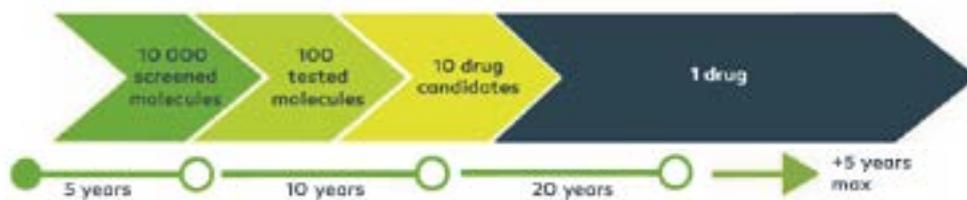


3D Bioprinted tumors for therapeutic innovation

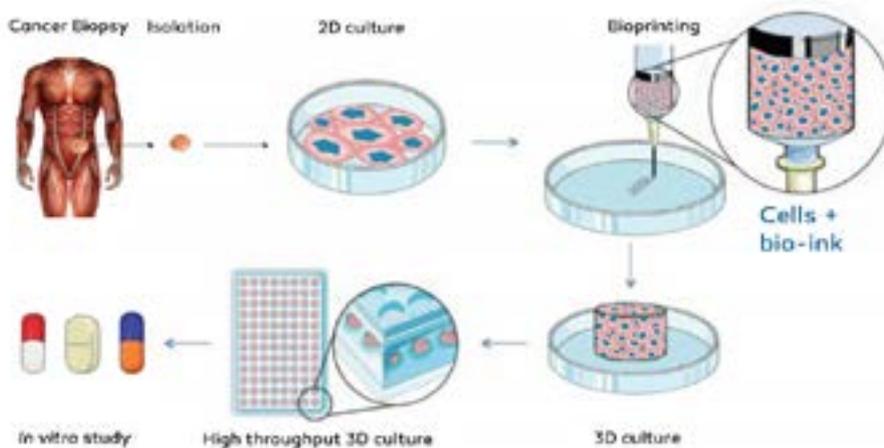
95% of new drug candidates fail cancer clinical trials, costing billions to the pharmaceutical industry and delaying new treatments for patients. Robust predictive human cell bioassays support faster development of pre-clinical trials, thereby saving time and money.



Development pipeline of a drug candidate : from the idea to the product

CTIBiotumors for predictive and personalized medicine

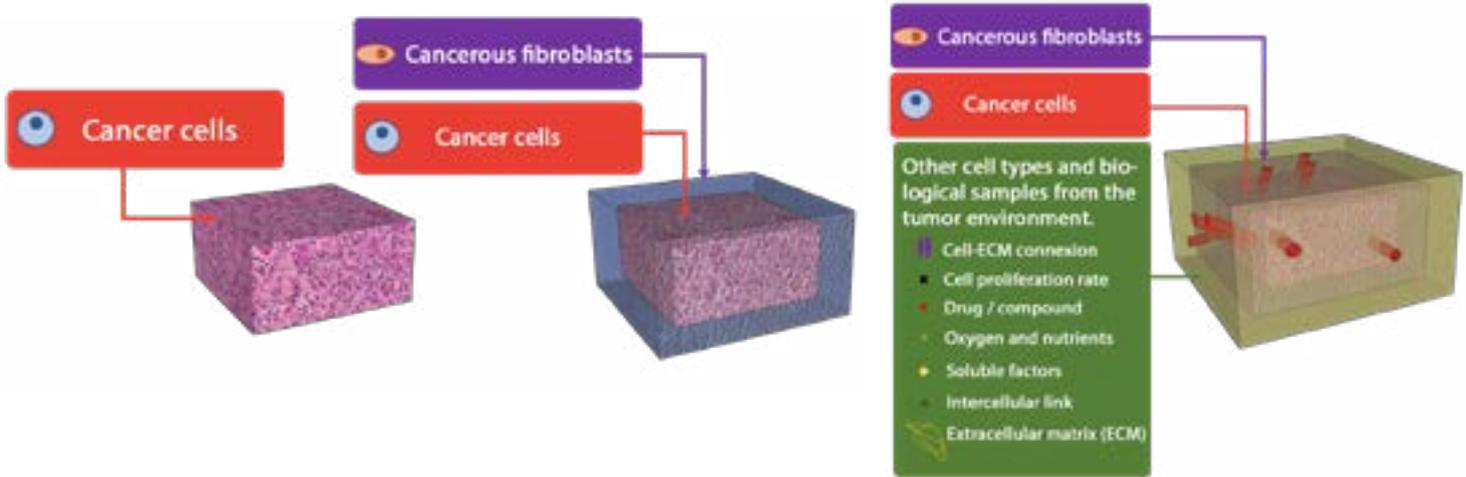
By combining excellence in cancer research, tissue engineering and 3D printing, CTIBiotech has developed the building blocks to produce large-scale, reliable, robust, reproducible, predictive, personalized 3D biological models of human tumors in sufficient quantity to accelerate the development of drug candidates for cancer chemotherapy and immunotherapy.



Schematic representation of the development and production of the CTIBiotumors models.



Average drug development time with and without CTIBiotech technology



Standard CTIBiotumor

This model contains a cancer cell type and associated bio-ink. It allows the development of new treatments against cancer cells in a 3D environment.

Complex CTIBiotumor

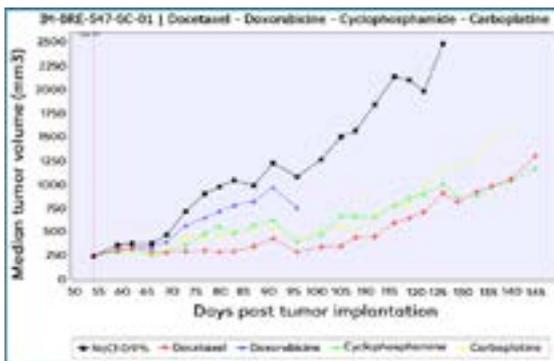
This model uses two cartridges, one containing a type of cancer cell and the other containing tumour fibroblasts. It allows the development of new treatments against cancer cells and other tumour-forming cells.

Advancer CTIBiotumor

Printed with 3 cartridges containing cancer cells, tumor fibroblasts and endothelial/blood vessel and/or immune cells. This model allows the development of new combined therapies against all aspects of the tumor.

Comparison of CTI 3D Biotumor and standard mouse model of breast cancer

Result on standard mouse model (BRE-547)

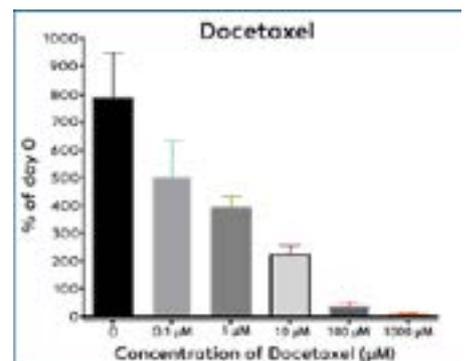


We show a dose dependant effect.

We are able to correlate the results of the 3D model with the mouse standard model.

Other chemotherapy are currently tested on our 3D models.

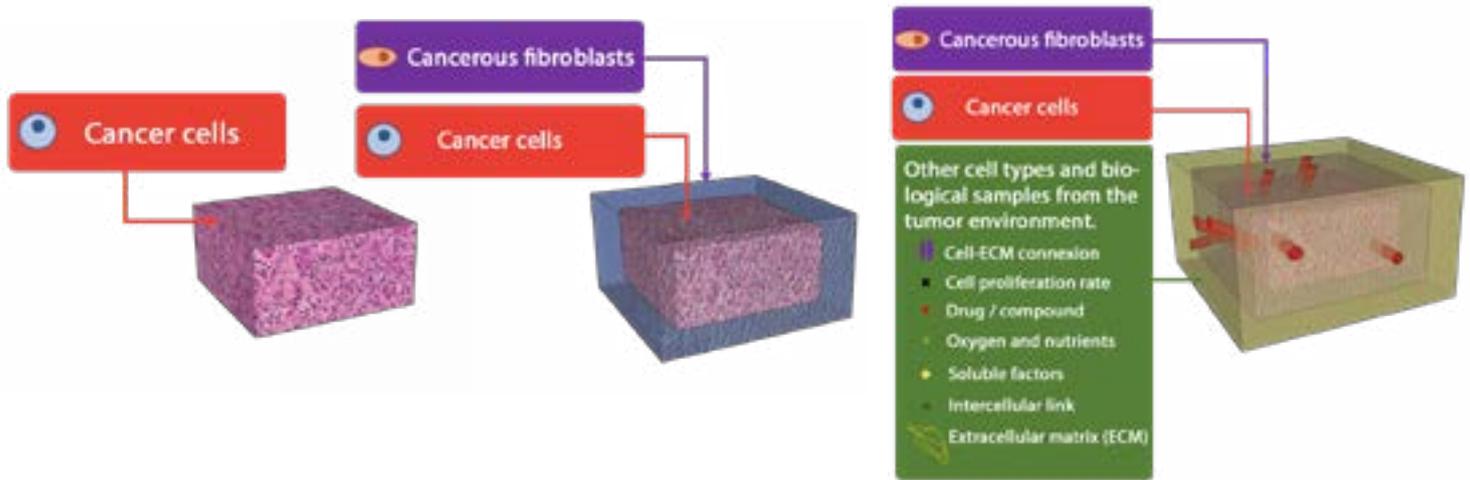
Result on CTI 3D model



For tomorrow

Our goal is to bring about a revolution on the production of complex multi-cellular systems through the automation of 3D bioprinting. This will include :

- To create 3D biological structures made of human cells that provide access to more reliable and less expensive tests that allow better assessment of the safety and efficacy of drug candidates.
- Reduce the time required for the pre-clinical evaluation phase by 3 years from 1 to 3 years (compared to 3 to 6 years today).
- Reduce the costs in the drug development chain by 20%, which represents a saving of € 520 million per drug developed.



Standard CTIBiotumor

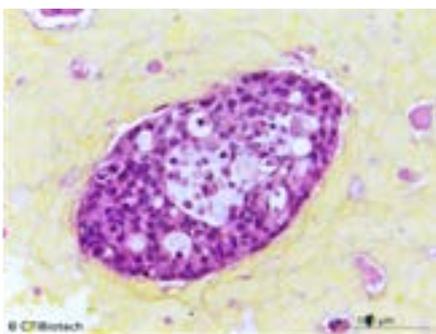
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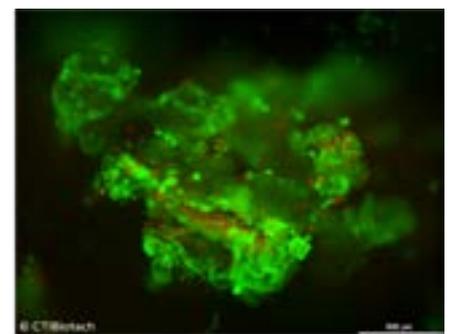
Printed with 3 cartridges containing cancer cells, tumor fibroblasts and endothelial/blood vessel and/or immune cells. This model allows the development of new combined therapies against all aspects of the tumor.



HES Staining of CTIBiotumor

The cells are printed and maintained in 3D culture until an organoid like structure is formed.

After a Docetaxel treatment, we observed the same dose dependant response pattern as the standard mouse model BRE-547.



Live/Dead test of CTIBiotumor

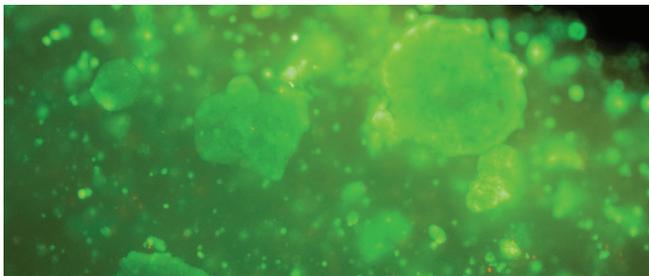
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Stringent bioassays for pre-clinical research

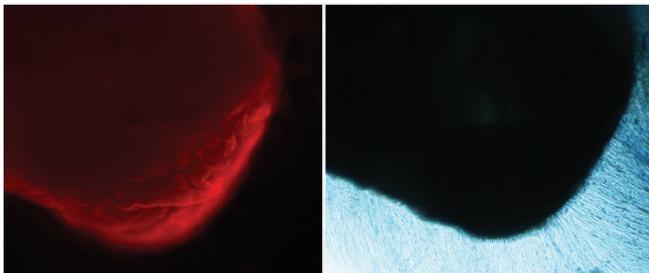
95% of new drug candidates fail cancer clinical trials, costing billions to the pharmaceutical industry and delaying new treatments for patients. Robust predictive human cell bioassays support faster development of pre-clinical trials, thereby saving time and money.



Live dead staining of CTIBiotech's 3D bioprinted pancreas micro tumour

3D bioprinted micro tumour

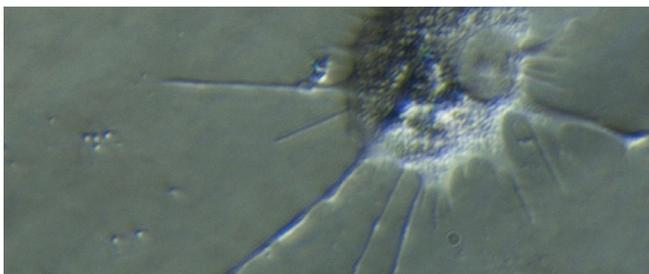
Using the latest tools in bio-engineering, CTI Biotech researchers are now printing cancer tissues in 3D. The resulting models can be used for highly significant pre-clinical testing. The models can be produced in 6/48/96 well plates for high throughput drug screening.



Medical device validation using live dead on CTIBiotech's primary cells

Medical device testing

Our stem cell and regenerative medicine expertise helped companies develop and test medical device technologies that are now FDA-approved and CE-marked for human use clinical market. Products put on the market with the help of CTIBiotech models include: CellEffic CB (Kaneka Corp.), ResQ kit (Thermogenesis).

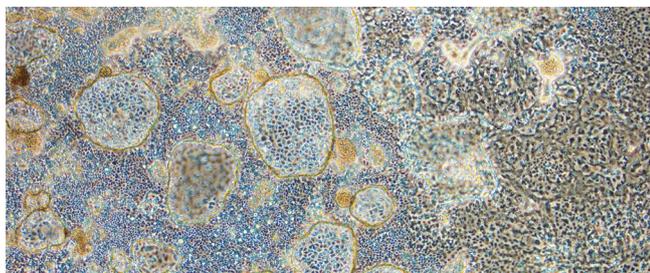


Microscopic observation of stem cell (brightfield)

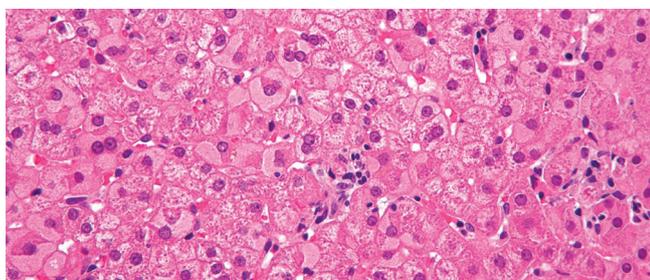
Stem cells and regenerative medicine

Extremely advanced in the stem cells and regenerative medicine field, we use adult human stem cells as a starting point. CTIBiotech staff were amongst the early teams that created the world's first liver & nervous tissue models and have continued to develop this technology from both a clinical point of view and for R&D towards products.

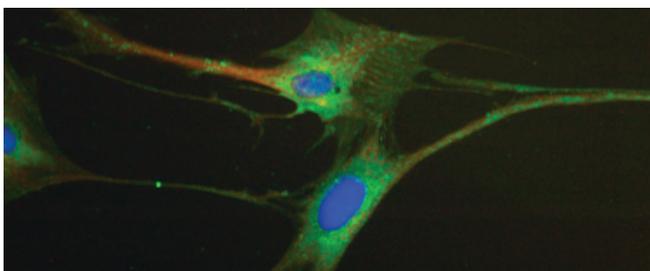
Stringent bioassays for pre-clinical research



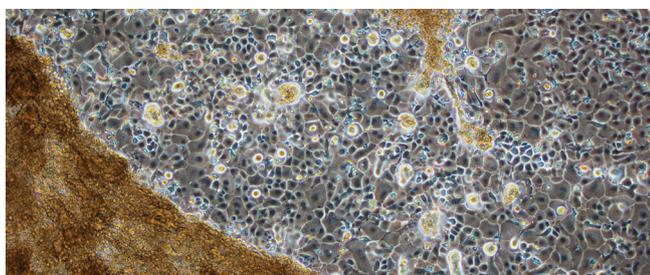
Primary lung cancer cells (brightfield)



Haematoxylin eosin (H&E) of hepatocytes



Neural specific staining



Primary breast cancer cells (brightfield)

360° opportunity in cancer

We provide cancer material for experiments at CTIBiotech or clients' facilities:

- Original tumours
- Single cells (cancerous, associated cells)
- Plates of cells
- 3D bioprinted micro tumours

Hepatocytes

We offer primary cells and hepatocytes produced by differentiation of human adult stem cells. They can be used for advanced testing of drug toxicity in ADMETox studies. These hepatocytes are offered cryopreserved or in plated format and can be shipped in proprietary culture medium.

Nervous tissues

Using DPSMC or MSC we are able to develop sensitive neuronal cells for bioassays. This model allows the analysis of inflammatory response. It is used in preclinical tests for drugs acting on pain or sensation, for research on blood-brain barrier and brain disease (Alzheimer, Parkinson, stroke...), and for toxicity studies.

Immuno-oncology

At the forefront of pharmaceutical research, the goal is to act on cancer or other diseases by stimulating the body's own immune system. Using our biosourcing capabilities and technical expertise, we are able to collect, purify & prepare blood cells for immuno-oncology experiments: neutrophils, T-cells, dendritic, NK (Natural Killer) and others.

Blood, Bone marrow & derived cells

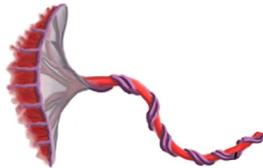


Biosourcing solutions for drug development

Blood and the cells that compose it are an essential component of our body. Several indicators present in Human blood allow the observation of variations such as immune reactions or inflammations.



Peripheral Blood



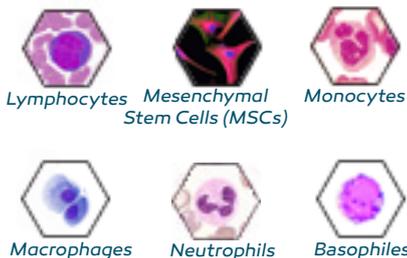
Umbilical Cord Blood



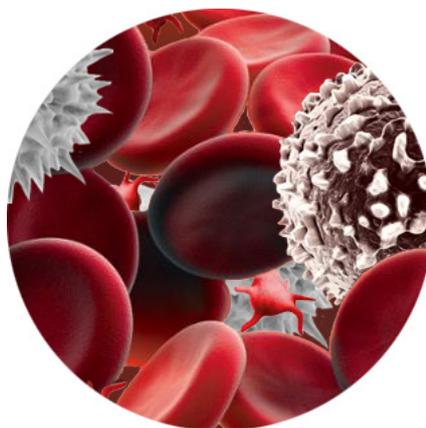
Bone Marrow

Biosourcing

We are able to **isolate a selection of subpopulations** from whole blood or PBMC by immuno-magnetic and affinity methods:



- CD4, CD8, CD14, CD19, CD56, CD61, CD34, CD25, CD3, etc.
- Stem cells
- Positive or negative selection, untouched cells
- Cell preparation for immuno-oncology



We offer healthy and pathological blood, donors can be selected by phenotype or polymorphism.

We provide **clinical grade** cryopreservation and thawing using control-rate freezer and specific proprietary reagents, designed for clinical research in mind but applied to research.

Analysis

- Enzyme-linked immunosorbent assay (ELISA)
- Flow cytometry (FACS)
- Immuno histochemistry
- Molecular biology (PCA)
- Haematological cell counting
- Safety test: HIV, HBV, HCV and others on request.

Blood cells and derived bioassays can be used for co-development, R&D, and for validation of **medical devices**, to produce data sets for **CE/FDA marking**.

We are able to validate systems, products or reagents for collection, transport, preservation or processing of blood and bone marrow samples. We can also offer co-innovation and research services on these samples.

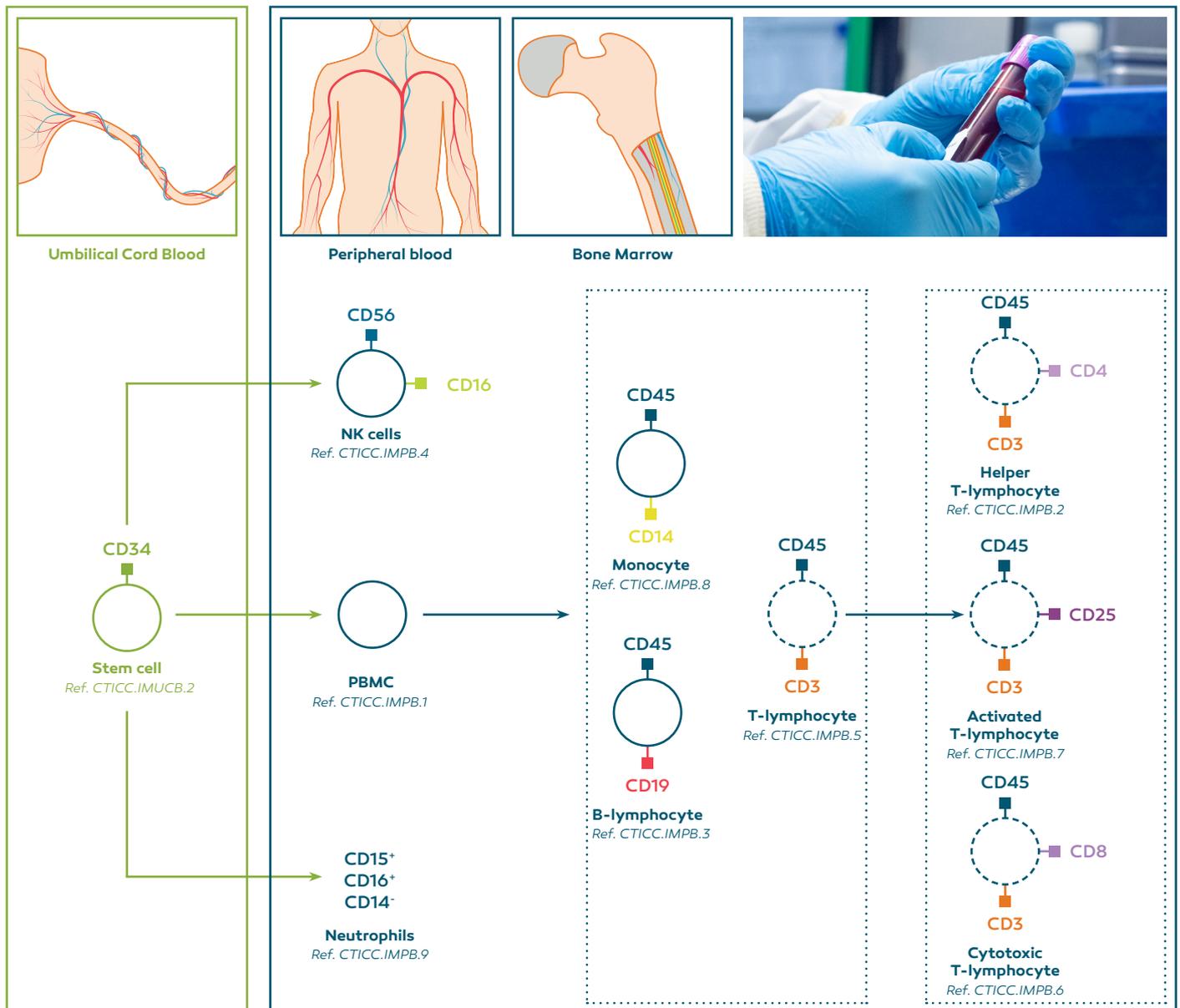
Focus on Immuno-oncology

In immuno-oncology, the immune system protecting our bodies is mobilised to recognise and destroy cancer cells. Since the first treatment was approved in 2010, immuno-oncology is one of the rapidly growing fields of pharmaceutical research. The CTIBiotech team, led by Pr McGuckin, is building on years of expertise in research in university-hospitals. We can help with pre-clinical tests protocol establishment and realisation, as well as biosourcing for high quality cells and samples.

“CTIPharma® provides you with purified human immune cells extracted from cord blood, peripheral blood or bone marrow. Our control of the whole supply chain, from donor consent to the extraction, purification, cryopreservation and shipping, allows us to provide you with high quality immune cells. After each extraction, a purity control by flow cytometry is performed to ensure the expression of cell-type specific phenotype. Each vial is produced with a minimum of 90% of purity.

Extracted from:

Extracted from:



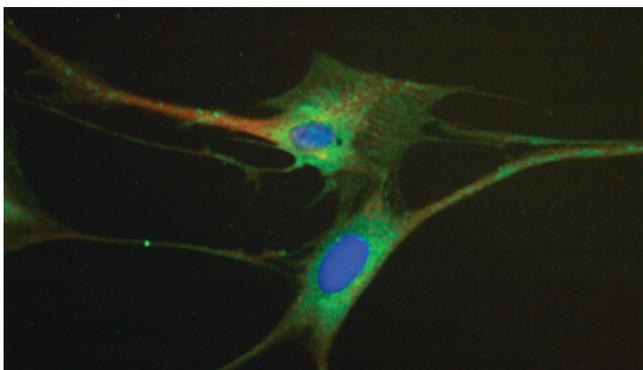
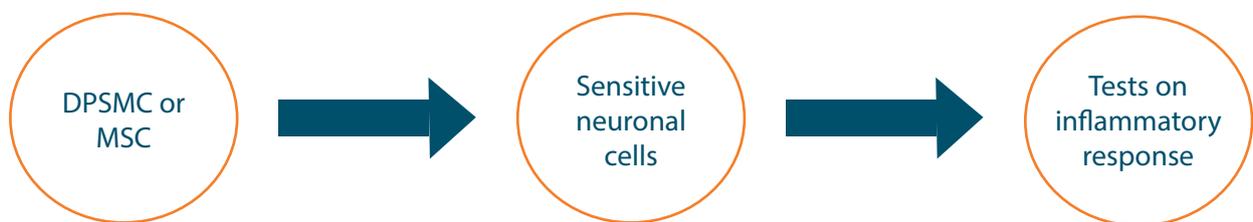
Positive or negative selection

Our immune cells can be extracted with a positive and/or a negative immunomagnetic selection, and referenced for each product data sheet and certificate of analysis. Please contact us for custom selection of immune cells.

Nervous Tissues

Biosourcing solutions for drug development

CTIBiotech has developed a human cellular model of neurogenesis from somatic stem cells allowing the in vitro production of neural cells for scientific research applications. Our neurogenesis model is based on a 27-day kinetics with an amplification phase, an induction phase and a maturation phase to stimulate in vitro the differentiation of human stem cells from dental pulp into functional neural cells.



Applications

- Sensation and pain bioassays
- Blood-brain barrier research
- Brain diseases (Alzheimer, Parkinson, stroke)
- Skin sensitivity
- Itching
- Dermatology (atopic dermatitis)

Nervous tissues in pre-clinical bioassays: test new generation drugs
Validate efficiency on neural cells
Discover new R&D targets

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