



Health - Projects

An overview of the funded projects from the Targeted Programme Health. The aim of these projects is to support the reliable and efficient exploitation of diagnostic and therapeutic techniques and the development of new technologies to improve healthcare and patient protection, while limiting costs.

Focus is placed on research to address major health-related societal challenges including lifestyle-related health issues, neurodegenerative diseases and global health issues such as anti-microbial resistance and emerging epidemics.

Fighting antimicrobial resistance

Innovative imaging techniques will support the development of improved antibiotics to beat resistant bacteria

In Europe, antimicrobial resistance is responsible for approximately 25 000 deaths a year with annual treatment and social costs estimated at around €1.5 billion. Drug-resistant Gram-negative bacteria are responsible for two thirds of these deaths and a key measurement challenge surrounds the effective penetration of antibiotic drugs into the bacteria. These bacteria have a double membrane and protein pumps that rapidly remove antimicrobial drugs that penetrate the membrane, before they can take effect. Although many of the molecular mechanisms involved in these steps are known, the dynamics of each step are unclear. This project will develop innovative measurement capabilities that will be able to quantify and image the penetration of drugs into Gram-negative bacteria and measure the accumulation and removal of the drug. The tools and understanding generated will provide vital help to scientists optimising antimicrobial drugs to combat these deadly bacteria.



Project 15HLT01

Quantitative measurement and imaging of drug-uptake by bacteria with antimicrobial resistance

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Earlier diagnosis of Alzheimer's disease

New and improved tests will allow patients to access effective treatment through earlier diagnosis

Over 6 million people are affected by neurodegenerative diseases in the EU and this number is set to double over the next 20 years. Early diagnosis of Alzheimer's disease, the most common form of neurodegeneration, can help patients access effective treatments and sources of support, but studies suggest only half of people with the condition have been diagnosed and these cases are often only identified in the advanced stages. One of the key reasons for this is the lack of accuracy involved in the measurement of biomarkers used to indicate Alzheimer's disease. This project will use the achievements of EMRP project HLT05: Metallomics to improve this accuracy by establishing new reference measurement procedures for established biomarkers in cerebrospinal fluid, found in the brain and spine, while also introducing procedures for potential new blood-based biomarkers. This will support reliable, comparable measurements in current diagnostic tests and further the development of population-based screening through blood testing, which is urgently required to enable earlier diagnosis of Alzheimer's disease.



Project 15HLT02

Role of metals and metal containing biomolecules in neurodegenerative diseases such as Alzheimer's disease

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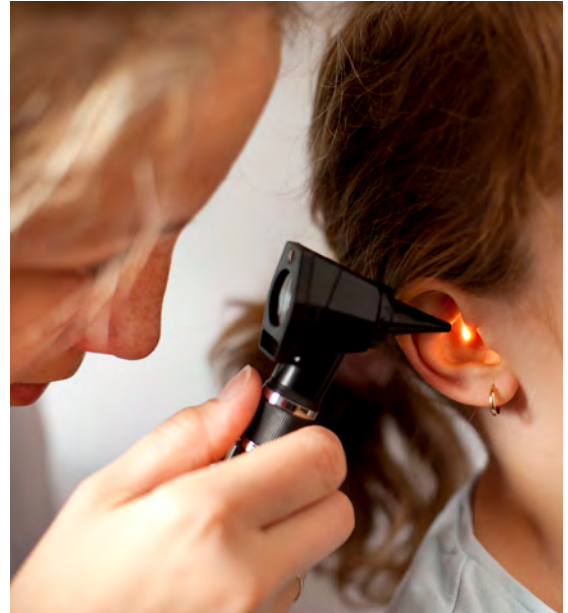
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Effective hearing tests and protection

An innovative device and new measurement methods will ensure more accurate diagnosis and treatment of hearing conditions

Hearing loss is an important public health concern with substantial economic costs, estimated at over €200 billion a year, and social consequences. Two key measures which can be implemented to manage this problem are effective hearing screening programmes and the prevention of excessive noise exposure, both of which must be underpinned by robust measurements. This project will use results from EMRP project HLT01 Ears to further develop and validate the innovative universal ear simulator concept in readiness for clinical practice. The device, used to calibrate hearing test equipment used in screening programmes, is designed to best represent the ears of the person being tested and will ensure more accurate diagnoses and treatment. New noise measurement methods will also be developed to determine the impact of non-audible sound on hearing, mental health, cognitive abilities and general wellbeing. Achieving these objectives will be a crucial contribution towards effective hearing assessment and protection for Europe's citizens.



Project 15HLT03

Metrology for modern hearing assessment and protecting public health from emerging noise sources

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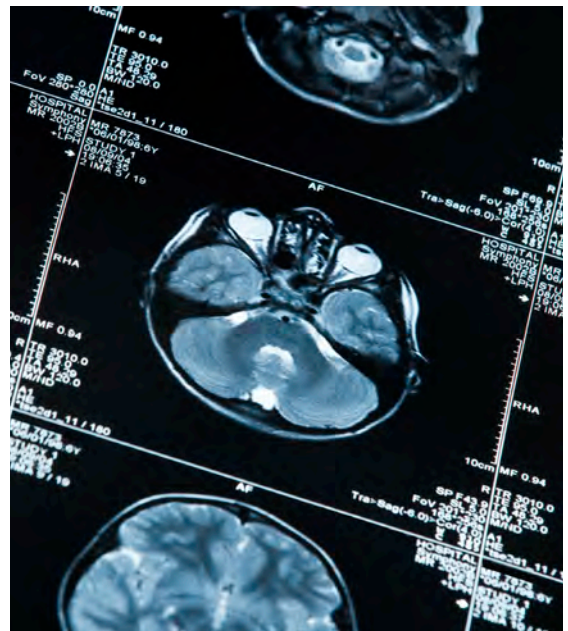
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Improved monitoring and treatment of neurodegeneration

Innovative techniques will help clinicians monitor disease progression and treatment success for Alzheimer's and Parkinson's diseases

Neurodegeneration is an incurable, debilitating process which presents a growing medical and economic challenge due to our aging population. Alzheimer's disease and Parkinson's disease are two of the most common neurodegenerative diseases, and while their symptoms differ, there are similarities between the underlying changes to the brain in each disease: both involve the build-up of certain proteins in the brain and the destruction of brain cells. Currently, there are no minimally invasive diagnostic tools which allow for early diagnosis or monitoring of the progression of these diseases in patients. This project will help to address this by exploring innovative techniques for early diagnosis and monitoring, based on non-invasive magnetic resonance imaging approaches, and developing improved clinical assessment protocols focused on monitoring declining motor and cognitive functions and increasing behavioural, communicative and psychological symptoms. By working directly with clinicians, the tools and protocols developed will be ready for implementation in partnering hospital laboratories, ultimately leading to improved diagnosis and dose monitoring for patients.



Project 15HLT04

Innovative measurements for improved diagnosis and management of neurodegenerative diseases

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Earlier detection of cardiovascular disease

New standards and tools will validate emerging techniques to identify those at risk of cardiovascular disease

Cardiovascular disease is the leading cause of death in Europe and costs the economy nearly €200 billion each year. Consequently, there is an urgent need for reliable diagnostic tests which identify patients at intermediate risk of cardiovascular disease, so they can be given the appropriate treatment at an earlier stage, increasing their chance of survival. Several landmark studies have shown that the accurate measurement of blood flow (perfusion) to the heart, which can indicate parts of the heart with inadequate blood supply, could be well-suited to this task. However, accurate quantification of perfusion is currently only possible through invasive measurements with catheters - a costly procedure with undesirable side-effects. Alternative medical imaging techniques have been developed to measure perfusion non-invasively but the results can vary significantly depending on which imaging technique is used. This project will develop physical standards and data analysis tools to assess the reliability of the different imaging techniques, thereby validating their potential use in the early diagnosis of cardiovascular disease.



Project 15HLT05

Metrology for multi-modality imaging of impaired tissue perfusion

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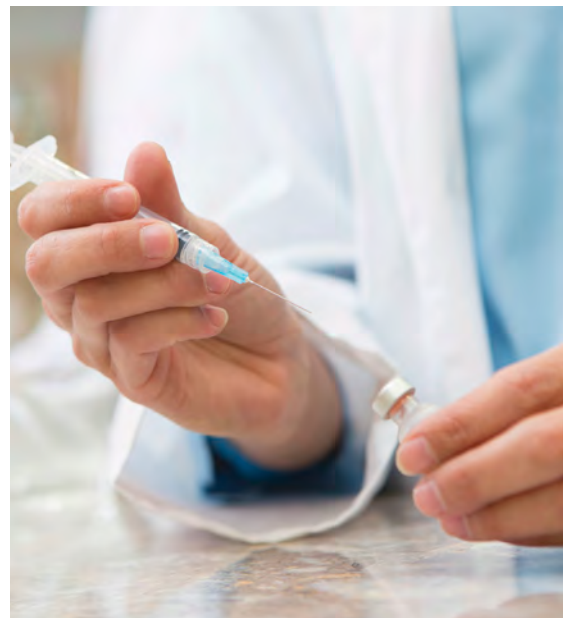
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Advanced dosimetry for effective cancer treatment

A suite of measurement resources will support clinics to implement individual dose planning for patients

The use of radiopharmaceuticals for treating cancer in Europe has grown considerably over the last few years. Current practice is to administer a carefully measured radioactivity dose to a patient, without taking into account the amount of radioactivity actually absorbed by tissue in the patient's body. As a result, the administered dose is not the best indicator of effective treatment, and accurate knowledge of the radioactivity absorbed by tissue would make a significant difference to the success of many patients' treatments. A recent EU Directive (2013/59/EURATOM) will require individual dose planning based on absorbed dose measurements for patients from February 2018. However, the planning process is complex and no standard methods exist to support clinics' compliance with the regulation. This project will overcome these obstacles by building on the work of previous EMRP project HLT11 MetroMRT, developing a robust measurement protocol and providing standardised methods, test objects and resources to support molecular radiotherapy clinics in setting up and validating dosimetry, thereby improving patient outcomes.



Project 15HLT06

Metrology for clinical implementation of dosimetry in molecular radiotherapy

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Ensuring effective, targeted treatment with antibiotics

New test methods will help clinicians effectively target treatments in the ongoing fight against antimicrobial resistance

Antimicrobial resistance threatens the effective prevention and treatment of an ever-increasing range of infections. Driven by the misuse of antimicrobial drugs, a key and achievable goal in the fight against antimicrobial resistance is the advancement of clinical test methods to enable doctors to determine the correct antimicrobial therapy to use. Reproducible, accurate and specific diagnostic test methods will enable a coordinated global approach which targets existing treatments effectively and supports the rollout of emerging antibiotics and other antimicrobial drugs. This project will develop the metrology needed to reliably evaluate new and existing clinical test methods used in the detection and monitoring of antimicrobial resistance, including reference materials for calibrating instruments and test systems. In addition, validated methods will also enable laboratories to benchmark their procedures, ensuring high accuracy, comparable measurements across Europe. Achieving these objectives will increase the efficacy of clinical testing, allowing clinicians to better target existing and novel treatments and mitigating the key driver of antimicrobial resistance.



Project 15HLT07

Novel materials and methods for the detection, traceable monitoring and evaluation of antimicrobial resistance

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Supporting innovative radiotherapy techniques

New standards will enable safe, effective treatment of cancer with emerging MR-guided radiotherapy

Cancer, the leading cause of death in Europe after cardiovascular disease, is responsible for roughly one in five deaths. Radiotherapy, which uses beams of ionising radiation to kill cancerous cells, is one of our most important defences against cancer and is used to treat around half of patients in Europe. One emerging technique, magnetic resonance (MR)-guided radiotherapy, provides real-time images of a patient during treatment, and offers more detailed and higher contrast images for the identification of tumours and soft tissues than conventional techniques. This boosts tumour targeting accuracy, reducing side-effects and increasing survival rates. Accurate radiation dose is crucial to the safe and effective treatment of patients, but radiation transport is strongly affected by the magnetic fields used in MR-guided radiotherapy. This project will develop new standards and measurement methods, adapted for MR-guided radiotherapy, to enable medical physicists to develop safe, accurate treatment plans. This metrological framework will support the clinical implementation of MR-guided radiotherapy, accelerating the rollout of this state-of-the-art treatment.



Project 15HLT08

Metrology for MR guided radiotherapy

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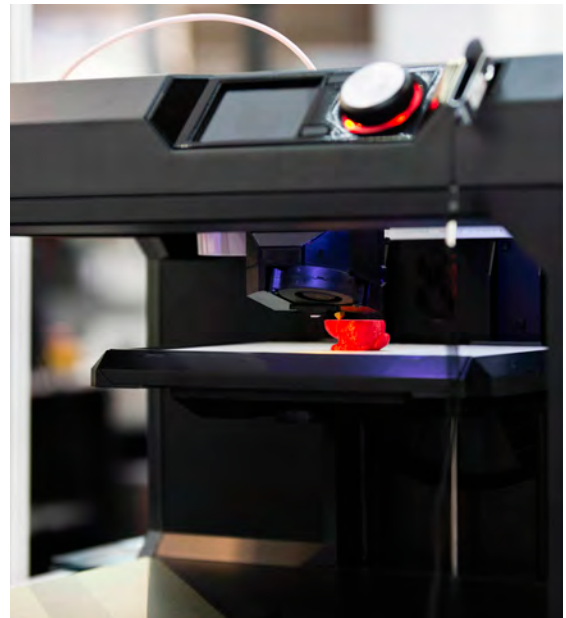
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Paving the way for 3D-printed medical devices

Quality control methods will facilitate production of high-quality, low-cost customised medical devices

The medical sector is set to benefit immensely from the rapidly expanding additive manufacturing (or 3D printing) industry, which has the capability to print a range of medical devices, such as prosthetics, dental implants and hearing aids, tailored to a specific patient. While medical devices are subject to strict safety requirements, additive manufacturing technology has advanced at a much faster pace than the available standards and quality controls. The high roughness, complex geometries, and internal structures of additively manufactured medical devices make acquiring accurate data for quality control challenging. This project will establish control methods, relevant to manufacturing and clinical practice, which would facilitate high-quality and mass production of a range of customised medical devices. These outputs will help enable the medical technology sector to benefit from this innovative manufacturing technique, an important step towards increased access to high-quality, low-cost medical devices across Europe.



Project 15HLT09

Metrology for additively manufactured medical implants

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Europe's National Measurement Institutes working together

The majority of European countries have a National Metrology Institute (NMI) that ensures national measurement standards are consistent and comparable to international standards. They also investigate new and improved ways to measure, in response to the changing demands of the world. It makes sense for these NMIs to collaborate with one another, and the European Association of National Metrology Institutes (EURAMET) is the body that coordinates collaborative activities in Europe.

The European Metrology Programme for Innovation and Research (EMPIR) follows on from the successful European Metrology Research Programme (EMRP), both implemented by EURAMET. The programmes are jointly funded by the participating countries and the European Union and have a joint budget of over 1000 M€ for calls between 2009 and 2020. The programmes facilitate the formation of joint research projects between different NMIs and other organisations, including businesses, industry and universities. This accelerates innovation in areas where shared resources and decision-making processes are desirable because of economic factors and the distribution of expertise across countries or industrial sectors.

EURAMET wants to involve European industry and universities at all stages of the programme, from proposing Potential Research Topics to hosting researchers funded by grants to accelerate the adoption of the outputs of the projects.



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