HEALTH TUESDAY:

CANCER – FROM GROUND-BREAKING RESEARCH TO NOVEL CARE

27.1.2021

Uptake of new research and technologies in cancer care

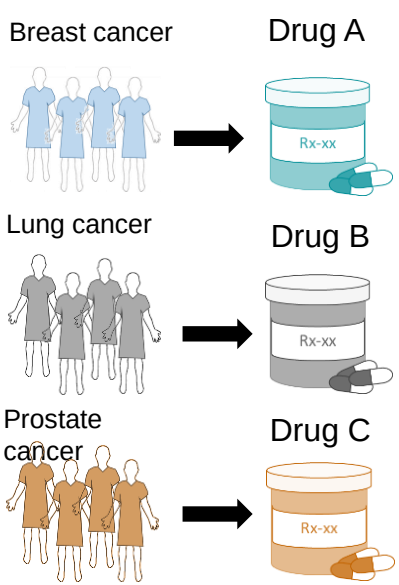
Ilpo Tolonen, CEO

Docrates Cancer Center
Helsinki

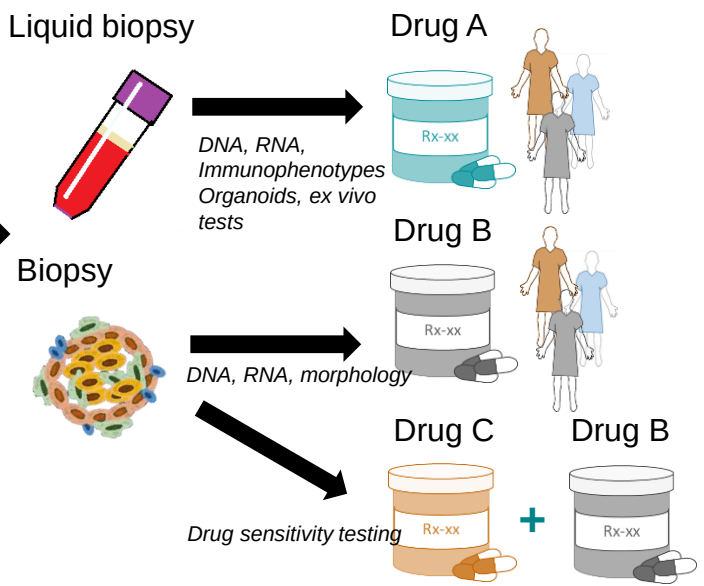
Cancer classification and treatment by involved organ

Cancer biology driven treatment

Standard cancer care



Precision oncology



Treatment is expensive and causes side effects – non-optimal treatments should be avoided.

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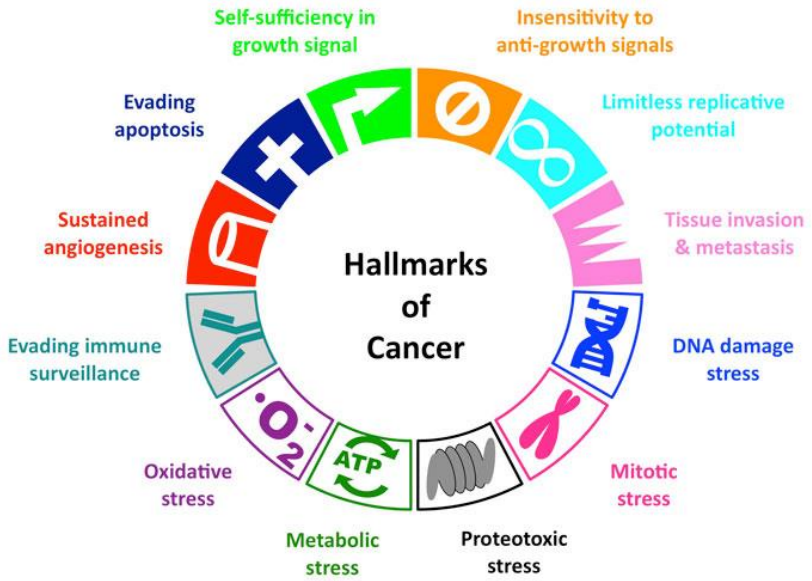
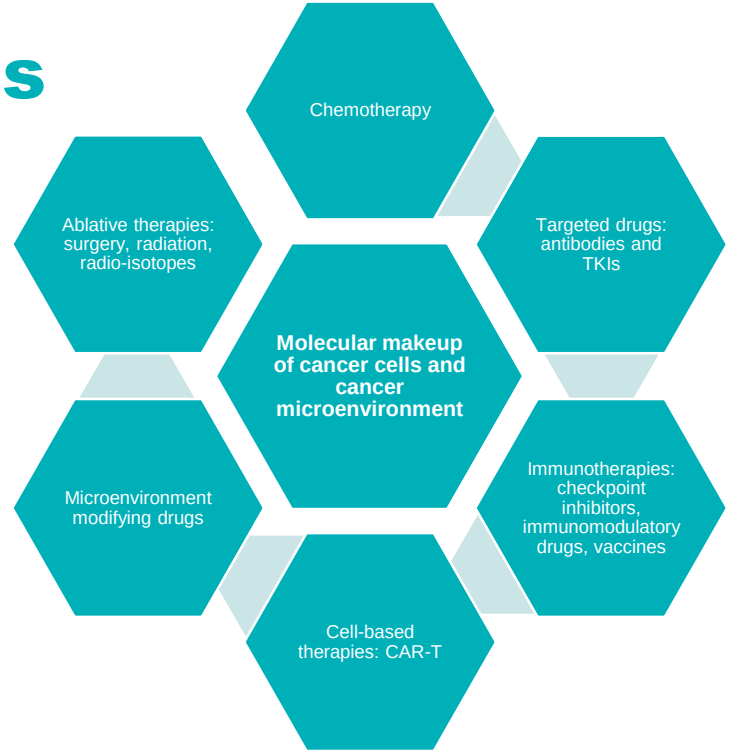
Cancer treatment strategies





Hanahan & Weinberg Cell 2011

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Examples of adapting new research findings and technologies in cancer care

1. Diagnostic techniques for higher sensitivity and specificity in cancer staging: help deciding the right overall treatment strategy
2. Predictive biomarkers: choosing the right medication for the right patient
3. Artificial intelligence and machine learning: reduce errors and facilitate workflow
4. Fast-track new cancer drugs: generate trial hypotheses with ex vivo assays and validate them in clinical trials

1: PET-imaging with new tracers reveals cancer with improved accuracy

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PET significantly more sensitive than bone scintigraphy

The same patient in both images

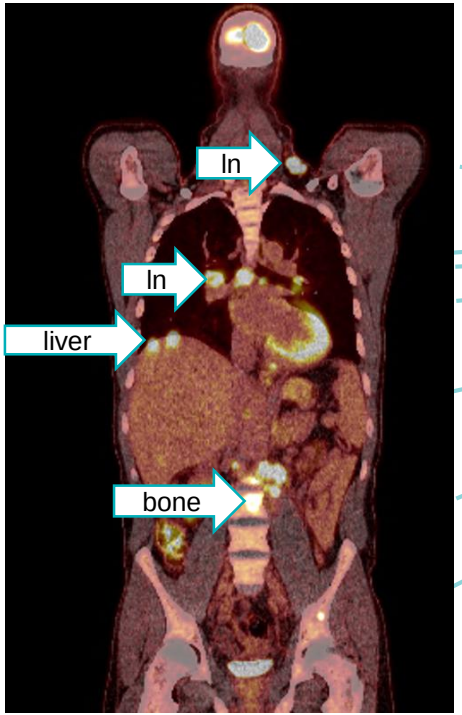
Traditional scintigraphy

PET-CT

Source: Even-Sapir et al. JNM 2006; 47:288

2. Liquid biopsy – predictive biomarker based on molecular profiling for disease burden evaluation

PET-CT



ctDNA in blood

- Metabolically active metastases shed ctDNA in blood
- Liquid biopsy can be used to measure total disease burden, detect currently prevalent clones
- Useful for
  - Diagnostic purposes
  - Rapid response evaluation
- Minimally invasive, can be repeated often

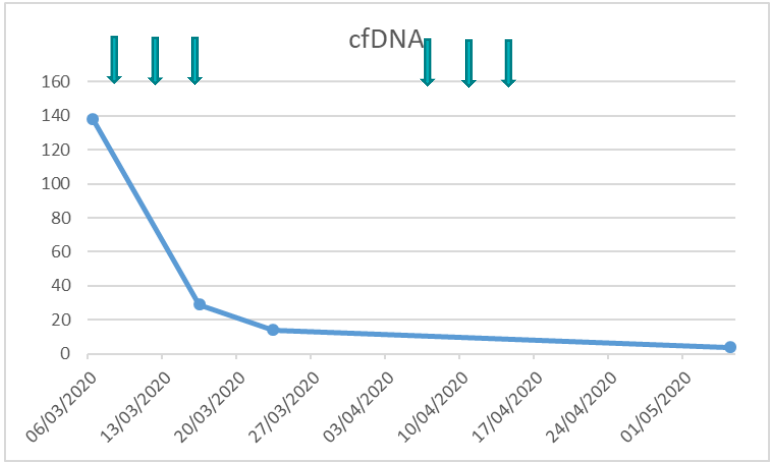
ln= lymph node metastasis

Siravegna G, et al., Nat Rev Clin Oncol. 2017 Sep;14(9):531-548.

2. Liquid biopsies have been routinely used at Docrates

- Diagnostic use:
  - Identify targetable genetic alterations
- Early response evaluation:
  - Signs of treatment response

cfDNA:n in blood after chemotherapy. Longitudinal measurements in metastatic breast cancer



295 liquid biopsy tests in 2020

Liquid biopsy can indicate treatment response within a week after treatment

3. Utilizing artificial intelligence in radiotherapy planning

diagnostics

MDPI

Article

A Deep Learning-Based Automated CT Segmentation of Prostate Cancer Anatomy for Radiation Therapy Planning-A Retrospective Multicenter Study

Timo Kiljunen [1,*], Saad Akram [2], Jarkko Niemelä [2], Eliisa Löyttyniemi [3], Jan Seppälä [4], Janne Heikkilä [4], Kristiina Vuolukka [4], Okko-Sakari Kääriäinen [4], Vesa-Pekka Heikkilä [5,6], Kaisa Lehtiö [5], Juha Nikkinen [5,6], Eduard Gershkevitsh [7], Anni Borkvel [7], Merve Adamson [7], Daniil Zolotuhhin [7], Kati Kolk [7], Eric Pei Ping Pang [8], Jeffrey Kit Loong Tuan [8,9], Zubin Master [8], Melvin Lee Kiang Chua [8,9,10], Timo Joensuu [1], Juha Kononen [1], Mikko Myllykangas [1], Maigo Riener [1], Miia Mokka [11] and Jani Keyriläinen [11,12]

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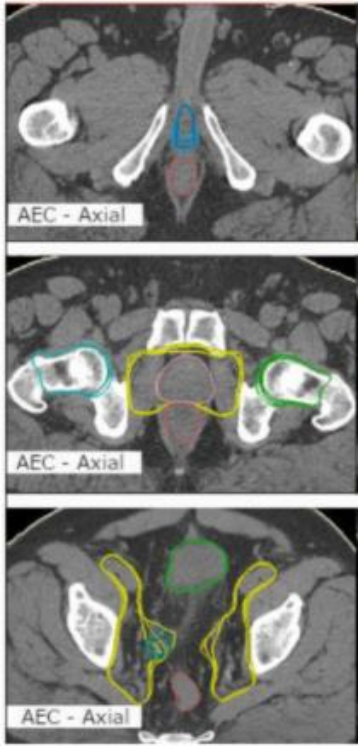

4. Ex vivo drug sensitivity and resistance testing for rare and hard-to-treat cancer cases

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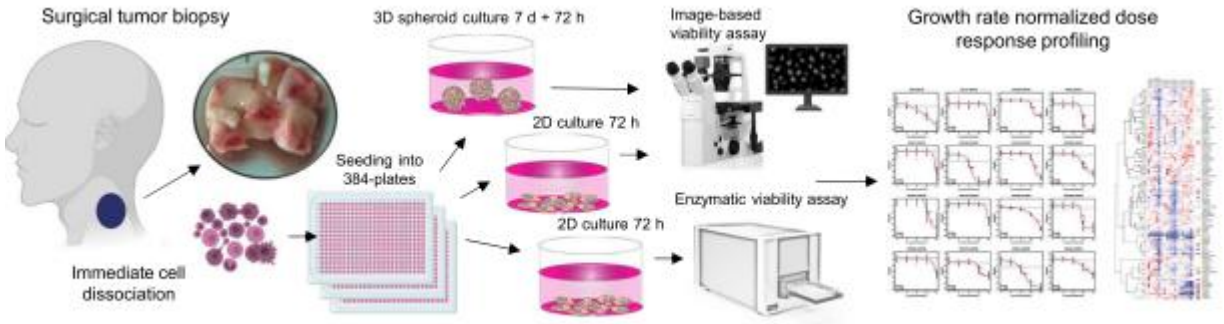

Using tumor derived live cancer cells and organoids as a model for cancer

ANTICANCER RESEARCH *39*: 5867-5877 (2019)
doi:10.21873/anticanres.13791

Clonal Evolution of MEK/MAPK Pathway Activating Mutations in a Metastatic Colorectal Cancer Case

KAISA I. LEHTOMAKI[1,2], LAURA I. LAHTINEN[3], NINA RINTANEN[3], TEIJO KUOPIO[3], IVANA KHOLOVA[1,4], RAMI MAKELA[5], JUHA K. RANTALA[5,6], PIRKKO-LIISA KELLOKUMPU-LEHTINEN[1,2] and JUHA KONONEN[3,7]

ELSEVIER
Neoplasia
Volume 22, Issue 9, September 2020, Pages 390-398

Ex vivo assessment of targeted therapies in a rare metastatic epithelial–myoepithelial carcinoma

Rami Mäkelä [a], Antti Arjonen [a], Aldwin Suryo Rahmanto [b], Ville Härmä [a, c], Janne Lehtiö [d], Teijo Kuopio [e], Thomas Helleday [c], Olle Sangfelt [b], Juha Kononen [a, f], Juha K. Rantala [a, c, g]

Mäkelä *et al. BMC Cancer* (2020) 20:590
https://doi.org/10.1186/s12885-020-07092-w
BMC Cancer
RESEARCH ARTICLE Open Access

Ex vivo modelling of drug efficacy in a rare metastatic urachal carcinoma

Rami Mäkelä[1], Antti Arjonen[1,2], Ville Härmä[1,3], Nina Rintanen[4], Lauri Paasonen[5], Tobias Paprotka[6], Kerstin Rönsch[6], Teijo Kuopio[4], Juha Kononen[4,7] and Juha K. Rantala[1,3*]

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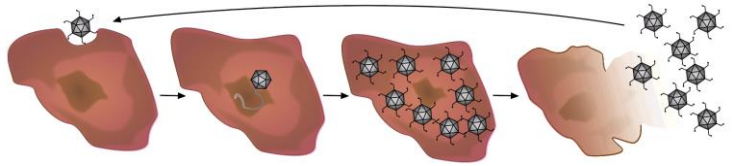
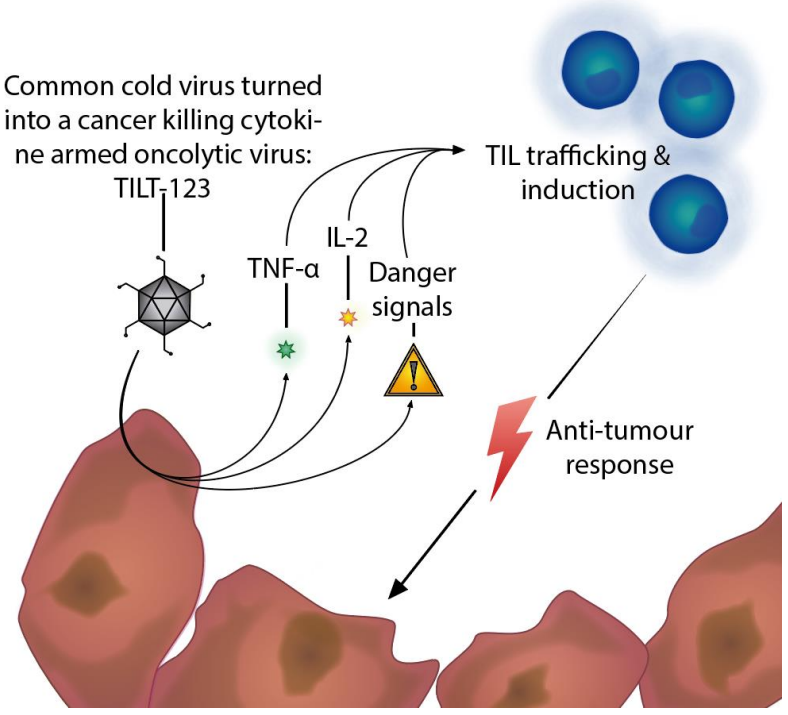
tilt® BIOTHERAPEUTICS

- Oncolytic viruses replicate selectively in cancer cells resulting in anti-tumor immunity
- TILT technology is based on observations made in treatment of cancer patients with oncolytic viruses
- TILT-123 is an armed oncolytic virus making T cells attack solid tumors
- TILT-123 exhibits 100% cure in preclinical models
- Ongoing international clinical collaborations with pharma/biotech (Merck-KGaA/Pfizer, Biotheus).
- Two Phase-I trials open in Europe with TILT-123, additional studies starting imminently



The therapeutic agent replicates and lyses cancer cells



Additionally, the treatment triggers immune-mediated anti-tumour effects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