CrownBio
CONNECTING SCIENCE TO PATIENTS

LABIOTECH.eu

How Are Organoids Revolutionizing Oncology Drug Development?

What if one day 2D cancer cell lines in drug discovery were a thing of the past? What if 3D cell cultures could mimic the human body perfectly? Enter organoids.

Also known as "mini-organs", organoids are one of the most exciting recent developments of stem cell research. Organoids are 3D cell structures that form functioning physiological systems mimicking key characteristics of an analogous organ or tissue in vivo.

Organoids through time

1907

Cells cultured in 3D for the first time

1940s

The term 'organoid' is first used to describe histological features of tumors

1960s

In *in vitro* biology, self-organizing organotypic cultures are described as 'organoids'

2009

Intestinal organoids are developed for the first time, which establishes the term 'organoid' as we know it today

2018

Patient-derived organoids (PDO) are shown to predict metastatic gastrointestinal cancer patient response to therapy

2019

Organoids are used in personalized medicine to predict rectal cancer patient responses to therapy.
They have a market value of **~$32M**

2029

Future outlook: The huge potential of organoids is recognized as researchers move to adopt organoids at various stages of drug development.
The market value of organoids is estimated to reach **~$134M**

What can organoids be used for?

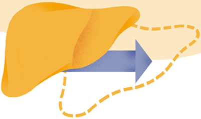
Drug toxicity testing

Efficacy evaluation in preclinical development

Developmental biology studies

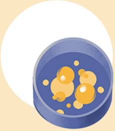
Discovering treatment options in precision medicine

Disease models to study pathophysiology



Organ replacement in regenerative medicine

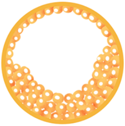
Organoids vs standard 2D and 3D *in vitro* tools



Traditional 2D/3D *in vitro* tools	**Organoids**
• Exhaustible	• Self-renewing
• Short-term culture	• Robust & stable in long-term culture
• Mostly monoculture	• Multiple differentiated cell types
• Prediction & translation into humans uncertain	• Greatly predictive & translatable into humans

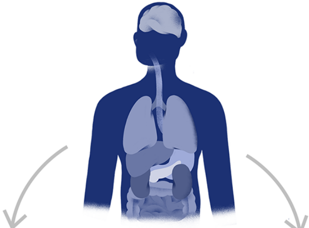
The exciting paths of organoid development

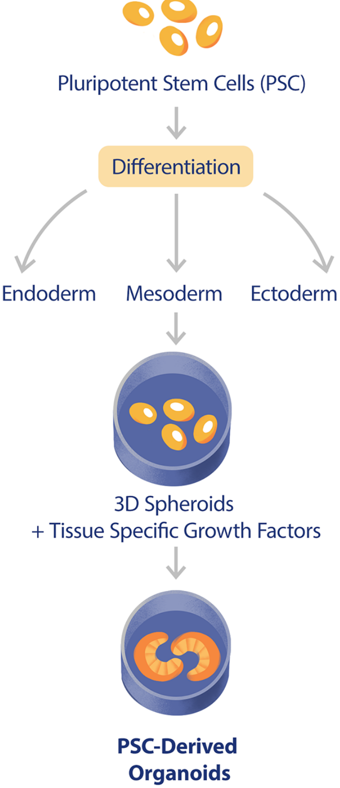
PSC-Derived Organoids



Blastocyst

ASC- Or CSC-Derived Organoids





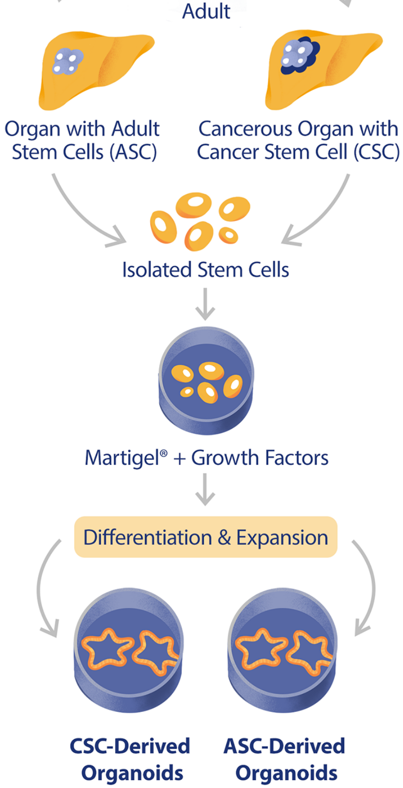
Pluripotent Stem Cells (PSC)

Differentiation

Endoderm Mesoderm Ectoderm

3D Spheroids
+ Tissue Specific Growth Factors

PSC-Derived Organoids



Adult

Organ with Adult Stem Cells (ASC)

Cancerous Organ with Cancer Stem Cell (CSC)

Isolated Stem Cells

Martigel® + Growth Factors

Differentiation & Expansion

CSC-Derived Organoids

ASC-Derived Organoids

Types of organoids

PSC-Derived Organoids

- Brain
- Pituitary Gland
- Inner Ear
- Retina
- Lung
- Liver
- Stomach
- Kidney
- Small Intestine

ASC-Derived Organoids

- Taste Buds
- Salivary Gland
- Esophagus
- Lung
- Mammary Gland
- Liver
- Stomach
- Pancreas
- Small Intestine
- Fallopian Tube
- Prostate
- Colon

CSC-Derived Organoids

- Lung
- Mammary Gland
- Liver
- Pancreas
- Intestine

Cancer research could greatly benefit from patient-derived organoids, BUT there is a challenge...

- Limited availability of human tissue for preclinical development
- Ethical reasons complicate the sourcing of human tissue
- Collection, storage, distribution of human tissue is heavily regulated

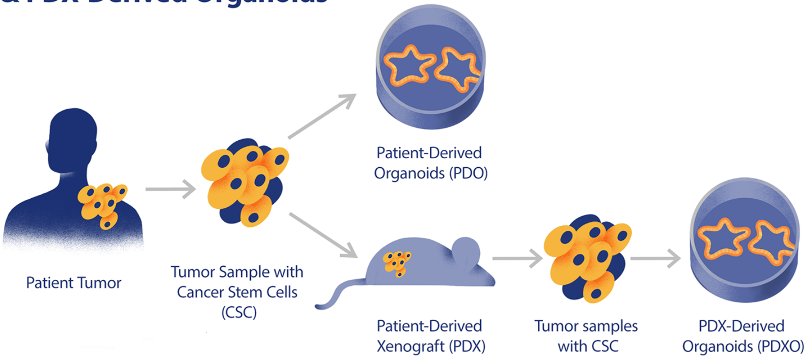
IN SHORT, gaining access to fresh patient tissue for tumor organoid development can be challenging.

The answer: Established biobanks & patient-derived models as a source of human tumor tissue

"PDX-derived organoids, also called PDXOs, are three-dimensional in vitro organoid models. They are generated using the same protocols as patient-derived organoids,

> *PDO, with the only exception that the patient's tumor tissue is expanded in murine PDX models first."*
>
> ***- Henry Li, CSO at CrownBio***

Development Process of Patient-Derived & PDX-Derived Organoids



Patient Tumor

Tumor Sample with Cancer Stem Cells (CSC)

Patient-Derived Organoids (PDO)

Patient-Derived Xenograft (PDX)

Tumor samples with CSC

PDX-Derived Organoids (PDXO)

How can PDXO help?

PDXO can be derived from a large library of already established PDX models, which can function as an alternative source of human tumor tissue!

- Represent patient diversity by developing the largest tumor organoid collection
- Expand the repertoire of cancer indications, e.g. bladder, cervical, esophageal, melanoma
- Easily scalable for large-scale screens to obtain drug sensitivity data
- High-quality readouts with low batch-to-batch variation & high signal:noise ratio
- Improved predictivity of tumor response *in vivo*

CrownBio's PDXO are developed using protocols from the Hubrecht Organoid Technology (HUB)

- The first & only technology to develop organoids from patient stem cells in healthy & cancerous tissues
- HUB protocols are robust, reproducible, & easily scalable
- HUB organoids preserve original tissue morphology, genomic, & expression profiles
- HUB tumor organoids are able to efficiently predict patient response in the clinic

Still, there is a great need for a paradigm shift...

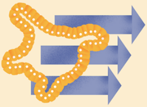
Present

Organoids are used as late-stage models in personalized approaches to predict patient responses in the clinic.

Future

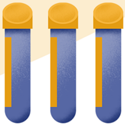
CrownBio's goal is to build the largest tumor organoid library for applications in all stages of drug development.

In the long run, this will achieve...



Better translatability into humans

Lowering the risks of clinical-stage failures



Improved development of CDx & biomarkers

More effective & safer drugs

Benefit from the most comprehensive tumor organoid collection there is and leverage the opportunity to improve the patient relevance of your preclinical research!

Check out this webinar on why you should choose organoids in drug development!

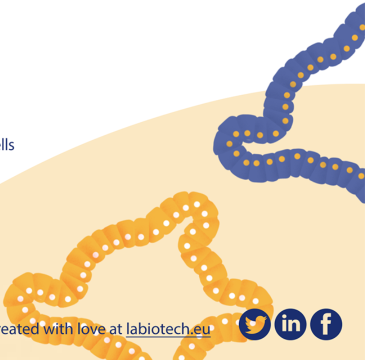
Register Now

Sources

Crown Bioscience
Science
Cell Press
Future Market Insights/ Future Market Insights
Development for Advances in Developmental Biology and Stem Cells
Journal of Cell Biology
Labiotech.eu

Want to work with us?
Reach out to contact@labiotech.eu

Text: Larissa Warneck
Design and images: Elena Resko



Created with love at labiotech.eu