



EUROPEAN UNION

Understanding cancer and importance of data exchange part 3: better models for cancer research and care



**5 years Cancer Mission:
Stronger Through Connection**

BRUSSELS
29 SEPTEMBER – 01 OCTOBER



Dr Antonis Billis

Senior Researcher at Aristotle
University of Thessaloniki,
representing the TWIN-X project

5 years Cancer Mission:
Stronger Through Connection

Brussels
29 September – 01 October



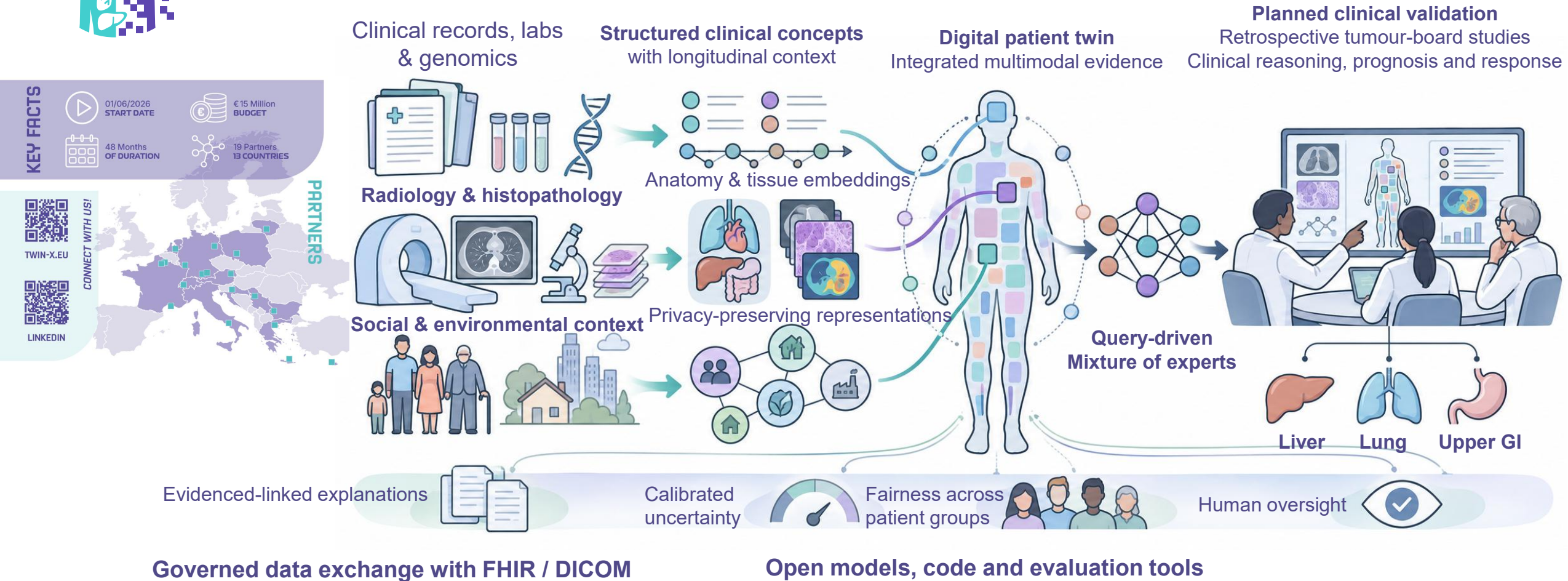
ARISTOTLE
UNIVERSITY
OF THESSALONIKI

Dr Antonis Billis



TWIN-X

Building trustworthy digital twins for patient-centred medicine



Funded by
the European Union

Grant 101287679



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Prof. Ioanna Zergioti

Professor at the National Technical University of Athens, Coordinator of the Tumor-LN-oC project & Chief Executive Officer of PhosPrint S.A.



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Tumor-LN-oC

Tumour and Lymph Node on Chip for cancer studies

Modelling — and blocking — metastasis to the lymph node

H2020-NMBP-TR-IND-2020 · Grant Agreement No 953234

Duration 54 months (start 1 May 2021) — extended from 48 months

EU contribution € 5 769 436 · **Coordinator** ICCS, Athens (GR)

Consortium — 11 partners, 9 countries

ICCS (GR) · **BRFAA** (GR) · **PhosPrint** (GR) · **TU/e** (NL)

TU Wien (AT) · **Åbo Akademi** (FI) · **ALPES LASERS** (CH) · **RAYFOS** (UK)

ELVESYS (FR) · **Asphalion** (ES) · **AMIRES** (CZ)

Clinical samples from 72 NSCLC patients · PDX biobank · 8 patient-derived cell lines

Ioanna Zergioti — ICCS / National Technical University of Athens

Rapid-fire session · 5 years EU Cancer Mission · Brussels, 29 Sep – 1 Oct



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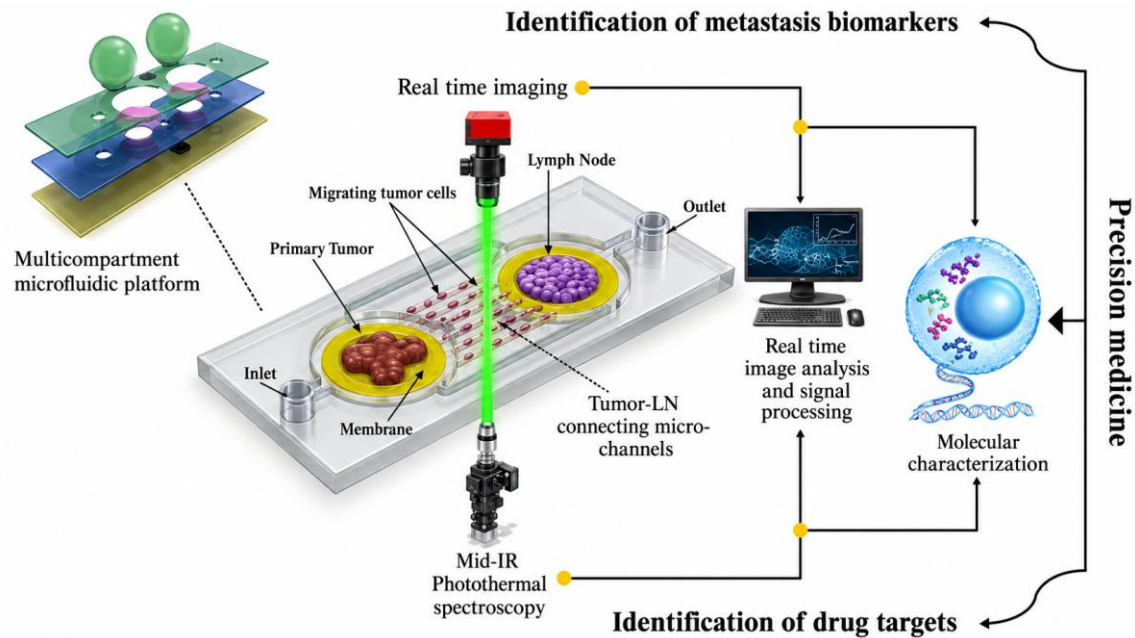
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Tumor-LN-oC: cancer metastasis to the lymph node, reconstructed on a chip

No approved therapy targets metastasis in NSCLC. Tumor-LN-oC reconstructs the tumour-lymph node interface from a single patient, *ex vivo*



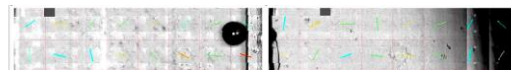
Tumour + LN compartments · chemokine gradients · live imaging · mid-IR read-out



Integrated TRL5 platform

6 chips in parallel, continuous flow, days-long runs

Live imaging output



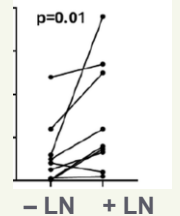
Segmentation → per-cell velocity & direction

KEY RESULTS

1 · Lymph node cells increase tumour cell migration

More tumour cells (EpCAM⁺) cross into the second compartment when the patient's **own lymph node cells** are present in the chip.

n = 9 patients · p = 0.01



2 · CCR7–CCL21 axis and inhibition

RNAseq compared migrating with non-migrating cells from the same tumour. Chemokine receptors were measured (**CCR2, CCR7, CCR9, CXCR4**) by FACS on patient-derived cell lines and took **CCR7** forward: expressed in primary tumour cells, reduced in cells already metastasised *in vivo*. Co-incubation with cosalane (CCR7 antagonist) minimizes this directed movement.

3 · Technological development

A high throughput multi-chip platform, that can support different types of assays was developed. Integrated live imaging runs on a multichannel microlens array giving a wide field of view at micrometre resolution, compact enough to scan six chips in place. Developed at ICCS · patent WO2025210084A1 (published Oct 2025)

Also on-chip: label-free mid-IR (MIP) read-out separates cancerous from healthy cells in the channel · RNAseq-grade RNA from on-chip cells · 72 NSCLC patients · PDX biobank · 8 patient-derived cell lines



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Saila Rinne

Head of Unit for Artificial Intelligence
in Health and Life Sciences at the EU
AI Office, DG CONNECT



Prof. Liesbet Geris

University of Liège and KU
Leuven, and coordinator of the
EDITH project



Prof. Alfonso Valencia

ICREA Professor, Director of the Life Sciences
Department, Barcelona Supercomputing Centre, and
the Spanish National Bioinformatics Institute



Dr Christina Kuhn

Researcher at the Fraunhofer Institute
for Cell Therapy and Immunology and
part of the coordinator team of the
CERTAINTY project



Dr Antonis Billis

Senior Researcher at Aristotle
University of Thessaloniki,
representing the TWIN-X project



Prof. Ioanna Zergioti

Professor at the National Technical
University of Athens, Coordinator of the
Tumor-LN-oC project & Chief Executive
Officer of PhosPrint S.A.

#MissionCancer

