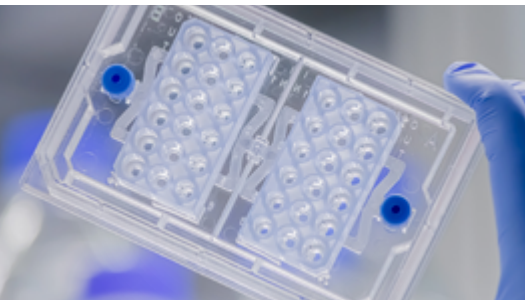
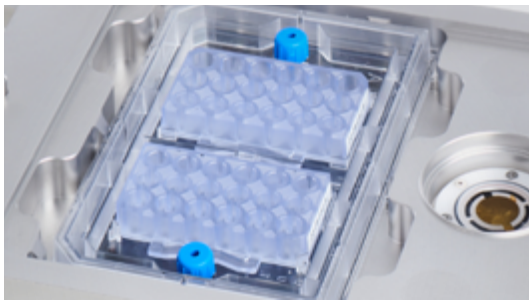
Advanced in vitro exposure systems





VITROCELL®
AX12 Systems

Organ-on-Chip Exposure

AlveoliX
In-vitro models inspired by nature

VITROCELL® SYSTEMS

AXBarrier-on-Chip System

AlveoliX
In-vitro models inspired by nature

The AXBarrier-on-Chip System allows in vitro modeling in outmost physiological conditions by replicating the essential key features of all organs in vitro, including lung, skin and eyes.

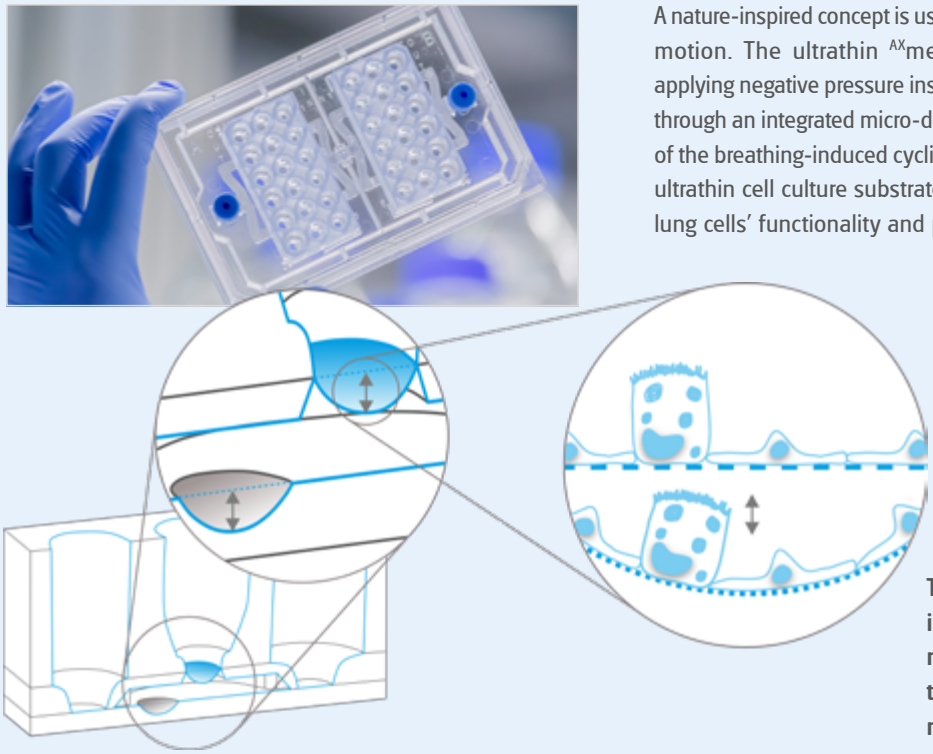
- Ultrathin, porous, and elastic support for cell growth
- Uni- or bidirectional mechanical stretching
- Air/Liquid Interface
- 3D tissues (multiple co-cultures)
- Tunable mechanical stimuli

The technology is a powerful tool to recreate healthy, diseased and personalized in vitro models. It provides answers to fundamental questions about biomechanics and cell biology. Furthermore, the method can be implemented in drug development to test molecule efficacy and safety, and in toxicity assessment of e. g. pollutants, chemicals and consumer goods. This will hopefully lead to more animal free product development in the future.

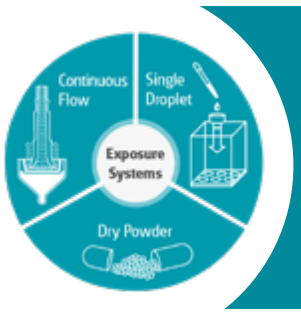
The AXBarrier-on-Chip System: AX Actuator, AX Exchanger, AXDock encompassing AX12 Chip

AXLung-on-chip Model

A nature-inspired concept is used to recreate the breathing motion. The ultrathin AXmembrane is deflected by applying negative pressure inside the basal chip chamber through an integrated micro-diaphragm. The combination of the breathing-induced cyclic stretch and the optimized ultrathin cell culture substrate (AXmembrane) preserves lung cells' functionality and phenotype.



The AXmembrane (blue) is deflected by applying negative pressure through an integrated micro-diaphragm (grey).



Organ-on-Chip exposure based on three distinct principles

- Continuous Flow for aerosols with gas and particle phase
- Single Droplet Sedimentation for liquid aerosols
- Dry Powder for direct aerosolization of smallest quantities of dry powders

Organs in vitro

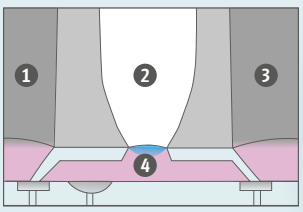
- Lung
- Skin
- Eyes

Application Aeras

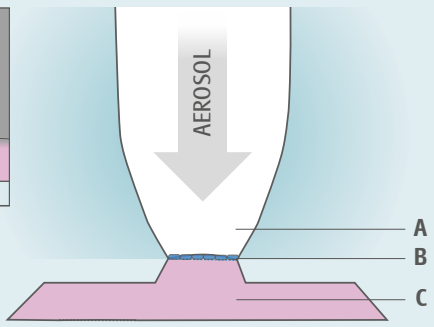
- Particles / Nanomaterials
- Environmental Pollutants
- Chemicals
- Pharmaceutical Compounds
- Virus Research

Air / Liquid Interface

All VITROCELL® AX12 systems have been specifically designed to enable direct exposure of cells or tissue at the Air/Liquid Interface under physiologically relevant conditions. Here, the cell cultures are not covered with media in contrast to submerged conditions, which cause an undesired interaction of the formerly airborne substances with the culture media. Cells cultivated on the membrane are exposed at the Air/Liquid Interface so that the test substances directly come in contact with the cells as aerosols. This approach allows for more in vivo like and lung-relevant cell response than if exposed to submerged conditions.



(1) Inlet well, (2) Cell well,
(3) Outlet well,
(4) Fluidic chamber

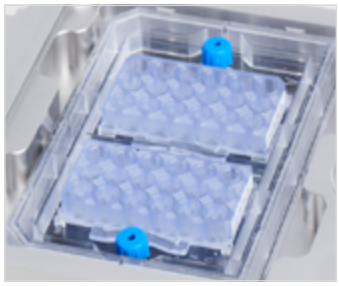


Air / Liquid Cultivation and Exposure

A Direct and controlled exposure of test atmosphere to cells

B Cells on ultrathin ^{AX}membrane

C Media below cells



The ^{AX}Lung-on-Chip model includes the human breathing motion.

Combined cutting edge technologies:

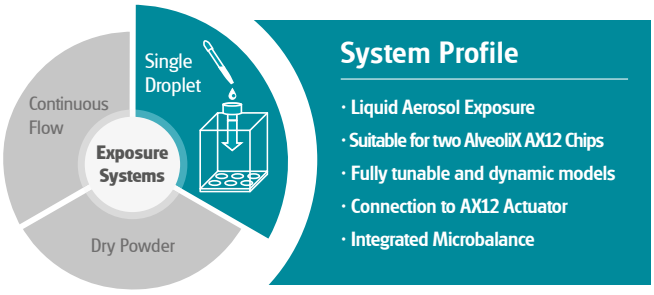
The scientifically proven AlveoliX lung-on-chip model integrates the human breathing motion. VITROCELL's aerosol delivery, with its unique integrated dosimetry, ensures precise and realistic modeling of human lung responses to various test substances.

AlveoliX
In-vitro models inspired by nature

VITROCELL® SYSTEMS

VITROCELL®
Cloud Alpha AX12

The Organ-on-Chip Exposure Solution for Liquid Aerosols



The VITROCELL® Cloud Alpha AX12 is part of our Cloud family and presents a great leap forward in automated exposure of cell cultures with breathing function. It combines highly efficient testing with ease of use. The development is based on the well-known and widely published VITROCELL® Cloud formats (6-, 12-, 24-, and 96-well). It features an all-in-one control unit that allows for fully automated processes.

Versatility

Whether for drug discovery and preclinical studies, substances of toxicological concern, environmental pollutants, chemicals, viruses or other biological samples: AlveoliX' and VITROCELL's platform can replicate diverse exposure scenarios, enabling most comprehensive in vitro research.

Ideal for small quantities of test substance

The VITROCELL® Cloud Alpha AX12 is designed for small nebulization volumes. The recommended nebulization volume is 300 µl. Therefore, the device is particularly suitable for testing materials even when quantities are limited.

The Cloud Alpha AX12 is equipped with a microbalance sensor.

Dosimetry using Quartz Crystal Microbalance (QCM)

The QCM6 sensor seamlessly integrates into the Cloud Alpha AX12 and Powder AX12 exposure module. It offers precision measurement of deposited mass, down to nanograms/cm^2.

All results are logged within the VITROCELL® Monitor software, where they are presented graphically and can be effortlessly exported as .csv files for for further analysis.

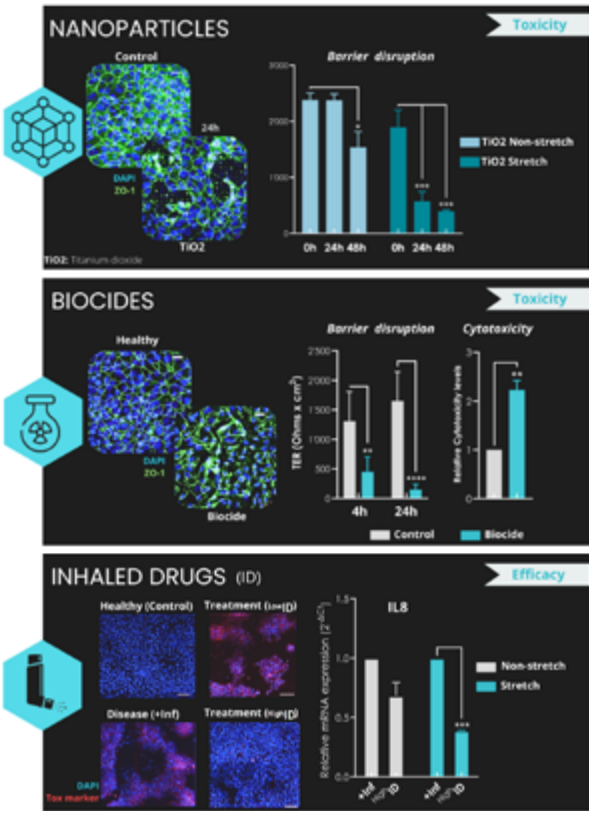
Edition: August 2025

Easy to use

VITROCELL® Cloud Alpha Single Droplet Sedimentation Systems are user-friendly. The aerosol is applied for a short duration of approximately 7–10 minutes and can be repeated several times to obtain a dose-response profile. All components are easy to clean.

Usability

Start dynamic experiments in mono- or coculture with the ^{AX} Barrier-on-Chip System to create advanced in vitro models. For a smooth integration into your laboratory, the membrane comes with a proprietary ECM coating. This allows the users to seed directly the cells inside the AX12 to create their model of interest.



Breathing motion makes the difference: For the most realistic mimicking of lung exposure

The patented 3D breathing concept applies human lung physics. The ultrathin membrane is deflected by negative pressure inside the basal chip chamber through an integrated micro-diaphragm. Cells cultured on the membrane are under continuous stretch and biomechanical stimulation.

The 3D breathing concept model has proven itself in a variety of publications.

Application examples:

Nanoparticles: Aerosolized TiO_2 causes significant cell barrier disruption on-chip, particularly more under breathing conditions.

Biocides: Nebulized biocides disrupt cell barriers and induces cytotoxicity on-chip.

Inhaled drugs effectively reduce inflammation and toxicity in a diseased bio-model on-chip.

Key Features:

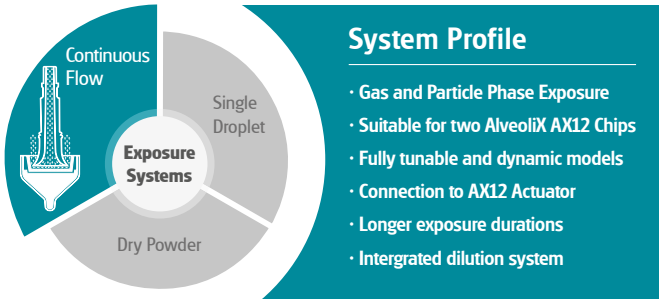
- Low nebulization volumes: 300 µl per exposure
- High deposition efficiency
- Easy handling with no external air-flow required
- Air/Liquid Interface exposure
- Breathing Lung on chip model
- Porous membrane allowing cell-cell interaction
- Increased cell sensitivity in physiological conditions
- Versatile Organ-on-chip system (lung, skin, eyes)

AlveoliX
In-vitro models inspired by nature

VITROCELL® SYSTEMS

VITROCELL®
Continuous Flow AX12

The Organ-on-Chip Exposure Solution for Gases and Complex Mixtures



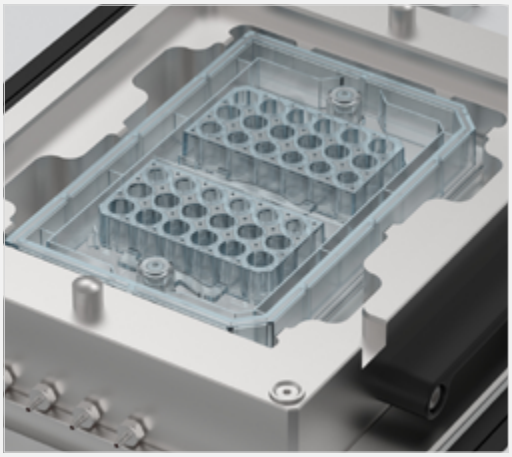
System Profile

- Gas and Particle Phase Exposure
- Suitable for two AlveoliX AX12 Chips
- Fully tunable and dynamic models
- Connection to AX12 Actuator
- Longer exposure durations
- Intergrated dilution system

Exposure System with one chip for aersol exposure including dilution system and one chip for clean air control

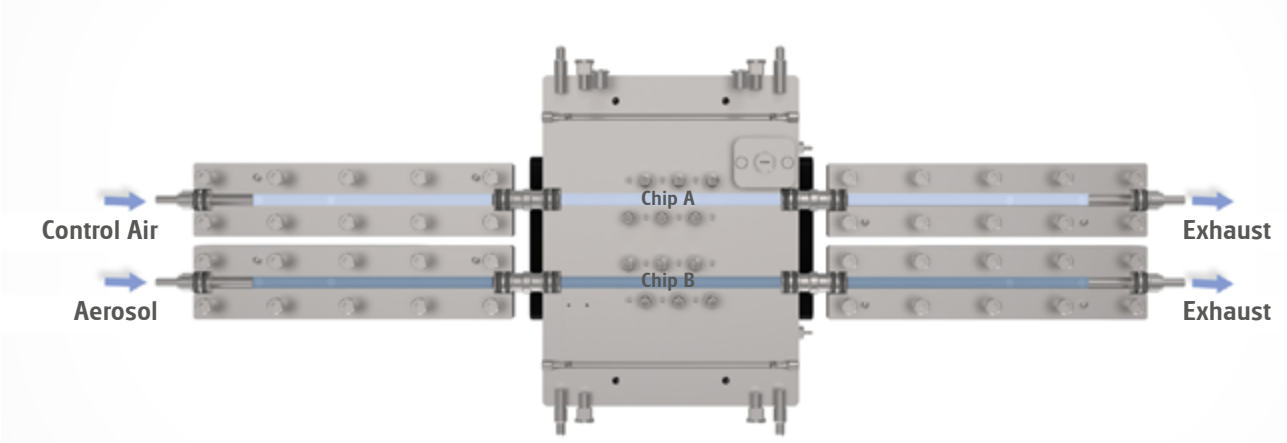
In the VITROCELL® Continuous Flow AX12 the advanced in vitro model is exposed to a continuous flow of gases, complex mixtures or particles. Only this exposure principle is suitable for aerosols in which both gas and particle phase are of relevance.

Continuous Flow Exposure is used for gases, chemicals or materials which are available in larger quantities (several g) under a constant delivery. When scarce and very expensive materials need to be tested, this method is less suitable. We recommend in these cases Single Droplet Sedimentation in the Cloud Apha AX12 or Dry Powder Exposure in the Powder AX12 Systems.

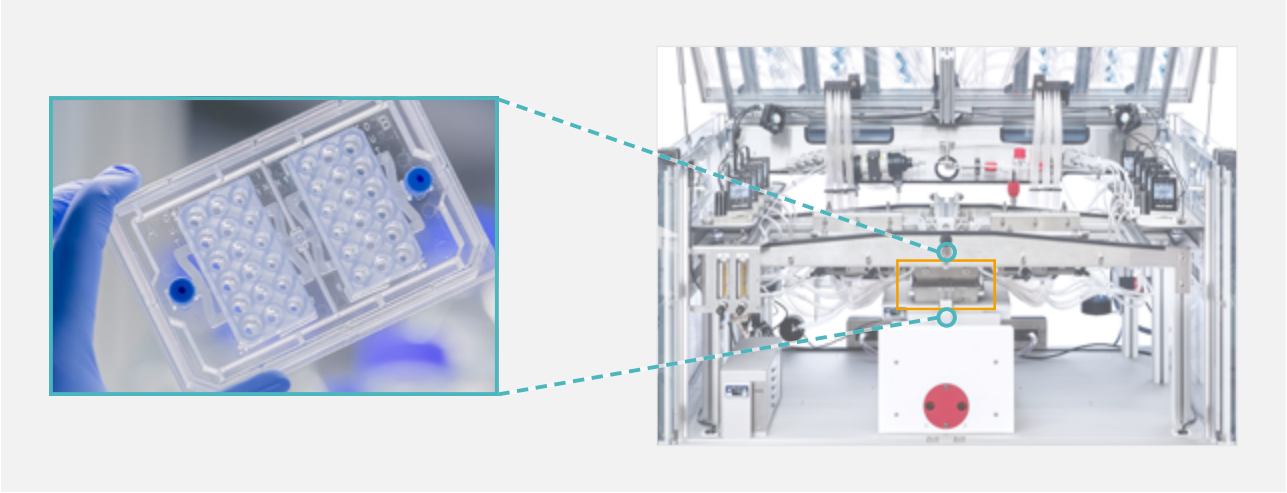


Base exposure module for two AX12 chips

Edition: August 2025



Aerosol flow in dilution and distribution system



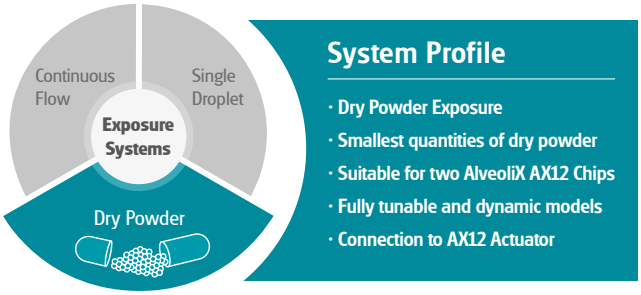
The exposure system is housed in a climatic chamber for best temperature stability, controlled humidity and condensation-free exposure

Key Features:

- Easy handling
- Suitable for aerosols in with gas and particle phase
- Air/Liquid Interface Exposure
- Breathing Lung on chip model
- Porous membrane allowing cell-cell interaction
- Increased sensitivity in phsiological conditions
- Versatile Organ-on-chip system (lung, skin, eyes)

VITROCELL®
Powder AX12

The Organ-on-Chip Exposure Solution for Dry Powders



The VITROCELL® Powder AX12 Exposure System is specificalley designed for direct aerosolization of smallest quantities of dry powders without the need of transfering them in suspension first. Thus, especially scarce and very expensive materials can be well used with this method, such as new drug candidates or particle samples from the environment.

Here quantities from 1 – 100 mg can be aerosolized. Aerosolization is performed directy into the cell culture exposure chamber. Aerosolization can be repeated a few times to obtain a dose-response profile.

Powder AX 12 allows for aerosolisation of small quantities of dry powders (1-100 mg) on the AX12 plate.

Working Principle

Powder sample is placed in quick-lock loading system.

Powder sample is aerosolized under high pressure to break up agglomerates for homogeneous dispersion in the expansion chamber.

Powder sample settles on the AX12 plate.

Key Features:

- Easy handling with no external airflow required
- Only small quantities of powder needed (1–100 mg)
- Exposure time < 30 minutes
- Air/Liquid Interface Exposure
- Breathing Lung on chip model
- Porous membrane allowing cell-cell interaction
- Increased sensitivity in phsiological conditions
- Versatile Organ-on-chip system (lung, skin, eyes)

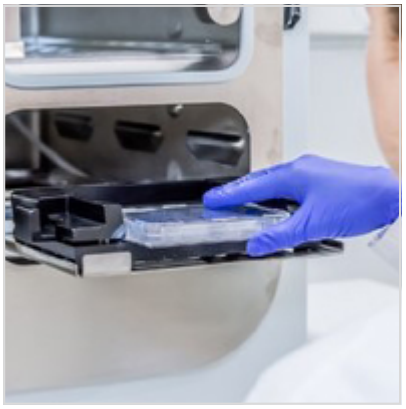
Edition: August 2025

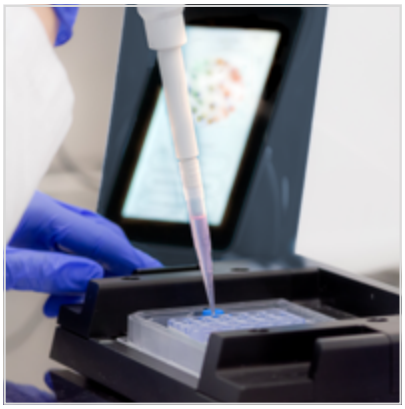
Unparalleled Expertise: AlveoliX and VITROCELL® are industry leaders

Combining decades of experience in respiratory research, our collaboration leverages the brightest minds in the field and our customers benefit from this experience to the fullest extent through close customer relationship and quick response times (often within 24 h), and monthly online meetings.

Qualified support

We offer a variety of support options, such as training, online support, and video assistance from our experts in aerosol delivery and dosimetry. Recurring online meetings are available to ensure that cell biology is working at its best, to ensure the robustness of the obtained data.





AlveoliX
In-vitro models inspired by nature

VITROCELL® SYSTEMS

Five reasons make VITROCELL® your unique partner

1. INNOVATION

We install turnkey solutions that incorporate aerosol generation, exposure, and dosimetry tools.

VITROCELL® solutions are tailor-made to perfectly match your specific requirements.

Each customer benefits from the experience we have gained from serving several hundred satisfied clients and from our leading expertise in the field, which is underscored by the support of nearly 300 publications.

2. RELIABILITY

When you acquire VITROCELL® equipment, the design features and materials used ensure you have made a long-term investment.

Customers benefit from high quality and durability, with product lifespans exceeding a decade.

3. QUALITY

Rigorous performance qualification testing ensures reliability and consistency for all VITROCELL® users.

You are entitled to request factory and site acceptance test reports. ISO 9001 certification across every aspect of our operations means you can confidently expect an excellent user experience.

4. SERVICE

V-CARE Service provides installation, training, and after-sales service around the world, including quick delivery of spare parts over the entire life cycle of all products.

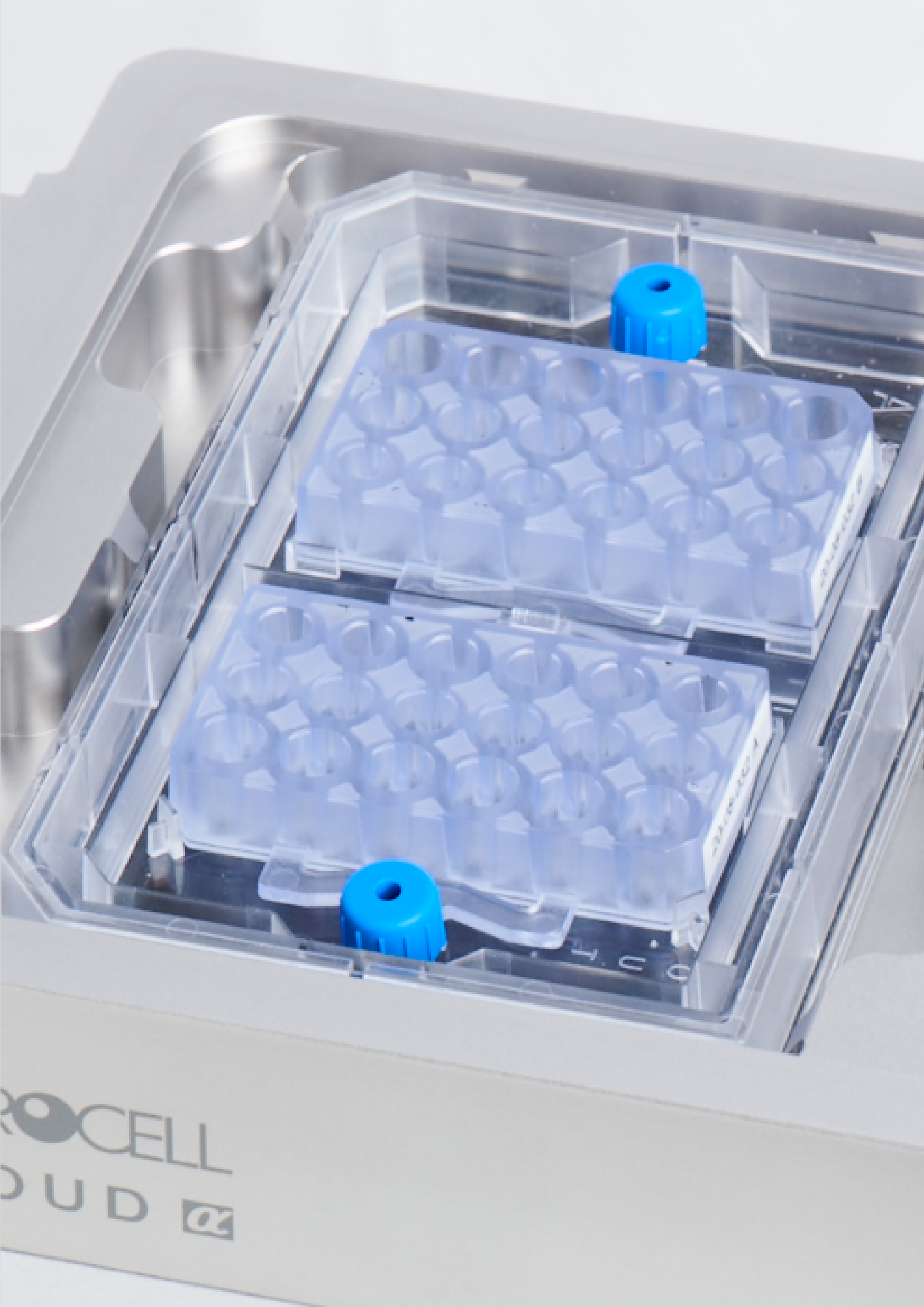
The benefits of V-CARE Service include maximum possible uptime and a prompt response from our V-CARE support team.

5. SUSTAINABILITY

VITROCELL® is committed to environmental protection and resource conservation.

In line with our customers' expectations, our sustainable solutions are delivered with an environmentally friendly design and the right choice of materials, coupled with investment in research and development.

Edition: August 2025


CELL
UD

About VITROCELL®

VITROCELL® exclusively concentrates on the developing, producing, installing, training and servicing of advanced *in vitro* exposure systems.

The VITROCELL® Systems' team is driven by their vision for new in-vitro standards through state-of-the-art technology, highly qualified workmanship and absolute client dedication. VITROCELL® has successfully collaborated with clients from leading research institutes, contract research organizations, regulatory authorities or industrial laboratories across the world. Working with our team experts, all modules have been tailored to create durable and complete turnkey-systems for *in vitro* inhalation toxicology. Gases, environmental atmospheres, nano particles and complex mixtures are analyzed on lung cells at the air/liquid interface using these systems. VITROCELL® technologies are also applicable to solutions for skin research.

Over a decade of devotion to research in this specific field has given our team of design & precision manufacturing specialists the opportunity to mentor highly diversified and complex projects from conception to completion. We strive to become a constructive member of each research team, providing support when it is needed, advice when it is required and modules of the highest quality, which are even polished by hand before leaving here to be integrated into your workspace. Every piece of our German engineered equipment is manufactured to the highest of standards – yours.

For more information please scan:

For more information on AlveoliX please scan:

AlveoliX
In-vitro models inspired by nature

VITROCELL® Systems GmbH
Fabrik Sonntag 3
79183 Waldkirch
Germany
Tel. +49 7681 497 79-50
Fax +49 7681 497 79-79
Email: info@vitrocell.com
www.vitrocell.com

Edition: August 2025

VITROCELL® SYSTEMS