Chip-Array™ Basic Research Kit

A revolutionary consumable empowering high-throughput Organ-Chip studies

Overview

The Chip-Array™ Organ-Chip is an advanced design that integrates 12 individual micro-engineered Organ-Chips into a single, high-throughput consumable. Made from low-drug-absorbing materials, Chip-Array ensures precision in biological modeling while significantly increasing experimental throughput. Compatible with the AVA™ Emulation System, Chip-Array provides researchers with a versatile, scalable solution for Organ-Chip experiments.

Chip-Array Configuration

Chip-Array features 12 fluidically independent, parallel Organ-Chips ("Emulations") within the footprint of a standard microplate. Incorporating the proven stacked-channel architecture and low-drug-absorbing materials of the Chip-R1™ Rigid Chip, Chip-Array amplifies throughput and optimizes workflows through seamless compatibility with multichannel pipettes and automated liquid handlers.

Each Emulation within Chip-Array features independent media reservoirs for the inlets and outlets of both the top and bottom channels. The reservoirs can store up to 1.3 mL of media for each microfluidic channel, enabling automated media flow for up to 3 days when connected to AVA. Media effluent from the outlet reservoirs can be easily collected using a multi-channel pipette or automated liquid handler for downstream analysis.

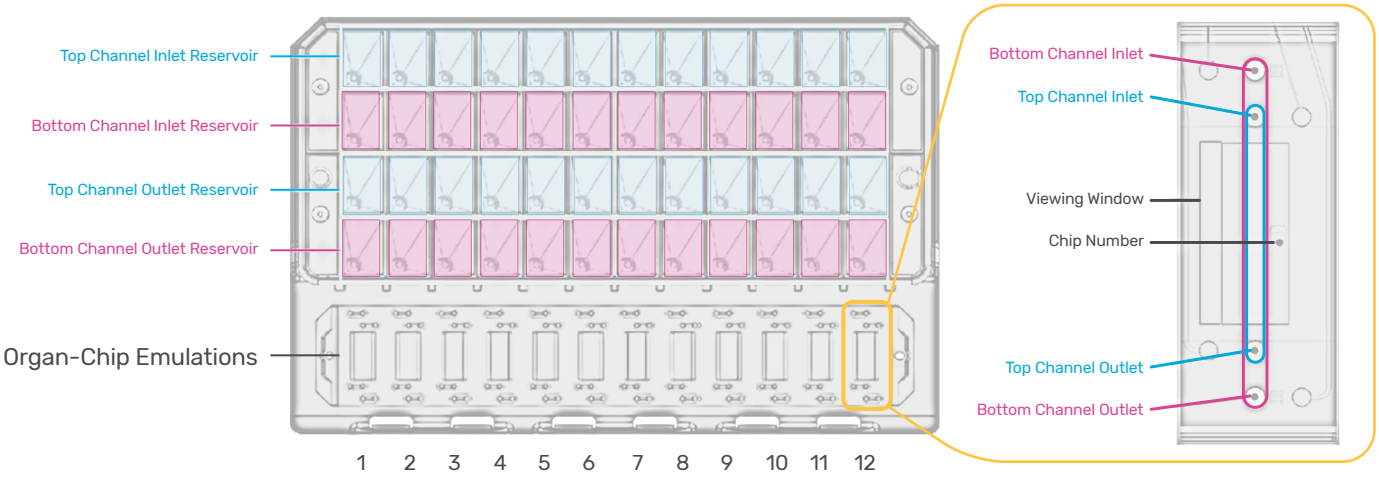

Figure 1: Chip-Array diagram. *Chip-Array supports up to 12 independent Organ-Chip "Emulations", with fluidically independent inlet and outlet media reservoirs for each Emulation.*

Biological Modeling Capabilities

With a classic two-channel architecture at the heart of each Emulation in Chip-Array, users can create a diverse array of biological models comprised of tissue-tissue interfaces with independent perfusion of the top and bottom channels. Chip-Array is compatible with practically any type of human or animal cell, including primary cells, dissociated organoids, induced pluripotent stem cells (iPSCs), and immortalized cell lines. As such, Chip-Array is suitable for a wide variety of organ models where mechanical strain is not required, such as liver, kidney, and brain.

One key design feature of Chip-Array is the complete overlap of the top channel with the bottom channel. This design ensures that all epithelial cells experience co-culture with the endothelium, thereby maximizing cellular crosstalk and the biological benefits of co-culture. Chip-Array thus enhances tissue functionality across the entire epithelial channel, resulting in a higher fidelity biological model.

Beyond the improvements to co-culture, Chip-Array also improves several other aspects of recapitulating *in vivo* microenvironments. With its shorter channel height, the vascular channel enables physiologically relevant levels of shear stress to be applied, which is critical for applications such as immune cell recruitment. Additionally, Chip-Array features a thin polycarbonate membrane at just 22 µm thick with 3 µm pores and 3% porosity, enabling enhanced cellular crosstalk and better approximation of the *in vivo* milieu.

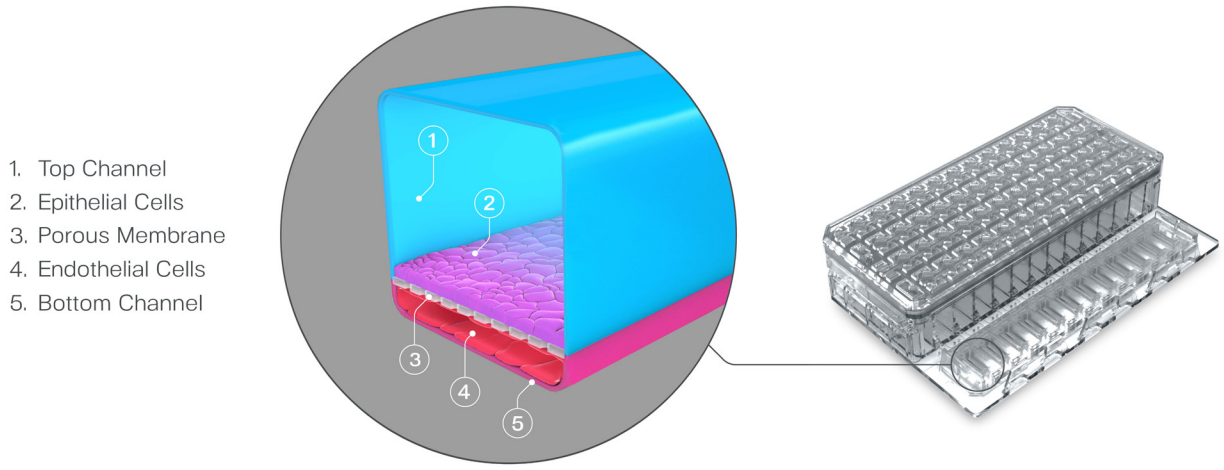

Figure 2: *Microfluidic channel architecture of Chip-Array.*

Kit Components

The Chip-Array Basic Research Kit contains all the non-biological components required to run a 96-sample experiment on the AVA Emulation System. Each kit consists of Chip-Array consumables, pipette guides, pipette guide covers, and flow guides (Figure 3). Pipette guides enable users to apply ECM and seed cells directly into the top and bottom channels, while the pipette guide cover enables users to transfer the Chip-Array between the biosafety cabinet and AVA without the risk of contamination. Upon completion of seeding, the pipette guides are exchanged for flow guides that complete the microfluidic circuit between the Emulations and the media reservoirs.

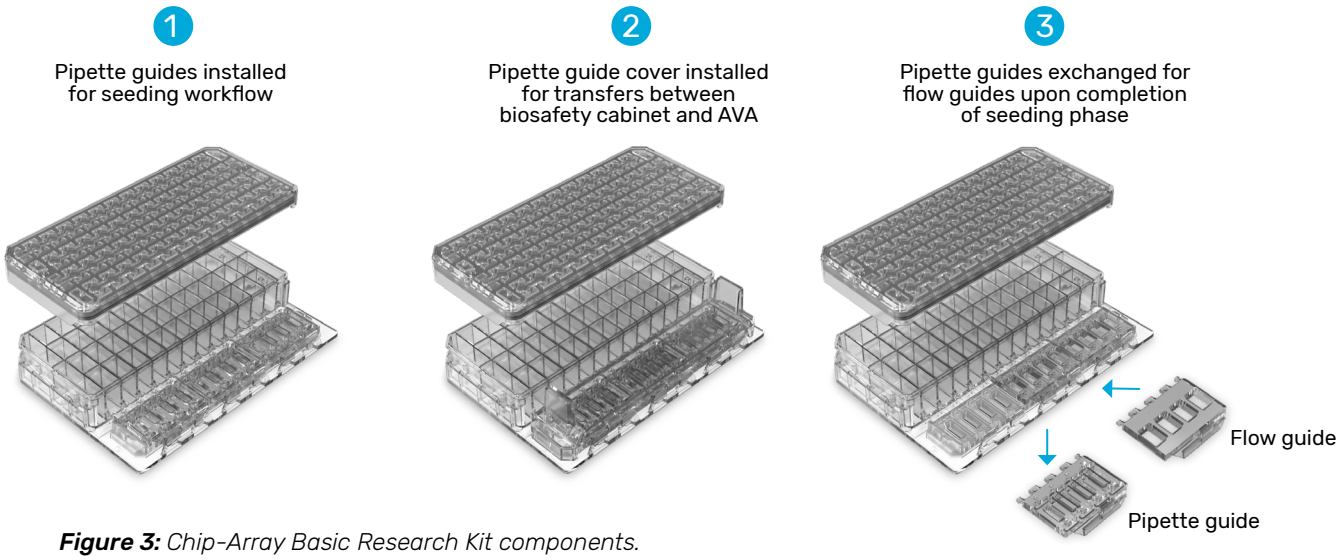

Figure 3: *Chip-Array Basic Research Kit components.*

Additional Features and Benefits

Fewer Cells Required Per Emulation

With a top-channel length approximately 50% shorter than Chip-R1, Chip-Array conserves valuable biological material by requiring fewer cells per sample. Despite the lower cell input, users can expect to recover ample biological material for routine downstream assays, including Western blotting, PCR, and ELISA.

	Top channel		Bottom channel	
	Chip-R1	Chip-Array	Chip-R1	Chip-Array
Channel surface area	25.7 mm^2	12.8 mm^2	29.5 mm^2	18.4 mm^2
Cell count (at seeding)	112,000	56,000	150,000	85,000
Protein recovery	300µg	150µg	150µg	100µg
RNA recovery	800ng	400ng	600ng	300ng

Table 1: Comparison of estimated biological yield for an Emulation within Chip-Array versus Chip-R1. *Please note that the exact number of cells per channel is dependent upon the model. The values in this table are estimates based on Emulate's Liver Quad-Culture model.*

Part of the AVA™ Emulation System

The Chip-Array Basic Research Kit is designed to be used as part of the AVA Emulation System, a complete Organ-on-a-Chip solution that includes instruments, consumables, and software, providing the dynamic conditions needed to culture up to 96 Organ-Chip Emulations per experiment.

Chip Specifications:

Top Channel

Width x height dimensions	1,000 µm x 1,050 µm
Total culture area	12.8 mm^2
Co-culture surface area	12.8 mm^2
Volume*	19.7 µL
Imaging distance from bottom of chip to top of membrane	172 µm

Bottom Channel

Width x height dimensions	1,100 µm x 100 µm
Total culture area	18.4 mm^2
Co-culture surface area	12.8 mm^2
Volume*	10.1 µL

Membrane

Pore diameter	3.0 µm
Pore spacing	Random distribution (track-etched membrane)
Porosity	2.8%
Thickness	22 µm

*volume includes the monoculture region of the channel (if applicable) and the seeding ports

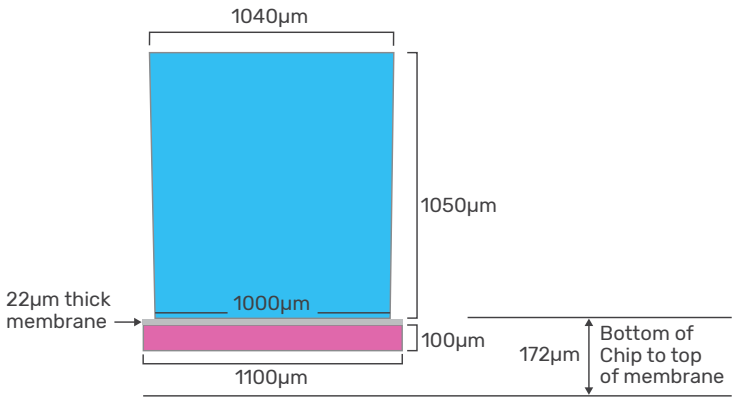

Figure 4: *Cross-sectional diagram of an individual Emulation within Chip-Array.*

Kit Specifications:

Specification	Details
Compatible cell types	The open nature of the Emulate Chip-Array Basic Research Kit makes it compatible with practically any type of human or animal cell, including: • Primary cells • Dissociated organoids • Induced pluripotent stem cells (iPSCs) • Immortalized cell lines Due to the rigid nature of the consumable, Chip-Array is not recommended for organ models that require stretch.
Characterization endpoints	Image analysis • Live imaging under flow via AVA: phase contrast and fluorescence microscopy • Fixed imaging: brightfield, phase contrast, and fluorescence microscopy Omics analysis • Transcriptomics, proteomics, and metabolomics Effluent analysis • Cytokine release, injury markers, barrier function (P_{app}), etc.
Storage conditions	Ambient temperature (15–25°C)
Shelf life	1 year from date of manufacture
Sterility	All consumables—including Chip-Arrays, pipette guides, pipette guide covers, and flow guides—are sterilized prior to shipment.

Ordering Information

Kits are available in sets of 8 or 16 Chip-Arrays, enabling users to create up to 96 or 192 Organ-Chip Emulations, respectively. Each set contains:

- 1 Chip-Array
- 3 pipette guides
- 1 pipette guide cover
- 3 flow guides

Product Name	Kit Contents	Catalog Number
Chip-Array Basic Research Kit (8-pack)	8 sets of Chip-Arrays to support up to 96 Emulations on AVA.	BRK-CA-96
Chip-Array Basic Research Kit (16-pack)	16 sets of Chip-Arrays to support up to 192 Emulations on AVA.	BRK-CA-192