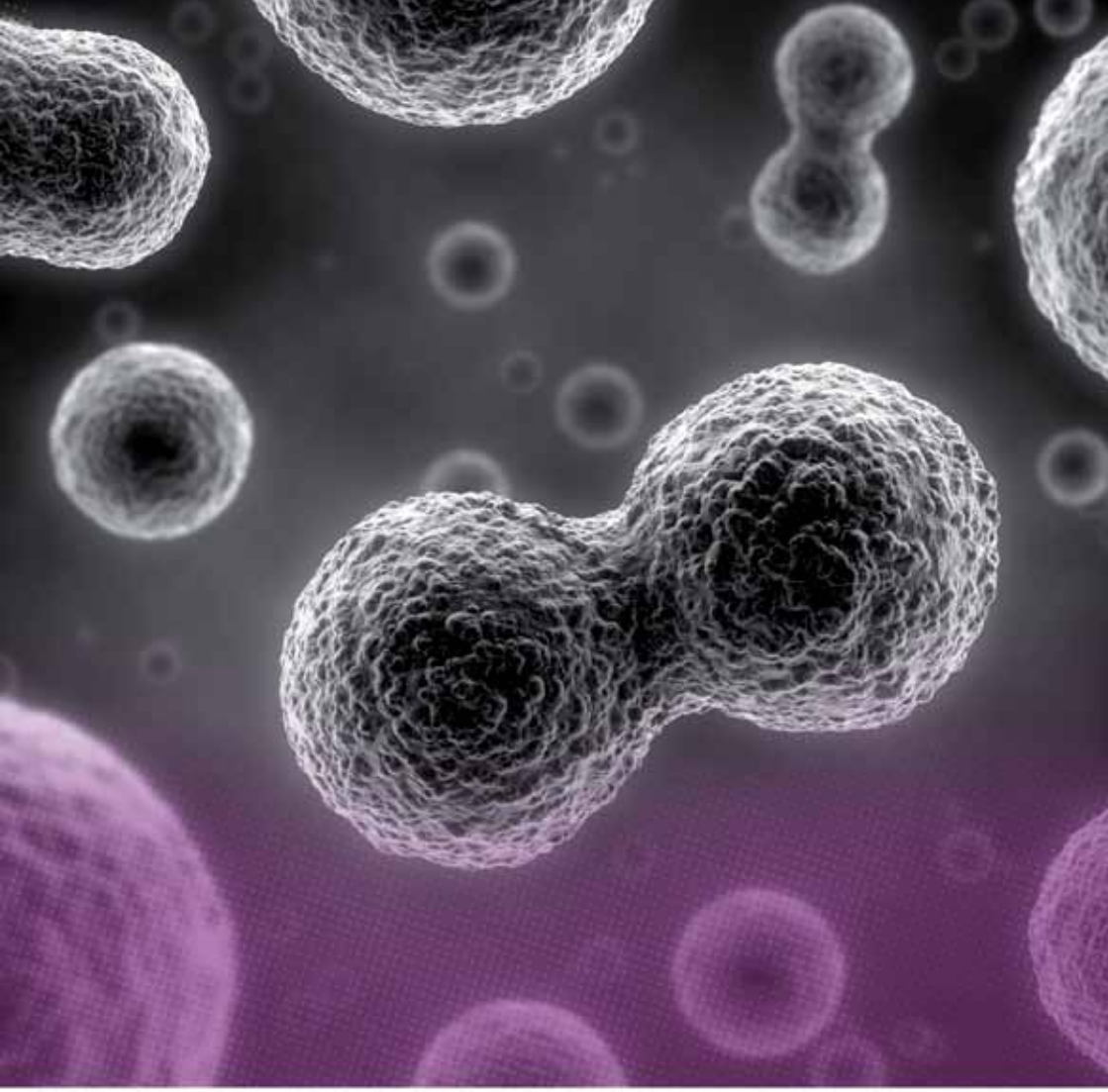


nanother

Integration of novel NANOparticle based technology
for THERapeutics and diagnosis of different types of cancer

A European Large-Scale Project supported through the Seventh Framework Programme
for Research and Technological Development.

The big C & the future of combined diagnosis & therapy

The World Health Organisation estimates that over 11 million new cases of cancer are diagnosed and more than seven million people die of cancer worldwide each year. The recorded incidence of cancer is set to increase rapidly, as new screening techniques accelerate the rate of diagnosis and the population ages. In addition to its impact on individual patients, cancer imposes a great economic burden upon society.

The main challenge for pharmaceutical biotechnology nowadays is to direct a drug or therapeutic agent specifically to a target molecule, enzyme, cell or tissue. Cancer is one of the most extensive and life-threatening pathologies in Europe, only surpassed by circulatory diseases so it is the perfect candidate pathology for the development of new drugs and new tools for therapy and diagnosis. There are many therapeutic agents that show activity in vitro, but when introduced in the human body they do not have the same effect due to the limitation of reaching specifically the target location, resulting in very high dosages given to patients to overcome this problem, leading to problems of side effects.

Nanother aims to successfully transform polymer nanomaterials into nanocarriers via biofunctionalisation (the linking of antibodies & ligands for detection), the binding of tumour cells, and the linking, delivery and release of therapeutic agents to treat the targeted tumour cells.

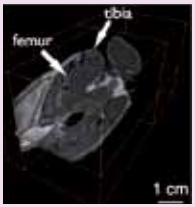
Nanother aims to select the best nanocarriers throughout the project by rigorously testing toxicity, biocompatibility, efficacy and biodistribution as an integral part of the selection process in order to continue developing only the most efficient, biocompatible and least toxic nanoparticles. The nanocarriers selected will be further developed and scaled-up, giving future exploitable nanoproducts.

Main Objectives

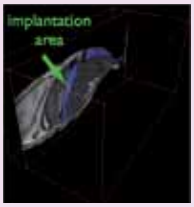
Nanother intersects biomedical, health and nano industries, and R&D sits at the interface of chemical, biological and physical sciences and engineering. The main **Nanother** objective is therefore based on the integration of 5 key elements of current technology:

- **a** Nanoparticle functionalisation technology,
- **b** contrast agent & specific antibody diagnostic techniques & imaging equipment,
- **c** novel drug-delivery & activation systems
- **d** new uses for electromagnetic based technology and medical equipment.
- **e** Another important innovation is RNAi technology, and the objective is to investigate the successful formulation and application of nanocarriers including siRNA as the therapeutic agent.

In vivo 3D MRI at 120 µm resolution of mouse hind limbs.



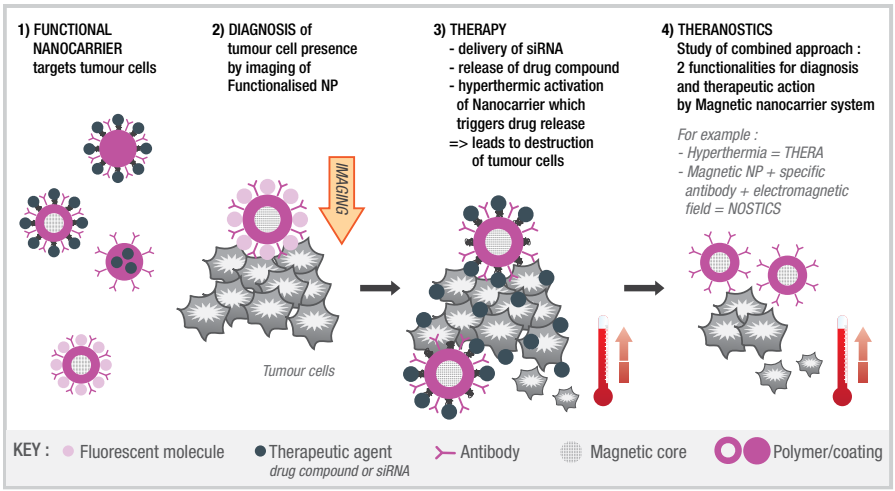
T1-weighted MRI with 3 orthogonal slices showing the left femur and tibia of a mouse.



Reproduction of the sagittal slice with image segmentation, allowing visualization of tumor implantation site.

Courtesy of Magnetic Resonance Center, UMR 5536, Bordeaux, France

NANOTHER - Functional nanocarrier system for tumour diagnosis & therapy

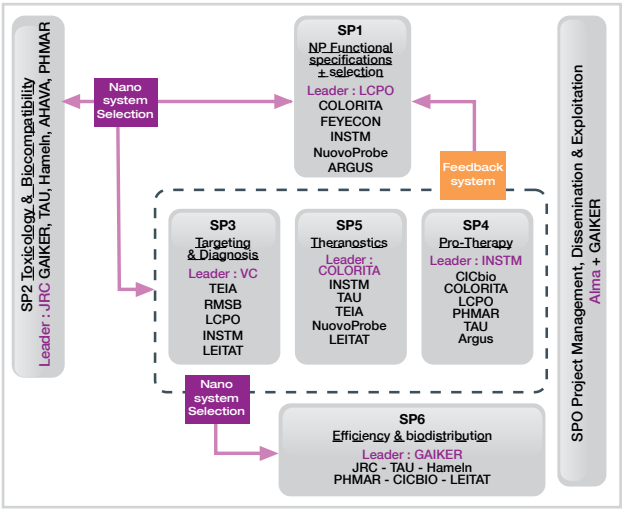


NANOTHER R&D Chain	Concept	Laboratory *(in vitro / in vivo)*	Development	Scale-up
Nanoparticles (polymer micelle & magnetic)			→	→
Targeting => Antibody & ligand (production & linkage)			→	→
Imaging => visualisation of targeted NP (MRI, SPECT, PET...)			→	
Therapy => Drug compounds (loading mode, release mode...)		→	→	
Theranostics => combined diagnostic & therapeutic approach		→	→	
Testing of functionalised nanoparticles => breast, colon & bone cancer (texicology & biocompatibility, efficiency & biodistribution)		→	→	

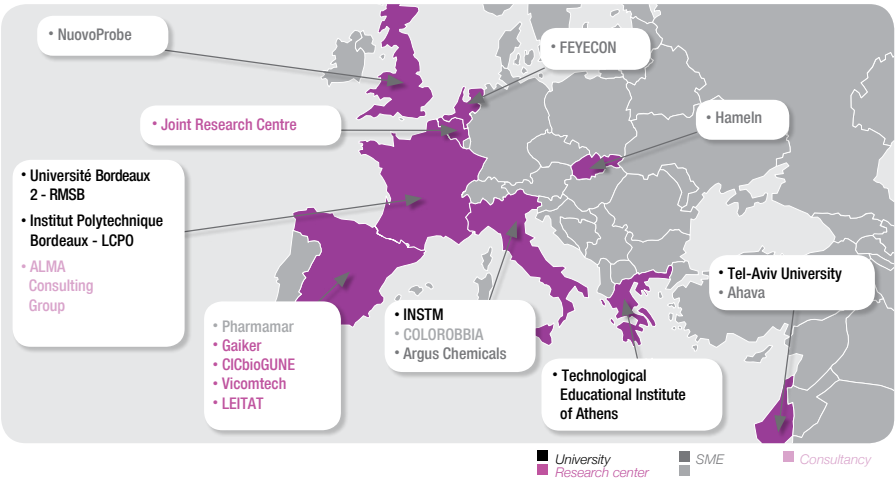
Methodology & work-flow

NANOTHER Pert Diagram

The NANOTHER consortium brings together 18 multi-disciplinary partners from 9 European countries, and is based on high-level scientific expertise from Universities, Research Centres, SMES & larger industry groups.



Consortium



Communication & impact – a high priority for Nanother partners

Communication and results dissemination are essential for the successful accomplishment of NANOTHER objectives, and these activities aim at generating an efficient information flow both within the consortium and also towards scientific communities. Nanother partners aim to fully exploit the results obtained, to communicate on contributions made to European knowledge and scientific excellence, as well as the value of the collaboration on a Europe-wide scale, and the benefits to EU citizens in general.

The diagnostic & drug-delivery system developed in NANOTHER will have a positive impact on the diagnosis & treatment of widespread diseases such as cancer, and therefore on the quality of life of EU citizens in the medium term. Currently, diagnosis is often late and once a tumour has been discovered, available treatments at present are imperfect and the probability of cure is not high. Current treatments are highly toxic to normal tissue and cause substantial loss of quality of life. NANOTHER will focus on diagnosis at cellular level which will mean earlier diagnosis and reduced diagnostic time so the treatment can be applied more rapidly and with reduced side effects. Another major break through will be the application of combined diagnosis & therapeutic technology via innovative theranostic development combining magnetic nanocarriers

Acknowledgment

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