

**Samenvatting toegekende MUMC+/FHML TKI-LSH subsidie projecten 2024**

**LSHM202402: Preventing neointimal hyperplasia in arteriovenous fistulas and grafts through viral-mediated TIMP-3 overexpression (PREVENT).**

**Public summary**

Arteriovenous fistulas (AVF) or grafts (AVG) are the cannulation points for haemodialysis machine connections in patients with end-stage renal disease. The venous lumen of these vascular access sites narrows through intimal hyperplasia, thereby reducing blood flow and leading to failure of the AVG or AVF. Although stenosis caused by intimal hyperplasia can be easily treated by percutaneous balloon angioplasty, the underlying haemodynamic disturbances remain and stenosis tends to recur within months. This project will assess whether a gene therapy approach that overexpresses human TIMP-3 is a novel and clinically relevant approach to treating AVF and AVG to prevent neointimal hyperplasia. This is a new collaboration between partners Maastricht University, the University of Glasgow and Batavia Biosciences B.V.

If successful, this project will lead to subsequent in vivo experiments in pigs to select the most effective viral vector to use in the next clinical phase. Eventually, viral TIMP-3 overexpression may become a gene therapy to complement AVF and AVG surgery which would have a major benefit to society for this unmet clinical need.

We will develop a biobank of tissues and create a novel virus expressing the therapeutic gene. We will assess its expression and function using cell culture models that mimic the disease processes.

By the end of the project, we will know whether the new gene therapy is worthy of developing into a clinical therapy and moving to the next stage of development.

**Consortium partners**

Maastricht University

University of Glasgow

Batavia Biosciences B.V.

**LSHM202404: Pre-ONSeT: Pre-operative nutrition to support tissue protein synthesis.**

**Public summary**

In this project, researchers from Maastricht University, Dutch Medical Food, and Amsterdam UMC collaborate to establish the stimulatory effects of protein-rich nutrition in the acute pre-operative period on protein synthesis (i.e., tissue buildup) rates of various musculoskeletal tissues.

Despite the negative impact of pre-operative malnourishment, including excessive pre-operative fasting, there is a lack of attention and awareness of pre-operative nutritional optimization. Though providing nutrition close to surgery has been suggested to improve overall nutritional status as well as surgery outcome and subsequent recovery, knowledge on underlying foundations at a tissue level is lacking. This is becoming even more important considering the ever-increasing number of surgeries needed within our aging society. For example, the number of hip and knee replacement surgeries already exceeds 75,000 per year in the Netherlands, and is expected to more than double over the next decades. In this project, we will determine the stimulatory effects of pre-operative protein-rich nutrition on protein synthesis in a large selection of musculoskeletal tissues to provide proof-of-principle for the beneficial effects of pre-operative nutritional optimization.

Thirty men and women scheduled for total hip replacement will be divided in a group ingesting a protein-rich drink and a group ingesting a non-caloric placebo drink in the hours before surgery. We will use so-called tracer methodology and collect blood as well as tissue biopsies during the surgery to calculate the protein synthesis (i.e. tissue buildup) rates of various tissues to compare pre-operative protein ingestion with pre-operative fasting. The fundamental, mechanistic insight from this project will serve as a proof-of-concept, establishing the anabolic responsiveness and remodeling potential of various tissues when pre-operative nutrition is provided. This will provide key leads for future scientific and industrial projects aimed to improve tissue recovery and surgical outcomes, based on which peri-operative nutritional strategies can be further developed and/or improved.

**Consortium partners**

Maastricht University

Dutch Medical Food

Amsterdam UMC

**LSHM202406: iLoF-MULTI-OMICS-AD: Towards personalised medicine; the use of multi-omics data integration and biophotonic fingerprinting in Alzheimer’s disease.**

**Public summary**

This project is a collaboration between Maastricht University and iLoF, a biotechnology company based in Oxford and Lisbon specializing in photonics—a new technique that detects molecular particles using lasers. Together, we aim to identify specific markers that can improve the diagnosis and treatment of Alzheimer’s disease (AD) by distinguishing between different subtypes of AD patients.

AD is the most common form of dementia, affecting around 30% of people over 85 years old. It is a neurodegenerative disease that leads to progressive deterioration in cognitive function, severely impacting the quality of life for those affected. Current medications only manage symptoms, and better diagnostic tools are needed to personalize treatment approaches. This project addresses this challenge by exploring innovative light-based technology to analyse blood samples, aiming to deliver more accurate diagnoses and guide the development of effective treatments. The results could lead to more tailored care, repurposing existing drugs, and identifying new therapeutic targets.

In this project, we will compare samples from individuals with AD, mild cognitive impairment (MCI), and healthy controls. We will analyse proteins and chemical particles in serum, cerebrospinal fluid, and brain tissue collected from the same individuals. Through advanced data analysis, we expect to discover molecular signatures specific to different subtypes of AD, which could lead to new treatment strategies. Additionally, integrating our findings with iLoF’s optical fingerprinting technology (Optomics®) could pave the way for non-invasive biomarkers for early detection and monitoring of AD and MCI.

The findings from this project are expected to contribute to better diagnosis and treatment options for AD, ultimately improving care and outcomes for patients.

**Consortium partners**

Maastricht University

iLoF - Intelligent Lab On Fiber Unipessoal Lda

**LSHM202407: Neurofeedback for resilience and stress prevention (NEUROCENTRE)**

**Public summary**

Work-related stress is a major factor contributing to chronic ill health and health disparities. Neurofeedback allows people to train self-regulation techniques for brain activation based on real-time feedback. The members of this partnership have been at the forefront of progress in the field of neurofeedback through the development of software tools (Brain Innovation) and clinical applications (Maastricht University). This project will apply neurofeedback training in emergency workers with the aim of preventing long-term stress.

The direct costs related to absence from work due to stress-related illness have been estimated at €800M per year in the Netherlands based on costs of sick leave. Overall costs due to work-related mental illness have even been estimated at 4.7 billion per year. One group that is particularly affected by stress and high risk of stress disorders triggered by traumatic events are emergency workers who make up appr. 1% of the Dutch workforce. We hypothesise neurofeedback can help emergency workers with their emotion regulation, increase their resilience and ultimately decrease the prevalence of stress-related disorders in this population. We will assess the feasibility of self-regulation protocols for brain activity associated with threatening or otherwise potentially traumatising situations, using fMRI (functional magnetic resonance imaging)-based neurofeedback. We will evaluate relevant triggers and how to model them with fMRI paradigms, and then couple them with non-invasive brain computer interfaces that allow participants to observe and regulate their brain activity. Paradigms will be developed in close consultation with user groups, and evaluated both for their neural and behavioural effects. This is the first time that the effect of fMRI-neurofeedback on resilience and stress responses in emergency personnel will be investigated. With this project we hope to create the experimental proof of concept for the further development of neurofeedback-based tools for stress prevention and reduction.

**Consortium partners**

Maastricht University

Brain Innovation

**LSHM202408: LoadGuard – A breakthrough in musculoskeletal health**

**Public summary**

This project aims to create a wearable tool, like a smart insole from Ato-Gear, that can use statistical models (machine learning) to estimate how much strain our tissues experience during daily movements, exercise, or recovery. By using an app on a smartphone or smartwatch, it could give users instant feedback on their tissue stress levels. This would help people recovering from injuries understand their limits and reduce the risk of worsening their condition. Right now, no product on the market can measure tissue stress like this, so this project combines advanced insoles, data analysis, and body movement models to make it possible in a public-private partnership between Ato-Gear and Maastricht University.

Traumatic musculoskeletal injuries such as anterior cruciate ligament (ACL) injuries are among the most common injuries with an annual incidence in the general population of 68.6 per 100,000 people for ACL injuries alone. Up to 90% of the individuals with traumatic knee injuries also develop post-traumatic musculoskeletal injuries such as knee osteoarthritis (OA), which severely limits their mobility, quality of life and incurs major health care costs. While the aetiology of traumatic and post-traumatic musculoskeletal injuries is multifactorial, biomechanical loading has been identified as a key contributor. A wearable sensor that can quantify this mechanical loading would therefore be highly relevant. As such, this project aims to develop such a sensor.

**Consortium partners**

University Maastricht

ATOGEAR

Sports and Orthopedics Eindhoven

**LSHM202410: The diagnostic value of late enhancement photon-counting CT in myocardial fibrosis in (non) ischemic heart disease (2ILLUMINATE)**

**Public summary**

The 2ILLUMINATE project aims to explore the value of photon-counting computed tomography (PCCT) in the detection and visualization of scarring of the myocardium, known as myocardial fibrosis, across several heart diseases. The newly formed consortium between Maastricht University and Siemens Healthineers Nederland B.V., a leading innovator in (photon-counting) CT imaging, will drive advancements in cardiac imaging, and potentially revolutionize the standard of care for heart diseases.

Currently, cardiac magnetic resonance imaging (CMR) is considered the gold standard for the non-invasive detection of myocardial fibrosis. However, CMR has its limitations, including the inability to effectively visualize coronary plaques and/or calcifications, as well as a relatively low spatial resolution, making it difficult to detect fibrosis in smaller structures. Additionally, the availability of CMR is hindered by its long scan time, resulting in extensive waiting lists. Certain contraindications, particularly in patients with heart conditions, further limit its applicability.

The recently introduced PCCT may revolutionize modern CT-imaging. PCCT technology allows simultaneous multi-energy acquisitions that can be used to visualize various tissue characteristics. This has major clinical implications by enabling assessment of coronary calcifications, coronary artery disease, atrial/ventricular fibrosis, extracellular volume, and viability in a single investigation. This one-stop-shop approach could substantially improve clinical decision making, patient care, resource use, health care costs, waiting lists, and patient comfort.

This project hypothesizes that PCCT will be able to visualize myocardial fibrosis as accurate as CMR. The current study will investigate the benefits and clinical applications of this technology.

**Consortium partners**

Maastricht University

Siemens Healthineers Nederland B.V.

**LSHM202411: A novel therapy to treat severe myopia**

**Public summary**

This project, a collaboration between Maastricht University and the biotech company ImPact Biotech, focuses on developing a novel treatment for high myopia, a severe form of near-sightedness that affects millions worldwide. We aim to create a minimally invasive therapy that could stop the progression of high myopia and prevent blindness by strengthening the weakened sclera (the white part of the eye) with a photosensitive crosslinker and infrared light.

High myopia is a growing public health concern. By 2055, it is expected to impact nearly one billion people, with one-third suffering from severe visual impairments or blindness. In the Netherlands alone, high myopia could lead to 175,000 people with vision impairment and 65,000 blind individuals, placing significant strain on healthcare and the economy. The cost of vision-related impairments in the Dutch economy is already over €1 billion annually, and this could rise to €3.5 billion by 2055. Current treatments for high myopia are inadequate, and innovation is urgently needed to address this challenge.

The approach involves injecting a photosensitive compound into the eye's sclera and activating it with non-toxic near-infrared light to strengthen the eye's structure. This method is less invasive than surgery and offers precise, localized treatment. We have already demonstrated the approach's safety and efficacy in preclinical studies, and the next steps include optimizing the treatment for human application and understanding its biological effects.

The next phase of the project will focus on optimizing the treatment parameters for human tissue. Additionally, we will also study how the treatment strengthens the eye and its impact at a cellular level. If successful, this research could offer a life-changing solution for millions of people at risk of vision loss due to high myopia, providing a way to preserve their sight and improve their quality of life.

**Consortium partners**

Maastricht University

ImPact Biotech

**LSHM202412: Innovative workflow including Machine-learning Assisted Movement Analysis system and cloud-based infrastructure for children with cerebral palsy**

**Public summary**

Clinical gait analysis is essential for functional diagnostics, evaluation and related treatment decisions for patients with cerebral palsy (CP). Its clinical use for large patient groups is, however, limited due to the high costs, long processing time (8 hours/patient), need for advanced equipment and specialized personnel. Moreover, manual actions are required in processing data. This project aims to improve the current workflow for clinical gait analysis in children with CP by developing and validating a proof-of-concept Machine-learning Assisted Movement Analysis (MAMA) system for automatic gait features annotation and identification of gait kinematic abnormalities to support clinical decision-making. MAMA will be implemented in a cloud-based infrastructure (‘Moveshelf’) which is accessible at any location and can be connected to electronic health record systems. This makes gait results visible for more care providers allowing better coordination within the chain.

The new workflow will reduce the processing time by 30% and lower operational costs making clinical gait analysis more scalable and cost effective, allowing more patients to benefit from advanced clinical gait analysis. The automatic detection reduces operator errors and allows more data to be involved, improving the reliability of gait reports. Altogether, this will contribute to better clinical decision-making and treatment advice and thus, finally to optimised and personalised patient care, i.e. healthier walking behaviour which positively influences the patients’ participation in society, well-being, quality of life and general health, and in turn reduce health-related costs.

First the requirements for the MAMA system will be established, and a large gait database comprising retrospective data of healthy children, adults and children with CP is created. Based on this, a MAMA algorithm is developed and validated. Next, MAMA is implemented in Moveshelf and the new workflow is evaluated in clinical practice. Finally an operational proof-of-concept workflow, including MAMA implemented in Moveshelf, is delivered.

**Consortium partners**

Maastricht University

MUMC+

Moveshelf Labs BV

**LSHM202413: ACHIEVE - Advancements in Cholesterol-targeted Hepatocellular Carcinoma: RN-005 as an Innovative and Effective approach**

**Public summary**

In this project, the University of Maastricht, Maastricht UMC, and Renatus Inc, aim to revolutionize hepatocellular carcinoma (HCC) treatment through the development of RN-005, a novel cyclodextrin compound. This newly established partnership aims to address the urgent need for more effective and less toxic therapies by exploring the therapeutic potential of RN-005, which selectively reduces cellular cholesterol accumulation.

HCC, the most common type of liver cancer, presents a significant challenge in oncology with a 5-year survival rate of ±20%. The current treatment modalities for HCC are limited by suboptimal efficacy and substantial side-effects, highlighting a critical need for more targeted, less toxic therapies. Moreover, HCC is associated with significant economic and healthcare burdens, with global liver cancer cases increasing.

Our project conceptualizes an innovative approach to combat HCC by leveraging RN-005’s ability to reduce cellular cholesterol accumulation. Unlike its predecessor, hydroxypropyl-beta-cyclodextrin (HPβCD), which has shown significant toxicity and inflammatory effects, RN-005 is engineered to selectively target intracellular cholesterol in cancer cells, reducing the risk of adverse effects. This project’s primary objective is to obtain preclinical evidence that RN-005-mediated depletion of cholesterol represents an effective intervention for curtailing HCC progression while concurrently augmenting the therapeutic effectiveness of existing treatments.

The project comprises three work packages: evaluating RN-005’s impact on tumor progression in vivo, its therapeutic efficacy in combination with conventional therapy *in vivo*, and its clinical value using patient-derived models. If successful, RN-005 could transform the HCC treatment landscape, offering a less toxic, more effective option and potentially extending its benefits to other cancers influenced by cholesterol metabolism. While immediate impacts on clinical practices may be incremental, the long-term potential of this research could lead to significant advancements in cancer treatment.

**Consortium partners**

Maastricht University

MUMC+

Renatus Inc

**LSHM202414: Generation of a brain *in vitro* model mimicking aging and Parkinson’s disease –PDAGE.**

**Public summary**

In this project, we propose to develop a laboratory model of the human brain that recapitulates key features of physiological aging and pathological neurodegeneration happening in Parkinson’s disease. To do so, we will use advanced tissue-engineering technologies and human cells from Parkinson’s disease patients. We will collaborate with the company OrganoTherapeutics, which is already focusing on developing molecules against the disease.

Parkinson’s disease represents the second most common neurodegenerative disorder in the elderly. More than 10 million people worldwide are living with the disease, with about 63,500 cases in the Netherlands alone. Currently, there is no cure for Parkinson’s disease due to the difficulty of studying the human brain and the excessive reliance in the past on the use of animal models, which do not develop this disease. Aging plays a significant role in the disease but is frequently overlooked.

We will develop a procedure to include the aging component in these cells by passing them a definite number of times. The cells will then be used to generate brain organoids mimicking the Parkinson’s-affected region of the brain. The organoids will then be treated with compounds known to remove aging cells as a proof of concept of the relevance of a strategy. The organoids will then undergo a thorough analysis using bioinformatics approaches.

The project will provide a pre-clinical testing platform and demonstrate the potential of targeting aging cells to combat Parkinson’s disease. Our approach to induce aging could also be applied to other age-associated disorders, such as Alzheimer’s disease.

**Consortium partners**

MERLN Institute (Maastricht University)

OrganoTherapeutics

**LSHM202424: Probiotic Regulation of Food Intake through Satiety Stimulation and Gut Microbiota Modulation**

**Public summary**

This unique research project will provide insight into the benefits of a newly formulated supplement for the regulation of food intake by combining expertise in food intake regulation and microbial composition from Maastricht University with expertise in the production of high-quality probiotics from Winclove, a company aiming to improve lives by making a sustainable impact worldwide.

According to the World Health Organization (WHO), obesity has reached epidemic proportions worldwide with more than 39% overweight (>1.9 billion) and 13% (>650 million) clinically obese adults. Societal costs of obesity with more than €79 billion per year for the Netherlands, affect the healthcare sector, but also include tremendous costs due to productivity losses. People living with obesity are sick more often and for longer periods of time, compared to people with a healthy weight. Therefore, there is a critical need for targeted nutritional strategies, which go beyond the selectively available pharmacological options, for the prevention of obesity. For this purpose, a new product has been developed with probiotic strains specifically selected based on their potential to influence hunger and satiety signaling. A total of 98 overweight/obese men and women will receive this probiotic supplement or a placebo for 16 weeks. Effects on food intake, satiety hormone release, and changes in the intestinal microbiota will be investigated.

A positive result will justify scaling up the development of this supplement and transforming it into a natural, cost-effective and sustainable product, available to a large part of the population, regardless of socio-economic status. This project has a) the unique and innovative opportunity to provide new hypotheses for the scientific community working to improve metabolic health in humans, b) delivers novel dietary strategies for consumers, and c) gives leads for product development for the treatment and prevention of metabolic disease.

**Consortium partners**

Maastricht University

Winclove Probiotics

**LSHM202426: Accelerating drug discovery and therapeutic targets selection for osteoarthritis with a Joint-on-a-Chip Osteoarthritis Microfluidic Platform (JOMIP).**

**Public summary**

Current osteoarthritis (QA) treatment strategies primarily focus on symptom management rather than addressing the underlying causes of the disease. These approaches typically involve pain relief medications, physical therapy, and surgical interventions. Although progress has been made in the last years, no drug is commercially available to arrest the disease. This is partially due to the inappropriate pre-clinical models for early drug development phases. Current Organ-on-a chip (OoC) platforms in the OA field primarily focus on assessing cartilage break down without considering the interplay between cartilage cells and other joint tissues. We will develop a novel and user-friendly joint-on-a-chip osteoarthritis microfluidic platform (JOMIP) that recapitulates the biological and mechanical joint environment.

Knee OA affects over 10% of the global population accounting for more than 18 billion euro in direct and indirect costs in the Netherlands alone. The disease affects different joint tissues primarily causing cartilage degradation leading to pain, stiffness, and impaired mobility. The incidence of OA is expected to rise with the aging population, posing a significant public health challenge.

Recently, the infrapatellar fat pad (IPFP) has been shown to be instrumental in the joint homeostasis, orchestrating pro-inflammatory cytokine secretion and promoting cartilage breakdown. Hence, its pro-inflammatory role makes the IPFP a significant target for developing specific OA therapies. JOMIP will focus on the incorporation of patient IPFP cells and primary cartilage cells with controlled mechanical load to mimic knee motion and inflammatory stimulation with the possibility of scaling-up for high-throughput drug screening.

By using patient-derived cells, JOMIP will facilitate the selection of personalized therapeutic targets and the development of new drugs to treat the OA disease. Ultimately, our OoC platform seeks to revolutionize OA management by providing a new OA pre-clinical model, leading to more effective treatments, reducing healthcare costs while improving life expectancy.

**Consortium partners**

Maastricht University, MERLN

MUMC+

Chiron

**LSHM202434: Screen4GutHealth: High-Throughput Screening for Tailored Prebiotic-Driven Gut Health Solutions**

**Public summary**

Antibiotics are essential for treating infections, but they can also disrupt the balance of bacteria in our gut, leading to long-term health problems and increasing the risk of antibiotic-resistant bacteria. The Screen4GutHealth project, a collaboration between Maastricht University and FrieslandCampina, aims to develop tailored prebiotic solutions to restore gut health after antibiotic use. Using an innovative screening platform, researchers will identify the most effective prebiotic combinations for different age groups and health conditions, with the goal of improving gut microbiome resilience and reducing the spread of harmful bacteria.

Antibiotic resistance is a growing global health crisis, responsible for over 1.2 million deaths per year worldwide. The gut microbiome plays a key role in our overall health, and disruptions caused by antibiotics have been linked to conditions such as obesity, diabetes, and inflammatory diseases. Infants, young children, and the elderly are especially vulnerable due to their weaker immune systems and frequent antibiotic use. Finding safe and effective ways to restore gut balance after antibiotic treatment is crucial to reducing long-term health risks and preventing the spread of drug-resistant bacteria.

This project will test a variety of prebiotic compounds—natural fibers that feed beneficial gut bacteria—using an advanced high-throughput screening method. By analyzing gut bacteria from infants and adults, researchers will identify which prebiotics work best for restoring microbiome health and eliminating harmful bacteria. The findings will inform a targeted human intervention study to validate the most promising prebiotic solutions. This approach ensures that the selected prebiotics are not only effective but also personalized to different populations.

**Consortium partners**

Maastricht University

FrieslandCampina

**LSHM202435: Health behaviour support for people with chronic conditions: development of the eSupporter**

**Public summary**

This project brings together patients, healthcare professionals, private partners (Easylog BV and Chiesi), and academic researchers to develop the eSupporter, a personalized health application that supports behaviour change and self-management in individuals with chronic conditions. The eSupporter will complement the Assessment of Chronic Conditions (ABCC) tool and use Artificial Intelligence (AI) to provide tailored coaching and motivation to help patients live healthier lives.

The growing prevalence of chronic conditions such as COPD, asthma, and type 2 diabetes, with 10.4 million people in the Netherlands living with one or more chronic diseases, is straining healthcare systems. Rising healthcare costs, workforce shortages, and a shift toward patient empowerment highlight the need for tools that support self-management. Current eHealth solutions often lack a holistic approach, addressing isolated health behaviours rather than the overall burden of chronic disease. This project builds on research showing the effectiveness of personalized approaches to support patients in managing their health behaviours.

The eSupporter will be co-created with end-users – patients and healthcare professionals – to ensure it meets real-world needs. Building on an existing app platform, the app will integrate AI to deliver personalized coaching, motivational messaging, and progress tracking. Initial focus will be on physical activity and smoking cessation, with future expansion to additional health behaviours. The aim is to create a flexible, user-friendly digital coach that empowers patients to set goals, initiate and sustain behaviour change, and ultimately improve perceived and long-term health outcomes. Additionally, the tool has the potential to lower healthcare costs by reducing in-person consultations and enhancing the efficiency of chronic care through scalable digital interventions.

Development will proceed three work packages: content development, interface design with a virtual coach, and iteratively testing with end-users. Success will be assessed through the creation of a functional prototype and its acceptance by both patients and healthcare professionals.

**Consortium partners**

Maastricht University

Chiesi

Easylog B.V.

**LSHM202436: Predicting Recurrence Outcomes Through Epigenetics, Clinical and Tumour characteristics in Melanoma**

**Public summary**

Melanoma is an aggressive form of skin cancer that causes 80% of skin cancer-related deaths. To improve the care for melanoma patients, Maastricht University and MLA Diagnostics BV have teamed up in a public-private partnership to develop a more accurate and less invasive method for predicting disease outcomes. This project combines advanced biomarker research with clinical insights to create a comprehensive prediction model for melanoma prognosis, potentially replacing the invasive sentinel lymph node biopsy (SLNB).

Every year, over 325,000 people worldwide are diagnosed with melanoma, and 57,000 die from the disease. The current SLNB procedure, while widely used, is invasive, costly, and comes with significant risks, including pain and long-term complications. Additionally, 6–28% of patients classified as low risk through SLNB still experience recurrences. This highlights the need for innovative tools to better predict melanoma progression, reduce unnecessary procedures, and provide more personalized treatments.

This project focuses on two main goals: improving biomarker testing and building a prediction model that combines molecular data (e.g., DNA methylation markers) with clinical and pathological information. Using advanced laboratory techniques, the team will measure these markers in melanoma samples from 378 patients and analyze their potential to predict disease outcomes. By integrating this data, the model aims to give clinicians a clearer picture of each patient's prognosis, improving treatment decisions.

The project will deliver a highly efficient biomarker test and a validated prediction model for clinical use. These tools will enable doctors to provide individualized care, sparing patients from unnecessary surgeries and side effects, while also cutting healthcare costs. By advancing melanoma care, this project aligns with the broader mission to improve patient survival, quality of life, and the overall efficiency of cancer treatments.

**Consortium partners**

Maastricht University

MLA Diagnostics BV

**LSHM202438: Novel assays to study the pathophysiology of antibody-mediated channelopathies of the nervous system.**

**Public summary**

PathAb aims to develop and validate in vitro assays in collaboration with Tzartos NeuroDiagnostics for the characterization of the effector functions of disease-causing antibodies of different neuroimmunological disorders to accurately diagnose and provide an optimal and personalized treatment.

Antibody-mediated autoimmune disorders are chronic, highly debilitating disorders that affect an increasing 2.5% of the general population. In the nervous system, the presence of autoantibodies can result in impairment of nerve conduction and synaptic transmission, translating into symptoms varying from hallucinations and delusions, muscle weakness, cognitive complaints, seizures, breathing difficulties, to comma and even death. These are sometimes difficult to diagnose, resulting in delayed treatment. Current treatment strategies rely mainly on general immunosuppression, associated with delayed and even lack of efficacy in some patients and collateral side effects.

Antigenic modulation and complement activation are two main autoantibodies-effector functions contributing to these disorders. The novel assays characterizing the pathogenic autoantibodies modulation and complement activation’s capacity in individual patients, developed in this project, will 1) speed up and improve diagnosis and 2) provide guidance on the selection of a treatment strategy with a higher success rate for each individual patient. These will prevent chronification and exacerbation of symptoms, reducing hospitalizations, follow-up visits and long-term work absences. In the Netherlands in 2020 the mean per-patient annual total cost of illness because of one of these disorders ranged from €14,950 to €44,690 based on production losses due to absenteeism, as well as informal care and total cost of illness.

Deliverables include 1) the development of modulation and complement activation assays for different neuronal surface antigens, 2) test the developed assays in a representative group of patients with antibodies against the selected antigens, 3) correlate the modulation and complement activation capacity to the pathophysiology and 4) define the significance of these on disease severity and treatment response.

**Consortium partners**

Maastricht University

Tzartos NeuroDiagnostics

**LSHM202439: POWER – Personalized Optimization of Wearables for Enhanced Rehabilitation.**

**Public summary**

This project aims to develop a personalized rehabilitation system for muscle and tendon rehabilitation. Research shows that rehabilitation from tendon and muscle injuries is often ineffective because the tissues are not optimally loaded. For example, while a tendon strain of ~5% is optimal for improving tendon strength, there is currently no practical method to determine this strain during a movement. The rehabilitation system to be developed aims to provide a personalized estimation of tendon strain and muscle loading by combining wearable sensors with physiological data that can be obtained by any health care provider. The system will be integrated into a user-friendly smartphone app, allowing patients to perform rehabilitation exercises at home, with real-time feedback and guidance. Specifically, tissue loading can be estimated from biomechanical data obtained with pressure insoles (ARION) and IMU’s (MOX) during various rehabilitation, daily living and sports movements. Muscle and tendon properties obtained with a 3D ultrasound scan at any health care clinic can then be used to translate this biomechanical load (e.g., tendon force) into a personalized tissue stress or strain (e.g., tendon strain). Ultimately, the goal of the project is to improve the effectiveness of non-invasive physical rehabilitation treatments.

**Consortium partners**

Maastricht University

ATOGEAR

UTC imaging