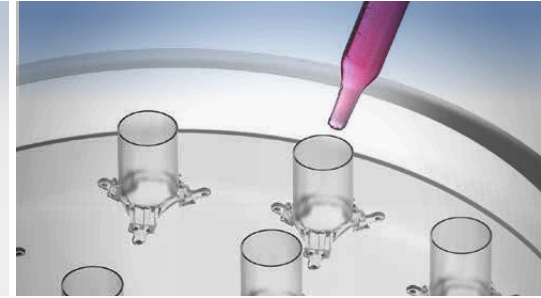
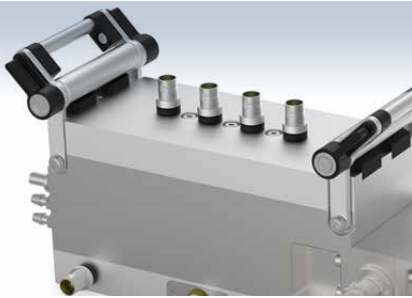


Advanced in vitro exposure systems



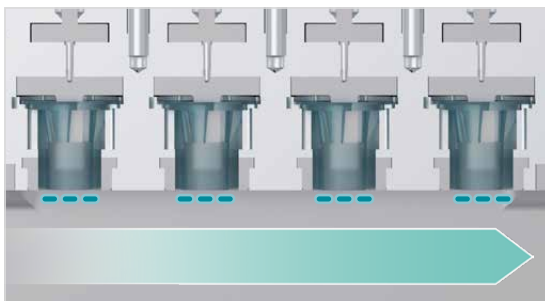
VITROCELL®
Navetta
Continuous Flow
Exposure Module

VITROCELL® Navetta

Compact Horizontal Flow Exposure Module
Advanced particle delivery with deposition enhancement



The unique feature of Navetta is its active deposition mechanism while exposing cell cultures in horizontal flow on inverted inserts. Instead of relying on gravity or diffusion, Navetta applies an electric field to actively direct charged aerosol particles onto the cells grown at the air-liquid interface (ALI).

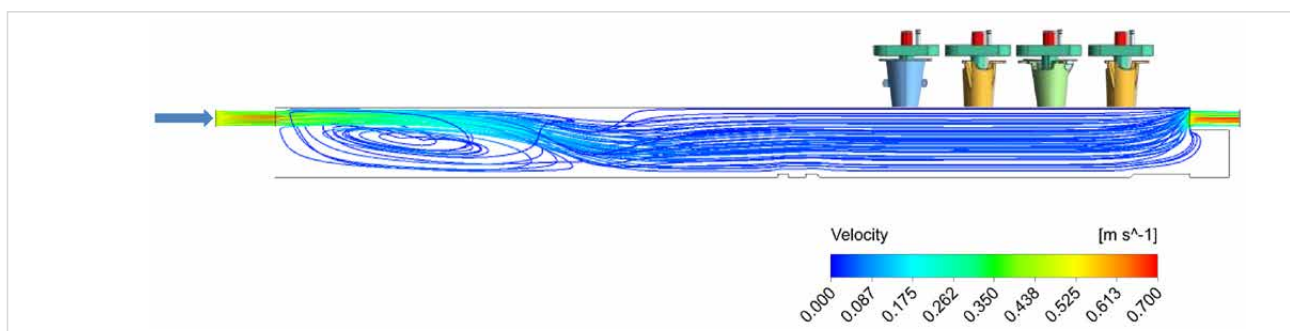


This leads to significantly higher deposition efficiency, even for very small particles (< 100 nm) that are otherwise difficult to deposit.

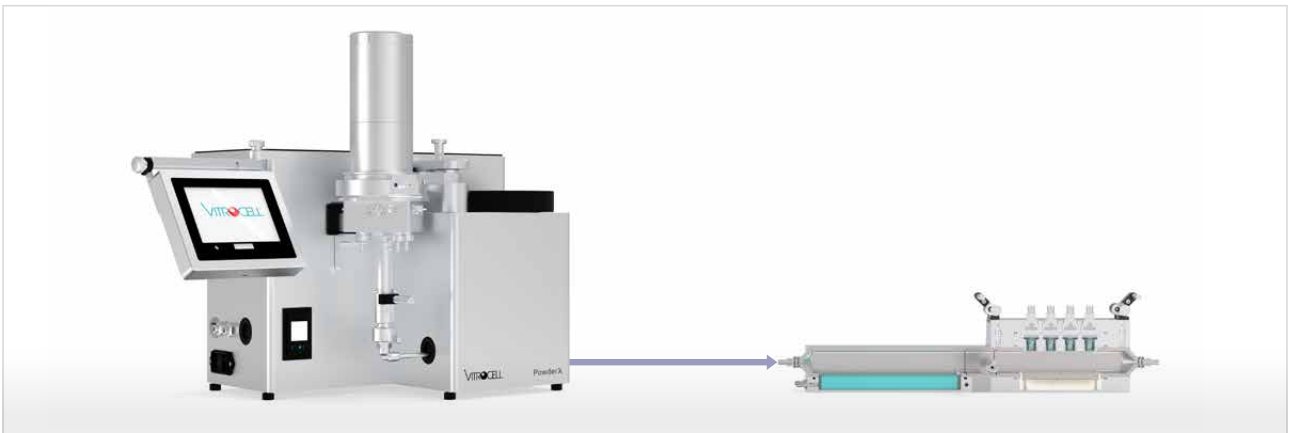
Navetta is an ideal tool to expose cell cultures to particles and drug compounds in combination with the VITROCELL® PowderX or Preciseinhale® aerosol generators. Due to the integrated humidification system, longer exposure durations are possible.

The combination of laminar airflow and electrostatic attraction ensures uniform particle distribution across all exposed cell culture inserts.

Upside down exposure



Horizontal airflow simulation



Setup with PowderX

Dry Powder Continuous Flow setups

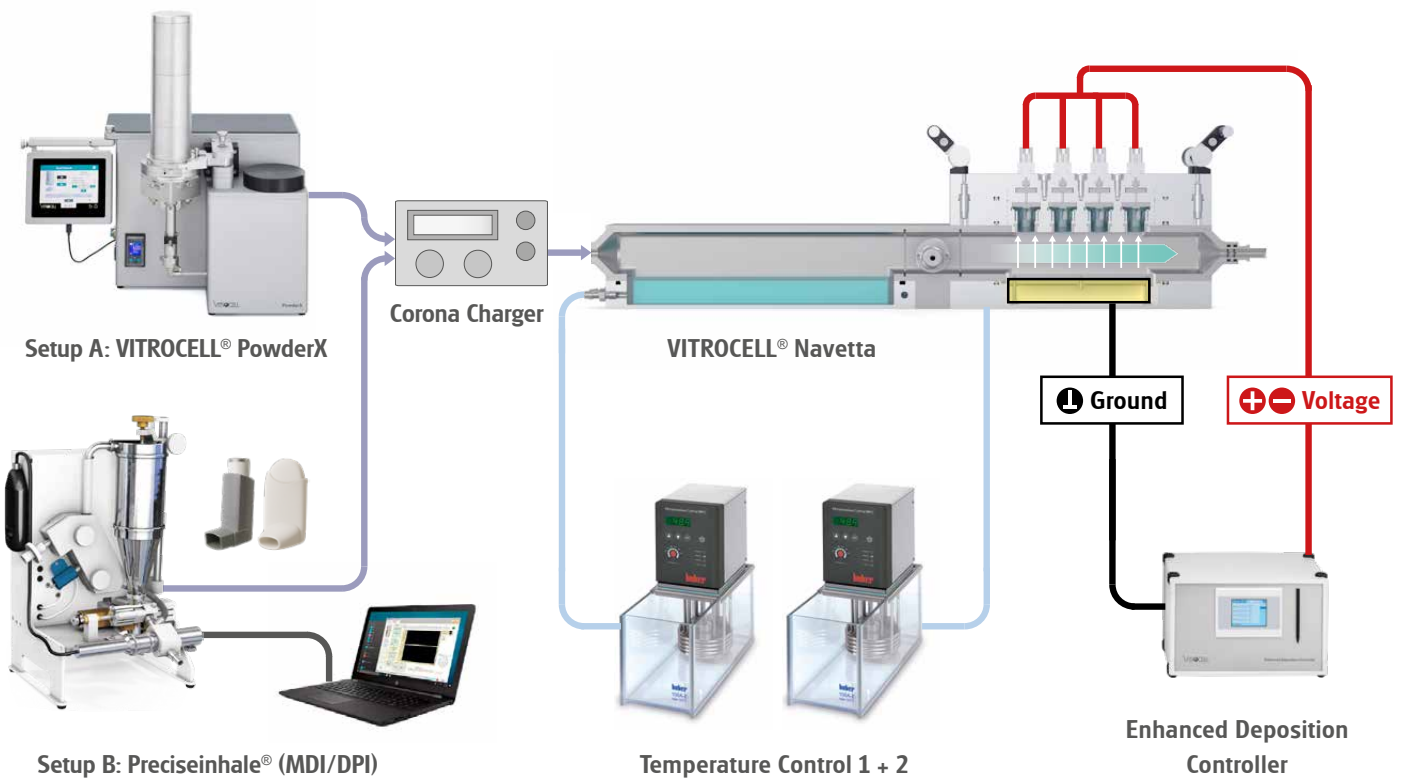
Testing of pharmaceutical compounds delivered by commercially available inhalers (DPI/MDI) is best performed with the Preciseinhale®. The aerosol is guided with controlled flow directly to the Navetta exposure module.

If small quantities of loose powder or pharmaceutical compounds need to be tested, the VITROCELL® PowderX is coupled to the Navetta.

Integrated temperature and humidity control

The exposure chamber maintains 37 °C and 95% relative humidity, mimicking the conditions of the human airway while maintaining cell cultures viable and functional over extended exposure periods.

This makes it suitable for sensitive epithelial or co-culture systems that require gentle, yet precise, aerosol delivery.



Principle of particle charging & deposition enhancement

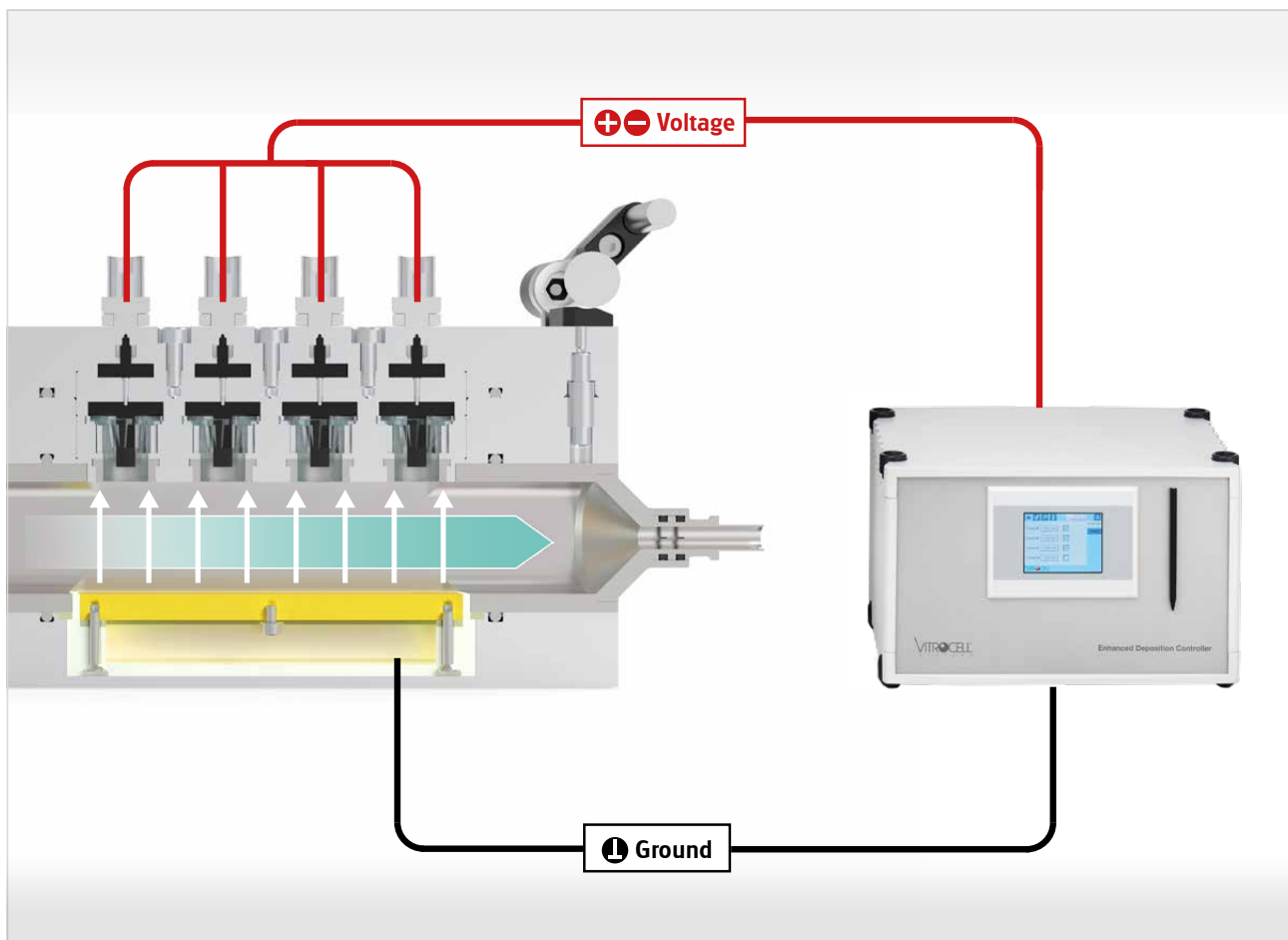
The system ensures that the airflow remains laminar and gentle, so the electric field enhances deposition without damaging the cell cultures.

In general, particles in an aerosol carry some electric charge naturally (due to friction, atomization, or handling). Navetta allows for controlled charging of the aerosol particles via corona charging before and applying high voltage during their passage through the chamber. Control experiments demonstrated that this process has no influence on cell viability.

The corona charger applies a high voltage to ionize the air and transfer charges to the particles, giving them a known polarity (positive or negative).

Inside the Navetta exposure chamber, a uniform electric field across the exposure area is generated between upper electrodes and a grounded plate. The strength of the field can be tuned at each insert position to the desired deposition rate.

Charged particles experience an electrostatic force within this field and are actively driven to the cell surface, resulting in high, uniform deposition efficiency.



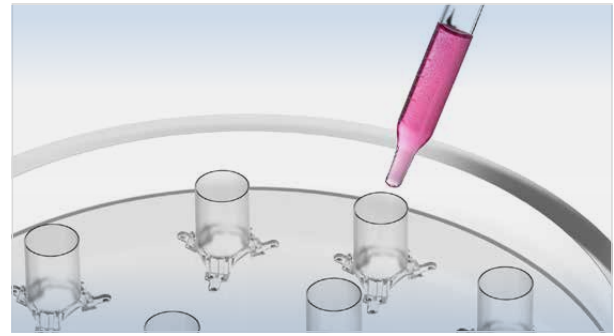
High-voltage deposition enhancement: electrodes in the cell-culture compartment (black) and the grounded support plate (red)

Inverted Cell Culture seeding

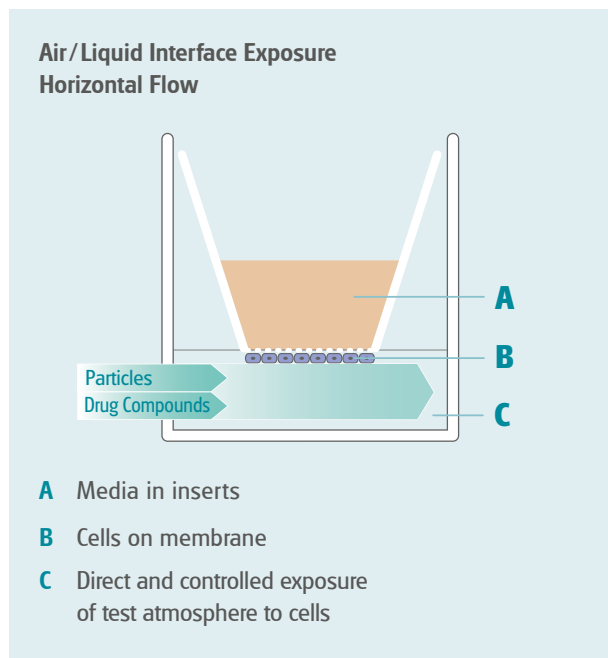
Normally, cells are seeded on the upper (apical) side of a porous membrane in a cell culture insert (e.g. cellQART®, etc.) and grow while the insert sits upright. In inverted cultivation the insert is positioned upside down and cells are seeded onto the lower (basal) surface of the membrane which is then facing up.

After attachment, the insert is brought back to its normal orientation to continue the culturing and then to carry out the exposure in the Navetta.

A detailed protocol is part of the delivery.



Seeding of cells on inverted inserts



Exposure at the Air/Liquid Interface

All VITROCELL® exposure devices have been specifically designed to enable direct exposure of mammalian cells or tissue at the Air/Liquid Interface in physiologically relevant conditions. Here the cell cultures are not covered with media as opposed to submerged conditions which cause an undesired interaction of the formerly airborne substances with the culture media.

This approach allows for more credible and authentic results than by submerged exposure due to a closer replication of the human physiology.

Features:

- Ideal for nanoparticles and drug delivery testing of inhaled therapeutics
- Dry powders delivered with devices like Preciselnhale® (MDI/DPI inhalers) or VITROCELL® PowderX
- Improves deposition rates by a factor of 5–10 compared to uncharged, passive deposition. Adjustment of the deposition dose by regulating the charge and field strength
- Laminar flow with uniform distribution across cell cultures
- Controlled environment maintaining cell health during exposure
- Physiologically relevant exposure conditions
- Compact design

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:



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