



PREVENTION & EARLY DETECTION CLUSTER

Prevention & Early Detection (Screening)

Horizon Europe health research cluster for a healthy society:

**DIOPTRA | LUCIA | MAMMOSCREEN | ONCOSCREEN
PANCAID | SANGUINE | THERMOBREAST**

UNIFIED EFFORT TO TACKLE CANCER

The overarching goal of the Mission on Cancer is to improve the lives of more than 3 million people by 2030 through prevention, cures, and for those affected by cancer and their families. A collaboration cluster of seven EU-funded research projects sets focus on unlocking the potential of new tools and digital solutions for a healthy society.

Over 2.7 million people in the EU-27 are diagnosed with cancer every year, with 1.3 million dying from the disease annually.

The Mission will achieve this by addressing **four key objectives**:

- ➔ **understand cancer and its risk factors**
- ➔ **prevent what is preventable**
- ➔ **optimise diagnostics and treatments**
- ➔ **support the quality of life of people living with and after cancer, while ensuring equitable access for all**

These objectives fit together holistically under the Mission on Cancer to improve the lives and prospects of millions of Europeans by 2030.



The EU Mission on Cancer makes sure that research and innovation go hand in hand with the policy actions covered by Europe's Beating Cancer Plan. Enabling and accelerating **new approaches to research and policymaking** in the field will ensure that the actions proposed under the Plan can be successfully implemented in an **integrated approach** to increase their impact.

This brochure showcases the seven **EU-funded research projects**, which form the EU Mission on Cancer's Prevention and Early Detection (Screening) cluster, describes their scientific goals and gives insights into the development of technologies and expected outcomes.

dioptra



MAMMOSCREEN



ONCOSCREEN



SANGUINE

ThermoBreast

DIOPTRA

Acronym meaning:

Early dynamic screening for colorectal cancer via novel protein biomarkers reflecting biological initiation mechanisms

Disease:

Colorectal cancer

28 partners from 15 countries

Colorectal cancer is the third most diagnosed cancer in men (after prostate and lung cancers) and the second one in women (after breast cancer)



TECHNOLOGY

DIOPTRA aims to revolutionise CRC screening via cutting-edge research towards a holistic, personalised and accessible method for early detection:

- ➔ Utilising liquid biopsies, blood samples from patients are analysed for novel protein biomarkers, offering a less invasive and potentially more sensitive detection method than traditional tests.
- ➔ A mobile application will provide risk assessment through questionnaires on individual factors, promoting patient engagement and awareness.
- ➔ These screening results will be processed using advanced AI models that undergo continuous refinement with incoming data, ensuring dynamic and precise evaluation.
- ➔ The project emphasizes transparency, trustworthiness, and bias-free algorithmic operations.
- ➔ Overall, DIOPTRA integrates modern technological advancements to offer a comprehensive, patientcentric, and efficient colorectal cancer screening system.



EXPECTED OUTCOMES

The DIOPTRA project aspires to redefine the way colorectal cancer screening is conducted. The project aims to supplement traditional methods of screening with cutting-edge techniques, emphasizing risk stratification and leveraging liquid biopsies.

1. Risk-based approaches will allow patients to be assessed based on individual susceptibility, ensuring that those most at risk receive prioritized attention.
2. Liquid biopsies will provide a less invasive method of detecting potential cancer markers in the blood, which may lead to earlier diagnoses.
3. Upon completion, the DIOPTRA initiative will offer a refined, comprehensive solution that combines these methodologies.

By demonstrating its efficacy and advantages over conventional procedures, the aim is to have the DIOPTRA protocol endorsed in official healthcare guidelines, setting a new gold standard for colorectal cancer screening in the future.

Project website

www.dioptra-project.eu



DIOPTRA on social media



PROJECT 02

LUCIA

Acronym meaning:

Lung Cancer-related risk factors
and their Impact Assessment

Disease:

Lung cancer

20 partners from 9 countries

Coordinator:

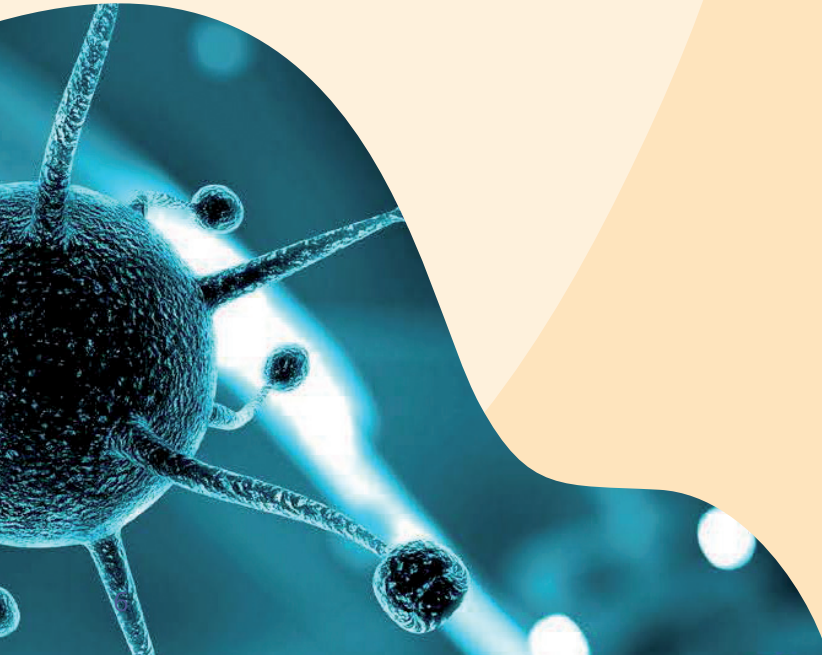
Professor Hossam Haick
Technion University, Israel



TECHNOLOGY

LUCIA will implement innovative miniaturised wearable and point-of-care sensing and analytical tools and enhanced CT analysis methods, to achieve swift, cost-effective, minimal-harm LCS (Lung cancer screening) and identification of risk factors. The sensing technologies to be applied within LUCIA are listed below:

- ➔ **Breath Analyser:** LUCIA will use a break-through breath analyser being developed
- ➔ **Wide-biomarker-spectrum Multi-Use Sensing Patch (WBSP):** LUCIA will use an innovative AI-driven non-invasive wearable sensing patch that enable continuous, real-time, and personalised monitoring of volatile biomarkers towards LC (Lung cancer) detection.
- ➔ **Spectrometry-on-Card (SPOC):** develop a spatio-temporal nano/micro-structural arrangement that enable real-time monitoring of wide spectrum of chemicals and complex mixtures for blood biomarker sampling.
- ➔ **Develop AI tools for medical image analysis** (CT, pathology ...)
- ➔ **Applying Multi-omics polygenic risk scores** for determining LC risk using Oxford Nanopore low coverage genome sequencing technology.





According to the WHO, LC is the leading cause of cancer-related deaths worldwide, accounting for the highest mortality rates among both men and women. LC is also often diagnosed at advanced stages when treatment options are limited.



EXPECTED OUTCOMES

LUCIA aims to develop a toolbox for discovering and understanding new risk factors that contribute to LC development via **three domains**:

1. The personal risk factors, which include a person's exposure to chemical pollutants, behavioural and lifestyle factors
2. The external risk factors, which include urban, built and transport settings, natural and green spaces, social aspects and climate
3. The cellular process, which occurs during the transition from a healthy state to LC initiation and progression, including metabolism, epigenetics, ageing, genetics ...

LUCIA will study how these three domains interact to develop individual and population risk scores.

Project website

www.luciaeuproject.technion.ac.il



LUCIA on social media



MAMMOSCREEN

Acronym meaning:

Innovative and safe microwave-based imaging technology to make breast cancer screening more accurate, inclusive and female-friendly

Disease:

Breast cancer

International consortium of 7 partners

Coordination:

Fondazione Toscana Life Sciences

MammoScreen is co-funded by the European Commission and the United Kingdom, with a total budget of € 7 millions in four years.



TECHNOLOGY

MammoWave technology uses safe and non-invasive microwave radiofrequencies and has already proven to be able to effectively detect all types of breast cancer. Besides, it is not affected by the density of the breast, unlike conventional mammography, whose assessment is limited in the case of dense breasts.

- ➔ MammoWave could therefore detect cancers that result invisible to a standard mammography.
- ➔ MammoWave is female-friendly, as it makes examination fast and easy and the shape of the device allows for total discretion for the patient.
- ➔ No pressure is applied on the breast, avoiding any discomfort or pain in sensitive women.
- ➔ MammoWave makes the screening process safe, accurate for women with dense breast tissue, reliable, comfortable for patients, and affordable.

Breast cancer is the most common cancer in women worldwide, affecting 1 in 8 women. The World Health Organisation estimates that in 2020, worldwide cases of breast cancer accounted for 24% of all cancers in women, with 2.26 million women diagnosed with breast cancer and 685,000 deaths globally.



EXPECTED OUTCOMES

MAMMOSCREEN project will generate evidence of:

1. MammoWave's performance in breast cancer detection in a clinical study involving 10,000 women already included in regular screening programs. The clinical research centers involved in the study are located in Italy, Spain, Switzerland, Portugal and Poland.
2. MammoWave's safety and efficacy in spotting cancer also in dense breasts might pave the way for reviewing current population-based breast cancer screening programs, with the inclusion of younger women who are often left out from screening programs, but nevertheless account for the 30% of all breast cancers detected in Europe.

Project website

www.mammoscreenproject.eu



MAMMOSCREEN on social media



ONCOSCREEN

Acronym meaning:

A European shield against colorectal cancer based on novel, more precise and affordable risk-based screening methods, and viable policy pathways.

Disease:

Colorectal cancer

Coordinator:

EXUS AI Labs

International consortium of 38 partners from 15 countries

11 technical solutions and
4 novel diagnostic solutions



TECHNOLOGY

- ➔ ONCOSCREEN integrates heterogeneous healthcare data with novel AI-assisted screening methods to design risk-based colorectal cancer screening approaches and provide tailored and evidence-based recommendations to high-risk patients, clinicians, and policymakers.
- ➔ In developing new technologies, ONCOSCREEN follows a modular approach that enables transferring and replicating the suggested solutions in different healthcare systems.
- ➔ ONCOSCREEN introduces novel diagnostic methods and tools based on breath and liquid biopsy. The project invests in improving existing screening methods with AI algorithms, advancing polyp detection and classification and providing personalised risk-based assessment.
- ➔ ONCOSCREEN innovative solutions will help to design an alternative colorectal cancer screening pathway that is less invasive, more cost-effective, and more accurate in colorectal cancer diagnosis.





**Colorectal cancer
accounted for 12.7% of
all new cancer diagnoses
in the European Union**



EXPECTED OUTCOMES

Modern healthcare systems need to offer new non-invasive methods for colorectal cancer screening. Screening programmes need to be affordable, accessible, and applicable to large parts of the population to effectively prevent the development of colorectal cancer. ONCOSCREEN addresses this challenge by developing groundbreaking technologies for colorectal cancer screening.

1. ONCOSCREEN will advance colorectal cancer screening technologies and offer solutions for risk-stratified cancer screening programmes for citizens, a diagnostic support system for clinicians, and monitoring tools for policymakers.
2. ONCOSCREEN solutions will undergo extensive validation through clinical studies involving 4100 participants from 10 European countries.
3. Citizen and patient perspectives will be integrated through participatory co-design and open innovation initiatives, ensuring a comprehensive and inclusive approach.

Project website

www.oncoscreen.health



ONCOSCREEN on social media



PROJECT 05

PANCAID

Acronym meaning:

PANcreatic CANcer Initial Detection
via liquid biopsy

Disease:

Pancreatic cancer

**International consortium of
18 partners from 8 countries**

Coordinator:

University Medical Center Hamburg-
Eppendorf

Co-coordinator:

Karolinska Institutet

Europe has the highest burden of PDAC in the world, with 150,000 new cases in 2018 and 95,000 deaths/year and worldwide half a million deaths. PDAC has the lowest survival of all cancers in Europe (median survival time 4.6 months, with patients losing 98% of their healthy life expectancy). The biggest challenge in the management of PDAC is the inability to diagnose it in time



TECHNOLOGY

Pancreatic cancer is a highly aggressive and often late-diagnosed malignant neoplasm originating in the pancreas. Pancreatic cancer is often difficult to detect in its early stages, as it tends to show minimal or no symptoms until it reaches advanced stages.

PANCAID aims to develop a minimally invasive blood test using liquid biopsy to detect pancreatic cancer to facilitate early detection of the cancer and its precursors. The project utilizes a comprehensive panel of liquid biopsy diagnostics, which involves analyzing genetic mutations, circulating tumor cells, and other biomarkers in blood samples, to detect pancreatic cancer at an early stage. This innovative approach has the potential to revolutionize the current methods of pancreatic cancer diagnosis, which often occur at later stages of the disease.





EXPECTED OUTCOMES

The PANCAID project has the potential to impact various aspects of scientific, technological, medical, and societal domains. From generating new scientific insights to developing a composite biomarker blood test for early detection, and improving treatment options for pancreatic cancer, PANCAID could contribute to significant advancements in the field, leading to improved patient outcomes and societal benefits:

- ➔ **Scientific:** New breakthrough scientific discovery on biology of PDAC development
- ➔ **Technological:** A new cancer screening blood test for pancreatic cancer may open new market for Liquid biopsy diagnostics.
- ➔ **Medical:** The project's findings may serve as a foundation for prospective clinical trials.
- ➔ **Societal:** Early detection could reduce mortality and improve patients' quality of life. Additionally, early detection may open up possibilities for curative measures, shifting the focus from palliative care to potentially curative interventions.

Project website

www.pancaid-project.eu



PANCAID on social media



PROJECT 06

SANGUINE

Acronym meaning:

Early detection and screening of hematological malignancies.

Disease:

Blood cancers

International consortium

of 11 partners from 7 countries

Coordinator:

Tel-Aviv University

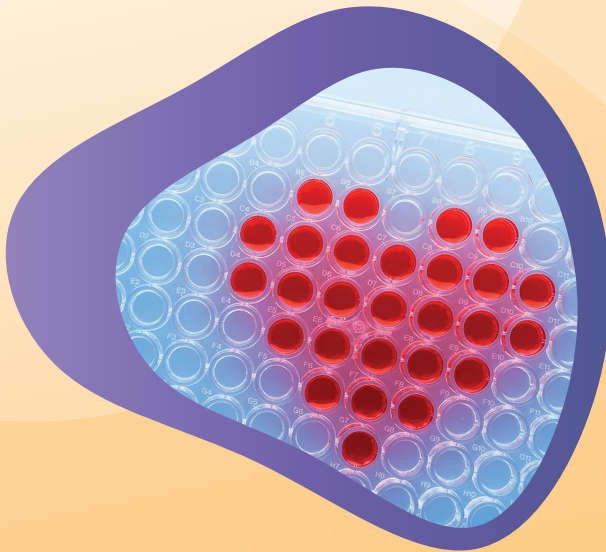
→ SANGUINE is a pioneering project dedicated to advancing early detection of hematological malignancies through the development of a state-of-the-art blood test. It addresses the objectives raised by the Cancer Mission Call, which emerged from the growing societal challenge faced by European citizens.

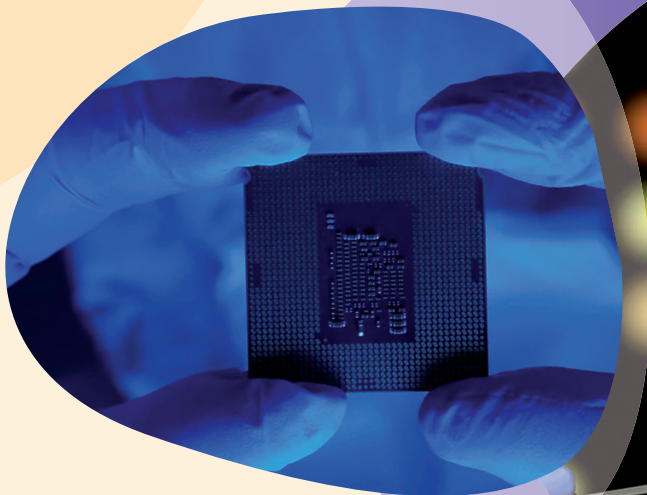
→ According to the European Cancer Information System (ECIS), each year, 2.7 million people in the EU are diagnosed with cancer. The SANGUINE project focuses on hematological malignancies, which account for 10% of those cases.



TECHNOLOGY

The SANGUINE project employs the innovative HemaChip technology for the early detection and screening of hematological malignancies. The HemaChip technology involves a minimally invasive approach that analyses peripheral blood samples for specific epigenetic biomarkers, such as 5-methylcytosine (5mC) and 5-hydroxymethylcytosine (5hmC), associated with early disease states. This novel detection method enhances sensitivity and reduces testing costs. Moreover, the technology enables regular monitoring of disease status, including the detection of minimal residual disease (MRD) after treatment. By revolutionizing the screening process, the HemaChip contributes to accurate and patient-centric cancer detection, potentially transforming the landscape of hematological malignancy management.





EXPECTED OUTCOMES

1. The project aims to develop a minimally invasive, fast, cost-effective, and highly sensitive screening and monitoring tool for blood cancers, using the HemaChip technology for early detection of hematological malignancies. This can lead to timely interventions and improved patient outcomes.
2. By identifying and monitoring epigenetic biomarkers, the project could enhance treatment selection and therapy response assessment, potentially revolutionising personalised medicine approaches.
3. SANGUINE's collaborative and holistic strategy involving various stakeholders, including hospitals, research institutes, SMEs, and policy-makers, is expected to drive scientific advancements and provide a comprehensive framework for hematological malignancy management.
4. The project's success could contribute to reducing the global burden of hematological malignancies and advancing broader cancer research efforts.

Project website

www.sanguine-project.eu



SANGUINE on social media



THERMOBREAST

Acronym meaning:

Safe and patient-centered breast cancer screening by next-generation dynamic thermal imaging and Artificial Intelligence

Disease:

Breast cancer

**International consortium of
18 partners from 11 countries**

Coordinator:

ThermoMind Ltd.

According to the American Cancer Society (ACS) 1 in 8 women has a chance of developing breast cancer in her lifetime.



TECHNOLOGY

ThermoBreast introduces a new, safe vertical in breast cancer screening using AI-based dynamic thermal imaging. The screening is performed with a next-generation device, developed by ThermoMind Ltd. It includes highly sensitive infrared sensors that can detect temperature differences up to 0.02°C. The device screens the entire chest area without any contact with a patient. An important component of the screening, which makes the system truly innovative, is advanced artificial intelligence. The AI analysis interprets captured thermal patterns and detect potential cancerous activity. Thus, the system offers an excellent means of identifying areas of interest for physicians to inspect. The ThermoBreast screening can be equally applied for women in all age groups and breast density.

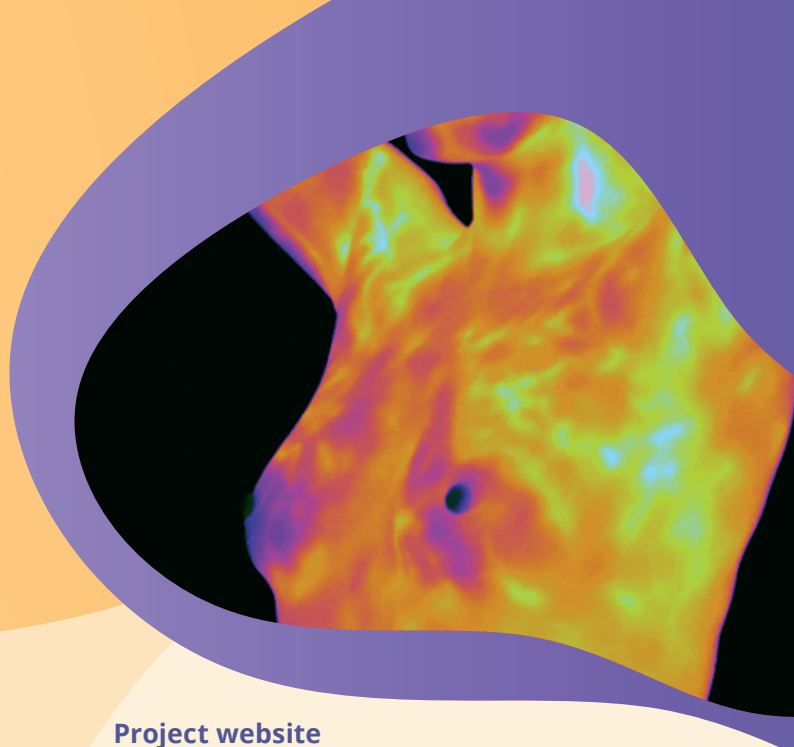


Another startling statistic from the World Health Organisation (WHO) reports that in 2020, there were 2.3 million women diagnosed with breast cancer and 685 000 deaths worldwide. The results of a study headed by the National Institute for Health and Care Research (NIHR) revealed that the annual screening of women aged 40 or above saves one life per every thousand women checked. The World Health Organization (WHO) also stated that when breast cancer is identified and treated at its initial stages, it can have a cure rate close to 90%.



EXPECTED OUTCOMES

ThermoBreast's unique approach presents an opportunity to unlock the potential of dynamic thermography, significantly improving breast cancer prevention, diagnostics, and monitoring. The project aims to improve the survival rate of breast cancer patients by effectively detecting cancer in early stages in women of all age groups and breast densities. Its cost-efficient method will make it possible to start regular screening of women from the age of 18 years, facilitate follow-up tests for better patient monitoring and use ThermoBreast as a supplementary diagnostic modality. Due to its harmless, comfortable screening and instant analysis, it will be possible to implement better patient monitoring programs in the future, reducing the burden on female patients, their families, healthcare professionals, and all others affected by breast cancer directly or indirectly.



Project website

www.thermobreast.eu



ThermoBreast on social media





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Project funded by



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