

# NEWSLETTER 1

## EuroNanoMed II

### What is Nanomedicine?

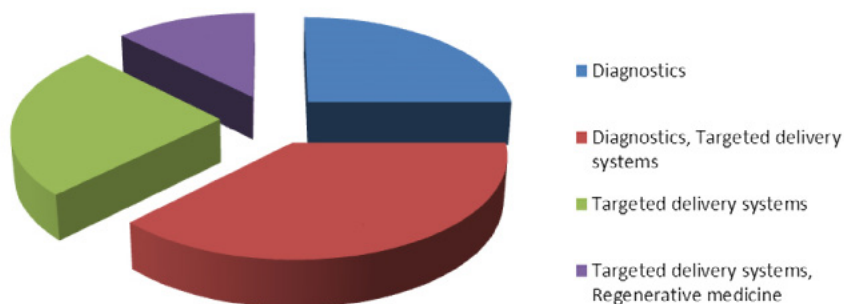
*Nanomedicine is the application of nanotechnology to health. It takes advantage of the altered physical, chemical and biological properties of materials at the nanometer scale to substantially improve diagnosis, treatment and follow-up of illness, to enable early detection and prevention of diseases.*

### EuroNanoMed II activities

- Strategic Research and Cooperation Agenda
- Joint funding activities in nanomedicine
- Monitoring and optimisation of activities
- Regulatory Affairs, Ethical and Safety Issues
- Communication and dissemination
- Foster the participation of junior researchers

## EuroNanoMed II Who are we?

EuroNanoMed II is a part of the ERA-NET scheme, established as a platform for funding agencies and ministries, to foster joint activities and programmes in coordinating high quality research across national borders. EuroNanoMed II comprises of 20 partners from 17 countries/regions, funded within the European Commission's 7th Framework Programme from November 2012 to October 2016. It builds on the achievements of its predecessor, EuroNanoMed, (2009-2011). The aim of EuroNanoMed II is to enhance the competitiveness of European nanomedicine stakeholders through the support of transnational collaborative and multidisciplinary research, technology and development (RTD) projects with participants from academia, clinical/public health communities and industry. A central activity of EuroNanoMed II is the coordinated funding of multinational research projects in nanomedicine, focusing on three areas: targeted delivery, diagnostics and regenerative medicine. In this frame, four annual joint calls are planned to be launched during the lifetime of the ERA-NET (2013-2016). The first call was already launched during January 2013, resulting in 42 submitted proposals



Distribution of the funded proposals EuroNanoMed II JTC-2013

The following eight projects were selected for funding following the 2013 joint transnational call:

## GadoLymph: Gadolinium Nanohydrogels for Lymph Node Magnetic Resonance Imaging

**Project coordinator:** Chuburu Françoise, University of Reims Champagne Ardenne, France

**Partner countries:** France, Belgium, Walloon Region, Romania

### Project description:

For many types of cancer the lymphatic system serves as a major thoroughfare for the dissemination of metastatic cancer cells. The early detection of metastases in lymph nodes is crucial for the effective diagnosis and treatment of cancer. Imaging techniques, such as ultrasound CT or MRI are limited in sensitivity, especially in the detection of micro-metastases in lymph nodes. The diagnostic accuracy of MRIs could be improved by injecting contrast agents prior to imaging. The objective of the GadoLymph project is to develop hypersensitive contrast agents for Lymph Node MRI (LNMRI) by developing lymphotropic biocompatible nanohydrogels which incorporate gadolinium chelates. These nanohydrogels are created by the self-assembly of biocompatible biopolymers capable of trapping substantial quantities of water. When a gadolinium chelate is incorporated in the nanohydrogel, the MRI signal is greatly amplified and detection is significantly improved.



Chuburu Françoise  
✉ [francoise.chuburu@univ-reims.fr](mailto:francoise.chuburu@univ-reims.fr)

partner countries:



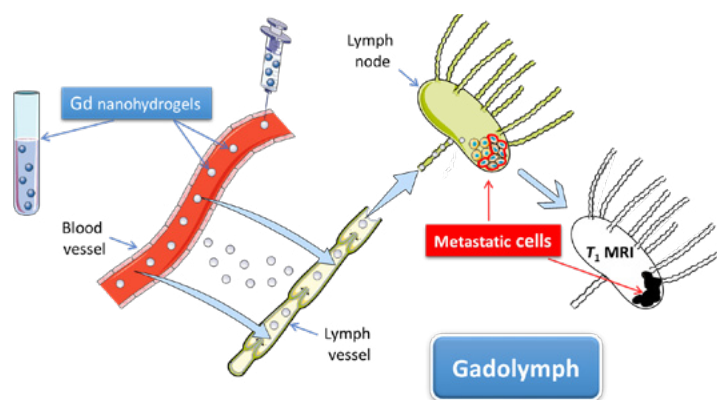
France



Belgium



Romania





Markus Glatzel  
✉ [m.glatzel@uke.de](mailto:m.glatzel@uke.de)

partner countries:



Germany



Portugal



Sweden

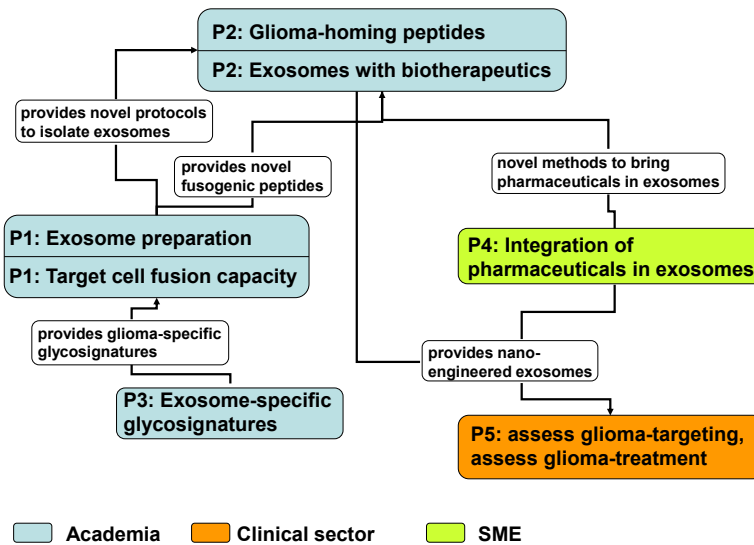
## GlioEX: Nanoengineered exosomes to treat glioma

**Project coordinator:** Glatzel Markus, University Medical Center Hamburg-Eppendorf, Hamburg, Germany

**Partner countries:** Germany, Sweden, Portugal

### Project description:

Pharmacotherapy has proven to be inefficient in the treatment of primary brain tumors. Ineffective penetration of the blood-brain barrier and the unspecificity of tumor cell targeting are the key factors hindering the efficacy of pharmacotherapy. Glioex aims at discovering novel vesicle-based therapeutic approaches to enable improved blood-brain barrier penetration and tumor-cell specificity. To this end, nanomedical approaches will be employed to manipulate exosomes, the membrane vesicles secreted by cells. This approach is designed to facilitate targeted therapy, while reducing side effects and simplifying treatment.



Carlo Francesco Morasso  
✉ [cmorasso@dongnocchi.it](mailto:cmorasso@dongnocchi.it)

partner countries:



Italy



France



U.K

## InNaSERSS: Development of Integrated Nanorray based SERS system for leukemia biomarker detection

**Project coordinator:** Morasso Carlo Francesco, Fondazione Don Carlo Gnocchi ONLUS, Italy

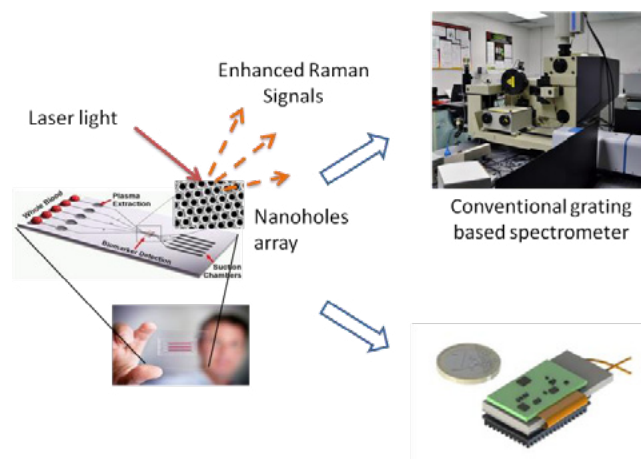
**Partner countries:** France, U.K

### Project description:

The monitoring of patients suffering from acute myeloid leukemia (AML) constitutes a challenge which has yet to be adequately addressed by modern medicine. Following chemotherapy residual malignant cells, undetectable by morphologic examination, may remain in the bone marrow of AML patients. This condition is known as "minimal

residual disease" (MRD) and is linked to the high rate of relapse (30%) for AML patients. Several studies have shown that the WT1 gene can serve as a biomarker to predict MRD and determine patient response to treatment. Polymerase Chain Reaction (PCR) is currently the most common method for examining WT1. In MRD patients, however, WT1 expression is extremely low and difficult to detect.

The aim of InNaSERSS is to develop a new, ultrasensitive diagnostic test based on Surface Enhanced Raman Spectroscopy for the detection of the WT1 gene. This will be possible through the use of new kind of nanostructured surfaces, like nanoholes arrays, capable of significantly enhancing the spectroscopic signal emanating from the target molecule. The project will also contribute to the development and test of a new generation of high resolution, low price portable Raman spectrometers based on stationary wave integrated Fourier-transform spectrometry (SWIFTS) technology.



Håkan Engqvist  
✉ [hakan.engqvist@angstrom.uu.se](mailto:hakan.engqvist@angstrom.uu.se)

partner countries:



Sweden



Norway



Switzerland

## Nanosit II: Allergy vaccination using novel drug delivery routes mediated via nanotechnology

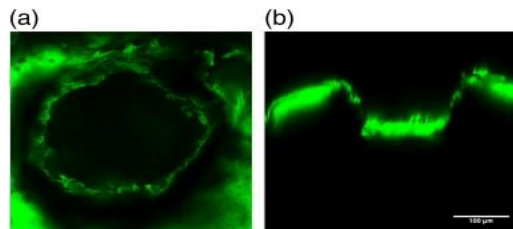
**Project coordinator:** Engqvist Håkan, Uppsala University, Sweden

**Partner countries:** Sweden, Switzerland, Norway

### Project description:

Nanotechnology constitutes the key to effectively tailoring safe and efficient targeted drug delivery. Nano-biomaterials are useful as novel drug delivery systems because they enable these systems to more effectively target organs, localize dosage and control drug release. Carriers based on nanotechnology can significantly improve the performance of current state-of-the-art treatments. The team behind NANOASIT II will drive the development of novel techniques for the development of allergy vaccines for clinical use. Allergies have become a major socio-economic and health care burden,

estimated to cost Euro 18 billion annually in Europe alone. Through basic knowledge regarding the manipulation of nanoparticulate carriers, this project aims at developing novel targeted delivery systems based on transdermal vaccine delivery.



Confocal images showing the transdermal delivery of the allergy vaccine

## NANOFOROSTEO: Multifunctional injectable nano HAp composites for the treatment of osteoporotic bone fractures

**Project coordinator:** Alini Mauro, AO Research Institute, Davos Platz, Switzerland

**Partner countries:** Latvia, France, Romania

### Project description:

The failure of osteosynthesis in cases of large bone defects and osteoporosis fracture repair still lacks adequate clinical orthopaedic solutions. While autograft is still considered the gold standard in many clinical circumstances, synthetic bone void fillers hold several important advantages over autograft treatment. Issues such as the availability and shape of bone tissue and donation site morbidity are avoided with the introduction of synthetic bone void fillers. NANOFOROSTEO focuses on the development of a new, injectable bone void filler, based on chemically modified hyaluronan. This conjugate will have the biological properties of hyaluronic acid, but will solidify at temperatures exceeding 32° C. The filler will easily adapt to the shape of the void. In addition, loading this thermo-responsive hydrogel with nano-microencapsulated hydroxapatite complexes will stimulate bone formation, providing more efficient and effective treatment of bone fractures.



Mauro Alini  
✉ [mauro.alini@aofoundation.org](mailto:mauro.alini@aofoundation.org)

partner countries:



Switzerland



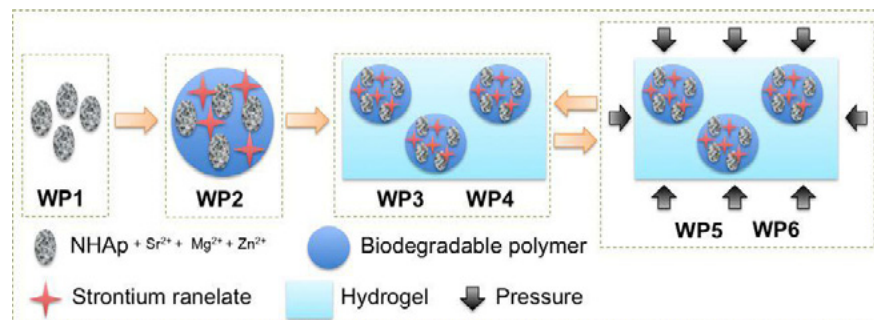
Latvia



France



Romania



WP1 Synthesis of nanoparticles. WP2 Formation of micro-particle complexes. WP3 Preparation of micro-particle/hyaluronan hydrogel compositions.

WP4 In vitro investigations of micro-particle/hydrogel compositions on osteoblast and osteoclast behaviour.

WP5 and WP6 Development of pressure sterilization processes.



Benoit Jean-Pierre  
✉ [jean-pierre.benoit@univ-angers.fr](mailto:jean-pierre.benoit@univ-angers.fr)

partner countries:



France



Belgium



Italy



Spain

## NICHE: Nano-Immuno-CHEmotherapy

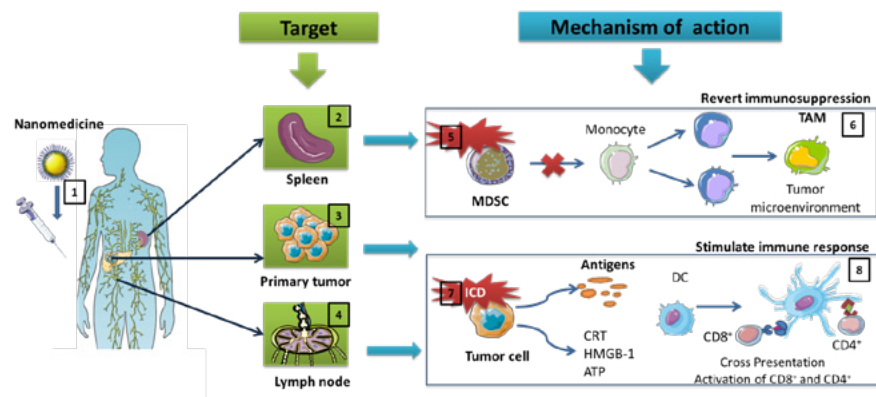
**Project coordinator:** Benoit Jean-Pierre, University of Angers, INSERM, Angers, France

**Partner countries:** France, Spain, Belgium, Italy,

### Project description:

The immune system plays a critical role not only during early tumorigenesis but in the response of existing malignancies to therapy as well. The tumor microenvironment determines the alteration of a particular population of myeloid-derived suppressor cells (MDSCs), which activates an immunosuppressive program supporting tumor growth and expansion. The manipulation of this immunosuppressive network provides an opportunity to restore immune competence in tumor-bearing hosts. Besides, the stimulation of specific immunogenic cell death (ICD) in cells located both in tumor mass and in tumor-draining lymph nodes, represents a ground-breaking approach to treat aggressive cancers.

Taking advantage of the ability of selecting nanomedicines to localize and accumulate in the sites of interest, i.e. spleen, tumor and lymph nodes, we plan to directly deliver selected anticancer agents and si/micro RNA to MDSCs and neoplastic cells to trigger a tumor-specific immune response.



Through the administration of specific designed nanomedicines (1), we aim at targeting the spleen (2), tumor mass (3) and tumor metastasis in the lymph nodes (4). In the spleen, drug released from nanomedicines will determine the depletion of tumor-conditioned myeloid-derived suppressor cells (MDSCs) (5). The depletion of MDSCs will hinder the accumulation of TAM (6). Nanomedicines can also reach the tumor environment (3) and lymph nodes (4), release the drug and induce the death of tumor cells (7) that also determines the release of antigens that stimulates a specific antitumor immune response (8).

## SONOTHERAG: Sonoactivable Nanotheragnostics for Cancer Treatment

**Project coordinator:** Contino-Pepin Christiane, University of Avignon, Avignon, France

**Partner countries:** France, Switzerland, Norway

### Project description:

SONOTHERAG focuses on the design and development of sophisticated nanotools designed to facilitate the diagnosis (through  $^{19}\text{F}$  MRI or ultrasound technologies) and controlled therapeutic treatment of tumor growth. These theragnostic devices comprise nanodroplets of liquid perfluorocarbon dispersed in water through the self-assembling properties of amphiphilic fluorinated compounds. If a hydrophobic sonosensitizer is trapped into the core of the nanodroplets we can expect to trigger its delivery, as well as the production of reactive oxygen species (ROS) in a controlled and focused way through ultrasound-mediated induction. More than 100 years following the Paul Ehrlich's dream of "magic bullets", our consortium aims at developing "magic droplets", initially innocuous, that will acquire a "drug profile" only when locally stimulated by the appropriate ultrasound waves.



Contino-Pepin Christiane

✉ [christine.pepin@univ-avignon.fr](mailto:christine.pepin@univ-avignon.fr)

partner countries:



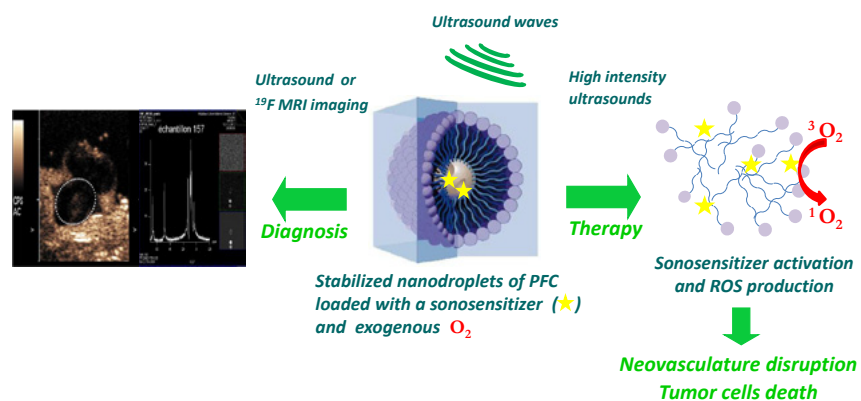
France



Norway



Switzerland



## VOLGACORE: Volatile Biomarkers for Early Detection and Characterization of Gastric and Colorectal Neoplasms

**Project coordinator:** Haick Hossam, Technion – Israel Institute of Technology, Israel

**Partners countries:** Israel, Sweden, Germany, Lithuania, Latvia

### Project description:

Gastrointestinal cancers, particularly gastric cancer (GC) and colorectal (CRC) cancer, remain an important global healthcare issue. There is currently no adequate non-invasive screening marker available for GC, and there is substantial room for improvement regarding currently available screening markers for CRC.

VOLGACORE aims to develop a novel, non-invasive and easy-to-use device to enable the earliest possible detection of gastric and colorectal cancers using volatile biomarkers present in exhaled breath. This device will be based on an artificial electronic nose, which makes use of cross-selective and sensitive sensor arrays trained to detect cancer biomarkers. Specifically, the project is designed to: (i) develop arrays of nanomaterial-based sensors for use in an electronic nose; (ii) test the feasibility of the developed devices for sensing volatile biomarkers of gastric and colorectal cancers; (iii) distinguish the targeted biomarkers from environmental clutter and correlate the cancer metabolite signature with genetic aberrations in the related pathways; and (iv) perform clinical related studies to assess cancer conditions in tissue and actual patients in the presence of confounding, real-world signals. The proposed approach would allow monitoring of disease outside specialist settings and barely any expertise would be required. Additionally, the proposed approach is simple and inexpensive enough to manufacture large numbers of disposable units.



Haick Hossam

✉ [hossam@technion.ac.il](mailto:hossam@technion.ac.il)

partner countries:



Israel



Germany



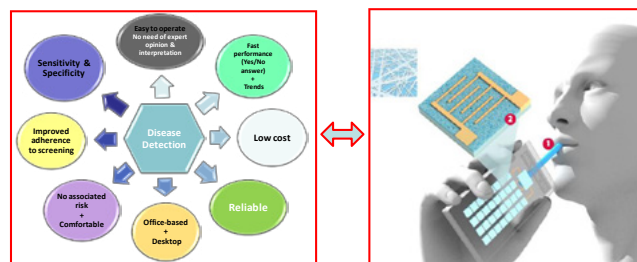
Latvia



Lithuania



Sweden



*Highly idealized illustration of the main features of the VOLGACORE concept and the diagnosis procedure for gastric and colorectal cancers*

**For Further information on EuroNanoMed II:** [www.euronanomed.net](http://www.euronanomed.net)

### Contacts:

ENM II coordinator Dr. Natalia Martin

Agence Nationale de la Recherche (ANR), France

[ENMIICoord@agencerecherche.fr](mailto:ENMIICoord@agencerecherche.fr) | +33.1.73.54.81.33

Network Steering Committee Chair Dr. Olaf Rotthaus

VDI Technologiezentrum GmbH, Germany | [rotthaus@vdi.de](mailto:rotthaus@vdi.de)