

2025

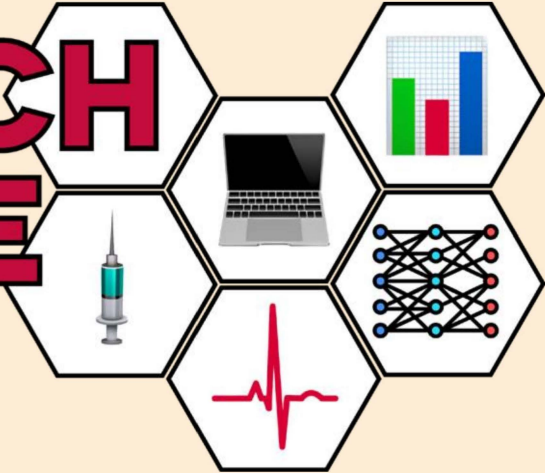


Cooper Innovation Center



Rowan University Innovations

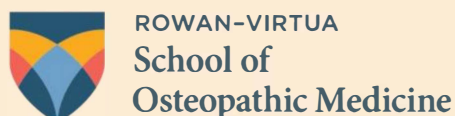
NJ MED TECH SHOWCASE



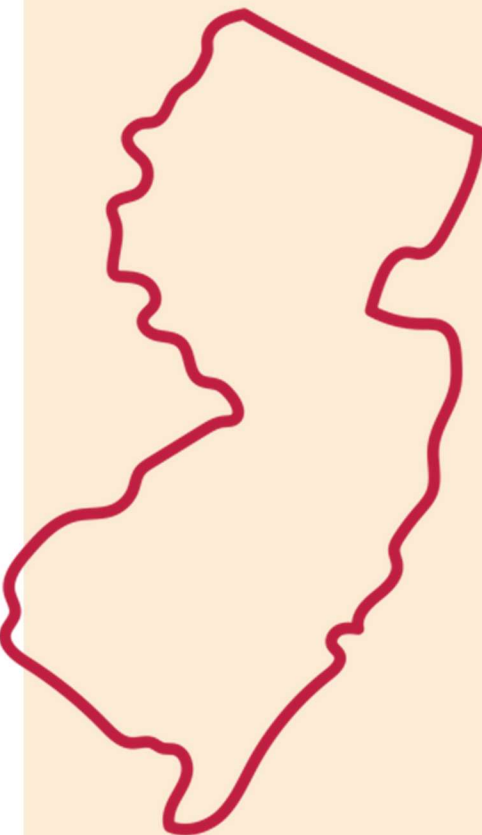
A Collaboration between Cooper Innovation Center,
Cooper University Health Care, Rowan University
Innovations, Cooper Medical School of Rowan University,
and Rowan-Virtua School of Osteopathic Medicine.



With special thanks to the New Jersey Health Foundation
for their sponsorship and support for innovation in
medical technology.



Medical Innovation in New Jersey



A STATE OF INNOVATION

New Jersey is rapidly emerging as a national leader in biomedical innovation, with South Jersey positioned at the forefront. Strategic partnerships between Cooper Health and Rowan University are accelerating commercialization of impactful medical technologies, supported by a robust research infrastructure and a growing ecosystem for inventors and entrepreneurs.

With Rowan University nearing R1 research status and Cooper Health anchoring clinical innovation, New Jersey continues to be a thriving hub for translational research, startup activities, and industry collaboration.

"I'm excited about what we can build here. We aim to establish an innovation center that works together with multiple institutions in South Jersey to help grow the knowledge economy. Our team assists with intellectual property, technology development, and industry agreements, as well as company startup and financing. Working together, the future is very bright."

- **Neal Lemon, PhD, MBA**
AVP, Technology,
Commercialization &
Innovation, Cooper Innovation
Center, Cooper University
Health Care,
Associate Vice Chancellor,
Rowan University

Cooper Innovation Center



MICHAEL KIRCHHOFF, MD, FACEP

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Technology Development Specialist



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COOPER INNOVATION CENTER

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Camden, NJ 08103

Innovation at Cooper

MISSION:

IMPROVING HEALTH
OUTCOMES BY
SUPPORTING THE
TRANSFER OF COOPER
INNOVATIONS TO THE
MARKETPLACE WHILE
PROMOTING A CULTURE
OF INNOVATION AND
ENTREPRENEURSHIP.

The Cooper Innovation Center (CIC) is a service department of The Cooper Health System. The CIC protects, develops, and commercializes health innovations originating from personnel of Cooper University Health Care.

Today we celebrate the ingenuity of Cooper's clinical innovators, whose frontline experience drives the development of technologies that improve care and solve real-world problems in New Jersey and beyond.

Rowan Innovations



NEAL LEMON, PHD, MBA

Associate Vice Chancellor & Executive Director



SANAZ SHAHI, PHD, MBA

Administrative Director, IP



NILE DELSO, ESQ

Intellectual Property Counsel



ROWAN UNIVERSITY

Office of Technology Commercialization

201 Mullica Hill Road

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Innovation at Rowan

MISSION:

TO MANAGE, PROTECT,
AND LICENSE TO
INDUSTRY, THE
INTELLECTUAL PROPERTY
DEVELOPED AND CREATED
AT ROWAN UNIVERSITY
WHILE CREATING
ECONOMIC VALUE IN THE
SOUTH JERSEY AREA AND
SUPPORTING REGIONAL,
STATE, AND NATIONAL
ECONOMIC
DEVELOPMENT.

Innovation is at the heart of Rowan Research, and everyday faculty and students are developing new, cutting-edge technologies. The Office of Technology Commercialization works closely with faculty and industry to bridge the gap between the lab and the marketplace.

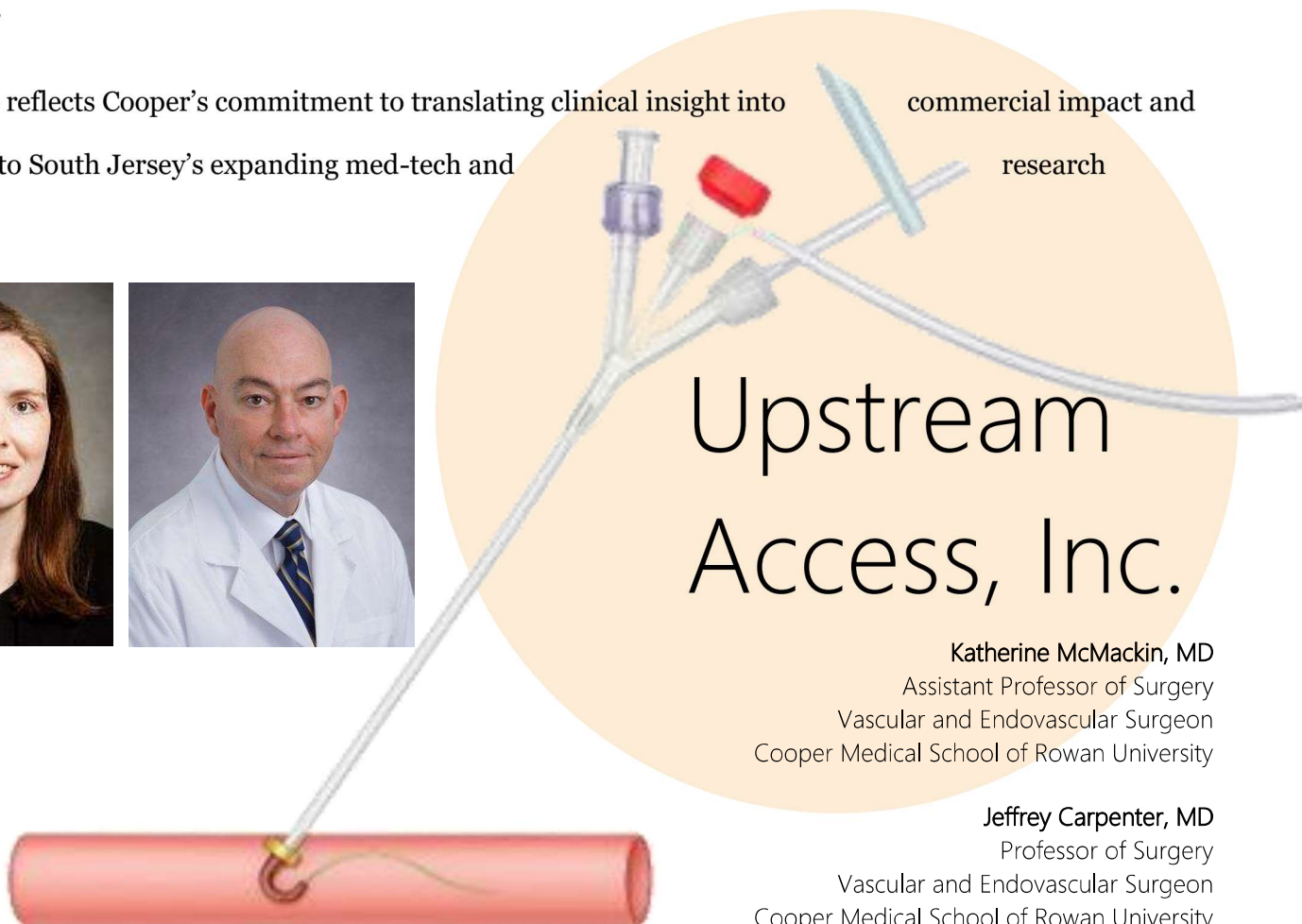
Today we celebrate Rowan's spirit of discovery, where research meets entrepreneurship, and ideas evolve into technologies that improve lives of those in New Jersey and across the world.

TOGETHER, SUPPORTING MEDTECH INNOVATION | UPSTREAM ACCESS, INC.

“Access is the number one complication across all endovascular procedures, occurring in 5-8% of angiograms.” -Katherine McMackin, MD

The Upstream Access Multi-Directional Sheath is a next generation vascular access system developed by two top-of-class vascular surgeons at Cooper University Hospital, Drs. Katherine McMackin and Jeffrey Carpenter, now advancing through a recently formed startup company. Designed to improve diagnosis and treatment of Peripheral Artery Disease (PAD), the device features a balloon-anchored sheath and a steerable catheter made of shape memory material, enabling precise wire placement from both antegrade and retrograde directions. This approach reduces the need for multiple access points, minimizes vessel trauma, and expands treatable vessel areas.

The startup reflects Cooper’s commitment to translating clinical insight into commercial impact and contributes to South Jersey’s expanding med-tech and research ecosystem.



Katherine McMackin, MD
Assistant Professor of Surgery
Vascular and Endovascular Surgeon
Cooper Medical School of Rowan University

Jeffrey Carpenter, MD
Professor of Surgery
Vascular and Endovascular Surgeon
Cooper Medical School of Rowan University

TOGETHER, SUPPORTING MEDTECH INNOVATION | HYDROPEP THERAPEUTICS, INC.

This technology introduces an injectable hydrogel designed to support local bone regeneration, offering a targeted solution for osteoporosis-related fractures. Unlike systemic treatments that affect the whole body and often lead to side effects, this approach delivers bone-healing peptide directly to areas of need, potentially reducing the need for invasive surgery and long recovery times. Early studies in animal models showed increased bone density at the injection site, suggesting strong potential for clinical use.

The hydrogel is formed from modified hyaluronic acid that clicks together upon injection to create a stable, cross-linked structure. It carries a BMP-2 mimetic peptide called DWIVA, which is chemically immobilized within the gel to promote bone growth. This immobilization ensures the peptide remains active at the site, where it successfully stimulated bone-forming activity in stem cells and enhanced bone regeneration in preclinical tests.

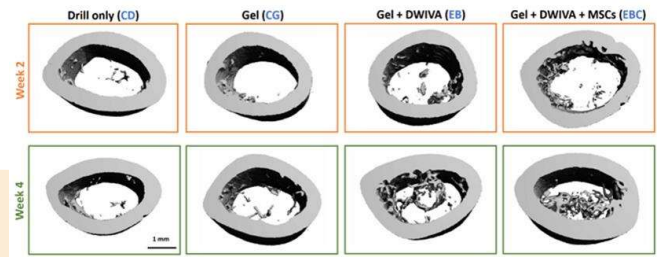
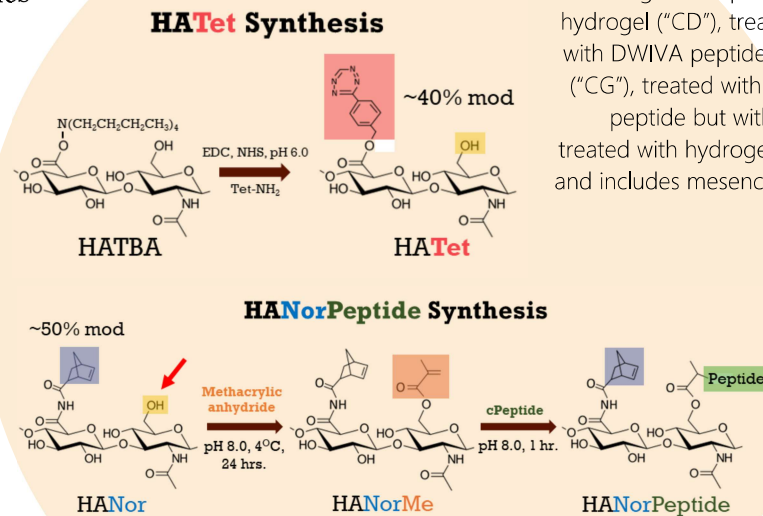


Fig. 1: comparison of drilled femurs not treated with hydrogel ("CD"), treated with hydrogels not functionalized with DWIVA peptide and without mesenchymal stem cells ("CG"), treated with hydrogels functionalized with DWIVA peptide but without mesenchymal stem cell ("EB"), or treated with hydrogels functionalized with DWIVA peptide and includes mesenchymal stem cells ("EBC") at two weeks and four weeks.



Patent: WO 2024/020558 –
Hydrogels and Methods of Using
the Same (PCT/US2023/070731)

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Cooper University Health Care

No.	Technology	Title	Inventor(s)
1	17-0007	A Body Cavity Evacuator and Drainage System of Viscous Fluids from the Pleural Space	David Shersher, MD, FACS and Wissam Abouzgeib, MD
2	21-0001	Transition Care Management App	Michael Kouch, MD, Robert Cole, MD
3	22-0002	Wearable multimodal sensory system to monitor cardiac health for early detection of CHF	Robert Hirsh, MD and Larry Mulligan, PhD
4	23-0005	Forward-Facing Snare Polypectomy Device	Samuel Giordano, MD
5	23-0006	Articulating Biopsy Forceps	Samuel Giordano, MD
6	23-0011	MRI Gantry Barrier	Michael Connelly
7	23-0014	Novel Noninvasive Pressure-Strain for the Application of a New Index of Myocardial Work	Jeffrey C. Hill, MSc, ACS, FASE and Lawrence Mulligan, PhD
8	24-0019	Thoracoabdominal Hybrid Graft	Joseph Lombardi, MD
9	24-0003	Upstream Access, Inc. - Multi-Directional Vascular Access Technology	Katherine McMackin, MD and Jeffery Carpenter, MD
10	24-0004	Moldable Magnetic Compression Device for Auricular Hematoma Treatment	Donald Solomon, MD
11	24-0005	Methods and Apparatus for Locating Arteries and Veins Using Light	Sai Batchu, MD and Ajith Thomas, MD
12	24-0012	Rapid Entry Thoracotomy Tray (RETT)	Bailey Fokin, Jeffrey Gair, PhD, John Chovanes, DO, FACS
13	24-0015	Noninvasive Estimation of Myocardial Oxygen Consumption and Efficiency	Jeffrey C. Hill, MSc, ACS, FASE, AACC and Lawrence Mulligan, PhD
14	25-0001	A Real-Time, AI-Supervised Virtual Reality (VR) Trauma Simulation Platform	Bobby DesPain, MD and Anna Goldenberg-Sandau, DO
15	25-0006	Handheld Vacuum Biopsy & Cryotherapy Device for Minimally Invasive Ablation of Breast Lesions	Adrienne Rosenthal, MD
16	25-0010	To Decrease Heme-Mediated Inflammation	Khalid Hanafy, MD, PhD
17	25-0008	Jersey Angels, Unmanned Aircraft System (UAS) for medical supply delivery	Bailey Fokin, Jeffery Gair, PhD, and John Chovanes, DO, FACS
18	25-0007	Rapid Access Printed Thoracotomy Retractor (RAPTOR)	Bailey Fokin, Jeffery Gair, PhD, and John Chovanes, DO, FACS
19	25-0009	PRIORI: A Bayesian Clinical Decision Support System for Patient-First, Cost-Aware Acute Cure	Sharad Patel, MD
20	22-0012	Injectable Hydrogels to Locally Regenerate Tissue	Sebastian Vega, PhD, Tae Won Kim, MD
21	211211	Machine Learning-Enhanced Neurocognitive Assessment in Primary Healthcare Settings	Ganesh Baliga, PhD and David J. Libbon, PhD
22	230701	Improved preclinical models for drug discovery using vascularized organoids	Louis Paone, PhD and Peter Galie, PhD

23	260704	New RNA-based Biomarker Discovery and Diagnostics	Dmitri Pestov, PhD and Ekaterine Kashakina, PhD
24	250706	Dynamic Cell Migration Chambers	Francesca J. Frontera, Nathaniel M. Bialecki, Abhay G. Aradya, Cayla J. Holdcraft, and Gary S. Goldberg, PhD
25	241003	Rapid Diagnostics for gastrointestinal diseases (IBS)	Sangita Phadtare, PhD, Lark Perez, PhD, and Joshua DeSipio, MD
26	210802	Bactericidal Biomedical Electrode Coatings	Jeffrey Hettinger, PhD, Gregory A. Caputo, PhD, and Lei Yu, PhD
27	13-101-COE	Bactericidal Coatings for Orthopaedic Trauma Applications	Gregory A. Caputo, PhD, Jeffrey Hettinger, PhD, Robert Ostrum, MD, and Robert Krchnavek, PhD
28	COE-17-110	Novel Biomimetic Self-Assembling Gels to Eradicate Ocular Fibrosis	Camila Vardar and Mark Byrne, PhD
29	260701	FREEDOM™ Lens: Smart, Sustained Ocular Drug Without the Drops	Hope Seybold and Mark Byrne, PhD
30	200906	i2Contour: MRIMath's FDA-Cleared AI Tumor Segmentation	Nidhal C. Bouaynaya, PhD
31	240320	AVF Gel for Vascular Access Maturation	Patrick Hwang, PhD and Shahab Edalatian Zakeri, PharmD
32	250610	Soluble Factor Incorporation with Native Signaling (SFINS) Receptors for Cellular Reprogramming	Evan Hutt, PhD and Peter Galie, PhD
33	250508	PrecisionRCS (Precision Recovery Capital Support System)	Richard Jermyn, DO, Kenneth Stagliano, PhD, Alexander Abbott, Joseph DiTaranto, and Joshua Smith
34	16-129-COE	ROBOSSIS: Surgical Robot for Femur Fracture Surgery	Mohammad Abedin-Nasab, MD, Marzieh Saeedi, PhD, and Chris Haydel, MD
35	240618	Customized Footwear Midsoles	Behrad Koohbor, PhD, Carl Pantano, and Andrew Solarski
36	210521	Neuron Foundry Mach 8: A Concept of a Multi-modal Neuro-supportive Energy Therapy Device for Treating Neurodegenerative Disorders	Charles McGlynn, PhD, Doni Dermawan, and Marie Canonizado
37	190803	Metabolic Gene Therapy for Amyotrophic Lateral Sclerosis	Paola Leone, PhD and Jeremy Francis, PhD
38	240511	Hydrogels with Embedded Aligned Nanofibers for Peripheral Nerve Regeneration	Varsha Prahaladan, Jacob Carter, Sebastian Vega, PhD, and Vince Beachley, PhD
39	-	Nanoyarns as Next Generation Suture Materials	Dominique Hassinger, Sean McMillan, DO, and Vince Beachley, PhD
40	250611	+Pouch, Electrolyte Oral Pouch	Braeden Twomey, Ryan Wilkinson, Zac Carcanague
41	260805	Assay for screening drugs that modulate mechanical tension	Ben Sorum, MD, PhD and Khalid Hanafy, MD, PhD
42	240512	An Actuated 3D Platform for Producing Regenerative Skin Serums	Andrea Vernango, PhD, Jennifer Weiser, PhD, Dana Cases, Nidhal Bouaynaya, PhD, Natarajaseenivasan Kalimuthusamy, and Stephanie Budijoni

A Body Cavity Evacuator and Drainage System of Viscous Fluids from the Pleural Space (pg. 19)

David Shersher, MD, FACS and Wissam Abouzgheib, MD

The Body Cavity Evacuator (BCE) is a prototype medical device designed to drain thick fluids like pus from the pleural space using a single entry point. It features a dual-lumen, opposing pigtail catheter system that enables simultaneous perfusion and suction, addressing the limitations of current drainage methods, which often require multiple access points and are ineffective for viscous fluids. The BCE is supported by Foundation Venture Capital Group and is available for co-development or licensing.

Transition Care Management App (pg. 20)

Michael Kouch, MD and Robert Cole, MD

The Transition Care Management App improves communication between hospitalists and primary care providers by delivering real-time updates on patient status. It helps reduce gaps in care transitions, which often lead to poor outcomes and dissatisfaction. The app has shown potential for improving patient satisfaction and lowering healthcare costs. It is currently in prototype development and seeking partnerships for broader implementation.

A Wearable Multimodal Sensory System to Monitor Cardiac Health for Early Detection of CHF (pg. 21)

Robert Hirsh, MD and Lawrence Mulligan, PhD

This wearable system combines ECG and SCG to monitor heart function more effectively than ECG alone, especially for early detection of congestive heart failure. It enables non-invasive, at-home tracking of cardiac health, potentially reducing reliance on hospital-based diagnostics. The technology is in preclinical development and backed by strong intellectual property. It could improve outcomes and reduce disparities in cardiovascular care.

Forward-Facing Snare, Polypectomy Device (pg. 22)

Samuel Giordano, MD

The Forward-Facing Snare Polypectomy Device improves polyp removal by offering a front-facing, expandable snare that enhances visibility and precision. It eliminates the need for repositioning and reduces complications compared to advanced resection techniques. The device is in prototype development and backed by a provisional patent. It is available for licensing and partnership opportunities.

Articulating Biopsy Forceps (pg. 23)

Samuel Giordano, MD

The Articulating Biopsy Forceps is a next-generation endoscopic tool designed to improve tissue sampling during procedures like colonoscopies and polypectomies. It features a 360-degree swivel and flexible hinge, allowing the jaw assembly to rotate and articulate for optimal alignment with the tissue plane enabling physicians to access anatomically challenging areas. The device addresses limitations of conventional forceps, which often struggle with precision in hard-to-reach areas, leading to inadequate samples and repeat procedures. The device is in prototype development and backed by a provisional patent. It is available for licensing and partnership opportunities.

MRI Gantry Pathogen Barrier (pg. 24)

Michael Connelly

The MRI Gantry Pathogen Barrier is a removable liner that protects MRI scanners from patient-borne pathogens, reducing infection risk and simplifying cleaning. It fits securely during scans and collapses inward after use to contain contaminants. This innovation improves safety and efficiency in radiology settings. The device is in prototype development and available for licensing or partnership.

Novel Noninvasive Pressure-Strain for the Application of a New Index of Myocardial Work (pg. 25)

Jeffrey C. Hill, MSc, ACS, FASE and Lawrence Mulligan, PhD

A noninvasive method to construct pressure-strain loops (PSLs) using central aortic pressure and strain imaging, offering an alternative to traditional myocardial work assessments. Their study with eight healthy subjects demonstrated feasibility and precision in capturing cardiac pressure and strain data simultaneously. This approach enables evaluation of myocardial work, oxygen consumption, and efficiency, and may serve as a vendor-neutral solution. The technology is in clinical proof-of-concept stage and backed by a provisional patent, with opportunities for licensing and collaboration.

Thoracoabdominal Hybrid Graft (pg. 26)

Joseph Lombardi, MD

The Thoracoabdominal Hybrid Graft is a surgical device that enables efficient repair of complex aortic aneurysms without the need for cardiopulmonary bypass. It combines a vascular prosthesis with a perfusion system to maintain blood flow during surgery. This innovation improves safety and procedural outcomes compared to traditional methods. The technology is in prototype development and backed by patent filings and venture support.

Upstream Access, LLC, Multi-Directional Vascular Access Technology (pg. 27)

Katherine McMackin, MD and Jeffrey Carpenter, MD

The Upstream Access Bi-Directional Sheath improves vascular procedures by enabling both forward and reverse access through a single entry point. Its balloon-anchored sheath and steerable catheter enhance precision and reduce trauma, infection risk, and surgery time. The device is in prototype development and backed by venture support. It is available for licensing and partnership through Upstream Access, Inc.

A Moldable Magnetic Compression Device for Auricular Hematoma Treatment (pg. 28)

Donald Solomon, MD

Dr. Donald Solomon has developed a moldable magnet compression device to treat auricular hematoma non-invasively. The device uses a conformable balloon with iron shavings and a magnetic backing to apply uniform pressure across the ear, preventing deformity. It offers advantages over traditional treatments by being non-invasive, adaptable to ear contours, and easy to use. Currently in prototype development, the innovation is supported by Foundation Venture Capital Group and open to partnership opportunities.

LEDINFRA, LLC, Methods and Apparatus for Locating Blood Vessels (pg. 29)

Sai Batchu, MD and Ajith Thomas, MD

This light-based device identifies arteries and veins by measuring oxygen saturation using LEDs and photodetectors. The system enables real-time, non-invasive vessel tracking, improving accuracy and safety during vascular access procedures. It reduces risks such as failed attempts and accidental arterial punctures, especially in critical care settings. The device is in prototype development and backed by a provisional patent, with opportunities for licensing and co-development.

Rapid Entry Thoracotomy Tray (RETT) (pg. 30)

Bailey Fokin, Jeffery Gair, PhD, and John Chovanes, DO, FACS

The Rapid Entry Thoracotomy Tray (RETT), a pre-packaged surgical kit designed for emergency chest surgeries in trauma settings. RETT consolidates essential tools into a sterile, ready-to-use tray, eliminating the need for time-consuming setup and reducing personnel requirements. The tray is in prototype development and supported by Cooper's MILDAF program, with opportunities for partnership and licensing.

Systems & Methods for Non-Invasive Calculation of Myocardial Oxygen Consumption and Myocardial Efficiency (pg. 31)

Jeffrey C. Hill, MSc, ACS, FASE, AACC and Lawrence Mulligan, PhD

Current non-invasive methods for assessing heart function rely heavily on imaging, but tools for evaluating myocardial oxygen use are limited and costly. By combining echocardiography, aortic pressure data from the Sphygmocor Xcel, and the Rooke-Fiegl equation, researchers can now estimate myocardial efficiency and wasted pressure work—metrics that reflect how aging affects cardiac workload. These calculations can be performed during routine visits, offering a novel addition to the cardiac assessment toolkit alongside strain measurements.

A Real-Time, AI-Supervised Virtual Reality (VR) Trauma Simulation Platform (pg. 32)

Robert DesPain, MD and Ann Goldenberg-Sandau, DO

SurgiSim Solutions, in partnership with Rowan University, is developing an AI-supervised virtual reality (VR) platform to modernize trauma training with real-time feedback and adaptive learning. The system will support team-based simulations and expand access to rural hospitals, military medics, and students through STEM-focused outreach. This innovation aims to improve clinical decision-making, reduce training costs, and promote public health awareness and career exploration.

Handheld Vacuum Biopsy & Cryotherapy Device for Minimally Invasive Ablation of Breast Lesions (pg. 33)

Adrienne Rosenthal, MD

This invention integrates vacuum-assisted biopsy and cryotherapy into a single device, enabling diagnosis and treatment of suspicious lesions in one procedure. It reduces treatment time, cost, and invasiveness compared to traditional biopsy followed by surgical lumpectomy, and can be performed under local anesthesia in outpatient settings. The cryotherapy component not only treats the lesion but also stimulates an immune response by releasing tumor-specific antigens. Future applications may extend to other organs and potentially replace sentinel lymph node dissection, though limitations exist for lesions near vital structures or skin.

To Decrease Heme-Mediated Inflammation (pg. 34)

Khalid Hanafy, MD, PhD

This invention repurposes MLR-1023, a selective allosteric Lyn kinase activator, to reduce heme-mediated inflammation following subarachnoid hemorrhage (SAH). Unlike broad immunosuppressants, MLR-1023 enhances Lyn signaling to selectively dampen harmful cytokine release, improve red blood cell clearance, and promote immune resolution. The compound is clinically advanced, having demonstrated safety and efficacy in Phase 2 diabetes trials, and is now being explored as a first-in-class, disease-modifying therapy for SAH, with strong translational potential and opportunities for rapid repurposing.

Jersey Angels: Unmanned Aircraft System (UAS) for medical supply delivery (pg. 35)

Bailey Fokin, Jeffery Gair, PhD, and John Chovanes, DO, FACS

The Jersey Angels is a developing fixed wing, vertical take-off and landing unmanned aircraft system (UAS) that will deliver life-saving medical supplies directly to the scene. The technology is in proof-of-concept stages and seeking collaboration and partnership opportunities.

Rapid Access Printed Thoracotomy Retractor (RAPTOR) (pg. 36)

Bailey Fokin, Jeffery Gair, PhD, and John Chovanes, DO, FACS

The Rapid Access Printed Thoracotomy Retractor (RAPTOR) is a lightweight, biocompatible retractor designed to replace traditional steel Finochietto retractors in trauma and infectious disease scenarios. It features a simplified two-part, crank-less design and leverages digital manufacturing for rapid, mold-free production and on-demand customization. The device is in prototype development, with opportunities for scalable manufacturing and commercialization in both civilian and military trauma care settings.

PRIORI: A Bayesian Clinical Decision Support System for Patient-First, Cost-Aware Acute Care (pg. 37)

Sharad Patel, MD

PRIORI is a voice-operated bedside assistant that uses Bayesian inference to support ICU decision-making by continuously updating diagnostic and treatment probabilities as new clinical data emerge. It provides transparent recommendations with confidence levels, evidence citations, and projected clinical impact, while also incorporating cost-utility modeling to promote high-value care. A secure MVP is currently being piloted at Cooper for bedside rounding, with planned expansion into HER integration, ventilator optimization, and specialty-specific pathways.

HydroPep Therapeutics: Novel Materials that Accelerate Long Bone fracture healing (pg. 38)

Sebastian Vega, PhD and Tae Won Kim, MD

This injectable hydrogel delivers a BMP-2 mimetic peptide to promote localized bone regeneration, offering a targeted treatment for osteoporosis. It enhances bone density and stem cell activity without the side effects of systemic therapies. Preclinical studies show promising results in rat models. The technology is in proof-of-concept stage and available for partnership or licensing.

Machine Learning-Enhanced Neurocognitive Assessment in Primary Healthcare Settings (pg. 39)

Ganesh Baliga, PhD and David J. Libbon, PhD

The Rowan Assessment of Visual Memory and Attention (RAMA) is an iPad-based, non-verbal neurocognitive screening tool that uses machine learning to detect early signs of cognitive impairment with high accuracy. Its culture-neutral, visual format makes it ideal for global deployment in primary care settings, where early detection of ADRD and MCI is critical. The technology is in early-stage prototype development, supported by two pending patents and validated through over 3,400 research administrations at national hospitals.

Improved Preclinical Models for Drug Discovery Using Vascularized Organoids (pg. 40)

Louis Paone, PhD and Peter Galie, PhD

This technology integrates vascularized organoids into spatially patterned 3D-printed hydrogels, enabling intraluminal perfusion and mimicking physiological flow conditions for more accurate drug transport studies. It bridges the gap between chip-based microfluidic models and tissue-specific organoids, offering a promising alternative to animal testing in preclinical drug discovery. The system has undergone bench testing and preclinical validation, with multiple patent applications filed and active opportunities for commercialization and collaboration.

New RNA-based Biomarker Discovery and Diagnostics (pg. 41)

Dmitri Pestove, PhD and Ekaterine Kashakina, PhD

This RNA-based diagnostic platform uses ribosomal RNA to generate digital biosignatures that detect cellular stress and damage across a wide range of clinical conditions, including cancer therapy response, autoimmune disorders, and toxic exposures. Its machine learning-ready outputs and universal RNA targets enable faster, more sensitive, and broadly applicable diagnostics compared to traditional biomarker approaches. The technology is in bench-tested, preclinical validation with a provisional patent filed and proof-of-principle established in cell culture models.

Dynamic Cell Migration Chambers (pg. 42)

Francesca J. Frontera, Nathaniel M. Bialecki, Abhay G. Aradya, Cayla J. Holdcraft, and Gary S. Goldberg, PhD

Dynamic Cell Migration Chambers are 3D-printed assay devices that enable accurate quantification of cell migration using minimal cell numbers, with high reproducibility and low trauma. Their design allows for visualization of cell movement and compatibility with post-processing techniques like H&E staining and immunohistochemistry. The technology is bench-tested and market-ready, with a patent pending.

Rapid Diagnostics for Gastrointestinal Diseases (IBS) (pg. 43)

Sangita Phadtare, PhD, Lark Perez, PhD, and Joshua DeSipio, MD

This paper-based biosensor enables detection of disease-specific stool metabolites to perform rapid, non-invasive diagnosis of gastrointestinal diseases, such as irritable bowel syndrome (IBS), at the point of care. It uses protein-indicator complexes that produce distinct colorimetric patterns for metabolite profiling, eliminating the need for costly instrumentation like GC-MS. The technology offers a low-cost, user-friendly alternative to invasive diagnostic methods and is in the proof-of-concept stage, available for co-development or partnership.

Bactericidal Biomedical Electrode Coatings (pg. 44)

Jeffrey Hettinger, PhD, Gregory A. Caputo, PhD, and Lei Yu, PhD

This bactericidal biomedical electrode coating enhances charge exchange between implanted electrochemical devices and surrounding tissue while releasing bactericidal ions on-demand to prevent infection. By integrating nanoparticle reservoirs into the coating, it offers long-term, targeted antimicrobial protection without compromising device function. The technology has been prototyped and bench-tested, with a nonprovisional U.S. patent application filed and opportunities for further development and clinical translation.

Bactericidal Coatings for Orthopaedic Trauma Applications (pg. 45)

Gregory A. Caputo, PhD, Jeffrey Hettinger, PhD, Robert Ostrum, MD, and Robert Krchnavek, PhD

This silver oxide coating for orthopedic implants delivers high concentrations of bactericidal silver ions to prevent biofilm formation and suppress infection in trauma cases, especially in occluded regions like the intramedullary canal. Its stable adhesion and controlled elution profile make it suitable for IM-nails and other devices, reducing the need for revision surgeries and improving patient outcomes. The technology has been prototyped and bench-tested, with preclinical validation underway and a granted U.S. patent supporting further commercialization.

Novel Biomimetic Self-Assembling Gels to Eradicated Ocular Fibrosis (pg. 46)

Camila Vardar and Mark Byrne, PhD

This injectable biomimetic sol-gel system enables sustained intraocular delivery of nucleic acid nanocarriers to prophylactically treat ocular fibrosis, particularly posterior capsule opacification following cataract surgery. By incorporating charged long-chain polymers into a PLGA-PEG-PLGA matrix, the gel extends nanocarrier release from 1 to 6 months, reduces the need for repeated injections, and maintains optical clarity for clinical use. The technology is in early-stage development with U.S. and EU patents pending, offering strong potential for clinical translation as a preventive strategy in cataract surgery.

FREEDOM™ Lens: Smart, Sustained, Ocular Drug Without the Drops (pg. 47)

Hope Seybold and Mark Byrne, PhD

The FREEDOM™ Lens is a patented, extended-wear, drug-eluting contact lens that delivers sustained, precise doses of bromfenac sodium for seven days, replacing traditional eye drops with a non-invasive, high-bioavailability platform. It maintains comfort, oxygen permeability, and optical clarity while improving adherence and accelerating recovery for post-surgical and inflammatory eye conditions. The technology has completed preclinical testing with an IND submission planned for December 2025 and a Phase I human clinical trial scheduled for January 2026.

i2 Contour: MRIMath's FDA-Cleared AI Tumor Segmentation (pg. 48)

Nidhal C. Bouaynaya, PhD

MRIMath is an FDA-cleared AI software platform that automates brain tumor segmentation from MRI scans, delivering expert-level accuracy in minutes while eliminating variability and improving treatment planning. Its deep learning engine integrates with clinical workflows to generate precise volumetric and morphological metrics for personalized oncology care. The technology is market-ready and FDA-cleared under 510(k), with granted and pending patents supporting commercialization.

AVF Gel for Vascular Access Maturation (pg. 49)

Patrick Hwang, PhD and Shahab Edalatian Zakeri, PharmD

The AVF Healing Gel is a localized, injectable hydrogel applied during arteriovenous fistula creation surgery to improve vascular access maturation by promoting vasodilation, reducing inflammation, and preventing neointimal hyperplasia. Composed of biocompatible polymers and designed for sustained sildenafil citrate release, it addresses the high failure rate of AVFs by targeting the biological mechanisms at the anastomosis site. The formulation has been developed and validated in rodent models, with a U.S. non-provisional patent application in preparation through Rowan University and Yonsei University, and opportunities for co-development partnerships.

Soluble Factor Incorporation with Native Signaling (SFINS) Receptors for Cellular Reprogramming (pg. 50)

Evan Hutt, PhD and Peter Galie, PhD

SFINS is a modular receptor platform that enables immune cells to interpret soluble environmental cues using their native NF- κ B signaling pathways, allowing for precise immune activation in complex tissue environments. Its design overcomes limitations of existing synthetic receptors and is adaptable to various ligands through a plug-and-play extracellular domain system. The technology is in bench-tested, preclinical validation with a U.S. provisional patent filed and opportunities for co-development.

PrecisionRCS (Precision Recovery Capital Support System) (pg. 51)

Richard Jermyn, DO, Kenneth Stagliano, PhD, Alexander Abbott, Joseph DiTaranto, and Joshua Smith

PrecisionRCS is a digital platform designed to standardize and support peer recovery coaching for individuals with substance use disorders by integrating an evidence-based coaching model with AI-powered tools for relapse prediction and personalized care. It streamlines documentation, progress tracking, and billing while enabling asynchronous client engagement and data collection to enhance intervention and research. The technology is in early-stage prototype development, backed by a provisional patent with opportunities for co-development.

ROBOSSIS: Surgical Robot for Femur Fracture Surgery (pg. 52)

Mohammad Abedin-Nasab, MD, Marzieh Saeedi, PhD, and Chris Haydel, MD

Robossis is a robotic-assisted surgical platform designed to improve accuracy, safety, and efficiency in femur fracture fixation by integrating real-time imaging, AI-driven navigation, and robotic actuation into existing orthopedic workflows. The system reduces fluoroscopy use and surgical time while enhancing fracture alignment and implant placement for better patient outcomes. The technology is in bench-tested, preclinical validation with five issued patents and two pending, and is positioned for further development and commercialization.

Customized Footwear Midsoles (pg. 53)

Behrad Koohbor, PhD, Carl Pantano, and Andrew Solarski

Customized midsoles are designed to optimize footwear for each user's unique anatomy, gait, and biomechanical needs, offering targeted support, cushioning, and shock absorption. By using pressure map data and modular foam compartments, the system enables precise material tuning for comfort, performance, and corrective support. The technology is in concept and early-stage prototype development, with a provisional patent.

Neuron Foundry Mach 8: A Concept of a Multi-modal Neuro-supportive Energy Therapy Device for Treating (pg. 54) Neurodegenerative Disorders

Charles McGlynn, PhD, Doni Dermawan, and Marie Canonizado

The Neuron Foundry Mach 8 is a multi-modal neuro-supportive device designed to deliver sequential, subtle energy-based interventions that stimulate neuronal activity and enhance neural connectivity. By targeting brain mitochondrial function, immune homeostasis, melatonin production, and white matter signaling, it aims to promote neuroplasticity and restore optimal neural function in individuals with neurodegenerative diseases. The technology is in early-stage development with potential applications across a range of neurological conditions.

Metabolic Gene Therapy for Amyotrophic Lateral Sclerosis (pg. 55)

Paola Leone, PhD and Jeremy Francis, PhD

This invention describes a gene therapy approach for treating bioenergetic deficits in motor neuron diseases like ALS by introducing a metabolic enzyme into motor neurons to liberate energy from a locally abundant amino acid derivative. Using adeno-associated virus (AAV) vectors targeted to the central nervous system, the method aims to augment synaptic energy requirements and improve motor neuron function. The technology is in early-stage development with potential for future therapeutic applications.

Hydrogels with Embedded Aligned Nanofibers for Peripheral Nerve Regeneration (pg. 56)

Varsha Prahaladan, Jacob Carter, Sebastian Vega, PhD, and Vince Beachley, PhD

This hydrogel-based scaffold integrates aligned nanofibers to guide peripheral nerve regeneration by promoting cell alignment, migration, and differentiation into axially aligned tissue structures. The manufacturing process combines nanofabrication and additive techniques to embed fibers without delamination, enabling compatibility with various hydrogel systems. The device is in early-stage prototype development and backed by a U.S. patent and PCT application, with opportunities for licensing and co-development.

Nanoyarns as Next Generation Suture Materials (pg. 57)

Dominique Hassinger, Sean McMillan, DO, and Vince Beachley, PhD

This advanced polymer nanofiber suture technology utilizes a multi-stage electrospinning and post-processing method to produce highly organized, bioactive nanoyarns that promote regenerative healing. The sutures offer enhanced flexibility, knot security, and tissue compatibility, with the ability to encapsulate peptides without degradation. The device is in early-stage prototype development and supported by issued and pending patents, with opportunities for licensing and co-development.

+Pouch, Electrolyte Oral Pouch (pg. 58)

Braeden Twomey, Ryan Wilkinson, Zac Carcanague

+Pouch is a flavored oral electrolyte pouch designed for buccal absorption, enabling rapid delivery of sodium, potassium, and magnesium directly into the bloodstream to relieve symptoms of POTS such as dizziness and fatigue. Its convenient, non-invasive format bypasses the digestive system, offering fast hydration without GI discomfort. The product is in concept and early-stage prototype development, with IP managed through the Office of Technology Commercialization and open for collaboration and refinement.

Assay for Screening Drugs that Modulate Mechanical Tension (pg. 59)

Ben Sorum, MD, PhD and Khalid Hanafy, MD, PhD

This mechano-fluorescent assay uses genetically engineered fluorescent proteins (fGEMs) to visualize real-time changes in cellular mechanical tension, enabling dynamic monitoring of biomechanical responses in live cells. It offers a high-throughput, quantitative alternative to traditional force measurement techniques, with broad applicability across cell types and disease models. The technology is in early-stage prototype development, with potential for commercialization in drug screening and mechanobiology research platforms.

An Actuated 3D Platform for Producing Regenerative Skin Serums (pg. 60)

Andrea Vernango, PhD, Jennifer Weiser, PhD, Dana Cases, Nidhal Bouaynaya, PhD, Natarajaseenivasan Kalimuthusamy, and Stephanie Budijoni

EXPECT is a thermoresponsive 3D hydrogel platform designed to produce high-potency exosome serums for under-eye skin rejuvenation by sustaining stem cell activity and enhancing regenerative signaling. The system mimics dynamic tissue environments to maintain mesenchymal stem cell migration and optimize exosome output, with potential applications in dermatology, wound care, and regenerative medicine. The technology is in bench-tested preclinical validation, supported by a provisional patent and NSF I-Corps market discovery, with opportunities for further development and commercialization.

A Body Cavity Evacuator and Drainage System of Viscous Fluids from the Pleural Space



David D. Shersher, MD, FACS¹ and Wissam Abouzgheib, MD²

¹ Associate Professor of Surgery, Cooper Medical School of Rowan University

² Associate Professor of Medicine, Cooper Medical School of Rowan University



Brief Description

A device for draining highly viscous fluids from the pleural space.

Problem

Retained hemothorax occurs when blood fills 1/3 of the pleural space and cannot be drained via thoracostomy within 72 hours or exceeds 500mL. It is mostly commonly caused by blunt, followed by penetrating, trauma. About 5-30% of the ~300,000 cases in the U.S. are retained and often require thoracoscopic surgery (VATS). Fibrinolytics are debated and largely ineffective over time and experimental pleural lavage shows promise but is painful and risks intercostal artery injury due to multiple chest tube sites. Early intervention is crucial to prevent trapped lung, dyspnea, and empyema.

Pleural empyema is characterized by the accumulation of pus in the pleural cavity, typically caused by bacterial infection. It often follows pneumonia, trauma, or surgery, with ~32,000 cases annually in the U.S. Empyema carries high morbidity and mortality, with 20–30% requiring surgery or resulting in death. Current drainage methods are ineffective for thick pus, often needing two entry points. Delayed intervention increases operative risk and hospital complexity.

Improved techniques are critically needed to efficiently drain thick pleural fluids and enhance outcomes.

Solution

The Body Cavity Evacuator (BCE), a device that effectively perfuse and removes viscous fluid from a body cavity using only one entry point into the cavity.

Technology

The inventors identified a need for a more effective and less invasive way to drain body cavities, particularly the pleural space during surgery. They designed a system which simultaneously maximizes perfusion and drainage using a novel opposing pigtail catheter design in which one catheter, with an independent lumen, perfuse and the other drains. The catheters are in a single tear-away sheath allowing for a single point of entry and ease of use.

Advantages

- Single point of entry for simultaneous combined perfusion/drainage system.
- Opposed pigtail catheter design allows for maximal coverage of body cavity.
- Optimized perfusion and drainage, least invasive method, lowering infection and procedure time.

Device Design

Figure 1. The pleural space is the thin, fluid-filled area between the visceral pleura (lining the lungs) and the parietal pleura (lining the chest wall). This space allows smooth lung expansion and contraction during breathing.

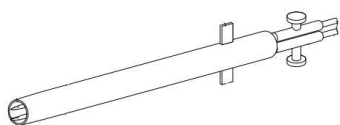
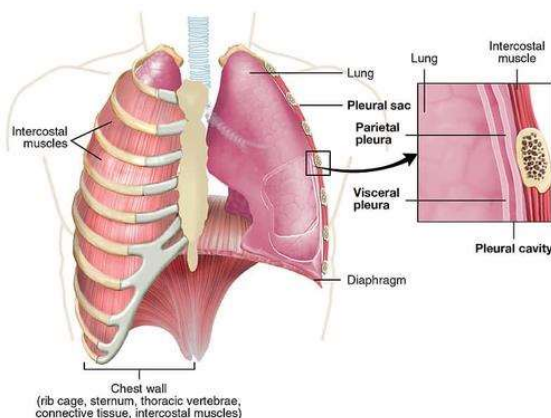


Figure 2. Perspective view of the body cavity irrigation and drainage system comprising a sheath and pigtail catheters.

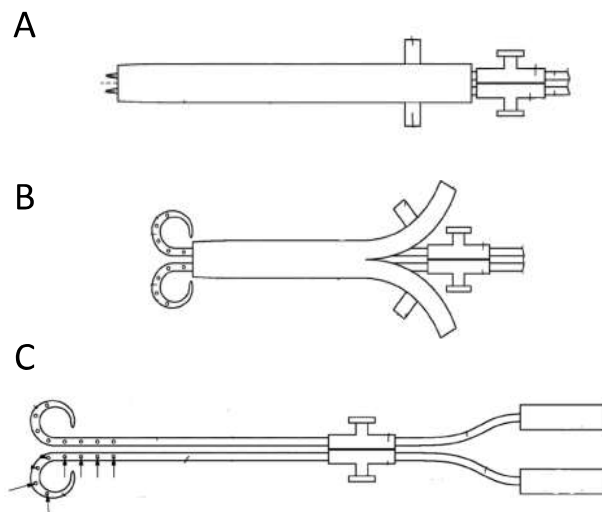


Figure 3A-C. Side view of the Body Cavity Evacuator (BCE) device with spatially opposed pigtail catheters, each with separate lumen, **A.** encapsulated within a tear-away sheath, **B.** in the process of having the sheath removed and catheter being deployed and **C.** the catheter fully deployed.

Source: US Patent Application Publication US 2020/0078568

Stage of Development

Stage of Development: Prototype Development

Partnerships: Co-Development, Licensing

Funding support by Foundation Venture Capital Group (Foundation for Health Advancement)

Transition Care Management App

Michael Kouch, MD¹, Robert M. Cole, MD²

¹ Critical Care Intensivist, Assistant Professor of Medicine, Cooper Medical School of Rowan University

² Critical Care Intensivist, Assistant Professor of Medicine, Cooper Medical School of Rowan University

Brief Description

The Transition Care App is a centralized platform designed to improve communication between inpatient hospitalists and outpatient primary care providers (PCPs). The app enhances real-time alerts, tracking, and coordination to ensure seamless transitions of care.

Problem

Communication gaps exist between hospitalists and PCP's, leading to:

- 22.3% of PCP's unaware of recent hospitalizations.
- 73% of internists reporting reduced continuity of care.

The impact of this gap is decreased physician and patient satisfaction, and misinterpretation of follow-up responsibilities.

Solution

A centralized, app-based alert and tracking system that:

- Provides real-time and delayed notifications to PCPs about their patients.
- Centralizes patient status updates, including admissions, discharges, and ED visits.
- Reduces communication breakdowns by directly connecting PCPs and inpatient providers.

Expected Impact

- Improved continuity of care by ensuring PCPs stay informed.
- Higher patient satisfaction (e.g., 70% when communication is perceived vs. 53.1% when it is not).
- Cost savings through reduced ED visits and unnecessary readmissions (Geisinger model: 14% cost reduction in Month 1, 20% in Month 2).

Future

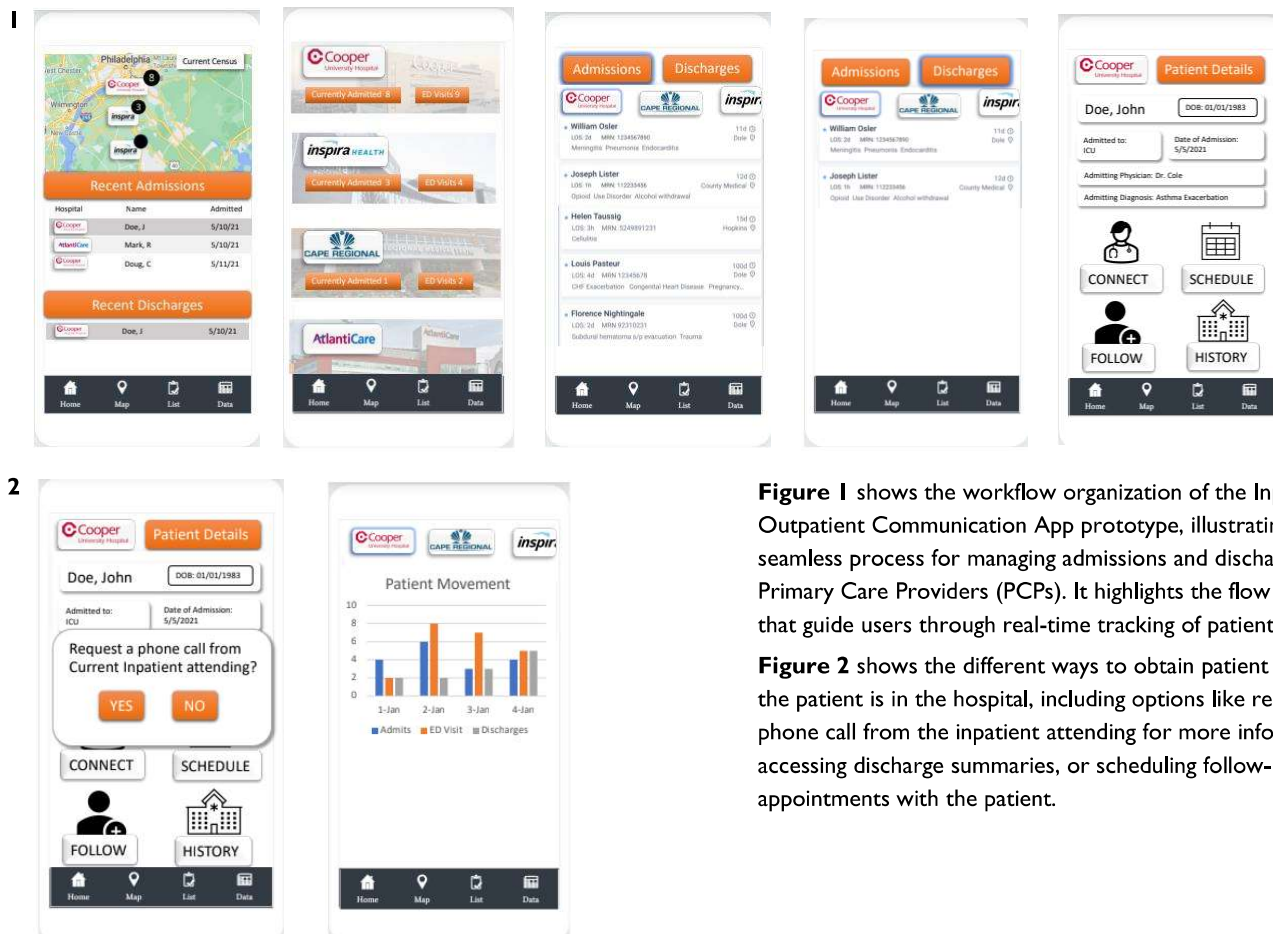
- Piloting the app within a hospital network.
- Securing partnerships and funding.
- Refining user experience based on provider feedback.
- Exploring expansion to other healthcare networks.

Stage of Development

Stage of Development: *prototype development*

Partnerships: Co-Development, Licensing, Start-up

Technology Prototype



Wearable Multimodal Sensory System to Monitor Cardiac Health for Early Detection of CHF

Robert A. Hirsh, MD¹ and Lawrence Mulligan, PhD FAHA²



¹ Anesthesiologist, Associate Professor, Clinical Anesthesiology, Cooper Medical School of Rowan University

² Associate Professor, Anesthesiology, Director of Research, Cooper Medical School of Rowan University



Brief Description

Cardiac disease impacts the ability of heart to contract and relax. These phases impact each other and the impact of CVD's on the phases may not be similar or correlated. A non-invasive wearable system to monitor the cardiac parameters during contraction and relaxation remains elusive.

Problem

Cardiovascular diseases are the leading cause of death both in the U.S. and worldwide. Between 2014 and 2015, the US economy spent ~\$219B on diagnosis and treatment of heart disease with the direct domestic medical costs associated with congestive heart failure (CHF) alone expected to reach \$53 billion by 2030, with the majority of costs related to hospitalization.

Possible Solution

Early diagnosis of CVD is presently hampered by a lack of awareness of the early warning signs. Loss of energy, new or persistent hypertension and poor diet are just a few of contributors to the development of CVD. Quantifying the presence of impaired contractile function or relaxation currently depends on a referral for an echo. Like the Apple watch's AF detect parameter, the Hirsh metric could be used in a similar manner and lead to early detection of a developing cardiac disorder. The technology has the potential to reduce healthcare disparities for underserved populations.

Technology

Electrocardiography (ECG) is a well-established and broadly useful method for diagnosing certain heart conditions and incorporated into mobile devices. However, many heart conditions, such as CHF, are not sensitively detected by ECG alone. Seismocardiography (SCG) monitors the mechanical movement of the heart. In this technology ECG and SCG are collected from sensors in a wearable device and analyzed in conjunction to provide novel insights into efficient cardiac function. This type of diagnostic information is currently only available in a snapshot taken through a 2-D echocardiogram, administered in a healthcare setting by a healthcare professional. Clinical proof of the concept was conducted in a pilot clinical study using a custom research grade device. Moving forward, studies are planned to provide clinical proof in several CVD populations.

Advantages

- Wearable functionality enables at home monitoring
- Strong IP Position (issued patent and patent applications)
- Works with existing proven device technology
- Addresses a large unmet need (i.e. HFPEF)

Results

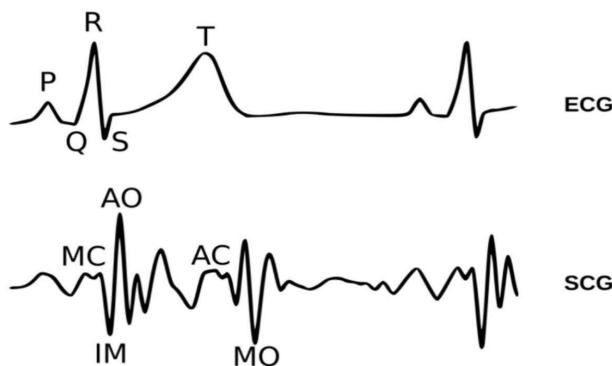


Figure 1. Temporal relations between ECG and CSG wave-forms; fiducial points of each signal are annotated as well. MC, mitral valve closed; AO, aortic valve open, AC, aortic valve closed; MO, mitral valve open.

Stage of Development

Stage of Development: *in vivo* proof of concept, Preclinical discovery

Industry Partnerships: Co-Development, Licensing

Funding support by Foundation Venture Capital Group (Foundation for Health Advancement)

Intellectual Property

- US Utility Patent #10,085,665
- US Utility Patent #10,918,300
- US Utility Patent Application
- US Provisional Patent Application: (Confidential)

Evaluation of a Novel Non-invasive Algorithm to Assess Systolic and Diastolic Function in Normal Subjects

Mulligan et al J Clin Trials Vol. 14 Iss. 1

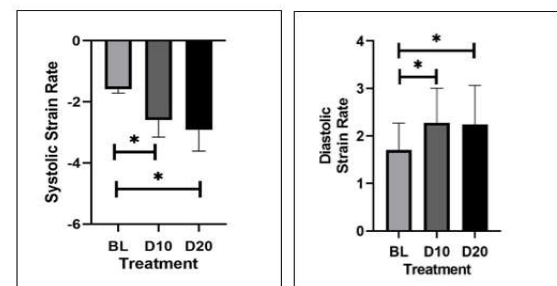


Figure 2. The changes in peak systolic and diastolic strain rate during dobutamine stress test. Both D10 and D20 infusions were significantly elevated compared with baseline ($p < 0.05$).

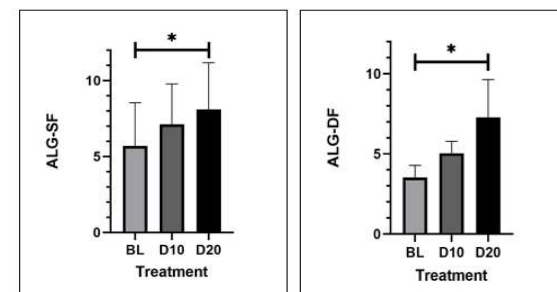


Figure 3. The changes in the Hirsh algorithm (ALG) systolic (ALG-SF) and diastolic (ALG-DF) metric during the dobutamine stress test. The D20 infusion was significantly elevated compared with baseline ($p < 0.05$).

Forward-Facing Snare Polypectomy Device

Samuel Giordano, MD¹

¹ Assistant Professor, Gastroenterology & Liver Diseases, Cooper Medical School of Rowan University

Brief Description

A medical instrument designed for the capture and retrieval of tissue, polyps, stones, and other foreign bodies from the body, featuring a braided wire that expands into a round or hexagonal shape, perpendicular to the length of the catheter.

Problem

Every year in the United States, approximately 14 million polypectomies are performed. Polypectomies play a critical role in the prevention of colorectal cancer—the second leading cause of cancer-related deaths in the United States. The majority of polypectomies are performed using snare polypectomy devices, consisting of self-contained metal rings designed to resect the polyp by tightening the ring. Polyps should be positioned at the 6 o'clock position prior to removal using the snare.

However, existing techniques for polyp removal with the conventional snare devices present challenges, particularly for larger, difficult-to-access, flat, or sessile polyps. Inaccurate tissue grasping can lead to poor or insufficient tissue samples, often requiring repeat or unnecessary procedures, which contribute to diminished quality of patient care and increased healthcare costs. Current snare technology also has limitations in removing longitudinal foreign bodies, particularly those that have been ingested. In addition, the more advanced resection methods, including Endoscopic Mucosal Resection (EMR) and Endoscopic Submucosal Dissection (ESD) have higher rates of complications, such as bleeding or incomplete removal, compared to traditional snare polypectomies.

Device Design

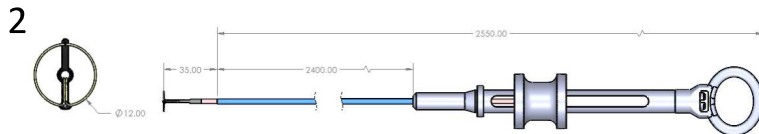


Figure 2. Overview of system. Schematic displays the braided wire snare, catheter, and handle / control mechanism.

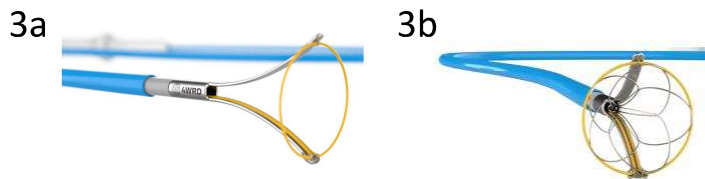


Figure 3a. Wide, 12mm Forward-Facing. Large nitinol loop with stainless steel support arms optimizes cold resection of pedunculated, sub-pedunculated, and sessile polyps. Reduced resection wire diameter results in a cleaner resection than other commonly used snares.

Figure 3b. Optional Retrieval Feature. Integrated "nitinol net" to capture and retrieve resected polyp.

Technology

To address these challenges, the Forward-Facing Snare Polypectomy Device was developed, featuring a braided wire that expands into a round or hexagonal shape, perpendicular to the length of the catheter. The snare loop can be expanded either passively or manually by prongs extended from the catheter. Polyp removal is achieved by either retracting the snare back into the catheter or by pulling a purse-string mechanism.

Advantages

The forward-facing design significantly enhances polyp visualization by aligning the snare with the catheter, improving precision of the procedure. This increased accuracy minimizes the risk of repeated surgery. An improved snare design also has minimal risk of complications in comparison to the advanced polyp resection techniques.

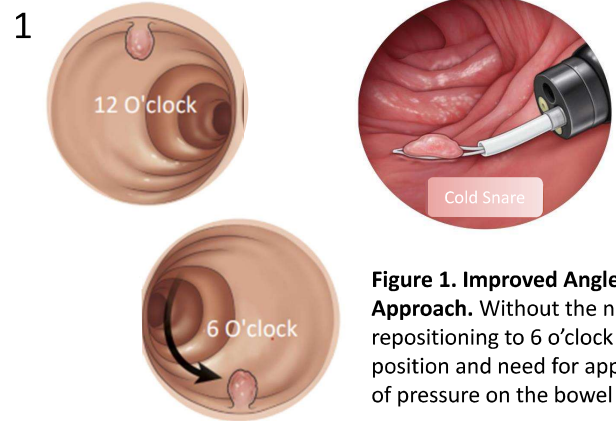


Figure 1. Improved Angle of Approach. Without the need of repositioning to 6 o'clock position and need for application of pressure on the bowel wall.



Figure 4. The forward-facing cold snare polypectomy device concept features a braided wire shape memory snare that is expanded in a plane perpendicular to the length of the catheter. The snare may be expanded with prongs that are extended from the catheter. The snare may be contracted by pulling on a purse-string feature.

Stage of Development

Stage of Development: Prototype development

Partnerships: Co-Development, Licensing, Start-Up

Intellectual Property: US Provisional Patent Application Filed

Funding support by Foundation Venture Capital Group (Foundation for Health Advancement)

Samuel Giordano, MD¹

¹ Assistant Professor, Gastroenterology & Liver Diseases, Cooper Medical School of Rowan University

Brief Description

Biopsy forceps with 360-degree swivel and flexible hinge.

Problem

Colorectal cancer is the second leading cause of cancer mortality in the US, but early detection and removal of polyps through procedures like polypectomy can significantly reduce the risk of cancer development. Polypectomies require the use of biopsy forceps, which are specialized instruments designed to grasp and extract small tissue samples. While the use of biopsy forceps has become standard for colonoscopies or endoscopies due to their simple, reliable design, they are often limited in their ability to effectively reach and extract polyps located in difficult or anatomically challenging areas of the body. These limitations hinder the ability to obtain adequate tissue for an accurate diagnosis, which can result in missed early-stage cancers. Thus, **there is a need for biopsy forceps that enhance maneuverability in order to minimize trauma to surrounding tissue and improve diagnostic accuracy.**

Solution

Articulating biopsy forceps with a 360-degree swivel and flexible hinge that automatically adjust to align perpendicularly with the tissue plane, ensuring optimal positioning for precise grasping and sampling of tissue.

Device Design

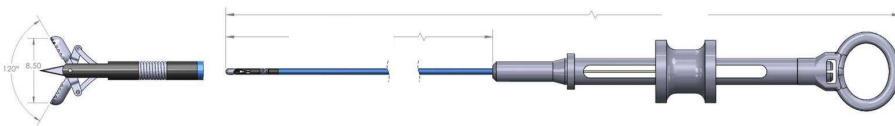


Figure 1. A biopsy forceps surgical instrument with a rotatable and deflective jaw assembly. The instrument includes a flexible biopsy forceps jaw assembly at its distal end. The actuation handle allows for the opening and closing of the jaw assembly relative to the endoscopic lumen through which the instrument extends while the control handle directs rotation of the distal end of the tubular member and jaw assembly about its longitudinal axis.

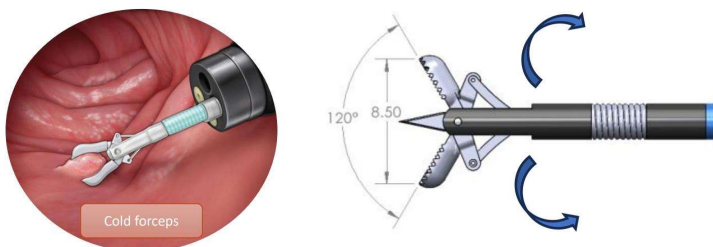


Figure 2. The articulation and rotation will enhance maneuverability, adjusting to itself to be perpendicular to tissue plant of interest, and ensure greater tissue sampling precision and grasping. Wide, 8.5mm, 120°, Articulating Jaws.

Technology

The technology improves precision during tissue sampling by incorporating a flexible tube with a rotating jaw assembly at the tip, which can open and close to grab tissue. The instrument also consists of handles that allow the jaw to bend and rotate to more effectively reach different areas. The biopsy forceps allow a physician and an assistant to control different functions separately, but the handles can be combined for a single physician to control both jaw movement and deflection.

Advantages

Existing forceps may not be able to reach difficult tissue areas or navigate complex anatomical structures, which can result in tissue damage, inadequate samples, and unnecessary repeat procedures. This device is designed for improved control and precision that is crucial for extracting high-quality tissue samples with minimal risk.

- Enhanced maneuverability
- Increased efficiency
- Reduced risk of complications
- Fewer repeat procedures needed
- Lower healthcare costs
- Improved patient outcomes
- Enhanced accuracy of biopsies

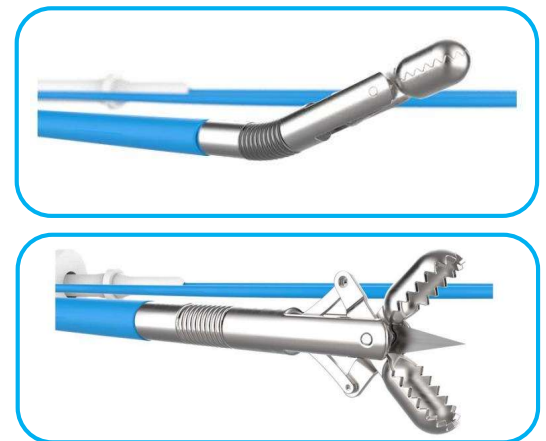


Figure 3. The distal articulating jaws of the biopsy forceps feature serrated, atraumatic tips with a stabilizing needle for secure, safe sampling. Sample can then be retrieved and withdrawn through a standard endoscope, maintaining sterility and sample integrity for histopathological analysis.

Stage of Development

Stage of Development: Prototype development

Partnerships: Co-Development, Licensing, Start-Up

Funding support by Foundation Venture Capital Group (Foundation for Health Advancement)

Michael Connelly

Director of Radiology and Ambulatory Imaging Centers, Cooper University Health Care

Brief Description

A removable liner for an MRI scanner which serves as a barrier between the patient and the scanner, preventing the contamination of the scanner with infectious pathogens.

Problem

In the United States approximately .36 million MRI scans are performed each year. Between successive scans performed in a given MRI scanner, the scanner must be cleaned to prevent the potential transmission of infections between patients. Currently, health systems sanitize the inner surface of the scanner by cleaning it by hand. However, this exposes healthcare staff to potential infection during the cleaning process. Furthermore, manual cleaning of the inner surface of the scanner may result in missing some areas, which could result in healthcare-acquired infections.

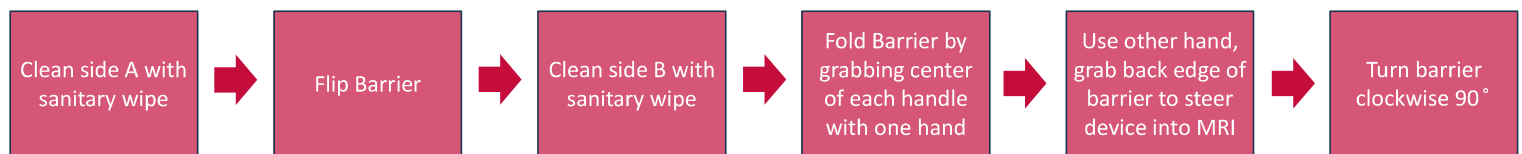
Solution

A novel, MRI gantry pathogen barrier, designed to streamline and improve the MRI sanitation process. It is a horseshoe-shaped in order to fit the inside surface of the scanner while allowing for the gantry table to move freely. The barrier remains in place during the scan and is fit securely. The liner and associated parts are constructed of material that does not interfere with MRI imaging. During removal of the barrier, it can be formed into a cylinder such that any pathogens from the patients are on the inside surface of the liner. This allows the liner to collapse onto itself, preventing staff exposures by keeping the pathogen-exposed area away from staff.

Advantages

- Reduces risk for cross-contamination between patients
- Simplifies cleaning protocols
- Reduces downtime between scans

Operational Flow



Device Design



Figure 1. Prototype of the MRI Gantry Pathogen Barrier displayed inside of a mock MRI frame.

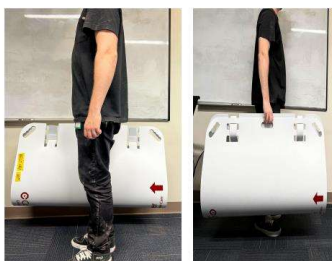
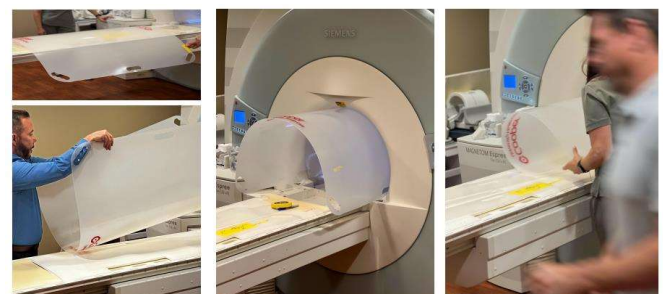


Figure 2. A photo demonstrating how the MRI Gantry Pathogen Barrier is rolled following removal from the MRI scanner. Handles, straps, clips, and other features ensure easy transport and secure storage.

Figure 3. A series of photos demonstrating the step-by-step use of the barrier: (3A) Placement within an MRI scanner, (3B) Barrier in place, and (3C) Removal from an MRI scanner following successful use.



A

B

C

Stage of Development

Stage of Development: *Prototype Development*

Partnerships: Co-Development, Licensing

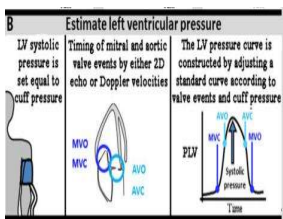
Intellectual Property: US Provisional Patent Application Filed

Novel Noninvasive Pressure-Strain for the Application of a New Index of Myocardial Work

Question

- This proof-of-concept study was to establish the feasibility of creating a noninvasive left ventricular (LV) pressure-strain loop (PSL) as an alternative approach to the previously validated myocardial work (MW).
- The conventional method for creating MW uses brachial peak systolic blood pressure (BP) measurement and valvular event timing generated pressure assumptions to construct the PSL.

Current Technology

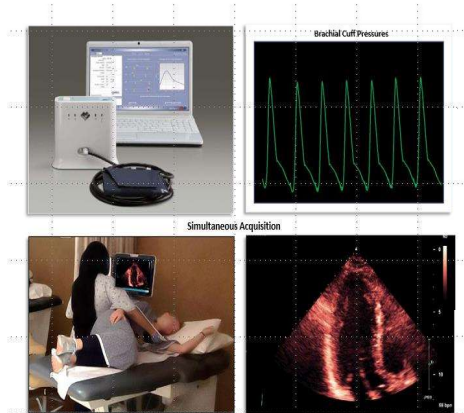


Current options combine the brachial artery systolic pressure with strain and use valve timing to generate the mitral valve opening and closing timing and pressures.

New Technology

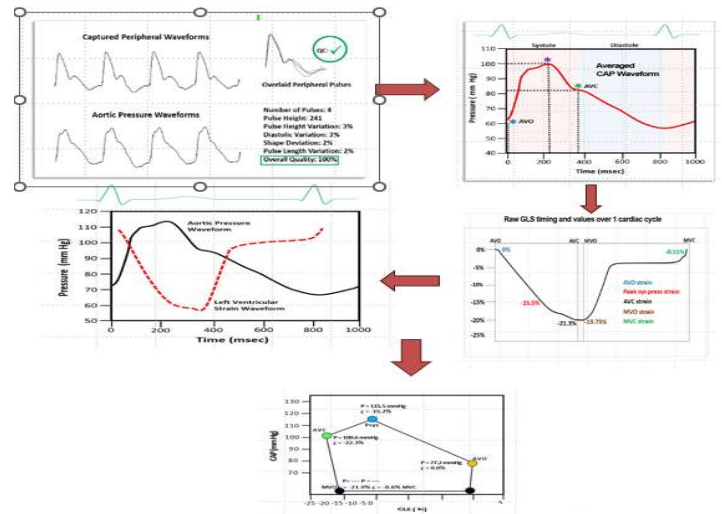
- The strain metric can be aligned with the Sphygmocor Xcel central aortic pressure signal.
- From these measurements, we can calculate the pressure-strain metric.
- We are also able to evaluate MW, estimated myocardial oxygen consumption and myocardial efficiency.
- These tools are not currently used to assess the patient's cardiac health.

Methods



- 8 healthy subjects (3 M & 5 W; ages 19-51)
- Subjects rested for 5 mins prior to acquisition
- CAP obtained simultaneously during 2D imaging acquisition for GLS
- Images/pressure acquired during apnea
- 3 cardiac cycles and pressures acquired and repeated in the apical 2, 3, 4 chamber views

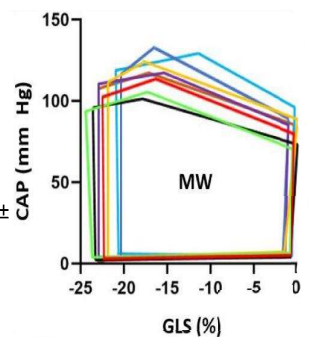
Data Analysis & Outcome



Results

- Construction of the PSL was possible in all subjects
- The systolic average GLS was -22.4 ± 1.8
- The systolic average CAP and GLS at:
 - Aortic valve opening were 77.2 ± 8.7 and 0.0 ± 0
 - Peak systole were 115.5 ± 9.6 and -15.2 ± 2.6
 - Aortic valve closure were 100.6 ± 10 and $0-22.3 \pm 1.7$
- The diastolic mitral valve opening and closures GLS values were 21.9 ± 1.6 and -0.6 ± 0.6

PSL (8 SUBJECTS)



Conclusions

- This novel approach is feasible using CAP combined with GLS to create a PSL
- Simultaneous acquisition of pressure and 2D imaging for GLS increase the precision of the test
- This alternative approach to the PSL construct may be used as a vendor-neutral solution for MW
- This proof-of-concept study, as an alternative to the previously validated work by Russell, et. al., holds great promise in advancing our understanding of cardiac energetics.**

Stage of Development

Stage of Development:

- 1) Clinical proof of concept
- 2) Discovery Partnerships
- 3) Licensing

Intellectual Property

US Provisional App. 63/659,927

Thoracoabdominal Hybrid Graft

Joseph V. Lombardi, MD, MBA

EVP, Chief Physician Executive, AtlantiCare Health System
(Former) Chief, Division of Vascular and Endovascular Surgery, Cooper University Health Care

Brief Description

Device for expediting the repair of a thoracoabdominal aortic aneurysm, type 2 or greater, allowing for distal aortic perfusion without the need for cardiopulmonary bypass.

Problem

Surgical repairs involving stents have become the standard when treating aortic aneurysms and recent advances have led to the use of hybrid stent-grafts. While use of such technology has proven revolutionary in treating aneurysms in the aortic arch, it has been harder to utilize the technology in repairing the more invasive thoracoabdominal aortic aneurysms. In addition, surgeons are still often required to utilize heart bypass techniques which increase the difficulty of successfully performing these already arduous surgical repairs. Thus, there is a need for a hybrid stent-graft with an attached perfusion apparatus that allows a surgeon to repair a thoracoabdominal aneurysm while minimizing the need for a heart by-pass.

Solution

The proposed surgical kit for repairing an aortic aneurysm is comprised of a vascular prosthesis and perfusion apparatus which can be deployed to efficiently perform the procedure, without the need for a heart by-pass.

Technology

This technology helps complete aortic aneurysm repair by coupling one end of the vascular prosthesis to the aorta upstream of the aneurysm, with the other end connected to the aorta downstream of the aneurysm. The perfusion apparatus maintains blood flow to the aortic branches while the surgeon is able to secure the prosthesis in place, completing the connections between the branches of the prostheses to the aortic branches.

Advantages

- Existing methods dependent on how fast the surgeon can sew, leading to unsatisfactory outcomes
- Greatly improves safety and quality of procedure

Device Design

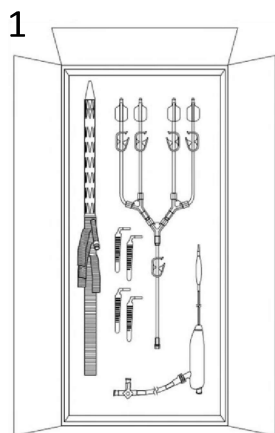


Figure 1. A surgical kit including the vascular prosthesis, visceral perfusion apparatus, and accessories necessary for repairing an aortic aneurysm.

Figure 2a-b. A depiction of the device used for repairing an aortic aneurysm. Figure 2A shows the perfusion manifold clamped to the endograft composite during the procedure. Figure 2b describes the completed visceral reconstruction.

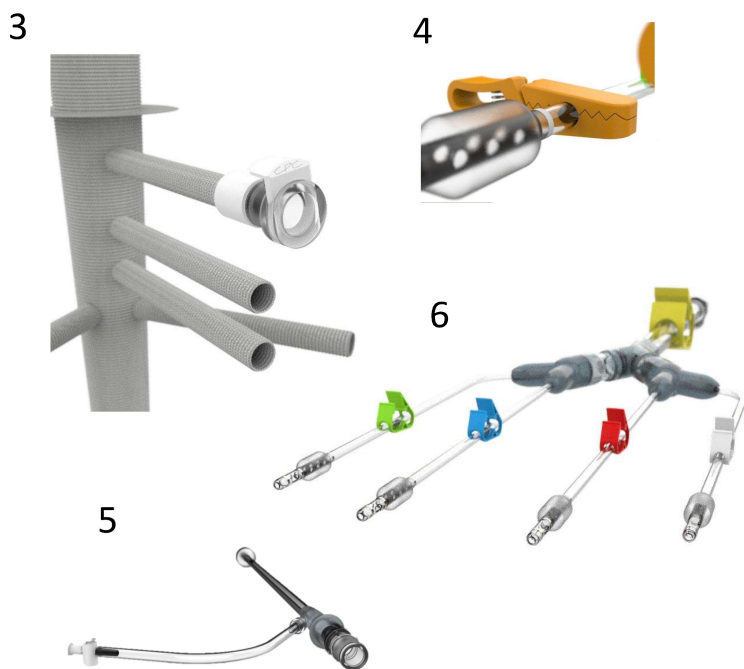
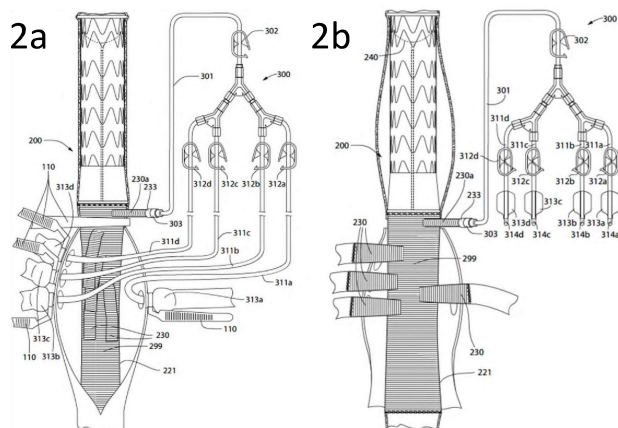


Figure 3. Vascular implant

Figure 4. Bulldog Clamp on manifold

Figure 5. Molding balloon

Figure 6. Manifold

Stage of Development

Stage of Development: Prototype development

Partnerships: Co-Development, Licensing

Intellectual Property: US and International Patent Applications

Funding support by Foundation Venture Capital Group (Foundation for Health Advancement)



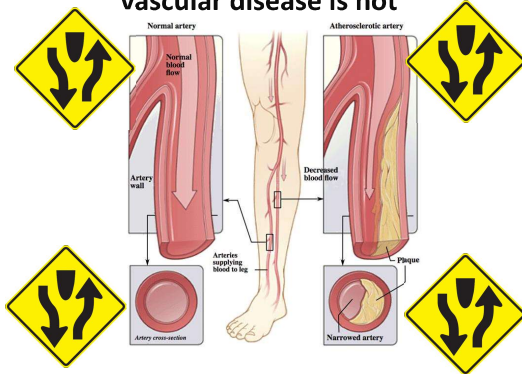
Upstream Access

Multi-directional Vascular Access Technology



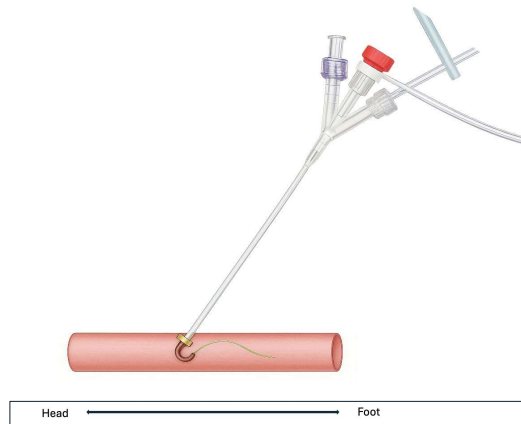
Unmet Need

Current arterial and venous access to treat blood vessel disease is unidirectional -- vascular disease is not



Vascular Interventionists wanting to treat multiple level disease either need to do **multiple procedures** on a patient or stick **multiple blood vessels** increasing **risk** and **complication rate**

Solution and Technology

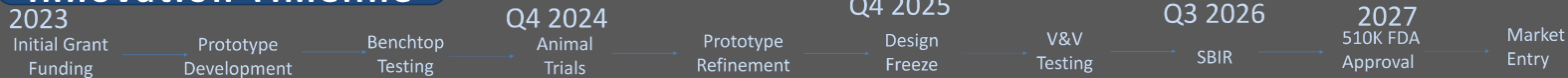


The device includes two main components:

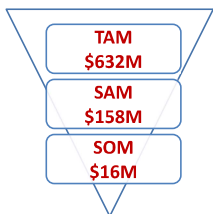
- Balloon Anchored Sheath and the U-turn catheter
 - The inflatable balloon securely anchors the sheath to the vessel wall without obstructing blood flow. The short sheath length allows access to more arteries for treatment.
- U-Turn Catheter
 - The catheter has a curved, steerable tip for precise wire placement in any direction, and it also includes a marker on the hub to guide catheter rotation.

The Upstream Access Multi-Directional Sheath addresses these challenges with a balloon-anchored design and a steerable U-turn catheter. This system provides antegrade and retrograde access in a single procedure, **reducing the need for additional access points** and thus **reducing the risk of complications**. It uses a balloon-anchor to secure the sheath within the vessel, reducing trauma and increasing treatable artery length. The device also enables precise, 360° wire placement using the steerable catheter with directional indicators. These functionalities serve to streamline procedural workflow.

Innovation Timeline



Market



Peripheral Arterial Disease

- 250,000 procedures per year
- \$10,000-\$25,000 per intervention

Dialysis Access

- 350,000 procedures per year
- \$1,800 to \$5,200 per intervention



National Science Foundation
I-CORP identified 3rd Market
Deep Vein Thrombosis
• 900,000 patients per year

Current State

Upstream Access

- C corp created in 2024

FDA Pathway

- Pre submission or direct to 510k
- Per RQM+ Regulatory Consultant – FDA likely will not require in patient testing

Current State

- Total FHA Innovation Grant Funding: \$104,600
- Received an additional \$30,000 from Cooper for the innovation grant phase
- Received Regional I-CORP Grant
- Completed initial development, prototyping and proof of concept animal testing
- Currently in design refinement

Leadership Team

President and CEO



Katherine McMackin MD, MS
Assistant Professor of Surgery
Cooper Medical School of Rowan University
Director of Vascular Surgery Research
Vascular and Endovascular Surgeon
Cooper Medical School of Rowan University

Chief Medical Officer and VP



Jeffrey Carpenter MD
Professor of Surgery
Cooper Medical School of Rowan University
Vascular and Endovascular Surgeon
Cooper Medical School of Rowan University

Innovation Partners



RESONETICS
Engineering Partner



RQM+
Regulatory Consultant



Next Funding Round

Phase 1 SBIR - Submitted
Awaiting NIH Funding Decision

Dilutive Funding in 2026
\$1.5 Million ask to get through FDA approval

Moldable Magnet System to Treat Auricular Hematoma

Donald Solomon, MD ¹

¹ Associate Professor of Surgery, Division of Otolaryngology, Cooper Medical School of Rowan University

Brief Description

A moldable magnet system designed to treat auricular (ear) hematoma (cauliflower ear) non-invasively using a conformable heat sensitive plastic (EVA) material in association with a magnetic compression device.

Problem

Auricular hematoma results from blunt trauma, commonly affecting athletes in wrestling, boxing, mixed martial arts, and rugby. Following the trauma and without treatment, there is subperichondrial collection of blood which eventually fibroses or scars, leading to permanent deformity. Auricular hematomas require drainage and applied pressure to the affected area to prevent this deformity.

Current treatments for auricular hematoma require drainage followed by pressure application described below. These traditional methods can lead to poor outcomes and patient experience:

- Invasive Bolsters: Sutured through the ear skin & cartilage, causing pain, infection risk, and the need for removal.
- Magnetic Compression Discs: Non-invasive but rigid, failing to conform to the natural ear contours leading to suboptimal results.

Solution

A moldable on-ear system, allowing conformation to the concavities and ridges of the ears natural contour which utilizes magnetic force to apply constant, uniform pressure without invasive suturing. The device is designed for comfort, reusability, and effectiveness in restoring the ear's pre-injury appearance.

Technology

The system consists of a moldable plastic medium and a dual magnet compression system. This innovation addresses the limitations of traditional ear bolsters by preventing sutures through the ear skin and cartilage and rigid magnetic devices by providing uniform, adaptable pressure to restore pre-injury ear appearance.

Advantages

- Uniform Moldable Pressure Application: Adapts to the ear's shape, preventing post treatment deformity more effectively than rigid magnetic systems.
- Non-Invasive: Unlike sutured through the ear bolsters, this device eliminates invasive treatment, pain, infection risk, and removal procedures.
- Ease of Use: No need for pre-molding or post-injury customization.

Device Design



Figure 1. An example of untreated auricular hematoma (cauliflower ear)

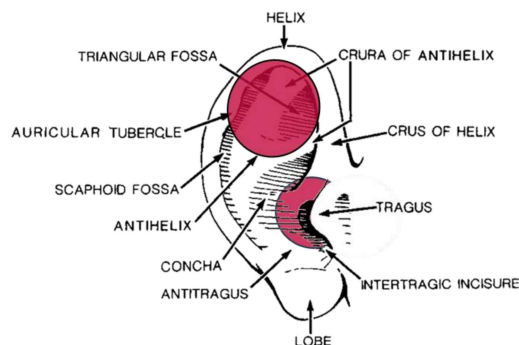


Figure 2. Diagram of the ear depicted areas where auricular hematoma can form and where constant pressure is needed.

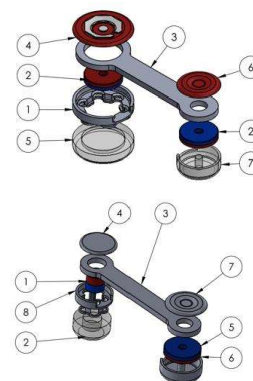


Figure 3. Exploded view prototype CAD design.
Top: Triangular Fossa device.
Bottom: Conchal bowl device.



Figure 4. Rendering and pair of prototypes.



Figure 5. Example of device moldability and use. Submerge in hot water and apply.



Figure 6. Device pair on healthy volunteer.

Stage of Development

Stage of Development: Prototype Finalization

Intellectual Property: US Provisional Patent Application Filed

Partnerships: Co-Development, Licensing, Start-Up

Funding support by Foundation Venture Capital Group (Foundation for Health Advancement)

Methods and Apparatus for Locating Arteries and Veins Using Light

Brief Description

A device comprised of an array of sensing chips designed to measure oxygen saturation in vasculature, enabling differentiation between arteries and veins.

Problem

Accurate, real-time identification and tracking of blood vessels is essential in clinical settings to improve patient safety and procedural efficiency. Difficulty in locating veins during routine vascular access procedures can lead to multiple failed attempts, increasing patient discomfort, infection risk, and procedural delays. Accidental arterial puncture, particularly in patients with small, fragile, or difficult-to-access veins, can result in severe complications such as excessive bleeding or vascular injury. In emergency and critical care scenarios, rapid and precise vascular access is crucial for timely resuscitation, medication delivery, and life-saving interventions. A real-time vessel identification system enhances procedural success, minimizes complications, and optimizes patient outcomes across various medical applications.

Solution

Given that a regular pulse oximeter can calculate oxygen saturation by comparing the absorption of red and infrared light by the blood. Dependent on the amount of oxygenated Hb and deoxygenated Hb present, the ratio of the red-light absorption to infrared light absorption changes. This same principle can be used to detect an artery or vein.

Technology

The device is designed to identify peripheral arteries and veins with the use of an array of light-emitting diodes (LEDs) and photodetectors to predict an artery or vein trajectory under a patient's skin or during open surgery in a region of interest or organ. An innovative array of infrared chips conforming to body contours is used to identify a precise artery or vein location based on measurement of SpO₂.

Advantages

- Non-invasive , improved patient safety and comfort
- Improves efficiency, saves time, and reduces risk
- Real-time operation enables continuous vessel tracking

Device Design

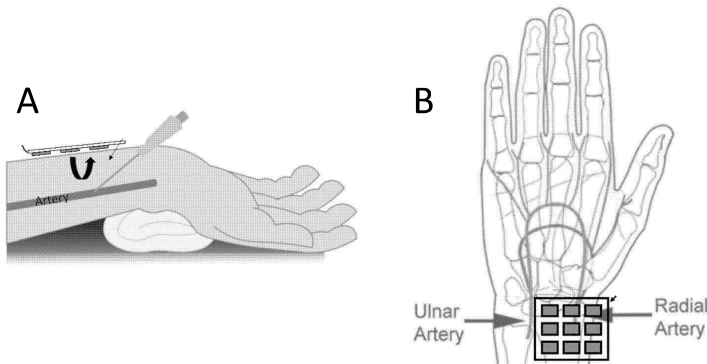


Figure 1A. A schematic displaying a side view of the device measuring blood vessels.

Figure 1B. A schematic displaying a top view of the device measuring blood vessels.

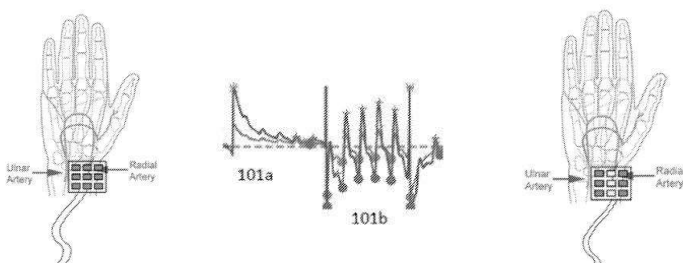


Figure 3. A diagram of the device describing how the LEDs and photodetector are used to predict the location of arteries. The image on the left displays the device upon placement on a hand. The plot represents the measure of SpO₂. The image on the right displays the device readout where shaded squares indicate location of an artery.

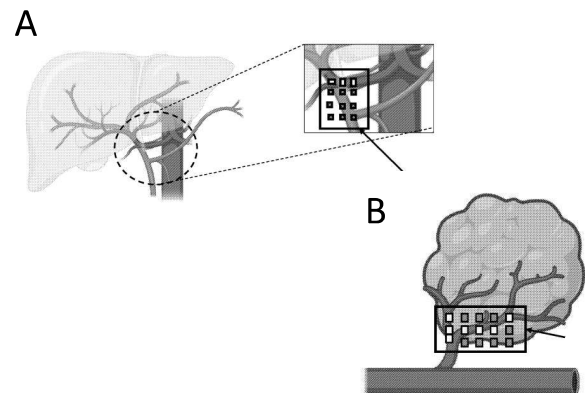


Figure 4A. A diagram of the device identifying an artery within hepatic vasculature.

Figure 4B. A diagram of the device identify an artery feeding a tumor.

Stage of Development

Stage of Development: *Prototype Development*

Partnerships: Co-Development, Licensing

Intellectual Property: US Provisional Patent Application Filed

Rapid Entry Thoracotomy Tray (RETT)

John Chovanes, DO, FACS

Associate Professor of Clinical Surgery, Trauma/Surgical Critical Care, Cooper Medical School of Rowan University

Jeffery Gair, PHD – MDC Studio

Bailey Fokin – MDC Studio

Brief Description

A thoracotomy tray designed to provide all essential instruments for emergency heart surgery, streamlining preparation and response time.

Problem

In cases of severe chest trauma, rapid surgical access to the heart, great vessels or lungs may be required to perform life-saving interventions. Traditionally, this involves a deep left chest incision and rib displacement to access the central thoracic cavity. It is not uncommon for the heart to be injured when “heart surgery” is to be performed. Unlike the typical heart surgery - where a dedicated cardiac surgical team uses hundreds of surgical instruments with extensive preparation- emergency thoracotomies are often performed in trauma bays or emergency rooms with limited resources and personnel.

The typical chest surgical tray has hundreds of surgical instruments, which are packaged in a sterilized box that must be unpacked, at times assembled, laid out on a large table and then handed to a surgeon by a surgical technician. Disposables, such as extensive sutures and scalpel blades must be gathered, opened, and prepared in a similar fashion. Some instruments, such as the rib spreader and scalpels must be assembled and placed on a large sterile holding table, for handling by a surgical technician when called for by a surgeon. This process takes hours and requires 6-12 trained personnel to be present.

The hundreds of instruments in a typical heart surgery, along with the many disposables are frequently what many hospitals utilize in an emergency setting. Yet the idea of using a massive surgical box, packed with instruments, in a limited resource trauma room or ER, requiring the gathering of additional disposables, and frequently needing to assemble key instruments, and sort through a box of hundreds of tightly packaged instruments, while a dying person - usually a young male-is lying next to the surgeon, is a formula for failure.

Solution

To address the need for rapid surgical access in emergency thoracotomy situations, a streamlined and resource-efficient approach is required. A specialized emergency thoracotomy kit can be developed, containing only the essential tools necessary for this specific procedure, such as a rib spreader, forceps, and vascular clamps. A pre-packaged and ready-to-use sterile tray eliminates the need for unpacking, organizing, and assembling components. The kit will be made lightweight, durable, and easy to store to ensure immediate availability without taking up excessive space. Surgeons can significantly reduce the time required to initiate life-saving procedures, improve patient survival rates, and optimize the use of limited resources in trauma settings.

Technology

The Rapid Entry Thoracotomy Tray (RETT) is an intelligently designed, all-in-one system that distills the chaos of a cardiac tray into a single, sterile, and ready-to-use kit. It is engineered to bring order and speed to the most critical moments in trauma care. The RETT consolidates every necessary instrument, disposable, and suture required for an emergency thoracotomy. Upon opening, all critical tools - such as scalpels and sutures - are logically arranged and are instantly ready for use, eliminating search and setup time. This self-contained system is purpose built for the resource-limited trauma bay. It dramatically reduces the need for extra personnel to find, open, and prepare instruments. By simplifying access and setup, the RETT enables faster, safer, and more effective care when every second counts.

Advantages

- Consolidates a wide range of surgical instruments and disposables into a single, easily accessible source
- Saves critical time during emergency heart surgery
- Minimizes staffing requirements for surgical preparation

Military, Diplomatic, and Field Surgical Affairs (MILDAF)



Figure 1. Photo of a thoracotomy procedure. The first version of the RETT (circled in red) being utilized in a typical trauma chest surgery.



Figure 2. Cooper Military, Diplomatic, and Field Surgical Affairs (MILDAF). Cooper’s expert trauma team, which includes members of the military, trains elite military medical teams from the United States Army, Navy, Air Force, Coast Guard, U.S. Department of Homeland Security, and U.S. State Department. At Cooper, the only Level 1 Trauma Center in South Jersey, members of military medical units gain tremendous real life trauma experience before heading to combat zones. Cooper’s research initiatives strive to develop and advance technologies that will improve the standard of care among the U.S. Armed Forces as well as civilians.

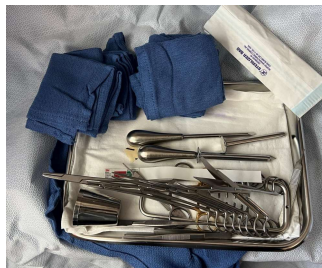


Figure 3. Photo of a contemporary thoracotomy tray. A typical thoracotomy tray missing even vital instruments such as a retractor.

Stage of Development

Stage of Development: Patent Pending
Partnerships: Co-Development, Licensing

Noninvasive Estimation of Myocardial Oxygen Consumption and Efficiency: New Metrics for Assessing Myocardial Energetics

Question

- Echocardiography-derived myocardial work is correlated with myocardial oxygen consumption (MVO_2) and provides insights into myocardial energetics.
- However, apart from positron emission tomography (PET), noninvasive tests are not available for this clinical tool. Accordingly, we used previously developed and available metrics to calculate stroke work (SW) and myocardial oxygen consumption (eMVO_2) providing myocardial efficiency (MyoEff).

Current Technology

- Options for assessing eMVO_2 include 1) an expensive PET scan or the 2) use of indirect metrics such as Rate Pressure Product (RPP) and Triple Rate Product (TRP).
- The PET scan can not be used as a tool for regular office visits.
- The RPP and TRP metrics do not provide sufficient and accurate insight in myocardial energetics.

New Technology

- The Rooke & Feigl algorithm (1982) provides a non-invasive tool to allow for the evaluation of eMVO_2 .
- Combining eMVO_2 with stroke work provides a quantification of myocardial efficiency: eMVO_2/SW . This metric can be assessed during echocardiographic exams. The accuracy of the Rooke & Feigl metric is due to the correlation between left ventricular mass (LVM) and eMVO_2 (Figure 1).

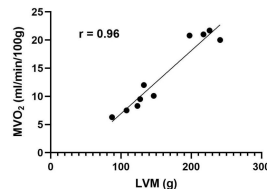
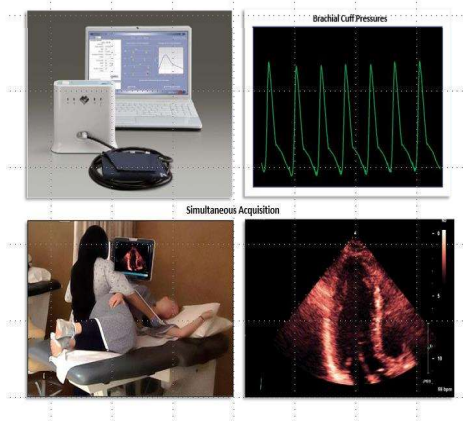


Figure 1

Methods



- 8 healthy subjects (3 M & 5 W; ages 19-63)
- Subjects rested for 5 mins prior to acquisition
- Central aortic pressures (CAP) obtained simultaneously during 2D imaging acquisition for stroke-work.
- Images/pressure acquired during apnea
- 3 cardiac cycles and pressures acquired and repeated in the apical 2, 3, 4 chamber views

Data Analysis & Calculations

- We chose to use two methods to evaluate this concept. We used a computational model (CM, Mulligan et al 2025) with simulated aging, intended to increase SW and a pilot study on healthy subjects (n=8) with echocardiography and the Sphygmocor Xcel BP device, providing central aortic pressures.
- Both yielded data for calculation of eMVO_2 and MyoEff.
- Both methods yielded physiologic values for eMVO_2 , SW and MyoEff.
- Calculation of SW = Stroke Volume * Peak Systolic Pressure-Arterial End-Diastolic Pressure (converted to Joules).
- Calculation of eMVO_2
- $\text{eMVO}_2 = K1(\text{SBP} * \text{HR}) + K2 (0.8 * \text{SBP} + 0.2 * \text{DBP} * \text{HR} * \text{SV}/\text{BW}) + 1.43$ (converted to Joules)
- $\text{MyoEff} = \text{SW} / \text{eMVO}_2$

Results

Results					
Computational Model					
		Percent Increase from Normal			
Aortic Compliance	Normal C _A	90%	80%	60%	Stiff
eMVO_2	10.7	16	24	33	49.4
MyoEff	14.8	8.1	12.8	20.8	27.8
Subject Data					
Estimation of SW, eMVO_2 , MyoEff					
	HR	SW	LVM	eMVO_2	MyoEff
M	67.6	8802	142.5	9.4	37.9
SD	5.4	3231	41.2	1.6	7.1

Conclusions

- The combined use of echocardiography and CAP offers a practical, noninvasive assessment of myocardial energetics. These preliminary results support further investigation in subjects with aortic and myocardial diseases.

Stage of Development

Stage of Development:
1) Clinical proof of concept
2) Discovery Partnerships
3) Licensing

Intellectual Property
US Patent App. 63/ 63/660,054

A Real-Time, AI-Supervised Virtual Reality (VR) Trauma Simulation Platform



Robert W. DesPain, MD¹ and Anna Goldenberg-Sandau, DO²

¹Trauma and Acute Care Surgeon, Cooper University Hospital

²Trauma and Acute Care Surgeon, Cooper University Hospital

Trauma Research Director, Associate Professor of Surgery, Cooper Medical School of Rowan University



Brief Description

SurgiSim Solutions Inc. aims to develop a real-time, AI-supervised virtual reality (VR) trauma simulation platform that delivers personalized, procedurally accurate feedback in immersive training environments.

Problem

Traumatic injuries are a major public health concern in both the United States and globally, resulting in high mortality, long-term disability, and significant economic burden. In the U.S., trauma accounts for approximately 2.6 million hospital admissions annually, while globally it causes nearly 6 million deaths each year - surpassing fatalities from all infectious diseases, including COVID-19. These figures are especially stark in regions lacking access to trauma care ("trauma deserts") and in areas affected by armed conflict.

Despite this burden, trauma education and research receive only about 1% of the global medical budget. Training remains outdated, inaccessible, and unevenly distributed, particularly in underserved regions. Traditional methods, such as mannequin-based simulations, are costly, inflexible, and lack the real-time, adaptive feedback necessary for high-stakes clinical decision-making and effective team communication.

Trauma resuscitation is a highly complex, dynamic process that involves a multidisciplinary team working under pressure to stabilize a patient who has sustained severe injuries. The complexities stem from the need for rapid decision-making, prioritization of interventions, and the necessity to address multiple physiological systems that may be compromised simultaneously. Given the speed of trauma resuscitation, decisions must often be made rapidly with incomplete information.

Solution

SurgiSim Solutions Inc. will develop a trauma training VR to complement existing methods, offering immersive simulations for individual learners and multidisciplinary teams. This platform replicates the high-pressure environment of trauma resuscitation, enhancing knowledge, teamwork, and decision-making skills crucial to saving lives. With support, we will create scalable and accessible solutions that set new standards in trauma care education while reducing training costs and enhancing patient outcomes.

Technology

The challenge of developing a realistic VR model for trauma resuscitations lies not only in presenting accurate medical scenarios but also in replicating the stress of the trauma bay. Effective VR trauma simulators must foster clear communication in crowded settings, demand timely and accurate decisions, and provide consequences for errors, such as the patient's condition deteriorating. The goal is for learners to immerse themselves in trauma scenarios, demonstrate effective teamwork, obtain critical information, make rapid decisions, and perform interventions under time pressure—ultimately contributing to patient survival.

Advantages

- Offers a realistic trauma resuscitation simulation
- Simulations designed and developed by experienced surgeons
- Use of Artificial Intelligence to act as a mentor and provide evidence-based feedback

Design & Approach



Figure 1. Cooper Health Care Operating Room. As a leading academic, tertiary care health system with the region's only Level 1 Trauma Center, Cooper provides advanced surgical capabilities and multidisciplinary expertise to manage the most complex and critical cases.

Aim 1: Develop a realistic and immersive VR trauma resuscitation platform.

Aim 2: Build a scalable, expandable library of trauma case scenarios and training materials.

Aim 3: Develop a multi-role component of the VR platform to allow team members from different disciplines to practice trauma resuscitations together within the same VR experience.

Aim 4: Development and implement a STEM-focused injury and violence prevention program for Camden County High School students.



Figure 2. By modernizing trauma care training, the platform improves clinical decision-making, enhances team communication, and builds confidence under pressure. This simulation runs on commercially available VR headsets—mock-up shown here.

Stage of Development

Stage of Development: *Prototype Development*

Partnerships: Co-Development

Intellectual Property: US Provisional Patent Application Filed

Handheld Vacuum Biopsy & Cryotherapy Device for Minimally Invasive Ablation of Breast Lesions

Brief Description

A minimally invasive device integrating vacuum-assisted biopsy and cryoablation into a single percutaneous procedure for treating suspicious or malignant breast lesions. The device offers both diagnostic biopsy and localized ablation, with or without local chemotherapeutic agents—reducing tumor disruption/seeding, minimizing recurrence risk, and eliminating the need for multiple instruments or procedures.

Problem

Current treatment for suspicious or malignant breast lesions typically involves percutaneous biopsy followed by surgical excision/lumpectomy, with or without radiation. While minimally invasive vacuum-assisted biopsy (VABB) is standard for tissue diagnosis, it does not treat the residual lesion. Cryotherapy is an established method of tissue ablation, but typically requires separate equipment, additional needle insertions. There is a need for a single, integrated device capable of both diagnostic biopsy and localized ablation in one procedure, especially for older or non-surgical candidates.

Solution

The device integrates vacuum-assisted biopsy and cryotherapy for breast lesion management for use during a single procedure. It features multiple configurations: a cryoprobe positioned behind the biopsy needle, a shared probe tip design, and an advanced version with dual side catheters for localized drug delivery (e.g., Tamoxifen via hydrogel).

Device Design

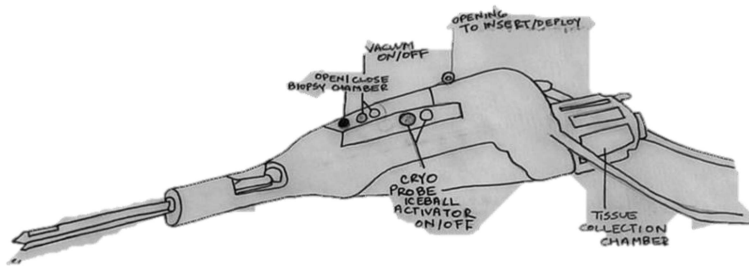


Figure 1. Biopsy cryoablation device schematic showing a handheld, single use, dual-probe device for biopsy and treatment of breast cancer, axillary lymph node, or another target lesion, where the cryoprobe is adjacent to the vacuum biopsy needle.



Figure 3. Image shows a 1.2 cm suspicious target lesion example with irregular margins, and the biopsy results of this lesion were positive for malignancy.

Technology

A handheld, single-use medical device that combines two key functions—biopsy and cryotherapy—into one tool for diagnosis and treatment of breast cancer. It allows clinicians to collect tissue samples and perform targeted cryoablation in a single, minimally invasive procedure, reducing the need for multiple instruments or steps. The device is designed in different configurations, including models with dual probes or a shared tip design, and can be further enhanced with side cannulas for delivering localized drug therapy directly into the treatment area, stabilized with a hydrogel formulation. Operated under ultrasound guidance, and adaptable for future imaging modalities like CT and MRI, the system is designed to simplify outpatient care while improving precision and safety. By integrating diagnosis and treatment into one device, this technology offers a more efficient and patient-friendly approach to breast lesion management.

Advantages

- Single-pass diagnosis and treatment
- Reduce risk of tumor recurrence
- Minimally invasive and designed for outpatient use

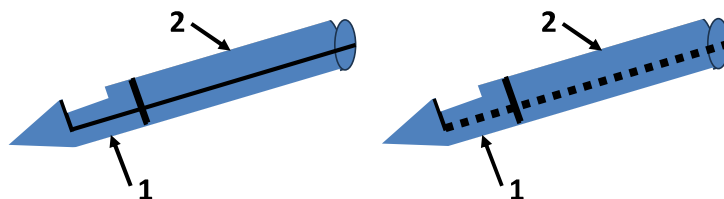


Figure 2a. Vacuum biopsy portion is fixed and seated on closed system cryoprobe. The material distal to the bold line labeled 1 is made of metal alloy optimized for cryoablation and in total spans approximately 4 cm. Proximal to the bold line the composition is stainless steel. Alternate designs may include variations of metal based on system optimization.

Figure 2b. In the next rendering two additional cannulas are affixed to the device, one on each side with multiple side holes to be used for sterile post-procedure administration of pharmacological therapeutics into the treatment cavity.

Stage of Development

Stage of Development: *Concept Development*

Partnerships: Co-Development, Licensing

Intellectual Property: US Provisional Patent Application (Confidential)

To Decrease Heme-Mediated Inflammation

Brief Description

Tolimidone (MLR-1023) is a first-in-class small-molecule **Lyn kinase activator** that potentiates Lyn's inhibitory signaling of TLR4-driven inflammation, reduces cytokine release, and improves cognition in preclinical subarachnoid hemorrhage models.

Problem

Hemorrhagic stroke affects more than a million people worldwide each year and remains one of the most devastating forms of brain injury. Despite advances in aneurysm repair and neurocritical care, **no therapy addresses the inflammatory cascade that drives secondary injury** after the bleed.

After SAH or intracerebral hemorrhage, **extravasated red blood cells release heme**, which acts as a potent damage-associated molecular pattern (DAMP). Heme activates **TLR4 on microglia and macrophages**, triggering chronic NF- κ B-driven inflammation that worsens edema, impairs perfusion, and contributes to long-term cognitive decline. Existing drugs like nimodipine only target vasospasm, leaving the heme-TLR4-inflammation axis untreated.

This persistent neuroinflammatory state is the key mechanistic bottleneck preventing true recovery in hemorrhagic stroke patients.

Solution

In murine SAH models, MLR-1023 treatment restored p-Lyn levels, suppressed NF- κ B and MAPK signaling, reduced pro-inflammatory cytokines (TNF- α and IFN- γ), and improved neuronal survival. Flow cytometry confirmed increased p-Lyn⁺ microglia and reduced cytokine-positive populations, while behavioral testing demonstrated improved memory and spatial learning. *(Based on JAHA 2025, Hanafy et al.)*

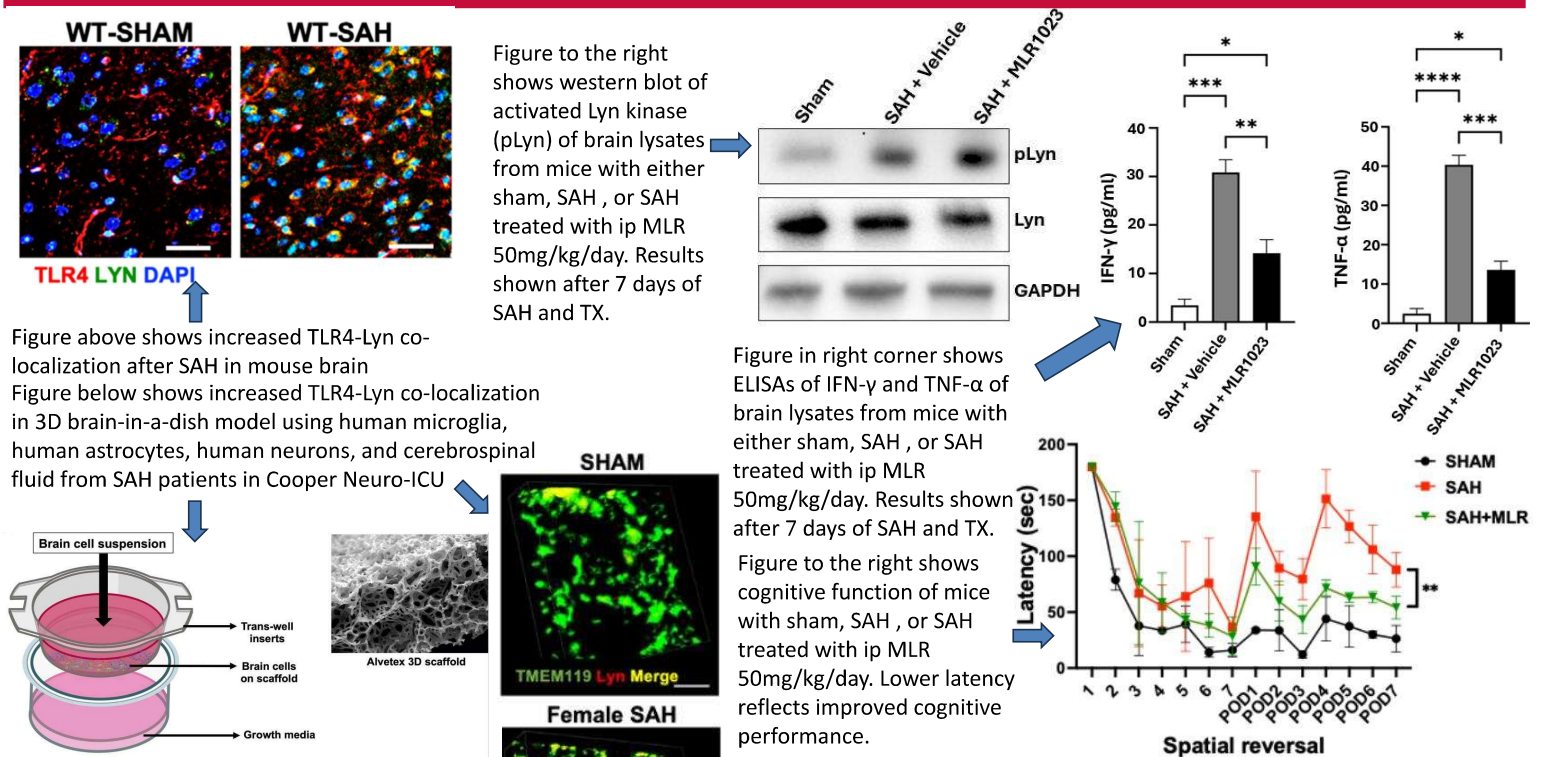
Technology

MLR-1023 selectively activates **Lyn kinase**, a key intracellular checkpoint that restrains TLR4-driven inflammation. By allosterically modulating Lyn rather than binding its active site, MLR-1023 restores feedback inhibition of downstream cytokine cascades, preventing excessive immune activation while minimizing off-target effects.

Advantages

- **Mechanism-guided therapy:** Activates an endogenous resolution pathway rather than broad immune suppression.
- **Clinically de-risked compound:** Phase 2b safety and PK/PD data already available. No adverse effects in over 700 patients treated for T2D.
- **Broad therapeutic potential:** Targets a conserved heme-TLR4-Lyn pathway relevant to SAH, ICH, and TBI.

RESULTS & FIGURES



Stage of Development

Preclinical validation completed – proof-of-concept established in murine SAH.
Partnerships: Open for co-development and licensing.
Intellectual Property: U.S. Provisional Patent Application filed (CMSRU / Hanafy).
Regulatory Status: MLR-1023 has completed Phase 2b safety trials for type 2 diabetes. Future CNS use will advance under a **505(b)(2) cross-reference IND**, not a new IND filing.

John Chovanes, DO, FACS

Associate Professor of Clinical Surgery, Trauma/Surgical Critical Care, Cooper Medical School of Rowan University
Bailey Fokin – MDC Studio

Brief Description

A fixed wing Vertical Take-Off and Landing (VTOL) unmanned aircraft system (UAS) that delivers critical medical supplies.

Problem

In a life-or-death emergency, the battle is against the clock. For first responders at the scene of a crisis, their ability to save lives is directly tied to the tools and supplies they have on hand. The current system for providing life-saving supplies to these critical scenes is slow, inflexible, and dangerously dependent on ground infrastructure, creating unacceptable risks when minutes matter most.

Emergency scenes can be chaotic and, by nature, sometimes inaccessible. For example, in New Jersey a multi-car pileup on the Turnpike or post-hurricane conditions could block access for miles. A medical emergency on a crowded beach or a remote trail in the Pine Barrens is completely cut off from accessible roads. Even if a hospital has the specific blood and supplies needed, there is sometimes no reliable way to get medical supplies past the gridlock and directly into the hands of the paramedic who needs it now. This "last mile" is often the most critical and where current logistical models fall short.

First responders can only carry limited specialized equipment and supplies. When first responders require a critical resupply, the current solution is to dispatch another emergency vehicle, possibly creating a dangerous ripple effect: pulling another unit out of service could potentially leave a community vulnerable. Currently, there are no agile systems to deliver a single crucial item without deploying an entire vehicle and crew. Moreover, when first responders are deployed, they are still susceptible to traffic/access delays.

This critical logistical gap identified extends beyond the emergency scene; it's a daily reality within New Jersey's statewide hospital network. Not every hospital is equipped with a comprehensive blood bank and a specialized testing lab. For example, when a patient in Cape May require a higher level of care that only a Level 1 trauma center can provide, their care is immediately bottlenecked by the 60+ miles of highway. Unfortunately, our current system forces facilities to operate in silos, rather than as a truly integrated, life-saving network.

Solution

To address today's critical logistical challenges, we present Jersey Angels: a drone delivery system that creates a new, unimpeded highway in the sky for life-saving supply delivery. By deploying a fleet of long-range, autonomous VTOL drones, we can transport blood, platelets, and critical devices from a centralized hub directly to any emergency scene or a regional hospital in the state in a fraction of ground delivery time.

This new system bypasses the chaos of traffic, the limitations of geography, and accessibility of certain crisis scene. A climate-controlled payload can be launched in minutes and fly a direct path, landing precisely where it's needed most – whether that's a hospital helipad in Cape May or a clearing next to an accident on the Turnpike. The Jersey Angels transforms our healthcare facilities from isolated silos into a single, integrated life-saving network.

Technology

This system is built on a foundation of proven, state-of-the-art technology selected for its reliability, safety, and mission-critical performance. The core of this platform is a VTOL drone, which can launch and land within a 5x5 foot space – a hospital rooftop, a parking lot, or a clearing next to an emergency scene – without the requirement of the space of a runway. What makes this technology unique is, once airborne, the drone transitions to efficient forward flight by using its fixed wing to generate lift, drastically reducing battery consumption and enabling the long-range, high-speed delivery.

Advantages

- Deploys in seconds, eliminating ground dispatch delays
- Capability to land almost anywhere without the cumbersome requirements of a runway
- Ability to bypass all traffic and ground obstacles for faster delivery
- Safe biologic transport for immediate use
- Provides on-demand support to both pre and post hospital settings

Military, Diplomatic, and Field Surgical Affairs (MILDAF)

Figure 1. Photo of the Jersey Angel Prototype. With vertical takeoff and landing, deployment can happen in seconds almost anywhere.



Figure 2. Cooper Military, Diplomatic, and Field Surgical Affairs (MILDAF). Cooper's expert trauma team, which includes members of the military, trains elite military medical teams from the United States Army, Navy, Air Force, Coast Guard, U.S. Department of Homeland Security, and U.S. State Department. At Cooper, the only Level 1 Trauma Center in South Jersey, members of military medical units gain tremendous real life trauma experience before heading to combat zones. Cooper's research initiatives strive to develop and advance technologies that will improve the standard of care among the U.S. Armed Forces as well as civilians.

Stage of Development

Stage of Development: Patent Pending
Partnerships: Co-Development, Licensing

Rapid Access Printed Thoracotomy Retractor (RAPTOR)

John Chovanes, DO, FACS

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Jeffery Gair, PHD – MDC Studio

Bailey Fokin – MDC Studio



Cooper Medical School
of Rowan University

Brief Description

An inexpensive and lightweight 3D-printed retractor tailored for rapid access and assembly.

Problem

Traditional Finochietto retractors are vital in cardiothoracic surgery, but their near century-old design presents unacceptable risks and inefficiencies in modern medical environments. They are financially unsustainable in specific cases, cumbersome in combat theaters, and too complex to assemble for high-stakes trauma scenarios.

While designed for reuse, traditional retractors become a single-use liability in cases involving high-risk infectious agents such as Creutzfeld-Jakob Disease (CJD), where all instruments are required to be incinerated after the procedure, resulting in an immediate financial for a single case. Compounding this with fragile supply chains, the inability to procure a replacement instrument could unfortunately force hospitals to turn away a critically ill patient.

In scenarios where every pound counts – such as a field hospital or medical helicopter – the weight of a steel retractor could displace other life-saving medical supplies; forcing teams to make compromises in medical care. The excess weight presents an ergonomic challenge that can compromise performance when it matters most.

In the high-stakes environment of a trauma bay, every second is crucial to patient outcome. Traditional retractors, when sterilized, are disassembled in three parts, meaning they are never ready for immediate use. When a surgeon requires a retractor, medical personnel must waste precious time fumbling with its assembly; lining one end of the retractor up with the other, dropping the pin in place, and painstakingly spinning the crank so the retractor can be used. This mandatory assembly process introduces a needless delay and potential point of failure during the most critical moments of patient care.

Solution

To address the challenges faced with traditional retractors, a change in design was made to meet the demands of modern surgery. The Rapid Access Printed Thoracotomy Retractor (RAPTOR) solves the flaws of its predecessor. Manufactured from a high strength biocompatible polymer, the RAPTOR significantly reduces the financial loss from post-op incineration in cases like Creutzfeld-Jakob Disease (CJD). Moreover, with fast manufacturing speeds, the retractor can be replaced swiftly. The materials utilized to manufacture the RAPTOR cuts the weight to a fraction of contemporary retractors and can also be reused through traditional sterilization. Further, the RAPTOR simplifies a three-part system to a two-part system and utilizes a crank-less design for rapid deployment.

Technology

Our technology leverages modern design and unique manufacturing techniques. This approach eliminates the need for expensive molds and tooling, resulting in minimal production overhead. By creating a digital design, instruments can be modified on the fly and enable on-demand production. This insulates hospitals from delays in fragile supply chains and provides a faster, more resilient solution for time-critical moments in the operating room.

Advantages

- Two-part non-crank design significantly speeds up assembly
- Significantly reduces financial loss from single-use cases
- Radio-opaque
- Fully compatible with existing hospital sterilization methods
- Exceptionally lightweight compared to its contemporary
- Agile design allows for rapid updates and surgeon-led improvements

Military, Diplomatic, and Field Surgical Affairs (MILDAF)

Figure 1. Photo of the RAPTOR. The image was taken while in preparation of a Creutzfeld-Jakob Disease (CJD) case.



Figure 2. Cooper Military, Diplomatic, and Field Surgical Affairs (MILDAF). Cooper's expert trauma team, which includes members of the military, trains elite military medical teams from the United States Army, Navy, Air Force, Coast Guard, U.S. Department of Homeland Security, and U.S. State Department. At Cooper, the only Level 1 Trauma Center in South Jersey, members of military medical units gain tremendous real life trauma experience before heading to combat zones. Cooper's research initiatives strive to develop and advance technologies that will improve the standard of care among the U.S. Armed Forces as well as civilians.

Stage of Development

Stage of Development: Patent Pending
Partnerships: Co-Development, Licensing

PRIORI: A Bayesian Clinical Decision Support System for Patient-First, Cost-Aware Acute Care



Sharad Patel, MD

Founder, PRIORI – Critical Care & Nephrology



Brief Description

PRIORI is a Bayesian decision support utility agent for acute care that reduces diagnostic uncertainty and avoids unnecessary testing by recommending the minimum safe next step—patient-first and cost-aware.

Problem

Acute care decisions are made under intense cognitive load, fragmented information, and severe time pressure. Clinicians must balance diagnostic uncertainty, patient safety, and rising costs—yet current tools offer static guidelines or opaque “black-box” outputs that provide recommendations without transparent reasoning. As healthcare shifts toward value-based care, unnecessary testing, low-value interventions, and variability in clinical decision-making drive both cost and harm. What is missing is a real-time, bedside utility framework that reduces cognitive burden *and* makes its reasoning explicit—supporting clinicians in choosing the **safest, most efficient next action** while maintaining trust and accountability.

Solution

PRIORI recommends the *minimum safe next step* by combining Bayesian updates with expected-utility logic. As new data arrive, the system adjusts disease probability (Prior $\times$ Likelihood Ratio $\rightarrow$ Posterior) and compares options based on three factors: **benefit, harm, and cost**. The “utility” of each action is calculated in simple terms: **Utility = Benefit – Harm – Cost**. PRIORI then selects the option with the highest utility that is also safe and evidence-aligned, displaying its reasoning transparently instead of acting like a black box.

Technology

PRIORI uses an **Agno-based Bayesian engine** that behaves like a *dynamic decision tree*, mirroring real clinical reasoning. As new vitals, labs, or exam findings arrive, it **updates posterior probabilities in real time** and re-ranks the safest next actions. Using **contextual engineering** with bedside data and cost references, it provides **transparent, auditable outputs** that show *why one branch is chosen and others are not*, instead of giving static black-box recommendations (vitals, labs, meds) with **CMS cost references** and locally configurable.

Approach

Figure 1 illustrates PRIORI's Bayesian reasoning process. Starting with baseline probability (prior), PRIORI continuously updates diagnostic likelihood as new clinical data arrives, generating real-time posterior probabilities. The system then ranks next-step actions by clinical benefit, safety, cost, and patient context—transparently recommending the highest-value intervention at each decision point.

Figure 1: How PRIORI Thinks
Bayesian Clinical Reasoning Loop

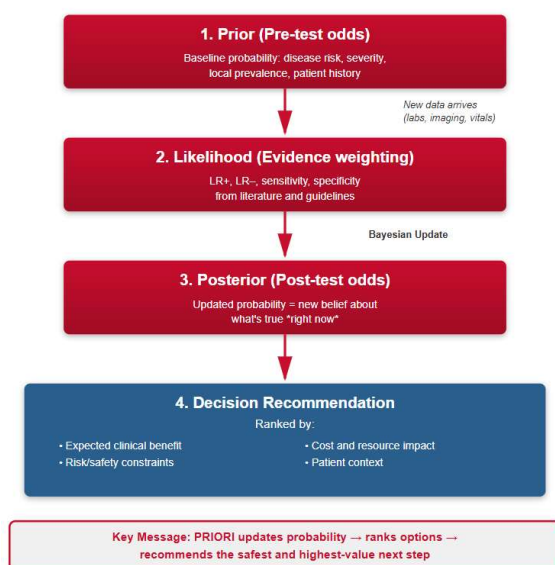


Figure 2: PRIORI Utility

Choosing the Highest-Value Next Action

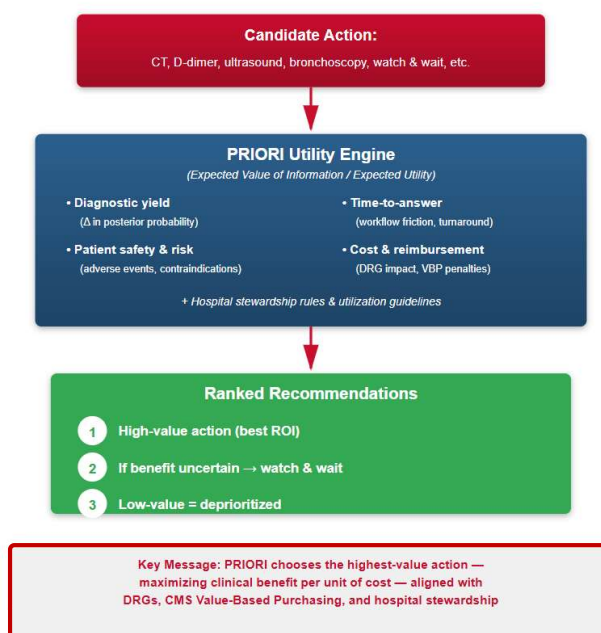


Figure 2 demonstrates PRIORI's utility-based decision framework. The system evaluates each candidate action across four dimensions—diagnostic yield, patient safety, time-to-answer, and cost/reimbursement impact—then ranks recommendations by Expected Utility. This ensures PRIORI selects the highest-value next step, maximizing clinical benefit while minimizing waste and aligning with DRG-based reimbursement and CMS Value-Based Purchasing requirements.

Stage of Development

MVP in progress; seeking funding. Core Bayesian engine and decision framework are built, with initial pathways in testing and clinical sandbox validation planned next.

Injectable Hydrogels to Locally Regenerate Tissue

Sebastián L. Vega, PhD¹, Kirstene Gultian, PhD², and Tae Won B. Kim, MD³



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Brief Description

Injectable Hydrogel with Immobilized BMP-2 Mimetic Peptide for Local Bone Regeneration.

Problem

Osteoporosis is a disease characterized by a decrease in bone mineral density, thereby increasing the risk of sustaining a fragility fracture. Most medical therapies are systemic and do not restore bone in areas of need, leading to undesirable side effects. Treating bone fractures often involves expensive and stressful surgery using plate and screw technology resulting in inflammation and long recovery times. Accordingly, there is a **long-felt need for improved methods to locally combat osteoporosis and prevent future bone fractures**. In 2018, the total annual expense of providing care associated with osteoporosis fractures was \$57 billion and is expected to rise to \$95 billion in 2040.

Solution

Injectable hydrogels can locally deliver therapeutics with spatial precision, and our team has developed an injectable hydrogel containing a peptide mimic of bone morphogenetic protein-2 (BMP-2). This technology can work alongside, or independently of stem cell implantation, to locally regenerate bone tissue when needed as a potential treatment for local osteoporosis.

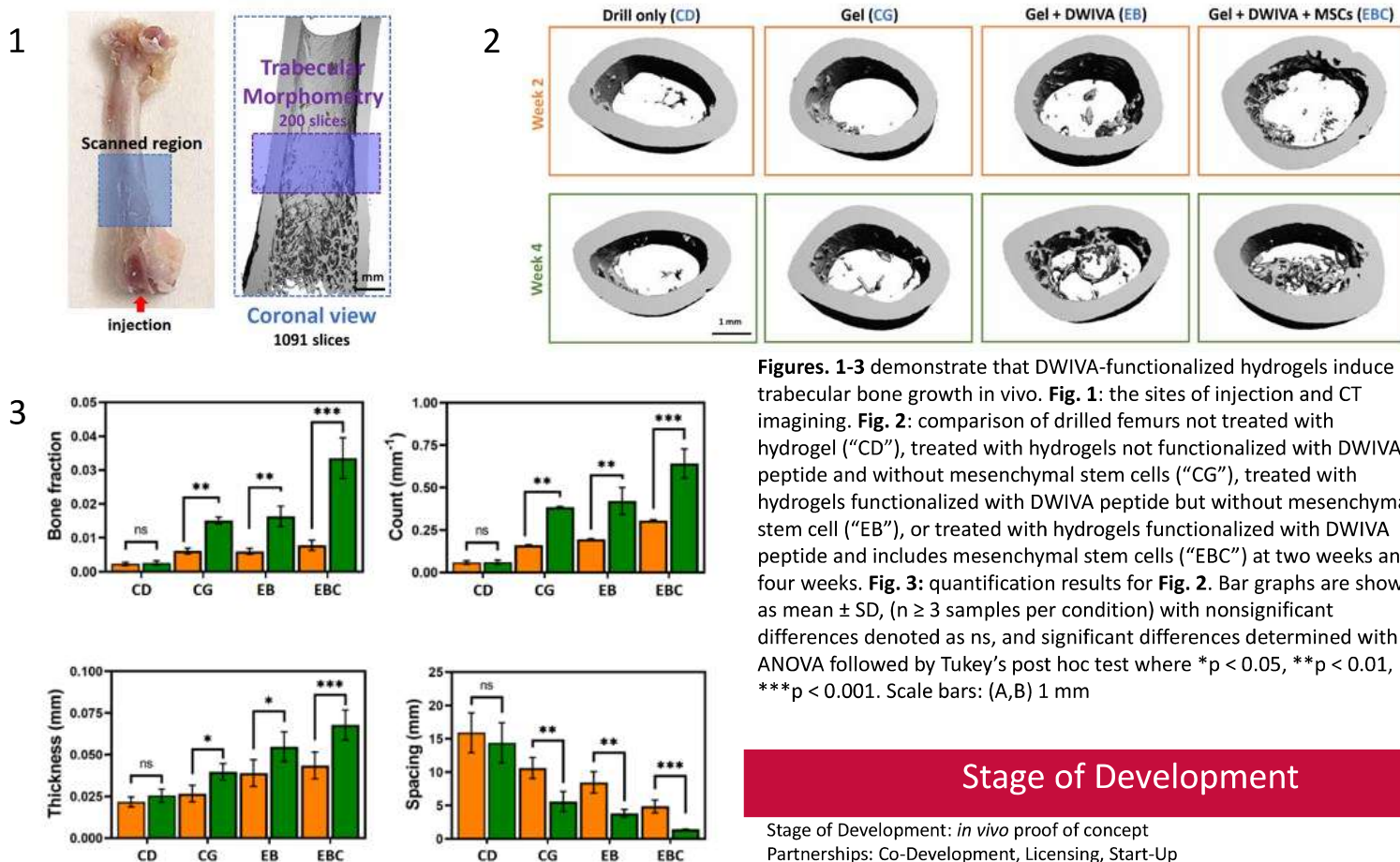
Technology

Injectable hydrogels are created using hyaluronic acid modified with norbornene (HANor) or tetrazine (HATet) which upon mixing click into covalently cross-linked Nor-Tet hydrogels. The inventors have shown this injectable hydrogel may be used to treat osteoporosis. As a therapeutic the Inventors used a peptide mimetic of growth factor BMP-2 specific to the DWIVA peptide sequence. HANor macromers were modified with methacrylates to immobilize the osteogenic thiolated BMP-2 mimetic DWIVA peptides through coupling of the thiols in BMP-2 to the methacrylates on the HANor macromer, with coupling confirmed by ¹H NMR spectroscopy. The DWIVA peptides presented in this immobilized form increased alkaline phosphatase (ALP) expression in mesenchymal stem cell cultured atop 2D and encapsulated within 3D Nor-Tet hydrogels. Injection of bioactive Nor-Tet hydrogels into hollow intramedullary canals of Lewis rat femurs showed a local increase in trabecular bone density as determined by micro-CT imaging (Figure.1).

Advantages

- Local application reduces systemic side-effect risks
- Prophylactic treatment possible with companion bone densitometry tests

Results



Stage of Development

Stage of Development: *in vivo* proof of concept
Partnerships: Co-Development, Licensing, Start-Up
Funding support by Foundation Venture Capital Group (Foundation for Health Advancement)

Brief Description

The Rowan Assessment of Visual Memory and Attention (RAMA) is an easy-to-administer, non-invasive iPad-based assessment composed of four well-tolerated, non-verbal neuropsychological tests. Employed in clinical research at leading and international hospitals, a highly accurate, machine learning based screening algorithm for cognitive impairment has been designed using RAMA test data.

Problem

With over six million Americans aged 65 and older currently affected by Alzheimer's Disease and Related Dementia (ADRD), and another 16% suffering from Mild Cognitive Impairment (MCI)—a high-risk precursor to ADRD—the public health crisis is immense. This challenge is further complicated by the fact that many frontline healthcare providers feel unprepared to properly screen, diagnose, and administer new treatments like anti-amyloid, monoclonal antibody therapy. The moment is critical for an easy-to-administer, effective cognitive screening tool that can be seamlessly integrated into a routine physical in a primary care setting.

Technology

RAMA is a non-invasive, digitally administered test suite built upon the scholarly foundations of neuropsychology. Delivered via an iPad app, it functions as an effective screen for cognitive impairment while remaining brief, non-invasive and well-tolerated by patients.

Solution

RAMA tests are brief, culture-neutral screening tools for early ADRD and administered on an iPad. Since recent research suggests visual assessment is more sensitive to early emergent ADRD than the prevalent verbal/auditory tests, the RAMA tests are designed to use a visual format. Unlike verbal tests, RAMA suite are inherently culture-neutral and deployable world-wide. RAMA tests are designed to be highly sensitive to core deficits associated with ADRD, including executive control, working memory, and visual episodic memory. With over 3,500 RAMA test administrations in clinical research validating their effectiveness and scalability, a machine learning algorithm developed using patient data collected at Rowan University School of Osteopathic Medicine memory clinic has further demonstrated RAMA's potential as a highly accurate screening tool in primary care.

Advantages

(1) Brief, well-tolerated, non-invasive; (2) Sensitive to ADRD cognitive deficits; (3) Culture-neutral and deployable world-wide; (4) Effective screen in primary care setting.

Stage of Development

Stage of Development: *Early stage/prototype*

Partnerships: Co-Development, Licensing

Intellectual Property: Two US Patent Application Filed

Methods and Results

A corpus of 72 memory clinic patients were assessed. Visual attention/scanning was assessed with the RAMA Cancellation Tests (Fig. 1); non-constructional, visuospatial skills were assessed with the RAMA Angle Matching Test (Fig. 2); and working memory was assessed with the RAMA Pointing Span Test (Fig. 3). Paper/ pencil testing collated patients into two groups - intact or normal cognitive abilities ($n = 30$) versus impaired cognitive abilities (subtle cognitive impairment or mild cognitive impairment or mild dementia; $n = 42$).

Figure 1

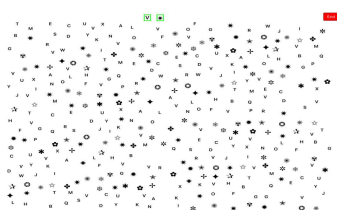


Figure 2

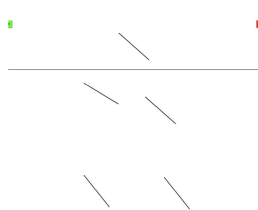
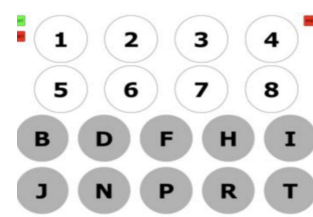


Figure 3



Three machine learning models (random forest, gradient boosting trees, and multilayer perceptron) were built using RAMA patient data. Patient age and education were also included. Models were fine tuned using 10-fold cross-validation and 80-20 training/test split. All models performed well. Training AUC: **0.9, 0.9, 0.91** Test accuracy **87%, 100%, 93%**

The RAMA tests are highly efficient, requiring only about **10 minutes** to administer. We have developed a machine-learning algorithm that utilizes RAMA test patient data to impressively screen patients for cognitive impairment, effectively distinguishing between cognitively intact versus impaired paper-and-pencil test performance groups. Because the RAMA is easily integrated into existing medical workflows, it has the potential for worldwide deployment and, at scale, could become a crucial tool for screening dementia and related illnesses.

Brief Description

We have developed a process to 3D-print hydrogels that can be spatially patterned with peptide motifs to anchor vascularized organoids and facilitate intraluminal perfusion: providing a bridge between traditional chip-based models and tissue specific organoids.

Problem

Organoids are generally cultured in rocker environments or other dynamic suspension culture systems that facilitate a level of nutrient and oxygen delivery that supports viability, but these approaches cannot mimic the mechanical and biochemical cues exerted by intraluminal perfusion. Although advances in organoid vascularization (Fig. 1) have resulted in the formation of physiological vascular architecture, the lack of flow within these structures limits their ability to mimic tissue vasculature.

Moreover, lack of intraluminal perfusion prevents accurate studies of drug transport, specifically in the context of brain tissue where the blood-brain barrier forms a selective impasse from blood into surrounding tissue.

Solution

Our bioink was used to print a channel with a funnel geometry (1) designed to trap an organoid (2) and facilitate interstitial fluid flow using a Vitroscope (Trondheim, Norway) flow chamber (3), as shown in Figure 2.

Technology

Application of interstitial fluid at a flow rate exerting velocities ranging from 5 - 20 micron/s for four days resulted in remodeling of organoid vasculature that facilitated intraluminal perfusion, as evidenced by perfusion with 2-micron fluorescent beads. At the end of the four-day perfusion period, TRITC-labeled polystyrene beads were added to the flow reservoir and perfused into the funnel. Bead velocities were calculated using particle image velocimetry and shown in Figure 3.

Advantages

Combined benefits of chip-based microfluidic in vitro models and tissue specific organoids paves the way for a sustainable alternative to animal testing.

FIGURES

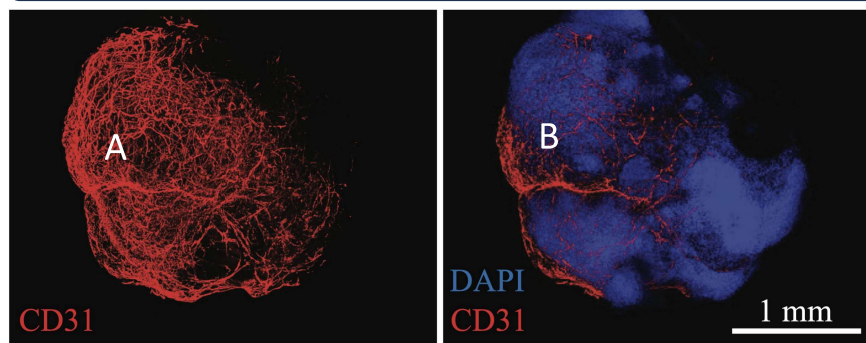


Figure 1A. CD31-positive cells within a vascularized cerebral cortex organoid showing complex vascular structure.

Figure 1B. Overlay of CD31-positive endothelial cells with DAPI showing cell nuclei within the organoid.

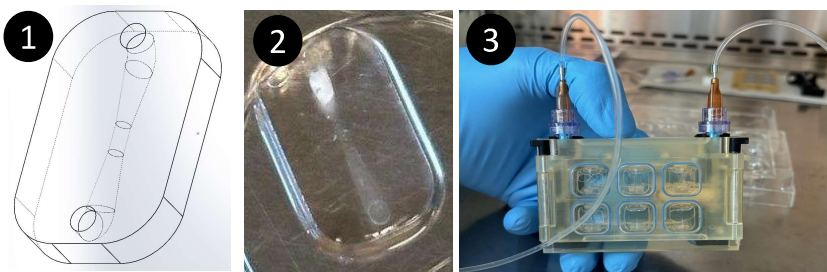


Figure 2. (1) Funnel geometry of the 3D-printed hydrogel, (2) Photograph of a vascularized organoid within the funnel design. (3) Perfusion system capable of simultaneously perfusing 6 organoids within isolated flow channels.

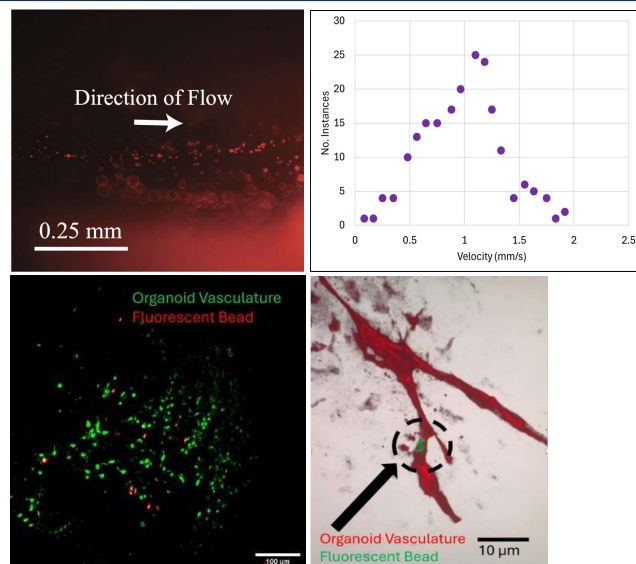


Figure 3. Fluorescent beads entered and exited the length of the vascular structures. Quantification of bead velocity indicated a range of values, indicative of a complex vascular network within the organoid. Finally, confocal microscopy indicated overlap between endothelial cells and fluorescent tracers, as well as beads within endothelial lumens

Acknowledgements

Brief Description

A molecular diagnostic platform that enables characterization of cellular stress and damage. This technology may be applied to a broad range of clinical settings, from assessing efficacy of cancer therapies to detecting inflammatory and autoimmune disorders, ischemia/reperfusion injury, and toxic environmental exposures.

Problem

There is a growing demand for accurate molecular diagnostics to assess cellular damage for disease monitoring and treatment. However, traditional types of biomarkers often face challenges such as limited interoperability, low sensitivity, and a lengthy, costly discovery process. These issues create a bottleneck in the development and implementation of effective new diagnostics.

Solution

Our RNA-based diagnostic platform eliminates the need for cell- and organ-specific gene panels, focusing instead on a single universal class of RNA molecules. This novel approach can generate digital, AI/ML-ready biomarkers adaptable for diverse operational workflows, including digital pathology and biofluid-based laboratory tests.

Technology

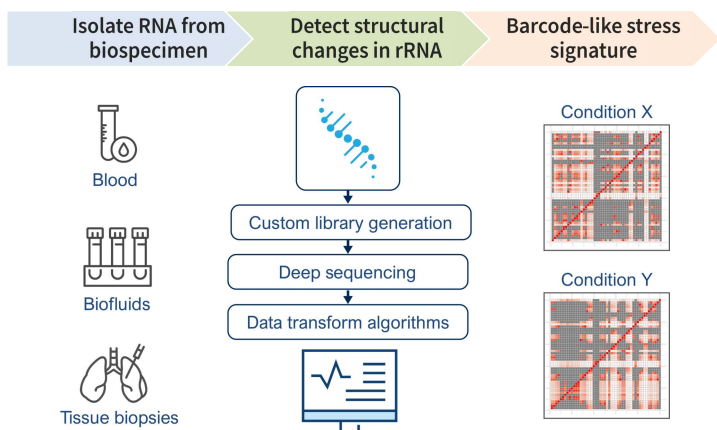
Our approach integrates advanced molecular biology, next-generation sequencing (NGS) and computational analysis to produce unique diagnostic biosignatures from ribosomal RNA (rRNA)—a universal and abundant type of RNA. Additionally, we aim to use machine learning (ML) algorithms to facilitate the translation of this technology into practical applications for clinical diagnostics.

Advantages

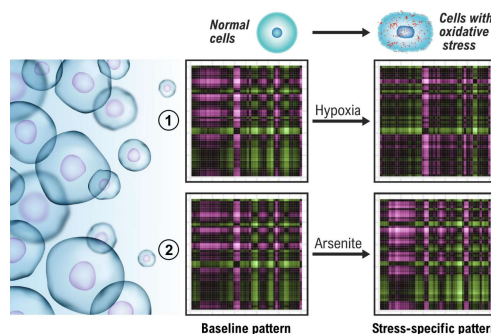
- **Faster, simpler biomarker discovery:** produces a digital signature from a single RNA type, reducing time and cost compared to traditional approaches
- **Broad clinical applicability:** rRNA is ubiquitous, universally occurring, and sequence-conserved across cell types
- **High analytical sensitivity:** rRNA abundance supports detection from low sample inputs, compatible with minimally invasive liquid biopsies and small solid-tissue specimens
- **Flexible digital readout:** outputs are visually interpretable 2D barcodes or numerical matrices ready for machine learning classifiers

Outline of the Method

Schematic of the analytical pipeline

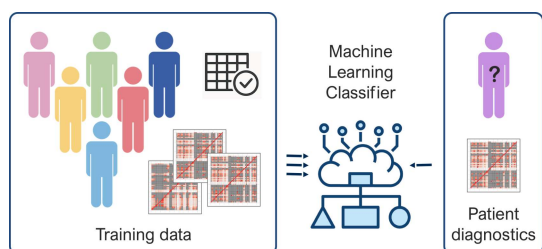


Demonstration in cell culture models



An example of differential stress signatures. Two biological samples from unstressed human A549 cells produce similar baseline patterns. Oxidative stress induced via different stressors (hypoxia and As(III)) produces treatment-specific patterns.

Planned AI integration for clinical workflows



A learning classifier system will be trained on validated disease-specific datasets. Once trained, the models can be deployed for clinical diagnostic tests.

Key milestones ahead:

- Validation in clinical tissue samples
- Implementation of the AI/ML pipeline
- Pilot partnerships with diagnostic laboratories
- Obtaining pre-market regulatory clearance

Stage of Development

Stage of Development: *Bench-tested / Preclinical validation (proof-of-principle established in cell culture models)*

Intellectual Property: US Provisional Patent Application Filed

Dynamic Cell Migration Chambers

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Brief Description

Dynamic Cell Migration Chambers are a 3D printed cell motility assay designed to offer a reliable and consistent solution to common issues found when performing cell motility assays, including when small sample sizes are required.

Problem

Cell migration assays are an important part of biological research and development. For example, cell motility assays are **used to assess effects on cell invasion for over 70% of cancer drugs**. Commonly used cell migration assays include the scratch assay, transwells, and other proprietary assays. The scratch assay allows for clear cell visualization and can be used to quantitate cell numbers and distance traveled. However, up to 10 million cells are required for each scratch assay, and cell damage and reproducibility problems can occur. Transwell assays reduce cell damage, offer high reproducibility, mimic invasion, and can be used to quantitate cell numbers. However, up to 1 million cells are required per transwell assay, visualization is difficult, and distance traveled cannot be measured. Other proprietary systems limit cell damage and can be used to quantitate distance traveled, cell numbers, and area invaded. However, these assays offer limited visibility and have technical constraints. **There is a need for a cell migration assay that minimizes cell numbers needed to quantitate cells migrated, distance traveled, and area invaded with consistent reproducibility, accurate visualization, and minimal cell trauma.**

Device Design

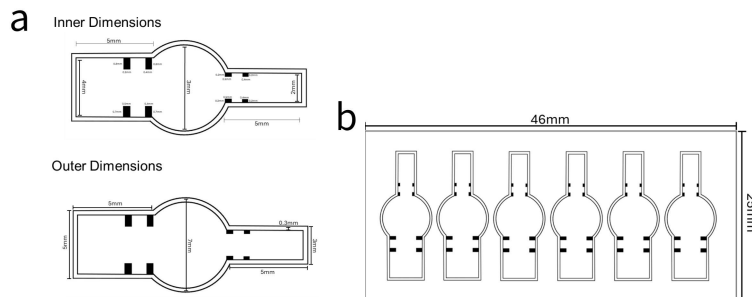


Figure 1: Chamber schematics with dimensions given in mm as indicated. (a) Top view of chamber with inner and outer dimensions. **(b)** Embodiment of top view of chamber in an array.

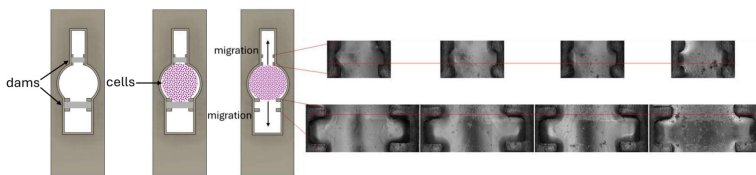


Figure 2: Visualization of cell migration. Cells in DMEM with 25mM HEPES and 10% FBS were dropped into the center of the chambers with dams placed in the respective arms. Cells were incubated (37°C, 100% humidity, 5% CO₂) for 24 hours to form confluent monolayers on slides. Dams were then removed, and media was replaced with fresh media. Phase contrast images were taken at 0 hours, 24 hours, 48 hours, and 72 hours.

Solution

Dynamic Cell Migration Chambers can be used to quantitate cell numbers, distance traveled, and area invaded. The device is made in arrays for easy side-by-side reproducibility and comparability. Dams allow for minimal cell trauma and give an accurate starting point for motility. The small size of the chambers allows for fewer cell numbers to be needed compared to other assays. These devices were used to analyze motility of a variety of cell types including fibroblasts, melanoma, and other carcinoma cells.

Technology

Dynamic Cell Migration Chambers and Dams are created using Autodesk Fusion and Preform Software. They are 3D printed using Formlabs 3B+ printer with BioMed Clear biological compatible resin. Chambers and Dams are washed in isopropanol using Formlabs Form Wash (first generation) and cured using Formlabs Form Cure (first generation). Chambers are sanded and adhered to cell culture dishes using Sylgard 184 Silicone Elastomer Kit. Dams are placed into chambers once curing is complete.

Advantage

- ~100 fold less cells
- Minimize cell trauma
- Consistent reproducibility
- Accurate quantification and visualization
- Quantitate cell numbers, distance traveled, and area invaded
- Post-processing abilities include H&E staining, IHC, and IF

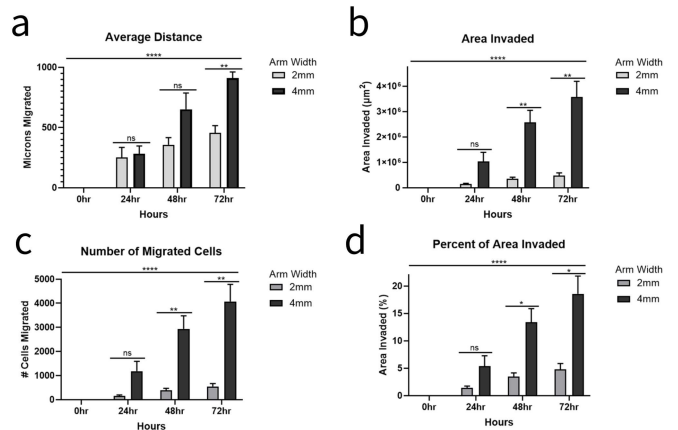


Figure 3: Preliminary Data using B16 mouse melanoma cells. (a) Average distance was measured at 24, 48, and 72 hours. Data was shown as microns migrated. **(b)** Area invaded was measured at 24, 48, and 72 hours. Data was shown as area invaded (µm²). **(c)** Estimated number of cells was measured at 24, 48, and 72 hours. Data was shown as # cells migrated. **(d)** Area invaded was measured at 24, 48, and 72 hours then divided by total area. Data was shown as the percentage of the area invaded.

Stage of Development

Stage of Development: *Bench-tested/ Market ready*

Partnerships: Rowan University and Sentrimed

Intellectual Property: US Provisional Patent Application Filed

Brief Description

We identified specific biomarkers that differentiate Irritable Bowel Syndrome (IBS) from control subjects. We are developing a breakthrough, first-of-its-kind, rapid, point-of-care (POC) diagnostic test to accurately and efficiently diagnose IBS.

Problem

IBS symptoms include abdominal pain, bloating, constipation and diarrhea. It is also associated with psychological disorders such as anxiety and stress. It affects 25-45 million people in the US and >19% of the world population. It significantly affects the quality of life of patients. Healthcare costs of this disease result in more than \$30 billion/year. There are no diagnostic tests available specifically for this disease and routine medical tests show normal results. Currently it is diagnosed by the process of elimination. Patients often have to go through a number of tests to rule out other issues before IBS diagnosis is determined. There is thus a strong need for a specific diagnostic test for this disease.

Solution

Certain fatty acids (our biomarkers) are differently detected in the stool samples of IBS patients compared to controls. Significant differences were observed *via* robust statistical analyses for concentrations of multiple fatty acids across control subjects and various IBS subtypes (IBS-Diarrhea, IBS-Constipation, IBS-Mixed). Our POC diagnostic test is based on differential detection of these fatty acids using a biosensor-array-based assay developed by us.

Technology

- The POC device based on biomarker-array-based analysis system with machine learning.
- A stool sample is collected using a simple swab method from the patient at home or within the clinic and placed in the collection tube.
- Then it is either shipped (from home) or sent to a laboratory diagnostic within the clinic for analysis of IBS-associated biomarkers.
- Our prototype assay successfully discriminated between IBS and control samples with more than 75% accuracy.

Advantages

- This is a diagnostic test specific for IBS that requires only a small amount of stool sample based on sensitivity.
- It is non-invasive, *i.e.* does not require a biopsy.
- It can be performed at home or in a clinic, with rapid results.
- Our target biomarkers were observed to be independent of the influence of diet emphasizing the general application of the test.
- Timely diagnosis will also reduce the economic burden of carrying out multiple tests and stigma associated with psychological comorbidities.
- The method itself can potentially be used to diagnose other gastrointestinal diseases.

Preliminary Data

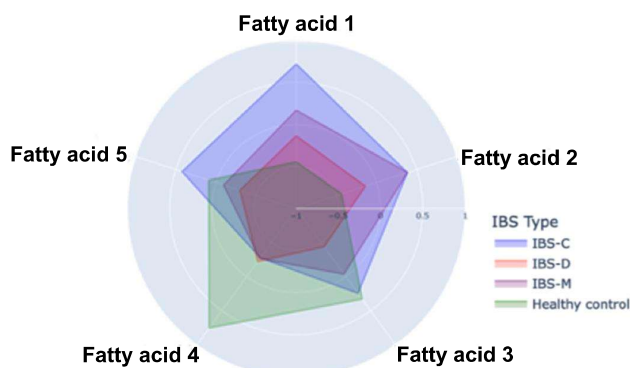


Figure 1. Distribution of various fatty acids (1-5) biomarkers in stool samples based on IBS type *versus* health controls.

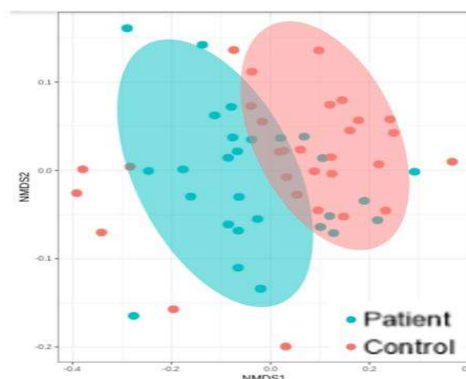
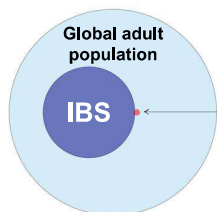


Figure 2. Proof-of-concept validation. Our matrix biosensor array provides discrimination between patient and control stool samples with more than 75% accuracy.



- Global adult population: **5 billion**
- Global IBS: **19.5% (975 million)**
- Global IBD cases: **3.83 million**

Stage of Development

Stage of Development: Prototype Development

Partnerships: Co-Development, Licensing

Intellectual Property: Patent Corporate Treaty CT/WO/2025/075714 published on April 10, 2025 for the IBS biomarkers; provisional patent filed for the biosensor assay, August 2025.

Brief Description

Bactericidal biomedical electrode coatings that enhance charge coupling and release bactericidal ions "on-demand".

Problem

Atrial fibrillation (Afib) affects over 12 million people in the US. It is a condition where the heart beats too fast, too slow, or irregularly. In those with advanced Afib, the heart does not pump sufficient blood to the body's vital organs, such as the brain, kidneys, and the heart's coronary arteries, leading to long-term complications and death. Treatment for Afib can include electrical "shock," usually with the implantation of a pacemaker, to interrupt the arrhythmia by increasing the heart rate. Many pacemaker electrodes are coated with titanium nitride (TiN), and while effective, they can be subject to biofilm formation, leading to severe infections that can result in serious complications. Furthermore, infection at the pulse generator and along the leads is even more likely. Infection on this device could necessitate its removal/replacement.

Solution

This invention addresses the issue of bacterial growth on electrodes by incorporating bactericidal elements into the TiN coatings, which are released upon application of an electrical potential to the electrode during use. These bactericidal elements include silver (Ag) and copper (Cu), where the Ag^+ and Cu^{2+} ions interact with bacterial cells, killing the bacteria. The coatings have been prototyped and tested with proof-of-concept efficacy generated within the laboratory.

Technology

The invention is a coating that is a co-deposited mixture of a stable columnar nitride with correlated pores and a bactericidal element. The stable nitride expels the bactericidal element from the columnar pillars into the correlated pores creating a reservoir of bactericidal element. For example, co-deposition of titanium (Ti) and silver (Ag) in a nitrogen-rich (N) atmosphere results in columnar TiN with Ag nanoparticles (Ag-NP) embedded along the correlated pores making the Ag-NP accessible by solution (blood plasma). The coating is placed on a metallic electrode and when an electrical potential of less than a volt is applied, the bactericidal element is oxidized and dissolves releasing bactericidal ions that diffuse through the correlated pores and are liberated from the surface into solution allowing the ions to kill distal bacteria preventing infection.

Advantages

- A novel coating using Ag and/or Cu for pacemaker electrodes to prevent and eliminate bacterial growth and subsequent dangerous infections.
- Enhances charge exchange between the electrode and the biological system
- Long-term stability that is superior to that of antibiotics and small-molecule coatings.
- Data from a prototyped process show significant decreases in bacterial growth on TiN coatings using Ag or Cu
- Applicable to other types of implants used within the body (e.g., neurostimulation devices).
- Reduces the high cost of implant replacement as well as complications.

Preliminary Data

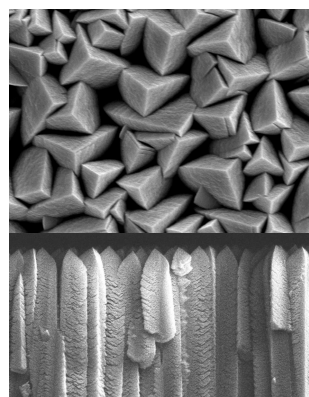


Fig. 1 Images of the microstructure of titanium nitride coatings. Upper image is a top-down view of the desired microstructure. The lower image is a high-magnification image of the fractured cross-section.

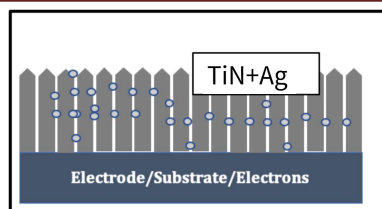


Fig. 2- Schematic of the silver nanoparticles that are expected to be expelled from the titanium nitride matrix.

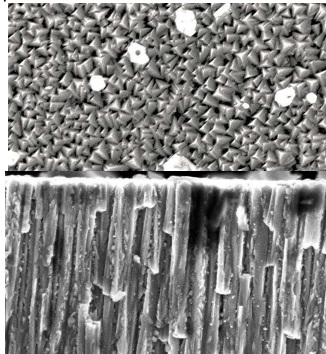


Fig.3 Microscopy (upper image) shows the micron-scale silver clusters on the Ti surface. The lower image shows nano-scale silver clusters embedded in the pores.

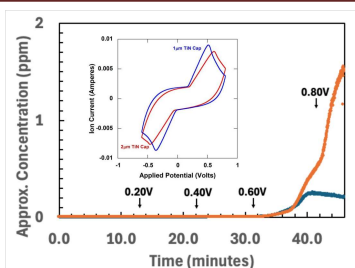


Fig. 4 Plot of the ion release stimulated by an applied voltage that increases as a function of time. The inset is a cyclic voltammogram that shows the oxidation peak of silver in simulated blood plasma.

Beaker Test (20mL PBS)				
Element	Time (min)	Initial CFU/mL	Final CFU/mL	% Reduction
Ag	0	10 ⁴	*	*
Ag	30	10 ⁴	150	98.5
Ag	60	10 ⁴	0	100

1mL Cell test (1mL PBS)				
Ag	0	10 ⁴	520	94.8
Ag	30	10 ⁴	22	99.8
Ag	60	10 ⁴	1	99.99
Ag	90	10 ⁴	0	100
Cu	0	10 ⁴	570	94.4
Cu	0	10 ⁴	160	98.5
Cu	30	10 ⁴	0	100

Table 1. Efficacy versus pseudomonas aeruginosa.

Stage of Development

Stage of Development: Prototype phase with in-house testing demonstrating control of release and excellent performance.

Partnerships: No current partnerships. Available for Co-Development, Licensing, and/or Start-Up

Intellectual Property: U.S. Nonprovisional Patent Application No. 17/507,951; Publication No. US2022/0125989 A1

Bactericidal Coatings for Orthopaedic Trauma Applications

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Brief Description

A coating that elutes broad-spectrum bactericidal silver ions (Ag^+) at high rates well above the rates of elution from silver nanoparticles (Ag-NP). These coatings can be applied to Intramedullary nails (IM-nails), among other implants, delivering broad spectrum ions in the occluded regions where infection occurs.

Problem

IM-nails are commonly used in orthopaedic trauma cases, in both military and civilian applications, when procedures are unscheduled and full removal of bacteria is difficult. This results in extremely high infection rates for this type of implant. When infection occurs, in the best case, two additional implant surgical procedures must be performed over a time frame of a couple of months. In other cases, amputation could be necessary. The development of a coating that delivers broad-spectrum bactericidal properties that can suppress biofilm formation on the implanted device and kill planktonic bacteria distal to the device is needed.

Solution

Silver ions demonstrate well known broad-spectrum bactericidal efficacy. The difficulty is delivery of the ions where they are needed in therapeutic concentrations without impacting healthy cells. Ag-NP are difficult to adhere to surfaces and are limited in their ion delivery capacity by the low solubility of metallic silver. Silver oxide has a solubility that is orders-of-magnitude higher than that of metallic silver and provides Ag^+ -ion concentrations in the needed range. Creating methods for coating metallic implants such as IM-nails with silver oxide will substantially reduce the infection rates in orthopaedic trauma cases.

Technology

The invention is a silver oxide coating that is stably adhered to all surfaces including metallic surfaces such as those on IM-nails. The adhesion of the coatings is excellent so that they dissolve from the top of the coatings toward the metallic surface in a slow predictable way (no delamination). Materials science techniques can be applied to slow the elution to extend the lifetimes of the coatings. The major phases of silver oxide have each demonstrated efficacy versus many bacteria including clinical and antibiotic-resistant bacteria.

Advantages

- Delivers therapeutically relevant concentrations of soluble Ag^+ -ions where needed, i. e. intramedullary canal.
- Ag^+ -ions have been shown to have broad-spectrum bactericidal efficacy including versus resistant bacteria.
- The coatings prevent biofilm formation and reduce existing biofilms.
- The coatings can be applied to stably adhere to any stable substrate including metals, ceramics, polymers and biomaterials.
- The delivery of the Ag^+ -ions can be extended by simply making the coatings thicker.
- Controlled delivery can be achieved using mixed or multilayer materials.
- Use will reduce the need for revision surgery saving trauma and money.
- Phase isolation of a particular oxide of silver is not necessary since all the phases are effective.
- Other applications are possible including the coating use on catheters or other implanted devices when tissue or bone adhesion to the device is not desirable.
- Since Ag^+ -ions are small, they do not impact the renal system.
- Preliminary results of a murine model demonstrate that Ag^+ -ions are passed with waste and does not accumulate in organs.

Performance Data

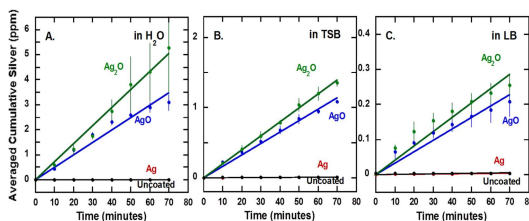


Figure 1. ICP-MS analysis of Ag^+ ion release from coated surfaces. Soluble Ag^+ concentration was evaluated over a 70-minute time period for coated discs submerged in DI water (A), TSB media (B), and LB media (C). All panels show data corresponding to uncoated, blank discs (black), Ag -coated discs (red), AgO -coated discs (blue), or Ag_2O -coated discs (green). (Caputo et al.)

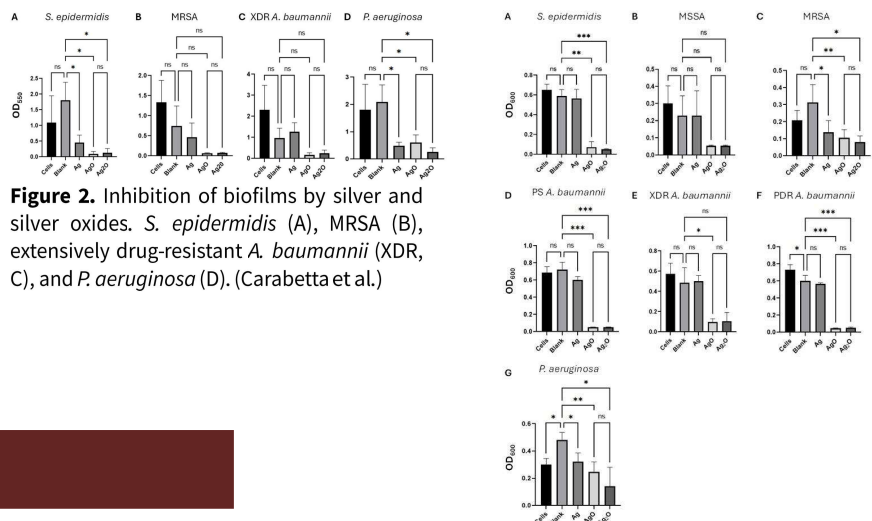


Figure 2. Inhibition of biofilms by silver and silver oxides. *S. epidermidis* (A), MRSA (B), extensively drug-resistant *A. baumannii* (XDR, C), and *P. aeruginosa* (D). (Carabetta et al.)

Figure 3. Growth inhibition of clinical bacterial isolates by silver and silver oxides. *S. epidermidis* (A), MSSA (B), MRSA (C), pan-susceptible (PS, D), extensively drug-resistant (XDR, E) and pandrug-resistant (PDR, F) *A. baumannii*, and *P. aeruginosa* (G). (Carabetta et al.)

Stage of Development

Stage of Development: Coatings developed and tested for efficacy. Preliminary results of a murine model demonstrate the safety of the coatings.

Partnerships: No current partnerships. Available for Co-Development, Licensing, and/or Start-Up

Intellectual Property: Patent No.: US 9,649,338 B2

Brief Description

Our injectable sol-gel controlled release system slows down the transport and release of negatively-charged, targeted nucleic acid nanocarriers (3DNA nanocarriers, ~120nm diameter) through multiple non-covalent interactions between the carriers and charged residues of long chain polymers incorporated into the matrix, with the aim of specifically depleting myofibroblast progenitors and prophylactically treating fibrosis in the eye.

Problem

- Over **1 million cataract surgeries** are performed annually worldwide, with cases projected to double within the **next 10 years**
- >50% of patients** who undergo cataract surgery develop secondary cataracts or posterior capsule opacification (PCO) following cataract surgery, significantly impairing vision
- Nd:YAG laser therapy is used to treat PCO, with an estimated cost to Medicare of **250 million USD** in 2000
- A prophylactic treatment strategy delivered during cataract surgery is a considerable unmet need**

Advantages

- Nanocarrier release** from gel platform **extended from 1 to 6 months**, compared to unmodified PLGA-PEG-PLGA gels
- Injectable sol-gel material** that gels at body temperature
- Decreases the need for multiple injections/administration, can **reduce major side effects** including loss of vision
- Low modulus, optically clear, small gel volume** (high to moderate nanocarrier payload to gel)
- Potential to **impact every cataract surgery patient, considerably decreasing the incidence of PCO** and associated complications
- By manipulating the gel components, novel self-assembled systems **can be engineered to control and sustain delivery of a broad range of drug molecules** to design interventional and preventive strategies for many ocular treatments

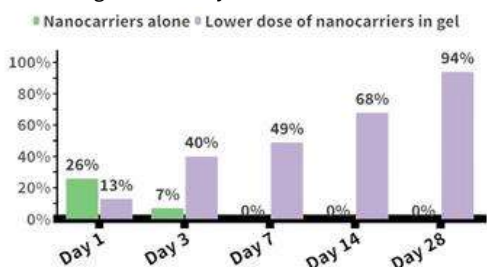


Figure 1. Targeting Cells that cause PCO in Dynamic Cultures. Cells were treated with nanocarriers as a bolus (green) or with hydrogel (purple) at t=0. The percentage of cells that cause PCO that were targeted were monitored every other day for 28 days. Significant differences are seen in targeting percentage between bolus and sustained release systems.

Stage of Development

Bench-tested / In vivo preclinical studies in progress
Intellectual Property: Optically Clear, In-situ Forming Biodegradable Nanocarriers for Ocular Therapy, and Methods Using Same. US Patent pending, US-20230140691-A1 & EU Patent Pending, Number 18 776 339.6

Solution

Naturally-occurring charged homopolymers were incorporated into poly(D,L-lactic-co-glycolic acid)-b-poly(ethylene glycol)-b-poly(D,L-lactic-co-glycolic acid) (PLGA-PEG-PLGA) matrices to further control and extend release of 3DNA nanocarriers through electrostatic interactions. The interaction between oppositely charged homopolymers and associated macromolecular complexes further control the release of the nucleic acid nanocarrier. This gel represents a potential strategy to improve the prolonged intraocular delivery of antibodies, oligonucleotides, genes, and growth factor therapeutics directly into either the anterior or the posterior segments of the eye, avoiding the use of drugs with comprehensive therapeutic indices that are commonly injected in large doses into the vasculature to treat intraocular diseases.

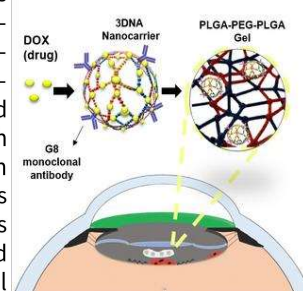


Figure 2. Proposed prophylactic solution for secondary cataracts. DOX-loaded 3DNA nanocarriers embedded in injectable PLGA-PEG-PLGA hydrogel systems are being designed as a prophylactic treatment for PCO. It can be safely administered during cataract surgery. Approximately, 60 to 100 mL of the sustained delivery formulation can be injected behind the intraocular lens. PCO, posterior capsule opacification; PLGA-PEG, poly(d,l-lactic-co-glycolic acid)-b-poly(ethylene glycol).

Technology

(Incorporation of charged and non-covalently interacting, long chain polymers into the PLGA-PEG-PLGA matrices extends controlled release of large molecules, such as the 3DNA nanocarriers for much longer durations than PLGA-PEG-PLGA alone, making an ocular drug delivery system possible as minimal administration is paramount to clinical translation. Additionally, incorporation of long chain polymers stabilize the degradation of the thermoresponsive polymer by forming electrostatic bonds between the hydrolyzed ester bonds between lactic acid and glycolic acid chains and the poly-L-lysine, thus slowing down matrix degradation.

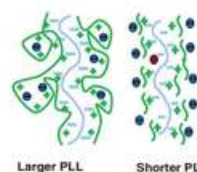


Figure 3. Release of 3DNA:DOX:G8 nanocarriers from PLGA-PEG-PLGA gels. Unmodified gels (A1) had the fastest release rate, whereas modification with PLL (A2) and multiple long chain polymers (A3) yielded extended and controlled release for up to 5 months (n=3).

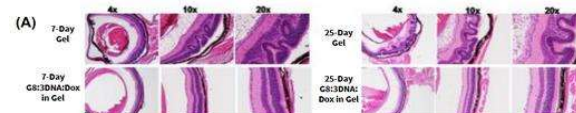
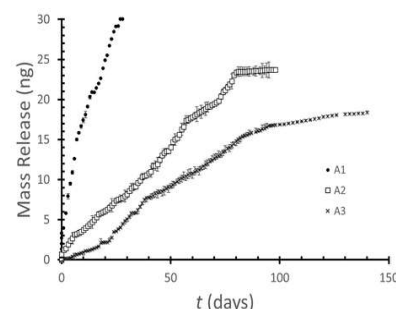
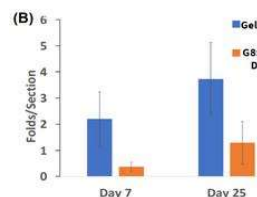


Figure 8. Histological assessment of eye morphology injected with hydrogel only or G8:3DNA:DOX in hydrogel. Mice received an intravitreal injection of gel alone or gel loaded with G8:3DNA:DOX nanocarriers. Eyes were harvested and fixed at 7 days and 25 days. (A) PVR was induced in eyes injected with hydrogel alone (PVR grade 5), indicated by the accumulation of cells on the inner surface of the retina, elevations and folds in the retina, and focal areas of detachment. Eyes treated with G8:3DNA:DOX exhibited a lower grade of PVR at 25 days (grade 1) (B) The number of folds was significantly lower in eyes treated with G8:3DNA:DOX in gel than in eyes that only received the gel. The results are the mean $\pm$ standard deviation.



FREEDOM™ Lens: Smart, Sustained Ocular Drug Delivery Without the Drops

Hope Seybold¹, Mark Byrne^{1,2}

1. Biomimetic & Biohybrid Materials, Biomedical Devices, and Drug Delivery Laboratories, Department of Biomedical Engineering, Henry M. Rowan College of Engineering, Rowan University, Glassboro, NJ 2. OcuMedic, Inc., Mullica Hill, NJ

Brief Description

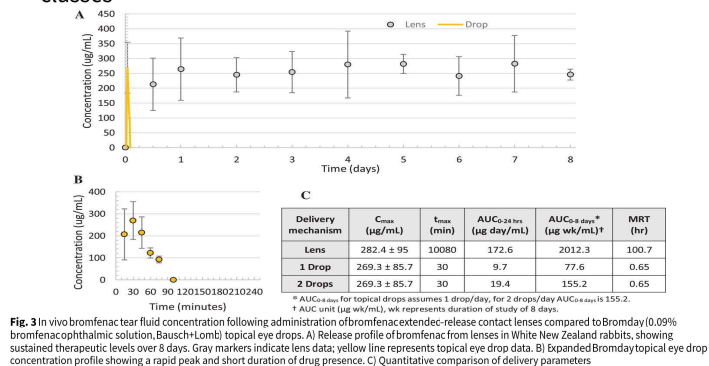
The FREEDOM™ Lens is a patented, extended-wear, drug-eluting contact lens that delivers sustained, precise doses of bromfenac sodium for seven days of continuous therapy. Designed to replace traditional eye drops, this non-invasive, dropless platform offers superior bioavailability, improved adherence, and faster recovery. By uniting smart drug delivery with everyday lens comfort, FREEDOM™ gives patients and providers a **reliable, hands-free treatment** option that sets a **new standard for ocular therapeutic delivery**.

Problem

- Over **1 billion people** worldwide live with preventable or treatable vision impairment, costing **over \$400B annually**.
- Eye drops remain the standard care but have **<5% bioavailability** and require **multiple daily doses**, leading to inconvenient and inconsistent therapy.
- No drug-eluting contact lens has reached the market due to the challenge of maintaining **comfort, oxygen permeability, and optical quality** while achieving sustained release.
- Current methods **leave millions at risk** of inflammation, pain, and delayed recovery after eye surgery.

Advantages

- Therapeutic drug levels for 100% of treatment time compared to 50% for eye drops**
- 26x greater bioavailability and 155x longer residence time** than eye drops, **6.26x greater bioavailability** to the aqueous humor than eye drops
- Maintains **optical clarity, comfort, and oxygen permeability** equivalent to commercial lenses
- Improves patient compliance** by eliminating the need for daily eye drops
- Reduces the risk** of postoperative inflammation and complications
- Compatible** with current lens manufacturing and sterilization processes
- Potential for **broad application** across multiple ophthalmic drug classes



Stage of Development

OcuMedic has 10 issued Patents (US, EU, & abroad), 1 pending in US & EU, & FTO Pre-clinical work completed on lead product with IND to be submitted 12/2025 CDER 505 (b)(2) with Precedent
Lead product Phase I human clinical trial January 2026 in partnership with Vipragen CRO

Solution

The FREEDOM™ Lens is a **patented extended-wear**, drug-eluting silicone hydrogel contact lens engineered to deliver bromfenac sodium, a leading nonsteroidal anti-inflammatory, continuously for up to **seven days**. This “dropless” platform is designed to eliminate the need for frequent eye-drop administration and maintain sustained, therapeutic drug levels directly at the ocular surface. By integrating convenience with controlled release, the FREEDOM™ Lens has the potential to **enhance compliance, accelerate healing, and improve post-surgical outcomes (post-cataract, LASIK/PRK (& laser surgeries), uveitis, corneal abrasion, >6B cases, \$2B Market)**.

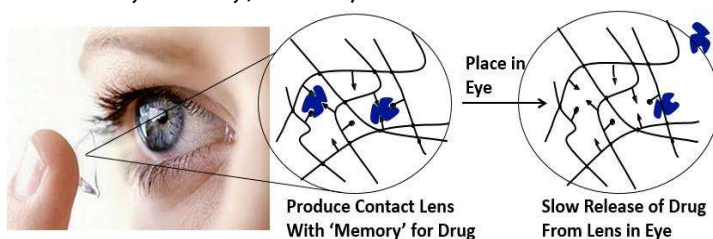


Fig. 1 Macromolecular memory formulation enhances bromfenac loading and controlled release compared to control. Memory sites formed through templated polymerization create non-covalent complexation sites distributed on multiple polymer chains within the lens network. The illustration highlights how the macromolecular memory design creates a predictable, extended-release profile while preserving lens comfort and clarity.

Technology

The FREEDOM™ Lens uses a patented macromolecular memory platform in which drug-specific binding sites are embedded within a silicone hydrogel matrix to enable controlled, sustained release of bromfenac. Based on FDA-approved Lotrafilcon B, the lens is compatible with existing manufacturing, sterilization, and packaging processes. This adaptable platform can be applied to other ophthalmic drugs, offering a scalable, non-invasive system with the potential to transform ocular therapy.

This adaptable system can be extended to delivery antibiotics, corticosteroids, or antiglaucoma agents, positioning it as a broad drug delivery platform for ophthalmology.

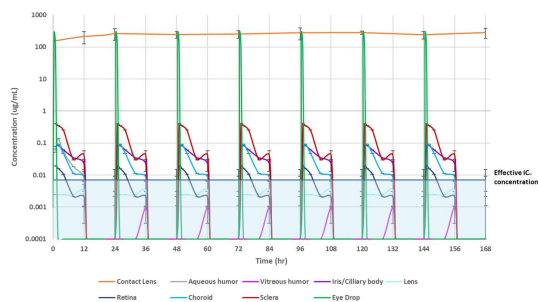


Fig. 2 In vivo Concentration profiles of bromfenac sodium in various ocular tissues over time. The IC₅₀ for COX-2, set at 0.007 μg/mL, is highlighted in light blue to indicate therapeutic threshold. Error bars represent the standard deviation, indicating variability in the raw data.

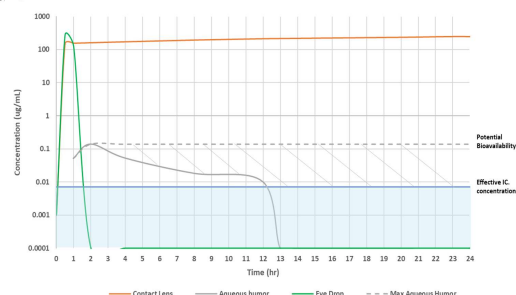


Fig. 4 In vivo Aqueous humor bioavailability comparison of bromfenac sodium delivery: drug-releasing contact lenses vs. topical eye drops. Bromfenac sodium concentrations are shown in the tear film (green line: eye drops; orange line: contact lens) and aqueous humor (solid gray line: eye drops; dashed gray line: extrapolated contact lens delivery). The blue shaded area indicates subtherapeutic drug levels; areas above represent effective therapeutic concentrations. Extended-release contact lenses demonstrate significantly higher and more sustained ocular bioavailability, achieving greater drug exposure in the aqueous humor compared to eye drops, where a decrease in inflammatory cells is a primary endpoint. These results highlight the superior, consistent, and prolonged delivery achieved by extended-release lenses over conventional topical administration.

Executive Summary

MRIMath empowers physicians to more accurately and efficiently target brain tumors and evaluate growth, resulting in improved health outcomes. MRIMath's AI technology saves time, adds precision to therapy planning, and eliminates inter- and intra-rater variability. The AI-powered software-as-a-service model transforms neuroradiology and radiation oncology into modern data-driven disciplines. MRIMath was awarded a Phase I and Phase II SBIR contracts from the National Cancer Institute.

Problem

Quantitative tumor analysis from MRI scans remains a **labor-intensive** and **subjective** process. Manual tumor segmentation requires expert radiologists to delineate complex structures across hundreds of slices, which leads to **variability**, **delayed diagnosis**, and **limited reproducibility**. In oncology trials and clinical care, this lack of standardized and automated quantification hinders accurate assessment of treatment response and longitudinal comparison. There is a critical need for a reliable, automated, and FDA-cleared AI solution that delivers precise, reproducible tumor measurements at scale.

Technology Solution

MRIMath delivers a fully automated, FDA-cleared AI software that performs precise, 3D tumor segmentation directly from MRI scans. The platform uses advanced deep learning architectures trained on large, multi-institutional datasets to identify and delineate tumor boundaries with expert-level accuracy. Once processed, the system generates the tumor contours along analytics, such as tumor volume, surface area, that can be integrated seamlessly into clinical workflows or research pipelines.

The system reduces contouring time from hours to minutes and eliminating inter-observer variability; thus enabling consistent, objective, and data-driven decision-making in oncology diagnostics, clinical trials, and therapy monitoring.

Advantages

FDA-Cleared: Regulatory compliance and clinical use.

Accuracy and Reproducibility: >90% segmentation accuracy with consistent performance across patients and scanners. Between-clinicians variability reduced by 70%.

Saves time: Reduces analysis time from hours to minutes, accelerating clinical decision-making and research workflows.

Secure: Cloud architecture with cleared cybersecurity, allowing deployment across research institutions, hospitals, and clinical trial networks.

Device Design

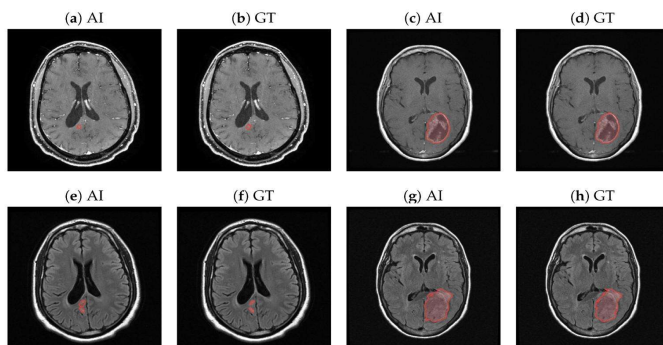
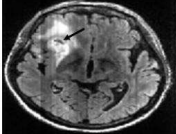
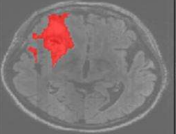
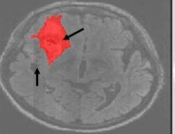
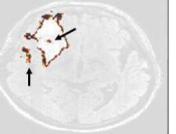
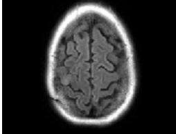
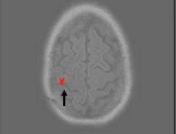
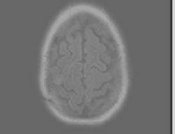
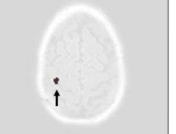
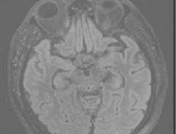
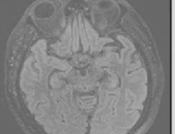
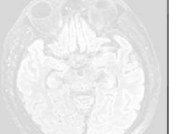
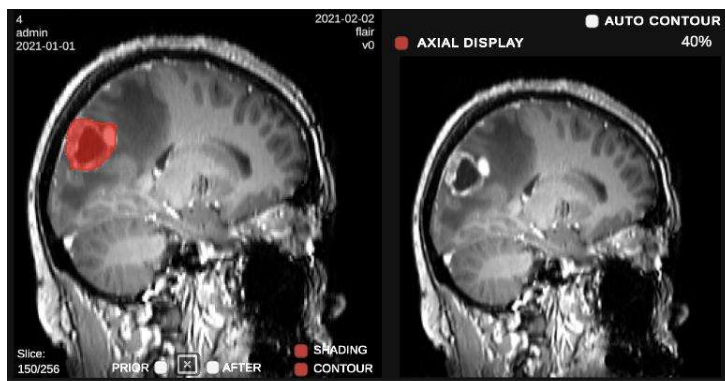


Figure 1. Contours of the AI (a,c,e,g) and consensus GT (b,d,f,h) for the T1c (a-d) and corresponding FLAIR series (e-h). (e,f) are the FLAIR sequences that correspond to the small tumor in (a,b). (g,h) are the FLAIR sequences that correspond to the large tumor in (c,d). Tumor segmentation is marked with a semi-transparent red overlay and delineated by a solid

FLAIR	Ground Truth	SUPER U-Net Prediction	Uncertainty
			
			
			



Stage of Development

Stage of Development: *FDA-cleared*

Intellectual Property: PCT/US2020/026113: A Method for Detecting Radiological Progression in Cancer Surveillance, filed in March 2022; US Pat. No. 12,198,334 granted October 2024.; US Pat. App. No. 18/989,230 pending October 2025

Brief Description

The arteriovenous fistula (AVF) Healing Gel is a localized perivascular hydrogel applied during AVF creation surgery in dialysis patients to improve vascular access maturation by enhancing vasodilation, reducing inflammation, and preventing neointimal hyperplasia.

Problem

AVF is the preferred vascular access for hemodialysis, but up to 60% of AVFs fail to mature properly, leading to repeated interventions or complete failure of dialysis access. The major causes of this high failure rate are inadequate vasodilation and the development of neointimal hyperplasia, which obstructs blood flow and prevents proper vessel remodeling.

Current clinical approaches primarily rely on surgical technique and systemic medications, which are often insufficient to address the localized vascular environment at the anastomosis site.

As a result, there is an urgent need for a localized therapy that directly targets the underlying biological mechanisms of AVF maturation failure.

Device Design

Natural Self-assembled Polymer Hydrogel network

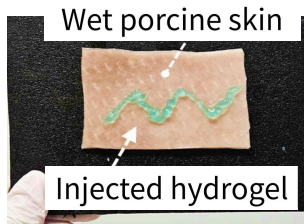
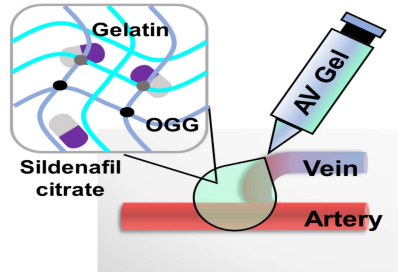


Figure 1. AVF gel development for perivascular delivery of sildenafil citrate.

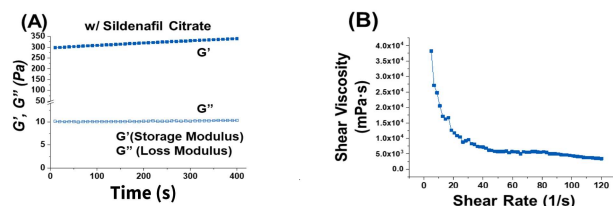


Figure 2. Rheological characterization of the hydrogel.

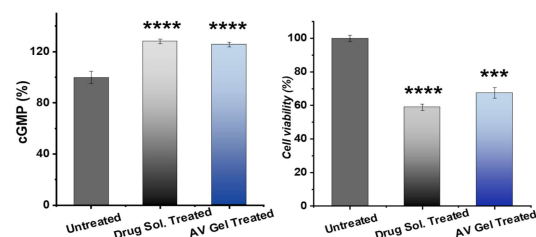


Figure 3. Effect of sildenafil citrate (10 μ M) or sildenafil-releasing AVF gel treatment on A) cGMP expression and B) SMC proliferation in Human umbilical vein smooth muscle cells.

Solution

A localized, perivascular hydrogel for sustained delivery of sildenafil citrate to promote vasodilation, reduce inflammation, and prevent neointimal hyperplasia during AVF creation surgery.

Technology

A natural polymer hydrogel composed of oxidized guar gum and gelatin, crosslinked with microbial transglutaminase (a widely used food-grade enzyme), is designed for sustained release of sildenafil citrate. All components are biocompatible and clinically proven safe, making the hydrogel suitable for therapeutic use.

Advantages

- Biocompatible, clinically safe components with proven efficacy
- Sustained, localized drug release with fewer side effects
- Injectable and conformable for easy application
- Simple, scalable fabrication for clinical use

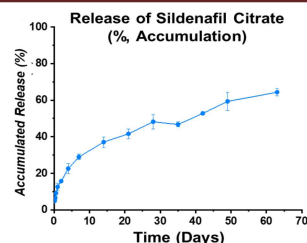


Figure 4. Release kinetics of the hydrogel

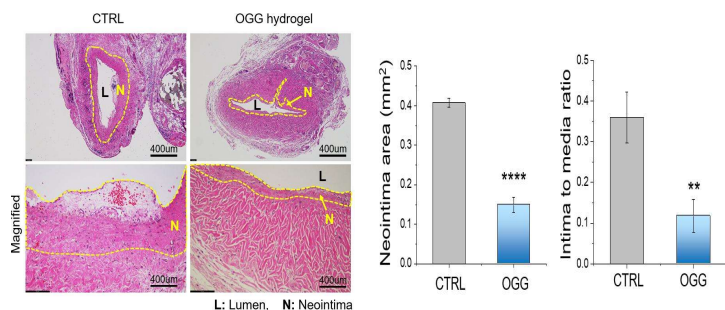


Figure 5. Histological analysis of AVF at 1 month post-surgery in a rabbit AVF model. Representative H&E-stained sections show reduced neointimal hyperplasia and larger lumen in the OGG group, with significantly lower neointima area and intima-to-media ratio.

Stage of Development

Prototype Development: The AVF gel formulation has been developed and validated in small animal (rodent) models.

Partnerships: Co-Development.

Intellectual Property: Intellectual property (patent filings): PCT/US2025/027176 filed on October 28, 2025

Brief Description

Soluble Factor Incorporation with Native Signaling (SFINS) is a modular receptor platform that enables immune cells to interpret soluble environmental cues using their own signaling mechanisms to control cell response.

Problem

Many current synthetic receptor systems for cell engineering, such as CARs, MESA, and SNIPRs, primarily depend on transcriptional reprogramming or proteolytic cascades that fail to integrate with the cell's native signaling machinery. These approaches are poorly suited for myeloid cells, limiting efforts to engineer macrophages to sense and respond to immunosuppressive soluble factors in the tumor microenvironment.

Furthermore, tumor and injury microenvironments are rich in soluble immunosuppressive cytokines (e.g., TGF- β , IL-10), which inhibit macrophage activation and reduce therapeutic efficacy. There is currently no robust platform for redirecting these native soluble signals into beneficial immune activation, creating a critical gap in the ability to engineer immune responses in complex tissue environments.

Solution

SFINS receptors directly interface with the endogenous NF- κ B pathway through ligand-induced dimerization of the TIR domain. This design enables macrophages and other immune cells to convert immunosuppressive cues like TGF- β into pro-inflammatory signaling events, overcoming the limitations of existing systems.

Technology

The SFINS platform uses engineered transmembrane receptors with modular extracellular domains that recognize soluble ligands (e.g., cytokines) and cytoplasmic TIR domains that initiate NF- κ B activation upon dimerization. Incorporation of transient leucine zipper motifs amplifies signaling output by increasing TIR interaction frequency. The platform's modularity allows for rapid adaptation to different target ligands by simply swapping the extracellular recognition domain.

Advantages

- Integrates directly with native NF- κ B signaling for responsiveness
- Modular design compatible with diverse soluble ligands (e.g., cytokines and other factors associated with the tissue microenvironment).

FIGURES

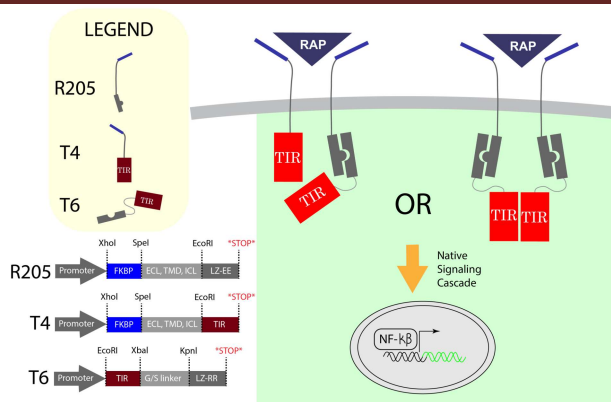


Figure 1A. Schematic illustrating receptor combinations enabling leucine zipper-mediated TIR dimerization and signal amplification.

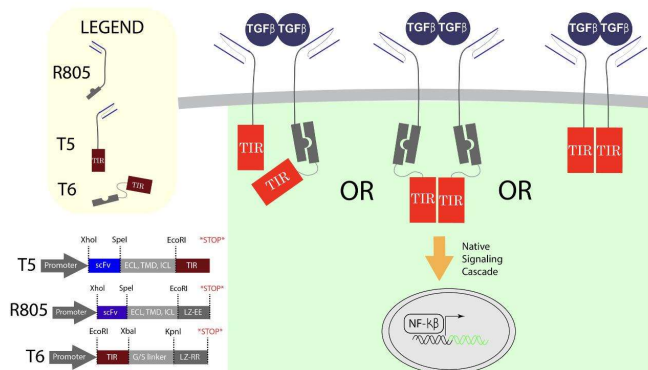


Figure 2. Schematic comparing baseline SFINS receptor configuration to LZ-amplified system

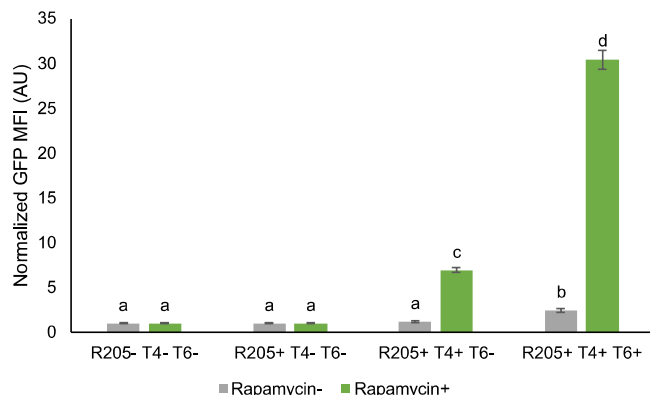


Figure 3. Results showing the additive effect of the leucine zipper on the response of the cells to rapamycin.

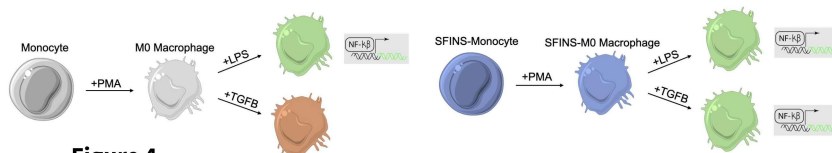


Figure 4.

Stage of Development

Stage of Development: Bench-tested / Preclinical validation

Partnerships: N/A

Intellectual Property: U.S. Provisional Patent Application filed

PrecisionRCS (Precision Recovery Capital Support System)

Richard Jermyn, DO; Kenneth Stagliano, PhD; Alexander Abbott;
Joseph DiTaranto; Joshua Smith

Brief Description

PrecisionRCS is the first evidence-based electronic recovery support record (ERSR) system specifically designed for peer recovery coaches (PRCs) that integrates an evidence-based recovery capital building framework with AI-driven analysis of real-time client data to systematically deliver, document, and track services while also enabling early intervention for individuals at risk of relapse to prevent fatal overdose.

Problem

Over 54 million Americans have substance use disorders (SUDs). Many damage key life domains (i.e. recovery capital) needed to sustain recovery. Those entering treatment receive care from peer recovery coaches. However, peer coaching services are not standardized, making it difficult to study the effects of peer coaching on SUD outcomes. Additionally, few digital tools exist to support peer coaches' daily tasks, resulting in poor documentation and data collection, and missed opportunities for data-driven early intervention to prevent relapse.

Solution

PrecisionRCS aims to integrate a standardized evidence-based peer recovery coaching model that builds recovery capital into a digital platform that can be used by peer coaches. The software represents the first digital standard for peer recovery coaches to build recovery capital that integrates multiple evidence-based practices, such as motivational interviewing, strengths-based case management, contingency management, and evidence-based screening tools into the digital environment. PrecisionRCS also features a patient portal that connects clients to the platform where data can be entered by clients.

Device Design

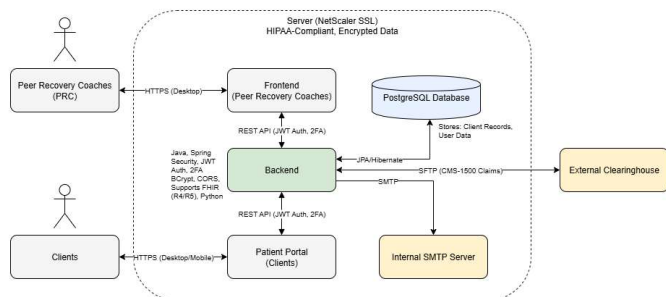


Figure 1. System Architecture

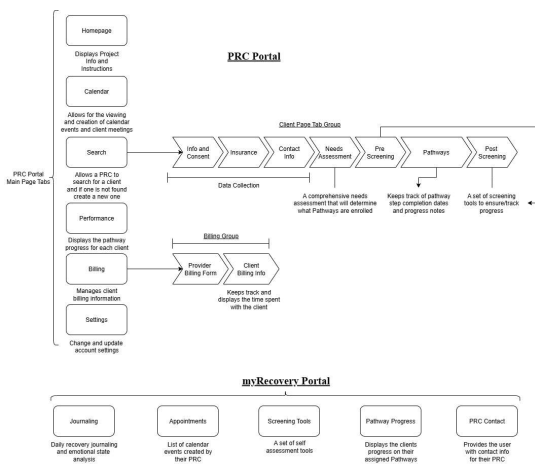


Figure 2. Map of all pages included in the PrecisionRCS application

Solution (Continued)

This allows clients to participate in data collection asynchronously reducing the burden of administration during PRC encounters and addresses situations in real time using AI-driven digital feedback. This also gives us the ability to collect daily inventories of recovery capital, which can be used to train AI models to detect early signs of relapse and provide potentially life saving interventions.

Technology

PrecisionRCS aims to integrate modern software development frameworks, many of which have not been integrated into the substance use treatment health IT marketplace. Software tools used for development include PostgreSQL for storing client data, Spring Boot 3 for backend development, Angular for front-end development, and Python to integrate artificial intelligence and machine learning algorithms. The software has been developed with AI in mind, with potential for natural language processing and deep learning model integration. FHIR Questionnaires have been implemented to allow for modular loading of data collection instruments, along with ASC X-12 837P format used for transmission of billing claims information.

Advantages

- First evidence-based digital platform specifically designed for PRCs.
- Program wide oversight, scheduling, billing, and data collection integrated into single platform solution.
- AI integration allows for rapid and personalized response to clients at risk for fatal overdose.

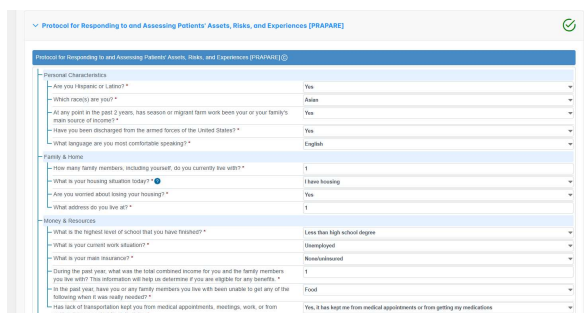


Figure 3. Evidence-based screening tools administered during client intake

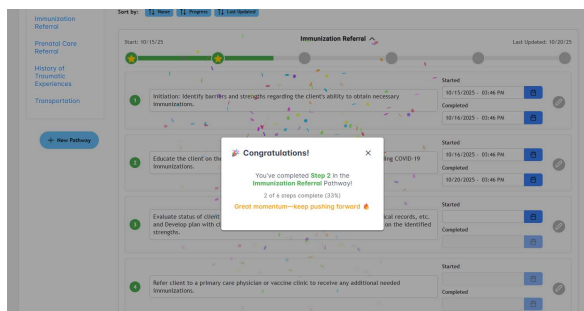


Figure 4. Client progress through pre-generated action plans is documented by the software, with congratulatory messages to facilitate contingency management

Stage of Development

Stage of Development: *Prototype Development*
Partnerships: Developed with support from the NJHF
Intellectual Property: US Provisional Patent Application Filed

Brief Description

Robossis is a surgical robotics company pioneering advanced navigation and robotic assistance for orthopedic trauma. Our initial focus is on femur fracture fixation, where we aim to improve surgical accuracy, safety, and efficiency by integrating robotics seamlessly into existing operating room workflows.

Problem

Current surgical techniques for femur fracture fixation rely heavily on manual alignment and repeated fluoroscopy. This not only exposes patients and surgical teams to unnecessary radiation, but also increases the risk of malalignment, longer operative times, and reoperations, issues that directly affect patient recovery and healthcare costs.

Solution

Robossis provides a robotic-assisted platform that augments the surgeon's capabilities with precise navigation and automated guidance. By improving fracture reduction accuracy and implant placement, our system reduces fluoroscopy use, shortens surgical time, and improves overall clinical outcomes for patients.

Technology

Our system integrates intraoperative imaging, AI-driven navigation algorithms, and robotic actuation to provide real-time assistance in the operating room. The platform is designed to enhance surgical precision while maintaining surgeon control, creating a safer and more efficient workflow that aligns with current orthopedic practices.

Device Design

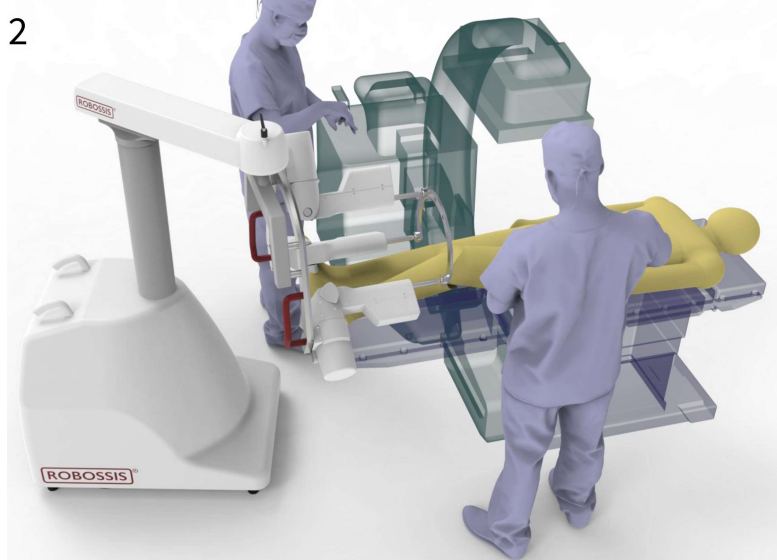
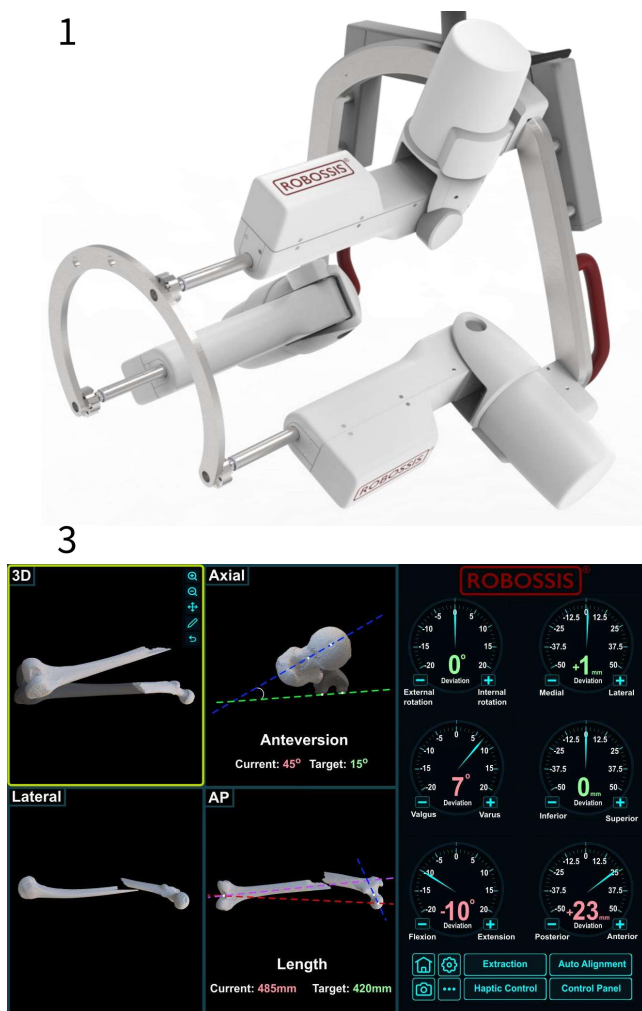


Figure 1. Patented Robossis surgical robot with 6 –DOF and 3 arms to accurately manipulate the bone fragments.

Figure 2. Surgeon-centric design to optimize the workflow for femur fracture surgery.

Figure 3. Graphical User Interface with real-time bone tracking.

Stage of Development

We are actively conducting pre-clinical validation and cadaver studies to refine system performance, while building collaborations with leading trauma surgeons and academic centers. Our next milestones include expanding clinical studies, pursuing regulatory clearance, and preparing for commercial deployment to transform fracture surgery worldwide.

Stage of Development: Intellectual property (patent filings): PCT/US2024/037613; US 16/374,024; PCT/US2017/018393.

Brief Description

Customized midsoles allow footwear to be tailored to each user's podiatric anatomy, gait, movement dynamics, intended use, and any specific foot or ankle issues. They can be optimized for individual biomechanical performance rather than just foot shape or weight, resulting in enhanced performance and greater comfort.

Problem

Most existing footwear materials are designed with a one-size-fits-all approach, paying little attention to individual needs. The majority of commercial products focus on insertable insoles rather than the midsole itself. Considering that the midsole accounts for about 75% of the footwear's volume and plays a key role in energy absorption and shock mitigation during movement, a paradigm shift is needed; one that prioritizes midsoles with customizable properties to better meet user needs.

Technology

This technology is developed to make footwear significantly more customizable, enabling shoes to be tailored to each individual's specific needs and intended use. The concept of customizable midsoles centers on designing materials and structures that enhance user comfort and well-being while also promoting cost efficiency and environmental sustainability. The technology involves the design and evaluation of shoe midsoles with tunable mechanical properties that can be applied in practical, real-world scenarios. Using foot pressure map data obtained from a custom-made insertable force sensor, midsoles were designed with multiple compartments separated by a thin, non-intrusive frame to accommodate different materials. The midsoles developed in this way aim to provide targeted cushioning and support for individuals experiencing foot pain or discomfort. They also offer a cost-effective alternative to expensive custom orthotics, benefiting both everyday walkers and performance-oriented runners.

Solution

The proposed solution involves two complementary objectives.

First, it focuses on developing systematic strategies and protocols to characterize and tailor the mechanical response of custom foam materials, including parameters such as cushioning, stiffness, energy return, and damping behavior. Establishing these protocols will enable precise control over material performance and ensure that the foams can be engineered to meet diverse user requirements.

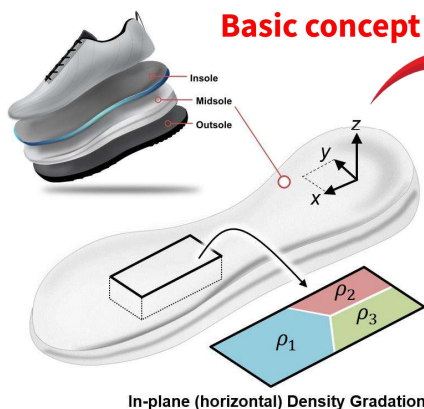
Second, the approach emphasizes the design and fabrication of midsoles with spatially varied mechanical properties. Such midsoles can be engineered to provide targeted support, flexibility, and shock absorption in specific regions of the foot, thereby enhancing both comfort and biomechanical efficiency. This customization has the potential to benefit a wide range of users, including patients with foot and ankle disorders who require corrective support, elderly adults who need improved stability and impact reduction, and athletes seeking performance optimization.

Ultimately, the proposed solution aims to establish a modular and adaptable footwear design framework that integrates advanced material engineering, digital design tools, and data-driven customization to deliver truly personalized performance and comfort.

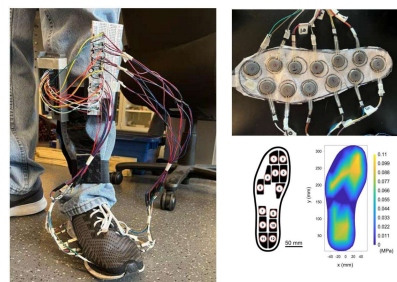
Advantages

- Fully customizable footwear designed to adapt to each individual's specific needs
- Cost-effective and reusable, reducing waste and long-term expenses
- Adjustable design that allows modifications during use and as often as needed

Device Design



Plantar pressure measurement



Prototype



Stage of Development

Stage of Development: *Concept / Early-stage prototype*

Partnerships: Co-Development, Licensing

Intellectual Property: Provisional patent filed September 2025 through Rowan University Office of Technology Commercialization.

Brief Description

The Neuron Foundry Mach 8 is a multi-modal neuro-supportive platform designed to target neural networks through the sequential delivery of subtle energy-based interventions.

Problem

One of the most common causes of limitations in physical and cognitive skills is neurodegenerative disorders. These illnesses impact roughly 15% of the global population and have increased steadily for the past 30 years. Over the next few decades, experts predict the trend among people with various neurological problems will double.

Neurodegenerative diseases pose significant challenges to healthcare systems worldwide, with conditions such as Alzheimer's disease, Parkinson's disease, multiple sclerosis, and amyotrophic lateral sclerosis affecting millions of individuals globally. While these diseases remain extremely challenging to manage, innovative approaches are continually being explored to counter them and enhance the quality of life for affected individuals.

Solution

This device proposes to deliver safe and controlled energy therapy through multiple therapeutic pathways, including stimulating brain mitochondrial energy, supporting homeostasis within the brain's immune system, increasing melatonin production within neuronal mitochondria, and triggering cellular communication through the brain's white matter.

Technology

The device employs subtle energy fields, including red light therapy, pulsed electromagnetic fields, vibrational frequencies, and audio-visual stimulation, to stimulate neuronal activity and enhance neural connectivity. These interventions aim to modulate cellular activity, promote neuroplasticity and neurogenesis, and restore optimal neural function in individuals with neurodegenerative diseases.

Advantages

- Target neural networks through multiple energy pathways
- Stimulate neuronal mitochondrial respiration
- Stabilize microglial movement and promote neuroprotective secretions

FIGURES

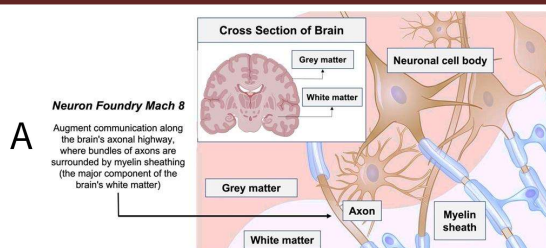


Fig. A. Neuron Foundry Mach 8 could trigger cellular communication through the brain's white matter.

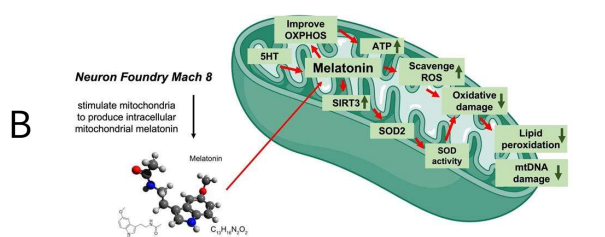


Fig. B. Neuron Foundry Mach 8 could increase the production of melatonin within the neuronal mitochondria.

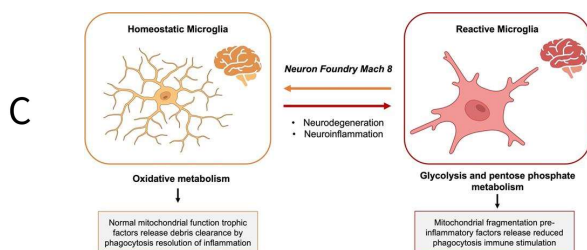


Fig. D. Neuron Foundry Mach 8 could support homeostasis within the brain's immune system.

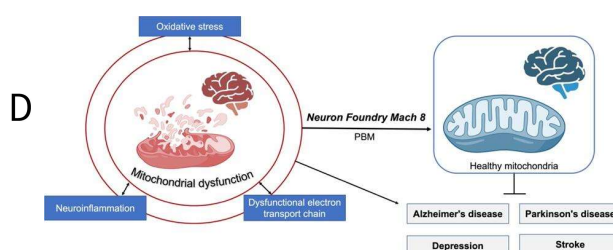


Fig. C. Neuron Foundry Mach 8 could stimulate the brain's mitochondrial energy

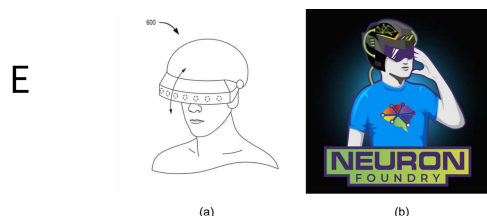


Fig. E. The helmet 600 further includes a visor portion extending downwardly from the cap portion. (a) Rough sketch and (b) Colored sketch.

Stage of Development

Stage of Development: *Prototype Development*

Partnerships: Co-Development, Licensing

Intellectual Property: US Provisional Patent Application Filed

Brief Description

Amyotrophic Lateral Sclerosis (ALS) is a currently intractable neurodegenerative disease affecting the motor system specifically. We present here a novel gene therapy strategy targeted to the integrity of energy metabolism in motor neurons.

Problem

ALS is a severe and devastating neurodegenerative disease that affects over 30 000 people in the USA alone. Progression of disease in affected individuals is relentless, with terminal end stage approximately 5 years from the time of diagnosis. Biomarkers for this disease are unavailable, but in both sporadic and familial cases a declining energy signature is apparent. The central nervous system (CNS) requires an uninterrupted supply of energy currency to function, with the majority of budgeted energy committed to maintaining the electrochemical axon potential which neurons require to drive synaptic function. Motor neurons have the largest axons in the human CNS, extending up to a meter or more to innervate the neuromuscular junction that drives muscle function that ultimately fails in ALS. Addressing the failure of motor neurons to adequately fuel this process is a major barrier to current therapeutics.

Solution

Augmentation of a naturally occurring energy sink in motor neurons is the aim of this strategy. This energy sink, N-acetylaspartate (NAA) is naturally abundant in motor neurons, but is physiologically inactive until catabolized by the enzyme aspartoacylase (ASPA). By conferring the ability of motor neurons to access the energy substrate within NAA via gene-therapy delivery of ASPA, motor neuron energy is augmented. The catabolic product of NAA catabolism (aspartate) powers the transfer of cytosolic reducing equivalent generated by glycolysis (NADH) to the mitochondrial electron transport chain to drive ATP synthesis.

Advantages

- One-off drug treatment for ALS
- Utilizes a gene therapy technology that is currently FDA approved
- Addresses the issue of rate-limiting energy supply in pathologically affected motor neurons in ALS

Mechanism of Action

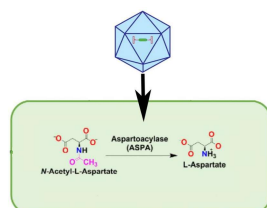
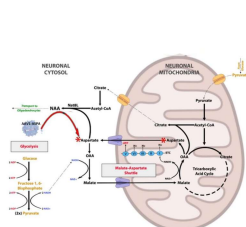


Figure 1. Mechanism of action in motor neuron mitochondria following gene therapy delivery (AAV-mediated) of ASPA. ASPA liberates aspartate from local NAA which powers the malate-aspartate shuttle to provide glycolytic NADH to the electron transport chain to drive supplemental ATP.

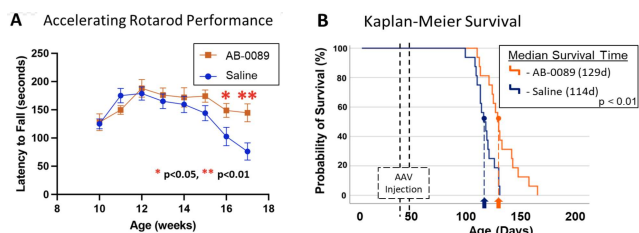


Figure 2A. Rescue of motor function in ALS mice following treatment with AAV-ASPA (AB-0089) as assessed by accelerating rotarod performance.

Figure 2B. Increased survival of AB-009 treated mice. Introduction of AB-0089 into motor neurons results in a significantly increased lifespan

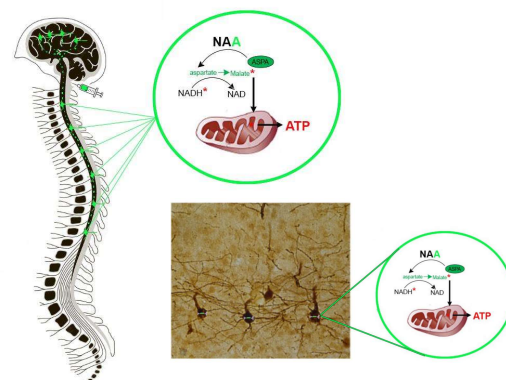


Figure 4. Injection of AB-0089 into the CNS is an augmentation gene therapy that supports energy metabolism in targeted motor neurons across the entirety of the corticospinal tract. This strategy addresses the fundamental requirement for uninterrupted energy supply required for function of the neuromuscular junction by promoting mitochondrial energy metabolism. Both AAV and ASPA are FDA approved Investigational New Drugs.

Stage of Development

Stage of Development: *Preclinical IND-driven*

Partnerships: *Aletheia Neuroenergetics*

Intellectual Property: *Leone P, Francis, JS* Methods of treating or preventing, Amyotrophic Lateral Sclerosis PCT/US2019/048985

Brief Description

This manufacturing technology uses a combination of nanofabrication, additive manufacturing, and sacrificial template infiltration to create hydrogels with embedded aligned nanofibers. Aligned nanofibers serve as architectural cues that induce cell and extracellular matrix alignment, accelerate cell migration into the scaffold, and induce cell differentiation toward phenotypes associated with aligned soft tissues.

Problem

Hydrogels are promising candidates for tissue scaffolds due to their biocompatibility, cell permeability, and capacity to serve as a volumetric template for new tissue growth and maturation. However, unmodified hydrogels do not have directional cues and thus cannot encourage the development of axially organized aligned tissue present in nerve, muscle and tendon.

Solution

A low-density fiber component (<1% volume) embedded in hydrogels guides uniaxially aligned regeneration, while leaving ample room for new tissue growth. This is critical for regeneration of highly cellular soft tissues, which require space for aligned cell repopulation.

Technology

This technology facilitates the 3D incorporation of continuous aligned nanofibers into hydrogels through a dip coating/layer-by-layer/sacrificial templating process that is compatible with many types of nanofibers and hydrogels and does not experience layer delamination.

Advantages

- Embedded aligned nanofibers accelerate regeneration with direct aligned tissue morphologies
- Manufacturing methods are versatile for many hydrogels and nanofiber material systems

Device Design

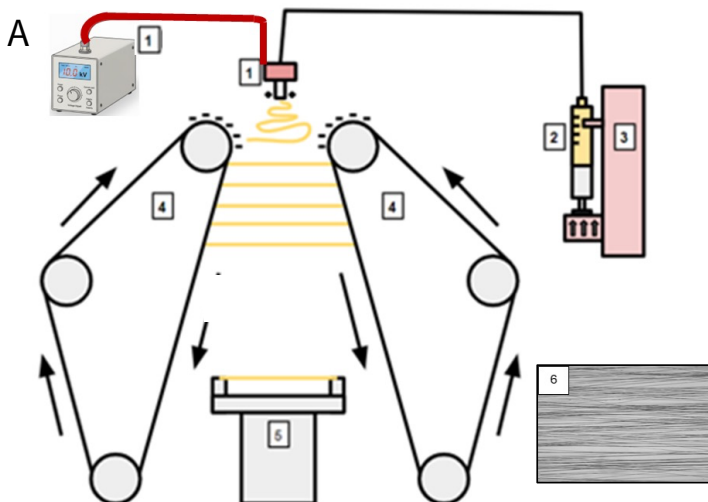


Figure A. Schematic illustration of the automated electrospinning setup for producing highly aligned polymer nanofibers. The system includes A high voltage power supply connected to blunt tip needle(1), polymer solution in syringe(2), syringe pump(3), and automated rotating parallel track collectors (4) used to align the fibers. Nanofibers are collected on the collection trays (5) placed between the tracks.(6) Representative image of highly aligned electrospun polymer nanofibers produced using the automated track electrospinning system.

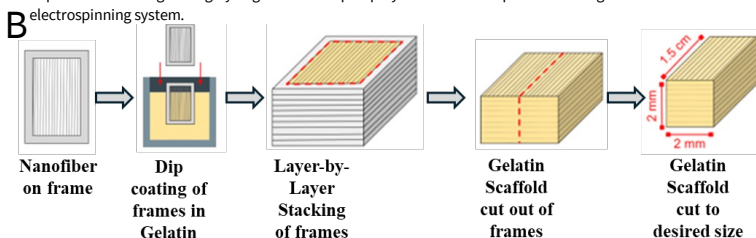


Figure B. Electrospun nanofiber frames are dip-coated in gelatin solution and stacked layer-by-layer to the desired thickness. The multilayer construct is sectioned and trimmed into uniform cuboidal sacrificial scaffolds (2 mm × 2 mm × 1.5 cm) for subsequent hydrogel infiltration.

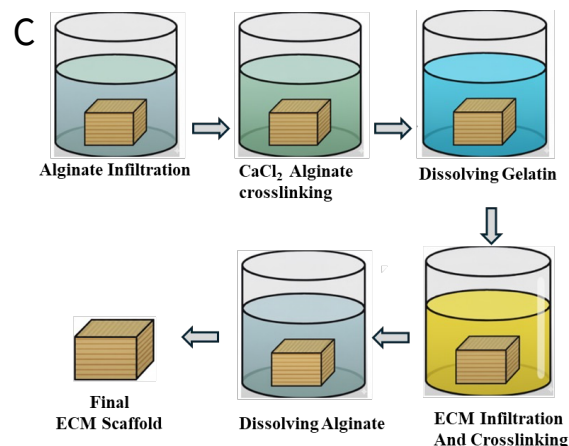


Figure C. Stepwise schematic of hydrogel scaffold fabrication using a gelatin template. The gelatin scaffold is first infiltrated with alginate solution and crosslinked in CaCl_2 . The gelatin component is then selectively dissolved, leaving an alginate template. This template is subsequently infiltrated with decellularized extracellular matrix (ECM) solution and finally processed by alginate dissolution to yield the nanofiber-embedded ECM scaffold.

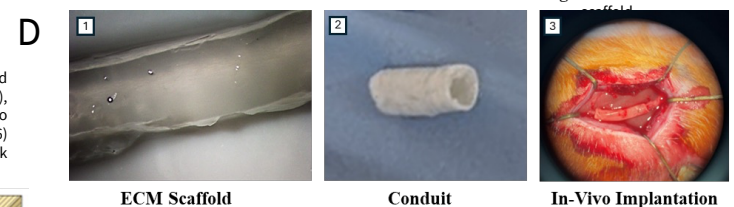


Figure D. Representative images showing the fabricated extracellular matrix (ECM)-based scaffolds and their application. (1) ECM gel/nanofiber scaffold after processing, (2) ECM gel/nanofiber scaffold inserted into a cylindrical conduit prepared for implantation, and (3) in-vivo placement of the ECM conduit bridging a peripheral nerve gap in the rat sciatic nerve gap model.

Stage of Development

Stage of Development: *Prototype Development*
Partnerships: Co-Development, Licensing
Intellectual Property: Two US Patent Applications Filed

Nanoyarns as Next Generation Suture Materials

Dominique Hassinger¹, Sean McMillan DO^{1,2,3,4}, Vince Beachley PhD¹

¹Department of Biomedical Engineering, Rowan University, Glassboro, NJ, ²Virtua Our Lady of Lourdes Hospital & Virtua Willingboro Hospital, ³Virtua Medical Group Sports Medicine and Shoulder Service, ⁴Rowan University School of Osteopathic Medicine

Brief Description

Advanced polymer nanofiber manufacturing technology enables fabrication of nanoyarns suitable for **suture applications**. Nanofiber architecture promotes favorable cell-biomaterial interactions that promote healing, such as an M2 regenerative response, organized extracellular matrix deposition, and cell differentiation toward preferred phenotypes. Electrospun nanofibers can be easily modified to include bioactive peptides to further enhance healing/regeneration.

Problem

The regenerative potential of nanofiber architecture in sutures is well known; however manufacturing polymer nanofiber yarns faces technical challenges. High velocity nanofiber fabrication results in poor fiber organization, yarn uniformity, and scalable lengths.

High temperatures associated with conventional melt spun sutures can degenerate bioactive factors and peptides.

Solution

A multi-stage nanofiber yarn manufacturing process stabilizes aligned fibers, producing uniform, mechanically suitable nanoyarns for sutures. Bioactive peptides can be encapsulated without activity loss, and diverse polymers can be combined to tailor properties like drug release, strength, and degradation.

Technology

This technology uses opposing automated tracks to immobilize and post-draw electrospun nanofibers to strength them. They are transferred to a continuous roll to enable twisting/winding into a yarn. Custom peptides are dissolved directly in the electrospinning solution to encapsulate in fibers.

Advantages

- Nanofiber architecture stimulates a regenerative healing response
- Nanofiber sutures** easily encapsulate bioactive peptides
- Nanofiber sutures** have better flexibility and knot security and are less likely to tear through tissue

Device Design

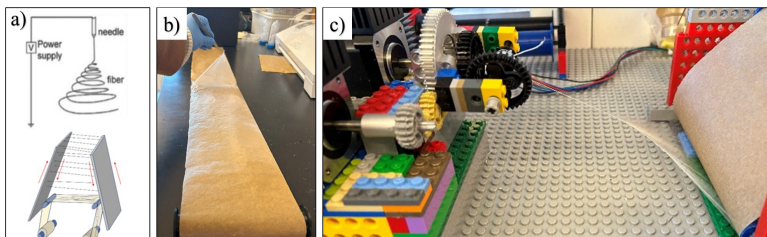


Figure 1: Nanoyarn fabrication technique via electrospinning with custom rotating parallel tracks and post drawing capabilities a) custom electrospinning setup with rotating parallel tracks, b) aligned nanofiber sheet for nanoyarn fabrication c) custom yarn spinning setup with adjustable twist per inch

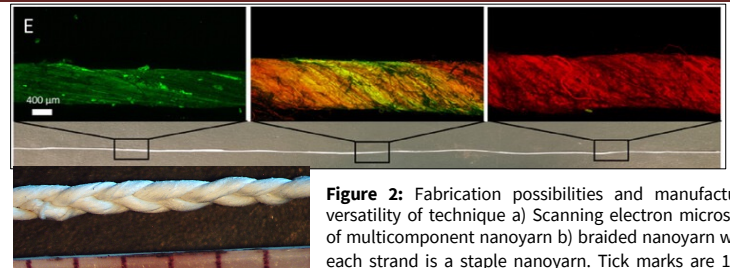


Figure 2: Fabrication possibilities and manufacturing versatility of technique a) Scanning electron microscopy of multicomponent nanoyarn b) braided nanoyarn where each strand is a staple nanoyarn. Tick marks are 1 mm spacing.

Peptide	Sequence	Functionality
Indolicidin	ILPWKWPWWPWRR	broad spectrum of biological activity, active against Gram+ & Gram- bacteria, fungi and viruses
BPC 157	GEPPGKPADDAGLV	Boosts fibroblast activity, reduces inflammation, stimulates collagen and muscle protein synthesis
TB500	ACSDGETTQKFTTSQA	Promotes differentiation of progenitor cells, potent anti-inflammatory effects, induces angiogenesis

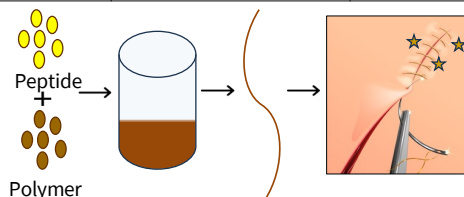


Figure 4 : Nanoyarns can be functionalized with biologic agents like peptides a) peptides of interest and their functionality b) concept of direct peptide incorporation into the electrospinning solution for a functionalized nanoyarn as a suture material.

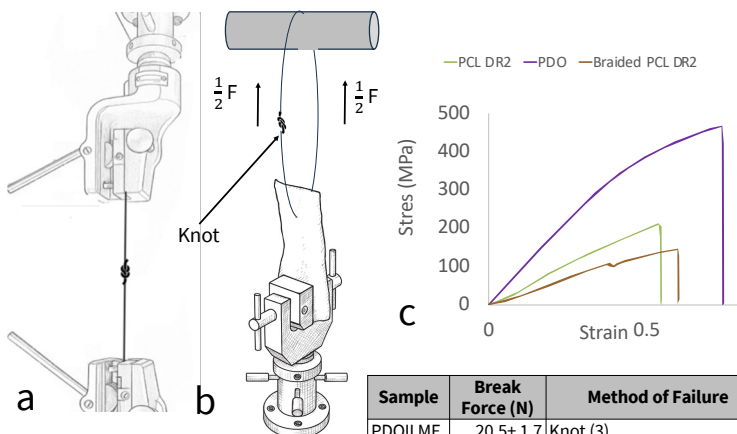


Figure 3: Suture specific testing of braided nanoyarns versus commercial control a) knot pull test setup b) tissue pull through setup c) USP 41 straight pull results d) knot pull and tissue pull through results

Sample	Break Force (N)	Method of Failure
PDOII MF	20.5 ± 1.7	Knot (3)
	16.4 ± 7.5	2x knot unties, 1x tissue tear by suture
PCL DR2	6.91 ± 2.8	Knot (3)
Braided	19.2 ± 6.7	gauge length (3), 1 x pull out of grips

Knot pull, Tissue pull through

Stage of Development

Stage of Development: *Prototype Development*

Partnerships: Co-Development, Licensing

Intellectual Property: Two granted US Patents and two US Patent Applications Filed

Brief Description

+Pouch is a fast acting, on-the-go electrolyte pouch designed for rapid hydration without the bloat or upset stomach by utilizing the buccal pathway. Perfect for athletes and individuals with POTS, it delivers essential electrolytes quickly and conveniently, helping you feel better, faster.

Problem

Patients with POTS have no easy way to offset symptoms, traditional electrolyte drinks can take 30–45 minutes to absorb, are inconvenient to carry, and often cause GI discomfort issues that are especially challenging for people with POTS, who need rapid hydration to manage symptoms like dizziness and fatigue. This delay of electrolytes in traditional hydration leaves them waiting for relief when they need it most, which is where +Pouch comes into play.

Advantages

- Fast acting- under 5 minutes to kick in
- Consistent diffusion rate
- Convenience - contains 20 servings that can be kept in you back pocket
- Cost efficient
- Contains flavors rather than just consuming salt

Solution

+Pouch is designed to provide rapid symptom relief for people with POTS who experience dizziness, fatigue, and brain fog due to dehydration. Unlike traditional electrolyte drinks that can take up to 45 minutes to absorb, +Pouch uses oral absorption for near-instant electrolyte delivery. Whenever symptoms start to hit, simply place a +Pouch on your gums to quickly ease discomfort and restore balance without the bloating or GI distress that often comes with liquid hydration.

Technology

+Pouch works through buccal absorption, meaning the electrolytes are absorbed directly through the lining of the mouth rather than passing through the digestive system. When placed between the upper lip and gum, the pouch slowly releases sodium, potassium, and magnesium into the bloodstream, providing rapid hydration within 5 minutes. This method bypasses the stomach, reducing bloating and GI discomfort, and allows people with POTS to quickly relieve symptoms like dizziness, fatigue, and brain fog. Its flavored, long-lasting pouch ensures steady absorption over up to an hour, making hydration fast, convenient, and effective.

Device Design (FIGURES AND METHOD)

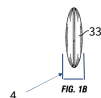
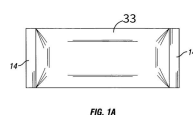
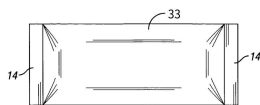
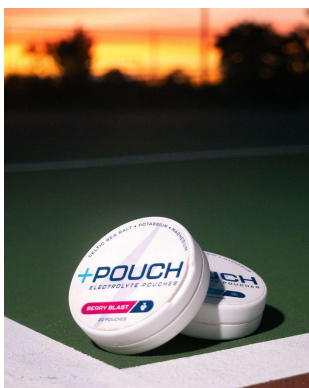


Figure 1A. Dimensions and size of the front of the pouch in MM.

Figure 1B. Dimensions and size of side of pouch in MM.

Figure 2C. Place in between upper gum and upper lip. Epithelial tissue is very thin allowing the ingredients to enter the bloodstream due to the high concentration of blood vessels in the area.



Stage of Development

Stage of Development: *Prototype Research and Development*
Partnerships: Office of Tech Commercialization, Rowan University
Intellectual Property: Managed in partnership with Dr. Neal Lemon and the Office of Tech Commercialization



Assay for screening drugs that modulate mechanical tension

Ben Sorum, MD, PhD¹ and Khalid Hanafy, MD, PhD²

¹-Professor of Biomedical Sciences, Cooper Medica School of Rowan University

²-Professor of Neurology, Cooper Hospital

Brief Description

We are developing a **mechano-fluorescent assay** that measures changes in **mechanical tension experienced by cells** through a fluorescent readout. For instance, cardiac cells can be induced to contract, or cells can be mechanically stretched, and pharmacological agents can then be perfused to identify compounds that alter cellular tension based on changes in fluorescence intensity.

Problem

Cellular mechanical tension underlies essential physiological processes such as heartbeat, vascular tone, and neuronal signaling. When this tension becomes dysregulated, it contributes to major human diseases including heart failure, hypertension, traumatic brain injury, and cancer. Yet despite its importance, mechanical tension remains one of the least measurable aspects of cell physiology. Existing methods—such as traction force microscopy or atomic force probing—are low throughput, require specialized equipment, and fail to capture dynamic changes in live cells. Critically, there is no assay or product that provides a direct, **quantitative fluorescent readout of mechanical tension in real time**. This absence prevents systematic discovery of drugs that could modulate the biomechanical state of cells and tissues, leaving a major gap in the **development of pioneering-generation mechanotherapeutics**.

Solution

We have **genetically engineered fluorescent proteins** that respond to mechanical stimulation with a measurable change in fluorescence. These **Fluorescent Genetically Encoded Mechanosensors (fGEMs)** allow visualization of real-time mechanical tension dynamics. By applying tension to cells and monitoring the resulting increase in fluorescence, we can then test drug candidates to determine their effects on membrane or cytoskeletal tension.

Technology

The goal is to develop a **mechano-fluorescent assay** capable of measuring changes in **mechanical tension experienced by cells** through a fluorescent readout. For example, cardiac cells can be induced to contract, or cells can be subjected to controlled mechanical stretch, followed by **drug perfusion** to identify compounds that modulate cellular tension—detected as corresponding changes in fluorescence.

Advantages

- Enables **direct visualization** of cellular tension as light signals
- Allows **real-time observation** of tension changes in live cells
- Can be **expressed in any cell type** for broad applicability
- Facilitates **high-throughput drug screening** for mechanobiology-focused therapies

Fluorescent increase with tension application

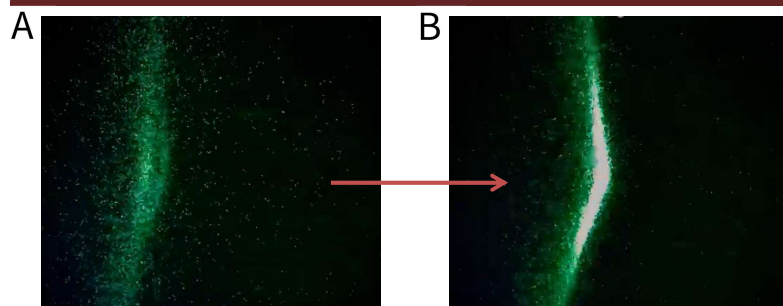


Figure 1A. Basal Florescence before tension application

Figure 1B. Tension induced fluorescence after membrane tension application

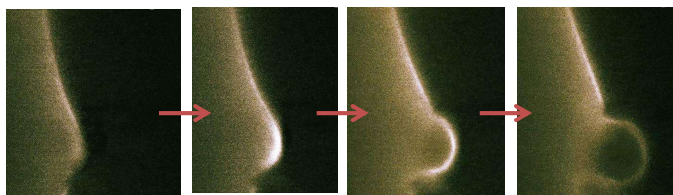


Figure 2. Vesicle formation in a cell membrane showing changes in membrane tension corresponding with changes in florescence.

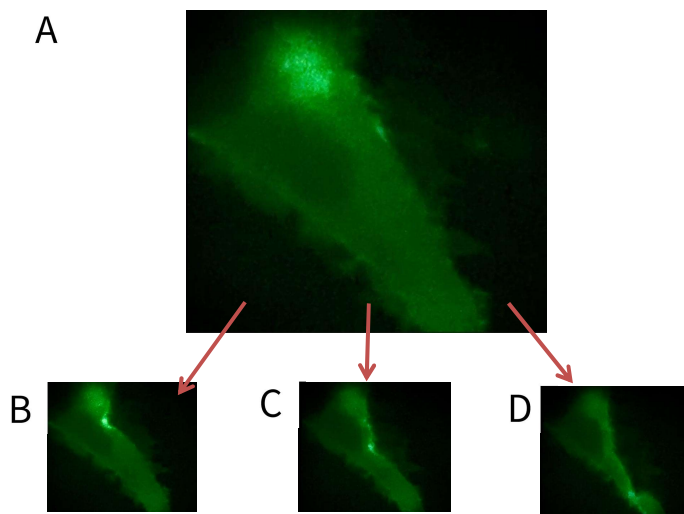


Figure 3A. Microglial cell before poking

Figure 3B. Poking top

Figure 3C. Poking middle

Figure 3D. Poking bottom of cell

Stage of Development

Stage of Development: *Prototype Development*

Partnerships: Co-Development, Licensing

Intellectual Property: US Provisional Patent Application Filed

An Actuated 3D Platform for Producing Regenerative Skin Serums

Inventors: Andrea Vernengo, PhD¹ and Jennifer Weiser, PhD²

Co-authors: Dana Casas¹, Nidhal Bouaynaya, PhD¹, Natarajaseenivasan Kalimuthusamy³, and Stephanie Budijoni (Industry Mentor)

¹Rowan University, ²The Cooper Union, ³Rowan-Virtua School of Osteopathic Medicine

Brief Description

- We are developing a **next-generation exosome serum** for **under-eye rejuvenation**, restoring collagen, elasticity, and barrier strength in aging skin.
- The concept emerged from **150+ customer-discovery interviews** through the **NSF I-Corps** program, which identified the under-eye region as a top unmet need for at-home skin repair between professional treatments.
- The serum is produced using **EXPECT¹**, a patent-pending 3D hydrogel culture system.
- While the first application targets **periorbital skin**, the platform has **broad potential** in **dermatology** and **regenerative medicine**.

Problem

- Under-eye skin** shows early signs of aging due to loss of collagen and elastin, extracellular matrix (ECM) breakdown, and weakening of the skin barrier
- There is a **\$14B global eye-care market** focused on restoring firmness and smoothness.
- Mesenchymal stem cell (MSC) exosome serums** offer a promising **cell-free** approach to skin repair, but have **current limitations**:
 - Standard 2D culture methods cause MSCs to age prematurely (senescence)
 - Senescent MSCs produce fewer chemokines and regenerative microRNAs (miRNAs)
 - These weakened signals reduce the ability to recruit repair cells and rebuild the ECM
- As a result, **most exosome serums fail to restore elasticity or strengthen the under-eye barrier**.

Stage of Development

Stage of Development: *Prototype Development*

Partnerships: Co-Development, Licensing

Intellectual Property: Provisional patent filed June 2023.

This IP is owned by Rowan University and is available for licensing or option-to-license agreements to support commercialization efforts.

Solution

- Most exosome serums lose potency from **flat, static cultures** that weaken stem cells and silence repair signals.
- EXPECT uses a **dynamic 3D nanostructure** with gentle temperature actuation cycles to keep cells migrating and communicating over long-term culture.
- Sustained activity is **hypothesized** to promote **regenerative signaling that rebuilds collagen and strengthens the skin barrier**.
- Goal:** To harness and concentrate these regenerative signals during manufacturing, creating a **high-potency exosome serum** for under-eye rejuvenation.
- Long-term vision:** Wound-prevention applications by strengthening aging, delicate skin.

Technology

- Integrates **biofabrication, biomaterials engineering, stem cell biology, and data science** to develop a new manufacturing approach for regenerative exosomes.
- Core platform: **EXPECT**, a **thermoreponsive 3D hydrogel** that supports long-term MSC activity.
- Gentle temperature actuation** sustains MSC migratory behavior for **over one month**, far exceeding traditional 2D culture duration.
- AI-guided optimization** identifies culture parameters that maximize exosome potency.
- Together, these elements establish a **next-generation biologic platform** for skin applications.

Advantages

- Extended cell activity:** Unlike 2D cultures that cause cells to weaken over time, EXPECT keeps stem cells active and continuously releasing repair signals.
- Potential for effective skin repair:** EXPECT-derived exosomes for collagen rebuilding and barrier restoration.
- Validated market focus:** Clinicians and consumers confirmed strong demand for a science-based solution targeting thin, aging skin between clinical treatments.
- Broader therapeutic reach:** The same platform can be adapted for skin rejuvenation, wound prevention, and other regenerative applications.

Device Design and Preliminary Results

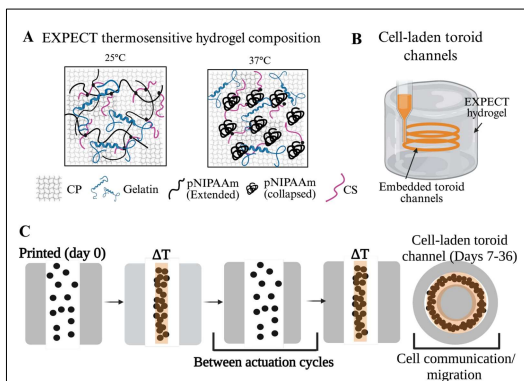


Figure 1. Schematic of the EXPECT system. (A) Thermosensitive hydrogel composition with poly(N-isopropylacrylamide) (pNIPAAm), gelatin, Carbopol®, and chondroitin sulfate (CS). (B) Extrusion 3D printing of cell-laden toroid channels within the embedding medium. (C) Temperature actuation cycles promote cell communication and migration within the toroid channels. Figure adapted from Pylostomou et al., 2025, with permission¹.

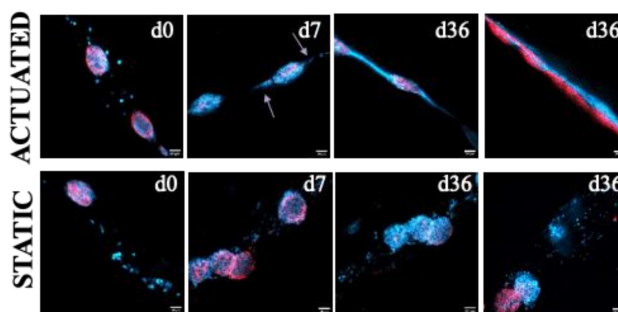


Figure 3. Mesenchymal stem cells (MSCs) within EXPECT hydrogels show directional migration and intercellular communication over 36 days in vitro. Cells were embedded within EXPECT toroids and stained with DAPI (nuclei, blue) and TRITC-phalloidin (actin filaments, red). Arrows indicate directionally migrating cells. Scale bar = 50 μm. Figure adapted from Pylostomou et al., 2025, with permission¹.

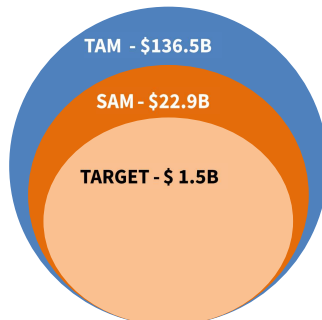


Figure 2. Market size of EXPECT exosomes. EXPECT beachhead target market is adults over 40 seeking at-home periorbital rejuvenation, addressing a ~USD 1.5B global direct to consumer anti-aging segment growing to 3.5B by 2033. This target market sits within the Served Available Market (SAM: North American skin care, USD 22.9B) and within the Total Addressable Market (TAM: global skin care industry, USD 136.5B).

The authors gratefully acknowledge support from NSF I-Corps (Award No. 2452277)

¹Pylostomou, A., Wychowanec, J.K., Tognato, R., Egger, S.T., Alig, G.U., Edwards-Gayle, C.J., Safari, F., Weiser, J.R., Loca, D., D'Este, M. Serra, T. and Vernengo, A., 2025. EXPECT: A Thermosensitive Embedded Bioprinting Platform for Guided Spatial Cell Organization. *Smart Materials in Medicine*.