Board of Regents
Committee on Economic Development and Technology Commercialization
12:30pm on June 4, 2020

Zoom Details to Be Provided to Committee Members
Public Listen-Only Access available at Dial in number - 1-443-353-0686, Conference ID - 299 678 831

Public Session Agenda

(1) Featured Innovator: UMB COVID Medical Device Challenge Grantee – Dr. Joe Friedberg, Head, Division of Thoracic Surgery (Information Item)

(2) USM COVID Response and Research & Innovation Task Force – Laurie Locascio, Vice President for Research, UMB and UMCP (Information Item)

(3) USM Office of Economic Development Update – Tom Sadowski, Vice Chancellor for Economic Development (Information Item)
   (a) Other USM COVID Updates
   (b) Momentum Fund Updates
   (c) Legislative Wrap-Up
   (d) Competitiveness Update
   (e) Venture Development Report
   (f) Strategic Plan

UNIVERSITY SYSTEM of MARYLAND

BOARD OF REGENTS

SUMMARY OF ITEM FOR ACTION
INFORMATION OR DISCUSSION

TOPIC: Featured Innovator: Dr. Joseph S. Friedberg – UMD School of Medicine

COMMITTEE: Economic Development and Technology Commercialization

DATE OF COMMITTEE MEETING: Thursday June 4, 2020

SUMMARY: Joseph S. Friedberg, MD FACS, who is a Charles Reid Edwards Professor of Surgery at the University of Maryland School of Medicine, Thoracic Surgeon-in-Chief at the University of Maryland Medical System, and Director of the University of Maryland School of Medicine Mesothelioma and Thoracic Oncology Center, will present information on his COVID-related research and innovation that involves converting the abdominal cavity into a "third lung". A grant through UM Ventures' Coronavirus Medical Device Challenge Program enabled the development of a prototype for testing.

ALTERNATIVE(S): This item is for information purposes.

FISCAL IMPACT: There is no fiscal impact

CHANCELLOR'S RECOMMENDATION: n/a

COMMITTEE RECOMMENDATION: DATE:

BOARD ACTION: DATE:

SUBMITTED BY: Tom Sadowski (410) 576-5742

Peritoneal Perfluorocarbon Perfusion: *Converting the Abdominal Cavity into a "Third Lung"*

Joseph S. Friedberg, MD

Charles Reid Edwards Professor of Surgery, University of Maryland School of Medicine
Thoracic Surgeon-in-Chief, University of Maryland Medical System
Director, University of Maryland School of Medicine Mesothelioma and Thoracic Onclogy Center

On Behalf of the University of Maryland School of Medicine & School of Engineering Third Lung Team

June 4, 2020

Disclosures

- Multiple patents
- Thoracic Surgery Editor for UpToDate
- Sporadic medical malpractice and expert witness work
- NIH mesothelioma-related grant funding
- UM Ventures and NSF Third Lung- related funding

- No conflicts related to this presentation

Requested Topics to be Covered in next 15 Minutes

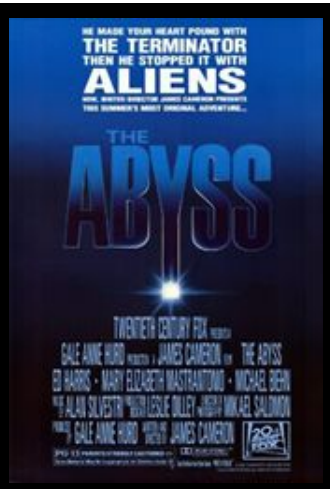
- My Background and that of the Team
- History of the project
- The unmet medical need being addressed
- Impact of University support
- Additional funding
- Current status of the project and future plans
- Commercialization potential

My Background

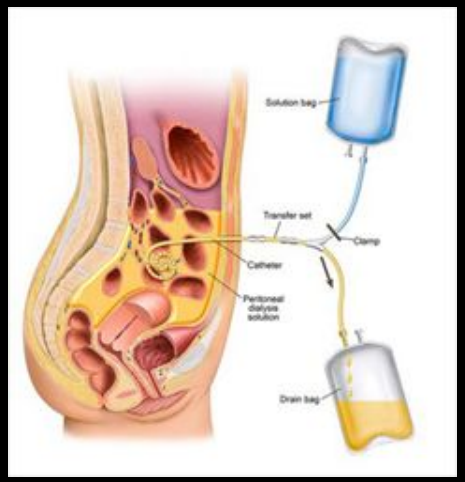
- *University of Pennsylvania* College of Engineering and Applied Science – *Bioengineering* (4.0 GPA)
- *Harvard Medical School* (Cum Laude) (**1 year research** as Grunebaum Research Fellowship with *Judah Folkman* (fetal small bowel transplants – Winner of Harvard Medical Soma Weiss Research Award)
- *Massachusetts General Hospital – general surgery* training (extra year at Mass Eye and Ear – ENT), **2 years of laboratory research** (projects - photodynamic therapy to selectively kill bacteria and artificial liver development)
- *Brigham and Women's Hospital – Cardiothoracic Fellowship* (1st matched General Thoracic Track Fellow
- Faculty positions, past 24 year
  - University of Pennsylvania – Faculty Thoracic Surgeon, Assistant Professor of Surgery
  - Thomas Jefferson University – Division Chief, Thoracic Surgery, Associate Professor of Surgery
  - *University of Pennsylvania - Thoracic Surgery Chief, Penn Presbyterian Medical Center, Professor of Surgery*
  - *University of Maryland (2015)* – Thoracic Surgeon-in-Chief UMMS, Charles Reid Edwards Professor UMSOM
- Achievements
  - International Recognition in *mesothelioma* treatment, as both a surgeon and researcher
  - Multiple: publications/presentations/editorial/positions/grants, leadership positions, clinical investigation roles
  - *Multiple Patents in multiple fields* (over 20 invention disclosures at Jefferson, over 100 invention disclosures at Penn)
  - *Multiple Scientific "firsts"*
  - Three sets of twins, Captain Penn Heavyweight Crew, Woodturned Chess Set won a prize at Hospital art show

Project History

- *The idea occurred to me in 1989 when I saw the John Cameron movie, The Abyss, while I was rotating on the MGH transplant service.*



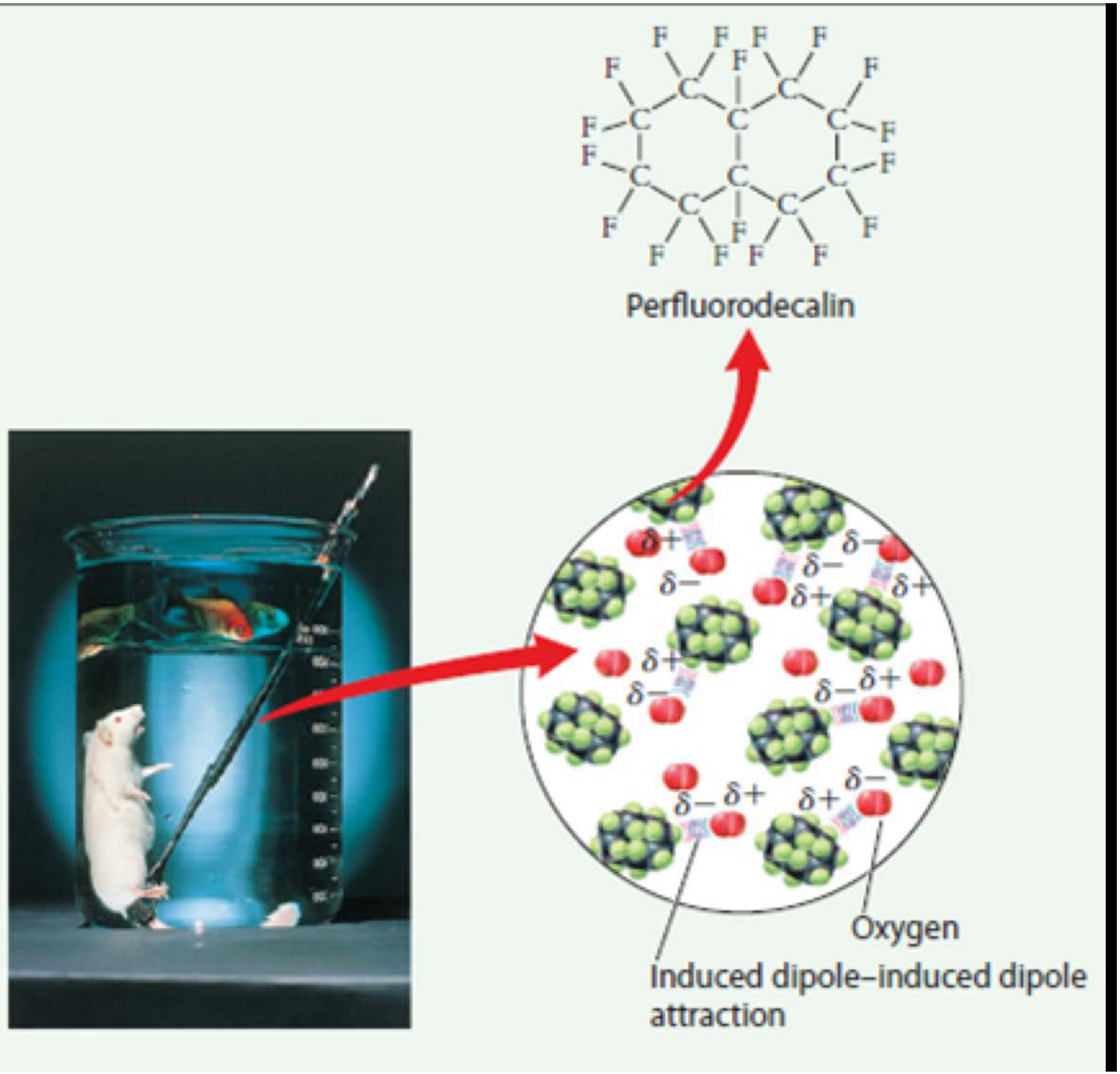
MGH 1811



If you can use the abdominal cavity like a kidney, could you use it like a lung?

Perfluorocarbons

- *Inert*, colorless, dense, nontoxic, fluorine-based organic compounds
  - Teflon, Gore-Tex
- Extraordinary gas dissolving properties
  - O_2: 500 ml/liter
  - CO_2: 2000 ml/liter
- Very safe
  - Liquid ventilation, blood substitute, intraocular applications



Unmet Medical Need

- The COVID-19 crisis highlights that patients with potentially recoverable lung injury will die if they exceed the support a mechanical ventilator can supply, particularly if extracorporeal membrane oxygenation (ECMO) is either not available or not an option
- COVID-19 Patients have an extraordinary mortality if they end up on the ventilator – are they particularly prone to ventilator-induced lung injury???

The NEW ENGLAND JOURNAL of MEDICINE

REVIEW ARTICLE

CRITICAL CARE MEDICINE

Simon R. Finfer, M.D., and Jean-Louis Vincent, M.D., Ph.D., *Editors*

Ventilator-Induced Lung Injury

Arthur S. Slutsky, M.D., and V. Marco Ranieri, M.D.

From the Keenan Research Center, Li Ka Shing Knowledge Institute, St. Michael's Hospital, and the Department of Medicine and Interdepartmental Division of Critical Care Medicine, University of Toronto — both in Toronto (A.S.S.); and Dipartimento di Anestesia e Medicina degli Stati Critici, Ospedale S. Giovanni Battista Molinette, Università di Torino, Turin, Italy (V.M.R.). Address reprint requests to Dr. Slutsky at St. Michael's Hospital, 30 Bond St., Toronto, ON M5B 1W8, Canada, or at slutskya@smh.ca.

This article was updated on April 24, 2014, at NEJM.org.

N Engl J Med 2013;369:2126-36.
DOI: 10.1056/NEJMra1208707

THE PURPOSE OF MECHANICAL VENTILATION IS TO REST THE RESPIRATORY muscles while providing adequate gas exchange. Ventilatory support proved to be indispensable during the 1952 polio epidemic in Copenhagen, decreasing mortality among patients with paralytic polio from more than 80% to approximately 40%.[1] Despite the clear benefits of this therapy, many patients eventually die after the initiation of mechanical ventilation, even though their arterial blood gases may have normalized.

This mortality has been ascribed to multiple factors, including complications of ventilation such as barotrauma (i.e., gross air leaks), oxygen toxicity, and hemodynamic compromise.[2,3] During the polio epidemic, investigators noted that mechanical ventilation could cause structural damage to the lung.[4] In 1967, the term "respirator lung" was coined to describe the diffuse alveolar infiltrates and hyaline membranes that were found on postmortem examination of patients who had undergone mechanical ventilation.[5] More recently, there has been a renewed focus on the worsening injury that mechanical ventilation can cause in previously damaged lungs and the damage it can initiate in normal lungs. This damage is characterized pathologically by inflammatory-cell infiltrates, hyaline membranes, increased vascular permeability, and pulmonary edema. The constellation of pulmonary consequences of mechanical ventilation has been termed ventilator-induced lung injury.

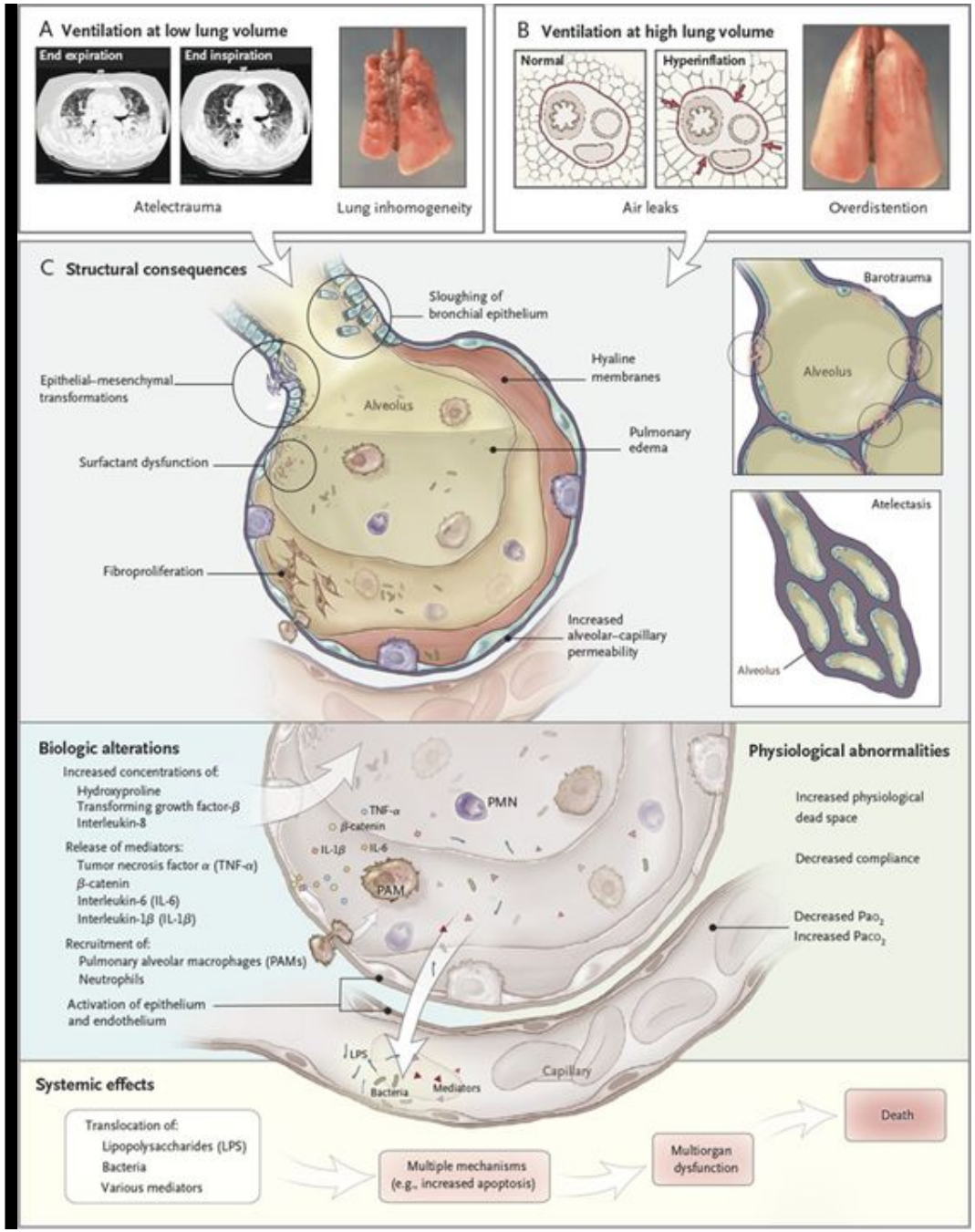
The concept of ventilator-induced lung injury is not new. In 1744, John Fothergill discussed a case of a patient who was "dead in appearance" after exposure to coal fumes and who was successfully treated by mouth-to-mouth resuscitation.[6] Fothergill noted that mouth-to-mouth resuscitation was preferable to using bellows because "the lungs of one man may bear, without injury, as great a force as those of another man can exert; which by the bellows cannot always be determin'd." Fothergill clearly understood the concept that mechanical forces generated by bellows (i.e., a ventilator) could lead to injury.

However, it was not until early in this century that the clinical importance of ventilator-induced lung injury in adults was confirmed by a study showing that a ventilator strategy designed to minimize such injury decreased mortality among patients with the acute respiratory distress syndrome (ARDS).[7] Given the clinical importance of ventilator-induced lung injury, this article will review mechanisms underlying the condition, its biologic and physiological consequences, and clinical strategies to prevent it and mitigate its effects.

PATHOPHYSIOLOGICAL FEATURES

PRESSURES IN THE LUNG

During a lifetime, a person will take approximately 500 million breaths. For each breath, the pressure necessary to inflate the lungs comprises the pressure to overcome airway resistance and inertance (a measure of the pressure gradient required



Unmet Medical Need

- The COVID-19 crisis highlights that patients with potentially recoverable lung injury will die if they exceed the support a mechanical ventilator can supply, particularly if extracorporeal membrane oxygenation (ECMO) is either not available or not an option
- COVID-19 Patients have an extraordinary mortality if they end up on the ventilator – are they particularly prone to ventilator-induced lung injury???
  - Could the Third Lung support patients who would die without some technique to supplement gas exchange?
  - Could the Third Lung mitigate ventilator-induced lung injury?

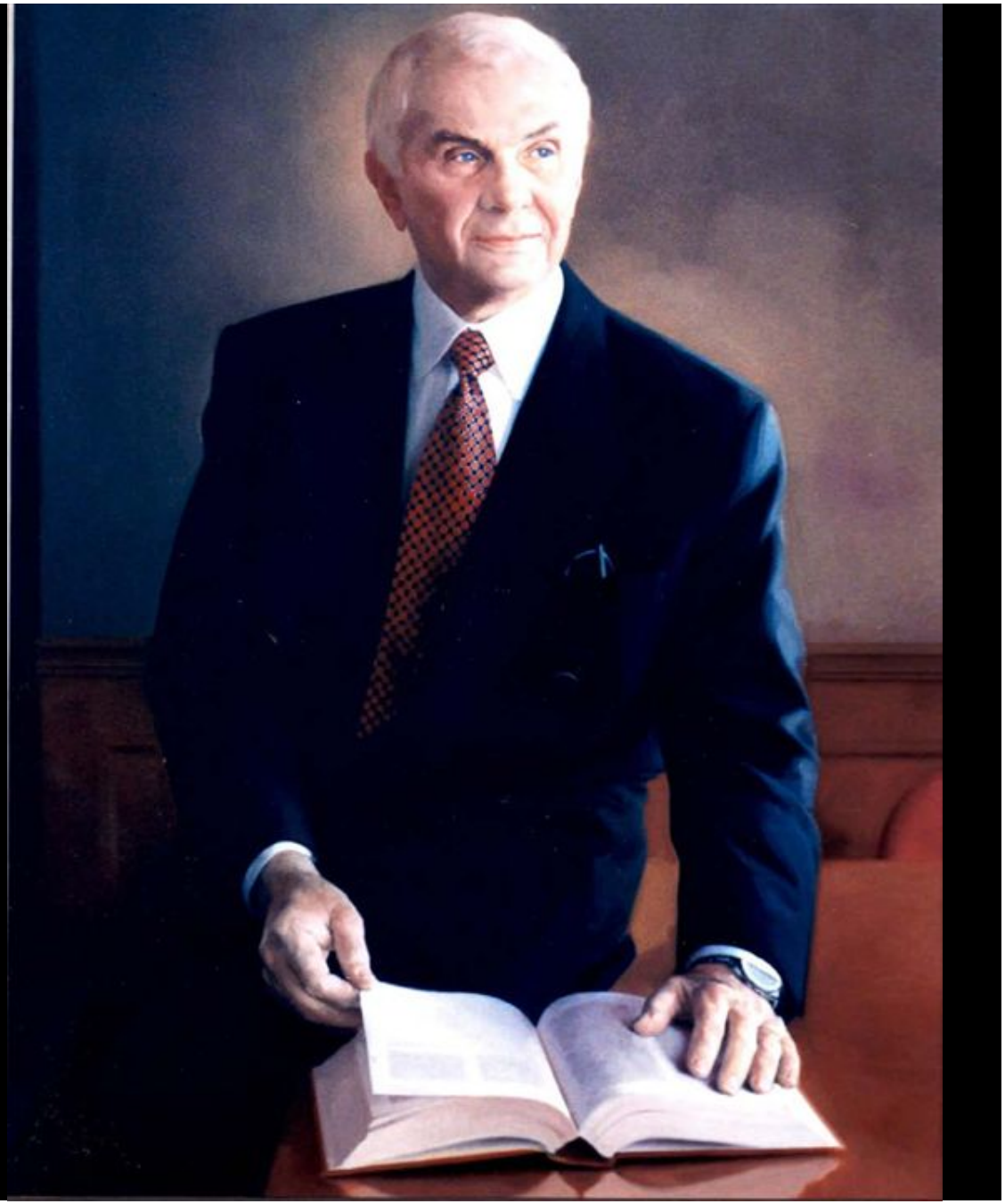
Project History

- The idea occurred to me in 1989 when I saw the John Cameron movie, *The Abyss,* while I was rotating on the MGH transplant service.
- *Around 2003 I was gifted 70 liters of perfluorocarbon.*

Jefferson™

THOMAS JEFFERSON UNIVERSITY

neuron Therapeutics, Inc.



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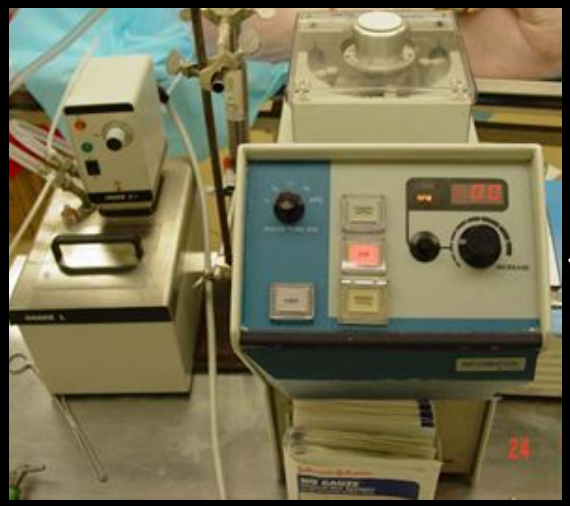
Peritoneal Perfusion Circuit in Large Animal Hypoxia Model



CHEST®

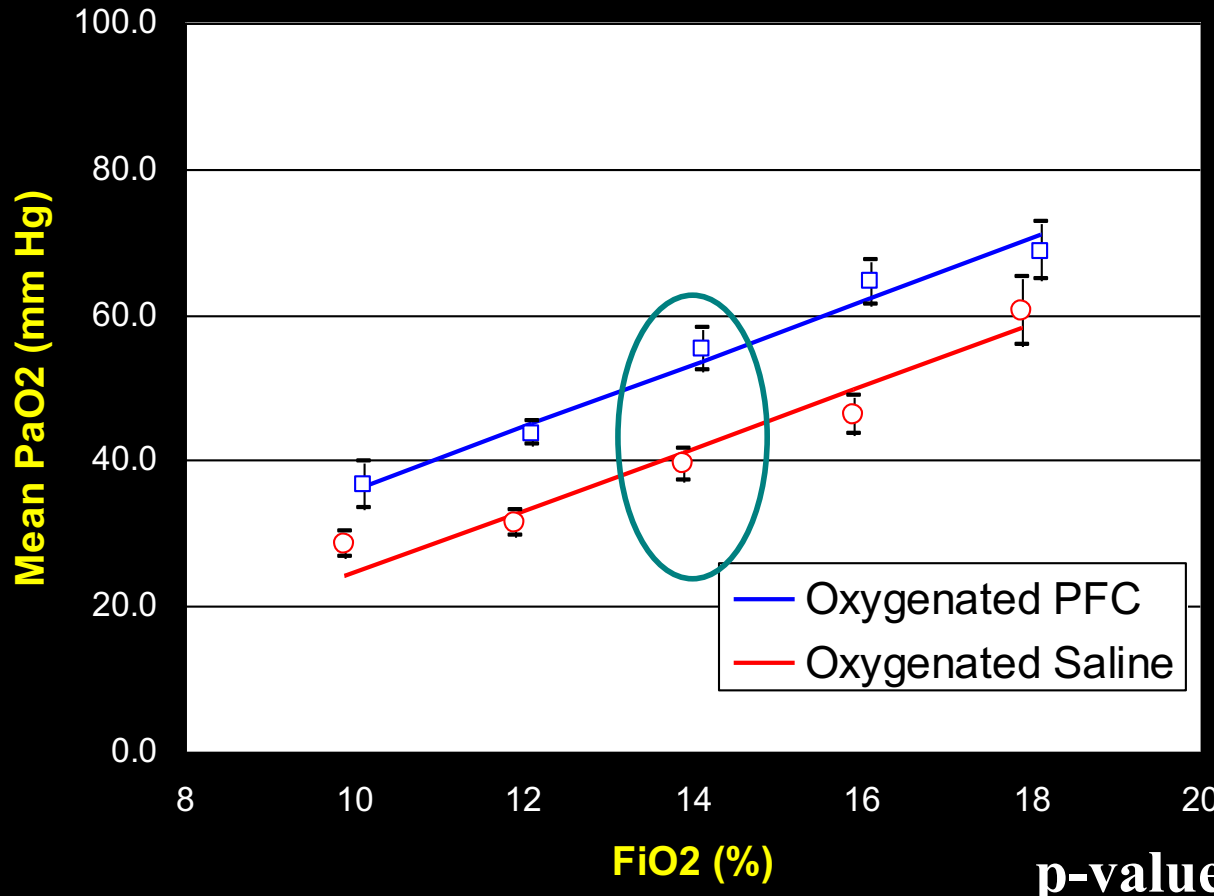
Official publication of the American College of Chest Physicians

Peritoneal Perfusion With Oxygenated Perfluorocarbon Augments Systemic Oxygenation

Shamus R. Carr, Joshua P. Cantor, Atul S. Rao, Thiru V. Lakshman, Joshua E. Collins and Joseph S. Friedberg

Chest 2006;130;402-411
DOI 10.1378/chest.130.2.402

Oxygenated PFC vs Oxygenated Saline

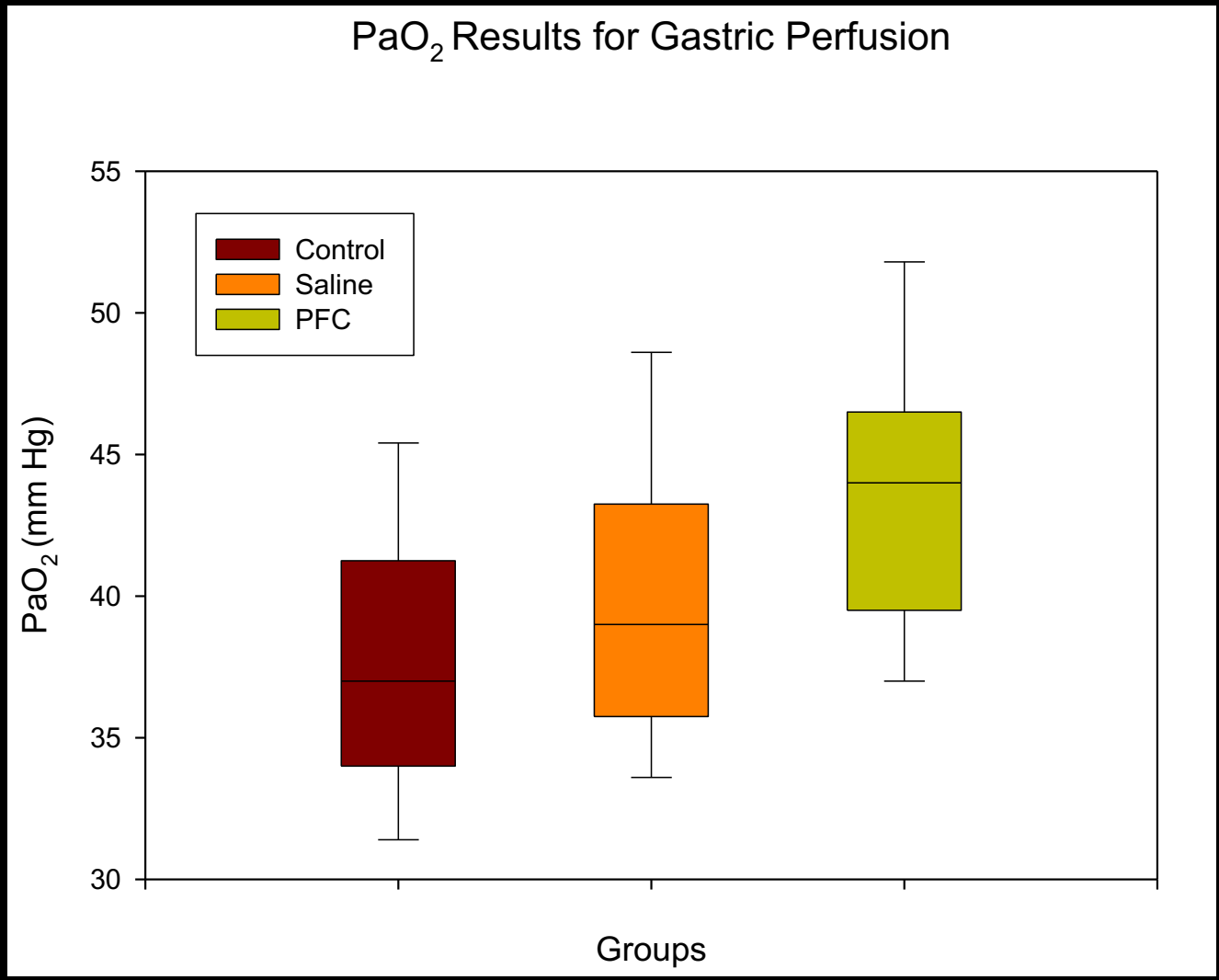


n = 15

p-value < 0.001

Oxygen Saturation increase from 73% vs 89%

Gastric Perfusion at an FiO_2 of 14%



N = 7

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- *Around 2006 I filed the project away when it looked like appropriate medical perfluorocarbons were off the market.*

Prospective, Randomized, Controlled Pilot Study of Partial Liquid Ventilation in Adult Acute Respiratory Distress Syndrome

Prospective, Randomized, Controlled Pilot Study of Partial Liquid Ventilation in Adult Acute Respiratory Distress Syndrome

RONALD B. HIRSCHL, MARTIN CROCE, DENNIS GORE, HERBERT WIEDEMANN, KEN DAVIS, JOSEPH ZWISCHENBERGER, and ROBERT H. BARTLETT, for the Adult Partial Liquid Ventilation Study Group

Supported by the Alliance Pharmaceutical Corporation.

Correspondence and requests for reprints should be addressed to Ronald B. Hirschl, M.D., University of Michigan Medical Center, F3970 Mott, Box 0245, 1500 E. Medical Center Dr., Ann Arbor, MI 48109-0245. E-mail: rhirschl@umich.edu

Am J Respir Crit Care Med Vol 165. pp 781–787, 2002
DOI: 10.1164/rccm.2003052
Internet address: www.atsjournals.org

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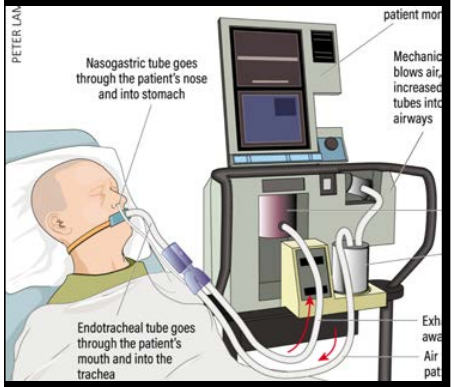
- *Between 2006 and a couple months ago, whenever I had a patient who I thought would benefit from this treatment, I would conduct a brief search of the internet to see if anyone was making the appropriate perfluorocarbon.*


Nasogastric tube goes through the patient's nose and into stomach
Endotracheal tube goes through the patient's mouth and into the trachea


Shanahan
"Have you tried searching under 'fruitless'?"

Project History

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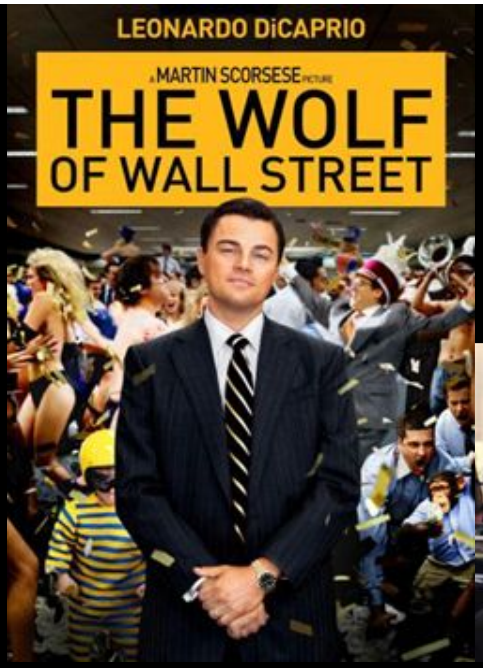
- Around 2006 I filed the project away when it looked like appropriate medical perfluorocarbons were off the market.
- Between 2006 and a couple months ago, whenever I had a patient who I thought would benefit from this treatment, I would conduct a brief search of the internet to see if anyone was making the appropriate perfluorocarbon.
- *A couple months ago, as the 2020 COVID-19 crisis evolved, I realized this treatment could potentially save lives so I sat down and scoured the internet until I found a company with a promising perfluorocarbon.*



Identified an instructional video on persuasive telecommunciations

APF-140HP: Currently available in metric tons, can be purchased at Medical Grade, and can be produced in unlimited quantities if demand exists

Perfluorodecalin

Products => Perfluorodecalin

Perfluorodecalin ($C_{10}F_{18}$)

FluoroMed Trade Name: APF-140HP

FluoroMed APF-140HP is a controlled mixture of isomers of perfluorodecalin and other perfluorinated C10 compounds. APF-140HP is currently available as a Cosmetic-Grade (external use only) and Research Grade (not suitable for use in humans except under an approved protocol and available in sterile or non-sterile filled containers.)

Typical Physical Characteristics

Boiling Range	140 – 143 °C
Pour Point:	0 °C
Liquid Density, 25 °C:	1.93 g/ml
Vapor Density, (air = 1):	16
Vapor Pressure, 25 °C:	6.25 torr
Thermal Conductivity, 25 °C	0.58 cal/hr cm °C
Average Molecular Weight:	462
Heat of Vaporization:	16.1 cal/g
Kinematic Viscosity, 25 °C:	2.94 cSt
Surface Tension, 25 °C:	19.3 dynes/cm
Coefficient of Expansion:	0.0010 cm^3/cm^3 °C
Refractive Index, 25 °C:	1.31*
Oxygen Solubility, 25 °C:	49 ml O_2/100 ml
Dielectric Strength, 25 °C:	>33 kV (2.5 mm gap)*
Ozone Depletion Potential:	0 (Relative to Freon 22)

*Estimated Value

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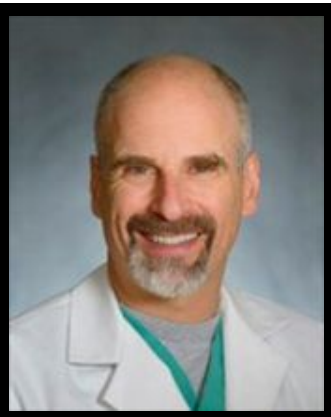
- A couple months ago, as the 2020 COVID-19 crisis escalates, I realize this treatment could potentially save lives, so I sit down and scour the internet until I find a company with a promising perfluorocarbon.
- *With the enabling compound available, I start drawing and networking.*

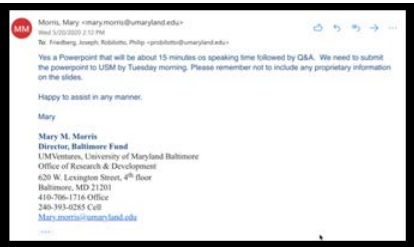
Medical Team

- Artificial Lung Research Advisors/Collaborators
  - Bart Griffith MD
  - Jon Wu PhD
- Critical Care Consultant/Advisor
  - Tom Scalea MD
- Core Medical Team
  - Gregory Bittle, MD
  - Whitney Burrows, MD
  - Melissa Culligan, RN, MS, PhD candidate
  - Joseph Friedberg, MD
  - Warren Naselsky, MD
  - Chethan Pasrija, MD

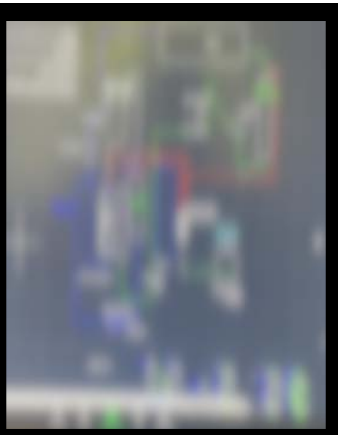
Engineering Team

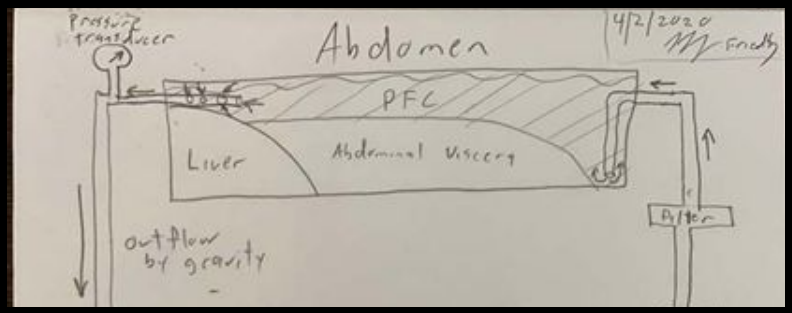
- Kevin Aroom, Research Engineer, Fischell Institute for Biomedical Devices
  - Areas of expertise: biomedical devices and systems
- Majid Aroom, Faculty Specialist and Machine Shop Director, Mechanical Engineering Department
  - Areas of expertise: engineering system design and prototyping
- Hosam Fathy, Professor of Mechanical Engineering
  - Areas of expertise: system dynamics and control; energy systems
- Jin-Oh Hahn, Associate Professor of Mechanical Engineering
  - Areas of expertise: system dynamics and control; biomedical systems
- Henry (Hank) Haslach, Research Professor in Mechanical Engineering
  - Areas of expertise: tissue mechanics and biomedical engineering
- Chandra Thamire, Principal Lecturer in Mechanical Engineering
  - Areas of expertise: product development, mechanical and thermal design systems, manufacturing, and biomedical –device design involving thermal and mass transport

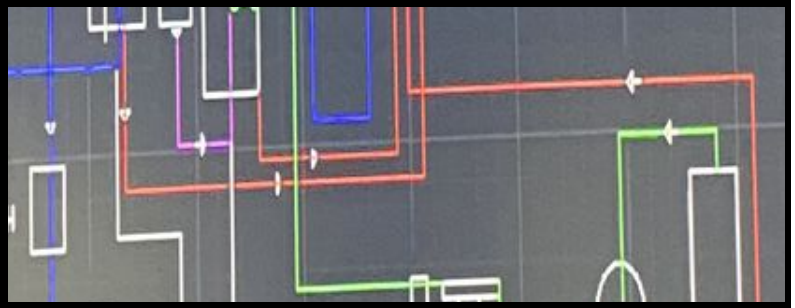


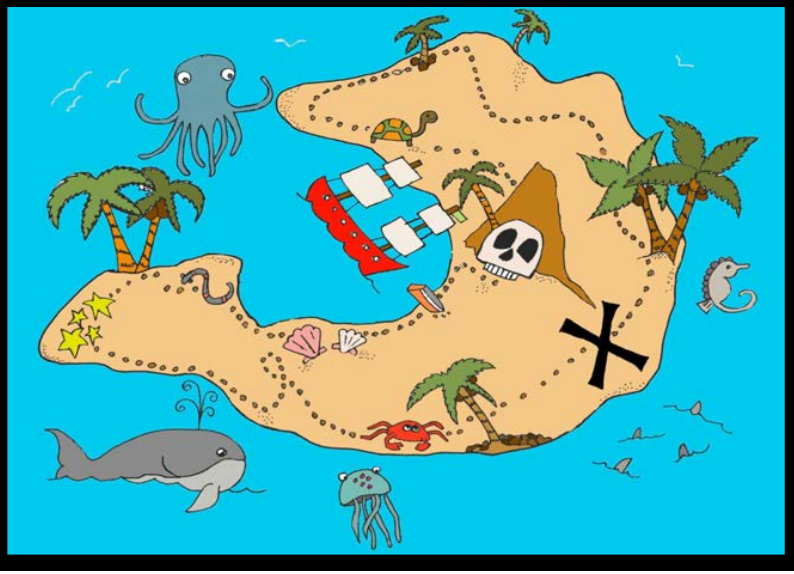


"Please remember not to include any proprietary information on the slides."









Where are we now?

- Absolutely incredible collaboration established
- Emergency privileges to conduct research obtained from the Dean of UMSOM and the President of UMB
- IAUCUC approved for large animal studies
- 20 liters of gifted PFC has been shipped
- Prototype circuit completed and ready for testing – UM Ventures grant made this possible!
- 3 Grant applications submitted:
  - UM Ventures – awarded
  - National Science Foundation – awarded
  - UMB-ICTR – awaiting announcement

What's next?

- Test circuit in engineering lab
- Conduct first set of animal experiments
  - Evaluate circuit performance.
  - Does the currently available perfluorocarbon work?
- NSF grant focus – will this remove carbon dioxide, or just add oxygen?
- MPOWER COVID-19 Response, NIH R21, and DOD grant applications all being prepared, with overarching research plan to rigorously evaluate this technology.
- Commercialization?
  - ***Incredible*** Team already established.
  - Need exists, but too early to speculate on potential population.
  - So, commercialization? Not currently our focus but maybe, hopefully, too soon to say.

Thank You

- Hosam Fathy
- Warren Naselsky
- Melissa Culligan
- Jon Wu
- Bart Griffith
- Tom Scalea
- Dean Reece
- Dean Kaper
- Webb Bailey
- Tim Juhlke
- Jin-Oh Hahn
- Hank Haslach
- Chandra Thamire
- Balakumar Balachandran
- Don DeVoe
- Dustin Lee
- Ned Kriel
- Matt Poland
- Jocelyn Klucar
- Alex Wang
- Whit Burrows
- Greg Bittle
- Brian McCormick
- Jim Gammie
- Steve Roller
- Phil Robilotto
- Ric Hughen
- Chethan Pasrija
- Kevin Aroom
- Majid Aroom

?'s – jfriedberg@som.umaryland.edu

UNIVERSITY SYSTEM of MARYLAND

BOARD OF REGENTS

SUMMARY OF ITEM FOR ACTION
INFORMATION OR DISCUSSION

TOPIC: USM COVID Research & Innovation Task Force

COMMITTEE: Economic Development and Technology Commercialization

DATE OF COMMITTEE MEETING: Thursday June 4, 2020

SUMMARY: Laurie Locascio, Vice President for Research for the University of Maryland, College Park and the University of Maryland, Baltimore, will present an update on the COVID Research & Innovation Task Force for which she is the Chair. USM Chancellor Jay A. Perman announced the formation of the COVID Research & Innovation Task Force in April. The task force is leveraging and mobilizing systemwide research and innovations to engage policymakers, business leaders, and the entrepreneurial community in addressing the COVID-19 pandemic.

ALTERNATIVE(S): This item is for information purposes.

FISCAL IMPACT: There is no fiscal impact

CHANCELLOR'S RECOMMENDATION: n/a

COMMITTEE RECOMMENDATION: DATE:

BOARD ACTION: DATE:

SUBMITTED BY: Tom Sadowski (410) 576-5742

UNIVERSITY SYSTEM of MARYLAND | COVID RESEARCH & INNOVATION TASK FORCE

Briefing for Regents Committee for Economic Development Tech Commercialization

Laurie Locascio

June 4, 2020

UNIVERSITY SYSTEM of MARYLAND

University System of Maryland

USM COVID Research & Innovation Task Force

Mission
Leverage and mobilize systemwide research and innovations that will engage policymakers, business leaders, and the entrepreneurial community in addressing the COVID-19 pandemic

Steering Committee
UMB, UMCP, UMBC, USM and UMD School of Medicine

Four Pillars of COVID Response Effort
Convene and Connect
Coordinate –Leverage capabilities, note gaps, redundancies and present/emerging opportunities
Identify Resources –Seed Grants, State/Federal Assistance, Industry partnerships
Amplify –Tell comprehensive story in sustained and purposeful manner

Strategic Purpose/Objectives
Mobilize Resources for Positive Impact
Look Long-term and Best Prepare USM to Address Future Pandemics/Crisis
Build awareness of USM's research and development projects centered on COVID-19
Foster Collaboration, both internal and external to USM

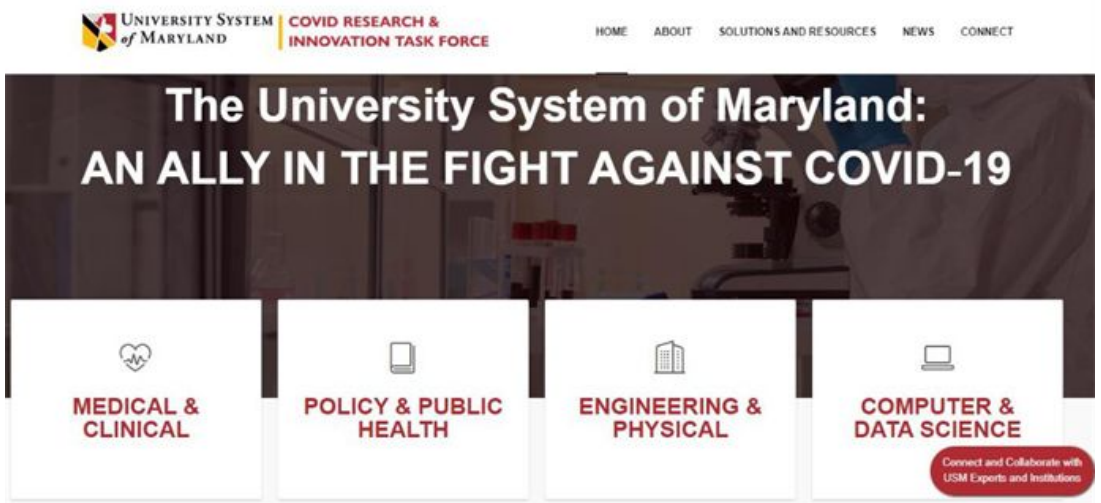
University System of Maryland

USM COVID Research & Innovation Task Force

One Stop for the System

Website https://www.usmd.edu/covid-taskforce/ shows projects to date and encourages collaboration.

Several connections made already between universities and industry partners



3

University System of Maryland

USM COVID Research & Innovation Task Force

Medical and Clinical COVID Response (Examples)

Watch

Testing Vaccine Candidates

Center for Vaccine Development and Global Health School of Medicine

University of Maryland, Baltimore

University of Maryland Baltimore

Read More

Researchers at the University of Maryland School of Medicine became the first in the U.S. to begin testing experimental COVID-19 vaccine candidates developed by Pfizer and BioNTech. The research, funded by Pfizer Inc., will study the safety, efficacy, and dosing of an experimental mRNA -based vaccine.

MARYLAND

Stem cells tested in trial as potential therapy for coronavirus

By Meredith Cohn

Researchers at the University of Mary- pating in therapy patients ng on in e testing ew ones, the co- lesoblast develops

ventilators at Mount Sinai Hospital in New York found that 10 of them survived and nine were removed from the ventilators in a median of 10 days, Mesoblast announced in late April. The compassionate-use study involved two infusions of remestemcel-L, and the results were significantly better than in the patient pool in other hospitals in hard-hit New York City at the time, the company said.

"The remarkable clinical outcomes in these critically ill patients continue to underscore the potential benefits of remestemcel-L as an anti-inflammatory

Read More

- Treatment and Testing
- Clinical Trials and Research

More from UMB School of Medicine here

4

University System of Maryland

USM COVID Research & Innovation Task Force

Policy and Public Health COVID Response (Examples)

Analyzing Complex Health Services Issues

The Hilltop Institute

University of Maryland, Baltimore County

UMBC

Working closely with the Maryland Department of Health, the Hilltop Institute is providing data analysis and operational support to the Maryland Medicaid program in response to the COVID-19 pandemic. Their analysis will identify Medicaid participants most at risk due to underlying health conditions or interruptions in support services.

Jennifer D. Roberts and Colleagues Receive RAPID Grant to Study COVID-19 Risk Perceptions and Behaviors

May 4, 2020 - A team of researchers, including School of Public Health's Jennifer D. Roberts, received a National Science Foundation RAPID grant to study COVID-19 risk perceptions and behaviors.

NSF's Rapid Response Research (RAPID) program funds proposals that require a quick-response to research on disasters and unanticipated events. In late March, the program began accepting proposals to investigate the spread of COVID-19 and to encourage the development of processes and actions to address this global challenge.

Read More

More from UMCP School of Public Health here and here

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USM COVID Research & Innovation Task Force

Engineering COVID Response (Examples)

CAMPUS & COMMUNITY

Incubator Hatches COVID-19 Solutions

UMD-Supported Business Development Facility Creating Ventilators From Breast Pumps Along With Masks, Shields to Fill Need

By Sala Levin '10 / Apr 15, 2020

Read More

Mobile Testing Booths

Read More

Project Leads: Axel Krieger, Kevin Aroom (Robert E. Fischell Institute for Biomedical Devices, Department of Mechanical Engineering, Maryland Robotics Center)

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Designing Next-Gen Equipment And Processes

Robert E. Fischell Institute for Biomedical Devices, A. James Clark School of Engineering (UMD) & School of Pharmacy (UMB)

University of Maryland, College Park
University of Maryland, Baltimore

Read More

Researchers from the two universities are collaborating to determine if a gamma irradiation sterilization process can be used to prolong the lifetime of N95 respirators.

More from UMCP School of Engineering here

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USM COVID Research & Innovation Task Force

Data Science COVID Response (Examples)


Sections

The Washington Post
Democracy Dies in Darkness

Transportation

Smartphone data shows out-of-state visitors flocked to Georgia as restaurants and other businesses reopened

Read More


CORONAVIRUS

University of Maryland partnering with Facebook to help collect coronavirus data for research efforts

By DANIEL OYEFUSI
BALTIMORE SUN | APR 30, 2020

Read More

Tracking Ventilator Usage

Eastern Shore Regional GIS Cooperative

Salisbury University

Salisbury University

The Salisbury University -affiliated Eastern Shore Regional GIS Cooperative has partnered with Peninsula Regional Medical Center to create an online dashboard with information on the number of ventilators in the Maryland/Washington D.C. area in reserve, the number of patients currently intubated and more. The dashboard will assist decision-makers with resource distribution as the pandemic continues.

Read More

Data response and response across many other fields at UMCP here.

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USM COVID Research & Innovation Task Force

Institutional Support for COVID Response

USM institutions are seeding research and technology development. Researchers are able to answer federal calls. Technology is better primed for clinical development and use.

- **Research:** UMCP and UMB both launched COVID research seed grants. For example, UMCP awarded 9 projects across a variety of disciplines.

- **Technology Development:** UMCP and UMB partnered to pivot a medical device development fund to support medical devices related to COVID response.

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USM COVID Research & Innovation Task Force

Task Force Support for COVID Response: COVID Response App Challenge

- Promoting individuals across the USM community, from students to startups, to develop mobile application solutions that help bring Marylanders together to more effectively respond to COVID-19 and future pandemics.
- Apps can support first responders/healthcare workers, educators, or other essential personnel, enable a safe return to social interaction and work, connect Marylanders with needed services and resources, or in other ways enable Marylanders to emerge from this crisis more united and stronger.
- Support and engagement with AWS and IBM
- Closes June 28; Winners Announced July 3
- More Information on the Task Force Website: https://www.usmd.edu/covid-taskforce/.

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USM COVID Research & Innovation Task Force

Task Force Support for COVID Response: Medium- and Long-Term

- Several other projects in development for medium- and long-term response and preparedness.
- Discussion with potential industry and government partners is underway, in conjunction with state supporters such as the Maryland Tech Council and Maryland Department of Commerce.
- Serves as a model for “three legged stool” university-industry-government interactions beyond pandemic preparedness.

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BOARD OF REGENTS

SUMMARY OF ITEM FOR ACTION
INFORMATION OR DISCUSSION

TOPIC: USM Office of Economic Development Update

COMMITTEE: Economic Development and Technology Commercialization

DATE OF COMMITTEE MEETING: Thursday June 4, 2020

SUMMARY: Vice Chancellor Tom Sadowski will provide a comprehensive update of USM Economic Development initiatives and related activities, to include: the USM Momentum Fund, strategic legislative priorities, and USM's Competitiveness Effort. Venture Development Director Lindsay Ryan will provide an update on USM Venture Development activities and related metrics to be incorporated as part of the USM Strategic Plan update.

ALTERNATIVE(S): This item is for information purposes.

FISCAL IMPACT: There is no fiscal impact

CHANCELLOR'S RECOMMENDATION: n/a

COMMITTEE RECOMMENDATION: DATE:

BOARD ACTION: DATE:

SUBMITTED BY: Tom Sadowski (410) 576-5742

USM Economic Development

Briefing for Regents Committee for Economic Development Tech Commercialization

June 4, 2020

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USM Economic Development
Agenda

- Other COVID-19 Updates
- Momentum Fund
- Legislative Session Wrap-Up
- USM Competitiveness
- Venture Development Report
- USM Strategic Plan

COVID-19 Updates

PPE Contributions – Large Scale

Manta Biofuel, founded by UMD/UMCES alum Ryan Powell, uses UMCES technology to convert algae into fuel. They have rapidly pivoted their manufacturing base to produce protective face shields for the Covid-19 response. Manta has scaled production to 6,500 units per week and is targeting a manufacturing capacity to 42,000 units/week. They are providing 25,000 units to Montgomery County and are actively looking for partners get the shields where they are needed most. *https://mantabiofuel.com/* | *Ryan Powell* | *ryan@mantabiofuel.com*

Potomac Photonics, a bwTech@UMBC company, was able to rapidly reconfigure our micro manufacturing equipment to fabricate 1,000's of PPE that are being shipped to hospitals in MD, NY, MA, FL, and more. They are providing Face Shields for the entire DC Fire Department. All materials and services so far have been donated. They also contributed $5,000 to UMBC Stay Black and Gold Emergency Fund. Finally, they are partnering with several customers to enable them to fabricate miocrofluidic devices related to the Covid-19 virus. *www.potomac-laser.com* | *Mike Adelstein* | *madelstein@potomac-laser.com*

DiPole Materials, Inc. and UMB partnered to speed Associate Professor Jerimy Polf's N95 mask concept to market. Polf's design uses readily available 3D printers to make a frame to hold filters in place. Filters were in short supply; however, DiPole Materials, a Baltimore manufacturer, was able to produce the perfect filter for Polf's mask and in the process supply hundreds of thousands of filters into the Maryland region. Collaborating with USM was nothing new for DiPole Materials which launched its first commercial product, a scaffold for tissue engineering, based on MIPS work done at UMBC in 2017. *https://www.dipolematerials.com/* | *Ken Malone* | *ken.malone@earlycharm.com*

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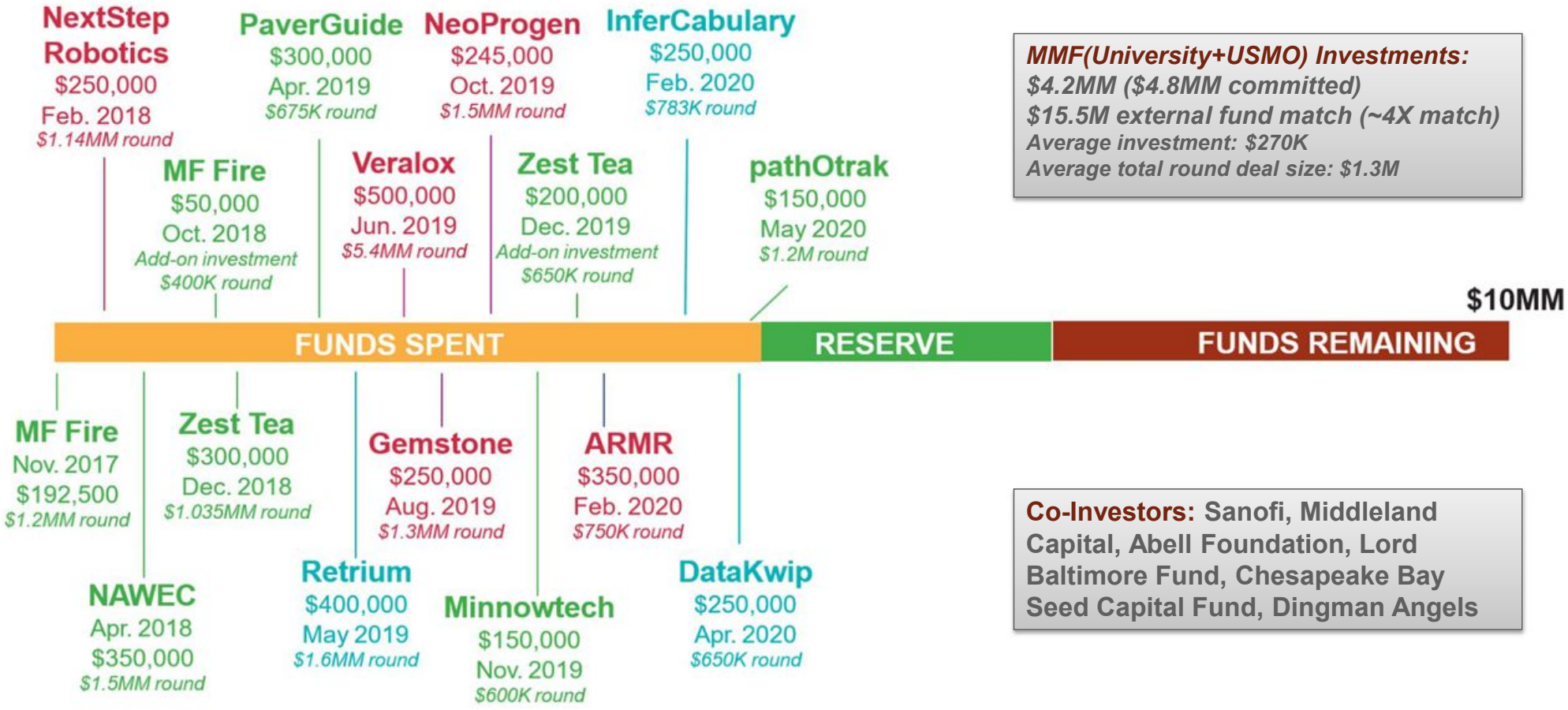
COVID-19 Updates

Identifying Other Opportunities to Support Response

- Federal
  - U.S. Dept of Commerce (EDA, OEA, SBA)
  - National Science Foundation
- State (USM, Commerce, DOL)
  - Select local jurisdictions
- Industry (AWS, IBM, CareFirst, Lockheed)
  - MD Technology Council

USM Momentum Fund

Investments



MMF(University+USMO) Investments:
$4.2MM ($4.8MM committed)
$15.5M external fund match (~4X match)
Average investment: $270K
Average total round deal size: $1.3M

Co-Investors: Sanofi, Middleland Capital, Abell Foundation, Lord Baltimore Fund, Chesapeake Bay Seed Capital Fund, Dingman Angels

USM Momentum Fund

Portfolio Companies

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UMCP IP and Alum
World's most advanced wood burning stove

UMB IP, Towson Alum
Exoskeleton robot to reverse foot drop for stroke victims.

UMCP IP, Alum
Advanced pulse jet engine

UMCP Alum
High caffeine tea, energy drink product

UMCP IP
Advanced semipermeable pavement system

UMCP Alum
Agile software development management product

UMBC and UMCP Alums
Tissue regeneration via stem cells

UMB IP and Alum
Anticoagulant drug, therapeutics for rare blood disorders

UMB IP and Faculty
Cell-based therapy for cardiovascular disease

UMCES Alum
Sonar to measure shrimp biomass

BioPark Tenant
Next-gen tourniquet

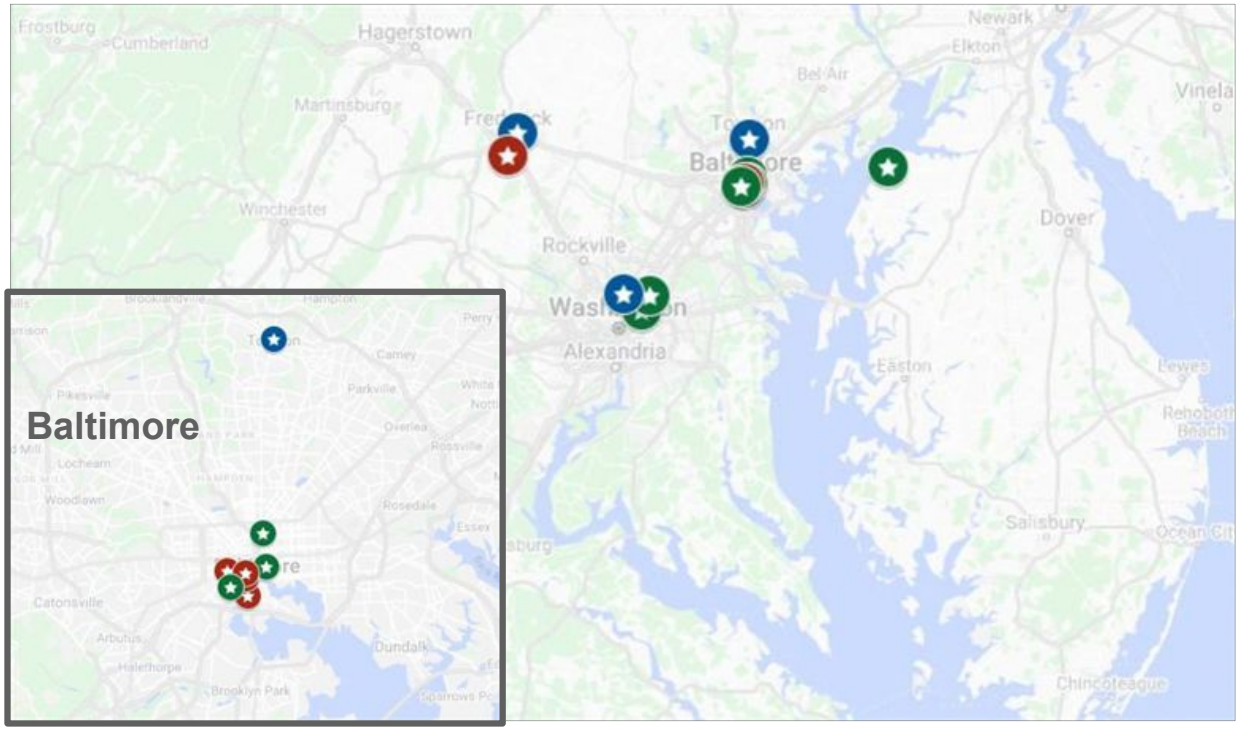
Towson Alum,
TU Incubator startup
Ed-tech vocabulary app

UMCP Alum
Software platform to manage energy across buildings

UMCP IP and Faculty
Food safety testing technology

USM Momentum Fund

Benchmarking: Geographic Spread



Red = Life Science Green = Hardware/Product Blue = Software

- 3 of 15 (20%) of portfolio companies are outside the DC/Baltimore corridor
- This is comparable to other seed investors in Maryland.
- However, angel investments go to a greater percentage of companies “outside the corridor” and may point to another avenue to increase geographic diversity of investments.

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2020 Legislative Session Wrap-Up

Maryland Technology Infrastructure Fund / Partnership Program (SB 602/HB 1239) *

- Enhancement of TEDCO authority to manage fund and invest in innovation infrastructure projects
- Target projects will offer 3x-4x external investment to match state funding
- Worked with Gov's Office, legislative leadership, TEDCO, MD Commerce and JHU
- $10 million allocated in Governor's supplemental budget contingent on passage of bill

**** Bill was to be addressed in May Special session, no such session was held***

Small Business Innovation Research (SBIR) Grant Assistance – *PASSED, BECAME LAW*

- Authorizes TEDCO to provide State matching funds and provide technical assistance to companies pursuing federal grants to further develop and scale technologies
- Testimony offered House and Senate; passed by both chambers and sent to Governor

Maryland E-nnovation Initiative Fund (MEIF) – *VETOED*

- Reauthorization of program for 5-years at original $8.5 million funding level
- One year of the program remains before it sunsets

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USM Economic Development
Competitiveness Effort – Key Initiatives

- Army Research Lab – Umbrella Collaborative Agreement & Unmanned Autonomous System (UAS) R&D Funding Pending
- COVID Task Force – Public/Private initiatives on tap to include… COVID Accelerator, Industry Marketplace, Vaccine Development and Pandemic Research Institute
- USM Industry Partnerships Director – Contract signed
- MD Quantum Alliance… AWS, IBM, Lockheed
- NSA STEM Education Partnership Agreement – Pending
- New UMD Fermentation Sciences Program – Flyin' Dog Brewery

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USM Venture Development Report
Analysis: USM IP-Based Startups Stay in MD

- Unofficial study of 92 IP-based startups formed mostly 2012-2017
  - 33 had an unknown status or were out of business
  - 8 didn't start as a solely Maryland-based company
  - 51 started as Maryland-based startups
    - 0 left!
    - 5 of those have been acquired, with none shifting a significant presence elsewhere

- According a recent Association of University Research Parks survey, only about 10% of *research park startups* left their region of origin.

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New USM Strategic Plan
Planning Process

- USM is conducting a new strategic plan, which will be the first full strategic planning process to occur with the USM Office of Economic Development in existence.

- The previous plan and an update are available here, with most economic development and technology commercialization matters in “Theme 2”:
  - 2020 Strategic Plan - https://www.usmd.edu/10yrplan/USM2020.pdf
  - 2018 Update - https://www.usmd.edu/10yrplan/USM-through-2020-Strategic-Plan-Update.pdf

- An environmental scan is underway to provide broad context. The outlook for the plan will be the next 10 years, but the specific goals and activities will look toward the next 5 years.

- Aiming to finalize the plan in Fall of this year.

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New USM Strategic Plan
EDTC-Related Metrics – Education/Workforce

- **Previous Goals and Progress** – Produce 11,000 STEM grads per year and other important degree. Met or almost met goals.

- **Potential New Goals**
  - Specific degree goals (TBD)
  - Credentialing goals (potentially, TBD)
  - Engage 50% of students in innovation and entrepreneurship experiences

- **Key Stakeholders** – MD Dept. Commerce, USM Student Academic & Student Affairs

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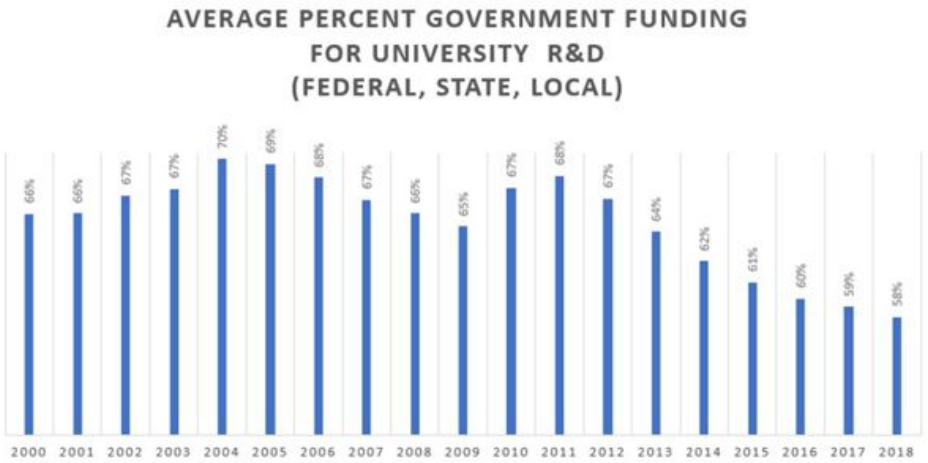
New USM Strategic Plan
EDTC-Related Metrics – Research

Previous Goals and Progress – 1% R&D funding growth annually. Goal met or exceeded.

Potential New Goals

- Continue 1% annual increase goal, in light of COVID disruption
- Reduce state and federal support of R&D expenditures from 68% to 55%; with special emphasis on funding from industry
- Submit 500 joint research proposals through 2025



Key Stakeholders *– USM Student Academic & Student Affairs*

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New USM Strategic Plan
EDTC-Related Metrics – Tech Transfer

- **Previous Goals and Progress** – Increase the annual number of licenses and options executed from 61 and new patents filed at 228. Licenses averaged 75, patents down slightly.

- **Potential New Goal**
  - Increase number of licenses and options to 100 per year

- **Key Stakeholders** – USM Student Academic & Student Affairs, USM Tech Transfer Offices

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New USM Strategic Plan
EDTC-Related Metrics – Ventures/ Economic Development

- **Previous Goals and Progress** – Serve 100 startups and small businesses per year. Goal met or exceeded.

- **Potential New Goals**
  - Serve at least 200 companies with founder(s) and/or owner(s) from underrepresented groups
  - Annually, deploy $7M in capital to 90 startups, small businesses, and non-profit ventures
  - Increase tenancy at USM research parks, incubators, and other spaces by 10%

- **Key Stakeholders** – USM Student Academic & Student Affairs

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New USM Strategic Plan
EDTC-Related Metrics – Potential New Categories

There may be an opportunity to add categories to the Economic Development goals and/or as part of the larger plan's goals:

- **Capacity –** Secure a certain amount yearly in non-institutional support for entrepreneurial support activities. This can include federal, philanthropic, and other sources.
- **Expand the "Entrepreneurship Footprint" –** Support a certain amount of student and Maryland-based startups and small business as a potential customer through customer discovery opportunities, pilots, and purchasing (within procurement limitations).
- **Community Engagement –** Enhance partnerships businesses and non-profits in local community via community-based learning experiences and internships; engage alumni entrepreneurs; increase touchpoints with regional and local economic development groups.

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New USM Strategic Plan
Questions for the Committee

- What is missing?
- Which metrics should be revised or examined more closely?
- What other entities would be able to provide valuable input on this portion of the strategic plan?
- What non-numeric goals and activities would you recommend in order to meet proposed numeric goals?