ELVEFLOW an ELVESYS brand

RESEARCH PROJECTS

- H2020 Projects
- MSCA Individual Fellow Projects
- MSCA Innovative Training Network Projects
- Research and Innovation Staff Exchange

ELVESYS
MICROFLUIDICS INNOVATION CENTER

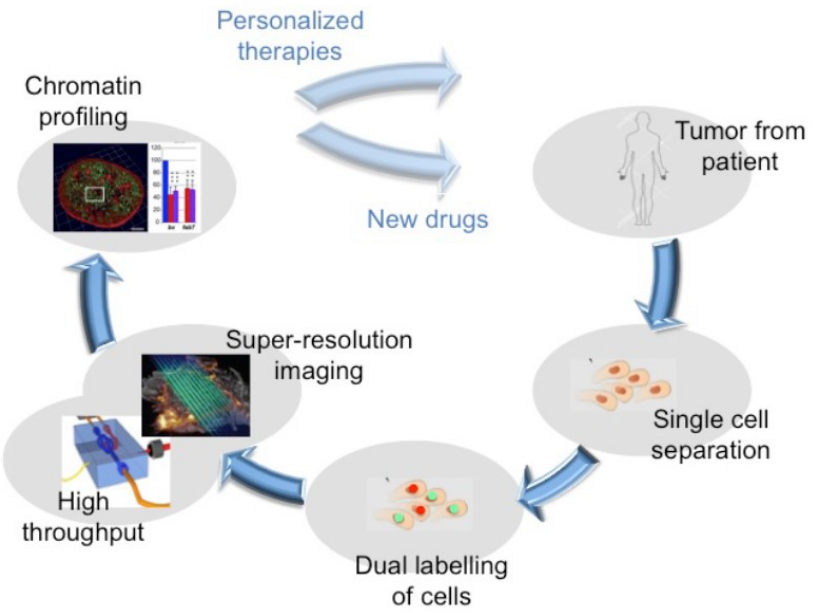
H2020 PROJECTS

Chromatin Organization Profiling with High-throughput Super-resolution Microscopy on a Chip

Understanding **3D-organization of cancer-associated chromatin domains** should help to unravel tumor heterogeneities and develop targeted therapies. As no microscopic techniques are currently available to characterize chromatin structures at single cell level, the **PROCHIP** project aims to develop a high-throughput super-resolution microscope to analyse chromatin quickly in a large amount of cells.

Imaging will be performed in a **1cm² microfluidic glass chip** in which the cells will flow and each single cell will be scanned automatically. All optical components necessary for the observation will be integrated into the microfluidic chip.

In this European consortium, Elvesys will bring its expertise on fluid handling for microfluidics to acquire precise data for flow velocities corresponding to **100 cells/min**.



Our activity on the project:

Flow control & instrumentation for low flow rate

Elvesys contact: aurelie.vigne@elvesys.com

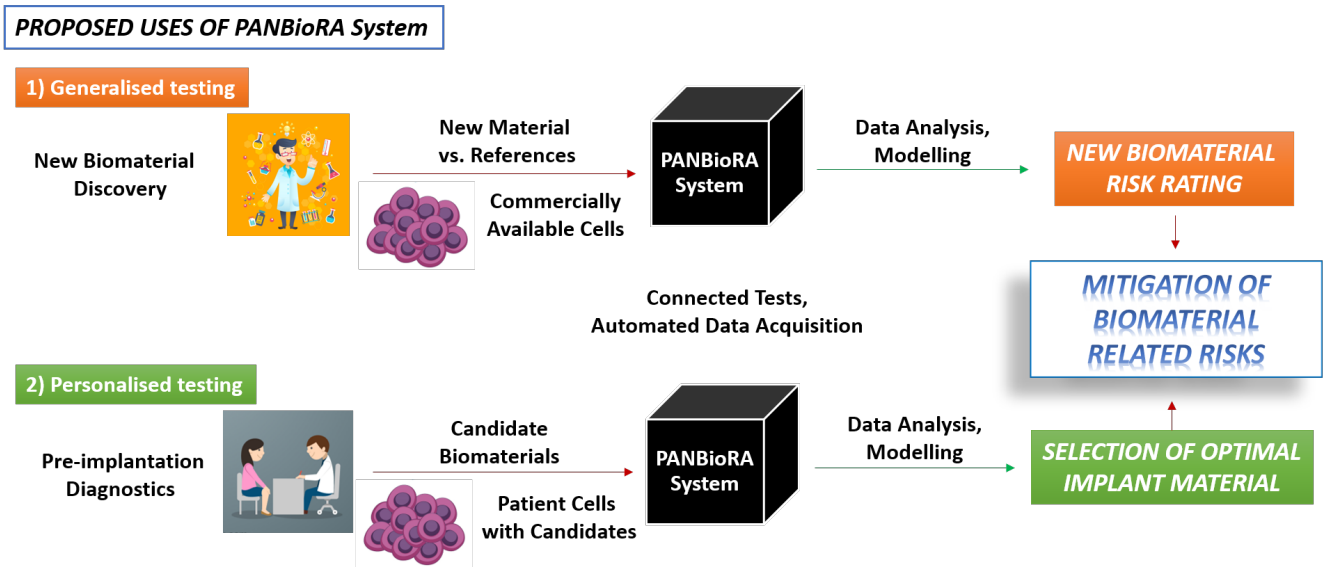
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 801336

Personalized and/or Generalized Integrated Biomaterial Risk Assessment

Lots of **medical devices**, such as implants, coronary stents or fracture pins, are made of **biomaterials**.

The biological evaluation of new biomaterials are currently time and resource consuming. Moreover, once implanted, biomaterial devices often lead to complications such as inflammation or infections, showing the difficulty to assess their innocuity and the importance of developing new tools for personalised pre-implantation diagnostics.

The goal of **PANBioRA** is to provide a set of tools to standardize evaluation of new biomaterials. The same platform should also allow personal testing of different materials to assess the risks and choose the most appropriate for each patient.



Our activity on the project:

Flow control & instrumentation for cell culture

Elvesys contact: julia.sepulveda@elvesys.com

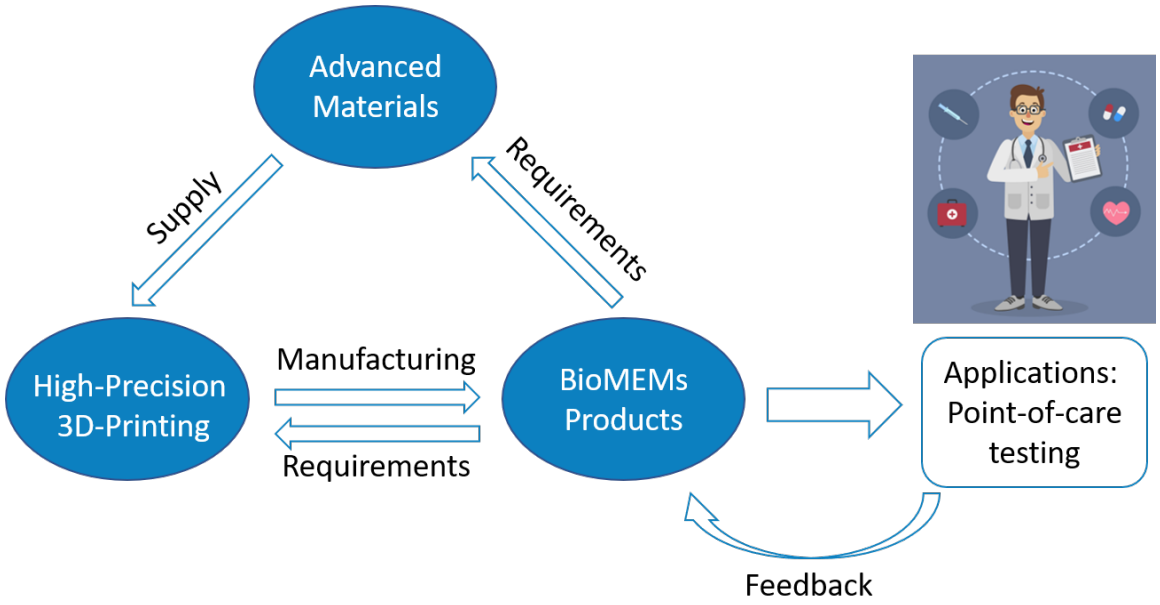
PANBioRA

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 760921-2

Additive Manufacturing of 3D Microfluidic MEMS for Lab-on-a-Chip applications

Microfluidic **lab-on-a-chip**, allowing the **reduction of volume samples and analysis time** as well as **improving the sensitivity**, is a promising technology for the development of efficient and portable diagnostic devices. However, the upscaling of lab-on-a-chip technology remains challenging. 3D-printing facilitates the production of microfluidics devices, offering an affordable and easy alternative to produce labs-on-chip in a reproducible way.

M3D-LoC consortium goal is to develop **the next generation of 3D-printed microfluidic devices for diagnosis**. A pilot line combining different manufacturing techniques to produce microfluidic chips with a good resolution and a low rugosity will be built, and the performance of this new manufacturing platform will be evaluated by designing novel lab-on-chip devices for the detection of three diseases: tuberculosis, HIV and lung cancer.



Our activity on the project:

Chip design & Prototype optimization

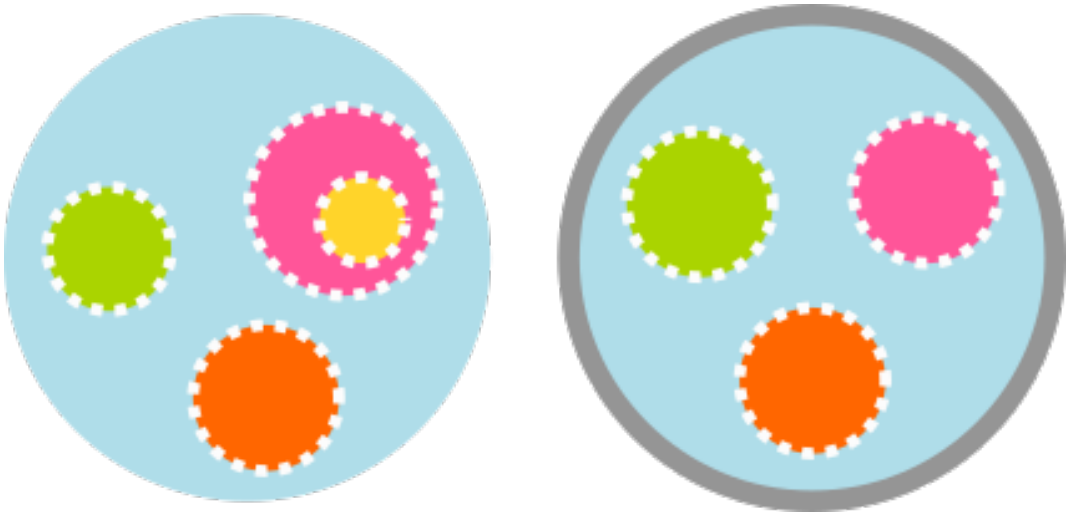
Elvesys contact: noemi.thomazo@elvesys.com

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 760662-2

Artificial Cells with Distributed Cores to Decipher Protein Function

This project aims at developing a new technology for the creation of **simple artificial cells** made of **liquid-based capsules**. These artificial cells will contain interactive and multifunctional cores (including sensing, actuating, reporting, energization and barcoding functions) and will act as **communicating micro-laboratories**. This new technology reproducing living cells will help to identify new targets for future drugs and to conduct drugs screening against the identified proteins.

The capsules will be made using microfluidics technologies, and in particular droplets generators based either on **flow-focusing geometries** to obtain the cores of the future capsule, or on an innovative bat-wing junction to encapsulate these cores into the capsule. The new generation of microfluidic devices designed for this purpose will be made by **3D-printing**, allowing the construction of 3D structures to produce artificial cells in a more effective way.



Our activity on the project:

Flow control & Instrumentation for capsule production

Elvesys contact: aurelie.vigne@elvesys.com

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No SEP-210507451

Electrochemically-enabled High-throughput Peptidomics for Next-generation Precision Medicine

The uptake of proteomics for precision or **personalised medicine applications** requires the development of an effective screening instrument, capable of detecting proteins at the low concentrations they are found in biological conditions, while addressing their large chemical variability.

The goal of the **ElectroMed** project is to build and validate a **proof-of-concept prototype of a programmable high-throughput peptide microarray technology**. It is based on the radical vision of integrating **electrochemical synthesis of peptide bioreceptors** to enable programmable in situ protein detection, with nano-functionalised FinFET sensors for high-performance data acquisition, within a **microfluidic-driven multiplexed platform** for parallel screening.

Our activity on the project:

User-friendly microfluidic setup for flow control

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Julia.sepulveda@elvesys.com

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862539

Scale-up of our isruptive antibody analytical platform based on flow-induced dispersion analysis(FIDA) to increase efficiency in the research of new antibodies and vaccines

Antibodies are important in the R&D of new vaccines. To test vaccines, we must follow the generation of autoantibodies to verify that the vaccine is working well. This analysis is performed with the same tools used in the antibodies research, and with the same drawbacks: artificial assays based on non-native sample materials. In addition, vaccine R&D is immensely costly.

FIDA is a patented solution that **simplifies and standardises immunological measurements** under native conditions. Current platforms require 15 treatment steps, when FIDA **only requires a single step**. FIDA focuses on both the global research antibodies market and vaccine R&D market at pre-clinical phase (in which certification as a diagnostic/prognostic device is not needed). In this project, we will further develop and scale up our analytical platform to engineer a product that can be commercialized.

Image credit: FIDA website
https://fida-tech.com/fida-technology/

Our activity on the project:

OEM (Original Equipment Manufacturer) for flow control

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Julia.sepulveda@elvesys.com

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No SEP-210595008

ELVESYS
MICROFLUIDICS INNOVATION CENTER

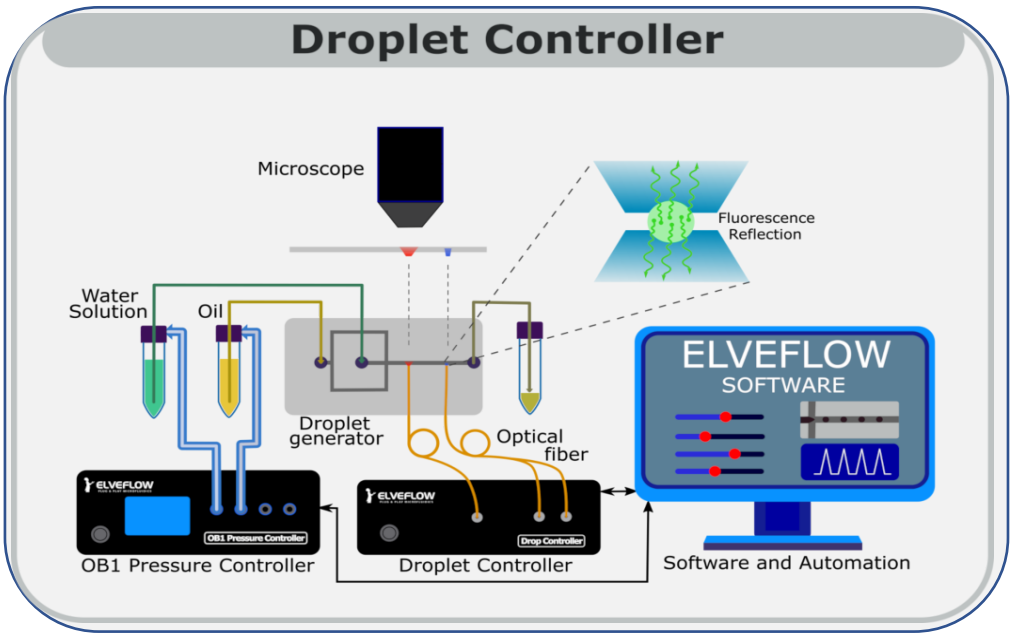
MSCA INDIVIDUAL FELLOW PROJECTS

Elveflow is a brand of the **Elvesys microfluidics innovation center.**

Automated High-Throughput Production of Monodisperse Emulsions

Monodisperse emulsions are of great interest for food industry, pharmaceutical industry and cosmetics industry as they show an increased stability and better controlled properties compared to the polydisperse ones.

The production of monodisperse emulsions in a single channel is already well controlled, thus we will concentrate in this new project on the **high-volume droplet production to meet industrial needs**. We aim to apply parallelized droplet generators in combination with controlled automated droplet production to provide monodisperse emulsions despite any fluctuations in the system (for example the clogging of a microfluidic channel or other instabilities). As a result, we will be able to offer a very versatile, stable and simple to use microfluidic system to perform the **generation of specific size monodisperse emulsions** at an industrial scale,



Keywords: **monodisperse droplets; emulsions; automatic production.**

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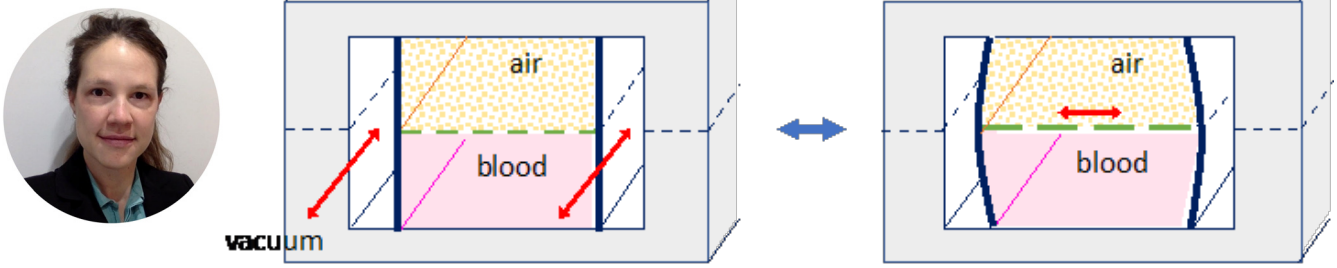
This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 796514

Mechanically Tuned Lung-on-a-chip Device to Model Pathology and Drug Screening for Lung Disease

To better understand these disorders and to screen potentially efficient drugs, **appropriate lung models need to be developed.** Lungs are constantly undergoing mechanical stress during breathing, **making the elasticity of the membrane a crucial parameter for understanding lung diseases.** However, the polymer typically used to mimic the air / liquid membrane has an elastic modulus of up to one thousand times higher than its physiological equivalent and does not offer biological stimuli. To advance lung-on-a-chip models, the aim of this project is to **control the mechanical properties of the membrane by adding fibrous matrix proteins** (e.g. collagen and elastin). Elveflow fast and stable microfluidic flow control system developed will help to finely control membrane deformation and culture media. The mechanical properties of this model lung membrane can be thus adapted to different disease phenotypes to be as relevant as possible in the development and screening of treatments.



Lung-on-a-chip microfluidic device: Application of vacuum in the side channels stretches the membrane separating the air and liquid chambers.

Keywords: **lung-on-chip; thin membranes; elasticity; mechanical modulation.**

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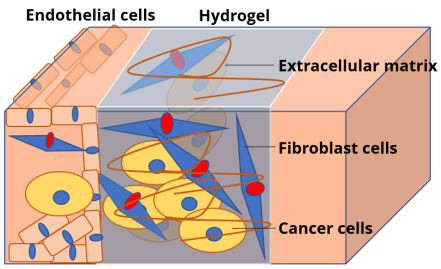
This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 793749

Multi-compartmental Tumor-on-a-chip Device to Mimic the Tumor Microenvironment and Drug Screening for Breast Cancer

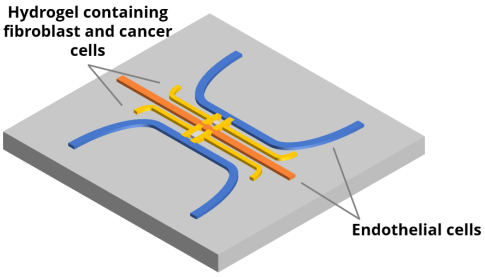
Currently, **cancer research** is mostly based on studies performed either on **2D cell culture,** which is not representative of real in vivo conditions, or directly on living animals, leading to ethical issues and questionable extrapolation to humans.

Organ-on-a-chip technology, and **tumor-on-a-chip** in particular, offers a powerful alternative to be more realistic and to better understand breast cancer mechanisms.

In this project, we will recreate the environment of **breast tumors** by surrounding tumor organoids with fibroblasts and endothelial cells, all types of cells being cocultured into a biocompatible hydrogel. In this tumor-on-a-chip, the microenvironment of the cells will be carefully controlled thanks to the Elveflow® pressure controller combined with valves and actuators. We will test **different combinations of anti-cancer drugs** in order to study the existing synergies between them and better understand how they interact with the tumor. This drug screening will allow to develop more effective breast cancer treatments.



Generation of tumor microenvironment



Representation of microfluidic cell culture device incorporating hydrogel

Keywords: **breast cancer; tumor on a chip; hydrogels.**

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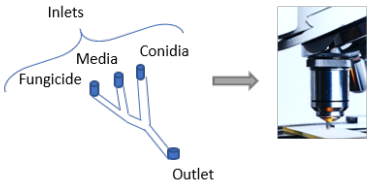
This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 795754

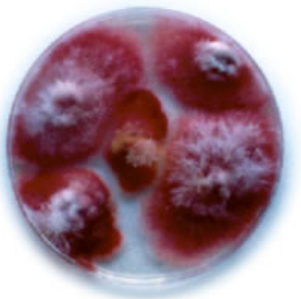
Microfluidic Approaches for High-Throughput Fungicide Screening and Sensitivity Testing

Fungicides have become an integral part of agriculture for **efficient food production**. The loss of a fungicide through resistance is a problem that affects us all.

Fungicide development and screening is stuck in an innovation gap, in which it incurs staggering expenses and takes many years to get a fungicide to market. Furthermore, **many pathogens develop a resistance against fungicides** which necessitates the sensitivity screening and recalled fungicides.

The conventional techniques to screen for fungicides and to identify the resistance are time consuming and laborious. One of the primary objectives of this project is to establish a **simple microfluidic lab-on-chip to perform high throughput (HT) fungicide screening studies into droplets.** Fungal spores will be encapsulated individually in droplets produced on chip, germinated and grown, and finally put in contact with fungicides.





Keywords: **lab-on-chip; agricultural plant pathology; plant-microbe interaction.**

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 843162

Plug-n-Play Tool-kit of Organ-on-Chips

A complete understanding of the **human physiological response** to newly developed **drug molecules** is a key step in drug discovery and development. In recent years, the cost of drug development has significantly increased, with a corresponding decrease in the number of new drugs being developed. The end deliverable of the action is an easy-to-use toolkit, which can be used to **rapidly design and assemble OoC systems**. The toolkit would consist of individual parts, each capable of eliciting a specific functional and structural aspect of a given organ. The approach of modular design enables the creation of a **wide variety of OoCs**, while at the same time increasing uniformity in the device design. **For industry R&D, it would enable standardized rapid prototyping of OoC platforms**, without the need to spend dedicated time and human resources for the design of the OoC platform itself.

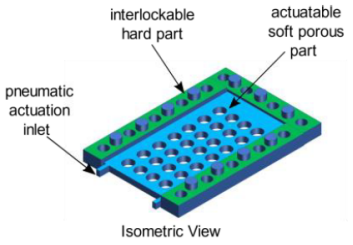

Figure 1 - Pneumatically Stretchable Porous Membrane

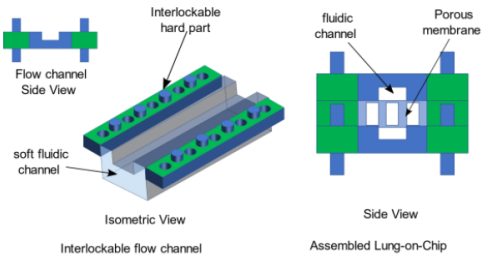

Figure-2 -Interlockable flow channel and assembled OoC

Keywords: **Microfluidics, Organ-On-A-Chip, Biomaterials, in vitro models, Pharmaceutical Testing.**

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 840231

Carotid-artery-on-a-chip Device to Model Thromboembolisms Induced by Vascular Lesions and Perform Drug Screenings

Stroke remains the second leading cause of mortality, the third leading reason for disability, and a top contributor to dementia and depression globally, but we lack sufficient preventative measures. A stroke develops when the dislodged embolus creates temporary blockage along the vasculature as it relodges within a narrower cerebral artery, causing an ischemic or hemorrhagic event.

Our innovative **CAR-OAC model** aims to provide a tool for **evaluating arterial thrombosis** by developing a more physiologically analogous carotid artery mimetic device, made of additional materials forming two functional layers.

The goal of the project will be to **develop a novel carotid-artery mimetic system**, with fat-embeddable zones which may be used to investigate how blood cells and vasculature interact to generate thrombi-inducing lesions that occur between common, external, and internal carotid arteries while changing the flow from laminar to turbulent, or its overall direction.

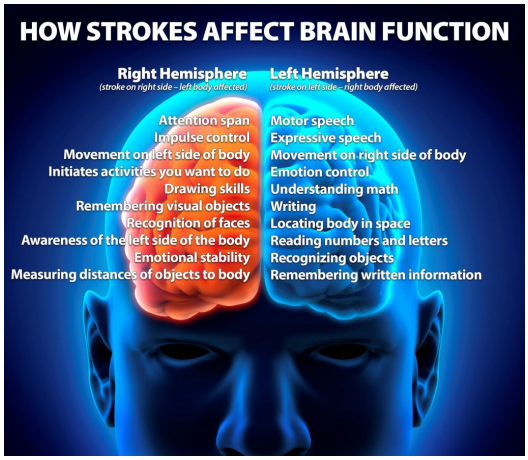

Image credit: Roane medical center
https://www.roanemedical.com/stroke-care/stroke-rehabilitation/

Keywords: **vasculature-on-a-chip, microfluidics, elastic modulus, biophysics, cardiovascular, membrane dynamics.**

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 843279

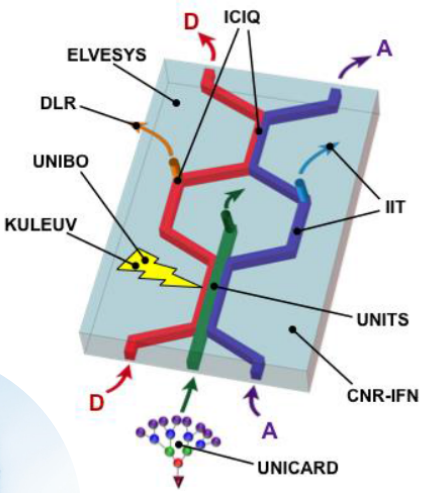
ELVESYS
MICROFLUIDICS INNOVATION CENTER

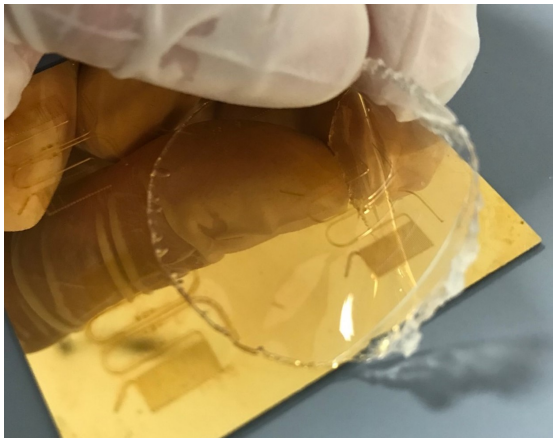
MSCA INNOVATIVE TRAINING NETWORK PROJECTS

Entrepreneuring Dynamic Self-Organized Interfaces in Photocatalysis

Today, light can provide valuable and sustainable alternatives that can help us **temper climate change and meet energy demands**, by providing energy and reducing energy consumption. This is the reason why new materials are being developed to collect solar energy for instance.

The main goal oh the **Phototrain Project** is to transform l**ight-fuelled processes from a proof-of-principle to an exploitable process**. To achieve this goal, they will use fundamental concepts in supramolecular chemistry and photochemistry to build functional photoactive interfaces which can be implemented to produce scalable and sustainable quantities of products.





Keywords: **microfluidics; photocatalysis; self-organization; molecular recognition.**

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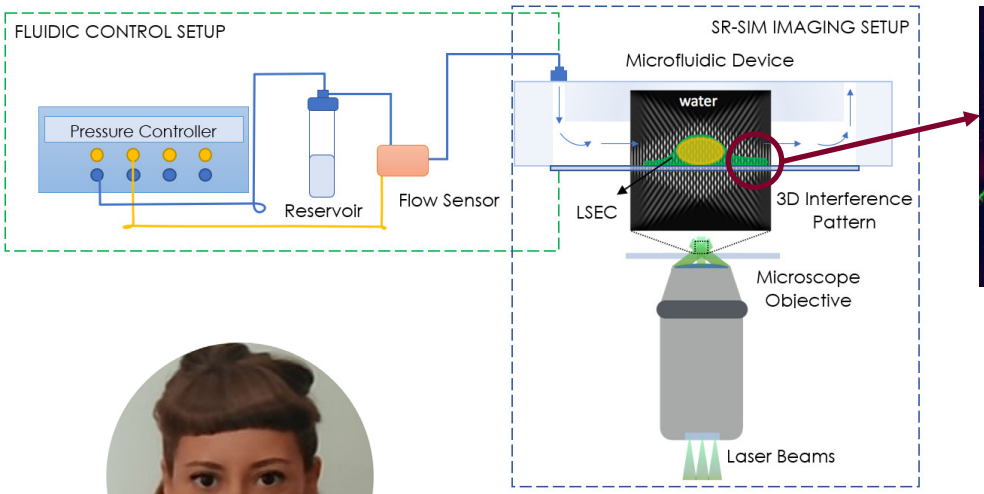
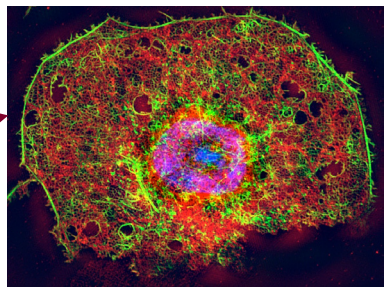
This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 722591

Development of 3D Microfluidic Cultivation and Cell Manipulation Systems for Optical Nanoscopy

The cleaning and metabolic activities of the liver are ensured by the combined activity of both parenchymal and non-parenchymal cells, such as liver sinusoidal endothelial cells. If hepatocytes have been deeply studied, the role of non-parenchymal cells and their interaction with hepatocytes are still not well documented. Specifically, **the endothelial cells of liver sinusoids are responsible for blood clearance and the endothelial transport is ensured by nanosized pores called fenestrations.** Their small size (50-200 nm) and the fact they are dynamic structures hinder their characterization in living cells by currently available microscopy techniques. This issue will be addressed in this project by the development a **novel high-speed super resolution microscope** capable of imaging the evolution of fenestrations over time and space.





Keywords: **Super-resolution microscopy; microfluidics for 3D cell culture; LSECs.**

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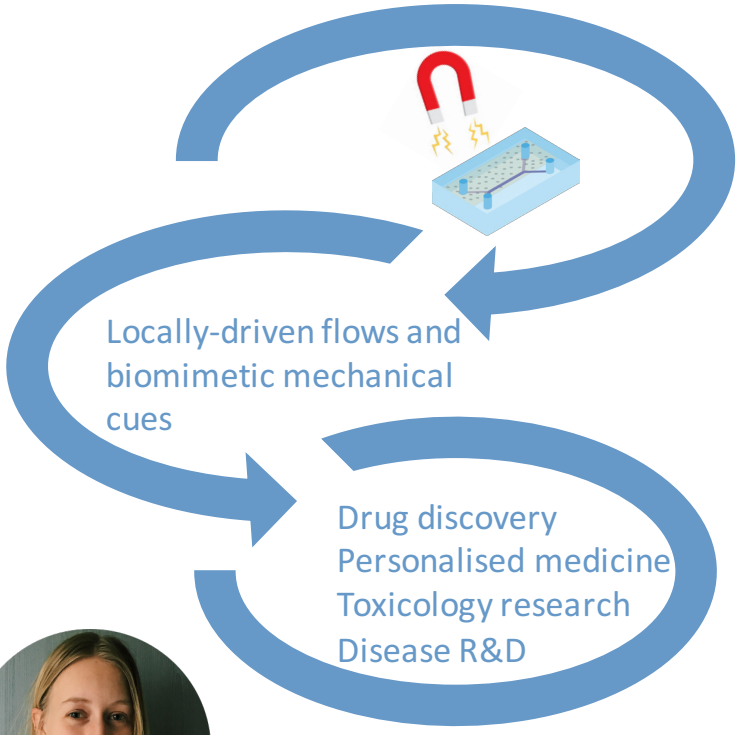
DeLIVER Innovative Training Network

MARIE CURIE ACTIONS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 766181

Development of Magnetically Controlled Biological Test Platforms

The **MaMi** project bridges the research fields of **microfluidics and magnetism**, by taking advantage of magnetic forces to control local flows and cargo transport inspired by biomimetic systems. The key research question guiding the project is **"How can magnetism and biomimetic locally-driven flows overcome the current limitations of microfluidics?"**.



The ultimate goal will be to address the hurdles that need to be overcome for transition of microfluidic techniques from prototype-state organ-on-chip into marketable devices.

MAMI

Magnetics and Microhydrodynamics

Keywords: **microfluidics for 3D cell culture; magnetism; biomimetic systems.**

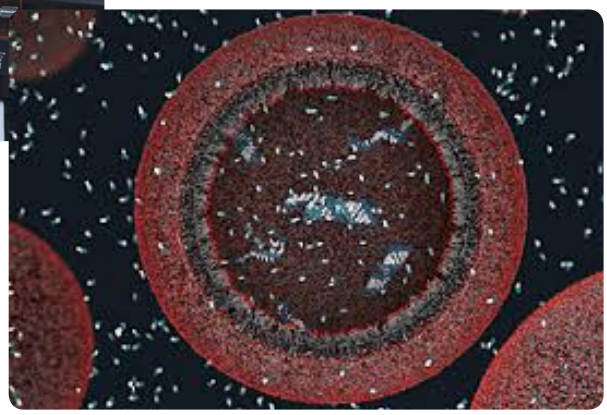
Elvesys contact: emma.thomee@elvesys.com

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 766007

Protometabolic Pathways: Exploring the Chemical Roots of Systems Biology

Understanding how **prebiotic chemistry** gave rise to life as we know it represents one of the greatest enduring mysteries. The complete absence of a historical record requires the collaboration of scientists from different disciplines with access to advanced tools in order to make any meaningful progress.

To better understand the origin of life, the partners of the project will develop together a **reconstituted protometabolism within compartments consisting of coacervates, vesicles, coacervate containing vesicles, and compartments etched into microfluidic chips.**



ProtoMet

Keywords: **droplets; pH control on chip; gas control on chip; protometabolism.**

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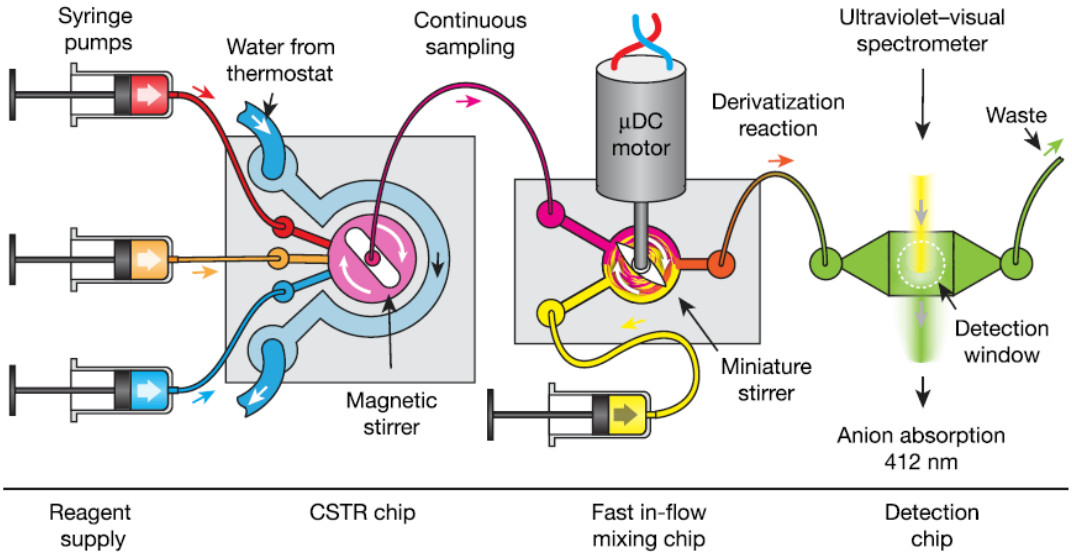
MARIE CURIE ACTIONS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 813873

Chemical Reaction Networks: Signal Amplification, Spatiotemporal Control, and Materials

CRNs are ubiquitous in biochemical systems and serve a range of complex biological functions such as **signalling** (e.g., switching, signal propagation, and amplification), **protein synthesis, and homeostasis.** Such CRNs operate necessarily in dissipative non-equilibrium states and are orchestrated by feedback loops (i.e., detailed balance cannot exist).

To keep reactions far away from equilibrium and thus to allow sustained chemical oscillations, most commonly a continuously stirred tank reactor (CSTR) is used, to which reactants/products and introduced/removed continuously. In this thesis, our goal is to **implement multiple micrometer-sized CSTRs (μCSTR) on an integrated microfluidic platform.**



CReaNet

Keywords: **μCSTR; chemistry on chip; chemical reaction networks.**

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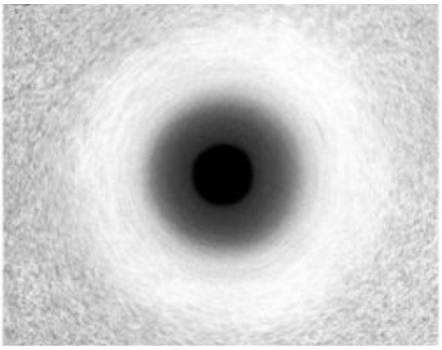
This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 812868

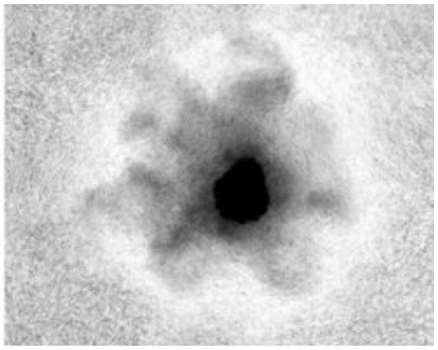
Active Matter: From Fundamental Science to Technological Applications

During the last decade, active matter has been attracting increasing interest because **its study can shed light on far-from-equilibrium physics** and provide tantalizing options to perform tasks not easily achievable with other available techniques on the micro- and nanoscale.

Nanoscience and **nanotechnology** are revolutionizing the way we live and do science. Micro- and nanodevices herald a new era of unprecedented possibilities in sensing and information processing at the nanoscale.

In the context of this drive towards the nanoscale, the aim of the **ACTIVEMATTER** network is to train a new generation of physicists and engineers with the scientific insight and **managerial skills to harness active matter at mesoscopic and nanoscopic length-scales** and to exploit it in high-impact applications (e.g. the design and fabrication of biomimetic materials, the targeted localization, pick-up and transport of nanoscopic cargoes, drug delivery, bioremediation and chemical sensing).





nature COMMUNICATIONS

Active Matter

go.nature.com/NC-ActiveMatter-03

Keywords: **Active matter, active Brownian particles, physics far from equilibrium.**

Elvesys contact: julia.sepulveda@elvesys.com & aurelie.vigne@elvesys.com

MARIE CURIE ACTIONS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 812780

Neurotransmitter Transporters: From Single Molecules to Human Pathologies

The vision of the **ETN network NeuroTrans** is to (i) enable an improved understanding of **how dysfunction of neurotransmitter**: sodium symport-ers (NSS) contributes to neuropsychiatric disease pathobiology and how psychoactive substances target these transporters and (ii) to establish a robust framework for comprehending these pathologies through changes in transporter function at the molecular level. The mission of NeuroTrans is to **develop a solid model that can predict changes in NSS function using fundamental principles obtained from quantitative experiments with an interdisciplinary approach**.

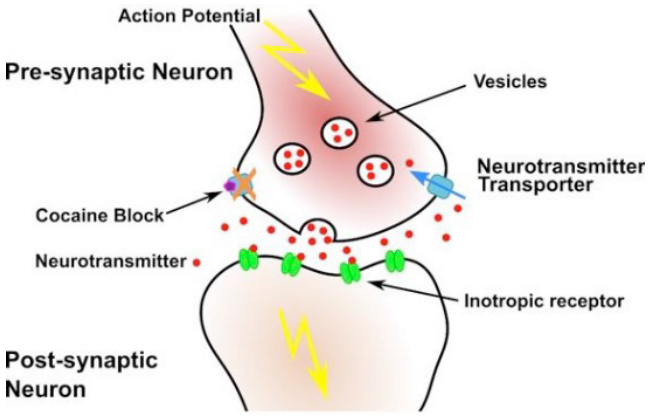


Figure 1.1a: Synapse showing the core steps of transmission: Arrival of an action potential, vesicle fusion, neurotransmitter release into the synaptic cleft, binding to the postsynaptic receptor and reuptake by the neuro-transmitter transporter into the presynaptic axon, as well as transporter blockage by the adulterant cocaine.

Keywords: **neurotransmitter transporters, cell culture on chip, controlled drug delivery, fluorescence monitoring.**

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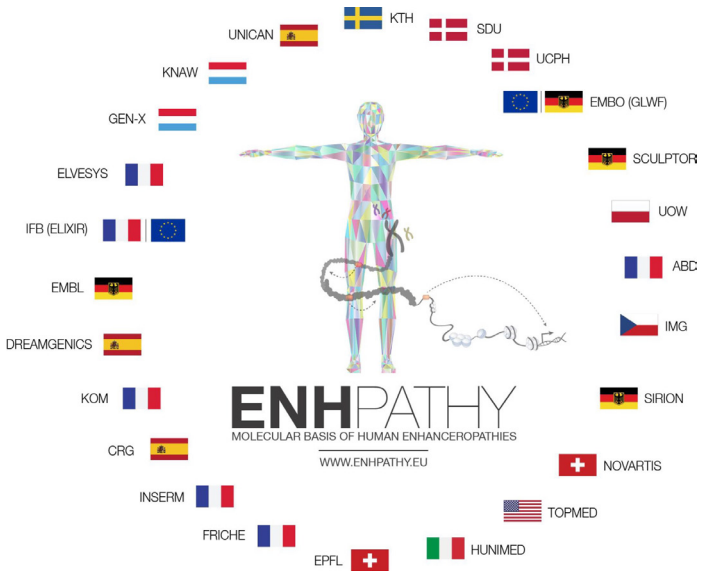
This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 860954

Molecular Basis of Human Enhanceropathies

Mutations within coding genes have traditionally been considered the **major genetic cause of human diseases.** However, it is becoming increasingly clear that the genetic, structural and/or epigenetic disruption of enhancers and enhancer landscapes represent major etiological factors in numerous human diseases (i.e. enhanceropathies), ranging from rare congenital disorders to common diseases associated with ageing (e.g. cancer, diabetes).

A comprehensive understanding of the diverse means by which enhancer activity is altered in human disease should **improve personalised diagnosis** and direct the discovery and development of new classes of therapeutics designed to target vulnerabilities of defined disease subgroups (e.g., by the use of specific epidrugs).



Keywords: **Enhancer, epigenetics; genomics, single cell analysis, droplet generation**

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 860002

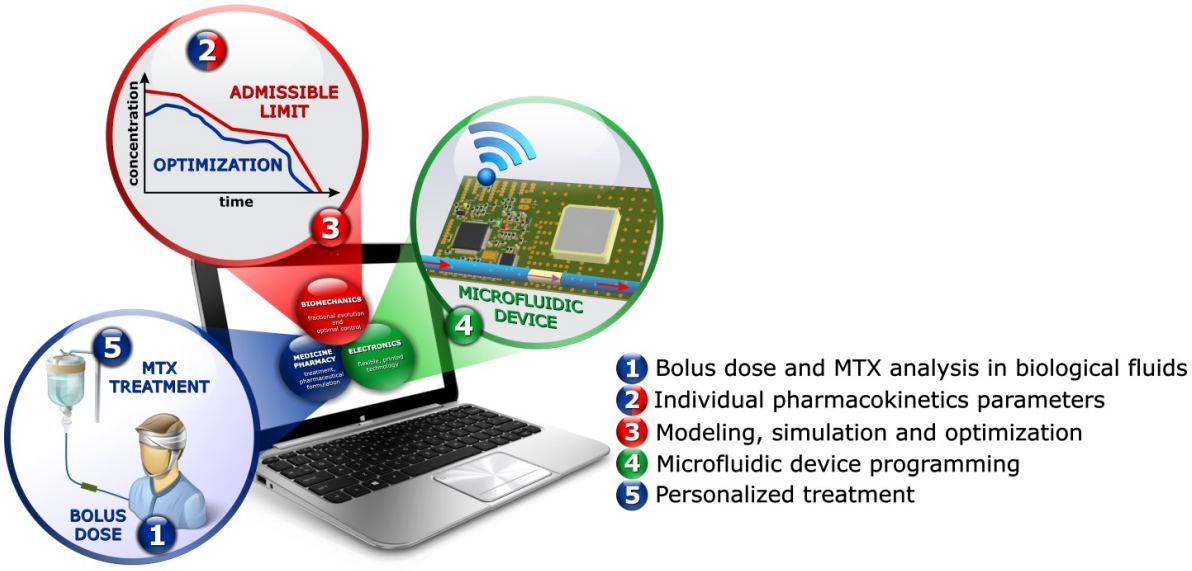
ELVESYS
MICROFLUIDICS INNOVATION CENTER

RESEARCH AND INNOVATION STAFF EXCHANGE

Cost-Effective Microfluidic Electronic Devices for Pptimal Drug Administration Based on FractionalPharmacokinetics for Leukemia Treatments

Leukemia is a group of cancers that start in blood-forming tissue and cause large numbers of abnormal blood cells to be produced and enter the bloodstream. Worldwide, **over 250,000 people are diagnosed with leukemia every year,** accounting for 2.5% of all cancers.

Implementation of the **MEDLEM** Project will help in both detection of high risk patients, especially children, and general improvement of the human condition during invasive treatment, what chemotherapy definitely is. Its overall goal is to **increase five and ten-year survival rates of patients with leukemia, in Europe and globally.**



The main concept of the MEDLEM project proposal

Keywords: **rapid prototyping, fractional pharmacokinetic, leukemia treatment, lab-on-chip, drug delivery**

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Medlem Personalized Dosing Solution

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 690876

Towards Early Molecular Diagnostics of Schizophrenia

The chronic nature and the high degree of patient disability **make schizophrenia the fourth leading cause of disease burden across the globe** with the management costs making up ~3% of the total healthcare budget in Western countries. Unfortunately, poorly understood aetiology and limited diagnostic arsenal make it difficult to detect and treat schizophrenia in a timely and efficient manner.

This underscores a critical need for better understanding of the mechanisms underlying this disease and development of new diagnostic possibilities allowing its early detection, ideally prior to the onset of psychosis. The overarching hypothesis underlying our work is that **genetic vulnerabilities, neurodevelopmental defects,** exposure to pathogens, immune system status and specific lifestyle choices may compound the risk of schizophrenia and that a systematic multivariate analysis of these factors should result in substantially improved diagnostic tools.

Image credit: vector designed by Rawpixel – fr.freepik.com

SZtest

Keywords: **Schizophrenia, biomarkers, early detection, cell culture on chip, diagnosis.**

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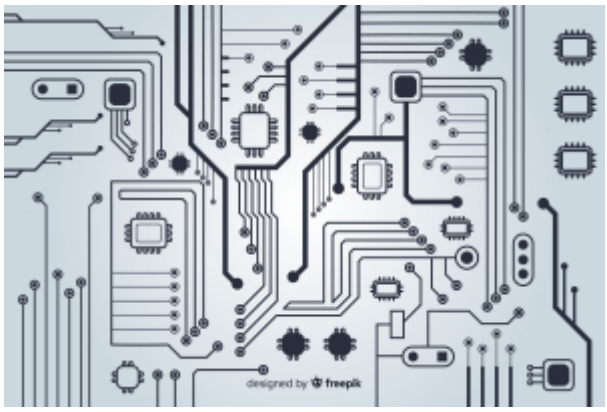
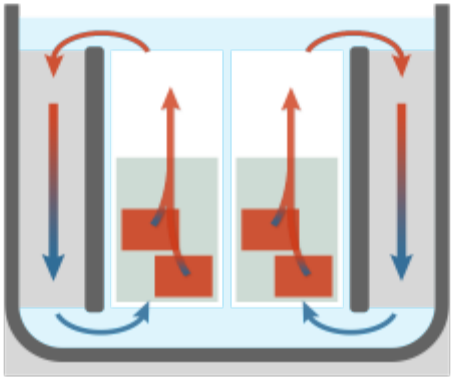
This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 734791

Smart Thermal Management of High-Power Microprocessors Using Phase-Change

Microprocessors are the basis of all electronical devices, but a constant cooling is necessary to durably maintain their speed. **Microprocessor cooling** can be achieved by using phase-change systems in which the condensation of a liquid leads to the production of cold. Ideally, the produced heat must be dissipated as fast as it was generated, but **the current air-cooling systems are only 60% effective**.

Elvesys will transfer its knowledge of microfluidics, microfabrication and entrepreneurship to the other members of the consortium in the frame of workshops and trainings. Our expertise in fluid handling, based on our fast and precise OB1 flow controller, as well as our experience in microfabrication, will be leveraged for **designing the cooling microdevice.**





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THERMASMART
Thermal Management of Microprocessors

Keywords: **Boiling, Evaporation, Wetting, Phase change cooling**

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MARIE CURIE ACTIONS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 778104

Automated Functional Screening of IgGs for Ddiagnostics of Neurodegenerative Diseases

Immunoglobulins (IgGs) are the key players of **immune response neutralizing pathogens**. In the **AUTOIGG** project we are recruiting IgGs, derived from patients suffering from neurodegenerative diseases, particularly amyotrophic lateral sclerosis, to study their effects on neurons and glial cells. The project aims to **produce an innovative automated device for diagnostics of neurodegenerative diseases**. One of our goals is a **small-scale perfusion system** with micro chambers on a chip suitable for fluorescent live imaging in individual cells or cell groups.

The first problem to solve is shear stress induced by normal work of the application system. This shear stress activates **mechanosensitive receptors,** thus inducing unwanted "artificial" responses that can totally overwhelm signals from compounds of interest. These artifacts become especially detrimental, when the studied compound, such as IgGs, induces comparably small responses that need to be carefully analysed. Secondly, existing perfusion chambers have rather big volumes, and require an unacceptably large amount of studying solution, while in the case of IgGs derived from patients, sample volumes are very limited. Thirdly, the design features of the existing macro-scale perfusion chambers and application systems require readjustments before each experiment, that lead to variation in spatial configuration and hence difference in final concentration and delivery time of applying solution.

Keywords: **Amyotrophic lateral sclerosis, ROS, immunoglobulin, live imaging, diagnosis, lab-on-chip**

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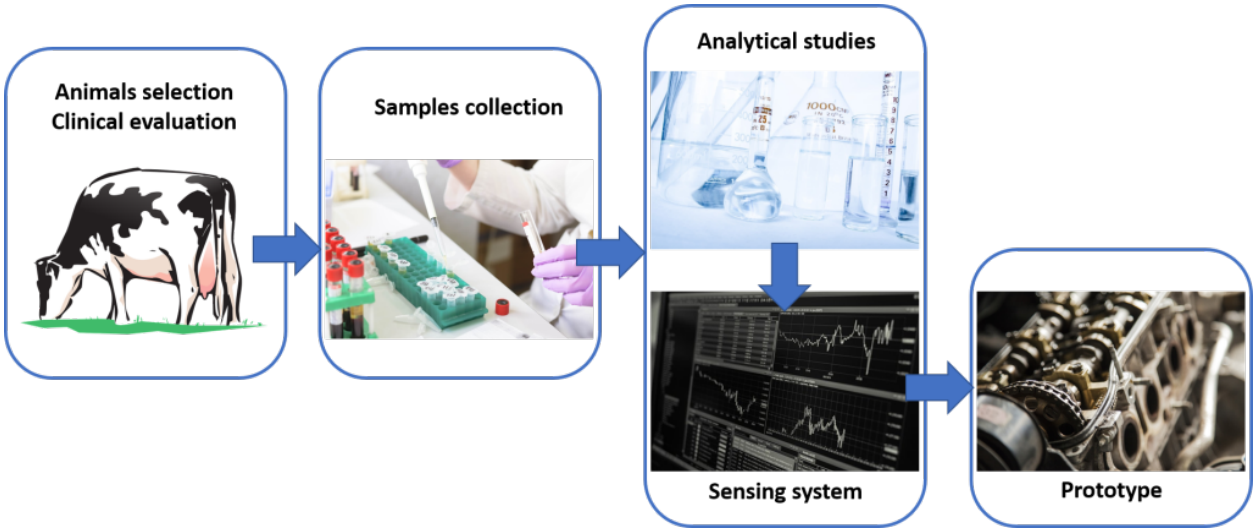
This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 778405

Volatolomics Test for the Diagnosis of Bovine Tuberculosis

Bovine tuberculosis can be transmitted to humans through milk or meat and is therefore a public health issue. Standard tuberculosis testing is efficient and sensitive, but also logistically challenging, and time and resource consuming. In this project, **a simpler and non-invasive method of detection will be developed on the basis of metabolomics research.** Metabolites, small-molecule compounds found in body fluids, reflect indeed changes in the blood chemistry induced by a disease. Analysis of metabolite types and concentrations may allow the early detection of a disease. We aim to identify the signature of the specific metabolites of bovine tuberculosis, and to develop a **standardized testing procedure to detect these biomarkers.** We will focus on the detection and analysis of volatile organic compounds,



Keywords: **Diagnosis, electronic nose, bovine tuberculosis, lab-on-chip.**

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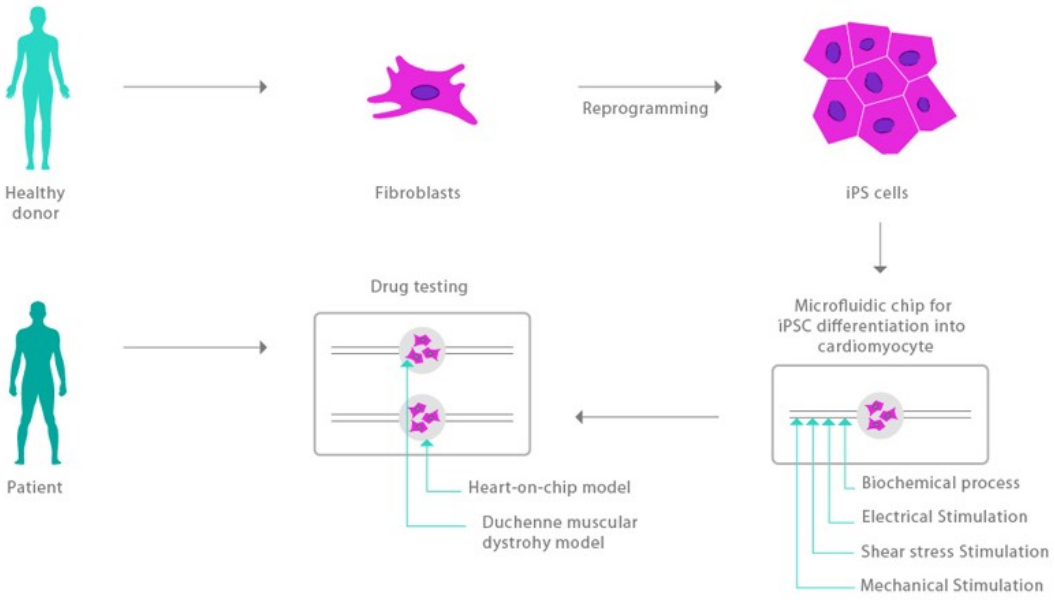
This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 777832

Heart on Chip Based on Induced Pluripotent Stem Cell Technology for Personalized Medicine

Duchenne muscular dystrophy occurs in 1/3,500 children, and leads for 60% of patients to the development of cardiomyopathy, a heart dysfunction, in the second decade of life. This rare pathology is still poorly understood and no efficient treatment is available. This project aiming to **develop more precise and personalized organs-on-chips**, human-induced pluripotent stem cells will be derived in a patient-matched manner in a microfluidic device. This system will allow a precise control of shear stress and electrical stimulation, mechanical strain and surface morphology.



CISTEM HEART-ON-CHIP

Keywords: **Organ on chip, rare diseases, iPSCs, microfluidic, cell differentiation.**

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 778354