Controlled Environments for iPSC Production

Alicia D Henn, PhD MBA
Chief Scientific Officer
BioSpherix, LLC

Ver. 10232024

The Cleanroom Challenge

VS

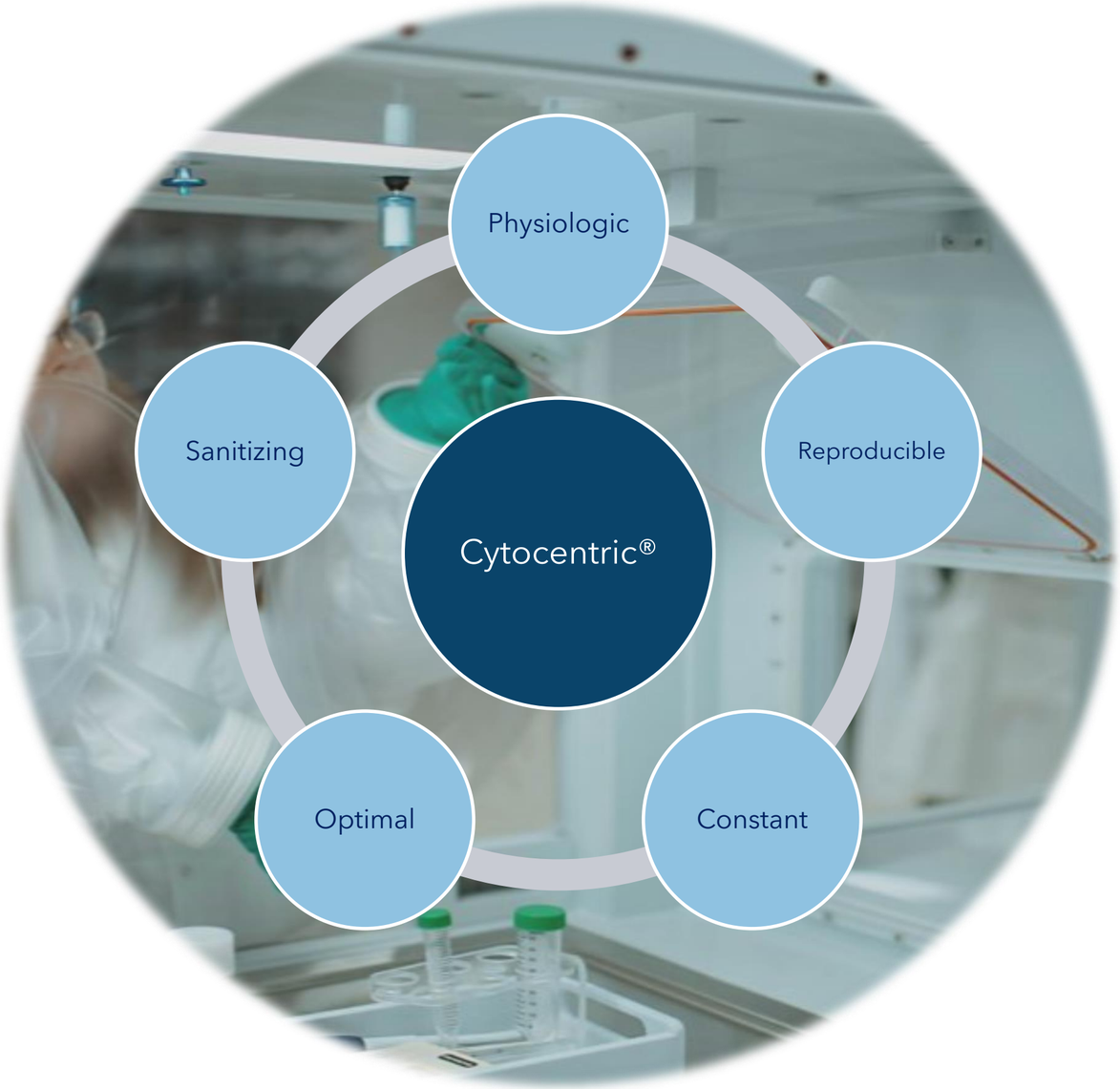
Traditional Cleanrooms

- Expensive to install, operate, and maintain
- Restricted in use
- Not operator-friendly
- Risk of contamination from personnel
- Not designed for the needs of cells

Xvivo GMP System®

- Reduced installation, operation, and maintenance costs
- Modular, scalable, and movable
- Operator-friendly
- Mitigates microbial risk
- Cytocentric®

The Cleanroom Challenge



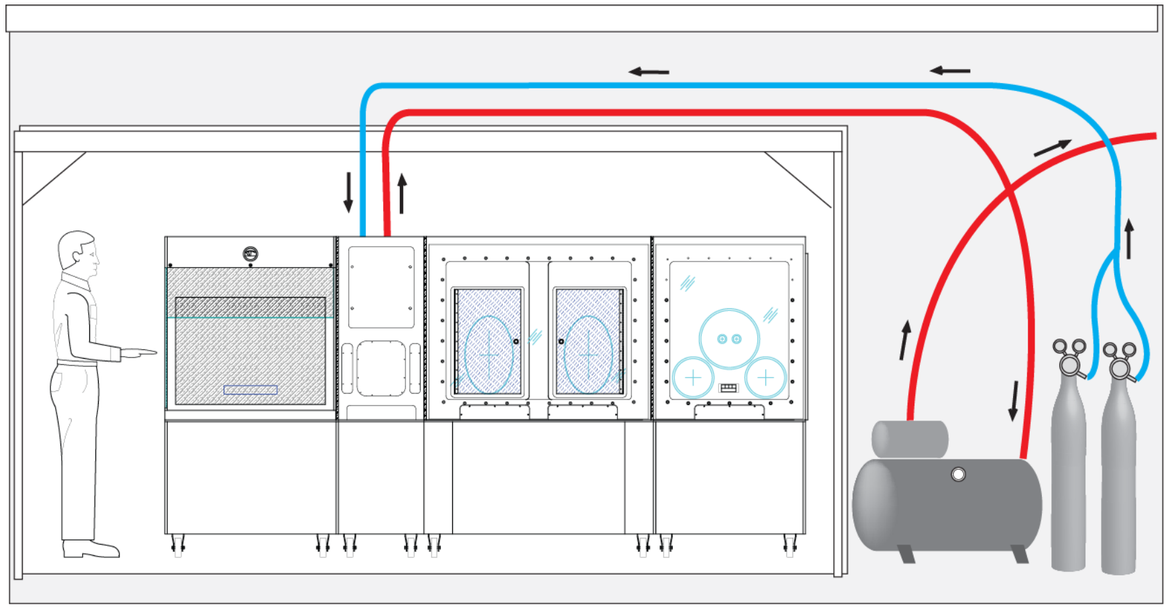
What is Cytocentric®?

- An environment that meets the needs of cells
- The cell production process is completely **closed** and **controlled** from start to finish
- Environmental conditions are optimal, physiologic, and constant
- No exposure to room air

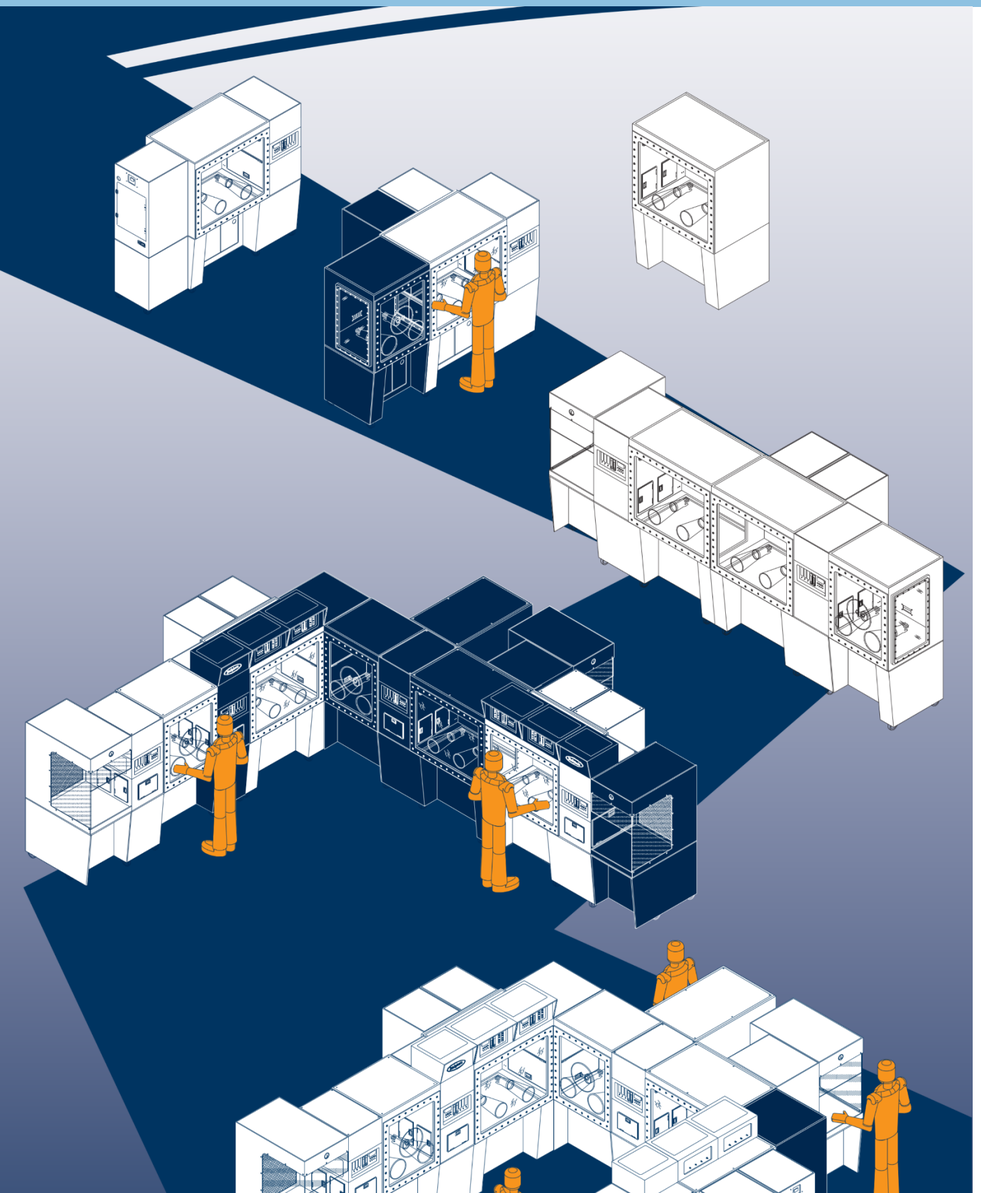
The Xvivo System® for iPSC Production

Mitigates Microbial Risks

- Cells are protected from room air risks
- Separation between cells and people
- Constant HEPA filtration
- Inputs from compressed, dry gases
- Patented, self-sanitizing process
- ISO 5 compliant
- Reduced harmful antibiotics and biocides



The Xvivo System® for iPSC Production



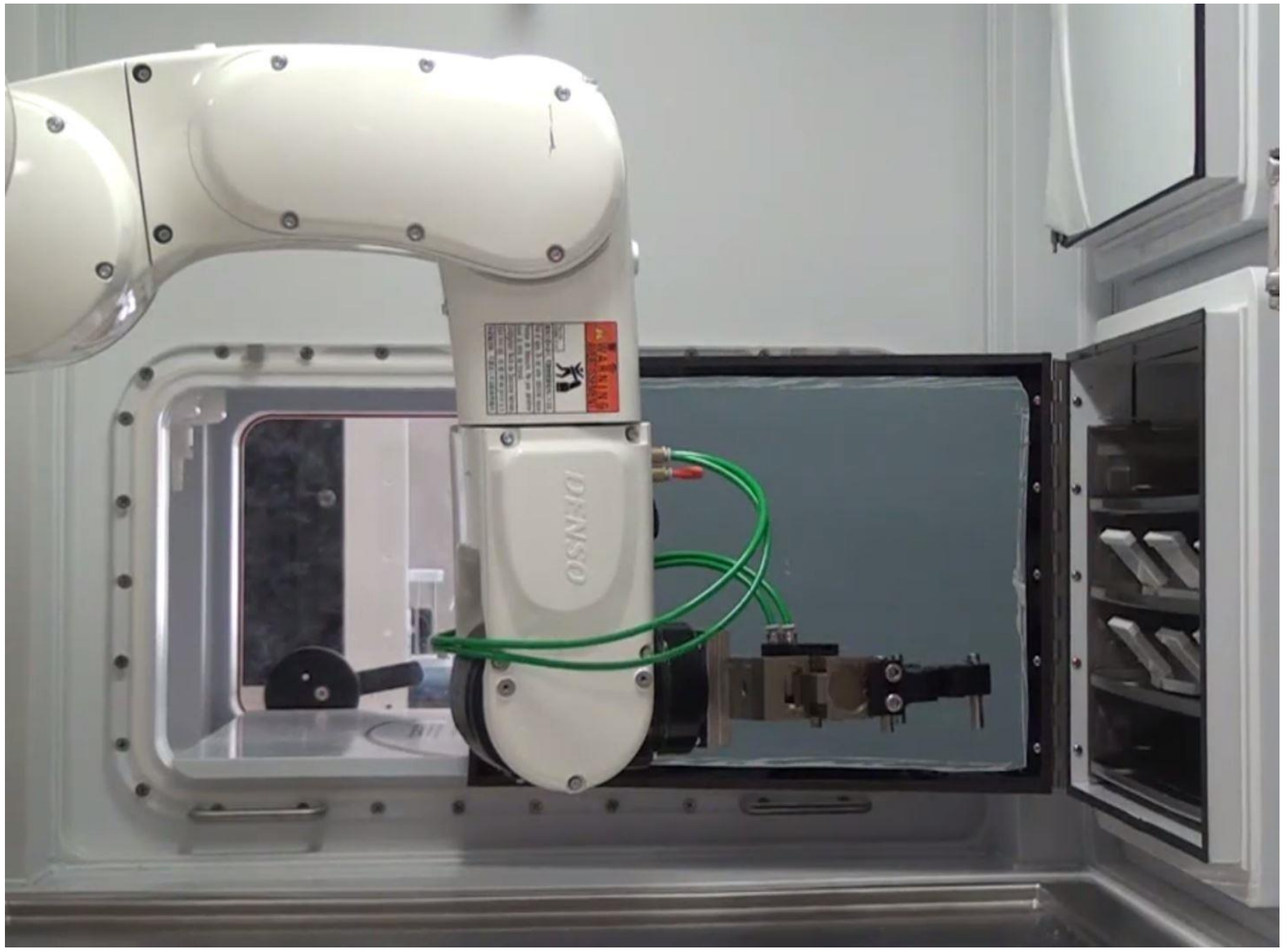
Modular, Scalable, Movable

- Adaptable to changing protocols
- Accommodates third-party equipment
- Customizable

Automation for iPSC Production

BioSpherix

Reproducible Actions + Reproducible Conditions = Better Constructs



The Xvivo System®

The Xvivo System environment is Cytocentric by design

Pre-clinical iPSC Research in the Xvivo System

Human iPSC Used to Generate

- Trophoblasts
- Cord Blood Endothelial Cells
- Retinal Endothelial Cells
- Cardiac Organoids
- Neurons

scientific reports

Check for updates

OPEN

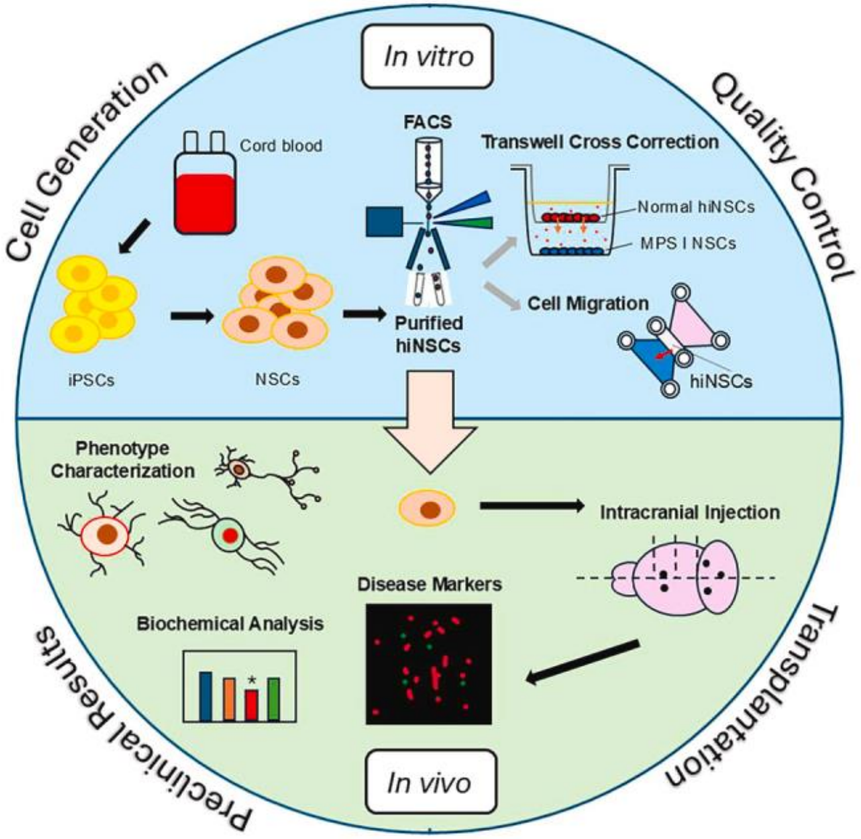
Modeling preeclampsia using human induced pluripotent stem cells

Mariko Horii[1,2], Robert Morey[2,3], Tony Bui[1,2], Ojeni Touma[1,2], Katharine K. Nelson[1,2], Hee-Young Cho[1,2,4], Hannah Rishik[1,2], Louise C. Laurent[2,3] & Mana M. Parast[1,2]✉

Pre-clinical iPSC Research in Xvivo Systems

Human Neural Cells from iPSC in the Xvivo System

- Differentiate into hiNSCs
- Which migrate through the BBB in mice
- Distribute through the brain
- Differentiate into glial cells
- Partially restore alpha-I-iduronidase deficiency



J Vis Exp. 2016 Jun 10;(112):53685. doi: 10.3791/53685.

Culturing Human Pluripotent and Neural Stem Cells in an Enclosed Cell Culture System for Basic and Preclinical Research

Alexander E Stover [1], Siranush Herculian [1], Maria G Banuelos [1], Samantha L Navarro [1], Michael P Jenkins [1], Philip H Schwartz [2]

Mol Ther Methods Clin Dev. 2024 Nov 5;32(4):101367. doi: 10.1016/j.omtm.2024.101367. eCollection 2024 Dec 12.

Human iPSC-derived neural stem cells engraft and improve pathophysiology of MPS I mice

Caitlin C Calhoun [1], Shih-Hsin Kan [1], Alexander E Stover [1], Jerry F Harb [1], Edwin S Monuki [2 3], Raymond Y Wang [4 5], Philip H Schwartz [1 3]

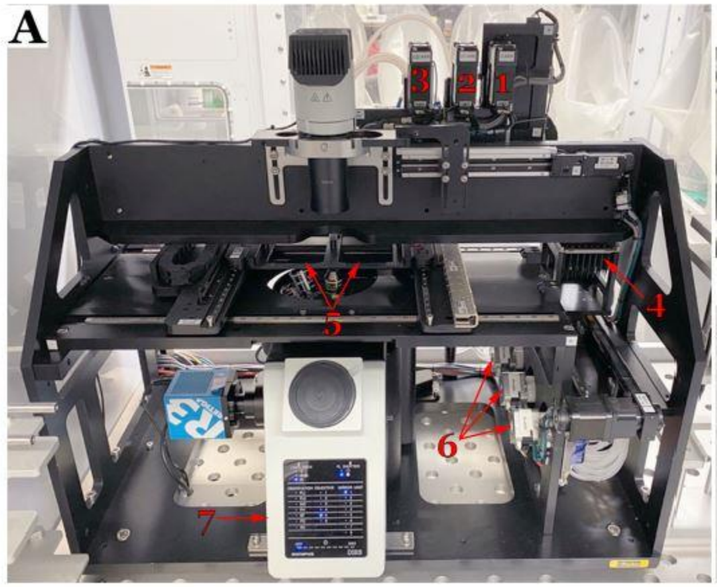
Affiliations + expand

PMID: 39764351 PMCID: PMC11701249 DOI: 10.1016/j.omtm.2024.101367

cGMP Production of iPSC in the Xvivo System

Human iPSC Grown in the Xvivo System with Cell-X Automation

- Skin samples from patients with genetic blindness
- Generate iPSC in low O_2
- High O_2 differentiate into retinal progenitors
- Place in scaffolds to make retinal patch



Automating iPSC generation to enable autologous photoreceptor cell replacement therapy

Laura R. Bohrer[1,2], Nicholas E. Stone[1,2], Nathaniel K. Mullin[1,2], Andrew P. Voigt[1,2], Kristin R. Anfinson[1,2], Jessica L. Fick[1,2], Viviane Luangphakdy[4,6], Bradley Hittle[3], Kimerly Powell[3], George F. Muschler[4,5], Robert F. Mullins[1,2], Edwin M. Stone[1,2] and Budd A. Tucker[1,2*]

"As reprogramming of somatic cells from elderly individuals can be difficult, the ability to reduce atmospheric oxygen tension can be extraordinarily useful."

cGMP Production of iPSC in the Xvivo System

Pre-print: cGMP Clinical-grade iPSC

- 5% O_2 for iPSC generation
- Higher O_2 for retinal organoids
- Xeno-free reagents
- Retinal organoids survive in rats' eyes
- Form new synaptic connections

Title: Production of clinical grade patient iPSC-derived 3D retinal organoids containing transplantable photoreceptor cells.

Authors: Laura R. Bohrer[1,2], Luke A. Wiley[1,2], Allison T. Wright[1,2], Bradley Hittle[4], Mallory J. Lang[1,2], Louisa M. Affatigato[1,2], Kimerly A. Powell[4], Lorena M. Haefeli[1,2], Ian C. Han[1,2], Robert F. Mullins[1,2], Edwin M. Stone[1,2], and Budd A. Tucker[1,2,3]

Decentralized Manufacturing for iPSC

The Three L's of iPSC Production – Location, Location, Location

- Autologous therapies - generated, maintained, differentiated and stored cGMP
- Using offsite CROs may require cryopreservation/shipping
- Some constructs with neurons are too delicate
- Need to place production near surgical sites everywhere

A protocol for the generation of xeno-free, cGMP-compliant patient-specific iPSCs from skin biopsy

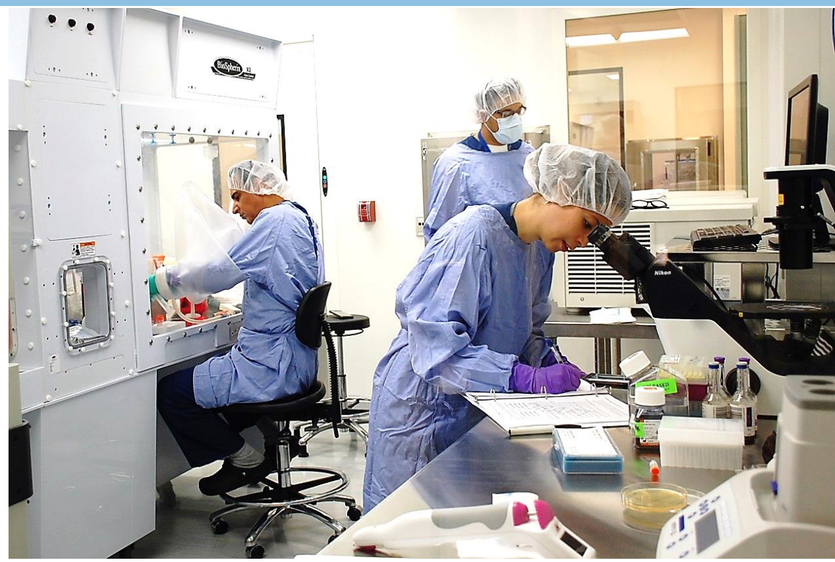
Luke A. Wiley[1,2], **Kristin R. Anfinson**[1,2], **Cathryn M. Cranston**[1,2], **Emily E. Kaalberg**[1,2], **Malia M. Collins**[1,2], **Robert F. Mullins**[1,2], **Edwin M. Stone**[1,2], and **Budd A. Tucker**[1,2,*]

[1]Stephen A. Wynn Institute for Vision Research, Carver College of Medicine, University of Iowa, Iowa City, IA

Clonable Cell Conditions in the Xvivo System®

Australia

Jordan



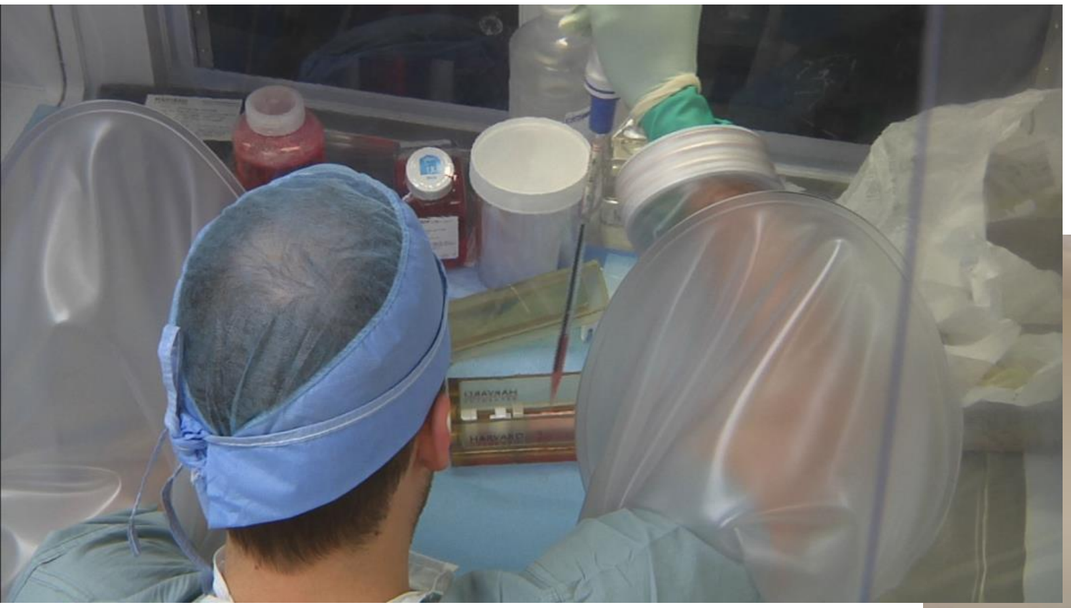
Canada

Decentralized Manufacturing for iPSC in the Xvivo System

- Identical conditions across multiple locations
- Centralized, remote monitoring and control
- Enables proximity to the clinic
- No cryopreservation needed

Decentralized Manufacturing

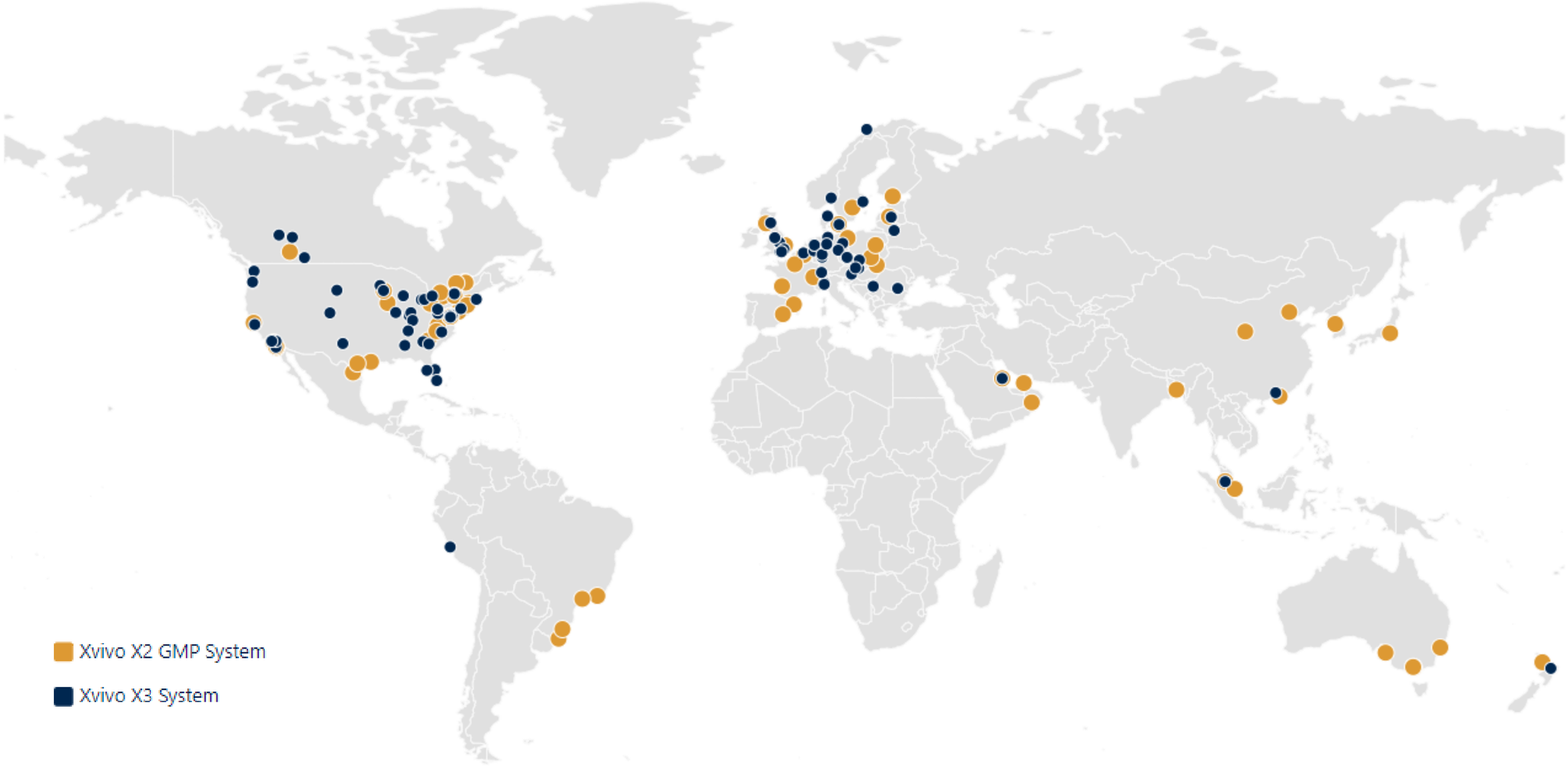
cGMP Production of Patient-Specific Organs in the OR in the Xvivo System



- Compassionate use case
- Installed, validated 6 weeks
- Produced trachea for baby

Our Customers

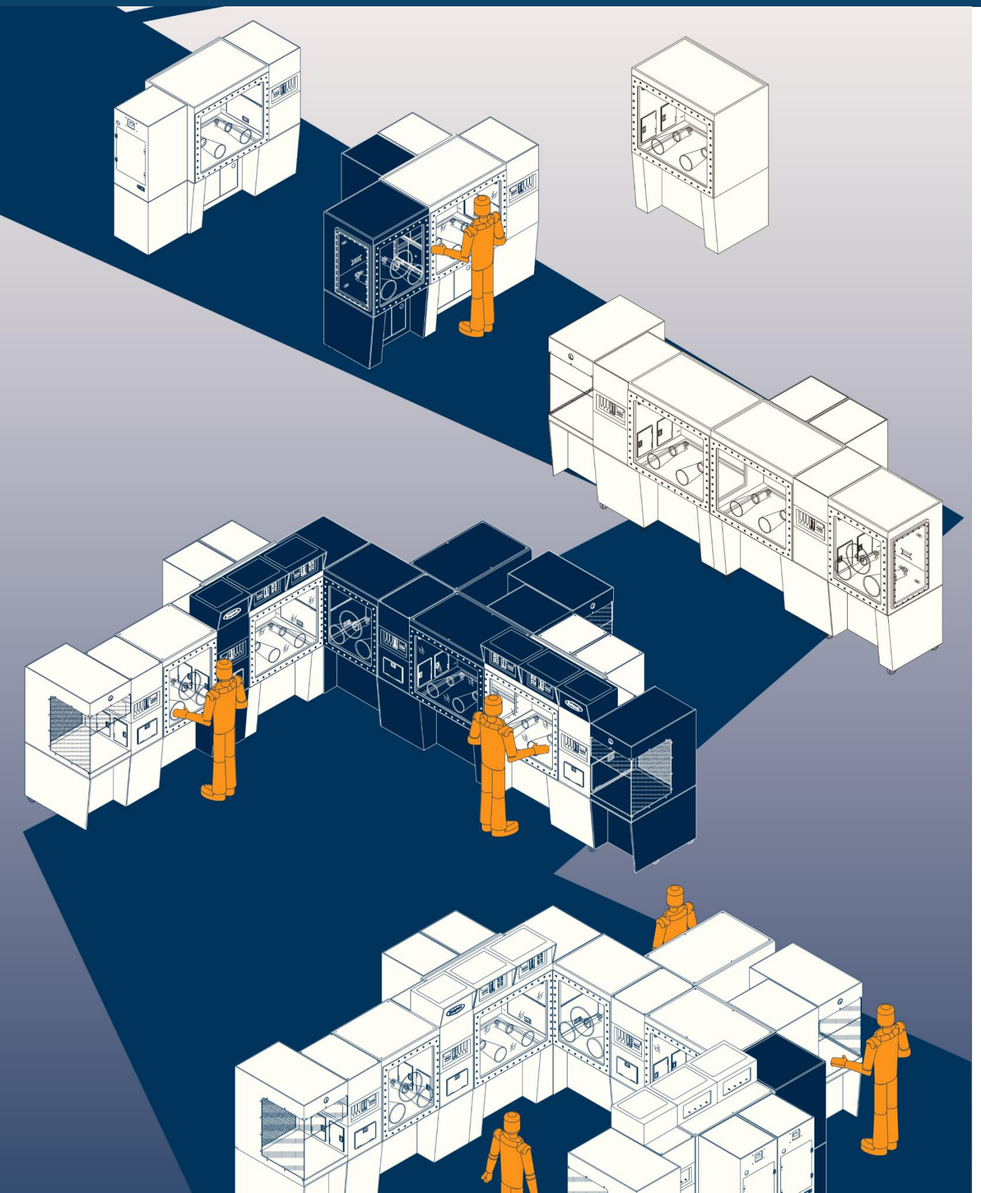
Xvivo Systems® are in locations across the world



The Xvivo System®

The Xvivo System environment is Cytocentric by design

Contact Us



Thank you!

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