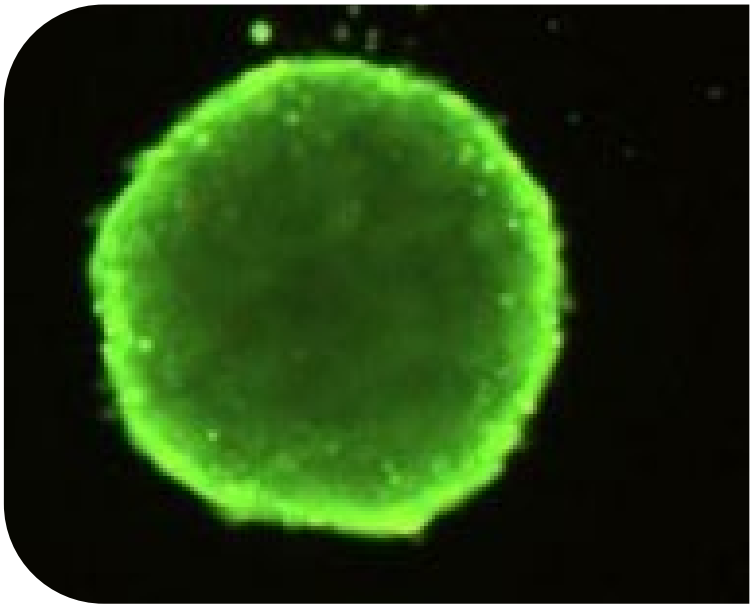
>> Live-cell Imaging with 3D Cell Models

Three-dimensional (3D) cell models like spheroids and organoids allow researchers to closely observe cellular behaviors and interactions in a more physiologically relevant environment and track dynamic processes in real time. By providing more accurate data on how cells function within complex tissue-like structures, live-cell imaging of 3D models can accelerate drug discovery, improve disease modeling, and enhance our understanding of underlying cellular mechanisms in health and disease.



Learn how the **Omni** and **Lux** can support 3D model research with **these selected publications:**

Targeting initial tumour–osteoclast spatiotemporal interaction to prevent bone metastasis

Gu C, Chen P, et al. Nature Nanotechnology. (2024)

Metastasis causes more than 90% of cancer deaths, with bone being the most common site. Low proliferation rate and immunoediting at the early metastasis stage make existing treatments less effective. Here, the authors propose a promising *in situ* decoupling-killing strategy for early prevention.

Highlights:

- This approach uses clinically approved components to ensure biosafety.
- This strategy can also be applied in various organs to treat metastasis.
- This study provides a proof-of-concept for behavior-target strategy and a research model for exploring tumor cell behavior in detail.

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Casein kinase 2 phosphorylates and induces the SALL2 tumor suppressor degradation in colon cancer cells

Hermosilla VE, Gyenis L, et al. Cell Death & Disease. (2024)

SALL2 is downregulated in cancer and acts as a tumor suppressor. SALL2 is also required during brain and eye development but despite its critical functions, information about SALL2 regulation is scarce. Here, scientists identify a new mechanism for SALL2 regulation and reveal new insights about SALL2 and CK2 interaction.

Highlights:

- Silmitasertib causes cell death and induces a methuosis-like phenotype in SW480 cells.
- SALL2 sensitizes cancer cells to CK2 inhibition because Sall2-deficient tumor organoids were more resistant to Silmitasertib-induced cell death.
- This report proposes a new mechanism that may have implications for cancer therapy with CK2 inhibitors for reducing SALL2 levels in cancer cells.

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Rapid prototyping of PMMA-based microfluidic spheroid-on-a-chip models using micromilling and vapour-assisted thermal bonding

Ahmed MAM, Jurczak KM, et al. Scientific Reports. (2024)

In the last decades, the application of microfluidic devices as next-generation cell and tissue culture systems has increased. Here, researchers create a spheroid-on-a-chip culture system, using micromilling and vapor-assisted thermal bonding of polymethyl methacrylate (PMMA).

Highlights:

- The use of chloroform vapor provides an effective method for bonding PMMA-based microfluidic devices and very effectively reduces the surface roughness of micromilled channels.
- This approach provides a strong and stable bond that was durable for long periods, maintaining the structures engraved on PMMA.
- This microfluidic system offers a valuable model in dynamic culture conditions for generation, maintenance, and analysis of multicellular tumor spheroids.

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Human apical-out nasal organoids reveal an essential role of matrix metalloproteinases in airway epithelial differentiation

Li L, Jiao L, et al. Nature Communications. (2024)

For airway epithelial development and remodeling, extracellular matrix (ECM) assembly/disassembly is a critical regulator. Using a biochemically defined hybrid hydrogel system, the authors in this study present a human apical-out airway organoid.

Highlights:

- Where inhibition of matrix metalloproteinases (MMPs) significantly suppresses the normal ciliation, expression, and activity of ECM-degrading enzymes, MMPs increase during organoid differentiation, resulting in increased goblet cell proportion.
- In inflammatory mucosa, a decrease of MMPs is found in goblet cell hyperplastic epithelium.
- This system reveals essential roles in the epithelial cell fate determination of epithelial-derived MMPs.

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Hepatic spheroid formation on carbohydrate-functionalized supramolecular hydrogels

Liu J, Zhang Y, et al. Biomacromolecules. (2023)

The extracellular matrix (ECM) provides cells with structural support and biochemical cues to direct cell growth and is formed by hydrogel-like networks of fibrous proteins. Here, the team used two synthetic supramolecular hydrogels as cell culture matrices *in vitro* that mimic features of the ECM.

Highlights:

- Researchers developed two fully synthetic supramolecular hydrogels to mimic the fibrous architecture, dynamicity, and bioactivity of ECMs.
- The self-assembled hydrogels provide a promising platform to elucidate the role of carbohydrate ligand structure, gel stiffness, and ligand density on spheroid formation.
- The hydrogels offer a new direction toward a processible and bioactive mimic of the natural microenvironment for liver tissue engineering.

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Functional HLA-C expressing trophoblast spheroids as a model to study placental–maternal immune interactions during human implantation

Alexandrova M, Manchorova D, et al. Scientific Reports. (2022)

For pregnancy outcomes, understanding the factors regulating each step of implantation and immune recognition is critical. The focus of placental tissue engineering is the creation of 3D cell culture models to resemble *in vivo* complexity and overcome the need for laboratory animals and human embryos.

Highlights:

- For evaluation of functionality during the *in vivo* concealed process of human implantation, Sw71 spheroids as a 3D *in vitro* model are a biologically relevant, useful tool.
- The 3D Sw71 models treated with different factors can be monitored by live-cell imaging systems and are easy to handle, select, and transfer for functional assays in small volumes.
- The 3D models are easy to implement in standard-equipped cell culture laboratories and are cost-effective.

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