

TECHNOLOGIES AND METHODOLOGIES FOR HEALTH PROTECTION

Carries out research and innovation in the fields of biotechnology, radiation biology and toxicology, with applications for industrial development, biomedicine and human health.

Strategic areas:

- To develop and apply innovative technologies to estimate potential health risks of physical and chemical agents associated with production, lifestyles or as a result of accidents.
- To define the mechanisms of action at the cellular and molecular level involved in the emergence of diseases with a high social impact to identify biomarkers and new therapeutic targets for diagnosis and the development of innovative and sustainable therapies.
- To promote technological innovation in the biomedical sector, also for the purpose of industrial transfer.
- To promote agreements with public and private companies for the evaluation of active ingredients, molecules and efficacy tests.

All activities are carried out within the following labs:

Biomedical Technologies (TEB)
Health and Environment (SAM))

Facilities and Platforms:

Cellular and molecular biology, histology, analytical microscopy, flow cytometry facilities; METAFER scanning and imaging platform; X-ray generator; electric field generators; electromagnetic field exposure systems; equipment room; epidemiological database of mortality by cause (from ISTAT data) at a municipal level throughout the country.



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TECHNOLOGIES AND METHODOLOGIES FOR HEALTH PROTECTION

DEPARTMENT FOR SUSTAINABILITY

- Efficient use of resources and closure of cycles
- Sustainable Materials
- Models and technologies for risks reduction
- Protection and enhancement of the territory and natural capital
- Biotechnology and agroindustry
- **Technologies and methodologies for health protection**

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DEPARTMENT FOR SUSTAINABILITY



The laboratory works in the field of technological innovation in the biomedical sector through a multidisciplinary approach, integrating basic and applied research and promoting the industrial transfer of the inventions produced.

More precisely:

- it proposes innovative health solutions by studying the molecular mechanisms involved in the onset of cancer and non-cancer pathologies related to ionising and non-ionising exposure radiation, in the regulation of the immune response and in the mechanisms determining inflammation-based immune-mediated diseases.
- it develops and uses in vitro, ex-vivo and in vivo models to identify molecular markers of radio-exposure, new tumour markers, new therapeutic targets and diagnostic and prognostic biomarkers of diseases with high social impact.
- it uses omics technologies using bioinformatics expertise to interpret data.
- it develops new adjuvant therapeutic strategies for cancer treatment; develops

and validates natural extracts with potential therapeutic applications; participates in clinical protocols undergoing standardisation; develops therapeutic vaccines; develops and tests new drug delivery strategies.

- it uses electromagnetic fields as adjuvant for conventional radiotherapy as well as proton therapy and hadron therapy.
- it maintains and renews basic skills and knowledge on the response of biological systems to ionising and non-ionising radiation, including for radiation protection purposes.
- it performs radiometric and dosimetric assessments of technologies that apply electromagnetic radiation in the industrial, environmental and health fields.
- it promotes agreements with public and private companies for the evaluation of active principles, molecules and efficacy tests.
- it maintains relationships with radiobiology platforms under EURATOM.

The Laboratory studies the impact of different environmental factors on human health through the characterisation of the Exposome – as a new paradigm for studying the complexity of environmental exposures and their interaction with the genome – for understanding the effect of the environment on pathogenesis and ageing.

It employs a multidisciplinary team of biologists and engineers whose various skills converge to study the impact of the environment on human health from multiple points of view and through different experimental and methodological approaches, in order to achieve the following objectives:

- the study of the mechanisms of action and the identification of early biomarkers of susceptibility following exposure to environmental pollutants, with particular regard to the relationship between health and air quality (outdoor and indoor), exposure to emerging contaminants and endocrine disruptors.

- the study of the mechanisms of action in response to electromagnetic fields following accidental, occupational and residential exposure and related characterisation and measurement of sources of exposure.
- the development of innovative biomarkers for the determination of the absorbed dose following radiological-nuclear emergencies, development and validation of new methods for the retrospective reconstruction of the absorbed dose of ionising radiation following radiological and nuclear accidents.
- the characterisation of the health status of populations living in different environmental settings and/or exposed to sources of potential health impact through environmental epidemiology studies.
- the study of the role of nutrition in the prevention of disease and ageing, with a focus on functional foods and bioactive molecules of natural origin, using nutrigenomics and nutri-epigenomics as a new frontier for the development of personalised nutrition.

SOURCES OF FUNDING:

- National programmes: BRIC-INAIL, Lazio Region, NRRP-MUR
- European programmes: Horizon Europe; Horizon 2020; EURATOM programme
- International programmes: NATO SPS, WHO
- Private foundations: AIRC Foundation for cancer research, Italian Glycogenesis Association (AIG)
- Business services

PARTICIPATION IN INTERNATIONAL PLATFORMS:

WHO BioDoseNet (Global biodosimetry laboratories network for radiation emergencies); RENEB (Running the European Network in Biological and retrospective Physical Dosimetry); International Commission Radiation Units and Measurements (ICRU); European Radiation Dosimetry Group (EURADOS); Multidisciplinary European Low Dose Initiative (MELODI).

The division represents ENEA in the “Alisei” National Life Sciences Technology Cluster.

RESEARCH TOPICS

- Innovative technologies and methodologies for assessing the impact of the environment on health
- Protection of health against physical agents
- Human nutrition and health: nutri-genomic and nutri-epigenomic approach
- Identification of new diagnostic, prognostic, and environmental exposure biomarkers
- Use of physical agents for the improvement of therapeutic strategies
- Immunotechnology for health



In vitro cultures of human cells



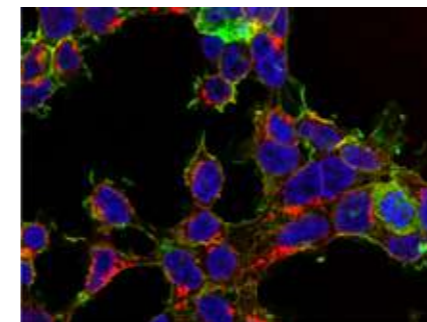
X-ray generator



Cell cultures, microscopic analysis and handling in a biological safety cabinet



Extremely low frequency (50 Hz) magnetic field exposure system



Human neuroblastoma cells



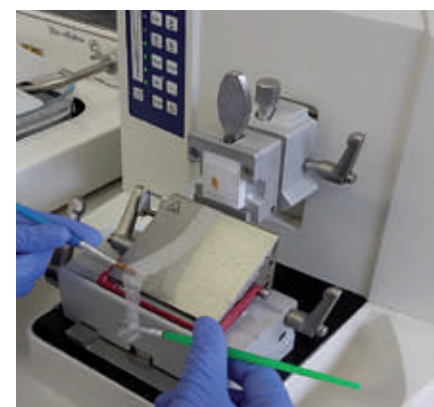
Fluorescence microscope



Automatic cell counter



Ultra-short electric pulse generator



Microtome for cutting histological sections