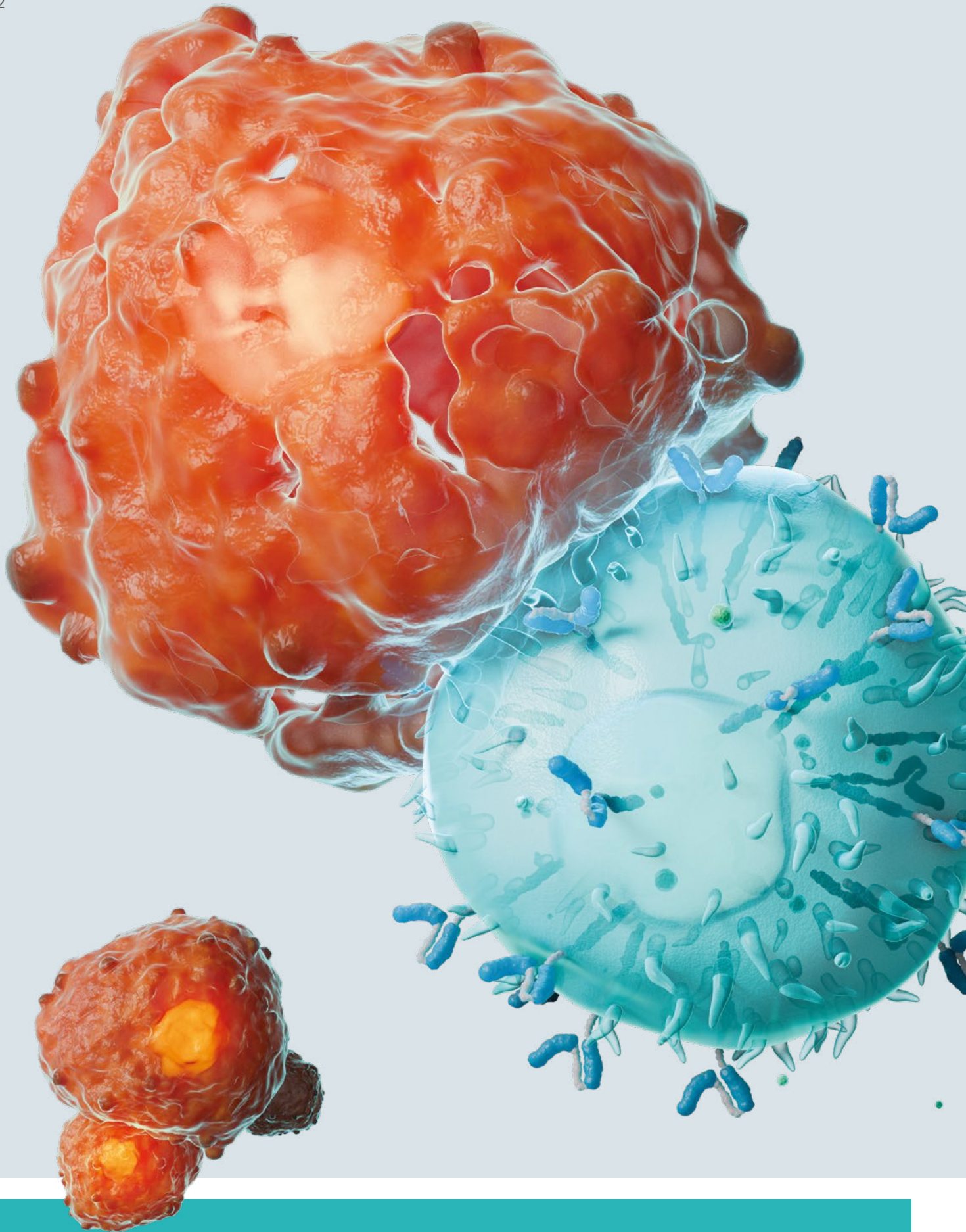




# Shift the Paradigm

Best-fit solutions for CAR-T cell research and development

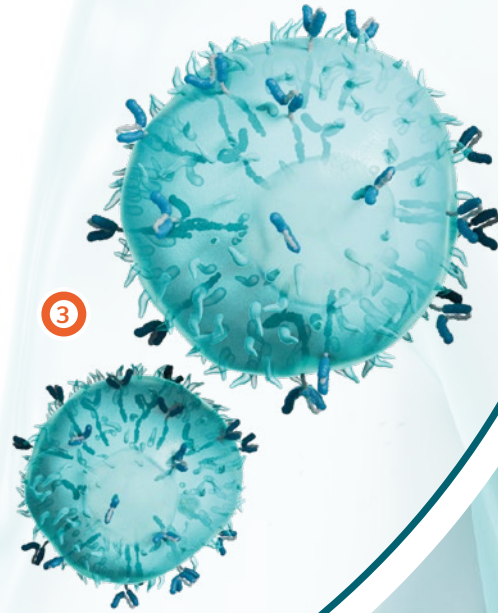
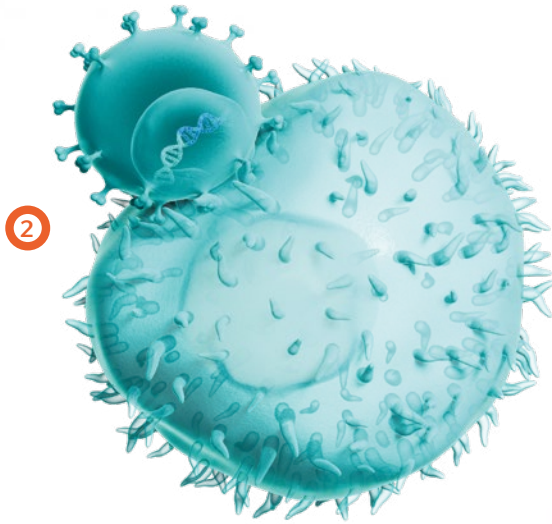
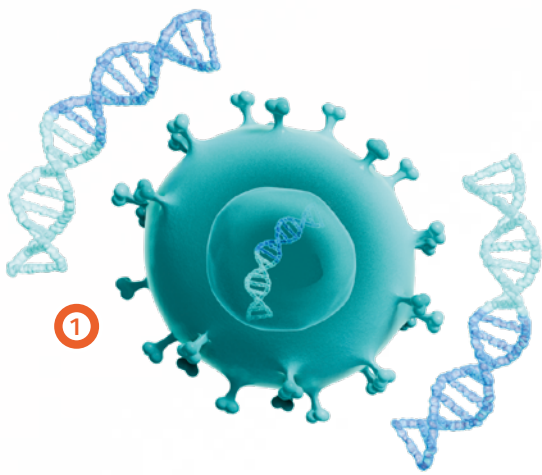


# CAR-T Cells: Breakthroughs in Cancer and Autoimmune Therapies

One of the most revolutionary cell therapies to transition from bench to bedside in the past decade is undoubtedly the development of chimeric antigen receptor (CAR)-T cells. Here, CAR-T cells have found a plethora of different applications. Firstly, by proving to be an effective treatment for certain blood cancers that were previously deemed incurable. Secondly, in holding promise for treating certain auto-immune diseases and solid tumours.

As ongoing research broadens the applications of CAR-T cells, the potential for transformative outcomes continues to grow. The promise of improved efficacy, reduced side effects, and enhanced patient outcomes propels CAR-T cell therapy to the forefront of the evolving cancer treatment landscape, offering hope for a future where even the most challenging malignancies can be effectively targeted and overcome.

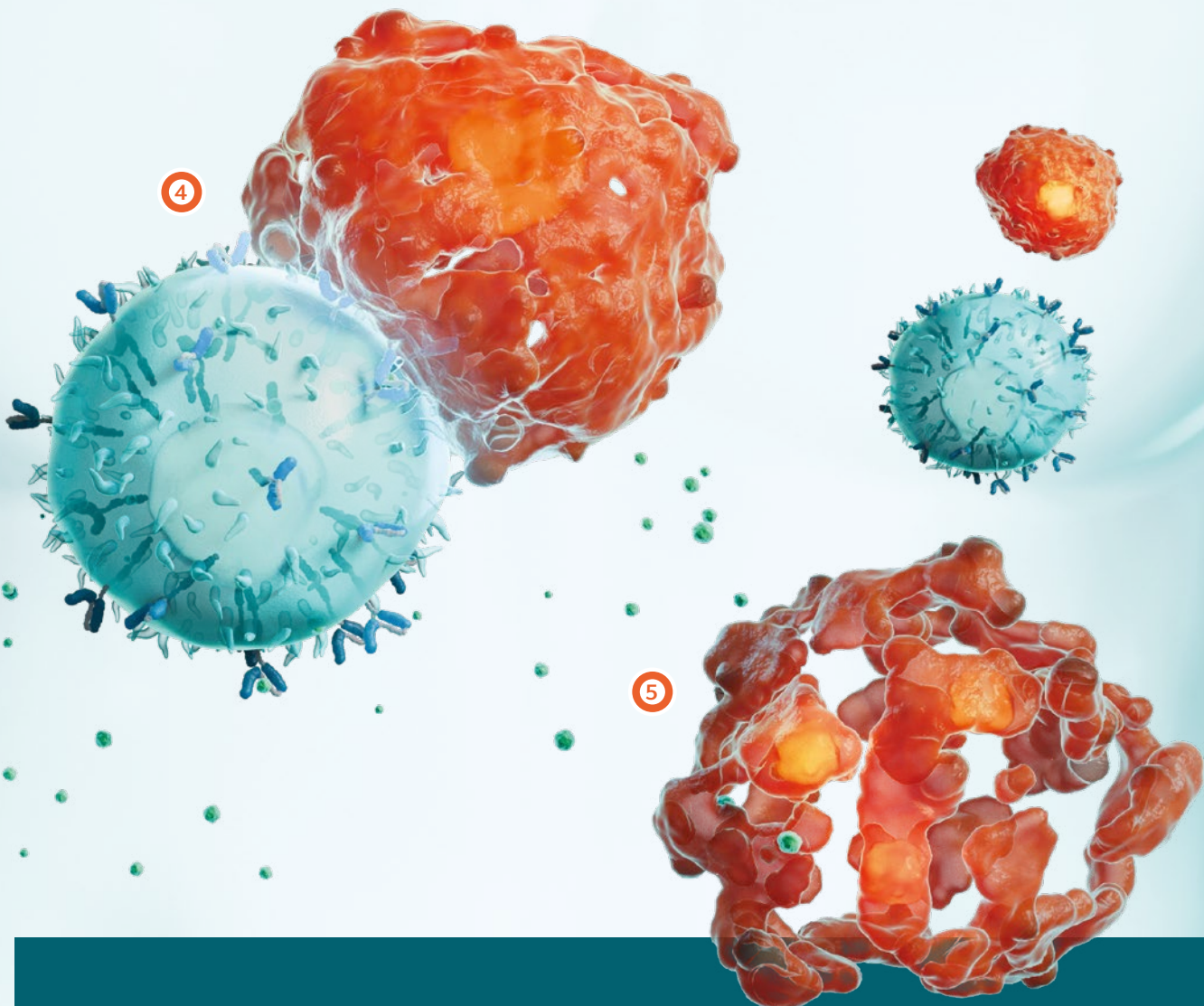




- ① Designing of CAR encoding vector
- ② CAR transduction into isolated T cells
- ③ Injection of CAR-T cells into patient
- ④ Binding of CAR-T cell to cancer cell
- ⑤ Destruction of cancer cell

# CAR-T Cell Development – The Future of Fighting Cancer

CAR-T cells, genetically engineered and equipped with specific receptors to target and combat cancer cells, are primarily divided into two categories: autologous and allogenic CAR-T cells. Hereby, autologous CAR-T cells derive from the patient's own white blood cells and are reintroduced after modification, whereas allogenic CAR-T cells are designed as off-the-shelf solutions for use in different patients. However, both approaches have their challenges. The manufacturing process for autologous CAR-T cells is complex and costly, as each patient's cells must be individually processed. Allogenic CAR-T cells, on the other hand, currently do not have the same safety profile, necessitating further research to address these issues.



# Advancing CAR-T Cell Research: From PBMC Isolation to La

## Reproducible PBMC isolation

The **Centrifuge 5910 Ri** has soft acceleration/break ramps for optimized PBMC isolation and significant time savings during Ficoll gradient separation. High throughput with up to 4 × 1,000 mL working volume ideal for cell harvesting on the benchtop.



## Safe and consistent culturing of cells

Ensure optimal activation of T-Cells with the uniform atmosphere of the **CellXpert® C170i**. Fanless design, seamless chamber, 180 °C sterilization cycle, and a removable water tray for reliable contamination control.



1

PBMC isolation from healthy humans or animal models

2

T cell enrichment from PBMCs

3

T cell activation

4

CAR transduction

Starting with frozen PBMCs



## Contamination proof thawing

The **Eppendorf ThermoMixer® C** and the **SmartBlock** cryo-thaw exchangeable block offers a special thawing program that supports reproducible, reliable thawing of frozen PBMCs up to 1 mL in standard 1.8-2 mL cryovials.



## Safer pipetting

The **ep Dualfilter T.I.P.S.®** pipette tips are proven to provide the optimized protection of your pipette and sample against unintentional and unnoticed contamination during viral work.



# Large-Scale Production

## Best conditions for your mammalian suspension cell culture!

The **CellXpert CS220** ensures precise temperature and CO<sub>2</sub> control, minimized evaporation by active humidity control and reliable shaking. The stainless steel chamber and integrated 180 °C sterilization protect your cells from contaminations.



5

## Reliable and traceable sample storage

Freeze down your CAR-T cells and digitally store data (donor, date, CAR construct etc.) with the Safe Code system to readily access sample information even after transfer to LN2 (compatible with any barcode scanner).



6

Freezing down of samples

5

CAR-T cell expansion

6

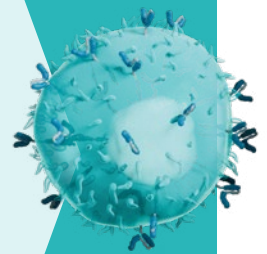
CAR-T cell harvest

7

*In vitro* or *in vivo* characterisation

8

CAR-T cell Upscale if required



5

## Optimized cell expansion

The **DASbox® Mini Parallel Bio-reactor system** provides precise control over culture conditions in a small volume range (100 mL-250 mL), optimizing CAR-T cell growth and viability during the crucial expansion phase.



7

## Speed up your characterization assays

The **Eppendorf Xplorer®** electronic pipettes enables quick filling of plates using the dispensing mode. When connected to the **Pipette Manager**, an even quicker operation of the pipette is possible.



7

8

## Simplify your scale-up

With the **BioFlo® 320**, scaling production is simpler than ever. Benefit from our intuitive *Scale-Up Assist* software, ensuring easy transition from bench to production while maintaining optimal growth conditions and process efficiency.

# Viral Vector Development – from cloning to transduction

## Countless PCRs in as little as 15 mins

The **Mastercycler® X50** with the 384-well or 96-well silver block can process hundreds of PCRs in as little as 40 min and with a fast polymerase kit even in less than 15 min. Connect up to 50 devices for increased throughput.



## Get high plasmid yields

The **Innova® S44i** can fit up to twice as many flasks as other shakers in the market and is ready to reliably support current high-yield plasmid production protocols at high speeds, 24/7.



CAR design



Cloning and amplification of plasmid system for lentiviral vector production



## Bring your process to the next level

**BioBLU® Single-Use Bioreactors** provide 400x-fold scalability for a working volume range from 100 mL to 40 L. Working in closed systems reduces cross-/contamination risks and reduces turn-around times.



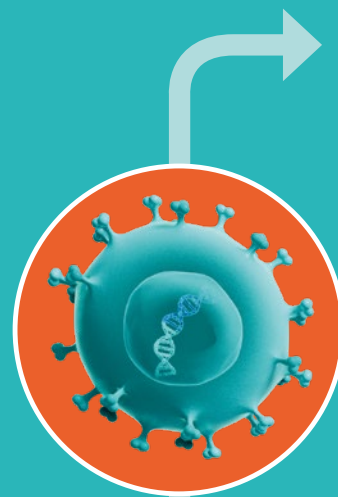
## Best conditions for your mammalian suspension cells!

The **CellXpert CS220 CO<sub>2</sub> incubator shaker** ensures precise temperature and CO<sub>2</sub> control, minimized evaporation by active humidity control and reliable shaking. The seamless chamber design and the integrated 180 °C sterilization function protect your cells from contaminations.



### Increase downstream quality and purity

The **Ultracentrifuge CP100NX** can spin your viral vector with a maximum speed of up to  $803,000 \times g$ . Rotor life management system for increased safety! The broad rotor and adapter portfolio enables flexible vessel selection and scalability.



3

Lentivirus  
vector  
production

4

Purification

5

Storage



3

### You need higher virus titers?

The **BioFlo® 320 Bioprocess Controller** revolutionizes virus production by enabling higher titers with intelligent control. Achieve consistent, scalable results from R&D to full-scale through our precise, user-friendly bioreactor controller, designed for virus yield.

5



### Storing your vectors at -80 °C?

Get ID-specific consumable information for comprehensive documentation during your R&D phase with the Safe Code system. The ACT® certified **CryoCube freezers** ensure energy efficiency and sample safety.

01



Click here!



## Centrifuge 5910 Ri

- > Faster PBMC isolation due to optimized acceleration and deceleration ramps for Ficoll-Paque® density gradient centrifugation
- > Accurate cooling with smart Dynamic Compressor Control (DCC) for optimal sample integrity.
- > Documentation function and user management support quality control with multiple authorization levels, password protection and documentation of all runs and user activities.

## CellXpert® C170i CO<sub>2</sub> Incubator



- > Easy cleaning, reliable contamination prevention with the fanless design, seamless chamber, 180 °C sterilization cycle, and removable water tray.
- > Uniform atmosphere thanks to temperature verification at 27 locations inside (German DIN 12880:2007-05 standard).
- > GMP supporting documentation and third-party certified ISO class 4/GMP grade – A clean-room compatible.



Click here!

03



## Eppendorf ThermoMixer® C

- > Eppendorf SmartBlock cryo thaw enables reproducible, reliable and water-free thawing of cells up to +37 °C.
- > QuickLock system for easy, tool-free exchange of the up to 13 different SmartBlocks. The ThermoTop® reduces the risk of condensation.
- > Eppendorf SmartExtender enables a second independent incubation temperature for up to 12 vessels (1.5 mL).



## Safe Code Cold Storage

- > Safely store up to 576 freezer boxes (740 L). Benefit of future-proof green cooling and efficient insulation
- > Reliably identify your valuable samples by vessel-specific barcodes, available for cryovials, tubes, and plates



05



## ep Dualfilter T.I.P.S.<sup>®</sup> PCR clean/sterile



- > Retain practically aerosols and biomolecules
- > Tested for filtration performance under the standard EN 29463 yielding a minimum particle collection efficiency of 99.5 % with test aerosol particles sizes of 0.05–0.5  $\mu\text{m}$ .
- > Sterilized by electron beams, certified pyrogen-free and free from human DNA, DNase, RNase and PCR-inhibiting substances.



## CellXpert<sup>®</sup> CS220

- > Integrated 180 °C sterilization and easy to clean seamless stainless-steel chamber without fan.
- > Nowhere for contaminants to hide: Stainless steel chamber without bells and whistles.
- > Up to 40% higher flask capacity and greatest platform size-to-footprint ratio in the market.





## DASbox<sup>®</sup> Mini Parallel Bioreactor System

- > Experience precise control in a compact system with 100 mL-250 mL working volumes, ideal for cell culture and process development.
- > Supports up to 24 parallel bioreactors, ensuring scalability and reproducibility.
- > Compatible with glass and BioBLU Single-Use Bioreactors, featuring liquid-free temperature control and easy exhaust condensation handling.
- > Fully mass flow-controlled gas mixing with individual gas mixtures, optimizing conditions for CAR-T cell growth and viability.



## BioFlo<sup>®</sup> 320 Bioprocess Control System and BioBLU<sup>®</sup> Single-Use Bioreactors

- > Universal connections for analog or digital sensors reduce sensor complexity.
- > Extensive working volume ranges from 250 mL to 40 L on a single control platform.
- > *Scale-up Assist* software to facilitate uncomplicated and intuitive upscaling.
- > Use with autoclavable vessels and our comprehensive portfolio of BioBLU Single-Use Bioreactors that support process customization.



## Mastercycler<sup>®</sup> X50s

- > Run time: About 40 minutes with block heating rates of up to 10 °C/s and cooling rates of up to 5 °C/s. Fast PCR with a fast polymerase kit in as little as 15 minutes.
- > 2D-gradient for optimizing the annealing and denaturation temperatures in a single run. This saves time and money.
- > Up to 50 units can be combined for high-throughput applications.



Click here!



## Eppendorf Xplorer® plus Electronic Multi-Channel Pipettes

- > Higher precision and reproducibility and an additional efficiency gain due to various operating modes (e.g. dispensing, pipetting & mixing, ...)
- > Extremely consistent sample pickup across all channels and user-to-user reproducibility for more consistent results.
- > Better results thanks to the intuitive operating concept and ergonomic design, supported by the Eppendorf PhysioCare Concept®
- > Use with the Pipette Manager to set up and document liquid-handling steps more quickly. Settings are instantly available on all connected electronic pipettes, avoiding setting errors.



## Innova® S44i Stackable Incubator Shaker

- > High throughput with parallel screening of up to 81 × 125 mL or 49 × 250 mL flasks on universal platform
- > Reproducibility with precise temperature and speed control: temperature accuracy ± 0.1 °C and uniformity ± 0.25 °C (at 37 °C), speed accuracy ± 0.5 rpm
- > High liquid load and 24/7 reliable performance: Eppendorf X-Drive with five weight-supporting shafts



## Ultracentrifuge CP100NX

- > Fast and easy balancing of samples. Visual check of sample height (within 5 mm\*) is sufficient.
- > Automatic rotor life management: run data is stored on the rotor and calculations are made on the basis of the actual run time for a prolonged lifetime.
- > Maximum centrifugation speed of 803,000 × g (100,000 rpm in centrifuge CP100NX with rotor P100AT2).
- > Use with Seal Tubes that can be heat welded shut with tube sealers, for infectious and pathogenic samples.



\* Excluding rotors S140AT, S110AT, S80AT3 and S50A



# Supporting You: Maintenance and Qualification Services

## Calibration and verification services

How do you know your experimental data is reliable? Assuring your instrument is maintained precisely and accurately according to specifications is your first step to achieving reliable results.

## Preventive maintenance services

How much do you rely on keeping your instrument in good working order? Our professional cleaning and maintenance services aim to prevent unexpected downtimes and failures by detecting of problems early on. Keeping your instruments in perfect working order will not only extend their service life, but also increase your productivity.

## Qualification services

Are you working in a regulated environment? We offer specifically created installation qualification and operational qualification services, including GxP-supporting documentation. These documents support complex GxP

standards and regulations while reducing your administrative workload and provide you with qualified assurance that your instrument is installed and operating in accordance with the manufacturer's specifications.

### Installation qualification and operational qualification services

	IQ/OQ GxP	OQ GxP
Check of delivery status and installation environment	■	–
Installation, including configuration and functional checks	■	–
Detailed IQ report	■	–
Test of alarm functions	■	■
Verification of instrument parameters (e.g., temperature, speed)	■	■
Detailed OQ report and handling of deviation list	■	■
Signed approval by customer and service technician	■	■



For more information, service ordering details and contact form please visit:  
[www.eppendorf.com/epServices](http://www.eppendorf.com/epServices)

# Sustainability Can Only Be Achieved in Collaboration

The fundamental principle of sustainability has always played a role at our company since its founding in 1945. Within the Eppendorf Group, our goal is to continue to grow and develop so that we do not exceed the bounds of our planet's resilience now or in the future, and to ensure that our actions are aligned with society's needs.

To achieve sustainable business activities, we identified eight key sustainability topics along our value chain. They are divided across four key strategic issues that guide our actions and activities as a responsible company:



## Climate Change:

- > Reduce CO<sub>2</sub> emissions generated at our own production and administrative sites
- > Reduce CO<sub>2</sub> emissions arising at the customers' end as a result of the use of our products



## Natural resources:

- > Prevent waste arising as a result of the use of our consumables
- > Minimize waste arising as a result of our packaging
- > Reuse and recycle resources and waste arising from our business activities



## Social Compliance:

- > Ensuring that our suppliers uphold fair labor conditions



## Social Wellbeing:

- > Promote the safety and health of our customers during the use of our products
- > Ensure diversity and equality of opportunity at our sites and lifelong learning



# Take a Deep Dive Into Our Solutions and Read Related Literature

	<p><b>Application-Note 411:</b> Transient Lentiviral Vector Production in HEK 293T Cells Using the StarLine® 300 Control Station with a BioBLU® 5p Single-Use Packed-Bed Vessel</p>		<p><b>White-Paper 069:</b> CAR T-Cell Research: Current Clinical Challenges and Outlook</p>		<p><b>Application-Note 450:</b> Adeno-associated Virus Production in Suspension Cell Culture Using the SciVario twin Bioprocess Controller</p>
	<p><b>Application-Note 453:</b> Optimizing CD4+ T Cells Long-term Expansion Process in the DASbox® Mini Bioreactor System: Impact of the Dissolved Oxygen</p>		<p><b>Application-Note 303:</b> Development of a Scale-Down Model for rAAV Viral Vector Production Using a Sf9/BEV System</p>		<p><b>Application-Note 407:</b> rAAV Production in Suspension CAP GT® Cells in BioBLU® 3c and 10c Single-Use Vessels</p>

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