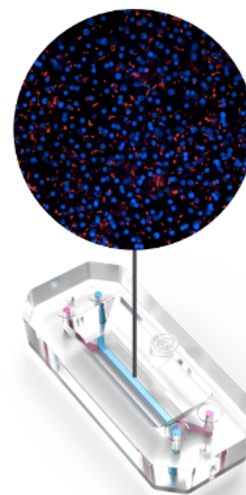


# Emulate Liver-Chip R1 BioKit

A human-relevant liver model with minimal drug absorption



## Overview

The Liver-Chip R1 combines up to four human cell types in the dynamic microenvironment of the Chip-R1™ Rigid Chip—the latest Emulate Organ-Chip consumable. The **Chip-R1** features a rigid plastic design that minimizes small-molecule drug absorption while retaining the stacked, two-channel architecture of Chip-S1® Stretchable Chip. The Liver-Chip R1 is well suited for the human-relevant assessment of drug toxicology, efficacy, and ADME profiles, even for compounds with PDMS absorption liability.

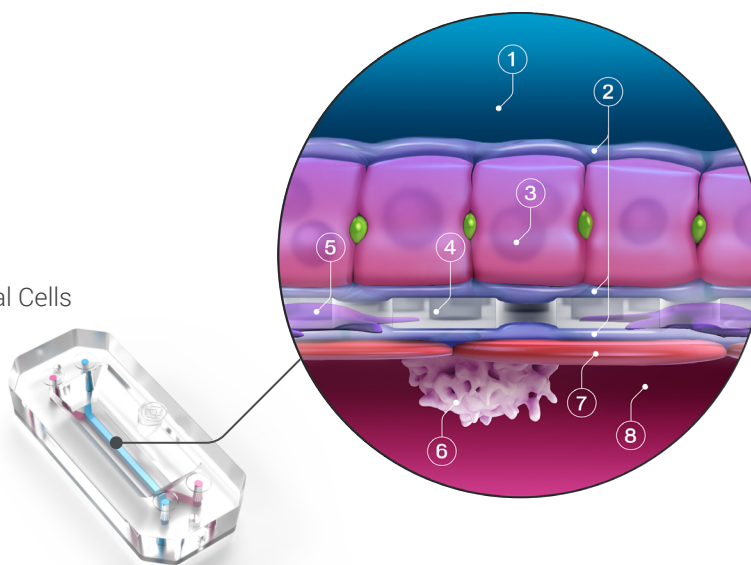
## Model Configuration

The Liver-Chip R1 is available in co-culture or quad-culture configurations:

- **Co-Culture:** Primary human hepatocytes and liver sinusoidal endothelial cells (LSECs)
- **Quad-Culture:** Primary human hepatocytes, LSECs, stellate cells, and Kupffer cells

Both configurations support complex cell-cell interactions, which are essential for modeling hepatic physiology and drug response. Unlike static hepatocyte sandwich monocultures, albumin secretion is comparable to *in vivo* ranges and sustained over time, indicating enhanced functionality.

1. Epithelial Channel
2. Extracellular Matrix
3. Hepatocytes
4. Porous Membrane
5. Stellate Cells
6. Kupffer Cells
7. Liver Sinusoidal Endothelial Cells
8. Endothelial Channel



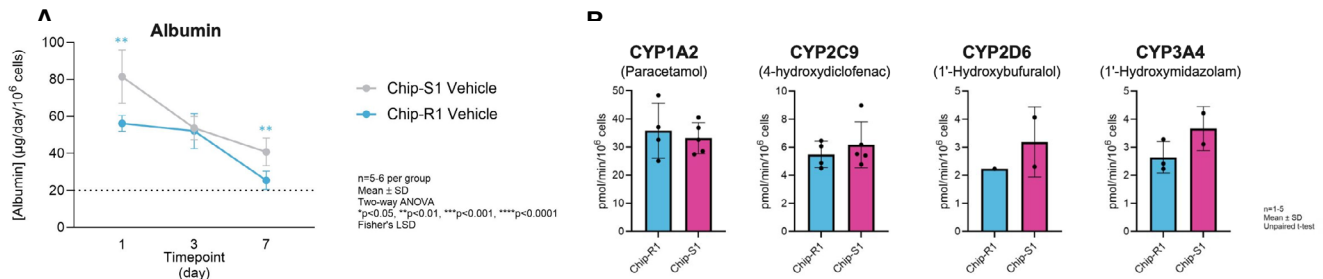
**Figure 1:** Liver-Chip Cross Section.

## Model Characterization

The Liver-Chip R1 replicates the 3D multicellular architecture and shear stress needed to accurately model the human liver. The Liver-Chip R1 displays morphological and functional characteristics of mature hepatic tissue for up to 12 days in culture, with a window of up to seven days for drug exposure and assessment of cellular response.

- **Human-based model:** Avoids translational issues caused by species differences.
- **Multicellular complexity:** Incorporates four hepatic cell types to capture complex cell-cell interactions.
- **Hepatic functionality:** Displays robust albumin production and liver metabolism (see **Figure 2**).

Learn more in the [Liver-Chip R1 Application Note](#).



**Figure 2:** Figure 2: Liver model characterization. **A)** Albumin secretion on days 1, 3, and 7 post-vehicle administration, measured by ELISA. Dotted line represents healthy albumin acceptance criteria of 20 µg/day/million cells. **B)** CYP cocktail metabolite formation, assessed 1 hour post-dosing at 150 µL/h and measured via LCMS. n=4 chips/group for Chip-R1, n=5 chips/group for Chip-S1. Metabolite formation rate could not be determined for all replicates due to some effluent concentrations being below the lower limit of quantification of the assay.

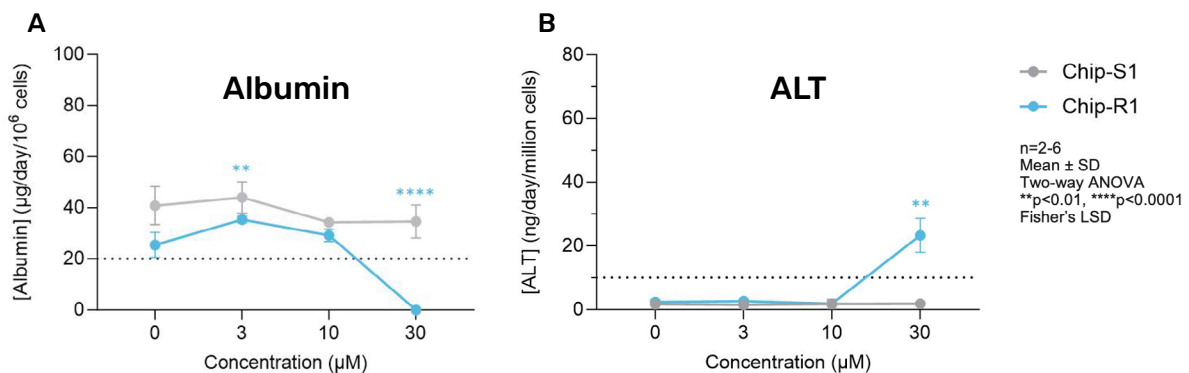
### SUPPORTED APPLICATION

## Toxicology

In a toxicology equivalency study between the Liver-Chip R1 and Liver-Chip S1, three compounds with varying toxicity and PDMS absorption profiles were evaluated. The Liver-Chip R1 demonstrated greater sensitivity in detecting the hepatotoxicity of nefazodone, a highly hepatotoxic compound with high PDMS absorption. This was evident through observable cell death, reduced albumin secretion (see **Figure 3A**), and increased ALT release (see **Figure 3B**).

The Liver-Chip R1 also matched the sensitivity of the Liver-Chip S1 in differentiating between more and less hepatotoxic compounds when treated with the analogs trovafloxacin and levofloxacin, respectively.

Learn more in the [Liver-Chip R1 Application Note](#).

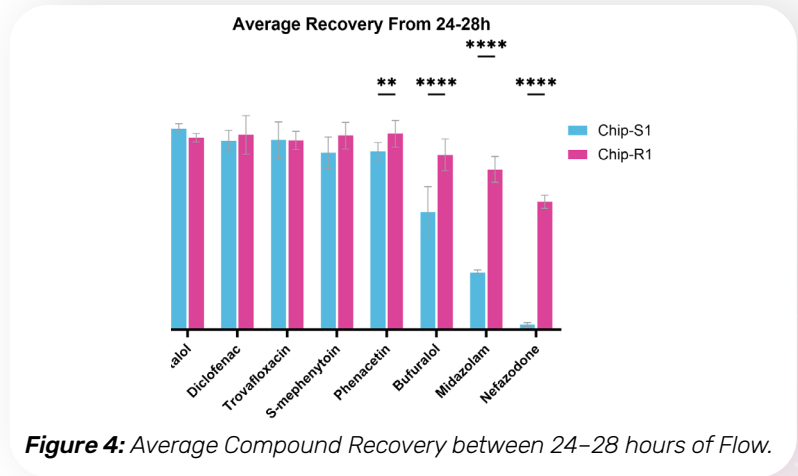


**Figure 3: Nefazodone toxicity assessment. A)** Albumin secretion and **B)** ALT release on day 7 post-vehicle administration, measured by ELISA. Asterisks represent significance level compared to 0 µM control of respective chip type. ALT levels above 10 ng/day/million cells were considered indicative of liver toxicity.

## Minimal Drug Absorption

The rigid plastic design of the Chip-R1 significantly reduces drug absorption compared to the Chip-S1. In a panel study with eight drugs of varying physicochemical properties, the acellular Chip-R1 demonstrated improved compound recovery for three of the eight drugs, with no significant absorption observed for the remaining five drugs in either chip. This supports the utility of the Chip-R1 for ADME and toxicology applications, including drugs prone to PDMS absorption.

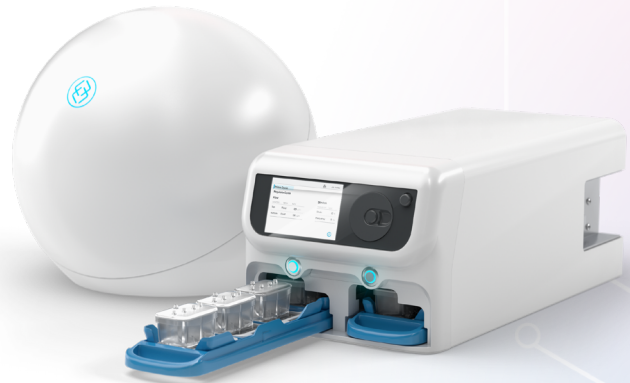
Learn more in the [Liver-Chip R1 Application Note](#).



**Figure 4:** Average Compound Recovery between 24–28 hours of Flow.

## Part of the Human Emulation System®

The Liver-Chip R1 is compatible with the Human Emulation System, a complete Organ-on-a-Chip platform that includes the instruments and consumables needed to culture up to 12 Organ-Chips.



## Liver-Chip Specifications:

Specification	Details
<b>Validated application</b>	Toxicology
<b>Storage conditions</b>	<ul style="list-style-type: none"> <li>Cells: Store in liquid nitrogen</li> <li>Other kit components: Ambient temperature (15–25°C)</li> </ul>
<b>Shelf life</b>	<ul style="list-style-type: none"> <li>Cells: 6 months from date of shipment</li> <li>Organ-Chip consumables: 1 year from manufacture</li> </ul>
<b>Cell types</b>	Available in two configurations, both using primary human cells <ul style="list-style-type: none"> <li>Co-Culture: Hepatocytes + LSECs</li> <li>Quad-Culture: Co-culture + Kupffer cells + stellate cells</li> </ul>
<b>Characterization endpoints</b>	Viability: <ul style="list-style-type: none"> <li>Morphological assessment</li> <li>Immunofluorescent staining</li> </ul> Functionality: <ul style="list-style-type: none"> <li>Albumin production</li> <li>Metabolic activity</li> </ul>

### Ordering Information

Each Liver-Chip R1 BioKit includes the essential components needed to create the Liver-Chip R1—including Emulate-qualified cells—and is available in multiple configurations. Each kit contains:

- Chip-R1™ Rigid Chips
- Pod-2™ Portable Modules
- Steriflip® Filter
- Corresponding set of Emulate-qualified primary human cells, shown in the table below

To learn more, visit [emulatebio.com/liver-chip](https://emulatebio.com/liver-chip)

Product Name	Primary Human Cells	Chips per Kit	Catalog Number
<b>Liver-Chip R1 BioKit Co-Culture</b>	Hepatocytes and LSECs	12	BIO-LH-CO12R1
		24	BIO-LH-CO24R1
<b>Liver-Chip R1 BioKit Quad-Culture</b>	Hepatocytes, LSECs, Kupffer cells, and stellate cells	12	BIO-LH-QUAD12R1
		24	BIO-LH-QUAD24R1