Novel Approaches to Improve Pancreatic Cancer Outcomes

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Our research focuses on:

- **Early diagnosis**: Detection of small tumours and precursor lesions. Identify risk factors and biomarkers.

- **Novel treatment strategies**: Resistant to almost all-available therapeutics. Achieve down-staging of patients from inoperable to resectable disease.
Reimagining the diagnostic pathway for gastrointestinal cancer

Rubin G et al 2018
Is there a window of opportunity to identify early symptoms?

A mutation occurs
Symptoms
A visit to the family doctor
Referral to a specialist
Diagnosis
Surgery and cure

Treatable disease

Screening

This is where we’d like to detect the disease

Diabetes?

Incurable disease

Incurable disease
When can we detect PDAC?

Early diagnosis Biomarkers

Normal  Hyperplasia  Dysplasia  Carcinoma in situ  Invasion  Metastasis

12 ± 3 years  7 ± 3 years  3 ± 1 years

‘window of opportunity’
Improving early diagnosis accuracy

- Earlier diagnosis of PanCa is linked to **improved survival**.
- Blood/Urine may be non-invasive sources of specific proteins that can be used to detect the presence of a tumour (**biomarker**).

Blood/Urine biomarker panels may be the key to detecting PanCa early.
Real-time imaging of PanCa: towards detection of high-risk precursor lesions

Confocal laser endomicroscopy

CT-EUS Image coregistration
Computer-assisted 3D navigation system
Need for novel pre-clinical models and treatments

- The poor prognosis is largely due to PanCa propensity to metastasis and its resistance to therapy.
- Combination therapy with FOLFIRINOX (5-FU, Leucovorin, Oxaliplatin and Irinotecan) and albumin bound paclitaxel (nab-paclitaxel/Abraxane) are currently used together with gemcitabine as first line therapy.
Photodynamic Therapy: a minimally invasive and local therapy

Clinical protocol

Requires 3 elements

Selective: ↓ side effects
Repetitive sessions
Combination with other therapies

injection  accumulation  
irradiation  regression

www.photochembgsu.com/applications/therapy.html
Photodynamic Therapy for Pancreatic Cancer: Clinical trial
Light-based therapies to improve pancreatic cancer outcomes

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**Background**

- Pancreatic cancer is resistant to their target sites.
- Photochemical Inactivation (PCI) is a novel minimally invasive technique that can significantly enhance the efficacy of cancer chemotherapies.
- PCI triggers chemodrugs release and re-distributes cancer cells using a light-sensitive agent (PARP), known as a ‘photosensitiser’ (PCI).
- The use of systemic chemotherapy and PCI has the added advantage of reducing systemic and haematological toxicity.
- In this study, PCI treatments in the photosensitiser Amphinex® were compared with the toxin saporin (an inactivating protein specific for pancreatic cancer cell lines MiaPaca2) and patient specimens. The results demonstrated a significant increase in cell viability with PCI treatments compared to saporin alone. This suggests that PCI may be a promising strategy for improving the outcomes of pancreatic cancer treatment.

![Graph showing cell viability percentages for different treatments.](image)
Earlier detection of pancreatic cancer is key to improve patient survival rates.

Light-based treatments are promising strategies to enhance the efficacy of conventional antitumour therapies in pancreatic cancer.

Current work: 3D models as tools for disease modelling, biomarker discovery and drug screening.
Acknowledgements