ACCELERATING THE
NEXT STEP
IN INNOVATION
The **Eshelman Institute for Innovation** at the University of North Carolina at Chapel Hill was established in 2014 with a $100 million commitment from Dr. Fred Eshelman.

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Welcome to the Eshelman Institute for Innovation’s 2021 Impact Report.

This has been a year of momentous change for the Institute. In spite of the challenges of working within the continued pandemic, the team has delivered across many domains and the outcomes within this report speak for themselves.

The start of the year was marked by a significant strategy review. The newly minted strategy firmly positions the Institute as a translational engine not only for the School of Pharmacy but across the entire campus at UNC-Chapel Hill. This extended scope is balanced by our domain focus. We have chosen to spend our precious time on developing novel therapeutics in infectious disease, oncology, and neuroscience alongside extending our expertise in digital health.

We have continued to lead the build-out of campus capabilities for novel drug discovery. Through the Drug Discovery Initiative (DDI), the highlight was the opening of a state-of-the-art full genome CRISPR library to help faculty discover novel disease targets. Through our funding, we now have a small internal portfolio of approximately ten early and novel therapeutic assets.

The Eshelman Institute for Innovation was created with the frame of launching innovation moonshots. This document spends time discussing two of our brightest and best examples:

- **READDI (Rapidly Emerging Antiviral Drug Development Initiative)** is our most significant therapeutic moonshot to date. This new global non-profit has been funded and launched by the Institute in support of the three virology founders. In November READDI was selected as the $5M RTI Forethought grant winner and, in addition, the NC state budget was signed with an appropriation of $18M for the work. We have a path to another $125-180M in funding in 2022. We will begin to staff a full-time team for this 501 c3. READDI puts NC at the center of global pandemic preparedness. Indeed READDI’s work was included in a report, developed by Boris Johnson and the UK cabinet, that was presented to members of the G7.

- **Digital Health Venture Studio.** At the end of October, we completed a venture studio pilot in digital health with our partner UNC Health. The first fundable startup out of the pilot is a technology that we have supported, with the help of Microsoft, for some time. This AI business will allow transplant centers to better match donors to recipients. We think it has exciting potential once we get it to market. This pilot success has resulted in the University wanting to fund a full Venture Studio. We continue down a path to bring that to reality.

I would like to take this opportunity to thank our amazing team for their work in 2021 alongside our Steering Board and a broad array of partners that made our ambitious plans a reality.

John Bamforth, Ph.D.
Director, Eshelman Institute for Innovation
Our Mission

The Eshelman Institute is forging a game-changing approach to translating bold new ideas into real-world impact for patients.

Our Vision

The Eshelman Institute aspires to be a preeminent driver of cutting-edge technologies that solve the most pressing healthcare challenges.
Our Model

Translational Research & Early Development

- Campus initiative powered to accelerate
  - Novel Target Identification
  - Drug Discovery
  - Early Translational Research

Venture Acceleration & Startups

- Provides pre-seed funding
- Startups surrounded by studio services to build
  - High Alpha Innovation

Therapeutics

Digital Health

READDI
- Rapidly Emerging Antiviral Drug Development Initiative

POWERUP INITIATIVE
- Empowering Untapped Innovators
Our Capabilities

**Impact Intelligence**
- Rigorous due diligence
- Needs assessment
- Impact opportunity identification

**Idea Curation**
- Science sourced from UNC and network of partners and peers
- RFP process with competitive analysis
- Discovery research co-investment

**Project Management**
- Active management to meet industry-relevant milestones
- Tranche funding
- Access to key technologies

**Translation**
- Support from in-house experts and external advisors
- Assistance with strategy, business development, and executive recruitment
- Capital investment connections
- Customized entrepreneurial training
## Results

### Impact to Date

<table>
<thead>
<tr>
<th>1:3 Ratio</th>
<th>$96.4M</th>
<th>$150M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each dollar in donation spent has created three dollars in follow-on funding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total follow-on grants and startup funds raised</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anticipated follow-on grant funding in 2022</td>
<td></td>
<td></td>
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</table>

### Funding to Date

<table>
<thead>
<tr>
<th>$32.1M</th>
<th>165</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Awarded</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Projects Funded</strong></td>
<td></td>
</tr>
<tr>
<td>$657K</td>
<td>28 Student Projects Funded</td>
</tr>
<tr>
<td>$31.4M</td>
<td>137 Faculty Projects Funded</td>
</tr>
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</table>

### Train

<table>
<thead>
<tr>
<th>105</th>
<th>197</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School Students</td>
<td></td>
</tr>
<tr>
<td>Institute Postdoctoral Fellows</td>
<td></td>
</tr>
<tr>
<td>PharmD/PhD/Post Docs Supported and Trained</td>
<td></td>
</tr>
</tbody>
</table>
Therapeutic Focus

The Eshelman Institute drives therapeutic strategy, creates enabling drug discovery infrastructure, and funds pre-clinical projects to create partner-ready assets for unmet needs in oncology, neuroscience, and infectious disease. The Institute de-risks cutting-edge innovations with an early-stage pipeline focused on novel target discovery, target validation, and platform technologies. Strategic investment and translational initiatives are designed to move assets from discovery to preclinical and early development studies. Robust project management, diligence, and support from industry advisors facilitate asset delivery across the translational gap.
# Our Portfolio

## THERAPEUTICS

<table>
<thead>
<tr>
<th>Active Pipeline</th>
<th>Therapeutic Area</th>
<th>Molecule Type &amp; Disease</th>
<th>Target ID/Screening</th>
<th>Lead Identification</th>
<th>Lead Optimization</th>
<th>Pre-clinical</th>
<th>Phase I</th>
<th>License/Spinout</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ONCOLOGY</strong></td>
<td>Small Molecule</td>
<td>Metastatic Cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Small Molecule</td>
<td>Multiple Myeloma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ONCOLOGY</strong></td>
<td>Biologic</td>
<td>Solid Tumors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ONCOLOGY</strong></td>
<td>Small Molecule</td>
<td>Various Cancers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NEUROSCIENCE</strong></td>
<td>Small Molecule</td>
<td>Parkinson's Disease</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>METABOLIC</strong></td>
<td>Biologic</td>
<td>Obesity</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>CARDIOVASCULAR</strong></td>
<td>Biologic</td>
<td>Stroke</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>PULMONARY</strong></td>
<td>Small Molecule</td>
<td>Idiopathic Pulmonary Fibrosis</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Institute Graduates**

| Infectious Disease | Biologic Platform COVID-19 |                     |                  |             |        |                |
| Reproductive Health | Medical Device IVR-based ART |                     |                  |             |        |                |

## TECHNOLOGY PLATFORMS

<table>
<thead>
<tr>
<th>Active Pipeline</th>
<th>Project</th>
<th>Usage Area</th>
<th>Research</th>
<th>Development</th>
<th>Validation</th>
<th>Market</th>
<th>License/Spinout</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cell-Free Loaded Exosomes</strong></td>
<td>Myocardial Infarction, Ischemic Heart Disease</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td><strong>Cell-based Therapeutic Delivery</strong></td>
<td>Oncology Melanoma, GBM, Pancreatic</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>NEL’s Screening against Membrane Protein Targets</strong></td>
<td>Various</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Institute Graduates**

| Small Molecule Chemical Epigenetic Modifier | Various | | | | | | |
| Synthetic Carbohydrates Anticoagulants | Various | | | | | | |
Novel viruses are emerging more frequently. As shown by COVID-19, the unchecked spread of viral disease can result in the suffering and death of millions of people and place massive strains on healthcare infrastructure and the economy. The current system is not optimized for pandemics. The pharmaceutical industry is reluctant to invest in products with no obvious market. University research funding is project-based and aimed at point solutions. Governments cycle between panic and neglect. The world urgently needs a better solution.

As a global non-profit public-private partnership, READDI brings together the world’s best scientific, business, and public health minds to proactively develop and deliver novel antiviral drugs before the next virus creates another global catastrophe. To achieve this mission, READDI has three strategic objectives:

- **Generate new antiviral drugs** – READDI curates and manages projects at all stages led by interdisciplinary teams of virologists, medicinal chemists, and drug development experts.
- **Aggregate and advance existing assets** – READDI advances promising antiviral compounds shelved by industry and develops stalled antivirals from academic labs.
- **Expedite treatment availability** – READDI creates solutions for the rapid clinical testing, manufacturing, and deployment of antivirals during outbreaks as well as equitable access.

READDI takes an end-to-end approach to antiviral development, engaging partners from around the world to combine scientific excellence in virology with biopharma, manufacturing, and regulatory experience to drive drug discovery and development. Importantly, these cross-sector teams will work together throughout the entire process to ensure all stages of drug discovery and development are considered from the start, minimizing false starts and allowing READDI to focus on the most promising avenues for new drug development.

With the Office of the Vice Chancellor of Research, the Eshelman Institute funded this work beginning in 2018. It also led to the creation of this new global non-profit based in Chapel Hill. 2021 saw a rapid delivery of READDI’s implementation plan which resulted in the receipt of the organization’s first funding. The team was successful in winning the RTI Forethought grant against 185 other bids and received an $18M appropriation from the NC statehouse. The group has applied to become an NIH-funded AViDD center which would present $108M of additional funding. READDI was included as the ‘antiviral development solution’ with the 100 Day Mission, a report developed by Boris Johnson’s office for the G7 countries. Thanks to the state support READDI will now hire a full-time team starting with its CEO.
Drug Discovery Initiative

The Drug Discovery Initiative (DDI) is a collaborative project built on funding from the Eshelman Institute for Innovation, UNC Eshelman School of Pharmacy, UNC School of Medicine, the UNC Lineberger Comprehensive Cancer Center, the Office of the Vice Chancellor for Research, and a generous $2MM gift from an anonymous donor.

The DDI provides access to new technologies and external partners that allow UNC researchers to advance therapeutic programs in-house to a point of higher value and readiness for commercialization. Initial projects have focused on leukemia and Alzheimer’s.

In October 2021, DDI launched the whole-genome CRISPR Screening Facility. CRISPR, a revolutionary new way to edit genes, was named “Breakthrough of the Year” in 2020. This exciting new technology has come to UNC-Chapel Hill to enable rapid whole-genome screening for new drug targets. While the center is primarily for use by UNC faculty, services will be available to external users, including other universities and biotechnology companies. In addition to funding from the UNC DDI member groups, the North Carolina Biotechnology Center provided a generous equipment grant to help purchase key robotic instrumentation for the facility.

“I am thrilled to bring a modern genetic and epigenetic screening facility to UNC’s laboratories. The CRISPR Screening Facility will enable many future discoveries and fill UNC’s drug discovery teams with new project pipelines,” said CRISPR Facility Director Nate Hathaway, Ph.D., of the UNC Eshelman School of Pharmacy. “With CRISPR, we have the ability to continue to help patients struggling with the world’s most challenging health issues.”
The Institute partnered with Amazon AWS in 2021 to accelerate software-based research translation to a point of higher value and readiness. This partnership is enabling UNC research faculty to access the modern Amazon app architectures to make software development much easier and efficient while offering the security and scalability needed to effectively deploy HIPAA-compliant technologies at scale. Amazon is providing free training and migration services, up to $10,000 of cloud credits per project, and in-kind collaborations with their top researchers and developers launching the first successful pilot in December of 2021.

John Bamforth, Ph.D., director of the Eshelman Institute for Innovation said, “This powerful relationship between the University, the Eshelman Institute for Innovation, and AWS has the potential to spark innovative health care ideas that are accessible worldwide and have the potential to change patients’ lives for the better.

First-In Digital Health Studio Pilot

The Eshelman Institute launched a digital health pilot with a top venture studio, High Alpha Innovation, and UNC Health with the intention of launching the first university-based digital health venture studio in the country.

In the first venture studio pilot cohort, the partnership evaluated 25 attractive university and UNC Health digital health venture concepts that were identified and curated by the Eshelman Institute. The 13-week studio sprint follows a rigorous assumption-testing approach to systematically shape concepts into new businesses. Only 2-4 of the most attractive and immediately feasible venture concepts make it through these stage gates and get to compete in sprint week. Sprint week is the venture studio’s intensive week long “forcing function” for launching new businesses.

During our summer sprint, two concepts – Gait BioFeedback and AI Virtual Crossmatch made it to sprint week with AI Virtual Crossmatch moving forward for launch in the Spring of 2022.
As a brain cancer survivor himself, Dr. Andrew Satterlee knows the difficult road patients must walk.

“To give patients the best chance, we need to identify effective therapies and match patients with the treatments that will work best against their specific tumor. I’m excited to help develop a tool to do just that.”

The Eshelman Institute continues to advance an innovative brain slice technology platform that blends the speed of a cell culture assay with the anatomic fidelity of an animal model. The team is collaborating with academia, industry, and the clinic to develop their technology for two applications: drug screening and precision medicine. In 2021, the team was awarded a $5MM multi-site U01 grant. The team is nearing the completion of the first manuscript.
Young Innovators Program

The Young Innovators Program (YIP) is developing the next generation of innovative thinkers by engaging exceptional high school students in hands-on laboratory research, encouraging them to explore STEM opportunities in pharmaceutical science research, and empowering them to discover new ways to improve the health of patients through the practice of pharmacy.

2021 YIP Participants

Eshelman Institute Rankin Innovator Award

The Eshelman Institute Rankin Innovator Award, supported by Lawson and Gisele Rankin, provides students with funding to pursue entrepreneurial training opportunities. In 2021, the Eshelman Institute selected Chinomunso Ahanotu for the Rankin Innovator Award.

Chinomunso “Chiso” Ahanotu is currently in his second year of medical school at Meharry Medical College in Nashville, TN. Chiso was awarded an Eshelman Institute grant which aims to use a chimeric antigen receptors (CAR) macrophage as a vehicle for anti-cancer gene therapy. Chiso hopes to develop immune and gene therapies patents and bring medical devices to market during his career.

Chinomunso Ahanotu
MD Candidate
Meharry Medical College
Diversity, Equity, and Inclusion

Empowering untapped potential through diversity, equity, and inclusion.

The Eshelman Institute continues to thread diversity, equity, and inclusion into all that we do. Strategically, the Institute is focused on recruitment, education, and culture. In 2021, the Institute defined success, established baseline metrics, and developed action plans for embedding DEI principles into the culture of our team. Several qualitative and quantitative analyses were performed within the team to establish three focal points of action that the Institute will use to measure itself over the next year. The below graphic highlights those focal points along with specific goals for each.

The Eshelman Institute’s newly formed DEI committee led multiple retreats on advancing our strategic priorities. Through these tailored activities, the DEI team focused on creating a supportive workplace environment for all staff, while promoting a team culture of innovation, accountability, and inclusiveness. Such activities included:

- Sessions on analyzing ways to leverage DEI principles within individual roles
- Showcasing and celebrating the many cultural assets of each team member
- Building strategies to expand our connections with diverse partners

In efforts to expand our innovator networks, our team has worked to build better translational strategies with diverse partners internal and external to the UNC campus. The Eshelman Institute has continued to strengthen its partnerships with two HBCUs: Meharry Medical College (MMC) and North Carolina Agricultural and Technical State University (NC A&T). In 2021, the Institute’s translational experts consulted with HBCU faculty on how to best position their science for future commercialization. By partnering with MMC, NC A&T, and other diverse organizations, we hope to identify, support, and launch bold new ideas into real-world impact for patients.
Our Future

The Institute’s Therapeutics approach has initially focused on harnessing innovative, commercially viable projects with the potential for a clear impact on patients. By providing funding and project management capabilities, the first goal is to achieve initial Proof of Concept validation (Stage 1).

In the future, we plan to raise external funds for this early stage, as well as build our own physical and workforce infrastructure over the long term. Furthermore, we plan to advance therapeutic projects further down the development path (stages 2 and 3) by establishing partnerships with industry partners.
Launch Venture Studio Pilot Startup

An AI virtual crossmatch is an innovative machine learning algorithm developed by Dr. Eric Weimer, associate professor at UNC’s School of Medicine and a lab director at UNC’s transplant center, and Dr. Katie Newhall, Associate Professor of Mathematics at UNC. This algorithm automates the highly time-sensitive process of matching donor organs to immunologically compatible patients, which will accelerate and improve outcomes in organ transplantation.

At the culmination of the venture studio pilot, Epulate Inc. is slated to be open for business in the spring of 2022.

AWS Big Picture Partnership

In 2022, we will continue to build on the successful pilot we ran last year to accelerate digital translation with Amazon AWS. The goal will be to create a standardized translational approach to digital health research and technologies and make the AWS cloud and its no code/low code artificial intelligence and machine learning tools broadly available throughout the university.

We look to add new UNC labs in areas such as:

- Precision digital phenomics around mild traumatic brain injuries (mTBI)
- Digital musculoskeletal care for rehabilitation after surgeries
- mHealth decision support tools that improve behaviors for optimizing blood glucose in type 1 diabetes patients
- Precision medicine tools in reducing contaminations in compounding pharmacies
Our Future

The gap in generational wealth remains one of the largest and most challenging problems for diverse communities. With the power of innovation and entrepreneurship, we have built a strategy to identify and support these untapped innovators. We aim to connect diverse ideas, diverse top talent, investment, and infrastructure. We hope to share more soon.
Our Team

Institute Leadership

John Bamforth, Ph.D.
Director

Roy Zwahlen, J.D.
Associate Director

Kelly Collins
Associate Director of Development

Scott Savage, M.S.
Chief Financial Officer

Therapeutics Team

Alex Abuin, Ph.D.
Assistant Director for Translational Studies

Sumitra Pati, Ph.D.
Strategic and Competitive Intelligence Associate

Andrew Satterlee, Ph.D.
Brain Slice Technology Program Manager

Program/Project Management

Alexandra Oak, M.S., PPCM
Awards Program Manager

Ashlie Thomas, LSSBB, CSM
Project Manager

Ava Vargason, Ph.D.
Project Manager, READDI

Entrepreneurs In Residence

Mark Crowell, RTTP
Entrepreneur In Residence

Tony Hickey, Ph.D., DSc
Entrepreneur In Residence

Chad McBride, MBA
Entrepreneur In Residence

Digital Health

Bob Dieterle, MBA
Managing Director
Digital Health Venture Studio

Administration

Ryan McDaniel
Executive Assistant
Steering Board

Fred Eshelman, Pharm.D.
Founder
Eshelman Ventures, LLC

Angela Kashuba, BSc.Phm, Pharm.D.
Dean, UNC Eshelman School of Pharmacy
University of North Carolina at Chapel Hill

Chris Clemens, Ph.D.
Executive Vice Chancellor and Provost
University of North Carolina at Chapel Hill

Renard Charity, Jr., M.B.A
Managing Partner
Fletcher Spaght

Eugene Flood, Jr., Ph.D.
Managing Partner
Next Sector Capital

Michael S. Maddux, Pharm.D
Executive Director
American College of Clinical Pharmacy

Rusty Gage, Ph.D.
President
Salk Institute for Biological Studies

H. Stewart Parker, M.B.A.
Principal
Parker Bioconsulting

Tom Skalak, Ph.D.
Senior Advisor
Joe and Clara Tsai Foundation

Matt Tremblay, Ph.D.
Chief Operating Officer
The Scripps Research Institute
S. Edward Torres, M.B.A.
Managing Partner
Vioplore Ventures

Jodi Virkus, Pharm.D.
Executive Director, Global Oncology Pipeline Strategy
Novartis

Prentice Stovall, M.B.A.
Head of Global Brand Development, Immunology
Eli Lilly & Company

Christy Shaffer, Ph.D.
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SVP, Clinical Development & Project Management
Syneos Health

Andrew Beelen, M.D., BsPharm
VP, Clinical Development
G1 Therapeutics

S. Edward Torres, M.B.A.
Managing Partner
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Jodi Virkus, Pharm.D.
Executive Director, Global Oncology Pipeline Strategy
Novartis

Tom Wiggans, RPh, M.B.A.
Chief Executive Officer
Dermira