

HEALTHY LONGEVITY GLOBAL COMPETITION

2022 Catalyst Awardees

Sponsor: EIT Health of the European Union

Alternative pain-free drug delivery solution for patients who need regular injections

Principal Investigator	David Uzoni, BA
PI Primary Affiliation	DP Innovations
Co-Investigator(s)	Balazs Polacsek, MSc; Tamas Kolb, MSc; Peter Adam, MSc; Tibor Ajpli, BSc; Barnabas Majay, MSc; Zsolt Finta, BSc; Yevgeniy Levkovets, BSc

PROJECT DESCRIPTION

Our company DP Innovations is developing a pocket-sized electronic inhalation device as an alternative pain-free drug delivery solution for patients who need regular injections. Injections like insulin for diabetes, where multiple studies show that less than 50% of patients meet the required sugar levels, due to poor treatment monitoring and inconvenience of needles. Unlike current asthma inhalers that are imprecise and wasteful, we are able to deliver a broader spectrum of reformulated drugs using our proprietary dosing technology, that lets patients inhale exact quantities and accurately track their treatment in an app without any extra work. So far we've done 5 years of R&D, our devices were tested by private institutions and universities, we partnered with a biotechnology company and now we are looking to conduct studies and begin pilot projects with live drugs.

Balloon Anchoring Technology for Chronic Arterial Stenosis

Principal Investigator	Danae Manolesou, PhD
PI Primary Affiliation	Shuttle Catheters
Co-Investigator(s)	Giannis Stefanidis, MD (inventor); Lefteris Papadopoulos, Mihalis Boutaris (team members)

PROJECT DESCRIPTION

Peripheral Artery Diseases (PAD) is a major chronic disease affecting millions of people worldwide and growing, due to an aging population. Our technology addresses an unmet need for minimally invasive PAD procedures in roughly 30% of all cases of chronic, severe arterial stenosis. We do this at a marginally higher cost than a conventional balloon catheter. This could mean 10bn dollars in savings for the US healthcare system and reduced morbidity rates thanks to averted open bypass surgeries for roughly 250,000 patients. The invention is a novel kinetic mechanism that allows for the shifting of a balloon over a catheter, thereby enhancing the catheter's maneuverability. The mobile balloon when inflated can be anchored inside a vessel, while the catheter is able to move forwards or backwards as desired. In other words, the invention is an anchoring mobile balloon technology. Up to date, the technology concept has been patented, designed and engineered for manufacturing assembly. Based on the engineering analysis, a proof-of-concept prototype has been built. Lab tests proved concept feasibility and validity: the new catheter design increases the force applied by the proximal tip of the catheter by 63.2%. Our project for the next semester consists of: designing and creating a demo prototype, organizing webinars with physicians to assess product/market fit, receiving mentoring on product management, industry relationships and certification, formulating the business case and strategy for product launch, disseminating information at scientific conferences, and assessing the regulatory pathway.

Curing infected wounds effectively with the most advanced antibacterial wound dressing

Principal Investigator	Olesja Bondarenko, PhD
PI Primary Affiliation	Nanordica Medical
Co-Investigator(s)	Anna-Liisa Kubo, PhD; Grigory Vasiliev, MD.

PROJECT DESCRIPTION

Nanordica Medical is Estonian deep tech company developing advanced antibacterial wound care products to reduce infection-related amputations. Our first product, antibacterial wound dressing, eliminates wound infections 8 times better than the current commercial best according to pre-clinical data. In Q3 2022 we are starting the first pilot clinical trial of our wound dressing on patients with infected diabetic foot ulcers. Our dressing is suitable for different types of acute as well as chronic wounds. Our ultimate vision is to help hundreds of millions of patients with wounds. See our video: <https://youtu.be/HrV1omJvjGc>, Contact our CEO: olesja@nanordica.com

ExoBand: Soft and Self-Powered Exoskeletons for Independent Living

Principal Investigator	Dr. Fausto Panizzolo, PhD and MSC
PI Primary Affiliation	Moveo Srl
Co-Investigator(s)	Margherita Mendicino, BSC; Simone Cimino, BSC; Samuel Mazzolin, MSC; Carlotta Damioli, High School Graduate; Anna Iannaci, High School Graduate

PROJECT DESCRIPTION

ExoBand soft exoskeleton is a revolutionary approach to support physical therapy treatments in medical conditions derived from degenerative diseases (Multiple Sclerosis or Parkinson's disease above all), aging or injured patients. It enhances mobility and allows remote rehabilitation and physiotherapy, with consequent benefits for health, cost savings and improved quality of life. Results of tests carried out confirmed that ExoBand strongly reduces the need for exertion by the user for walking and with a few weeks of training, patients can increase the distance walked by up to 50%, with an average increase of 15-20%.

Moveo holds the IPR to manufacture and exploit ExoBand thanks to two patent applications, filed to protect the IP generated from the new product development.

ExoBand is unique: it does not require any power, being based on a mechanical passive mechanism, it is lightweight, wearable and affordable. In Italy it can be fully reimbursed through national healthcare service and Moveo is going through the reimbursement process in other EU countries as well. ExoBand supports both patients and professionals in rehabilitation and physiotherapy programmes. It strongly improves the quality of life of: 1) People with degenerative disease. Prolonging the active life of PD, post-stroke and MS patients has a major impact on their quality of life, in addition to the savings associated with deferring immobility and socio-economic benefits due to their working activity.

2) Elderly people: The technology is very timely to tackle the socio-economic challenge of an aging population with a significant proportion having mobility difficulties.

Gene expression analysis for optimizing your health status

Principal Investigator	José Manuel Soria, PhD: Genomics & complex diseases director at Hospital Sant Pau, KOL in thrombosis
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PI Primary Affiliation	Exheus
Co-Investigator(s)	Teresa Tarragó, PhD: Senior Executive, MBA at ESADE, PhD in Biochemistry 1 exit (Iproteos, actual Accure therapeutics)

PROJECT DESCRIPTION

41 million people a year die from chronic disorders worldwide (obesity, diabetes, heart disease). The adoption of a sedentary lifestyle is driving obesity and related chronic disorders, and the WHO estimates that prevalence will increase by 57% by 2020.

Advanced diagnostic tools, such as genetic (DNA-based) testing, are ineffective in addressing these problems, as they only suggest the likelihood of developing a disease, but these disorders have less than a 20% predetermined genetic origin. Furthermore, they cannot monitor gene expression status or improvements made due to changes in diet, exercise, and medical plans, so they cannot follow an individual's trajectory to provide tailored solutions.

No other diagnostic tool in existence today can support customized treatment and recommendations to patients with the high level of personalization expected to drive adherence that Exheus provides.

Physicians have time constraints and there are few tools to help them enroll their patients in lifestyle and anti-aging programs.

That's why Exheus has created a unique health intelligence report that analyzes the expression levels of all 22,000 genes in the genome using RNA sequencing and AI. Exheus makes an accurate prediction of a person's level of risk to a given treatment through gene expression analysis and AI-aided data processing. They offer the most personalized tool currently available on the market for treatment monitoring and chronic disease prevention.

Immunotherapies for Humans, Manufactured in Plants

Principal Investigator	Linda Avesani, Ph.D.
PI Primary Affiliation	DIAMANTE SRL
Co-Investigator(s)	Valentina Garonzi, MBA, Master in Social Foresight Roberta Zampieri, Ph.D in Biotechnology Linda, Ph.D. in Biotechnology

PROJECT DESCRIPTION

Diamante is a biotechnology company that is developing Plant-based peptides drugs for autoimmune diseases. Educating the human immune system not to attack itself. We exploit this approach for a specific drug for Rheumatoid Arthritis, already tested on animal models. Rheumatoid Arthritis affects almost 1% of the worldwide population, causing €80 Billion costs every year.

For Rheumatoid Arthritis there is no cure, only general treatments based on the immunosuppression of the general functionality of the immune system and this causes severe side effects. Moreover, 20% of the patients do not respond to any drug in use. To solve these unmet needs, we are developing a specific drug that is based on the restoration of self-tolerance: we re-educate the immune system to specifically tolerate the body's own cell that is mistakenly attached, maintaining the immune system's ability to protect itself. No more severe side effects. Moreover, to produce our therapeutic particles, we use plants as a natural bio-facility. This production system is safer, cost-effective, and easy to scale. We have already done a successful proof of concept on animal models with the complete remission of the disease, raised seed investment and grants of more than 1 million euros, and filled 3 patents. We will do another pre-clinical trial by 2022, then the toxicology studies by 2023, and the phase 1 clinical trials in humans by 2024. We believe the re-education of the human immune system is becoming the main industry pillar and we want to pioneer it.

Innovative Active Cooling Technology to Optimize Sleep of the Elderly

Principal Investigator	Damien Testa, PhD
PI Primary Affiliation	MOONA SAS
Co-Investigator(s)	David Stoikovitch, MS; Tabya Sultan, BA

PROJECT DESCRIPTION

Older adults experience changes in the quantity and quality of their sleep. That modification could be due to the modifying mechanisms underlying the body's internal clock. A large proportion of older adults, between 40% and 70% of them, have chronic sleep problems. This leads to many negative health outcomes, including reduced quality of life and mental health issues.

Sleep research studies have shown that temperature is a key factor in sleep quality. Fluctuations in body temperature regulate the body's circadian rhythm and our sleep. It specifically regulates when we go to sleep, how well we sleep, and when we wake up.

It has been reported that older adults are significantly more sensitive to exogenous increases in nighttime ambient temperature than other age groups. That's why, in the context of global warming, the effect of a rise of 1°C of minimum temperature has been predicted to have on older adults twice the negative effect as for the rest of the population.

In this context, to tackle the problem of getting poor sleep, we have developed a smart system that understands each user's sleeping pattern and regulates the temperature of the user's head and neck to help him/her get the best sleep. Our product is active throughout the night, allowing the user to fall asleep faster, get more deep sleep and wake up beautifully rested!

Although this system has already shown great outcomes on elderly users of our existing product, we aim to get additional scientific evidence. For that purpose, we will run specific at-home trials on that population and get precise results on sleep and quality of life improvements. We will also assess how to further adapt the product to the elderly population. For that purpose, we will launch a market research project and use generated insights to develop a specific version of the product.

To conclude, this project will provide a validated, easy-to-use active cooling product that will help the elderly get restful sleep and improve their quality of life. This type of innovation will be even more essential in the current context of global warming.

MrTEEmothy - Transesophageal Echocardiography Simulator

Principal Investigator	Andrzej Gackowski, MD PhD
PI Primary Affiliation	Medical Simulation Technologies
Co-Investigator(s)	Tomasz Dziwiński, PhD Eng. Kamil Kipiel Paweł Piątek, PhD Eng. Adam Piórkowski, PhD Eng. Kamil Szostek, Eng.

PROJECT DESCRIPTION

Medical Simulation Technologies has developed unique simulation platform for echocardiography training (TEE) called MrTEEmothy. The clinical datasets used for virtual simulation are obtained from real, standard computed tomography (CT) studies of the heart, providing absolutely anatomically correct models. The simulation system is composed of:

- torso phantom,

- transesophageal echocardiography probe,
- ultrasound control panel,
- computer with preinstalled MrTEEmothy software.

Probe and panel need to be connected to the computer via USB ports.

Thanks to advanced OpenGL-based engine, MrTEEmothy software is able to truly simulate not only 2D but also 3D and 4D images (4D visualization showing the same section as the original 2D image with added depth called elevation). Color Doppler flow maps are added to give an information of the blood flow as well.

In our solution, the three-dimensional CT image is processed by a numerical algorithm and then displayed to the user in the form of a 2-dimensional projection that would be seen during the examination. This allows a user to learn anatomy based on the actual heart structures rather than on the synthetic model drawn by the graphic designer.

The main features are:

- Over 40 normal and pathological cases
- Realistic response to the probe manipulations
- On-screen graphical indicators of probe position and orientation
- 2D, 3D, 4D, Color Doppler modes, MPR
- Custom marks positioned in 3D space helping to understand the anatomy
- Automatic trainer of Standard TEE views according to American Society of Echo
- Automatic views acquisition test with reporting.

myLAB: towards a novel method to manage Chronic Kidney Disease (CKD)

Principal Investigator	Marco FM Vismara, MD, PhD
PI Primary Affiliation	lightScience srl
Co-Investigator(s)	Ennio Tasciotti, PhD. Antonio Valentini, MSc.

PROJECT DESCRIPTION

According to the Centre for Disease Control and Prevention (CDC) “More than 1 in 7, that is 15% of US adults, or 37 million people, are estimated to suffer from CKD. As many as 9 in 10 adults with CKD do not know they are affected. About 2 in 5 adults with severe CKD do not know they have CKD. [...] CKD is more common in people aged 65 years or older (38%) than in people aged 45–64 years (12%) or 18–44 years (6%)”. For these patients, the key to lower risk for further kidney failure is lifestyle changes such as healthy eating and physical activity, to delay as much as possible the need for dialysis or renal transplant. The main pillar of a kidney-healthy eating plan is a low protein intake. lightScience’s technology allows to measure phenylalanine (PHE) and tyrosine (TYR), two amino acids (protein components) which concentrations fluctuate the most after a high-protein meal. Our aim is to give patients affected by CKD a solution to help them realize the risks they are facing, and to find the best diet, leveraging on innovative biomarkers. Our solution is based on NIR Spectroscopy and machine learning, originally developed for Phenylketonuria patients, who need to often test their PHE levels due to an inborn metabolic error. We soon realized how our technology could bring benefits to CKD patients and to people in need of performing at their peak, i.e. astronauts and professional athletes.

NutriCare.Life

Principal Investigator	Bogdan Ivanov, BSc, BA
PI Primary Affiliation	Smart EpiGenetX
Co-Investigator(s)	Simona Ivanov (MD); co-founder, CEO Mircea Ivanov (BA); co-founder, Project management Gabriel Moldoveanu (BSc); Software Engineer Radu Paun (BSc); Software Engineer Daniela Stoian (BSc, PhD); Genetic and nutrition consultant

PROJECT DESCRIPTION

Lifestyle changes are hard to do. The digital health platform NutriCare.Life leverages human individuality to drive sustainable lifestyle changes with the final goal to prolong health conscious Americans healthy life by 10 years and reduce individual carbon footprint by 13%.

Using nutrigenetics, gut microbiome digital markers and wearables we provide scientifically validated ultra-personalized recommendation for a: • healthy weight maintenance, • adequate physical activity, • healthy diet for people and planet

Currently we have a free public beta MVP launched <https://app.nutricare.life/my/login> and, in the pipeline, the next B2C web & mobile version will be launched at the end of this year.

Quantum Pupillometry

Principal Investigator	Iannis Kominis
PI Primary Affiliation	Quantum Biometronics
Co-Investigator(s)	Ioanna Demeridou, PhD

PROJECT DESCRIPTION

Pupillometry is the measurement of the pupil's diameter as a function of time upon changes in the light illumination of the eye. All commercial pupillometers work with LED light, and usually stimulate the whole eye with a broad beam of light. We have developed the first laser pupillometer which provides for the first time for a spatially selective stimulus of the retina. Since the pupil diameter changes are regulated by mid-brain neural circuits, our pupillometer can access individual neural pathways, whereas current pupillometers offer an average response of many such pathways. With the precision in light stimulus and the precise measurement of the pupil's diameter we have achieved, and thus the ten-fold or hundred-fold increase of information we extract from the measurements, we can realistically expect to be able to offer for the first time early diagnosis for a number of pathologies, like glaucoma and the Alzheimer's disease.

Remote cardiac monitoring made simple.

Principal Investigator	Illya Chaikovsky, PhD
PI Primary Affiliation	Cardiolyse
Co-Investigator(s)	Anna Starynska

PROJECT DESCRIPTION

Cardiolyse provides a chronic & post-discharge CVD patient monitoring platform with cloud-based heart health analytics, that enables remote vital sign monitoring and personalized patient reports for early diagnostics

and better care.

Heart Health Analytics platform features:

- Automatic rest ECG & Holter ECG, as well as HRV data analysis.
- Cardiac risk assessment and monitoring.
- Warnings of personal behavioral changes.
- Device agnostic solution.

We take raw ECG data and turn them into actionable insight, so caregivers and doctors can take the appropriate action.

Our risk-stratification and decision support Scoring System can be used for different patient groups (chronic, post-MI, CAD).

It consists of key parts - Standard ECG analysis (19 arrhythmias), Myocardial damage (determines the dynamics of myocardial changes and determines the effectiveness of therapeutic measures), and our patented Universal ECG Score System (Quantitative assessment of patient's condition. This method is non-specific but sensitive for evaluating the effectiveness of therapeutic measures and has a proven predictive value in relation to the outcome of a number of diseases).

Our analytics modules and the whole cloud architecture are ideal for remote patient monitoring. It includes secured data storage, web dashboard, and applications for patients, as well as supervisory access and report editing software for caregivers. We are device agnostic but have already integrated more than 10 trusted partner devices.

SCREENING AND MONITORING OF IRON DISORDERS OUTSIDE THE LABORATORY AND FOR CLINICAL AND RESEARCH PURPOSES

Principal Investigator	Simona Roggero, PhD
PI Primary Affiliation	Fidelio Medical srl
Co-Investigator(s)	Fabiana Arduini, PhD

PROJECT DESCRIPTION

Rephrase mode Copia Fidelio Medical is developing the first comprehensive screening program for iron disorders, to facilitate access to screening, monitoring and consulting experts for iron disorders. 1 in 3 people suffer from iron disorders, in particular women, people with chronic illnesses and the elderly. If left untreated iron diseases can lead to serious problems, from anemia to chronic mental and physical fatigue, disability, heart and kidney disease. Blood iron is affected by diet and abnormally high or low levels are linked to age-related conditions such as Parkinson's disease, liver disease and a decline in the body's ability to fight infection in older age. Blood iron levels could be key to slowing ageing.

Early detection of iron deficiency or overload is critical for targeted, preventative treatment. Also, monitoring iron levels using our simpler tool will increase understanding of the role of iron in aging.

Fidelio Medical's innovative electrochemical sensors have been combined to provide reliable, easy-to-use digital diagnostics out of the lab.

We will allow iron metabolism multi-marker screening out of the lab, at home and during medical visits, in screening program. Through our algorithm we will correlate them supporting clinical decisions and also researchs in this specific area.

Existing point-of-care solutions can only detect either ferritin, that alone leads to misdiagnosis in more than 50% of cases, or hemoglobin, which alone signals anemia, an already advanced state of iron deficiency.

Fidelio diagnostic units, based on multi-marker analysis in the Fe²⁺ and Fe³⁺ zone, will provide comprehensive and frequent monitoring of the iron panel settings.

Fidelio is also developing a digital platform around its point-of-care diagnostic unit. The platform collects, elaborates and reports data from point-of-care testing. In Fidelio Medical's digital space, patients access iron disorders risk assessments and on-demand services, and physicians provide evidence-based support, enabling continuous monitoring and preemptive treatment.

The integration of the diagnostic units with a digital platform will allow data collection, data development through algorithms and new high-quality digital consulting services.

We are collaborating with key international experts in the iron disorders field.

Our data into the hand of our strong experts network will support the main research projects worldwide involved in the area of better understanding of the blood iron involvement in the slow ageing.

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SmartLungDx - Lungfunction testing for everyone

Principal Investigator	James Hugall, PhD
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PI Primary Affiliation	Breaz Medical SL
Co-Investigator(s)	Petra Stockinger, PhD; Rodolfo Plaza Herz, Msc

PROJECT DESCRIPTION

Chronic respiratory diseases affect 1 in 10 people globally and sadly many are misdiagnosed or not diagnosed at all due to the invisible slow-progressing nature of these diseases. Chronic Obstructive Pulmonary Disease (COPD) has an underdiagnosis rate of 75% and causes 3 million deaths per year, making it the third cause of death. This disease causes huge disability and many hospitalizations with huge costs to society estimated to be around EUR 400 billion globally. Early interventions are key to delay or stop disease progression and to avoid much of this devastation. However, practical solutions for the early and accurate diagnosis of these diseases are currently not available.

BREAZ Medical SL is a Barcelona based MedTech startup simplifying lung health diagnostics. They are currently developing a novel solution for accessible diagnosis and monitoring of lung diseases in resource-limited settings like primary care, starting with chronic obstructive pulmonary disease (COPD).

By detecting chronic respiratory diseases earlier and improving the accuracy of the diagnosis in community settings, they want to reduce the huge burden in society of these diseases to improve patient quality of life, reduce mortality and reduce hospitalization.

BREAZ was formed in 2020 after witnessing the devastating impact seen in hospitals caused by the late and incorrect diagnosis of chronic diseases. In 2021, they won public grants of over €320K and have established a close clinical partnership to finish their technology demonstrator and trials.

Keywords: prevention; respiratory disease; COPD; screening; diagnosis;

Sustainable incisional negative pressure wound therapy device

Principal Investigator	Antonio Nunzio D'Angelo M.Sc
PI Primary Affiliation	Medicud Srl
Co-Investigator(s)	None

PROJECT DESCRIPTION

Medicud has developed an innovative incisional Negative Pressure Wound Therapy device to reduce infection risk. The device is mechanically powered and ultraportable, engineered to be cost effective and reduce ecological footprint thanks to the use of novel biopolymers. Surgical site infections are a global burden with on extremely high associated cost, more than 30 billions dollars are spent each year to treat infected surgical wounds. Incisional NPWT has a proven prophylactic efficacy, supported by ten years of use, unfortunately current device are highly expensive, unhandy and being battery powered and single use they have an important ecologic cost, nothing is recycled.

Medicud wants to make this treatment the gold standard prophylactic treatment for surgical incisions with its innovative solution. As of today more than 250 million major surgeries can benefit from Medicud device, making a 12 billion dollars potential market, market will be driven in the next years by increase of global population, comorbidities (diabetes, obesity...) an increased global access to surgical procedures.

The Rehabilitation Gaming System Ecosystem

Principal Investigator	Santiago Brandi, CEO
PI Primary Affiliation	Eodyne Systems

Co-Investigator(s)	None
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PROJECT DESCRIPTION

Health services are increasingly moving towards a treatment continuum aligned with the patient journey from the clinic to the home environment. This transition will critically depend on the successful deployment of trustworthy AI-enhanced technologies for data processing, diagnostics, prognostics, and patient-tailored intervention that are accurate, secure, and trusted by clinicians and patients alike. Eodyne is leading a number of initiatives to develop and validate operating procedures and guidelines for integrating AI in healthcare, focussing on post-stroke rehabilitation, the second leading cause of death worldwide and the primary contributor to the burden of neurological disease with over 13.5 million stroke cases every year and a total population of chronic stroke survivors of 80 million.

Using Phototherapy to Promote Well-being in Older Individuals

Principal Investigator	Aleksandra Lesiak, PhD, MD
PI Primary Affiliation	Phlecs
Co-Investigator(s)	Rene Wenmekers, MBA David Aubert, MBA

PROJECT DESCRIPTION

Itching is highly prevalent among the older adults, studies in the Netherlands and in Denmark show that up to 50% of nursing home residents suffer from Chronic Itching.

Comorbidities are also very frequent such as hypertension that affects more than 70% of the 65 years plus and depression that could raise up to 50% in the nursing home population.

Current treatments have important limitations, because of overmedication, potential side effects and the time it requires to provide skin care, when care givers capacity is limited. Because of that, adherence to treatments is low and this significantly impacts the quality of life of our parents and grandparents. Phlecs leverages more than 15 years of clinical research and technology development originated at Philips. Studies show that blue light, that is UV-free so easy and safe to administrate, is effective to reduce itching, hypertension and depression. These clinical results are confirmed with the most recent studies conducted at the Universities of Lodz in Poland and Düsseldorf in Germany using the full body blue light device of Phlecs.

Phlecs has introduced a Full Body Blue Research device last year, the device is currently used by dermatology clinics to do research on blue light and sold to large care homes that have the facility to provide the treatment. Phlecs has also initiated the development of a Full Body Home connected device that brings therapy at patient's bed and captures patient biomedical data. This device will be launched in 2025."