Cellbox Labs

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Informācija par uzņēmumu: https://www.cellboxlabs.com/

1. Lymph node-on-a-chip for early vaccine testing

It would be highly valuable to develop a lymph node on chip platform that allows early stage vaccine testing in a human-relevant, in vitro system. This model could mimic the flow and structure of human lymph nodes and enable co-culture of dendritic cells, T cells, and B cells under dynamic conditions. Such a system would make it possible to monitor key immune responses like cytokine release or antibody production in real time. If developed, it could reduce the need for animal testing and help identify the most promising vaccine candidates earlier. This platform could be offered as a service or as a reagent kit with validated protocols for vaccine developers.

2. Bispecific antibody testing on organ-on-a-chip

It would be beneficial to create an organ on chip assay specifically designed for testing bispecific antibodies. These complex therapies require dynamic interactions between immune cells and target cells, which are difficult to replicate in traditional in vitro systems. A chip that includes 3D tumor models, endothelial barriers, and human immune cells under flow could allow for real time observation of immune cell recruitment, target cell killing, and cytokine release. This kind of system could improve early decision making in drug development and help predict both efficacy and off-target effects. A suitable business model could involve offering this as a CRO service or licensing the assay format to biotech and pharma companies.

3. Proximal tubule-on-a-chip for kidney toxicity assay

There is a strong need for an organ on chip model that replicates the human kidney's proximal tubule to assess drug induced nephrotoxicity. A dynamic chip using human renal epithelial cells under flow could simulate the tubular architecture and shear stress found in vivo. It would allow testing of drug effects on barrier function, transport activity, and early injury biomarkers. Developing such a model would help pharmaceutical companies identify kidney toxicity earlier and reduce failure rates in clinical development. This could be delivered as a ready to use assay kit or as a specialized testing service.

4. Dynamic bacterial adhesion assay on gut on chip

It would be useful to have a next generation bacterial adhesion assay that works in dynamic conditions mimicking the human gut. By using a gut on chip system with flow and mucus producing epithelial layers, it would be possible to study how bacteria attach and interact with host cells in more realistic conditions. The platform could include real-time microscopy and automated image analysis to quantify colonization patterns. This would significantly improve the predictive value of in vitro testing for probiotics, pathogens, and microbiota-targeted therapies. The assay could be offered as a combination of protocol, and software.

5. Optimized co-culture medium for microbiota-host interaction

A dedicated culture medium that supports co culture of anaerobic gut microbes and human epithelial cells on a chip would address a major technical barrier in microbiome research. It would be ideal to have a dual compartment medium system: one side oxygenated for host cells, the other anaerobic for microbiota designed for use in perfused organ on chip platforms. Such a solution would preserve microbial diversity and epithelial barrier integrity, making it easier to study host - microbe interactions, immune responses, and metabolite production. This type of medium could be sold as a specialized reagent for microbiome focused drug and nutrition studies.

6. Scaling of organs for multi organ modeling

It would be highly beneficial to develop better methods for scaling organ functions on a chip. Current allometric approaches provide some guidance, but they fail to capture the biochemical and physiological complexity needed for accurate inter-organ communication. In the future, modeling platforms could include dynamic scaling tools that adjust nutrient concentrations, signaling molecule ratios, and fluid dynamics to match organ size and function in human physiology. This would be essential for building multi-organ systems with predictive value for systemic drug effects or disease modeling. A potential business model could involve software modules or calibration algorithms bundled with hardware platforms or customized simulation services for multi-organ chip developers.

7. Shear stress sensors

To improve physiological accuracy, it would be valuable to develop integrated sensors that can directly measure shear stress, rather than relying on indirect calculations from flow rate. Since media composition and channel geometry significantly impact shear forces in microfluidics, a real-time, embedded sensing solution would allow more accurate control of the microenvironment. Such a sensor system could be critical for chips modeling the vascular system, kidney, intestines, or lung, where mechanical stress affects cell behavior. This could lead to the development of modular biosensor

chips, shear calibration kits, or software-hardware bundles for real-time biophysical monitoring in organ-on-chip experiments.

8. Porosity compensation for imaging

In many organ on chip platforms, porous membranes introduce visual distortions that compromise the accuracy of brightfield imaging. It would be useful to develop image processing algorithms capable of recognizing and compensating for these pores, effectively “cleaning” the background of live microscopy images. This would enhance the utility of OOC platforms for automated imaging and data extraction, particularly in barrier models. A software solution for pore-removal or compensation in brightfield images could be sold as a plug-in for existing microscopy platforms or integrated into AI-based imaging workflows for high-content screening.

9. Morphodynamic phenotyping algorithms

There is a need for more advanced algorithms that can automatically quantify and classify cell behavior on-chip based on morphology and dynamic behavior. In the future, algorithms could be developed to evaluate not only basic features like starting cell density, but also more complex phenomena like cell migration, differentiation, and barrier formation over time. This would allow researchers to track and compare cell behavior under different conditions without manual image annotation. A viable business model could involve a subscription-based software platform or SaaS model offering morphodynamic analysis tools tailored to organ-on-chip datasets, supporting applications in toxicity testing, stem cell research, and regenerative medicine.