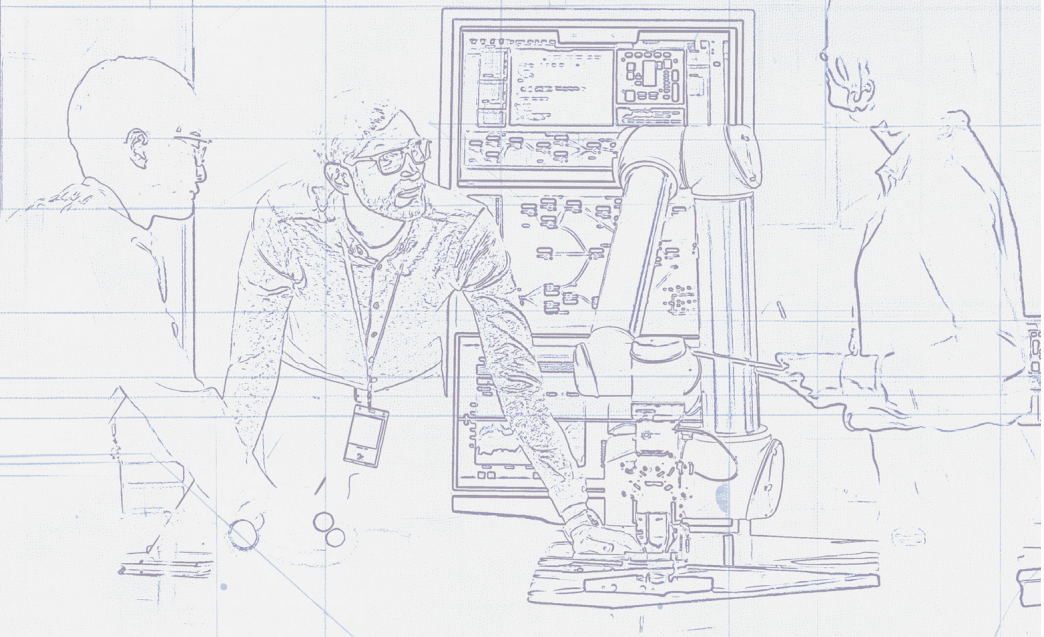
RESEARCH AND TECHNOLOGY TRANSFER

University of Trieste



UNIVERSITÀ DEGLI STUDI DI TRIESTE

UNIVERSITÀ
DEGLI STUDI
DI TRIESTE

La versione elettronica ad accesso aperto
di questo volume è disponibile al link:
https://www.openstarts.units.it/handle/10077/37425

Grafica e impaginazione Elena Tonzar per EUT Edizioni Università di Trieste

EUT Edizioni Università di Trieste
via Weiss 21 – 34128 Trieste
https://eut.units.it
https://www.facebook.com/EUTEdizioniUniversitaTrieste

RESEARCH AND TECHNOLOGY TRANSFER

University of Trieste

SUMMARY

INTRODUCTION

Technology transfer is a vital bridge between research and industry: it enables the enhancement of scientific results, the generation of revenue through licensing, the creation of spin-offs, the development of industrial collaborations, and, importantly, the creation of new job opportunities.
The University of Trieste is home to a vast network of cutting-edge research laboratories, equipped with recently upgraded instruments. These facilities not only support academic research and teaching but also play a strategic role in technology transfer, one of the University's core missions.
Each department at the University fosters multidisciplinary research that responds to industry needs, the scientific community, and major international research initiatives.
The University of Trieste is proud to contribute to the growing cooperation network between research institutions and businesses through its facilities and expertise. We believe these networks represent an actual engine of progress—not only for UniTS, but for the entire country.

Donata Vianelli
Rector

WHAT IS THE INNOVATORS COMMUNITY LAB THINK TANK?

The 'Innovators Community Lab' or ICL Think Tank represents the evolution of the University's commitment to entrepreneurship education and innovation. The ICL aims to guide and support students in developing an entrepreneurial mindset and business-oriented skills. It is a place where innovation spreads from direct contact between people from different educational backgrounds. Within this structure there are physical spaces dedicated to innovative teaching and coworking as well as a creative laboratory where prototypes can be developed. Covering approximately 1,000 square meters across two floors, the ICL offers students access to coworking areas, prototyping labs, and innovative learning environments—inviting them to invest their time and ideas in their future. The ICL is one of the University's 'STUD.ENT' (STUDent ENTtrepreneurship) initiatives, which aim to promote training opportunities for students at various stages of their university careers, with a view to developing skills in management and project-based work. Participants' projects are also developed in line with the Smart Specialisation Strategies (S3) identified within the Friuli Venezia Giulia region and UniTS equally contributes to these strategies through its strong commitment to education and research. Rooted in innovation and interdisciplinary collaboration, the ICL fosters the development of future leaders and changemakers.

Contacts/Info: icl@units.it

LABORATORIES

Contacts/info: ilo@units.it

DEPARTMENT OF ECONOMICS, BUSINESS, MATHEMATICS AND STATISTICS

Economic and Political Geography Laboratory – GEP Lab

The GEP Lab is a multi- and transdisciplinary centre dedicated to the University's three geographical-territorial missions: research, education and public engagement. It focuses on economic and political geography, geoeconomics, geopolitics, environmental and energy issues (sustainable development), and the socio-economic implications of territorial organisation.
The laboratory deals with research on the relationships between territory and socio-economic development, with a particular focus on geographical mobility, transport geography, logistics and energy, and the use of GIS tools. It supported the AGeI task force on Geography of Transport and Logistics until 2023 and collaborates with the PhD course in Circular Economy at the University of Trieste on issues of circular economy, industrial symbiosis and decarbonisation. As a member of the LabGeoNET network, it participates in the activities organised by the Italian Association of Cartography and publishes the Association Bulletin.
In terms of teaching, the laboratory supports students with their exams and with any theses in economic geography and geographic information systems (GIS), offering training internships and practical activities in the use of GIS software.
The GEP Lab is also involved in public engagement and outreach and collaborates with companies on virtual/augmented reality projects and with schools through the Immaginario Scientifico science museum organising outreach events such as TriesteNext and the conference 'Transport and logistics between global challenges and local development'.

Soft Computing for Finance and Insurance Lab – SOFI Lab

The SOFI Lab applies soft computing techniques to solve complex problems in the financial and insurance industry. Soft computing is a set of artificial intelligence techniques that uses tolerance to data inaccuracy and uncertainty to improve the treatability and robustness of low-cost solutions. The laboratory and the Department of Economics, Business, Mathematics and Statistics (DEAMS) have a number of common focuses such as decision theory under uncertainty, forecasting models, financial and insurance markets, value creation, corporate governance and ESG investments.
SOFI Lab's main activities include:

- creation of an interdisciplinary network on soft computing for finance and insurance companies that promotes research and education;
- participation in regional, national and international research projects;
- promotion of technology transfer within the region and local economic sectors;
- promotion of knowledge dissemination to increase awareness and use of soft computing in finance and insurance companies.

Commodity Trading Lab – MerceoLab

The MerceoLab specialises in *merceologia*, that is, the study of commodities. The Lab evolved from the old Department of Economics and Trading of Raw Materials and Consumer Goods and focuses on the analysis of agri-food products, evaluating their quality, safety and nutritional value. The Lab's equipment and software has been updated thanks to research funds in

order to offer more services to companies, including tools for life cycle analysis (LCA) and carbon footprint (CF) calculation, both of which are particularly relevant in the agri-food sector.

DEPARTMENT OF LEGAL, LANGUAGE, INTERPRETING AND TRANSLATION STUDIES

Corpora Linguistics Lab – LiCor

LiCor is a laboratory dedicated to textual analysis and has 6 workstations. There is a variety of software available, including OCR and PDF editing programs, concordance analysis programs, automatic tagging, readability indexes, basic vocabulary incidence, etc., such as TalTaC2, AntConc, TagAnt, Corrige!, plus two specially created programs:

- BRAN, a complete solution for those who study Italian linguistics by creating and analysing corpora of texts;
- FLO (*Facile da Leggere Online* - accessible language online), an automatic writing assistant which helps writers to use 'plain language' and in 'easy language' in Italian.

DEPARTMENT OF HUMANITIES

Numismatic Laboratory – NummusLab

The numismatic laboratory studies coins for research and educational purposes through various methods and perspectives, including history, chemical analysis, art history, archaeology, economic history, archaeometry, computer science and communication. This holistic approach examines coins from different historical periods from all around the world, from the Celtic and Roman West to Eastern and Central Asian cultures, from the Archaic Period to the Middle Ages.
The collaboration between universities and private individuals has allowed us to create a numismatic collection that includes thousands of ancient and medieval coins, as well as auction catalogues and books. Since 2013, an agreement with the Superintendence of Friuli Venezia Giulia has further expanded the collection with coins from various eras and origins. The laboratory has modern instruments for the technical and metrological analysis of coins. Part of the collection is visible in the UniTS Museum Services. NummusLab created a digital project on the international platform Nomismata.bcf for the census of Byzantine coins found from 498 to 1453.

DEPARTMENT OF PHYSICS

Aerosol Jet Printer Laboratory – AJP-LAB

The AJP-LAB revolves around the Aerosol Jet Printer (AJP), an innovative tool that can print traces and create three-dimensional structures on any object, using various 'inks' such as metals, polymers and chemical and biological compounds.
The material is sprayed and deposited layer by layer, thanks to a jet driven by a high-speed gas, speeding up the creation of complex prototypes when compared to traditional methods. The aerosol jet printer is used in chemistry, physics and engineering, from the development of detectors for nuclear and particle physics to applications in medical physics, chemistry, crystallography, aerospace engineering and satellite communications.
In particular, teaching staff and researchers at the Department of Physics intend to initially use the AJP for the development of semiconductor detectors for research in sub-nuclear physics, research on medical X-ray imaging with phase contrast, and applications of aerospace robotics with integration of mechanics, circuits and sensors.

Artificial Quantum Systems Laboratory – ArQuS Lab

The ArQuS laboratory focuses on building artificial quantum systems by cooling, trapping and controlling individual neutral atoms optically. The many-particle systems made in the ArQuS laboratory are used as quantum simulators, i.e. prototypes for studying the emerging effects caused by the interaction of a large number of quantum particles. The precise control over individual atoms is also exploited to generate strongly correlated states of matter that constitute a primary resource for precision atomic measurements and quantum computing algorithms.

Quantum Communication and Information Laboratory – QCI

The QCI lab focuses on the research and technological development of new solutions for secure quantum communications in fibre optics and free space. Using the instruments available, it is possible to generate quantum cryptographic keys and experiment with secure optical communication protocols to study their robustness to external disturbances and intrusions. The aim of the QCI laboratory is to implement quantum networks that are secure, compatible and able to co-exist with the network infrastructures typical of classical telecommunications.

The Vibronic Spectroscopy Laboratory

This laboratory, designed in 2012 and opened in 2013, hosts an experimental setup with few equivalents in the world. The spectrometer (Ekspla) can be used to make IR-Vis SFG vibronic spectroscopy measurements for the study of solid-gas, solid-liquid and liquid-gas interfaces. An ultra-high vacuum sample preparation chamber (E-10 mbar) houses standard surface growth and characterisation techniques for pre- and post-experiment analysis. Without breaking the vacuum, samples can be transferred to the reaction cell which is coupled to the spectrometer, where it is possible to study catalytic processes *in situ* which operate between E-10 and E+3 mbar and 300 – 1000 K. Compound gas mixtures (up to 3) can be used and molecules for growth can be deposited not only by PVD and CVD, but also from a solution.

Photon-counting Edge-illumination Phase-contrast Imaging – PEPI Project

This laboratory deals with the development of advanced techniques of tomographic micro-imaging with X-rays and related applications on biological samples. Specifically, the system, designed and built between 2020 and 2022, is equipped with a single-photon count spectral detector and a phase contrast system based on the edge illumination technique. The main lines of research concern the quantitative analysis of osteoarticular samples for the study of degenerative diseases (osteoarthritis) and the development of virtual histology protocols, in particular for the study of thyroid diseases. The laboratory is currently supported by the PRIN-NRRP project called MUST and supports several INFN-funded projects.

DEPARTMENT OF ENGINEERING AND ARCHITECTURE

Digital Energy Transformation & Electrification Facility – D-ETEF

D-ETEF is a network of laboratories dedicated to the study of terrestrial and naval electrical systems. The lab's research focuses on voltage regulation, naval electrical systems, direct current distribution, port microgrids, electrical systems reliability and preliminary design of all-electric ships. D-ETEF also has educational purposes and offers exercises, internships and thesis support.
D-ETEF deals with the digital transformation of energy for terrestrial networks, naval electrical systems and port infrastructure, covering modelling, design, digital twinning,

management and control of electrical systems. It collaborates with industrial stakeholders and academic institutions at regional, national and international level, and manages Italian and European research projects with the University of Trieste as lead partner or coordinator.

Laboratory of Vibration Mechanics – LVA

The LVA experimental laboratory is dedicated to the dynamic characterisation of machinery and components, using advanced instruments to meet research and development needs. The laboratory has multi-channel acquirers with a sampling frequency of up to 200 kHz, which are able to capture precise details of mechanical dynamics.
Equipped with sensors to measure forcings and mechanical, thermal and electrical responses, the laboratory offers a complete view of the performance of the materials and components tested. It uses electrodynamic shakers with capacities from 5 to 10 kN to generate load profiles and simulate real conditions, evaluating the strength and durability of components.
High-frequency video systems allow detailed and real-time visualization of the motion of the tested parts, identifying anomalies or critical points. All instrumentation is periodically calibrated to ensure accurate and reliable measurements, maintaining high quality standards for research and development activities.

Safety and Road Materials Laboratory

The laboratory carries out research, teaching and third-party activities in the road safety and road materials sectors. In the road safety sector, its main activities are:

- analysis of accident occurrence;
- analysis of road safety;
- study of user behaviour;
- assessment of road traffic service levels;
- support and advice in geometric road design.

In the road materials sector, its main activities are:

- assessment of the physical and strength characteristics of stone aggregates for bituminous and cementitious conglomerates;
- assessment of the physical and mechanical characteristics of land for road applications;
- design and verification of bituminous conglomerate mixtures, cemented mixtures and lime stabilisations;
- study of innovative mixtures;
- on-site control of the quality of materials and the correct execution of laying operations;
- support in the design and construction of test fields (embankments and large areas of experimental conglomerate);
- design and evaluation of the functional characteristics (adhesion and regularity) of road surfaces both in the laboratory and in the field.

'Domenico di Santolo' Non-destructive Testing Laboratory (rope lab)

Non-destructive testing (NDT) is a type of testing aimed at detecting defects in a piece or article, without destroying it and ensuring its integrity after inspection.
The 'Domenico di Santolo' laboratory was one of the first in Italy to deal with non-destructive testing on special transport and cableway systems, both carrying out research projects in this area, and performing direct periodic control activities on wire ropes of cableway and lifting systems, in mountain and port areas.
In this specific case, non-destructive testing is used to verify the integrity of the elements that make up the wire ropes of installations.
The method currently used by operators to do this (or by professionals in charge) employs the inductive magnet. The active part of the instrumentation is run along the ropes,

creating a magnetic field inside them. A sensor detects any defects and estimates the section of the discontinuity and its longitudinal position.
Today, the laboratory is the only one in Italy authorised by the Ministry of Infrastructure and Transport to verify the correct functioning of all the components of inductive magneto instruments.
The laboratory has a cableway system emulator, sample ropes of different diameters, and instrumentation designed and manufactured by the laboratory itself, in order to ensure full compliance of control instruments with government standards and thus contribute to the safety of Italian cableway systems.
These activities support and complement laboratory's institutional tasks such as research, through scientific publications and participation in conferences, and collaboration in teaching.

Smart-grid and Electric Mobility Laboratory

The Smart-grid and Electric Mobility laboratory is a state-of-the-art facility for the study of charging systems for electric vehicles powered by renewable energy. It specializes in the collection and analysis of real-time data, essential for developing data-driven approaches, and in optimised testing of vehicle charging power. It offers tools for the development of energy management systems aimed at optimising energy flows, both from an economic and environmental point of view.

Energy Laboratory for Interdisciplinary Storage Applications – ELISA

This laboratory is a structure of excellence that takes an interdisciplinary approach to the study of energy storage systems. It turns to engineering for device and system modelling, to chemistry for operating mechanisms, to computer science for data analysis, to economics for economic-industrial assessments, and to social sciences for social acceptability.
ELISA enables tests for the characterisation of cells, modules, battery packs and fuel cells, developing models for their integration into complex systems.

Fluids, Industrial and Environmental Fluid Mechanics (IE) Laboratory

The IE-FLUIDS laboratory has a wealth of experience in computational, industrial and environmental fluid dynamics. The lab develops cutting-edge numerical techniques for academic and engineering applications, and promotes technology transfer.
Over the past twenty years, the group has searched to solutions to problems related to turbulent flow, conjugate heat exchange, multiphase flows, environmental risk analysis, hydraulic structures, indoor and outdoor pollutant dispersion, and fluid-structure interaction.
The group is particularly skilled in hydroacoustic modelling for engineering applications such as propellers and naval turbines, developing models to study the propagation of noise in the oceanic environment and the fluid dynamics of cavitation flows.

Operations Research Lab

Since its inception in 2007, the Operations Research Lab has focused on issues related to the development of mathematical models for the optimisation of transport and logistics systems. In addition to this, the laboratory currently develops methods and models of artificial intelligence and data science to solve complex problems and optimize processes in areas such as smart mobility, bio-informatics, production and resource allocation.
Owing to the lab's participation in international projects, issues of environmental and economic sustainability have always been of central importance both in the field of air traffic and in that of tourism.

Image Processing Laboratory – IPL

Active since 1973, the IPL is internationally recognised for its contributions to research on video and audio signal processing using artificial intelligence techniques and non-linear and adaptive operators with implementations on DSP, FPGA and ASIC circuits.
There are a variety of areas of application including the restoration of period iconographic material, forensic and industrial applications, energy storage systems, agri-food sectors, mobile telephony, satellite and IoT, embedded systems and instrumentation for experimental physics laboratories.
The IPL collaborates with local institutions and companies in the fields of embedded and IoT systems, forensics, metallurgical and automation industries.

Rheology Laboratory

The laboratory is equipped with instrumentation for the characterisation of various materials, with a special focus on gels, emerging systems with numerous practical uses. Their peculiar structure, a three-dimensional solid lattice containing a considerable amount of liquid (up to 99% of their weight), makes them much more similar to solids than to liquids from the point of view of mechanical (rheological) properties. It is precisely for this reason that gels are the synthetic materials that best mimics the mechanical behaviour of the soft tissues of living beings. Their structure is also able to regulate the release process of the drugs incorporated within it, which is the basis of modern controlled-release pharmaceutical systems.
The laboratory's instrumentation is also ideal for the analysis of biological materials, e.g. from patients with cystic fibrosis, chronic obstructive pulmonary disease or liver and brain tissue diseases.
Finally, mathematical models capable of describing and predicting various material properties can be developed in the laboratory.
These are the instruments available:

- low-field NMR, which shows great potential in the study of polymeric systems, gels, living tissue and foodstuffs;
- a rheometer, the main instrument for studying the viscoelastic properties of liquid, gel and semi-solid materials;
- a UV spectrophotometer, to identify different molecules and determine their concentration in liquid environments;
- a DLLS, to study submicrometric systems with regard to size distribution and surface charge (Z potential);
- a tensiometer, for characterising material surfaces.

Machine Building Workshop – 3D Fab Lab

The 3D Fab Lab is a laboratory dedicated to the design, construction and mechanical characterisation of materials with a complex structure of both biological and industrial origin. This is achieved using experimental and numerical methods and additive manufacturing (3D printing) is also used in the production phase.
The laboratory is equipped with a machine for low-load tensile tests, an FDM setup, an SLA setup for the realization of components which can also be achieved from photogrammetric and radiological 3D scans.
The work carried out in the laboratory ranges from the development of medical devices to the realisation of radiological phantoms, from the rapid prototyping of special supports to the realisation of components for orbit applications, guaranteeing a rich scientific production in sector magazines, international cooperations with prestigious universities and collaborations with local companies.

Drone Lab

The Drone Lab in Trieste is an advanced research and development facility specialised in drone control, equipped with high precision instrumentation. It is one of the few university Drone Arenas in Italy.
It develops advanced control strategies for individual drones and groups of drones, addressing issues such as resilience to cyber-attacks and the optimization of trajectories for common missions, such as search and rescue operations, with possible coordination with land-based transport.

Industrial Automation Lab

The Industrial Automation Lab recently acquired a state-of-the-art robotic quadruped. This multipurpose robot is used for research into machine adaptation and learning, locomotion, object manipulation and environmental monitoring. Its potential applications include rescue, exploration and surveillance operations, offering important insights into animal locomotion and fostering interdisciplinary collaboration.

Ship Noise and Vibration Laboratory – NVL

The Ship Noise and Vibration Laboratory (NVL), active since 2006, deals with the dynamic characterisation of materials and components to reduce vibration and noise on board ships. The team of researchers aims to disseminate knowledge and promote new technologies to improve vibro-acoustic comfort and reduce the acoustic impact of ships in air and water. NVL has advanced simulation resources and equipment for experimental verification, and performs measurements on simulated naval structures and real boats.

DEPARTMENT OF MATHEMATICS, COMPUTER SCIENCE AND GEOSCIENCES

Applied Geophysics Laboratory

The Department of Mathematics, Computer Science and Geosciences' Exploration Geophysics Group has been carrying out research, development and application of innovative geophysical methodologies for the non-invasive study of the subsurface for over fifty years. This research has a wide range of applications including: regional-scale studies for understanding the structure and evolution of the Earth's crust; research and cultivation of natural resources (water, minerals, fossil and renewable energy); prevention and mitigation of natural hazards; applied studies in archaeology, glaciology, hydrogeology, non-destructive testing, humanitarian demining. Laboratory equipment includes: four complete 2-D GPR systems (2 Mala Geoscience, 1 Zond, 1 Pulse Ekko) with full suite of surface antennas (25 MHz to 2.3 GHz) and well antennas (100-200 MHz); a 3-D GPR MALÅ MIRA 8, 400 MHz; a multi-channel IRIS resistivimeter with surface and marine cables and electrodes; a TDEM system; 2 Geode seismographs with P, S and well geophones; three optical pumping gradiometers (Scintrex, Geometrics); two proprietary seismic sources; an Edgetech DF-1000 side scan sonar; 1 drone with camera and multispectral sensor. The lab is also equipped with a processing centre with 2 servers, 12 workstations and dedicated partitions on departmental clusters. Finally, there is state-of-the-art software for the processing, modelling, inversion and interpretation of proprietary and academically licensed geophysical data (Schlumberger, Shearwater, Halliburton).

Analogue Modelling Laboratory - SMOLAB

The Analogue Modelling Laboratory, founded in 2016 in collaboration with the National Institute of Oceanography and Applied Geophysics (OGS) and the National Institute of Geophysics and Volcanology (INGV), studies the evolution of tectonic structures and the relationship between folds and faults. Using kaolin as an analogous material for natural

rocks, the laboratory is able to analyse the evolutionary mechanisms of tectonic structures with high resolution and to insert complex fault geometries in experimental set-ups to study their impact on subsequent deformation phases.

Sedimentology Laboratory

The Sedimentology Laboratory is part of the Geosciences section of the Department of Mathematics, Computer Science and Geosciences (MIGe) and develops analytical methodologies for the study of granulometric characteristics of sediments. The lab also determines the characteristics of the main mineralogical, organogenic and anthropogenic components. The processing of data on the size distribution of grains primarily complies with the rules imposed by legislation in the field of environmental measures and characterisation of sedimentary materials both in cases of restoration (beaches, sandbanks, dunes) and in the field of recycling and waste.
In research, particle size and compositional data are processed and used for the interpretation of sedimentary processes (erosion, transport and deposition) especially in marine contexts (deep basins), coastal areas, lake basins and transition areas such as lagoons and coastal ponds. The particle size data is a useful indicator for the interpretation of recent and past climate change, for the assessment of the quality of the environment and the bioavailability of any contaminants present.
The laboratory also develops operational methods for the sampling of surface sediments using instruments including core drills, buckets, box-corers, manual samplers.
The instruments supplied by the laboratory are:

- Laser sediment analysis with Malvern Hydro 2000S autosampler
- Sediment analysis at Laser Mastersizer Malvern, 3000 HydroMV and AERO_S
- Water Distiller A8000
- Brezina GRANOMETER sedimentation balance for sand analysis
- THALASSIA sedimentation balance for sand analysis
- MICROMERITICS 5000ET x-ray sedigraph for sludge analysis
- MICROMERITICS 5100 x-ray sedigraph for sludge analysis with MasterTech 51
- Stirrer Thermoline NEW_II
- FRITSCH sample divider
- MORANDI vibrating sieve for sand analysis
- MMM ventilated oven
- 0.00001g METTLER analytical balance
- 0.01g METTLER precision balance
- HETO heated water bath for heating reactions with sediments
- SONOREX ultrasonic tank for sample disintegration
- Anton PARR ultrapyc 5000 gas pycnometer for measuring density

X-ray Diffractometry Laboratory

The powder diffractometry laboratory uses machines such as a diffractometer with various interchangeable slides and a graphite monochromator to identify and give semi-quantitative estimations of crystalline phases in dust and massif samples (such as thin sections, rocks, ceramics, metals, archaeological artefacts and clays). For single crystal diffractometry, it uses a specific instrument with a point detector to determine the structure of the crystalline phases. It also offers an outsourced analysis service.
Recent instruments acquired by the laboratory can analyse a wide range of samples, from powders to solids on a single device.

Seismological Research and Monitoring Laboratory - SeisRaM

This laboratory is dedicated to the maintenance and calibration of seismological instruments of the accelerometer and broadband stations in the Friuli Venezia Giulia and

Veneto Accelerometric Network (RAF) and in the CE3RN cross-border network. The laboratory has a wealth of experience in seismology and carries out research, training, knowledge dissemination and consulting activities. The main activities concern seismic monitoring, identification of active fault systems, optimisation of localisation algorithms, crustal tomography, definition of seismic source and ground motion parameters, calculation of ground motion scenarios, seismic monitoring of buildings, seismic monitoring of landslides, characterisation and response of sites and seismic microzonation.
In addition, SeisRaM also has a mobile laboratory. It is a mobile workshop van equipped with all the tools and instruments necessary for the maintenance of seismic stations. For calibration in the countryside, it is equipped with 'tiltable'. It also contains 6-9 accelerometer stations ready for installation if replica monitoring is required.

INTERDEPARTMENTAL LABORATORY:

- DEPARTMENT OF MATHEMATICS, COMPUTER SCIENCE AND GEOSCIENCES
- DEPARTMENT OF CHEMICAL AND PHARMACEUTICAL SCIENCES
- CLINICAL DEPARTMENT OF MEDICAL, SURGICAL AND HEALTH SCIENCES

TRace Elements in the Environment Laboratory - TREELab

The TREELab combines the analytical chemical skills of the Department of Chemical and Pharmaceutical Sciences, the geochemical skills of the Department of Mathematics, Computer Science and Geosciences, and the medical skills of the Operational Clinical Unit of Occupational Medicine. This interdisciplinary laboratory focuses on environmental sciences, investigating the biogeochemical cycle of potentially toxic trace elements (PTEs) such as mercury, cadmium, lead and arsenic. Using advanced instrumentation, the laboratory analyses the composition of various environmental matrices, from soils and sediments to water, organisms and atmospheric particulate matter, studying their abundance, distribution and health impacts.

DEPARTMENT OF CHEMICAL AND PHARMACEUTICAL SCIENCES

Mass Spectrometry Laboratory

This laboratory hosts high- and low-resolution mass spectrometry systems coupled with liquid chromatography separation and direct infusion systems. These systems can be used for the analysis of small molecules relevant to the development of materials with applications across a range of sectors and fields, including: environmental, industrial, pharmaceutical, toxicological, metabolomic and proteomic. Ion trap and q-Orbitrap, ESI and nano-ESI technologies are also used, and software and databases are available for the processing of complex signals generated by the lab's instruments.

INTERDEPARTMENTAL LABORATORY:

- DEPARTMENT OF CHEMICAL AND PHARMACEUTICAL SCIENCES
- DEPARTMENT OF LIFE SCIENCES
- DEPARTMENT OF ENGINEERING AND ARCHITECTURE
- CLINICAL DEPARTMENT OF MEDICAL, SURGICAL AND HEALTH SCIENCES

BioAerosol and Air Quality Laboratory - BAQlab

BAQlab provides a specially designed infrastructure for the study of micro-organisms, gases and dust in the air and for the development of environmental sanitisation systems.

This laboratory brings together expertise from a range of disciplines, integrating a network of laboratories for: the identification of bacteria, viruses, spores and fungi with molecular genetic techniques; the development of sanitisation technologies; and the assessment of risks to human health and the environment. The laboratory offers support to students in both controlled conditions and in real environments for projects related to aerosols conveying microorganisms and air quality in indoor and outdoor environments.

CLINICAL DEPARTMENT OF MEDICAL,SURGICAL AND HEALTH SCIENCES

Medical Simulation and Advanced Training Centre - CSMAA

The centre consists of 4 simulation rooms connected by 3 director's rooms and houses the most up-to-date technologies currently available. The core of CSMAA are four life-size mannequins (two adults and two for children, in addition to HAL s5301, the most advanced interdisciplinary simulator in the world) which perfectly mimic the functioning and reactions of the human body to medical, surgical and pharmacological interventions. The laboratory also boasts a digital anatomical table for virtual autopsies, an advanced ultrasound simulation device and one for cardio-pulmonary auscultation. The laboratory is also equipped with virtual reality for viewing rotational anatomical images in 3D. Thanks to interactive programmes and visors, it is possible to learn about the body's anatomical systems by interacting with them virtually. Two laparoscopic simulators with automated analysis of student performance are also included. The CSMAA is also equipped with two types of simulation software: LungSim for training on mechanical ventilation, and DrSimTM for training on interactive clinical cases. There is also a next-generation CAE Learning Space Essentials system, through which simulation sessions can be recorded and reviewed in streaming or debriefing in the same building. The same system also saves student performance and monitors progress.

Laboratory of Hygiene and Preventive Medicine

This laboratory is the regional reference centre for the surveillance and diagnosis of numerous infectious viral, bacterial and fungal diseases and ensures that microbiological agents of interest to public health and, in particular, of emerging infectious diseases are characterised. The laboratory uses first-, second- and third-generation sequencing tools. The main areas of activity of the structure are:

- molecular characterisation and sequencing with Sanger and NGS techniques for the definition of genotype and susceptibility/resistance to antivirals of hepatotropic viruses and HIV;
- molecular characterisation by sequencing endemic Arboviruses (e.g. TBE), epidemic Arboviruses (e.g. West Nile Virus) and imported Arboviruses (e.g. Dengue, Chikungunya and Zika) in its role as regional reference centre and laboratory of the Arbonet national network;
- molecular characterisation by sequencing vaccine-preventable diseases, in particular measles and rubella, in its role as regional reference centre and laboratory of the national MoRoNet network;
- molecular characterisation of viral agents responsible for epidemic gastroenteritis (e.g. Rotaviruses and Noroviruses) and viruses responsible for epidemic episodes of fecal-oral transmitted hepatitis, in particular HAV and HEV;
- diagnosis of new emerging pathogens, including in-house molecular techniques developed for early identification/diagnosis in the absence of commercial kits (e.g. Avian influenza, SARS-CoV2, imported Arbovirus, monkey pox, etc.);
- virological surveillance and molecular characterisation by sequencing of seasonal influenza and respiratory viruses in its role as regional reference centre and laboratory of the national Respivirnet network;

- activity integrated with the Microbiology Department for the study of the epidemiology and molecular characterisation of bacterial/fungal agents responsible for epidemic events or in any case of public health interest (e.g. multi-resistant microorganisms).

The role of reference laboratory implies not only an in-depth knowledge of the molecular techniques used in virological diagnostics, but also the possibility of isolating and cultivating viruses for:

- assessing the infectivity of samples which have tested positive for molecular testing;
- carrying out neutralisation tests on immunometric test positive sera to identify protective/immunity serological correlates;
- characterising viral isolates in order to define their transmission chains and provenance.

Advanced Translational Microbiology Laboratory

This research department focuses on advanced translational microbiological diagnosis. The lab contributes to the University of Trieste's institutional missions through its translational biomedical research activities and didactic activities. It is equally involved with the research hospital Burlo Garofolo through its work in healthcare and technological advancement. It also hosts the Specialisation School in Microbiology and Virology. The laboratories are equipped with the latest generation of instruments dedicated to omics sciences in the field of microbiology in addition to basic instruments. The lab is centred around its integrated multidisciplinary approach for both care and research. This approach enhances its research into the various etiopathogenetic aspects of STIs and fungal infections, dismicrobisms of the patient in various anatomical regions and the relationship with any pathology present, and emerging respiratory infections in paediatrics. The laboratory is also engaged in the fight against antibiotic resistance and its impact on hospitalised patients by monitoring the microbiome and resistome of the hospitalised patients. In addition to translational research, the research department is engaged in public health functions at regional and national level.

Maxillofacial Surgery and Dentistry Clinic Research Laboratory

This laboratory engages in scientific research into materials for biomedical applications in order to expand knowledge about biomaterials as much as possible.
Its research areas are:

- topographic characterisation by electron microscopy;
- surface chemical characterisation by microanalysis probe;
- characterisation of roughness and surface morphology;
- characterisation of mechanical properties by static and dynamic tests;
- characterisation of the physico-chemical properties of materials;
- three-dimensional characterisation by computed tomography. The laboratory is also partnered with Elettra, where its Tomolab laboratory is located. The instruments in the Tomolab perform non-destructive characterization of biological and non-biological samples, three-dimensional visualisation and virtual sectioning of samples.

In addition to the activities listed above, the laboratory also carries out purely biological investigations, such as cytotoxicity, proliferation and cell differentiation tests. These are also carried out in collaboration with other laboratories within the University of Trieste.
The laboratory cooperates with companies producing biomedical devices both for the development of research projects and for collaborations on behalf of third parties.

Microsurgery Laboratory

The microsurgery laboratory provides field training for residents and students who want to approach this surgical discipline. The laboratory is equipped with microscopes and microsurgical kits.

The laboratory offers a training course that begins with basic theoretical lessons and continues with practical activities. The exercises include the use of latex simulation plates, silicone tubes and, eventually, the wet model.
The aim is to teach the basic techniques of microsurgery and management of vessels 1-2 mm in diameter as well as the various techniques for microanastomosis of both arterial and venous vessels.

Cardiovascular Biology Laboratory

The laboratory is located at ICGEB (International Centre for Genetic Engineering and Biotechnology) and specialises in the development of biological drugs (gene and cell therapy, recombinant proteins) for the therapy of cardiovascular diseases and cancers. The laboratory's activities make use of the availability of high-processivity screening platforms, cellular and animal models of human disease, vector and non-viral production for gene transfer, microscopy, cytofluorimetry and cell sorting. For years, the laboratory has collaborated with numerous research institutions and companies, both at a national and international level.

Nutrition and Obesity Laboratory

This laboratory carries out research on metabolism and nutrition, with particular attention to the translational relevance of conditions and pathologies linked to both over- and under-nutrition. It uses clinical biochemistry techniques, cell models, animals, and data and biobanks from clinical-epidemiological studies. The laboratory is equipped for all major molecular biology techniques and has developed expertise in *ex vivo* assessment of function, redox status and other mitochondrial parameters. It has a Luminex xMAP system. In addition to research activities promoted and managed independently, it collaborates with national and international groups.

Functional Assessment and Rehabilitation Research Lab

This laboratory is equipped with tools dedicated to the study of motor and neurophysiological functionality under physiological and pathological conditions, as well as the development and validation of innovative rehabilitation protocols and tools (augmented reality, virtual reality and robotics).
The laboratory is divided into the following sections:

- movement analysis: there is a video analysis system with Qualysis system of 8 cameras, integrated with force platforms, for the study of biomechanical alterations of movement in orthopedic and neurological diseases;
- augmented reality and virtual reality: the laboratory is equipped with innovative systems that encourage participation in rehabilitation protocols, in part thanks to sensorimotor integration and dual-task protocols. In particular, there are the D-Wall, Walker View and ProKin systems, which combine 3D cameras and sensorized platforms with screens for augmented reality;
- neuromuscular analysis: there is equipment for the study of muscle morphology through ultrasound (possibility of shear wave elastography), and neuromuscular evaluation of contractile capabilities (tensiomyography), strength (dynamometers), and electromyography. In particular, a 16-channel wireless surface EMG system is available, which is waterproof and has integrated inertial sensors (Cometa systems);
- sensitivity and pain: the laboratory is equipped with instruments for the quantitative evaluation of thermal and mechanical sensitivity and pain;
- applied clinical physiology and kinesiology: the laboratory integrates instruments for the study of physiological parameters during exercise, in sport and in extreme environments, through non-invasive monitoring of cardiopulmonary, neuromuscular and body temperature parameters;

- recovery lab: the laboratory studies and validates protocols and instruments for post-exercise recovery, such as cryotherapy, massage and other systems.

Molecular Cardiology Laboratory

This laboratory was created with the aim of facilitating the transition between research results and their clinical applications for patients with myocardial infarction and cardiomyopathies. It performs the dosing of biomarkers using non-invasive immunoenzymatic methods, requiring minimal amounts of blood from patients. Among the technologies used, there is the innovative Ella platform, which allows automated, rapid and replicated quantification of biomarkers. The collected biological material, which includes whole blood, plasma, serum and polymorphonuclear leukocytes, is stored in a biobank in -80°C freezers. The laboratory also has instruments for PCR, real-time PCR and cell cultures. Finally, it has active national and international collaborations in the cardiovascular field.

Microscopy Laboratory

The new structure dedicated to microscopy allows students to acquire the observational microscopy skills for both normal and pathological cytological and histological samples. It includes 20 stations equipped with optical microscopes with the possibility of projecting images of the slides on monitors and sharing them on mobile devices with a dedicated app. The laboratory also has an 86-inch screen to allow all those present in the classroom to see the samples at the same time.

Clinical Pharmacology and Pharmacogenetics Laboratory

The laboratory focuses on the personalisation of therapies which use immunosuppressive drugs (thiopurines, glucocorticoids) and monoclonal antibodies to inhibit TNF in pediatric patients. It is a national reference centre for both research into innovative approaches and for the implementation of dedicated pharmacokinetic and pharmacogenetic assays.
It also offers pharmacological consulting services for the personalisation of therapies with antimicrobial and neuroleptic drugs, both in pediatric and adult patients.

Mass Spectrometry Laboratory Orbitrap Exploris 240 + HPLC Vanquish NEO

The Mass Spectrometry Laboratory is equipped with the Vanquish NEO HPLC chromatographic system and Orbitrap Exploris 240 mass spectrometer. This instrumentation offers an advanced resource for scientific research which can manage the complexities of biological models with integrated studies in the proteomic and metabolomic fields. With these technologies, the lab can perform detailed molecular characterization of biological systems and processes that are essential to understanding cellular responses and molecular alterations under basal conditions and in response to various xenobiotics, including drugs. Biological matrices are intrinsically complex and rich in thousands of molecules and represent an analytical challenge that cannot be adequately addressed with traditional instruments. The chromatographic system coupled with high-resolution mass spectrometry allows for an extremely efficient separation of the numerous molecules present in the samples and the precise identification of even very similar molecules. The main applications concern metabolomics and proteomics.
Metabolomics is the study of metabolites, small molecules essential for physiology and pathology. High-resolution mass spectrometry allows for the generation of a complete map of the metabolites present in biological samples, offering valuable indications for the development of targeted pharmacological treatments and providing insight into pathological conditions.
Proteomics focuses on the analysis of proteins, which are fundamental for the functionality of living organisms.

Protein identification uses a bottom-up approach, in which peptides derived from the digestion of the proteins present in the sample are analysed to trace them back to the original proteins. This process makes it possible to map all the proteins present in a biological sample, identifying potential pathological biomarkers or therapeutic targets.
These technologies are applied in the medical and pharmacological sectors where they support the development of precision medicine, and in the environmental sector, where they are used in the analysis of small molecules such as pollutants and toxins, even at extremely low concentrations, essential for environmental monitoring.

Advanced Genetics and Genomics Laboratories

The Department of Medical Genetics at the 'Burlo Garofolo' research hospital in Trieste is characterised by advanced genetics and genomics laboratories equipped with the most sophisticated technologies for genome analysis. In particular, there are four different next-generation sequencers (NGS) capable of sequencing panels of genes (targeted sequencing), exomes and genomes. The complex preparation of samples for these NGS analyses is facilitated by the presence of dedicated robots, while the bioinformatics analysis of the data produced is supported by a suitable IT infrastructure for both computing and storage. In addition, there are technologically advanced instruments for high-progressivity cytogenetic analysis (SNPs-array) as well as an automatic nucleic acid extraction pipeline.

Paediatric Laboratory (in collaboration with the Burlo Garofolo research hospital)

This laboratory was founded almost forty years ago with a strong translational vocation in the field of immune-mediated diseases. Since its founding, the main fields of activity have included gastrointestinal inflammatory and autoimmune pathology, with pioneering studies in the field of celiac disease and early-onset inflammatory bowel disease. In the field of celiac disease, diagnostic and screening tests have been developed that have resulted in the optimisation of ELISA assays and immunofluorescence, the development of organoid-based models and, finally, a patent for a new method for diagnostics on biopsy samples. In the field of inflammatory bowel diseases, links with primitive immunodeficiencies have been established, helping to describe and decipher the apparent paradox between the deficiency of a specific immune function and inflammatory and autoimmune excess, paving the way for therapeutic approaches based on mechanisms. The study of congenital immune deficiencies has offered numerous monogenic prototypes to understand the mechanisms in place in autoimmune and inflammatory diseases and to select, where possible, targeted treatments. The study of these models aims both to clarify the biological meaning of new genetic variants through cell immunology methodology, and to trace the signal pathways involved in different diseases to facilitate the choice of targeted and appropriate treatments. In the field of inflammatory and rheumatological diseases, the laboratory has developed diagnostic tests that can be used for the screening of rare diseases such as interpheronopathies or for the profiling of inflammation in subjects with complex diseases. These areas of research make use of articulated methodologies, from the study of the phenotype and immune functions, to genetic analysis with NGS techniques to transcriptomic studies. The laboratory participates in the activities of the main national and international networks in the field of immunology, rheumatology and pediatric gastroenterology and has numerous active collaborations with the other health research institutes in the Friuli Venezia Giulia region.

Advanced Disease Models Laboratory at ICGEB

Research interests:
stem cells; metabolic liver diseases; cancer; obesity; bioengineering; drug repositioning; tissue regeneration; organoids

Description of research:
Our research centres around unravelling the intricate interplay between metabolic diseases and tumour development, particularly within the context of the tumour microenvironment and stem cell nickels. We leverage our multi-disciplinary expertise in the fields of cancer, stem cells, and bioengineering to explore and gain understanding of the fundamental mechanisms that underlie tumour initiation and progression in chronic liver diseases. Furthermore, we are keenly interested in investigating the biology of tissue-resident epithelial stem cells to pave the way for innovative regenerative medicine strategies. To address our basic biomedical questions, we adopt an integrative approach combining dietary-induced and genetically-engineered mouse models, tissue engineering techniques, as well as 3D organotypic cultures. Our work involves the meticulous design of sophisticated disease models, which provide a close representation of the intricate interplay of biological factors and signalling pathways found within human and mouse tissues. This allows us to simulate disease processes with a high degree of fidelity, allowing us to investigate the underlying factors and discover novel insights into disease progression and treatment.

Immune Thrombocytopenias Laboratory

Within the ASUGI Shared Departmental Laboratory (local health authority) there is a section dedicated to research on immune thrombocytopenias. The laboratory is dedicated to research activities in the field of the physiopathology and diagnostics of immune thrombocytopenias, a group of pathologies determined by increased platelet destruction and haemorrhagic risk, characterised by extreme heterogeneity of presentation and response to therapies and, in particular, the lack of availability of predictive factors that can better guide the choice of drugs available today. In this context, the laboratory centralises and performs analyses that are carried out within the framework of the study of the Italian Group for Haematological Diseases of Adults GIMEMA 1222 BIO-ITP, a national multicentre prospective study on immune thrombocytopenias. The objective of this study is to better understand the heterogeneity of immune thrombocytopenias and to explain their response mechanisms or resistance to certain drugs. The analysis carried out in this section of the laboratory concerns the search for platelet autoantibodies, immunological and functional investigations on cells of the immune system and bone marrow. The laboratory uses state-of-the-art analytical platforms that are able perform complex analysis, including the Sysmex XN haematology platform, which carries out the fluorescent evaluation of various parameters of platelets and immune system cells, and MAIPA kits which identify the presence of autoantibodies. Bioinformatics software interprets large amounts of information and identifies patterns relevant to diagnosis and research.

Bone Lab

The Bone Lab operates in the field of osteo-integration within dental and orthopaedic specialisms. The laboratory's main objectives are the study of the physiopathology and the clinical management of osteo-integration processes, as well as the study of innovative biocompatible nanostructured materials.
The research group is equipped with skilled personnel and technologies capable of performing the morphological analysis of mineralised bone tissue and all its cellular and molecular components.
In particular, the Bone Lab is developing its expertise in the field of bone histomorphometry, that is, the quantitative analysis of parameters referring to the structure and remodelling of bone.
The laboratory instruments for optical microscopy (normal and fluorescence), transmission electron microscopy (TEM) and scanning electron microscopy (SEM) are particularly worthy of note, as well as the management of three-dimensional co-culture models and sample preparation flow.

Molecular Histopathology and Dermatology Laboratory
Pathological Anatomy - Clinical Medicine

The Molecular Histopathology and Dermatology Laboratory's research activity focuses on the study of morphological and molecular alterations involved in neoplastic pathogenesis and tumour progression. The lab's main focus is the analysis of phenotypic alterations (RNA and proteins) for the identification of biomarkers for diagnosis, prognosis and targeted therapies in certain types of neoplasm, in particular cutaneous melanoma, colorectal cancer, and ovarian cancers. In these neoplasms, the PI3K signal pathway is also analysed and studied, in particular the function of the three isoforms of AKT and their potential silencing as a therapeutic target.
The lab's research activity also aims to standardise pre-analytical processes in in vitro diagnostics, with the characterisation and study of new fixatives and stabilisers for clinical samples, both liquid and solid.

Forensic Molecular Biology Laboratory
Pathological Anatomy - Clinical Medicine

The research activity of this laboratory focuses on forensic molecular biology. More specifically, the laboratory applies molecular techniques for the genetic typing of forensic samples, including bones and samples from excavations of historical and/or archaeological interest (for example, mass graves from the Second World War).
The lab's research activity is divided between the analysis of judicial findings (such as third-party activities) and/or historical/archaeological findings, and the development of new analytical strategies that can improve the quality of results from samples that are often in limited quantities and/or degraded.
In order to minimise the risk of contamination, the laboratory has been divided into rooms, each of which is used for a specific phase of sample processing:

- retrieval and sampling room;
- DNA extraction room (with the possibility of using Maxwell automatic extractor);
- room for DNA quantification by Nanodrop spectrophotometer;
- PCR reaction preparation room;
- DNA amplification rooms (PCR endpoints and real-time PCR);
- room for analysis using an automatic sequencer (in 2023, the SeqStudio was purchased thanks to extraordinary funding from UniTS).

Recently, thanks to donations, a room has been set up exclusively for the preparation of bone and tooth samples for DNA extraction. In this room, the samples are cleaned, milled and sawn inside a negative pressure hood. The samples are then pulverised using a mechanical mill in metal jars pre-treated in liquid nitrogen to prevent overheating.

Clinical Biochemistry and Molecular Biology Laboratory
Pathological Anatomy - Clinical Medicine

The laboratory's activities focus on the study of new diagnostic/prognostic markers of certain diseases such as liver cancer, prostate cancer, ovarian cancer, breast cancer, liver fibrosis, and lung diseases such as cystic fibrosis and chronic obstructive bronchopathy. The multidisciplinary group also studies the possible use of new drugs such as proteasome inhibitors and nucleic acid-based drugs for the aforementioned pathologies. Using a combination of molecular, cellular, animal and bioinformatic approaches, the group studies the mechanisms of action of the molecules used, as well as their targets. Finally, the multidisciplinary group deals with precision medicine in the field of liquid biopsy in translational research, collaborating with national and international research groups.

Clinical Medicine Metabolism Laboratory

This laboratory carries out clinical and molecular research into different aspects of metabolism in different human clinical conditions such as diabetes, reduced physical activity, obesity, dyslipidemia, vascular diseases and sepsis. This is achieved through the study of protein/amino-acid turnover, cellular lipid composition, redox status, and the determination of biomarkers in various clinical conditions with various methods. Among the advanced instruments available to the laboratory are a sequencer (Applied Biosystems), an AGILENT Bioanalyzer and a mass spectrometer. The laboratory has various collaborations with national and foreign research centres as well as with supranational organisations.

Forensic Histopathology Laboratory

The laboratory is exclusively dedicated to forensic activity and actively conducts research in this field. Research areas include routine staining and immunohistochemistry, topics related to the study of cardiomyopathies, the mechanisms of autophagy and apoptosis in traumatic encephalic injuries, and in the study of gunshots (e.g., immunochemical staining with sodium rhodizonate). The laboratory also uses electrophoresis and western blot techniques and instrumentation.
The lab's expertise and equipment are made available to the prosecutor's offices and courts of the Friuli Venezia Giulia region for the possible forensic needs of clients through their consultants / experts. It also has numerous national and international collaborations.

Digital Pathology Laboratory

Alongside its Menarini D Sight scanner, the laboratory has recently acquired a new Olympus VS200 scanner with a fluorescence module. The scanner's set-up is still being perfected and it will be used for applied research. The scanner transforms an analogue slide (of the traditional cytological and histological sort) into a digital 'slide' with variable resolution, achievable thanks to the scanner's multiple lenses and image acquisition system. The instrument can also be used to scan multiple layers (Z Stack) and capture the fluorescent field. The digital scans are compatible with a variety of analysis software, and artificial intelligence programs shall also be available soon. Over the last two months, a large set of digital slides was installed on the University server, which can be viewed from the computers in the computer room. Currently the laboratory is engaged in scanning images in different formats and in the production of sets of digital slides for telepathology and histopathological teaching activities. The laboratory is already collaborating with the Department of Life Sciences research group so as to enhance the applications of the instrument for advanced research, including in florescence. Other collaborations are already planned with some research groups from the Department of Physics. The connection with the University server has been perfected for the optimisation of the storage of the scanned material with a good data transmission speed. Available memory space will have to be approved, however, given the very significant size (tens of gigabytes) of the individual digital scans.

DEPARTMENT OF LIFE SCIENCES

Applied Immunotechnology Laboratory - LIA

This laboratory has been developing innovative technologies for over 20 years to identify standardised, high-quality 'affinity reagents'. The laboratory's approach has moved beyond old technologies based on the use of animals, instead applying the latest antibody display technologies. These technologies now provide powerful tools to create a 'tube immune system' through which is possible thanks to an innovative integrated pipeline, high throughput selection and characterisation of recombinant monoclonal antibodies.

The procedures use the most modern tools: cell sorting by FACS for in vitro antibody selection; next-generation sequencing for the analysis of the procedure; biolayer interferometry, cytofluorimetry and in vitro tests for functional characterisation.
Over the years, antibodies which work against over 100 different proteins have been selected in collaboration with academic and industrial laboratories. To date, many of the affinity reagents developed are being evaluated for their therapeutic potential or are already used in diagnostic kits available on the market.

Applied and Comparative Genomics Laboratory - GACT

This laboratory offers a range of advanced services and activities in the field of genomics and bioinformatics. The laboratory collaborates with national and international institutions on advanced research projects in the field of genomics and evolution. Having at its disposal advanced next-generation sequencing technologies and state-of-the-art instrumentation for bioinformatics analysis and genetic data management, the laboratory is well-placed to collaboraßte on large scale projects for the study of biodiversity and species conservation.
The main activities and services provided are:

- genomic analysis services, with assembly and annotation of transcriptomes, and the prediction of homologies and phylogenetic studies to study the evolutionary relationships between species, with particular focus on the comparative genomics of the animal immune system;
- eDNA analysis from environmental samples for full biodiversity analysis, identification of specific species and pathogens in environmental samples of soil, air, water, early detection of pathogens and invasive species, and study of aerial biodiversity on human health and the environment.

Genomic studies for the conservation of endangered species and genetic analysis are also carried out to support biodiversity management and conservation plans.

Molecular Oncology Laboratory - LOM

This laboratory brings together research teams with specific expertise in the use of cell models for the study of cancer. The group deals with the generation and use of organoids derived from both cell lines and clinical samples of tumours. It has a facility dedicated to these cultures, equipped with a biosafety cabinet, phase contrast microscope with video camera, and incubator that allows the control of the oxygen percentage.
In addition, it has extensive knowledge of the production and use of lentiviruses and retroviruses for research applications on classical and organoid cell models. For these activities the group has a dedicated departmental facility, with BSL2 level security.
The laboratory has a state-of-the-art tool to perform single cell gene expression analyses (10X Genomics) in complex biological samples.

Plant Ecophysiology Laboratory - LEV

This laboratory serves as a meeting point for research groups with specific expertise in the field of plant biology and physiology, with particular regard to vascular plants and lichen symbiosis. Controlled experiments in greenhouses and laboratories as well as field investigations are used to study how the water balance of plants is affected by different environmental parameters and how plants deal with the reduction of water availability, the energy balance of lichen symbiosis and gaseous exchanges. State-of-the-art non-invasive methods such as X-ray microtomography (Micro-CT) are adopted to validate and support more traditional techniques used in the study of plant hydraulics, while a rich and modern range of instruments allows the characterisation of gaseous exchanges and the emission of chlorophyll fluorescence at different levels of organisation, from the individual, to the tissues of an organ, to the individual cells of a culture.

Psychology Unit

This laboratory is active in several areas of research closely linked to the paradigms of experimental psychology in the study of neuro-cognitive functions over the life span of an individual. It is equipped with advanced equipment and systems for the study of various physiological parameters related to psychic activity and boasts unique equipment within the University.
In particular, there is a workstation with Eye-Tracker in its Desktop Mount configuration with the Remote Camera upgrade combined with the Tower-Arm Combination. The instrument is a flexible system and allows the study of eye movements (both slow and fast) in controlled and free conditions of the head (that is, whether the head is stabilized or not by a chin guard) in response to computer-generated and real stimuli.
In addition, there are tools for the functional physiological investigation of normal and pathological psychological processes and mechanisms.
The laboratory's expertise in the use of these instruments is available to health and welfare bodies and/or companies operating in the area to provide specific measurement protocols to be used in both high-control and ecological experimental settings.

PATENTS

The Technology Transfer and Business Relations Office manages the intellectual property of the University of Trieste. In particular, it oversees procedures for the development, administration, and protection of patents based on technology produced within the University. Activities include:

- support to teaching and research staff in defining the patentability requirements of their findings;
- prior art searches;
- the stipulation of agreements with external patent specialists able to provide expert advice to University staff interested in patenting; assistance in the stages of filing, validation, and commercialization;
- management of the related administrative processes.

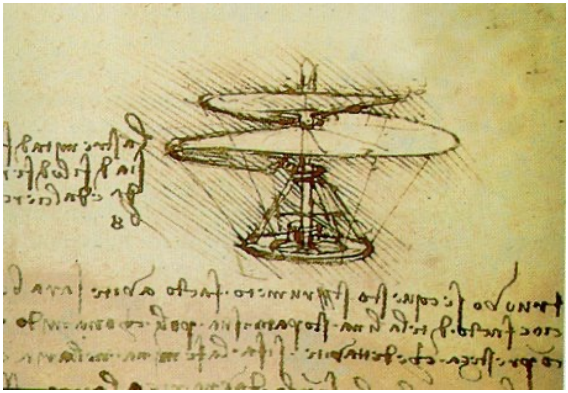
If you believe you have achieved an inventive result, you can submit your proposal by completing the disclosure form available in the forms section and sending it to the Technology Transfer and Business Relations Office.
The three basic requirements for the validity of a patent are novelty, originality (inventive step) and industrial applicability:

Novelty
An invention is considered new if it is not already included in the state of the art, i.e. if it has not yet been made accessible to the public, in Italy or abroad, before the date of filing of the patent application through written or oral disclosure, use or any other means (Ref. Art 46 IPC).

Originality
An invention involves an inventive step if, for an expert in the field, it is not obvious from the state of the art. The requirement of non-obviousness is intended to ensure that patents are granted only to results that are the subject of an inventive or creative process and not to processes that a person, with ordinary skill in the relevant technological field, could easily deduce from what already exists (Ref. Art. 48 IPC).

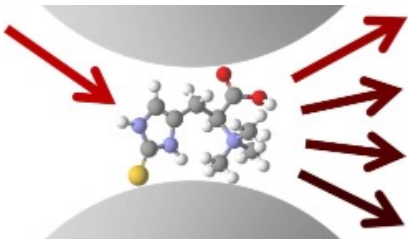
Industrial aspplicability
An invention has an industrial application if its object can be manufactured or used in any kind of industry, including agriculture (Ref. Art. 49 IPC). An invention cannot therefore be a mere intellectual process, but it must be technically feasible and capable of leading to an immediate result in the field of industrial technology by generating practical effects.

Contacts/info: brevetti@units.it



Vite aerea, Leonardo Da Vinci, 1489

SERS METHOD FOR ERGOTHIONEINE (EG) QUANTIFICATION



Category: Analytical Chemistry
Patent Ownership: UNIVERSITÀ DI TRIESTE
Inventors: Stefano Fornasaro, Gioia Venturotti, Alois Bonifacio
Priority Date: 21/09/2023
Patent Application Number: 102023000019458
Patent Status: (Pending/granted)
Licensing Availability: Available Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description

The proposed technology enables the quantification of ergotioneine in a sample by employing Surface enhancer Raman scattering (SERS) spectroscopy and an internal standard that is specific to ergothioneine.

Innovative aspects and main advantages

SERS spectroscopy utilises the phenomenon of enhanced Raman scattering signal when analytes are adsorbed on nanostructured metal surfaces, like gold or silver nanoparticles, enabling precise and sensitive analytical measurements.
The use of an internal standard for ergothioneine helps to reduce any potential variability in the SERS signal that may occur during sample preparation and analysis.

Applications

Ergothioneine is a dietary amino acid that has garnered significant attention due to its impressive antioxidant properties and potential health benefits. There is an increasing need for a precise and straightforward method to measure ergothioneine in various complex matrices like food, cosmetics, and biological samples. Current analytical methods necessitate cumbersome and destructive procedures for sample preparation, time-consuming separations, the use of high-purity reagents, and frequently lack the necessary sensitivity to detect ergothioneine at low concentrations in biological fluids.

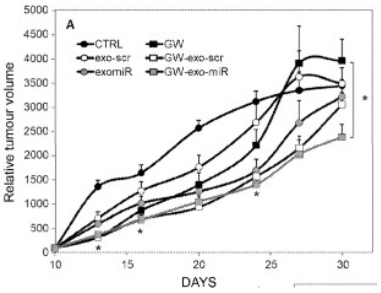
Potential market

With the continuous discovery of its benefits and applications, the use of ergothioneine as an ingredient is expanding. Its versatile properties, stability and powerful antioxidant properties make it an interesting choice for many industries that aim to develop products with enhanced functionality, health benefits and attractive to consumers. Companies working in the field of ergothioneine production can immediately benefit from this quick method. Furthermore, the proposed technology may also be exploited for the development of a diagnostic and prognostic tool for use in clinical trials involving ergothioneine.

Development status

Technology available for the market.

miRNA FOR THE THERAPEUTIC TREATMENT OF TUMOURS



Category: Medical Sciences
Patent Ownership:
Università Politecnica delle Marche Università degli Studi di Trieste
Inventors: Massimo Bovenzi, Federica Monaco Marco Tomasetti, Lory Santarelli
Priority Date: 20.04.2022
Patent Application Number:
Patent Status: granted
Licensing Availability: Available
Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description

The present invention falls within the field of the therapeutic treatment of tumours. More 5 specifically, the invention relates to a combination anticancer therapy, including the administration of the tumour suppressor miRNA miR-126 carried within exosomes, in combination with a further compound having the purpose of increasing the effectiveness of the tumour suppressor miRNA.

Innovative aspects and main advantages

The invention allows miR-126 to be accumulated within the tumour cells, which results in growth arrest and death of the tumour cells. Advantageously and unexpectedly, the combination treatment of the invention was found to be effective both against the primary tumour, limiting its growth and development, and against cancer stem cells, inhibiting the occurrence of relapses and metastases.

Applications

- Combined anticancer therapy
- Reduction of the systemic toxicity of the treatment
- miR-126 and the exosome release inhibitor are administered in the same preparation

Potential market

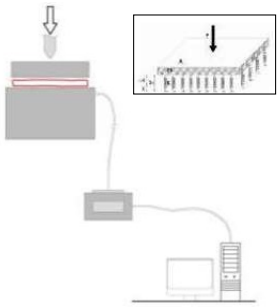
Industrial production of pharmaceutical formulations for anticancer therapy.

Development status

Completed experimental work in cell lines and animal models.

DEVICE AND METHOD FOR DETECTING THE STRUCTURAL INTEGRITY OF A SAMPLE OBJECT

An innovation in non-destructive tests



Category: Engineering
Patent Ownership:
UNIVERSITÀ DI TRIESTE
Inventors: Marco CANIATO
Priority Date: 02/07/2015
Patent Application Number:
102015000030143, EP3112836
Patent Status: Granted in Italy, France, Germany, Great Britain
Licensing Availability: Available
Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description

The major problem encountered in the application of polymer industrial products is the difficulty to model and effectively predict material performances and service life according to applied loads and operating environmental conditions.
Furthermore, the presence of defects such as voids or inclusions created during manufacturing may affect the final performance.
The aim of this invention is to develop an innovative acoustic non-destructive technique, able to verify defects into composite laminates.

Innovative aspects and main advantages

Starting from the determination of the dynamic stiffness (spring behavior) the aim is to extend the application range of this technique and provide information on polymer composite internal structure.
The dynamic stiffness is based on the mass-spring effect. Hence, it could be possible to check the presence of defects within materials without using destructive tests time, speeding up the quality control time and extremely reducing costs.

Applications

The invention could be applied to quality control at the end of the production process as well as in situ consolidation and defects investigations.

Potential market

Target industries are polymers and polymer composites industries dealing with laminates or panels products as well as companies performing non-destructive tests.

Development status

The technique is ready and tested on polymer laminates; the development processon defect position identification is under evaluation. The next step concerns the scale-up of the process.

METHOD TO RECYCLE MATERIALS OBTAINED BY GELATION

Method for the functional recycling of materials based on polymeric matrices with polymer-counterion ionic junctions

Category: Engineering
Patent Ownership:
UNIVERSITÀ DI TRIESTE
Inventors: Matteo Cibinel, Vanni Lughi
Priority Date: 10th January 2020
Patent Application Number:
102020000000322, EP21150687
Patent Status: Granted in Italy, pending in Europe
Licensing Availability: Available
Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description

This invention concerns a functional, efficient and low- temperature method of recycling composite materials whose matrix is formed by ionic interaction between an ionic polymer and a counterion. More specifically, the utilization of a water solution containing a chelating agent allows the selective sequestration of the counterion that forms the reticulant junctions. The compound matrix is thus dismantled and the material, which is now in a liquid form, may be processed. The inhibition of the chelating agent by change of pH makes the counterion available again, allowing the reticulation of the matrix. The material thus recycled, if processed in the same conditions as the original material, maitains its functional properties. The presence of the deactivated chelating molecule within the matrix of the recycled material facilitates further functional recycling with the abovementioned method, making it unnecessary to add more chelating agent. The patent includes the parameters needed for the material to be recycled with this method (structure of the matrix and chemical composition) and the parameters of the recycling process.

Innovative aspects and applications

Polymers with an ionic reticulation, especially polysaccharides, can find notable applications in fields such as pharmaceutics, the food industry, biomedicine and constructions (thermoacoustic isolation). Nevertheless, there is little interest in finding an alternative solution to the disposal of materials based on these polymers, which limits their “utilization life span.” The process described in this patent is therefore meant not only to lengthen their functional life, but also, at the same time, to reduce the environmental and financial impact coming from the production of new materials from virgin raw materials.

Main advantages

Inexpensive; the recycling process does not damage the polymer; once the main matrix is dismantled, the material is completely workable, and the initial composition can be changed to improve/modify the properties of the final material; the recycled material can easily go through further recycling; the functional properties of the material can be maintained.

Potential market

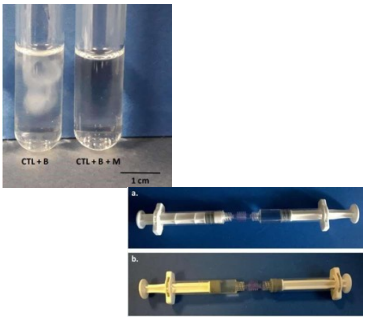
Sectors of the construction industry, the food industry, biomedicine and pharmaceutics that use/develop materials based on a matrix with ionic interactions.

Development status

The process was lab tested on a thermally insulated and sound- absorbing compound. The functional characteristics are maintained in the material recycled with the abovementioned method.

CHITOSAN OLIGOSACCHARIDE-BASED HOMOGENEOUS HYDROGELS AND THEIR APPLICATIONS

Procedures for the preparation of chitosan oligosaccharide-based hydrogels to obtain homogeneous matrices and viscoelastic materials



Category: Life Sciences
Patent Ownership:
UNIVERSITÀ DI TRIESTE
Inventors: Ivan Donati, Eleonora Marsich, Pasquale Sacco, Franco Furlani, Francesca Scognamiglio
Priority Date: 30th April 2019
Patent Application Number:
102019000006448; P021169IT-01/lm
Patent Status: Pending in Italy
Licensing Availability: Available
Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description

The invention concerns the procedures for the preparation of chitosan oligosaccharide-based hydrogels and boric acid to obtain homogeneous hydrogels through homogenising reagents.
It also comprises the description of the uses of hydrogels in biomedical and pharmaceutical sectors, in viscosupplementation applications, as a substitute for extracellular matrices and as a drug delivery device.

Innovative aspects and applications

As is known, after the addition of boric acid, chitosan oligosaccharide derivatives form pH-neutral inhomogeneous precipitates unless an intense mechanical agitation is applied.
The inventors identified a procedure for the preparation of hydrogels that involves the use of homogenising reagents to obtain homogeneous matrices and viscoelastic materials from chitosan oligosaccharide derivatives.

Main advantages

- Provides hydrogels and viscoelastic materials without the disadvantages connected to the presence of precipitates
- Quick
- Inexpensive
- Versatile

Potential market

Biomedical, food and cosmetic industries.

Development status

Available for the market.

PHOTOPOLYMERIZABLE ANTIBACTERIAL MONOMER

The present invention relates to a photopolymerizable antibacterial onomer suitable for use in dentistry

Category: Biomedical
Patent Ownership:
UNIVERSITÀ DEGLI STUDI DI TRIESTE
ALMA MATER STUDIORUM - UNIVERSITÀ DI BOLOGNA
Inventors: Milena Cadenaro, Gianluca Turco, Lorenzo Breschi, Eleonora Marsich, Lidia Fanfoni
Priority Date: November the 12th, 2019
Patent Application Number: 102019000020949
Patent Status: Granted
Licensing Availability: Available
Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description

It is a new family of molecules with antibacterial properties, capable of being easily and effectively used as antibacterial monomers in a wide range of adhesive resins for dental use, without cytotoxic effects at the concentrations used and without compromising the mechanical properties of the resins after photopolymerization.

Innovative aspects

One of the critical issues in restorative dentistry is the presence of bacteria in the oral biofilm, which are involved in the development of secondary caries and the demineralization of enamel and dentin at the margins of restorations. To this end, new restorative materials containing antibacterial compounds have been developed. These compounds can copolymerize with the methacrylate monomers commonly used in dentistry, leading to the formation of a polymer network with antimicrobial properties.

Main Advantages

- It is biocompatible
- It is antimicrobial
- It does not alter the color of the polymeric material with which it is mixed
- It is effective even at low concentrations: 0.75-1.25%
- It can be integrated into adhesive systems and composite materials for dental use
- It is soluble in ethanol, acetone, water, and isopropanol

Potential market

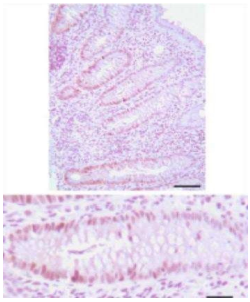
One of the strengths of this invention lies precisely in the ease of including the molecules covered by this patent in the most common restorative dentistry products. Several companies producing dental materials could be interested in and benefit from this patent.

Development status

The research demonstrates feasibility. The concept is proven with a mock-up that reproduces the analytical expectations.

METHOD AND APPARATUS FOR THE ANALYSIS OF A SAMPLE OF SPUTUM

Use of low-field nuclear magnetic resonance (LF-NMR) on patients with pulmonary pathologies



Category: Biotechnology - Engineering
Patent Ownership:
UNIVERSITÀ DI TRIESTE
Inventors: Gabriele Grassi, Mario Grassi, Michela Abrami
Priority Date: 10th June 2016
Patent Application Number:
102016000060004, 17175371.8
Patent Status: Granted in Italy, pending in Europe
Licensing Availability: Available
Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description

The invention concerns the use of low-field nuclear magnetic resonance (LF-NMR) to monitor patients with pulmonary pathologies on a microbial basis using sputum.

Innovative aspects and applications

Currently, sputum is analysed to assess whether pharmacological therapy is needed and what its possible effects could be in patients with pulmonary pathologies on a microbial basis. This procedure is expensive (it requires well-equipped laboratories and highly specialised staff) and the results are not immediately available (average waiting time = 3 days).

Main advantages

This invention's advantages are numerous: it is simple (it is sufficient to insert a sample of saliva in the NMR machine), inexpensive (it does not require labs nor highly specialised staff) and, therefore, it allows frequent monitoring of the patients.

Potential market

The global market of medical diagnostics hospital labs, as well as the low-field NMR equipment manufacturers.

Development status

Available for the market.

APPARATUS AND METHOD TO MONITOR THE PARAMETERS OF MECHANICAL VENTILATORS

New technology in artificial respiration

Category: Life Sciences
Patent Ownership:
UNIVERSITÀ DI TRIESTE
Inventors: Umberto Lucangelo, Francesco Fabris, Luca Bortolussi, Alberto Casagrande, Massimo Borelli, Francesco Quintavalle
Priority Date: 14th October 2016
Patent Application Number:
102016000103298, EP3308819
Patent Status: Granted in Italy, France, Germany, Great Britain, Spain, Switzerland, Sweden, Netherlands Licensing Availability: Available
Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description

This invention consists of both an apparatus and a method to monitor the operating parameters of mechanical ventilation equipment. Based on the information received by the machinery, the apparatus regulates the parameters of the ventilator. Mechanical ventilation machinery, known as ventilators, are generally set up to manage a patient's breathing by providing their lungs with air at a preset frequency.

Innovative aspects and main advantages

The apparatus and the method mean to detect asynchronies between the inspiration and expiration conditions imposed by the machinery and the inspiration and expiration attempted by patients who are attached to the ventilator for their partial inability to breathe on their own. During artificial respiration, pathologic phenomena or breathing asynchronies between the inspiration and expiration of the patient and the phases of the ventilator may occur, causing severe damages and dangerous issues. These asynchronies are not detected automatically in real time by the machinery unless invasive devices are used. This invention thus provides a way to quickly modify the parameters of the ventilator without resorting to invasive measures and to synchronise the induced inspiration and expiration phases with the patient's actual inspiration and expiration phases.

Applications

This invention, by providing a simple and automatic way to detect breathing asynchronies, allows to effectively manage the operation of ventilators.

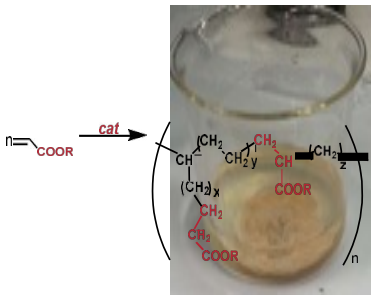
Potential market

The main recipients of this invention are the manufacturers of intelligent artificial ventilation solutions.

Development status

Available for the market.

CATALYSTS AND PROCESS FOR OLEFINS AND POLAR VINYL MONOMERS COPOLYMERIZATION AND OLEFINS HOMOPOLYMERIZATION



Category: Chemistry
Patent Ownership:
UNIVERSITÀ DI TRIESTE
Inventors: Barbara Milani, Anna Dall'anese, Cyril Godard, Myriam Yasmine Souleymanou
Priority Date: 17/02/2020
Patent Application Number: PCT/EP2020/054037
Patent Status: Pending
Licensing Availability: Available
Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description

The present invention deals with the development of new, efficient, homogeneous catalysts for the synthesis of functionalized polyolefins featuring the polar vinyl monomer either in the main chain or both in the main chain and at the end of the branches. The content of inserted polar monomer is in the range 0.2 – 4.0 mol %; the molecular weight of the synthesized macromolecules covers the range 800 Da – 360 kDa. These catalysts perfectly fits in pursuing the objectives of sustainable resources exploitation, cost and atom-efficient technologies.

Innovative aspects and main advantages

The main innovative aspects deal with the proper combination between the peculiar ligand present in the catalyst and the reaction conditions.
With respect to the current industrially applied technologies, these new catalysts:

- are active under very mild reaction conditions;
- do not require the addition of any cocatalyst and/or additive;
- allow a high control of the macromolecule architecture.

Applications

Synthesis of functionalized polyolefins.

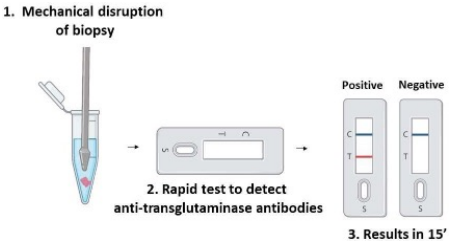
Potential market

Industries involved to plastic material production.

Development status

Research level, ready to pilot plant.

NEW METHOD
A new easy and fast method to detect celiac disease specific antibodies



Category: Chemistry
Patent Ownership:
University of Trieste, IRCCS Burlo Garofolo
Inventors: Tarcisio Not and Luigina De Leo
Priority Date: July 23d, 2021
Patent Application Number:
102021000019616, EP22186201
Patent Status: Granted in Italy, pending in Europe
Licensing Availability: Available
Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description
The patent describes a new method of manipulating the intestinal biopsy sample to obtain a biological liquid in which to detect intestinal anti-transglutaminase antibodies (anti- ttg). Intestinal anti-ttg are specific of celiac disease (CD) and are particularly useful for making an early diagnosis of the disease in its atypical forms of manifestation that are difficult to identify.

Innovative aspects and main advantages
To date the detection of intestinal anti-ttg is based on too demanding methods that require highly specialized personnel and dedicated instrumentation. Therefore, this marker is available in a few specialized centers. By using this new method any gastroenterology center with a digestive endoscopy unit will be able to detect intestinal anti-ttg and have the result at the end of the endoscopic session.

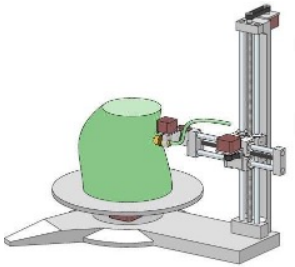
Applications
The new method will allow a more widespread use of this marker to promptly recognize CD and reduce delay in diagnosis resulting in economic savings for the healthcare system. Currently, patients with atypical forms of CD have to undergo repeated and invasive tests before receiving the diagnosis. An early diagnosis of CD in children is essential to ensure good health and good growth.

Potential market
The reference market is represented by companies involved in the implementation of products useful for the diagnosis of autoimmune and gastrointestinal diseases such as CD and by hospitals/clinics with gastroenterology centers equipped with a digestive endoscopy unit.

Development status
The patent has so far been validated at the laboratory level with a recently published single- center study (AmJGastroenterol 2023 1;118(4):738). A multicenter study financed with the PNRR call (PNRR-POC-2022-12376280) is
currently underway for validation in the reference context (endoscopic room of a gastroenterology center). The current TRL of the technology is 4 and we hope to reach 5 with the implementation of the multicenter study.

AN ADDITIVE MANUFACTURING DEVICE FOR MANUFATURING A THREE- DIMENSIONAL OBJECT

A revolution in 3D printing



Category: Engineering
Patent Ownership:
UNIVERSITÀ DI TRIESTE
Inventors: Stefano Seriani
Priority Date: 24/07/2015
Patent Application Number:
PCT/IB2016/054484
Patent Status: Granted in Italy
Licensing Availability: Available
Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description

Traditional Fused Deposition Manufacturing (FDM) 3D printing works by deposition of planar layers of termoplastic polymers. The resulting components are prone to delamination which occurs between these layers. The hybrid 3D printer we propose exploits a 2-phase approach, where a core is initially printed in the usual way (from the top), and subsequently acts as a substrate for the deposition of material on its side, with a revolving motion.

Innovative aspects and main advantages

By adding 2 axis to the print-head, and exploiting a cartesian-revolving kinematics, this revolutionary approach allows FDM technology to overcome inter-layer delamination. It is exceptionally well suited to be implemented in concert with the most recent techniques for long fibers composite 3D printing, providing unparalleled strength-to-weight ratios, especially in loosely revolved geometries.

Applications

Turbine blades, rotating shafts, pipelines, and presurrized tanks, for example, have geometries that get along extremely well with this technology, and often require either the high strength and low weight that it is able to deliver. All of this within the realm of additive manufacturing, suited for reduced lead-time production and prototyping.

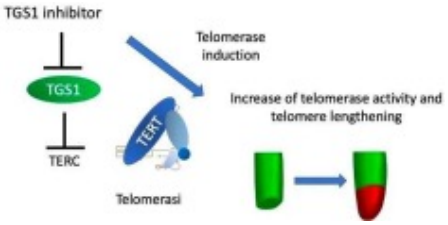
Potential market

Small-scale production of high strength/weight ratio components, for example in isolated areas (Antarctica, disaster-struck communities, ISS), where supplying and delivery costs are too high or where access is entirely hindered.

Development status

Principle evaluation and testing, prototipation of a print head, development of a machine prototype. Currently waiting for patent approval.

PHARMACEUTICAL COMPOSITION FOR THE CHEMICAL INHIBITION OF THE THERAPEUTIC TREATMENT OF TELOMEROPATHIES



Category: Biomedicine
Patent Ownership:
UNIVERSITÀ LA SAPIENZA, UNIVERSITÀ DI TRIESTE
Inventors: Grazia Daniela Raffa, Stefano Cacchione, Stefan Schoeftner
Priority Date: May 27th, 2020
Patent Application Number:
102020000012577, EP21732980.4, Canada 3180376, USA 17/99
Patent Status: Pending in Italy, Europe, Canada, USA
Licensing Availability: Available
Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description

Telomeropathies are multiple organ diseases characterized by abnormal telomere shortening caused by mutations in genes regulating telomerase activity. A promising therapeutic strategy aims to increase the expression of TERC, one of the telomerase components. TGS1, a gene that negatively regulates TERC levels, is a possible target. The present invention uses the compound sinefungin to inhibit TGS1 activity. TGS1inhibition results in an increase of telomerase activity and in telomere lengthening. The invention represents a new therapeutic strategy for telomeropathies.

Innovative aspects and main advantages

There are no current effective treatments that directly target the causative factors of telomeropathies. Transplantation represents the only hope to alleviate the tissue damages consequent to the reduction of the replicative potential of several types of staminal cells, and in particular of the hematopoietic cell line. The strength of the patent is that the invention targets specifically the primary causative effect, that is short telomeres. The discovery that the enzyme TGS1 is a negative regulator of TERC, the RNA component of telomerase, suggests that TGS1 might be an excellent therapeutic target. The present invention consists in the pharmacological inhibition of the TGS1 enzyme and in the consequent lengthening of telomeres, which could potentially counteract the progression of short telomere diseases.

Applications

The present invention is targeted to the therapeutic use in diseases such as discheratosis congenita (DC), aplasticanemia, idiopathic pulmonary fibrosis, Hoyeraal–Hreidarsson syndrome. All these genetic diseases have in common the same primary defect: abnormally short telomeres and strong decrease of the replicative potential of several typesof stem cells. The used compound causes a remarkable increase of telomere length in several cell types. The development of the invention has two main goals. The first is the preparation of pharmacological compositions that can be directly administered to patients. The second goal is treating in vitro stem cells of the patients until a significant increase of telomere length is reached. Then, treated stem cells may be reintroduced in the patient.

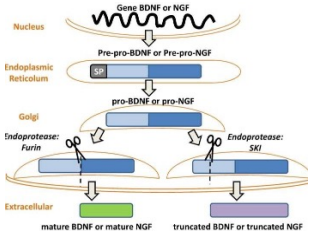
Potential market

Pharmaceutical companies; therapeutic intervention to attenuate pathologies connected with accelerated aging; anti-aging.

Development status

TRL 3 – experimental proof of concept-3 years.

METHOD FOR THE PRODUCTION OF PROTEOLYTICALLY PROCESSED FORMS OF TROPHIC OR GROWTH FACTORS



Category: Biology, Red Biotechnologies
Patent Ownership: UNIVERSITÀ DI TRIESTE
Inventors: Tongiorgi Enrico, Giaretta Laura
Priority Date: 24.12.2020
Patent Application Number: 102020000032423
Patent Status: Granted on 01.02.2023
Licensing Availability: Available
Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description

The invention consists in a method for producing a trophic or growth factor in a mature or truncated form, by expression in the same eukaryotic cell of a sequence coding for said factor in the immature form, together with the sequence coding for the enzyme that proteolytically cuts it to obtain the mature or truncated form. The sequence coding for the trophic or growth factor in the immature form and the sequence coding for the proteolytic enzyme may be included in the same expression vector or in two different vectors to be co-expressed in the same cell transiently or constitutively. The cell hosting the expression vector(s) for production is a eukaryotic cell that can be of any animal origin. Purification can be by tags (e.g. His-tag) for research applications or by chromatography for tag-free forms intended for therapeutic, implantological or cosmetic use.

Innovative aspects

The neurotrophins BDNF (Brain-Derived Neurotrophic Factor) and NGF (Nerve Growth Factor) are useful repair factors for neurons, epithelia and in dental transplants. The present invention, through expression in eukaryotic cells, enables production of mature BDNF or NGF directly in the secretory pathway with release of the final product directly into the culture medium, thus facilitating their large-scale production and purification.

Main advantages

- Release of recombinant trophic or growth factor directly into the culture medium
- Selective production of mature peptide with high yields (especially in combination with another of our patents)
- Physiological glycosylation and folding of the protein as it is produced in eukaryotic cells
- Possibility of production with C-terminal tag or without any tag

Applications and Potential market Therapeutic applications

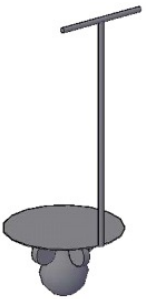
- Eye drops for retinitis, lens surgery, cataracts,
- Intranasal sprays for neurological and neuropsychiatric disorders
- Plasters, gels and medicated ointments for tissue regeneration
- Cosmetic applications: regenerative preparations for skin and nails
- Implantology applications: dental implants, gum reconstruction
- Biomedical and biotechnology research

Development status

TRL 4: “Lab-validated technology”. An initial production prototype was built to demonstrate the technology, its function, and results in the laboratory. The objective of TRL 4 is to determine whether the individual components are able to work together as a system.

VEHICLE ON SPHERICAL SUPPORT AND METHOD FOR MANAGING THE MOVEMENT OF SAID VEHICLE

Moving in a new way: Ecological, compact and safe



Category: Engineering
Patent Ownership:
UNIVERSITÀ DI TRIESTE
Inventors: Walter Ukovich, Massimiliano Nolich, Fabrizio Roman
Priority Date:22/09/2015
Patent Application Number:
IT102015000053758, EP3353043
Patent Status: Granted in Italy,
Licensing Availability: Available
Contacts:
Technology Transfer and Business Relations Office
E-mail: brevetti@amm.units.it
Ph: + 39 040 558 3821

Brief description

This patent describes a method for manage the movement for a vehicle using a spherical support capable of omnidirectional movement. It can perform real-time synchronization of data gathered from two parallel and independent subsystems that rules the forward/backward movement and the left/right movement: it is well suited for personal movement in indoor and structured environments.

Innovative aspects and main advantages

This patent is related to an electric vehicle that can simplify the movement in urban spaces that can be crowded as it allows to move in all the direction without having a wide space for manoeuvres. It is also well suited as a basis for wheelchairs to simplify movement is structured environments.

Applications

This type of personal mobility vehicle is more flexible with respect with existing electric ones (e.g. Segway) as it allows the user to move easily in all the directions without complex manoeuvres to steer the vehicle. Moreover, the parallel and synchronized management method is computational inexpensive and can be implemented on state of the art hardware.

Potential market

The vehicle is well suited for a wide range of structured environments, both indoor (industrial plants, warehouses, shops, malls, hospitals, houses) and mixed indoor-outdoor (parking areas, railway stations, airports, etc).

Development status

The technology is ready to be implemented in the real world market.

SPIN-OFFS

A 'spin-off' is a new entrepreneurial initiative created to use specific results from university research to produce something that does not fall within the institutional aims of the university. Spin-offs are useful tools for innovation, i.e. the process of economic valorization of knowledge and its transformation into goods, services and production processes through technology transfer activities. The University carries out these activities in line with its policies on enhancing scientific and technological research. Spin-offs are limited liability companies characterized by:

- the involvement of at least one university staff member who will develop their idea for an industrial application;
- a clear business aim, consisting of a specific project for the transfer of technologies and for the development of results of industrial research activities;
- the involvement of third parties, as financing and/or industrial partners.
- Spin-offs at the University of Trieste are divided into two main types:
- university spin-offs (if they envisage the University's participation in the share capital);
- academic spin-offs (if they do not include the University as a partner).
- Members of teaching and research staff or technical and administrative staff (if they are patent holders or have relevant know-how) may propose the establishment of spin-offs at the University of Trieste by submitting:
- a spin-off activation request form;
- a business plan that includes an economic and financial plan with a 5-year perspective;
- a proposal for the regulation of any intellectual property;
- a proposal for a financial allocation in the form of share capital, its composition and the way in which it will be raised.

The proposal for a university spin-off must be approved in advance by the department of the proposers. This approval should consider any initial request to be hosted within the department, a declaration of absence of conflict of interests with the institutional activities carried out at the department itself, and a declaration of any burdens deriving from the sharing of obligations.
The proposal then goes to the Rector, the Technical Committee, the Academic Senate and the Board of Directors for approval.
Proposers from within the University must necessarily assume the status of spin-off members and retain this status for a period of at least 5 years. One of them must also take on the role of Project Manager. The Project Manager is responsible for ensuring that the business aims remain consistent with the project approved by the University bodies and also acts as the University's main contact for coordinating activities with administration.

Name:	AMBIENTE RICERCA CONSULENZE E SOLUZIONI SOSTENIBILI – ARCo SolutionS s.r.l.
Activities:	Assessments on the state of the environment and chemical risk, development of innovative methodologies for monitoring air quality and local products, design of computerised centres for the collection and management of chemical-environmental data.
Project Manager:	Gianpiero Barbieri
Website:	www.arcosolutions.eu

Name:	Bilimetrix s.r.l.
Activities:	Products and processes of the biomedical sector, with particular regard to the development of in-vitro diagnostic systems, and creation of diagnostic devices in the neonatal field to determine bilirubin in new-borns.
Project Manager:	Diego Sardon
Website:	www.bilimetrix.net

Name:	bio IMeD s.r.l.
Activities:	Development, production, and commercialization of a device for automating the liquid biopsy process for the isolation of circulating tumor cells, utilizing an innovative microfilter made with nanotechnological components, microfluidic chips, and artificial intelligence.
Project Manager:	Agostino Accardo
Website:	www.bioimed.it

Name:	CENERGY s.r.l.
Activities:	Production, commercialization, and management of products and systems for energy generation, particularly in the areas of energy generation and propulsion within the naval, aerospace, aeronautical, and transportation sectors.
Project Manager:	Rodolfo Taccani
Website:	www.cenergy.it

Name:	D-ETECH s.r.l.
Activities:	Research, development, prototyping, and production of solutions for energy generation, distribution, storage, and utilization systems for fixed users and transportation systems with a smart grid perspective.
Project Manager:	Giorgio Sulligoi
Website:	www.d-etech.it

Name:	Dyn@mika s.r.l.
Activities:	Strategic analysis in the areas of management control and corporate finance, with the development of innovative management and IT solutions to support the advancement of the local and national business landscape.
Project Manager:	Bruno De Rosa
Website:	www.dnksrl.it

Name:	Esplora s.r.l.
Activities:	Engineering studies, marine, geophysical, geological, and geodetic surveys, development of innovative and advanced technologies in the fields of construction, telecommunications, geological investigations, engineering, energy, and natural resources.
Project Manager:	Michele Pipan
Website:	www.esplorasrl.it

Name:	ESTECO S.p.A.
Activities:	Provision of informational services and software for advanced optimization and integration environments, intended for specialized applications in virtual experimentation, design, research, and industrial development utilizing extensive scientific computing tools.
Project Manager:	Prof. Enrico Nobile
Website:	www.esteco.com

Name:	Laboratorio di Ingegneria Ferroviaria e Traffico - LIFT s.r.l.
Activities:	Consulting in the field of railway engineering, traffic engineering, and more broadly transportation engineering, including the planning of public and private services and the functional design of complex systems and individual components.
Project Manager:	Giovanni Longo
Website:	www.liftlab.it

Name:	Lungo Raggio s.r.l.
Activities:	Integrated support for business processes of companies and institutions, scientific consulting, applied studies and research, development and production of multimedia resources for training and staff development.
Project Manager:	Andrea Tracogna
Website:	www.lungoraggio.eu

Name:	M2TEST s.r.l.
Activities:	Development of experimental techniques and numerical methods for modeling biologically complex materials; development of methods and devices for additive manufacturing applications; 3D printing with biomechanics applications; development of methods and devices for virtual biopsies of the patient's bone architecture, obtained from radiographic images and based on the simulation of force applications.
Project Manager:	Francesca Cosmi
Website:	www.bestest.it

Name:	MaterialScan s.r.l.
Activities:	Innovative, high-tech products, services, and processes in the field of engineering; development of devices for monitoring the structural integrity of materials.
Project Manager:	Luca Cozzarini
Website:	www.materialscan.it

MEDnoTE

Name:	MEDnoTE s.r.l.
Activities:	Clinical research and technology transfer related to medical and laboratory devices, pharmaceuticals, clinical data, epidemiological data, and software systems primarily in the fields of epidemiological, clinical, and molecular oncology; design and use of advanced IT technologies for the planning of preclinical and clinical studies, the development of new drugs and therapeutic regimens, and the management of databases.
Project Manager:	Daniele Generali
Website:	www.mednote.it

modefinance

a TeamSystem company

Name:	Modefinance s.r.l.
Activities:	Analysis and interpretation of the health status of companies through the processing of quantitative and qualitative data; creation and management of databases; technical support and maintenance of software.
Project Manager:	Valentino Pediroda
Website:	www.modefinance.com

MoMoTe

Name:	MoMoTe s.r.l.
Activities:	Design and production of hardware and software components for real-time monitoring of technological systems and industrial plants, with a particular focus on those in the mountainous sector—such as ski lifts, snowmaking systems, hydroelectric power generation, and water conveyance systems; assistance, consulting, and maintenance of the plants, as well as analysis of the collected data.
Project Manager:	Luigi Bregant
Website:	www.momote.net

Name:	Nanoxer s.r.l.
Activities:	Testing, design, prototyping, industrialization, manufacturing, application, and commercialization of chemical products, instruments for chemical measurements, and insulating materials; research in the field of reducing polluting naval emissions and steel manufacturing processes.
Project Manager:	Jan Kašpar
Website:	www.nanoxer.it

Name:	O3 Enterprise s.r.l.
Activities:	Implementation of integrated hospital-territory-community systems, distribution of systems for managing health data created with open-source technologies, study and application of artificial intelligence methods (Deep Learning) to medical imaging aimed at developing algorithms for the analysis of radiological and pathological anatomy images.
Project Manager:	Andrea Poli
Website:	www.zeeromed.com/o3-enterprise

Name:	PicoSaTS s.r.l.
Activities:	Development of products, processes, and services in the space sector, with particular focus on the development of pico/nano-satellites, their associated instrumentation, and corresponding data management via ground stations.
Project Manager:	Anna Gregorio
Website:	www.picosats.eu

Quolity.

Name:	Quolity s.r.l.
Activities:	Development of tools, methods, and digital applications to assess customer satisfaction and the social impact of projects, products, services, and organizations, as well as for organizing basic nursing services and home care.
Project Manager:	Luca Bianchi
Website:	www.quolity.eu

YOURVALUE FINANCE

Name:	YourValue Finance s.r.l.
Activities:	Financial and business counselling focused not only on revenues, but also on social and environmental sustainability, aiming to promote a more responsible and aware economy within the framework of EU regulations and the ESGs..
Project Manager:	Giorgio Valentinuz and Massimiliano Kaucic
Website:	site under construction

Printed in September 2025 by
Communication and External Relations of the University of Trieste