GRGAN BANKING SUMMIT

PROGRAM GUIDE

Aug. 3-6, 2017 | Boston, MA









Co-organizers



The Center for Engineering in Medicine is headquartered at Massachusetts General Hospital and affiliated with Harvard and MIT.

Learn more at massgeneral.org/CEM



The American Society of Mechanical Engineers represents an engineering community of more than 140,000 members worldwide.

Learn more at asme.org



Charlotte Banks is a research initiative at the University of North Carolina Charlotte that aims to cryopreserve whole organs and large tissues.

Learn more at charlottebanks.org

Partners



Society for Cryobiology societyforcryobiology.org



X-therma, Inc. x-therma.com





Association of Organ Procurement Organizations aopo.org



International Institute for the Advancement of Medicine iiam.org

Supporters









Principal Organizer

The **Organ Preservation Alliance** is a 501(c)3 non-profit dedicated to catalyzing breakthroughs in organ and tissue preservation. Learn more at organpreservationalliance.org





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Background on the Summit: Meeting a Grand Challenge

The **Summit on Organ Banking through Converging Technologies** brings together scientists, engineers, key stakeholders from government and industry, and leaders from non-profits focused on human health, with the aim of addressing the challenge of banking organs and large tissue systems for transplantation, research, regenerative medicine, and other applications.

Together we will outline new and emerging research strategies that can overcome the remaining scientific sub-challenges in organ banking, with the hope of benefiting millions of patients each year worldwide.



See organpreservationalliance.org/media for more background information, e.g. in:

SCIENTIFIC AMERICAN™



U.S. Funds Efforts to Freeze Human Organs for Long-Term Storage





The Economist

Organ preservation

Wait not in vain

After decades of piecemeal progress, the science of cryogenically storing human organs is warming up
Feb 6th 2016 | From the print edition



AUGUST 3

Hyatt Regency Boston, 3rd floor Martha's Vineyard

AUGUST 4

Joseph B. Martin Conference Center, main auditorium

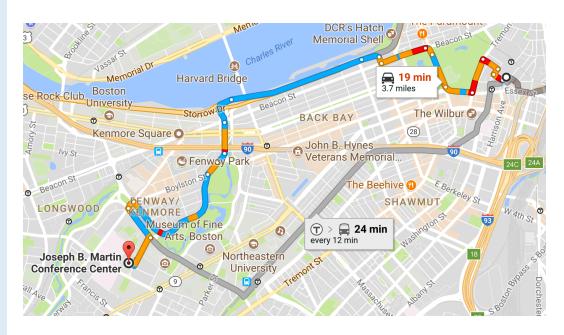
Shuttles available: Hyatt front lobby, starting at 8:00 a.m.

AUGUST 5

Hyatt Regency Boston, 4th floor ballroom terrace

AUGUST 6

Hyatt Regency Boston, 4th floor ballroom terrace



Joseph B. Martin Conference Center

Harvard Medical School, 77 Avenue Louis Pasteur Boston, MA 02115



Hyatt Regency Boston

1 Avenue de Lafayette Boston, MA 02111 Program Agenda and Description

Summit on Organ Banking through Converging Technologies: PART 1

The grand challenge of organ banking

Outlining unmet needs and setting goals for organ banking research



Organ and tissue preservation presents a crosscutting unmet need in biology and medicine. Diverse areas of public health would be transformed by advances in this field, spanning transplantation, tissue engineering and regenerative medicine, trauma care and emergency preparedness, cancer care, drug discovery, and basic biomedical research.

While the benefits of preservation advances vary across these areas, their needs can be met by a common set of technologies and research challenges. Just as agriculture, fertility, molecular biology, and other areas were revolutionized by the ability to cryopreserve and bank cells, much of biomedicine could be revolutionized by the ability to scale cryobanking to larger tissue systems and whole organs.

As one example, over 80% of the U.S. National Institutes of Health budget goes to institutes and centers whose missions are directly impacted by the "organ banking" research effort. This effort aims to make fundamental advances to extend preservation times across a variety of organ and tissue systems, combining advances

in cryopreservation, hypometabolism, ex vivo perfusion, and related areas.

During the Aug. 4 sessions, speakers from many of fields of biomedicine affected will discuss ways that this research effort can advance their respective areas. Special focus will be given to organ transplantation, which has already saved hundreds of thousands of patients through the heroic efforts of organ procurement organizations, the United Network of Organ Sharing, transplant centers, and others – even while facing severe logistical constraints imposed by organ preservation times that are measured in hours. Leaders across many aspects organ transplantation will discuss what organ banking could mean for the ability of this field to reach its lifesaving potential.

These speakers will be joined by experts in cryopreservation, ex vivo perfusion and other fields. Together they will outline needs and goals for organ banking research, setting the stage for a cohesive organ banking "Apollo Program" distributed across research labs and clinics worldwide.

Session 1: The grand challenge of organ banking

SESSION CHAIR AND MODERATOR:

Dr. Andrew Marshall

Chief Editor, Nature Biotechnology

LOCATION:

Joseph B. Martin Conference Center Ampitheater

9:00

Introduction: the promise of organ and tissue preservation to transform medicine

Jedediah Lewis

President and Chief Executive Officer, Organ Preservation Alliance

9:15

Organ banking 101

Crash course talk

Dr. Erik Woods

Past President, Society for Cryobiology

Chief Science Officer and Co-founder, Ossium Health

9:35

Is organ banking within reach?

Dr. Sebastian Giwa

Chairman and Co-founder, Organ Preservation Alliance, Sylvatica Biotech, Ossium Health

9:55

Achieving organ banking: proofs of principle and paths forward

Lightning talks and panel discussion

MODERATOR:

Dr. Andrew Marshall

Chief Editor, Nature Biotechnology

PANELISTS:

Dr. Helen Picton

Professor, Leeds University School of Medicine

Dr. Korkut Uygun

Assistant Professor, Harvard Medical School

Deputy Director of Research, Shriners Hospitals for Children

Dr. Greg Fahy

Chief Science Officer, 21st Century Medicine

Dr. Nir Shani

Director,
Microsurgery and Plastic
Surgery Lab,
Tel Aviv Sourasky Medical
Center

Dr. Shaf Keshavjee

Professor, University of Toronto Chief Medical Officer, Perfusix

Dr. Kenneth Storey

Professor,
Carleton University
Canada Research Chair
in Molecular Physiology

Dr. John Bischof

Professor, University of Minnesota 10:40

Enabling organ banking by combining the best of academia and the best of industry Dr. Mehmet Toner

Professor, Harvard Medical School

10:55

Networking Break Snacks and Beverages

Session 2: Steps toward realizing organ transplantation's full potential

SESSION CHAIR AND MODERATOR:

Dr. Joren Madsen
Director, Transplant Center, Massachusetts General Hospital
Past President, American Society of Transplantation
Associate Editor, American Journal of Transplantation

LOCATION:

Joseph B. Martin Conference Center Ampitheater

11:25

Fireside chat with Charity Sunshine Tillemann-Dick Charity Sunshine Tillemann-Dick

Professional opera singer Two-time double lung transplant recipient Dr. Sebastian Giwa

Chairman and Co-founder, Organ Preservation Alliance, Sylvatica Biotech, Ossium Health

11:50

Transforming transplantation through ex vivo preservation and organ banking Dr. James Markmann (recorded remarks)

Chief, Division of Transplantation, Massachusetts General Hospital

12:00

Bringing transplantation to new frontiers Dr. Gerald Brandacher

Scientific Director, Johns Hopkins Reconstructive Transplantation Program

12:10

Logistical needs in organ recovery and transplantation

Crash course talk

Elling Eidbo

Chief Executive Officer, Association of Organ Procurement Organizations 12:25

Taking advantage of increased organ preservation time: OPTN/UNOS perspectives Dr. David Klassen

Chief Medical Officer, United Network of Organ Sharing

12:40

Envisioning a new logistical framework for organ recovery and transplantation

Dr. Shaf Keshavjee

Professor, University of Toronto Chief Medical Officer, Perfusix

12:55

1:25

The impact of organ banking on transplantation

Panel discussion

MODERATOR:

Dr. Joren Madsen

Director, Transplant Center, Massachusetts General Hospital

Past President, American Society of Transplantation

Associate Editor, American Journal of Transplantation **PANELISTS:**

David Hartell

Executive Director, Canadian National Transplant Research Program

Dr. David Klassen

Chief Medical Officer, United Network of Organ Sharing

Dr. Shaf Keshavjee

Professor, University of Toronto Chief Medical Officer, Perfusix Elling Eidbo

Chief Executive Officer, Association of Organ Procurement Organizations

Dr. Gerald Brandacher

Associate Professor of Plastic and Reconstructive Surgery, Johns Hopkins School of Medicine

Dr. David Nelson

Chief of Heart Transplantation, Baptist Integris Medical Center

Lunch

Main Lobby

Session 3: Enabling diverse new technologies through organ banking

SESSION CHAIR AND MODERATOR:

Dr. Orla Smith **Editor**, *Science Translational Medicine*

LOCATION:

Joseph B. Martin Conference Center Ampitheater

2:20

Off-the-shelf xenotransplantation: making "organs on demand" a reality Dr. George Church

Professor, Harvard Medical School

2:40

Immune tolerance induction through organ banking: moving transplantation from a treatment to a cure

Dr. David Sachs

(recorded remarks) **Professor,**Columbia University

School of Medicine Professor Emeritus, Harvard Medical School

2:55

Envisioning new possibilities for regenerative medicine and research

Panel discussion

PANELISTS:

Rony Thomas

Chief Executive Officer, LifeNet Health

Dr. Wendy Dean

Medical Officer, Tissue Injury and Regenerative Medicine Program, U.S. Department of Defense

Dr. Anthony Letai

Associate Professor, Harvard Medical School

Dr. Claudia Zylberberg

Chief Executive Officer, Carleton University Akron Biotech

MODERATOR:

Dr. Orla Smith

Editor, Science Translational Medicine

Gina Dunne Smith

Executive Director, International Institute for the Advancement of Medicine

3:20

Department of Defense interest in tissue preservation and biomanufacturing

Dr. Wendy Dean

Medical Officer, Tissue Injury and Regenerative Medicine Program, U.S. Department of Defense

3:35	Increasing the quality and shelf-life of pancreatic islets: What we learned from encapsulation studies	Dr. Clark Colton Professor, Massachusetts Institute of Technology
3:50	Perspectives on ovarian	Dr. Helen Picton
	and testicular tissue cryopreservation	Professor, Leeds University School of Medicine
4:05	Networking Break Snacks and Beverages	

Session 4: Meeting a grand challenge

0_00	ON CHAIR AND MODERATOR: Dert Kruger Cell		LOCATION: Joseph B. Martin Conference Center Ampitheater
4:35	Fireside chat: How to think about large- scale challenges in biomedicine	Dr. Ed Boyden Assistant Professor, Massachusetts Institute of Technology 2016 Breakthrough Prize recipient	Dr. Robert Kruger Editor, Cell
5:05	Charlotte Banks: first steps toward building a convergence-based research program	Dr. Gloria Elliott Professor, University of North Carolina Charlotte Director, Charlotte Banks Research Initiative	
5:15	Launching an organ banking Apollo Program	Jedediah Lewis President and Chief Executive Officer, Organ Preservation Alliance	
5:30	Poster session, Networking and cocktails	Main Lobby New Research Building, Harvard Medical School	

Summit on Organ Banking through Converging Technologies: PART 2

The scientific deep dive

Designing an organ banking Apollo Program



These "deep dive" sessions have two objectives:

- 1. To allow those outside the field to become familiar with the remaining scientific and engineering challenges of organ banking. For instance, new researchers will gain knowledge they need to launch projects in the organ banking space, while potential funders, investors, and other supporters will gain an understanding of the kinds of projects they can help accelerate.
- 2. To allow researchers from diverse backgrounds to gain insight into each other's approaches and identify opportunities for collaboration. Speakers from within the fields of cryopreservation and organ preservation will give talks along with many researchers completely new to this challenge, integrating knowledge from many domains (engineering, physics, chemistry, cell and molecular biology, computational biology, pathology, etc.).

Talks are intended to be short, jargon-free, and kept at the level of an overview. The aim is to focus on articulating the overall approach, proofs of principle, and reasons for optimism that the approach could yield progress. At the end of every session, an interactive panel Q&A will allow for collaborative brainstorming among session speakers and audience members, with the main goal of (together) answering the question:

"How could these approaches and technologies be leveraged to create organ banking breakthroughs?"

Session 5: Limiting cryoprotectant and osmotic toxicity

SESSION CO-CHAIRS:

Dr. Janet Elliott Professor, *University of Alberta* Canada Research Chair in Thermodynamics

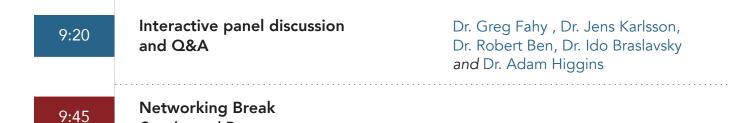
Associate Editor, Cryobiology

Dr. Greg Fahy
Chief Science Officer,
21st Century Medicine

LOCATION:

Hyatt Regency Boston 4th floor grand ballroom

8:00	Welcome, agenda, session format	Jedediah Lewis President and Chief Executive Officer, Organ Preservation Alliance
8:10	Ice formation and cryoprotectant toxicity in tissue cryopreservation Crash course talk	Dr. Janet Elliott Professor, University of Alberta Canada Research Chair in Thermodynamics Associate Editor, Cryobiology
8:30	Cooling injury in rabbit kidneys below -22°C	Dr. Greg Fahy Chief Science Officer, 21st Century Medicine
8:40	Mechanisms of intracellular ice formation in tissues	Dr. Jens Karlsson Professor, University of Villanova
8:50	Designing the next generation of cryoprotectants to meet the needs for emerging cellular therapies and tissue engineering	Dr. Robert Ben Professor, University of Ottawa
9:00	Ice-binding-proteins and their interaction with ice crystals	Dr. Ido Braslavsky Professor, Hebrew University of Jerusalem
9:10	Development of organ perfusion strategies to reduce CPA toxicity	Dr. Adam Higgins Associate Professor, Oregon State University



Snacks and Beverages

SESSION CHAIR:

Session 6: Strategies for controlling physical effects during organ cryobanking

LOCATION:

Dr. Yoed Rabin Professor, Carnegie Mellon University			Hyatt Regency Boston 4th floor grand ballroom
10:15	Physical effects in cryopreservation: an engineering approach Crash course talk	Dr. Yoed Ra Professor, Carnegie M	bin Iellon University
10:35	Nanoparticle heating for improved cell and tissue preservation	University o	nd Department Chair, of Minnesota
10:45	Ice-free vitrification of complex large tissues		rockbank utive Officer, ng Technologies
10:55	Thawing for cryopreserved tissues	Dr. Girish Sr Partner and TDA Resear	Director of Technology,
11:05	Factors affecting the success of organ cryobanking	Surgery Lab	icrosurgery and Plastic



Session 7: Nature-inspired induction of hypometabolism

SESSION CHAIR:

Dr. Kenneth Storey
Professor, Carleton University
Canada Research Chair in Molecular Physiology

organ procurement and storage

guided by physiological systems

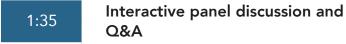
LOCATION:

Hyatt Regency Boston 4th floor grand ballroom

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12:35	Turning the switch to OFF: hypometabolism of organs at any temperature Crash course talk	Dr. Kenneth Storey Professor, Carleton University Canada Research Chair in Molecular Physiology
12:55	Hacking temperature to extend	Dr. Korkut Uygun
	and enhance preservation	Assistant Professor, Harvard Medical School
		Deputy Director of Research, Shriners Hospitals for Children
1:05	Partial freezing: a nature-inspired	Dr. Shannon Tessier
1.03	strategy for organ banking	Research fellow, Mehmet Toner Lab, Massachusetts General Hospital
1:15	Identification of non-coding RNAs	Dr. Pier Jr. Morin
1.13	modulated at low temperatures in animal models of cold adaptation	Associate Professor, Université de Moncton
1.25	Preserving vascular function during	Dr. Guillermo García-Cardeña

Associate Professor,

Harvard Medical School



Dr. Kenneth Storey, Dr. Korkut Uygun, Dr. Shannon Tessier, Dr. Pier Jr. Morin and Dr. Guillermo García-Cardeña

1:55

Break

Session 8: Protecting key biological systems during organ banking

SESSION CO-CHAIRS:

Dr. Janet Elliott Professor, *University of Alberta* Canada Research Chair in Thermodynamics

Associate Editor, Cryobiology

Break

2:45

Dr. Julie Stacey Editor-in-Chief, EBioMedicine

LOCATION:

Hyatt Regency Boston 4th floor grand ballroom

2:00	Cryopreservation of endothelial cells	Dr. Janet Elliott Professor, University of Alberta Canada Research Chair in Thermodynamics Associate Editor, Cryobiology
2:10	Copolymer surfactant catalyzed membrane sealing linked to reduction in interfacial tension	Dr. Raphael Lee Professor, University of Chicago
2:20	Cell adhesion and the cytoskeleton	Dr. David Calderwood Associate Professor, Yale School of Medicine
2:30	Interactive panel discussion and Q&A MODERATOR: Dr. Julie Stacey Editor-in-Chief, EBioMedicine	Dr. Janet Elliott, Dr. Raphael Lee and Dr. David Calderwood

Session 9: Enhancing stress tolerance and aiding tissue recovery

SESSION CHAIR:

Dr. John G. Baust **Professor,** Binghamton University, State University of New York

LOCATION:

Columbia University Medical Center

Hyatt Regency Boston 4th floor grand ballroom

3:15	Understanding cryoinjury and cell stress pathways Crash course talk	Dr. John G. Baust Professor, Binghamton University State University of New York
3:35	Enhancing stress tolerance and aiding recovery	Dr. John M. Baust Chief Executive Officer, CPSI Biotech
3:45	Utilizing the amino acid response to induce organ cytoprotection	Dr. Malcolm Whitman Professor, Harvard Medical School
3:55	Prophylactic treatment of ischaemically stored organs with novel organic carbon monoxide donor molecules	Dr. Ivan Sammut Associate Professor, University of Otago
4:05	Nanomedicine for improving cell and tissue preservation	Dr. Thomas Webster Professor and Department Chair, Northwestern University
4:15	Induction of synthetic lethality in glioblastoma	Dr. Markus Siegelin Assistant Professor,

4:25	Interactive panel discussion and Q&A	Dr. John G. Baust, Dr. John M. Baust, Dr. Malcolm Whitman, Dr. Ivan Sammut, Dr. Thomas Webster <i>and</i> Dr. Markus Siegelin
4:50	Break	
4:55	Breakthrough Ideas in Organ Banking Hackathon: Finalist Presentations	
5:40	Break	
7:30	Cocktail reception	4th floor foyer

Session 10: Unlocking a new world of transplant capabilities through organ perfusion platforms

SESSION CHAIR:

Dr. Barry Fuller **Professor,**University College London Medical School

LOCATION:

Hyatt Regency Boston 4th floor grand ballroom

8:00	Morning announcements	Jedediah Lewis President and Chief Executive Officer, Organ Preservation Alliance
8:05	Organ perfusion technologies - improving the physiology of transplant preservation and creating opportunities for organ cryopreservation? Crash course talk	Dr. Barry Fuller Professor, University College London Medical School
8:25	How to create and measure normal physiology outside of the body	Dr. Jayan Nagendran Assistant Professor and Director of Research, Division of Cardiac Surgery, University of Alberta
8:35	Ovine model of prolonged normothermic ex situ heart perfusion and support for 72 hours	Dr. Álvaro Rojas-Peña Assistant Research Scientist and Extracorporeal Life Support Laboratory Manager, University of Michigan
8:45	Novel, non-obvious applications of perfusion technology	Dr. Michael Taylor Chief Science Officer, Sylvatica Biotech

Dr. Klearchos Papas

University of Arizona College

Professor,

of Medicine

Gaseous oxygen perfusion as an

organ preservation method

8:55



Dr. Barry Fuller, Dr. Jayan Nagendran, Dr. Álvaro Rojas-Peña, Dr. Michael Taylor *and* Dr. Klearchos Papas

9:25

Networking Break Snacks and Beverages

Session 11: Assessing preservation needs and outcomes

SESSION CHAIR:

Dr. Jason Acker President, Society for Cryobiology Professor, University of Alberta

LOCATION:

Hyatt Regency Boston 4th floor grand ballroom

9:55	3D imaging of whole organs at single-cell resolution	Todd Huffman Chief Executive Officer, 3Scan
10:05	Measuring viability and functional status of tissues for transplantation	Dr. Clark Colton Professor, Massachusetts Institute of Technology
10:15	Should consideration be given to the role that donor factors may play in the cryobiological response of cells, tissues and organs?	Dr. Jason Acker President, Society for Cryobiology Professor, University of Alberta
10:25	Molecular mapping of tissue histological features by imaging mass spectrometry as a tool for tissue and organ transplant studies	Dr. Peggi Angel Assistant Professor, Medical University of South Carolina
10:35	Interactive panel discussion and Q&A	Todd Huffman, Dr. Clark Colton, Dr. Peggi Angel <i>and</i> Dr. Jason Acker

10:55 B

Break

Session 12: New tools for organ cryopreservation

SESSION CHAIR:

Dr. Ramón Risco Delgado Professor, Universidad de Sevilla Research Director and Founder, Safe Preservation

LOCATION:

Hyatt Regency Boston 4th floor grand ballroom

Pressure-aided preservation: adding thermodynamic

degrees of freedom

Dr. Brad Weegman

Lab Director, Sylvatica Biotech

XT-ViVo[™]-next generation natureinspired ice prevention for better biobanking Dr. Xiaoxi Wei

Chief Executive Officer, X-Therma

11:20

Avoiding recrystallization in organs by selective targeting of ice through magnetic ice-binding proteins

Dr. Ramón Risco Delgado

Professor, Universidad de Sevilla

Research Director and Founder, Safe Preservation

11:30

Non-newtonian, shear-thickening behaviour with cryoprotectant solutions

Dr. Peter Kilbride

Senior Research Scientist, Asymptote Ltd.

11:40

Interactive panel discussion and Q&A

MODERATOR:

Dr. Luis Alvarez

Director, Organ Manufacturing United Therapeutics Dr. Brad Weegman, Dr. Xiaoxi Wei,

Dr. Ramón Risco Delgado and

Dr. Peter Kilbride

12:00

Closing,

Hackathon winners announced

Notes:



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