



EU- Funded Research & Innovation in Cancer & Chronic Pain

By Izzy Margetts

Horizon

Horizon Europe is the worlds largest research and innovation programme running from 2021 to 2027

**EUR 93.5
billion**

Total funding

**EUR 8.2
billion**

Health research funding

- Supports ground breaking ideas across various fields, from curing diseases to safeguarding cultural heritage
- Cross border collaboration
- Make partnerships with industries
- Support innovations with break through potential which may be too risky for investors

- Five main missions: **fighting cancer**, adapting to climate change, protecting our oceans, living in greener cities, ensuring soil health and food

EU MISSION: CANCER

€4 BILLION

Spend on previous cancer research projects

€1.25 BILLION

Funding for Europe's beating cancer plan

Over 2.5 million people in the EU-27 are diagnosed with cancer annually, with 1.3 million people dying from the disease annually

The economic cost of cancer was €199 billion in 2018 across the EU27 plus Iceland, Norway, Switzerland and the UK₁

- Aim to improve the lives of **more than 3 million people by 2030** through prevention, cure and for those affected by cancer including their families to live longer and with a higher quality of life



01

RAPAMYCIN- can we beat ageing?

[Curiosity and a simple compound in soil bacteria help unlock a potential way to slow down ageing | Horizon Magazine](#)

RAPAMYCIN- slowing down cancer growth

- **Rapamycin** was discovered in soil samples from Easter Island by Professor Micheal Hall
- It was isolated from a bacterium called *Streptomyces hygroscopicus*

In 2024 Professor Micheal Hall received the Balzan Prize for 'ground breaking contribution' to our understanding of the molecular mechanism that regulate cell growth and ageing

- Rapamycin is able to suppress the body's immune response.
- It is now used to treat certain forms of cancer and for preventing organ rejection

RAPAMYCIN- How it works

Rapamycin interferes with the enzyme TOR (target of rapamycin)

Initially TOR was thought to control cell division
Now, research reveals that TOR orchestrates **CELL GROWTH**,
which was previously thought to be unregulated

TOR acts like a 'nutrient sensor' – when TOR is active, the cell focuses on cell growth **RATHER THAN** maintenance, in response to food

When calorie intake is reduced TOR shifts to maintenance mode.

The cell focuses on repair processes, cleaning up damaged components, conserving resources.





Slowing ageing

Ageing is often associated with the build up of cellular damage overtime.

Reducing TOR activity due to dietary restrictions can slow down the ageing process.

Rapamycin can mimic the effects of dietary restrictions by restricting TOR activity.

Rapamycin can slow the ageing process and **delay the onset of age-related disease such as cancer and neurodegenerative disorders**

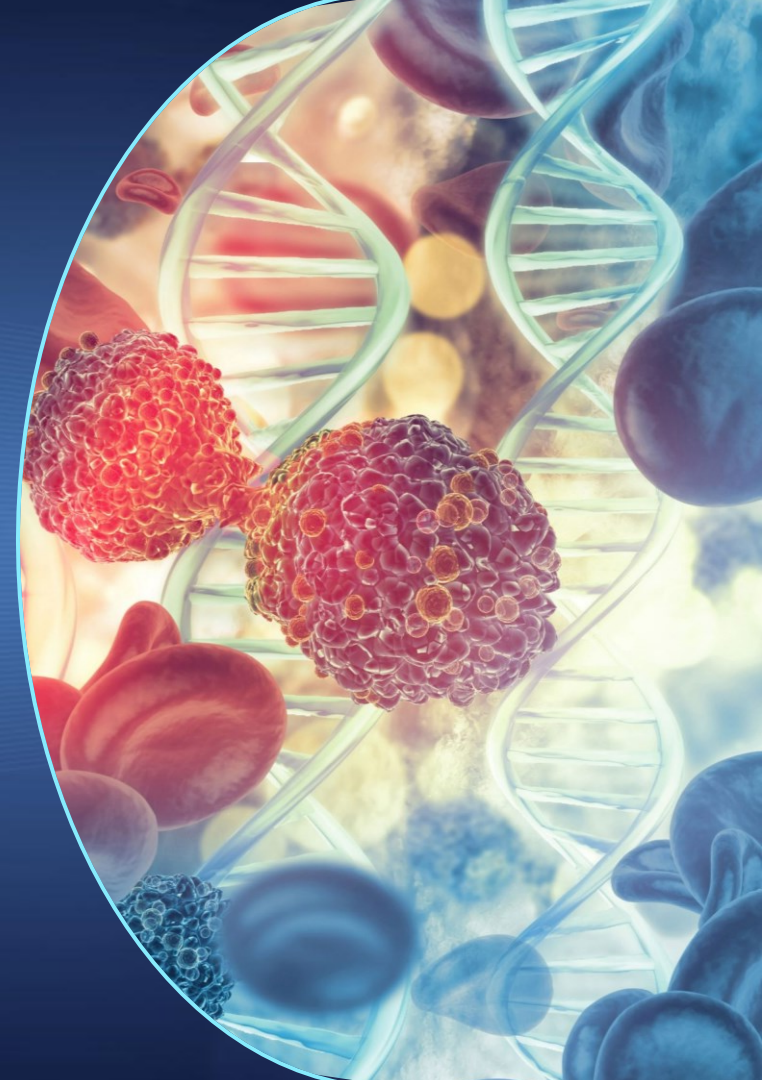
Slowing down cancer

“It has been calculated that the TOR complexes are upregulated and contribute to tumorigenicity in ~70% of all cancers” – Micheal Hall

Restricting TOR activity with rapamycin can slow the growth of cancer cells, making them more susceptible to chemotherapy and radiation

CONS:

- rapamycin can affect normal cell function
- Can lead to side effects





02

PANCAIN-

fighting pancreatic cancer with AI

[Fighting pancreatic cancer with computers and lasers | Horizon Magazine](#)

How fatal is pancreatic cancer?

Pancreatic cancer patients face some of the lowest chances of survival of all cancers in Europe

132,000
deaths

From pancreatic cancer in Europe in 2020

4.6
months

Median survival time

25%

Of pancreatic cancer patients
survive for a year

12%

Of pancreatic cancer patients are
still alive after 5 years

PANCAIM

- At PANCAIM they believe that the biggest challenge in treating pancreatic cancer is selecting the right drug for the individual patient.
- Novel immunotherapy drugs specifically target tumors with a particular genome
- However pancreatic patients with a tumor with a similar genotype still tend to present with a whole range of disease patterns i.e. differ in phenotype.

PANCAIM integrates genomics and imaging phenomics using AI
The project relies on machine learning to scrutinise patient scans and tissue samples as well as DNA from the cancer

- The aim is to help clinical decision- makers to give the right treatment to the right patient at the right time.
- Reducing trial-and-error use of expensive drugs with strong side effects

Quotes taken from Henkjan Huisman, a professor of medical imaging and AI at Radboud UMC
and Dr John Hermans, a clinician and a part of PANCAIM

the issue with pancreatic cancer is late diagnosis, poor outcome and no curative chemo

Because the disease has already spread too far when it is detected in about 80% of patients, lifesaving surgery for them is impossible.

PANCAIM have collected thousands of patient scans to train AI to recognise early signs of pancreatic cancer.

Digital images of patient's tissue show millions of cells which pathologists must carefully examine for signs of cancer. This is painstaking work and abnormalities are easily overlooked.

' Tumors can be visible on early CT scans but they are missed in about 40% of the cases' - HERMANS

' AI can do things humans can't such as spot a couple of cells among a billion or hone in on tiny structures' - HUISMAN



03

LASER OPTIMAL- fighting pancreatic cancer with lasers

[Fighting pancreatic cancer with computers and lasers | Horizon Magazine](#)



← Dr Francesco Di Matteo broke medical ground by guiding a laser light through thin fibre optic cable towards patient's tumours in the pancreas to destroy them with a tiny laser.

Now the technique is being refined by Dr Paola Saccomandi as part of another EU funded project called LASER OPTIMAL



LASER OPTIMAL

8 pancreatic cancer patients so far have had their tumors scanned using MRI. Calculations were run for individual patients.

This told the surgeon where and how much energy to direct at the patient's tumor

Scientists guide laser light through a tiny fibre optic cable.

The light absorbed by the tissue is converted into heat. Prolonged exposure of tumor cells from 45-55°C causes irreversible cell damage.

PROS

- They can control the energy delivery in the tumors, aiming to minimise unwanted heat dispersion into surrounding healthy tissue
- This could provide an alternative to surgical resection

CONS

- The pancreas has a lot of important blood vessels therefore it is important that the light does not damage them and cause bleeding



04

AURIMOD- VIVO

unlocking the vagus nerve

[Touching a nerve in the fight against chronic pain and diseases | Horizon Magazine](#)

'There are few, if any, effective pharmaceutical treatments for complex pain conditions'

-says an 83 year old Austrian woman living with chronic pain

An estimated 20% of Europeans experience chronic pain

150 million Europeans

Chronic pain causes an EU economic loss of

€441 billion annually

Stefan Kampusch led a research project that received EU funding to alleviate chronic pain by stimulating the longest cranial nerve in the body, **the Vagus nerve**.

Kampusch developed Aurimod, a company that designed VIVO.

VIVO is a prescription-only wearable device that stimulates the vagus nerve.





What is the Vagus nerve?

'The vagus nerve plays a key role in processing pain.'

-Kampusch

The vagus nerve is the longest nerve of the autonomic nervous system.

It is part of the parasympathetic nervous system and helps to regulate heart rate, blood pressure, sweating, digestion, and even speaking.

By stimulating the vagus nerve we can target both the brain stem and brain circuits where pain is processed and controlled.

Other forms of stimulating the vagus nerve can help treat neurological disorders such as epilepsy and depression



What's VIVO?

VIVO resets the vagus nerve when signals reporting pain back to the brain get subdued and the nervous system gets stuck in pain mode.

It aims correct the signals that say there's pain when there's no actual injury.

VIVO attaches behind the ear where electrodes enter the skin close to the autonomic vagus nerve.

A small battery powered stimulator is then attached to the neck, just behind the ear.

The electrodes stimulate the vagus nerve in a special rhythm which triggers the body's own sustainable pain relief.

Possible advantages of this treatment:

- **Personalised**
- **Without the side effects of medication**
- **Less invasive**

RESULTS

Over six weeks of intake

83%

Sustainable pain reduction

96%

Less opioid intake

VIVO has the possibility to be integrated into more comprehensive pain management



05

MyPAL Project

- the power of palliative healthcare

<https://projects.research-and-innovation.ec.europa.eu/en/horizon-magazine/mission-transform-palliative-healthcare>

What is Palliative Healthcare?

Palliative healthcare is focused on providing relief from pain and other symptoms of a terminal illness.

Palliative care implements multiple approaches to improve quality of life.

MyPAL Project

MyPAL project aims to change the doctor-patient relationship through digital platforms.

They want to enable better communication between patients and doctors to enable them to provide better care and ultimately improve their quality of life.





Research trial

A trial was conducted with over 200 adults and adolescent cancer patient in 5 different EU countries, they used MyPAL for over 2 years.

MyPAL allowed patients to communicate remotely to their doctors, educate themselves on illness, report real-time updates on their health and fill in questionnaires

MyPAL can give doctors a fuller overview of a patient's health status before they see them in person. This could allow doctors to give more personalised, targeted healthcare to their patient.

MyPAL

'It is a supplement to usual care it doesn't replace it'

-explains Dr Chatzikonstantinou

MyPAL could make up for how little doctors see patients in person – usually 10 minutes every 3 months for each patient.

The app accumulates data on each patient and can identify vital patterns using built in statistical and analytical functions.

MyPAL has the potential to address geographical imbalances for those who can't receive the same depth of healthcare due to their remote location

Thanks

Do you have any questions?

All articles referenced from Horizon – The EU
Research & Innovation Magazine
[Horizon Magazine | Research and Innovation](#)

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