ACED INTERNATIONAL ALLIANCE FOR CANCER EARLY DETECTION

ACED's Scientific Remit

The ACED Alliance Executive Board has developed three broad strategic themes where expertise is located across ACED Member Centres and where ACED is uniquely placed to drive forward progress towards the early detection of cancer. These three domains reflect ACED's current research portfolio and may extend to related areas:

What is the scientific remit of ACED?

ACED will engage in early detection research, with a focus on the detection of pre-cancerous and cancerous lesions at the earleist possible point and understanding the risks for malignant progression, aiming to reduce the burden of late-stage disease.

It includes discovery and validation of the signatures of early (and pre-) cancer, and development and translation of the technologies to enable such discovery and validation; these signatures may detect and also underpin prognosis, stratification, treatment decision, prediction of response to therapy and/or prevention of cancer. This involves:

Biological research underpinning early detection and biomarker discovery and validation, including but not limited to:

- Basic cellular and molecular science around the earliest transformational events pushing a cell from normal to at-risk to dysregulated to cancerous (including understanding of cancer cells' interaction with the local and immune microenvironment)
- 'Omics for early detection; high-throughput high-dimensional data research in markers for early detection, including proteomics, metablomics, lipidomics, genomics, epidenomics, transcriptomics
- Basic biology and detection of circulating cellular and nucleic acid markers for early detection of cancer or pre-disease (e.g. ctDNA, circulating tumour cells, organoids and xenografts, and/or primary human samples)

Human-based EDx discovery research including but not limited to:

- Biomarker discovery and validation in early stage disease (and pre-cancerous state) patients
- Biomarker discovery and validation in healthy volunteers
- Exploitation of existing cohorts and biobanks for discovery research and technology development in an early detection context

Stratification of populations by risk to identify and exploit high-risk groups as populations for EDx research:

- Use of the tools, methods and insights of population science, epigemiology and risk assessment through collaborative research with behavioural scientists, psychologists and primary care physicians to inform risk-stratification approaches
- Development of novel detection technologies for clinical contexts

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Data and computation-driven approaches to EDx, including but not limited to:

- Biomedical and health informatics; computational high-dimensional data analytics for interpretation of potential EDx marker profiles; analysis and integration of multimodal data (e.g. from genomics, imaging, e-health records, patient/public-derived data, etc.)
- Computational and systems biology: computational and mathematical modelling of complex networks and systems to understand normal, pre-cancer and early cancer biology.

Development and utilisation of preclinical EDx model systems (e.g. human cellular and organoid models, xenograft, animal models, etc.) to recapitulate early cancer and pre-cancerous states, including but not limited to:

- Creation and characterisation of new model systems
- Use of model systems to probe and understand early events leading from normal cellular function through to cancer
- Use of model systems to identify potential EDx markers for future clinical validation
- Use of model systems as platforms for development of EDx technologies

EDx technology development - exploratory and translational research, including but not limited to:

- **Imaging:** progressive research into advanced imaging technologies for cancer detection; novel modalities, novel probes, novel contrast agents, novel imaging methodologies (of existing modalities)
- **Circulating marker detection technology:** enhancement of sensitivity/specificity of detection technologies for ultra-low concentration circulating markers (e.g. cels, DNA, proteins, exosomes, metabolites, etc.)
- **Advanced detection technologies (nanotechnology, photonics, synthetic markers, etc.):** engineering and physical science approaches to enable novel methods of detection of very low-concentration markers
- **Translational and clinical EDx research:** experimental work in patients and healthy volunteers around development and validation of EDx approaches and technologies