Micro-Organ Device

Early Stage in vivo-like drug screening without animal experimentation

The NASA Johnson Space Center has developed the Micro-Organ Device (MOC) platform technology that serves as a drug screening system with human or animal cell micro-organs to supplement and reduce animal studies, while increasing the success of clinical trials with new drugs. The technology was originally developed to evaluate pharmaceuticals in zero gravity to accelerate development and validation of countermeasures for humans in space as well as evaluate space and planetary stressors on a biological level. The NASA developed Micro-Organ Device is a microfluidic device containing a variety of microstructures and assemblies of cells, all designed to mimic a complex in vivo microenvironment by modeling one or more in vivo micro-organ structures, the architectures and composition of the extracellular matrices in the organs of interest, and the in vivo fluid flows. The fully automated technology can be used to perform early stage in vivo drug screening without the use of animal experimentation, saving time, money, and resources.

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THE TECHNOLOGY

The NASA developed Micro-Organ Device (MOD) platform technology is a small, lightweight, and reproducible in vitro drug screening model that can inexpensively biomimic different mammalian tissues for a multitude of applications. The technology is automated and imposes minimal demands for resources (power, analytes, and fluids). The MOD technology uses titanium tetra(isopropoxide) to bond a microscale support to a substrate and uses biopattering and 3D tissue bioprinting on a microfluidic microchip to eliminate variations in local seeding density while minimizing selection pressure. With the MOD, pharmaceutical companies can test more candidates and concentrate on those with more promise therefore, reducing R&D overall cost.

This innovation overcomes major disadvantages of conventional in vitro and in vivo experimentation for purposes of investigating effects of medicines, toxins, and possibly other foreign substances. For example, the MOD platform technology could host life-like miniature assemblies of human cells and the effects observed in tests performed could potentially be extrapolated more readily to humans than could effects observed in conventional in vitro cell cultures, making it possible to reduce or eliminate experimentation on animals. The automated NASA developed technology with minimal footprint and power requirements, micro-volumes of fluids and waste, high throughput and parallel analyses on the same chip, will advance the research and development for new drugs and materials.

More Information

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