: Ernest Giralt, Alejandro Sosnik, Xavier Decleves, Yann Courbebaisse

Spain Israel France

"A newly discovered peptide that targets the transferrin receptor"

Diffuse Intrinsic Pontine Glioma (DIPG) is a devastating pediatric cancer of the central nervous system (CNS), with virtually no cures reported in the world. The most likely reason for the therapeutic failure is the poor access of drugs to the tumor, due to the blood-brain barrier (BBB), a formidable physical and biological barrier that tightly controls the passage of molecules from the blood to the brain tissue. We have established several DIPG primary cultures from patient biopsies, from which a very reproducible animal model has been developed. We will use a newly discovered peptide that targets the transferrin receptor and crosses efficiently the BBB that will be chemically linked to anti-DIPG drugs and to novel drug-loaded nanocarrier formulations.

Chemotherapy for diffuse intrinsic pontine glioma (DIPG)		CNS-targeted drug delivery		DIPG xenograft survival
Conventional drug (free)	●	Poor ✗		Poor ✗
Nanoparticle-BBB shuttle-drug (Cure2DIPG project)	⚲	Improved ✓		Improved ✓

Engineered nanotools for advanced cell therapies

Acronym: CytoNanoHeal

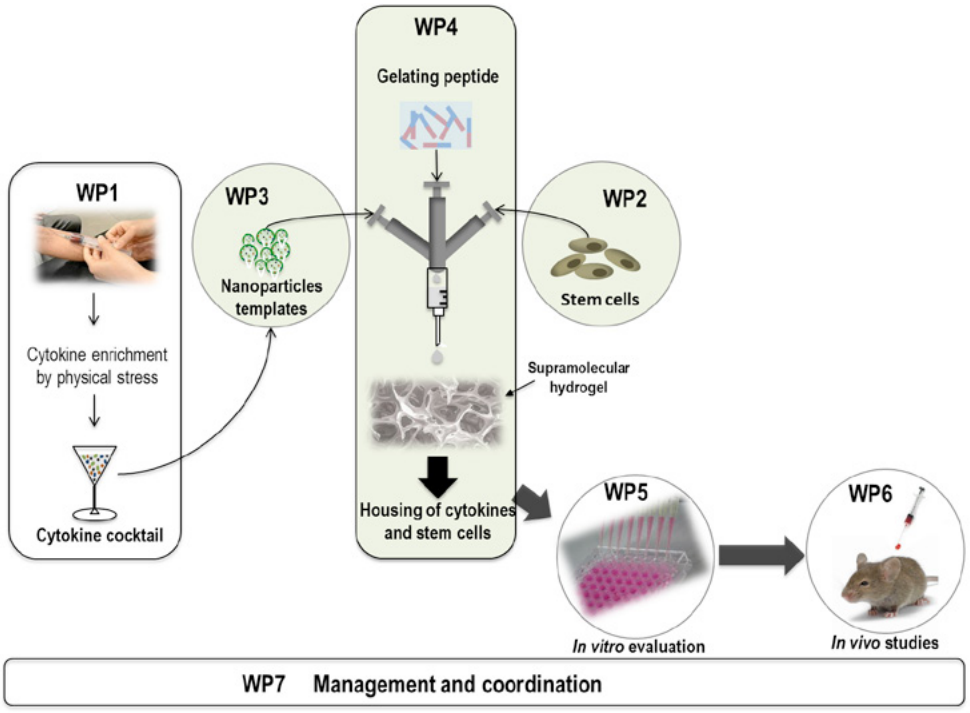
Coordinator: Tzanko Tzanov, Universitat Politècnica de Catalunya, Department of Chemical Engineering Terrassa, Spain, tzanko.tzanov@upc.edu

Partners: Iva Pashkuleva, Yiztahk Mastai, Francisco Vidal

Portugal Israel Spain

"Delaying disease progression and relieving the pain in osteoarthritis"

CytoNanoHeal aims at engineering innovative delivery systems to boost the therapeutic effect on osteoarthritis as a proof of concept in regenerative medicine. A designed nanoconstruct formed by injectable hydrogels will be built up. This nanostructure will house a patent-protected anti-inflammatory cocktail for delaying disease progression and relieving the pain, and stem cells, for cartilage regeneration. CytoNanoHeal will impact not only in society due to the increase in quality of life of patients by reducing pain and inflammatory effects, but also technologically for the development of new tools applied to cell and tissue-based therapies.



Nanoscintillator-Porphyrin Complexes for Bimodal RadioPhotoDynamic Therapy

Acronym: NanoBiT

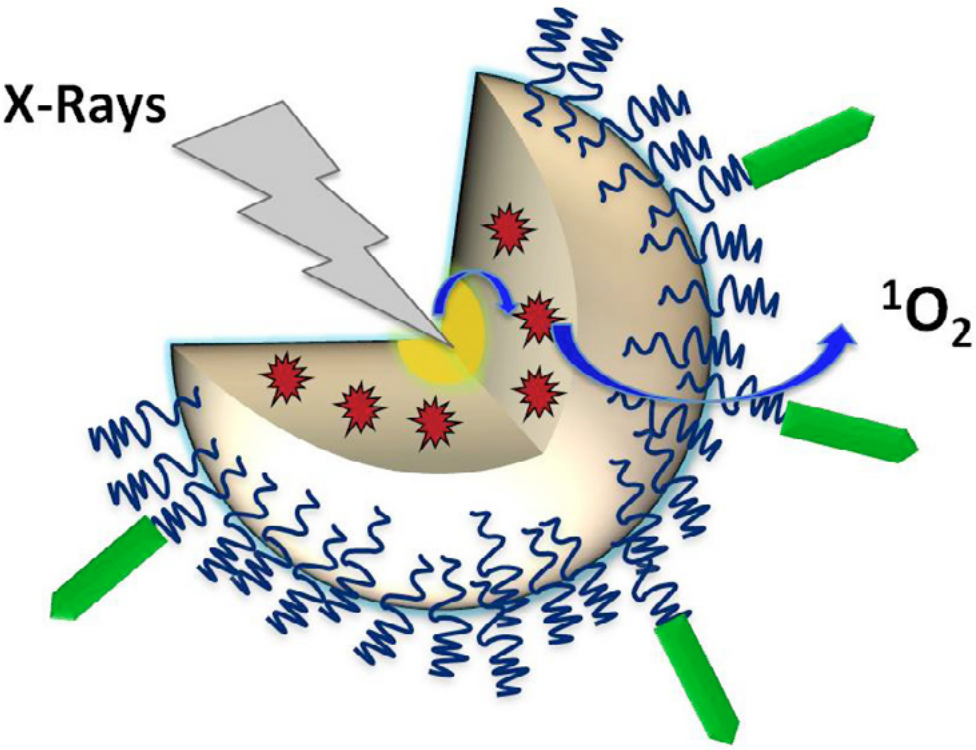
Coordinator: Petras Juzenas, Radiumhospitalet, Oslo University Hospital, Oslo, Norway; petras.juzenas@rr-research.no

Partners: Céline Frochot, Milos Nesladek, Thierry Bastogne, Benoit Habermeyer

France Belgium Norway

"Develop nanoparticle contrast agents that would increase efficiency and reduce the toxicity of radiotherapy"

Radiotherapy is considered effective in treating cancer, but success is limited due to incomplete response, resistance and damage to surrounding tissues. The aim of this project is to develop nanoparticle contrast agents that would increase efficiency and reduce the toxicity of radiotherapy. Nanoparticles will be engineered to enable activation of photosensitizers by X-rays. Radiotherapy and photodynamic therapy will be combined into a novel bimodal approach that will enhance local radiation effects and allow treatment of tumors using lower radiation doses than in conventional radiotherapy. Nanoparticles will be designed and tested in preclinical in vitro and in vivo models.



Towards a single therapy against triple negative breast cancer and neuroblastoma by nucleolin-mediated multicellular targeting with a synergistic drug combination

Acronym: NanoDoxer

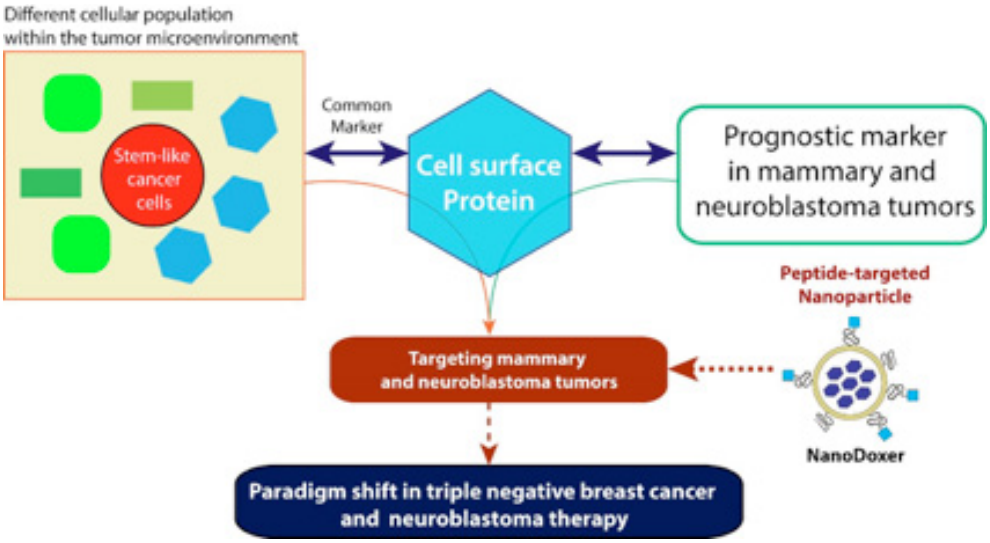
Coordinator: João Nuno Moreira, Department of Vectors and Gene Therapy, Center for Neuroscience and Cell Biology, University of Coimbra, Faculty of Medicine, Coimbra, Portugal; jmoreira@ff.uc.pt

Partners: Vera Dantas Moura, Fabio Pastorino, Lúcio Lara Santos, Ana Mafalda Antunes de Melo e Oliveira

Portugal Italy Spain

"A marker of different cell populations within the tumor microenvironment, responsible for fueling tumor initiation"

Triple negative breast cancer and neuroblastoma, two of the most aggressive forms of solid tumors, are often associated with metastasis and without current specific treatments. The NanoDoxer project proposes a novel cell surface protein as a common marker of different cell populations within the tumor microenvironment, responsible for fueling tumor initiation, development and metastasis, as stem-like cancer cells. Simultaneous validation of the target protein as a prognostic marker in triple negative breast cancer and neuroblastoma will be conducted, hopefully leading to a decreased tumor burden and recurrence.



Universal Nano-enhancer for a new multiplexing Surface Plasmon Resonance Imaging analysis of miRNAs in Multiple Sclerosis

Acronym: NanoPlasmiRNA

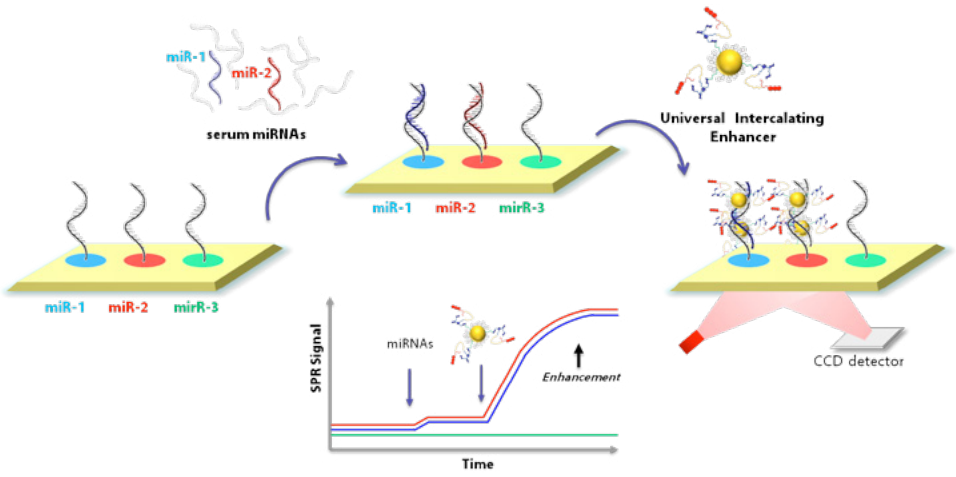
Coordinator: Renzo Vanna, Laboratory of Nanomedicine and Clinical Biophotonics (LABION), Fondazione Don Carlo Gnocchi - Research Hospital, Italy; rvanna@dongnocchi.it

Partners: Jesús M de la Fuente, Aija Linē, Dev Arya

Latvia Spain USA Italy

"Develop a nanotechnology-enhanced surface plasmon resonance imaging method in Multiple Sclerosis "

Multiple Sclerosis (MS) monitoring and treatments are currently based solely on subjective and scarcely predictive analyses such as MRI and clinical assessment. The use of biomarkers circulating in blood would certainly improve the management of this disease. MicroRNAs (miRNAs) could be promising biomarkers but, at the same time, the validation and the clinical use of miRNAs are hampered by the limited availability of appropriate analytical technologies. The aim of this project is to develop a nanotechnology-enhanced surface plasmon resonance imaging (SPRi)-based method of facilitating more effective analysis of miRNA biomarkers, and demonstrate its use in MS.



Biomaterials and nanoparticles for improved delivery of cell and protein therapeutics for heart repair

Acronym: NanoReHeart

Coordinator: Felipe Prosper, Clínica Universidad de Navarra, Spain; fprosper@unav.es

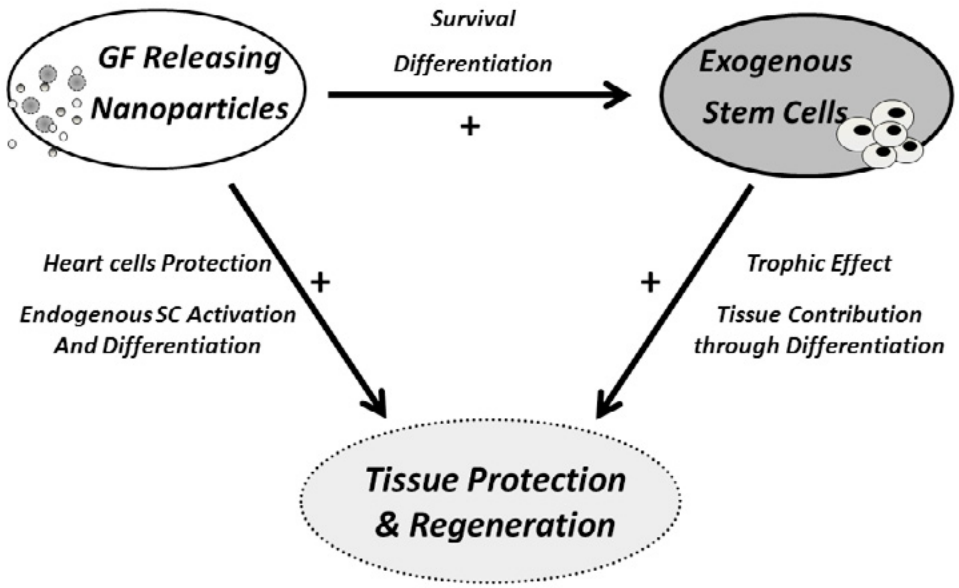
Partners: Stefan Jansens, Smadar Cohen, Beatriz Pelacho

Belgium Israel Spain

"Explore new therapeutic possibilities for the treatment of myocardial infarction"

The aim of this project is to explore new therapeutic possibilities for the treatment of myocardial infarction based on nanotechnology, biomaterials and stem cell therapy. The regeneration capability of factors stimulatory for stem/progenitor cells, angiogenesis and myogenesis (IGF and HGF) while administered as sustained release nanoparticles will be investigated. Furthermore, adoptive transfer of stem/progenitor cells from different sources, the blood and the adipose tissue will be also determined in an autologous preclinical porcine model of myocardial infarction.

Improved delivery of cell and proteins for heart repair



MRI-guided, intrathecal delivery of hydrogel-embedded glial progenitors for treatment of amyotrophic lateral sclerosis

Acronym: NanoTech4ALS

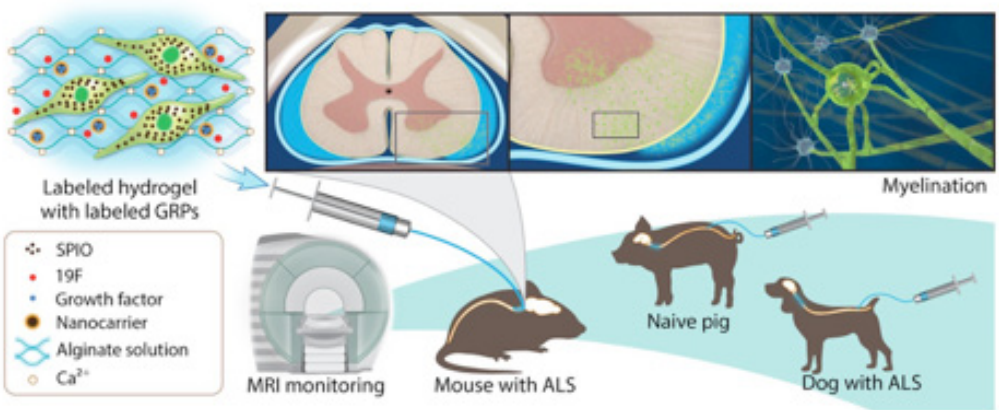
Coordinator: Piotr Walczak, University of Warmia and Mazury in Olsztyn, Poland; Piotr.walczak@uwm.edu.pl

Partners: Miroslaw Janowski, Jan Egil Melvik, Silva-Correia

Poland Norway Portugal

"We will utilize growth factor-laden nanocarriers that will be embedded with cells into the hydrogel for slow release"

Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disorder with no cure. Recent progress in the field of stem cells and nanotechnology has raised hope for a treatment breakthrough. The significant role of glia for the proper function of motor neurons has been recently reported, and efficient methods to isolate glial restricted progenitors (GRPs) have been established. This project will use novel nanomedicine and imaging tools, to characterize cell delivery systems and monitor cell treatment progression. We will use human fetal GRPs and deliver them into the cerebrospinal fluid, targeting the cells primarily to the cervical spinal cord with the goal of rescuing respiratory function, which is a primary problem in ALS. To improve survival and differentiation of transplanted cells we will utilize growth factor-laden nanocarriers that will be embedded with cells into the hydrogel for slow release. Both cells and the gel will be labeled with MRI tracker for monitoring distribution, stability of the hydrogel and cell migration after transplantation in small and large animal models of ALS.



Targeting tumor microenvironment by a translational multivalent nanomedicine: towards an effective anticancer combination immunotherapy

Acronym: Nanotumim

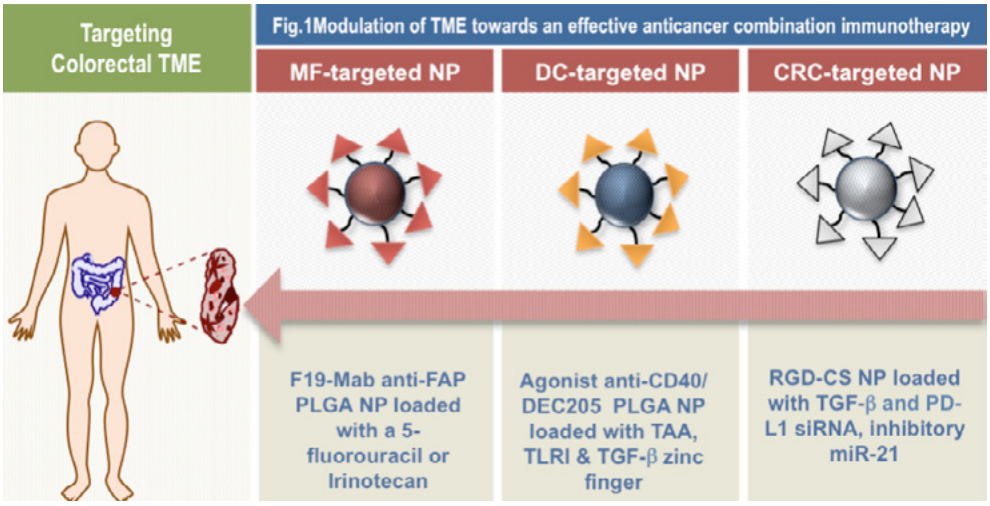
Coordinator: Véronique Préat, Université Catholique de Louvain, Louvain Drug Research Institute, Brussels, Belgium; veronique.preat@uclouvain.be

Partners: Rogério Gaspar, Diego Arango, Sofia Corte-Real

Portugal Spain Belgium

"This highly innovative nanoplatform will allow the combination of a cytotoxic drug at cancer site with a balanced and multi-targeted immunotherapy"

The survival of patients with metastatic colorectal cancer is low; therefore an effective strategy against the heterogeneous population of cancer cells requires a combinatory approach. The Nanotumim project will develop an integrative and multivalent nanotechnology-based therapeutic strategy to manipulate the multiple pro-tumorigenic mechanisms within tumor microenvironment. The project will develop a chemically-defined nanoplatform able to conjugate engineered targeting moieties to in vivo target and modulate distinct cell populations including myofibroblasts, cancer cells, and dendritic cells aiming at reverting the tumor-immune network to a pro-inflammatory environment. This highly innovative nanoplatform will allow the combination of a cytotoxic drug at cancer site with a balanced and multi-targeted immunotherapy that hopefully will improve the outcome of patients with metastatic disease.



Nanoparticle mediated Photochemical Internalisation (PCI) of small anticancer drugs

Acronym: PCInano

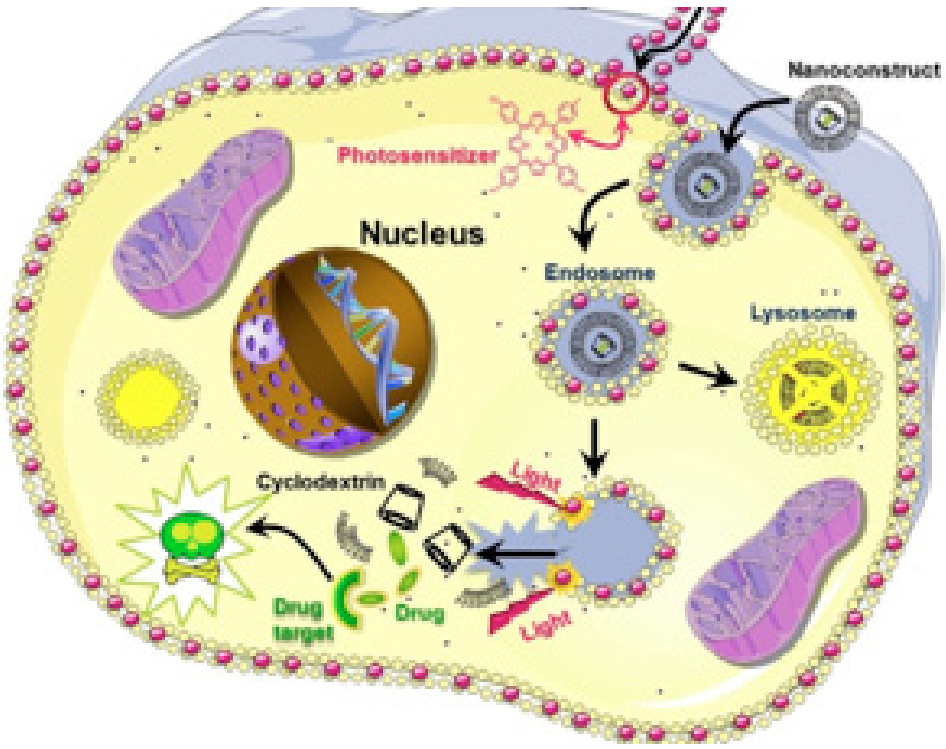
Coordinator: Kristian Berg, Department of Radiation Biology, Institute for Cancer Research, Oslo University Hospital – Radium Hospital, Oslo, Norway; Kristian.Berg@rr-research.no

Partners: Kristian Berg, Ruxandra Gref, Konstantina Yannakopoulou, Catherine Ladaviere, Laurent Garrelly

Norway France Greece

"Cancer specific drug delivery system, enabling controlled chemotherapy release upon light irradiation"

Current chemotherapy has drawbacks such as side effects and drug resistance. The PCInano project will implement a novel nanoparticle-based, cancer specific drug delivery system, enabling controlled chemotherapy release upon light irradiation. This will be implemented by parallel administration of the PCInano nanocarriers with a light activatable agent (photosensitiser, PS). We expect the proposed technology to mature into a cost effective and once off cancer specific treatment.



(Nano) systems with active targeting to sensitize colorectal cancer stem cells to anti-tumoral treatment

Acronym: Target4Cancer

Coordinator: Simo Schwartz Jr. CIBBIM-Nanomedicine; Hospital Universitari Vall d'Hebron, Vall d'Hebron Institut de Recerca, Barcelona, Spain; simo.schwartz@vhir.org

Partners: Stefania Scala, Mafalda Videira, Ling Peng, Ming Wei

Portugal Italy France Spain

"Drug Delivery Systems targeting cancer stem cells to improve the therapeutic window"

Even though current treatments have improved the overall survival of patients with colon cancer, relapse and development of therapy-resistant metastases are still frequent. This project will develop Drug Delivery Systems targeting cancer stem cells to improve the therapeutic window of Doxorubicin and/or AKT2 siRNA against colorectal cancer. In vitro and in vivo preclinical validation will be performed to select the best performing nano-conjugate targeting for future scale-up and regulatory studies. The project is expected to produce clinical useful proof-of-concept results suitable for protection by patenting, as well as data of general scientific interest useful to the broad scientific community.