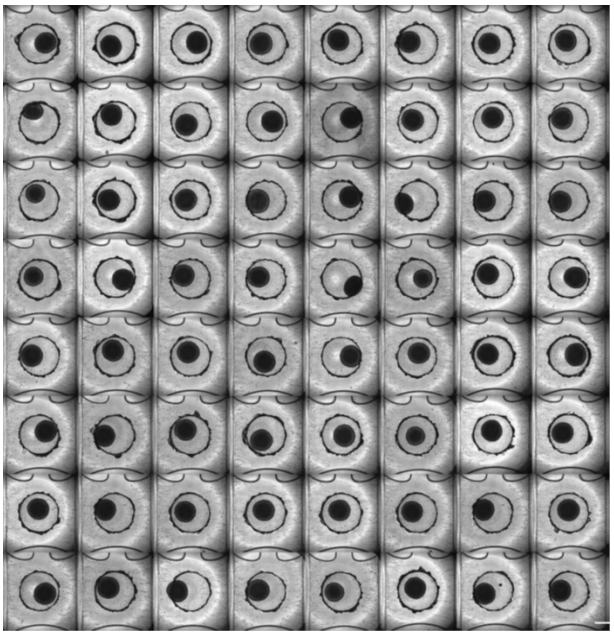
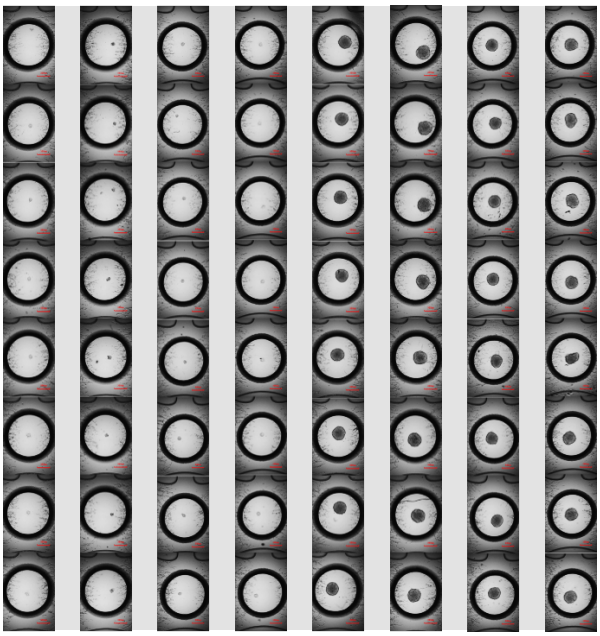
Automated placement of varied sized spheroids in OrganoPlate® Graft

Combining OrganoPlate® Graft with automated system: YAMAHA Cell Handler™

Manual spheroid placement



Automated spheroid placement



Spheroids can be placed in the OrganoPlate® Graft, which allows vascularization of 3D tissues. Placement of spheroids can be done manually (left) or automated with the YAMAHA Cell Handler™ (right). In the example above the manually placed samples contain 20k cells per spheroid, whilst the automated samples were placed in increasing sizes of 50, 100, and 400 µm.

Vascularized Spheroids

Placement and handling of vascularized spheroids.

The OrganoPlate® Graft is developed to grow functional microvessels to create a microvascular bed. It is the first *in vitro* tissue culture platform that allows co-culture of spheroids, organoids, and tumors with a perfused microvascular bed and vascularization of 3D tissues. The standard SBS plate format makes it compatible with a high-throughput automated workflow.

The open-top design of the OrganoPlate® Graft makes it possible to place tissue grafts that are connected to the system of human blood vessels, achieving *in vitro* vascularization. In these experiments, spheroids were manually or automatically placed in the graft chamber of the OrganoPlate® Graft. For the automatic placement robotic tools can be used, in this example the YAMAHA Cell Handler™ (YCH) was used.

Using the YCH, the accuracy of placing the spheroids in the center was improved **(Fig. 2, 3)** and cell transfer time was significantly reduced: 30min manual versus 6min and 56sec with the YCH. In addition, by using the YCH, cell characteristics (size, shape, microscopical features) are acquired by imaging and the desired cells were selected based on cell type and size. The experiments showed that accuracy and precision are improved by using the YCH compared to manual placement of spheroids.

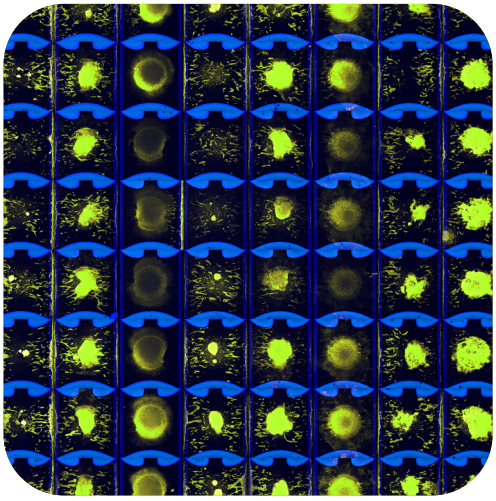


Fig. 1. The OrganoPlate® Graft cultured with Collagen I, HUVECs, and an angiogenic cocktail to form 64 vascular beds. *Spheroids of HT-29, HCT-15, and SW480 were cultured at various sizes and placed in the Graft Chambers using the YCH. After several days of co-culturing the spheroids and vasculature, the cultures were fixed and prepped for staining. The graft chambers were stained with ActinRed for actin and Hoechst for nuclei, and imaged on a confocal microscope to visualize the vasculature – spheroid interactions. The maximum projection of the 64 chips is shown in the image.*

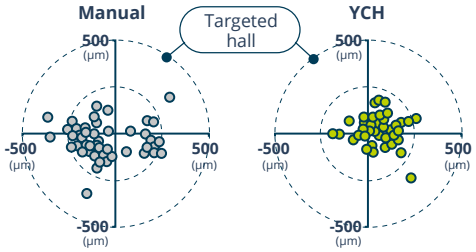


Fig. 2*: Improved precision is shown by the closer proximity to the center of the graft chamber of the spheroids placed by the YCH (green dots) compared to the manually placed spheroids (grey dots).*

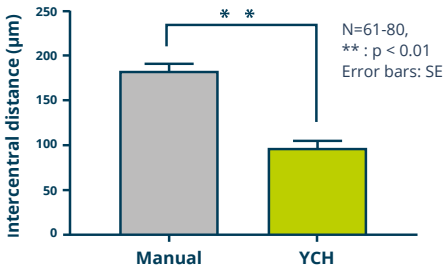


Fig. 3*: Improved accuracy is shown by the lower average distance to the center of the YCH placed spheroids compared to manually placed spheroids.*

3D Tissue Culture Platform
OrganoPlate® Graft
Product No. 6401-400-B
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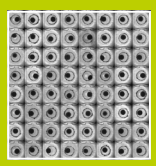
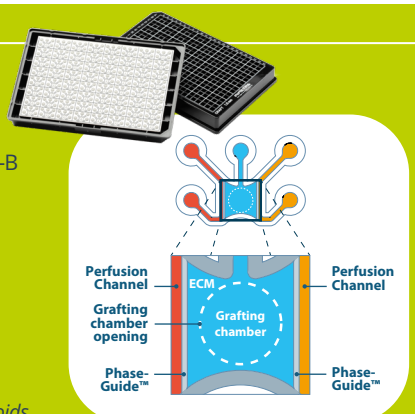


64X vascular beds that interact with spheroids



Cell picking and imaging system
Cell Handler™
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