RESEARCH LINES (2019-2020)

BIOMEDICINE AND HEALTH

Biomarkers and new therapies for lung cancer

- Biomarker searches for the diagnosis and prognosis of lung cancer, especially in the context of screening programs for the early detection of the disease.
- Identification of new targets and therapeutic strategies against lung cancer.
- Identification of molecular markers predictive of sensitivity or resistance to treatment in lung cancer.
- Development of imaging techniques and miniaturized devices for diagnosis, pharmacological evaluation and characterization of cancerous processes.
- Development of bioinformatic techniques for the search of markers and mechanisms of action based on DNA (chromosomal alterations, mutations and / or SNPs) and RNA (changes of expression or splicing patterns).

Biomarkers and new therapies for tumors of the central nervous system

- Searches of diagnostic markers, prognosis of response to therapies in peripheral blood exosomes.
- New biological therapies alone or in combination with radiotherapy.
- Improvement of our knowledge of the response to radiotherapy.
- Clinical trials of new therapies.

Brucella-Brucellosis

- Serological and molecular diagnosis of animal and human brucellosis.
- Mechanisms Brucella virulence.
- Vaccines against brucellosis.

Leishmaniasis

- Identification and study of new therapeutic targets.
- Search and tests of treatments.
- Immunology of pathogens.
- Mechanisms of parasites virulence.
- Virus and Leishmania (Leishmania RNA Virus, LRV).

Medical Physics and Biophysics

- Image guided and adaptive radiotherapy.
- Soft matter and complexity in fluids.
- Organ and tissue biophysics.

Molecular mechanisms in the development and progression of acute myeloid leukemia

- Molecular mechanisms in the development and progression of acute myeloid leukemia.
- Study of the SET oncoprotein as a therapeutic target in acute myeloid leukemia.
- Development of new combined therapies for the acute myeloid leukemia, towards a personalized treatment in patients with overexpression of the SET oncoprotein.
- Development of a new tool for the search of more effective antitumor treatments using zebra-fish (animal model).

Statistic design and Data analysis (StatData)

- Design of experiments: classic and optimum.
- Modelling: lineal models, generalized and non-lineal models; mixed models.
- Variable selection; model discrimination; non-parametric models; Bayesian models; space-time statistics.
- Quantitative methods in management of experimental data.
- Sampling; design, validation and analysis of polls.
- Statistic techniques in Big Data management: Variable reduction; classification models; heuristic and meta-heuristic algorithms of optimization. Machine learning; application of the experiment design in the search for maximum information.

Translational cancer immunotherapy

- Leukocyte trafficking through the lymphatic vessels.
- Development of antitumor vaccines.
- Combination of monoclonal inmunostimulators antibodies.
- Strategies of tumour immunotherapy based in cytokines.
- Strategies of immunotherapy based in NK cells.
- Radioinmunotherapy.
- Adoptive cell therapy.
- Intravital microscopy.

EXPERIMENTAL SCIENCES, ENVIRONMENT AND SUSTAINABILITY

Agricultural Biology and Chemistry

- Mineral nutrition of plants: basic and applied aspects. New fertilizers.
- Development of molecules capable of improving the growth of plants subjected to biotic and abiotic stresses.
- Soil organic matter. Physio-chemical of Humus.
- Interactions plant-microorganism-humus.
- New chemical methods for environmental remediation in water and soil.
- New methods for the efficient recycling of nutrients in the context of a circular economy.

Biocidal products of natural origin (BIONA)

Botany, Chemistry, Zoology, Soil fauna, Taxonomy, Molecular design, Nematodes, Pests, Chemical analysis, Mites, Fungi.

Biodiversity Data Analytics and Environmental Quality (BEQ)

- Information infrastructures for biodiversity: treatment of environmental data (Big Data) and Ecoinformatics.
- Biogeographic, temporal and taxonomic guidelines of biodiversity.
- Quantification and Bioindicators of ecological and environmental quality.
- Management and preservation of biodiversity.
- Environmental knowledge accessibility for the society.
- Ethical, educational and social aspects derived from knowledge about biodiversity and environmental quality.

Granular media laboratory

- Discrete Element Simulations.
- Granular flows and silos.
- Granular convection.
- Pedestrian dynamics.
- Particle shape.
- Clogging and Jamming.
- Force network and topology.
- Granular dynamics in microgravity.

Inorganic materials and environment

- Lime mortars for various applications (air lime and hydraulic lime mortars). Building materials for restoration of Cultural Heritage modified with additives and admixtures. Compatibility studies between different additives and admixtures in lime mortars.
- Polymer-modified binders: study of both cement mortar and lime mortar with improved properties upon the addition of various polymeric additives. Performance assessment on the properties of mortars.
- Retention of toxic metals in cement matrices. Use as agents for solidification/stabilization in aluminate cement. Aluminate cement and phosphate as retaining agents. Leaching tests. Polymer-added matrix behaviour to improve the degree of retention of toxic metals. Complexation.
- Matrices of cement and lime with decontaminating properties. Self-cleaning mortars. Detoxifying greenhouse gas emissions through photocatalytic agents and CO_2 retention. Recovery of industrial waste.

Integrated laboratory of environmental quality

- Biomonitoring of environmental contaminants: exposure and effects.
- Effects of reactive nitrogen in the different environmental spheres.
- Monitoring and evaluation of pollution in ecosystems, urban areas, industrial areas and interior environments.
- Study of biogeochemical cycles in ecosystems: integrated monitoring.
- Monitoring of greenhouse gases in ecosystems sensitive to climate change.
- Classification, cartography, evaluation, conservation and rehabilitation of soils. Mineralogy of the soil.

Stress Physiology in Plants

- Response of plants to abiotic and biotic stress factors.
- Vine biology.
- Effects of climate change on plants.
- Arbuscular mycorrhizae in natural and agricultural ecosystems.
- Organic waste management. Agricultural application of sewage sludge.

Supramolecular Materials for Biomedical and Environmental Technologies

- Supramolecular interactions of substances of pharmaceutical, biological or environmental interest with cyclodextrins, surfactants and polymers.
- Phase structure and properties of colloidal and polymer materials.
- Hydrogel matrices for the sorption and release of target molecules.
- Thermoplastic and soft nanocomposites.
- Wastewater treatment.
- Waste valorisation.
- Biomethanization of organic wastes.
- Photocatalytic degradation of emerging pollutants.

Topology and FUZZY logic

- Topological groups
- Computational Topology
- Fuzzy Logic
- Soft Computing