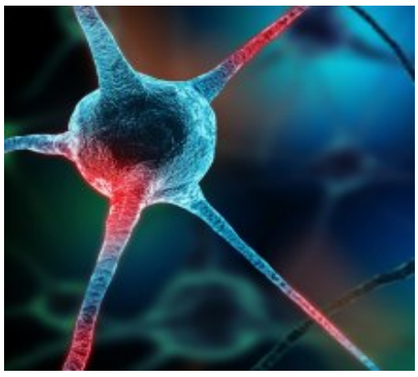
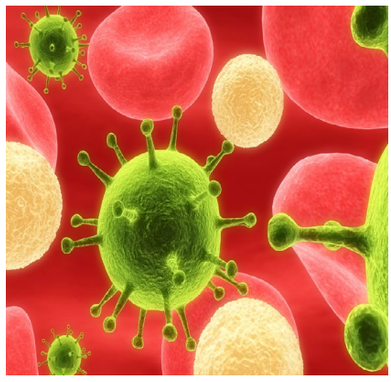
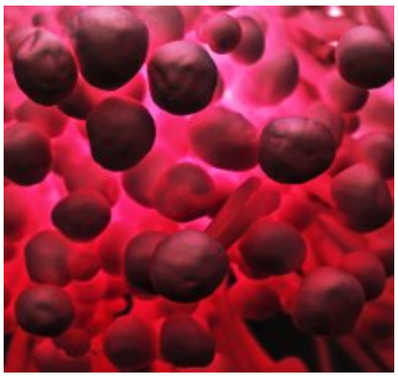
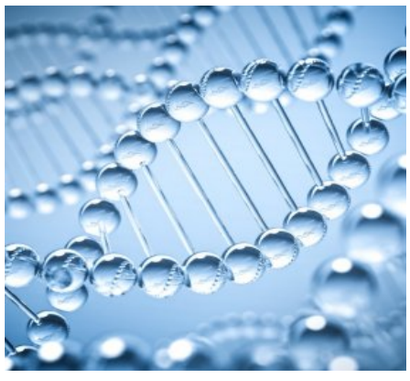
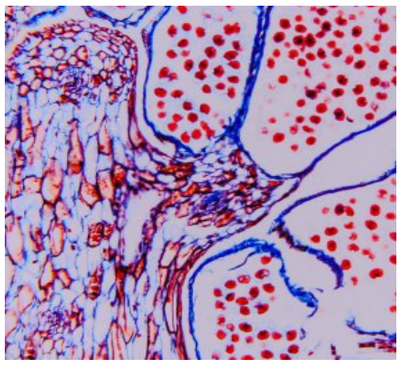



# Commonwealth Health Research Board (CHRB)

# 2020/2021 Annual Report

# Commonwealth Health Research CHRB [CHRB]
# FY 2020/2021 Annual Report

## Goals, Purposes and Accomplishments of the Commonwealth Health Research Board (CHRB)

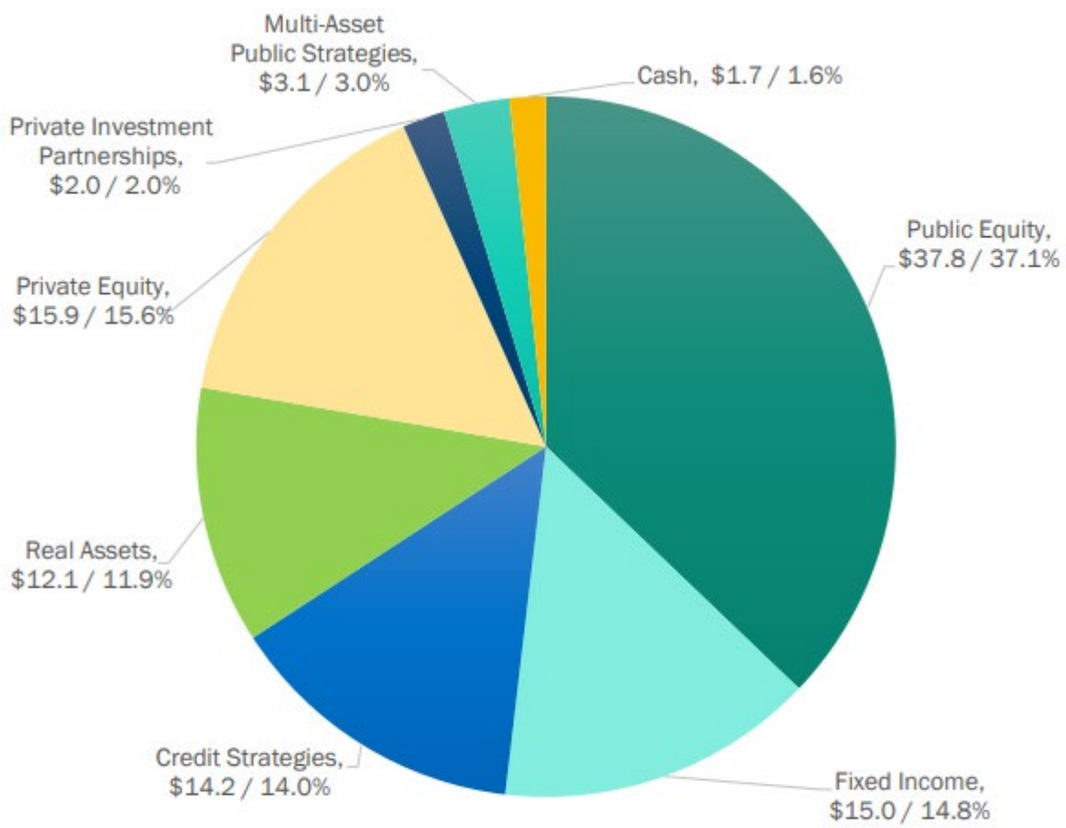
The Commonwealth Health Research Board (CHRB or Board) was created by ***Virginia Code* §32.1-162.23** to provide financial support—in the form of grants, donations, or other assistance— for research efforts having the potential of maximizing human health benefits for the citizens of the Commonwealth. Research efforts eligible for support by the Board may include traditional medical and biomedical research relating to the causes and cures of diseases, as well as research related to health services and the delivery of health care.

In accordance with ***Virginia Code* §32.1-162.24**, the Board encourages collaborative research efforts among two or more institutions or organizations, gives priority to those research efforts where Board support can be leveraged to foster contributions from federal agencies or other entities, and supports both new research efforts and the expansion or continuation of existing research efforts. CHRB grant recipients — for grant awards life-to-date — have leveraged over **$38.2 million** in additional private and federal grant funds to further their research studies. Additionally, numerous publications in peer-reviewed scientific journals and periodicals as well as presentations of the data at regional and national scientific meetings have resulted from CHRB grant funded research projects.

## Commonwealth Health Research Fund [CHRF]

***Virginia Code* § 51.1-124.36** delegates the authority to invest and manage the assets of the Commonwealth Health Research Fund (CHRF) to the Virginia Retirement System (VRS). Assets of the CHRF are pooled with the $101.8 billion VRS investment fund [as of June 30, 2021]; however, the provision requires the VRS to maintain a separate accounting for the CHRF assets. The estimated value of the CHRF as of June 30, 2021 was almost $48.4 million.

VRS current Asset allocation as of June 30, 2021:




The Department of Accounts serves as the fiscal agent for the Commonwealth Health Research Board through a Memorandum of Understanding. Audits are conducted every two years by the Auditor of Public Accounts.

# Commonwealth Health Research CHRB [CHRB]
# FY 2020/2021 Annual Report

## Executive Summary of FY 2020/2021 Grant Process:

| Institution/ Organization Identification # | Institution/Organization | Concept Papers Received | Full Proposals Requested | Requested Presentations to the Board | Grant Awards |
|---|---|---|---|---|---|
| 207 | University of Virginia | 12 | 3 | 3 | 3 |
| 208 | Virginia Polytechnic Institute and State University | 12 | 5 | 3 | 2 |
| 216 | James Madison University | 2 | 0 | 0 | 0 |
| 221 | Old Dominion University Research Foundation | 4 | 0 | 0 | 0 |
| 236 | Virginia Commonwealth University | 12 | 3 | 3 | 1 |
| 247 | George Mason University | 8 | 5 | 2 | 1 |
| 274 | Eastern Virginia Medical School | 12 | 4 | 1 | 1 |
| 302 | Virginia College of Osteopathic Medicine | 2 | 0 | 0 | 0 |
| 307 | University of Richmond | 2 | 0 | 0 | 0 |
| 323 | Randolph Macon College | 1 | 0 | 0 | 0 |
| 349 | Washington and Lee University | 1 | 0 | 0 | 0 |
| 371 | Liberty University | 2 | 0 | 0 | 0 |
| 811 | McGuire Research Institute | 4 | 2 | 0 | 0 |
| | **Total** | **74** | **22** | **12** | **8** |

# Commonwealth Health Research CHRB [CHRB]
# FY 2020/2021 Annual Report

## CHRB Current and Historical Funding

Since its inception, the CHRB has made 246 grant awards totaling almost **$20.8 million** in grant funding to institutions of higher education and other not-for-profit or nonprofit organizations that conduct health, or health-related research in Virginia. When the required 33% matching funds are added to the CHRB funded amount, the cumulative funding totals approximately **$30 million** for health research in Virginia. For a description of past CHRB grant awards and abstracts, visit CHRB's website at www.chrb.org.

| Grant Year | Total Grant Awards | Number of New Grant Awards | Number of Ongoing Grant Awards | CHRB Grant Awards | Grantee Matching Funds | Total Project Funds |
|---|---|---|---|---|---|---|
| 1999 | 9 | 9 | 0 | $597,377 | $272,041 | $869,418 |
| 2000 | 11 | 11 | 0 | $717,442 | $305,309 | $1,022,751 |
| 2001 | 13 | 13 | 0 | $825,590 | $344,954 | $1,170,544 |
| 2002 | 12 | 12 | 0 | $718,382 | $344,603 | $1,062,985 |
| 2003 | 8 | 8 | 0 | $509,806 | $199,999 | $709,805 |
| 2004 | 14 | 10 | 4 | $868,514 | $367,202 | $1,235,716 |
| 2005 | 10 | 6 | 4 | $755,436 | $305,909 | $1,061,345 |
| 2006 | 12 | 8 | 4 | $954,058 | $451,983 | $1,406,041 |
| 2007 | 12 | 7 | 5 | $1,105,585 | $512,493 | $1,618,078 |
| 2008 | 12 | 8 | 4 | $1,102,030 | $446,400 | $1,548,430 |
| 2009 | 8 | 2 | 6 | $727,615 | $310,338 | $1,037,953 |
| 2010 | 9 | 7 | 2 | $775,105 | $312,808 | $1,087,913 |
| 2011 | 11 | 5 | 6 | $1,061,644 | $397,212 | $1,458,856 |
| 2012 | 8 | 6 | 2 | $799,746 | $327,186 | $1,126,932 |
| 2013 | 8 | 5 | 3 | $746,688 | $372,766 | $1,119,454 |
| 2014 | 11 | 6 | 5 | $1,017,500 | $558,485 | $1,575,985 |
| 2015 | 13 | 7 | 6 | $1,213,983 | $645,285 | $1,859,268 |
| 2016 | 11 | 6 | 5 | $1,077,444 | $526,569 | $1,604,013 |
| 2017 | 11 | 6 | 5 | $1,019,696 | $445,311 | $1,465,007 |
| 2018 | 13 | 8 | 5 | $1,251,185 | $577,194 | $1,828,379 |
| 2019 | 14 | 8 | 6 | $1,399,997 | $583,883 | $1,983,880 |
| 2020 | 16 | 8 | 8 | $1,517,067 | $700,610 | $2,217,677 |
| **Cumulative Total** | 246 | 166 | 80 | $20,761,890 | $9,308,540 | $30,070,430 |

Commonwealth Health Research CHRB [CHRB]
FY 2020/2021 Annual Report

**Comparison of Grant Award Success Rates** (based upon a five-year average)

| **Step 1:** Concept Paper to Step 2: Submission of a Full Proposal | **Step 2:** Submission of a Full Proposal to Step 3: Presentation of the Full Proposal to the Board | **Step 3:** Presentation of Full Proposal to the Board to receiving a CHRB Grant Award |
|---|---|---|
| 28% | 53% | 63% |

**Success rate from the submission of a Concept Paper to CHRB Grant Award = 9%**

| **Grants Cycle** | **Step 1: Concept Papers submitted** | **Step 2: Full Proposals submitted** | **%** | **Step 3: Full Proposal presented** | **%** | **New Grant Awards** | **%** | **From Step 1 to Grant Awards** |
|---|---|---|---|---|---|---|---|---|
| 2019/2020 | 76 | 23 | 30% | 13 | 57% | 8 | 62% | 11% |
| 2018/2019 | 73 | 20 | 27% | 14 | 70% | 8 | 57% | 11% |
| 2017/2018 | 66 | 21 | 32% | 10 | 48% | 6 | 60% | 9% |
| 2016/2017 | 66 | 17 | 26% | 9 | 53% | 6 | 67% | 9% |
| 2015/2016 | 91 | 24 | 26% | 10 | 42% | 7 | 70% | 8% |
| **Cumulative Total** | 372 | 105 | 28% | 56 | 53% | 35 | 63% | 9% |
| **Cumulative Average** | 74 | 21 | 28% | 11 | 53% | 7 | 63% | 9% |

Please note:

[1] This chart excludes two-year grant awards that are approved for Year 2 funding.

[2] *Beginning with the FY2016/2017 CHRB Grant Process, the number of Concept Papers allowed for submission by any one institution or organization decreased from 15 to 10 submissions. Beginning with the FY 2018/2019 CHRB Grant Process, the number of Concept Papers allowed for submission will increase from 10 to 12 per institution or organization.

Commonwealth Health Research CHRB [CHRB]
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## CHRB Grant Awards and Funded Types or Categories of Research

The chart below provides statistics concerning the number of CHRB Grant Awards funded by type or category of research, from 1999 to 2020.

| Key Codes | Disease/Research Area | 1999 to 2020 Grant Awards | 1999 to 2020 Grant Awards in CHRB Dollars |
|---|---|---|---|
| AG | Aging and Diseases of the Aging | 6 | $710,675 |
| BD | Behavioral Disorders | 7 | $734,039 |
| BV | Bacterial and Viral Diseases and Treatments | 23 | $3,522,381 |
| CA | Cancer and Cancer Treatment | 41 | $5,156,520 |
| CB | Cartilage and Bone | 6 | $776,078 |
| CV | Cardiovascular Disease | 13 | $1,626,209 |
| DI | Diabetes | 10 | $1,280,685 |
| DM | Drug Metabolism | 2 | $125,900 |
| DA | Drug Addiction and Alcoholism | 1 | $83,350 |
| EE | Eye and Ear Diseases | 5 | $678,925 |
| GI | Gastrointestinal Diseases | 3 | $248,274 |
| GE | Genetics | 0 | $0 |
| HS | Health Services Research | 3 | $181,126 |
| HE | Hematology | 4 | $120,983 |
| KD | Kidney Disease | 3 | $340,927 |
| LD | Lung Disease | 7 | $884,083 |
| ME | Metabolism | 8 | $716,082 |
| ND | Neurological Disorders | 12 | $2,070,238 |
| WH | Women's Health | 7 | $751,560 |
| PD | Psychiatric Diseases | 2 | $278,382 |
| WO | Wound Healing | 1 | $76,373 |
| ZZ | Other | 2 | $399,100 |
| | **Total** | **166** | **$20,761,890** |

A one-year or two-year grant award is still considered one grant award for purposes of categorizing disease/research areas.

Commonwealth Health Research CHRB [CHRB]
FY 2020/2021 Annual Report

## Commonwealth Health Research Board (CHRB) FY 2020/2021 Grant Awards

| Principal Investigator | Institution/ Organization | Grant Award | Recipient Matching $ | Total Project Funds | Grant Title |
|---|---|---|---|---|---|
| Farrokh Alemi, Ph.D. | George Mason University | $78,382 | $44,039 | $122,421 | *Optimizing Antidepressant Selection through Artificial Intelligence* |
| Bahareh Behkam, Ph.D. | Virginia Polytechnic Institute & State University | $100,000 | $60,000 | $160,000 | *Mechanobiology of Implant Infection: Effect of Surface Roughness on the Attachment Density and Phenotype of Adherent Staphylococcus aureus* |
| Matthew Buczynski, Ph.D. | Virginia Polytechnic Institute & State University | $100,000 | $60,000 | $160,000 | *Evaluation of a 12/15-LM receptor as a target for Non-Opioid Pain Therapeutics* |
| Paul Fisher, MPhil, Ph.D. | Virginia Commonwealth University | $100,000 | $99,785 | $199,785 | *Rational Design of Cancer Invasion and Metastasis Inhibitors* |
| Brent French, Ph.D. | University of Virginia | $100,000 | $33,000 | $133,000 | *Bioengineering of Cardiac Regeneration In Situ after Myocardial Infarction* |
| Aurora Esquela Kerscher, Ph.D., | Eastern Virginia Medical School | $100,000 | $50,000 | $150,000 | *Molecular dissection of a microRNA cluster network of aggressiveness* |
| Kyle Lampe, Ph.D. | University of Virginia | $100,000 | $33,000 | $133,000 | *Self-assembling, shear-thinning peptide hydrogels to support cell transplantation and host cell interaction after ischemic stroke* |
| James Landers, Ph.D. | University of Virginia | $100,000 | $33,000 | $133,000 | *Diagnostic Assay for On-Site Detection of Bordatella pertussis* |
| Nagaraja Nagre, Ph.D. | Eastern Virginia Medical School | $100,000 | $50,000 | $150,000 | *Exploring the potential role of cannabinoid receptor type-2 activation in protection against bacterial pneumonia-induced lung injury* |
| Swati Palit Deb, Ph.D. | Virginia Commonwealth University | $99,940 | $33,000 | $132,940 | *Targeting mutant p53-dependent checkpoints of genome duplication in lung cancer* |
| Bhaumik Patel, M.D. | McGuire Research Institute | $100,000 | $33,000 | $133,000 | *Development of a Selective Non-Saccharide Glycosaminoglycan Mimetic for Colon Cancer* |
| Alicia Pickrell, Ph.D. | Virginia Polytechnic Institute & State University | $100,000 | $60,000 | $160,000 | *STING-dependent Type I Interferon Response in TBI* |
| Jason Reed, Ph.D. | Virginia Commonwealth University | $100,000 | $33,000 | $133,000 | *A new approach for detecting IGH translocations in hematologic malignancies* |
| Steven Shell, Ph.D., | University of Virginia's College at Wise | $38,745 | $12,786 | $51,531 | *Mass Spectrometry Analysis of the Human XPA-XPC Complex* |
| Martin Wu, Ph.D. | University of Virginia | $100,000 | $33,000 | $133,000 | *Are persister cells culprits of recurrent Clostridium difficile infections?* |
| Chongzhi Zang, Ph.D., | University of Virginia | $100,000 | $33,000 | $133,000 | *Aberrant CTCF binding as an epigenetic signature of cancer* |
| | | **$1,517,067** | **$700,610** | **$2,217,677** | |

Commonwealth Health Research CHRB [CHRB]
FY 2020/2021 Annual Report

## FY 2020/2021 Grant Award Project Summaries

The Commonwealth Health Research Board [CHRB] has awarded **$1,517,067** in grants to 16 medical and health researchers in Virginia.

**George Mason University**
**Principal Investigator: Farrokh Alemi, Ph.D.**
**Grant Award: $78,382**
**Grant Title: *Optimizing Antidepressant Selection through Artificial Intelligence***

The long term goal of this study is to improve management of depressed patients in primary care. Robert Wood Johnson Foundation has funded the principal investigator to analyze outcomes for depressed patients taking antidepressant. The foundation has funded the analysis of data on 115 million lives, at QualLabs, under the supervision of Alemi. No funds are available for activities at the university. The current request will supplement the existing foundation-funded effort and enable the creation of the first Artificial Intelligence decision aid for prescription of antidepressants. The aid is composed of two parts: (1) an emphatic, conversational interview to assess the patient's medical history and (2) a report to the patient and the patient's clinician of the antidepressant most likely to benefit the patient.

**Virginia Polytechnic Institute and State University**
**Principal Investigator: Bahareh Behkam, Ph.D.**
**Grant Award: $100,000**
**Grant Title: *Mechanobiology of Implant Infection: Effect of Surface Roughness on the Attachment Density and Phenotype of Adherent Staphylococcus aureus***

The increasing demand for orthopedic implants in our aging society, coupled with a dramatic increase in the emergence of antibiotic-resistant bacterial strains has made implant infection control progressively challenging and costly. Bacterial adhesion and biofilm formation on implants play important roles in infection and treatment resistance. It has been demonstrated by us and others that nanoscale surface features significantly affect microbial adhesion and viability; however, the physical and biological underpinnings of microbe-nanostructure interactions remain largely unknown. We propose to nanofabricate topographical features of well-defined sizes and spacing on titanium implants and investigate the effect of the nanostructures on the attachment density and biological activity of *Staphylococcus aureus*, the most common etiological agent for orthopedic infections. Through understanding the mechanisms by which the physical properties of engineered surfaces regulate adherent bacteria behavior, this proposal has the potential to uncover novel non-toxic antimicrobial strategies for mitigating medical implant infection.

**Virginia Polytechnic Institute and State University**
**Principal Investigator: Matthew Buczynski, Ph.D.**
**Grant Award: $100,000**
**Grant Title: *Evaluation of a 12/15-LM receptor as a target for Non-Opioid Pain Therapeutics***

The opioid crisis has reached epidemic proportions in the United States, and in 2016 Governor McAuliffe declared opioid addiction in the Commonwealth as a Public Health Emergency [1]. Rural western VA (where Virginia Tech is located) reports some of the highest per capita opioid abuse in the country. Thus, non-opioid therapeutic alternatives to NSAIDs (Nonsteroidal Anti-inflammatory Drugs, e.g. ibuprofen) for the effective management of chronic pain are essential to limiting opioid overuse. Our published studies identified a novel class of signals (12/15-lipoxygenase metabolites, 12/15-LMs) that contribute directly to (NSAID)-insensitive nociceptive behaviors in multiple pre-clinical pain models, and our preliminary results identified a novel receptor for 12/15-LMs. In this proposal, we plan to characterize the 12/15-LM receptor, and screen potential lead compounds that block receptor activity. Ultimately, our goal is to enable drug discovery efforts for novel analgesics with minimal abuse potential and mitigate risks of opiate misuse, diversion and addiction.

**Virginia Commonwealth University**
**Principal Investigator: Paul Fisher, MPhil, Ph.D.**
**Grant Award: $100,000**
**Grant Title: *Rational Design of Cancer Invasion and Metastasis Inhibitors***

Approximately 90% of patient deaths from solid cancers result from metastasis. Melanoma differentiation associated gene-9 (*mda-9*) is a key genomic element in diverse cancers that controls invasion and metastasis. We developed a first generation novel pharmacological inhibitor of MDA-9, PDZ1i that profoundly suppresses cancer cell spread, invasion and metastasis in a broad-spectrum of human cancers in preclinical animal models. Our central goal, is to develop effective pharmacological *in vivo* inhibitors of cancer migration/invasion/metastasis. We will apply rationally-designed medicinal chemistry approaches to produce the next generation PDZ1i (NG-PDZ1i) and PDZ2i with further enhanced anti-metastatic properties. To ensure achieving this endpoint we will use two innovative strategies we have developed, i.e., semi-high throughput screening assays in zebrafish and invasion assays using cultured mammalian tumor cells. Developing NG-PDZ1i and PDZ2i will provide significant societal health benefits and enhance the economy of VA through growth of a biotechnology company, InVaMet Therapeutics.

**University of Virginia**
**Principal Investigator: Brent French, Ph.D.**
**Grant Award: $100,000**
**Grant Title: *Bioengineering of Cardiac Regeneration In Situ after Myocardial Infarction***

Heart failure currently afflicts some 5.7 million Americans, and by 2030 this number will increase by 46%. The single most common cause of heart failure is heart attack (or myocardial infarction) which results in the irreversible loss of cardiac muscle. Current statistics show that ~790,000 people in the US have heart attacks each year. Of those, about 114,000 will ultimately die from heart failure. The overarching goal of this project is to combine recent advances in cardiology, radiology and gene therapy to demonstrate that cardiomyocytes can be genetically-reprogrammed to divide and replace the heart muscle lost during heart attack. This is important because the adult heart has essentially no capacity to repair itself after a heart attack. Instead, injured cardiomyocytes are replaced by scar tissue to prevent the heart from rupturing. If successful, this research will show that gene therapy can regenerate muscle tissue after heart attack instead of scar.

**Eastern Virginia Medical School**
**Principal Investigator: Aurora Esquela Kerscher, Ph.D.**
**Grant Award: $100,000**
**Grant Title: *Molecular dissection of a microRNA cluster network of aggressiveness***

Prostate cancer (PCa) is the most prevalent form of cancer in Virginian males. Our state's PCa mortality rate is ranked 8th in the nation. This proposal will develop more effective theranostic tools for this disease, focusing on the microRNA (miRNA) class of small noncoding RNAs. MiRNA dysregulation is a common feature of PCa but little is known how they functionally interact as a cancer network to promote disease progression. We will investigate this problem by studying the miR-888 cluster, which consists of seven miRNA genes mapping close together on human chromosome X within a hereditary PCa locus. We found that the miR-888 cluster is elevated in patients with aggressive PCa and induces proliferation, invasion, and tumor formation. Our integrated translational research team (EVMS, University of Virginia) will use high throughput CRISPR gene editing, proteomics, nanostring technology and antimiR reagents to molecularly dissect the miR-888 cluster and validate its clinical potential.

**University of Virginia**
**Principal Investigator: Kyle Lampe, Ph.D.**
**Grant Award: $100,000**
**Grant Title: *Self-assembling, shear-thinning peptide hydrogels to support cell transplantation and host cell interaction after ischemic stroke***

Stroke is the third leading cause of death in the US and 20% of stroke survivors are so significantly disabled that they cannot walk without help. Despite broad research, stroke and other disorders of the brain and spinal cord continue to be the leading cause of disability nationwide. No treatment exists to rebuild neural tissue destroyed by ischemic stroke and the subsequent cell death. We propose a new engineered biogel to transplant neural stem cells (NSCs), and encourage growth of host NSCs and vascular cells into the infarct site. These materials are designed to be injectable and cell compatible, and thus may improve NSC transplantation survival. Establishing this collaboration will support future development, especially early insight to biogel interventions in a rat model of ischemic stroke. The aims will provide important materials development and characterization and pre-clinical data toward supporting cell growth and decreasing or reversing stroke-induced brain damage.

**University of Virginia**
**Principal Investigator: James Landers, Ph.D.**
**Grant Award: $100,000**
**Grant Title: *Diagnostic Assay for On-Site Detection of Bordatella pertussis***

*Bordetella pertussis*, the causative agent of whooping cough, infects millions of individuals worldwide each year and continues to be the world's leading cause of vaccine preventable deaths. In recent decades, there has been an alarming resurgence of reported pertussis cases. A major step to address this problem is for *B. pertussis* to be detected rapidly during a suspected outbreak, enabling initiation of treatment, limitation of transmission and reduction in mortality. However, current methods require patient samples to be sent to centralized laboratories for analysis and results are typically not available in time to support epidemiologic intervention. Instead, physicians and healthcare officials use presumptive antibiotic treatment until diagnostic results are available, thereby putting many individuals at risk unnecessarily. To address this challenge, we are developing a portable microfluidic device, "lab-on-a-CD", to screen for the presence of *B. pertussis* DNA and allow for robust identification of infection in 20 min or less.

**Eastern Virginia Medical School**
**Principal Investigator: Nagaraja Nagre, Ph.D.**
**Grant Award: $100,000**
**Grant Title: *Exploring the potential role of cannabinoid receptor type-2 activation in protection against bacterial pneumonia-induced lung injury***

Bacterial pneumonia is a major risk factor for developing acute lung injury (ALI). Although mechanical ventilation remains the last resort of treatment, it carries risks of lung cell injury, high mortality, and morbidities. *Pseudomonas aeruginosa* is an opportunistic pathogen causing a wide range of acute and chronic infections and is a major cause for Ventilator-Associated Pneumonia (VAP). The ineffectiveness of conventional antibiotics therapy among severe pneumonia-induced lung injury patients appeals for novel options of treatment. One such candidate is Cannabinoid receptor-2 (CB2R) that is predominantly expressed in immune cells. Synthetic agonists like endocannabinoids (that do not generate undesired psychotic effects) can be used to activate these CB2Rs leading to the display of anti-inflammatory functions. Considering the unique stance of CB2R as a potential novel therapy for bacterial pneumonia, the hypothesis that CB2R activation can ameliorates bacterial pneumonia induced lung inflammatory/injury (using a well-validated mouse model) will be tested in this project.

**Virginia Commonwealth University**
**Principal Investigator: Swati Palit Deb, Ph.D.**
**Grant Award: $99,940**
**Grant Title: *Targeting mutant p53-dependent checkpoints of genome duplication in lung cancer***

The American Cancer Society estimated number of new lung cancer cases this year alone is 234,030 in the US, and 5,860 in Virginia, of which at least 60% of patients will not survive, suggesting extremely poor efficacy of current lung cancer treatment. Gain-of-function (GOF) mutations of tumor suppressor p53 are very frequent (up to 70%) in lung cancer and establish resistance to chemo- or radiotherapy and are essential for oncogenesis. Accordingly, the tumorigenic ability of human lung cancer cells lines is drastically reduced or eliminated when endogenous mutant p53 is disabled. In a recently published study (highlighted by the Journal of Clinical Investigation), we demonstrated that GOFp53 activates checkpoint signaling to establish its oncogenic activities**.** Here we propose to determine the mechanism by which GOFp53 activates checkpoint signaling to establish dependency in lung cancer cells and evaluate the therapeutic efficacy of GOFp53-induced checkpoint signaling inhibitors, which has not been explored.

**McGuire Research Institute**
**Principal Investigator: Bhaumik Patel, M.D.**
**Grant Award: $100,000**
**Grant Title: *Development of a Selective Non-Saccharide Glycosaminoglycan Mimetic for Colon Cancer***

Complete cure of cancer is never achieved for most advanced colorectal cancer, in part, due to the inability of the standard chemotherapy and other targeted drugs in eradicating the 'seeds of cancer', also called cancer stem cells (CSCs). We have demonstrated, for the first time that specific short sequence of heparin (HSO6) selectively eliminates CSCs. But, HSO6 cannot be a candidate drug as it is very difficult and expensive to purify it. However, we have succeeded in synthesizing a non-sugar mimetic of HSO6 – G2.2 which is easy to make, homogenous, and rather inexpensive. Using primary human CSCs, innovative animal models, and advanced in vitro methods to study stem cells, we will determine the efficacy and toxicity of G2.2 as well as its potent analogs against colon CSCs in conjunction with FDA approved colon cancer therapies. This, in our opinion, is a major step towards achieving complete cancer cure.

**Virginia Polytechnic Institute and State University**
**Principal Investigator: Alicia Pickrell, Ph.D.**
**Grant Award: $100,000**
**Grant Title: *STING-Dependent Type 1 Interferon Response in TBI***

Traumatic brain injury (TBI) is the most commonly acquired central nervous system (CNS) injury affecting both civilian and military populations in the United States. This highly complex, heterogeneous epidemic results in excessive morbidity and long-term disability for an estimated 5.3 million Americans with an annual economic cost of $37.8 billion. In Virginia (VA), over 2% of the population suffer from disabilities related to TBI, and an estimated 28,000 Virginians sustain a TBI annually. Inflammation in the brain after the mechanical insult contributes to neurodegeneration affecting functional outcomes for patients. In our published and preliminary data, we profiled a novel immune response in a preclinical mouse model of TBI. TBI-injured mice showed an abnormal upregulation of Type I interferons. In this proposal, we plan to characterize this novel interferon pathway after TBI to decipher whether targeting interferon signaling therapeutically reduces inflammation and neurodegeneration in the brain after injury.

**Virginia Commonwealth University**
**Principal Investigator: Jason Reed, Ph.D.**
**Grant Award: $100,000**
**Grant Title: *A new approach for detecting IGH translocations in hematologic malignancies***

Blood cancer represents a large group of different malignancies and represents roughly 10% of all cancers diagnosed in the United States each year. The complexity and implications for treatment, of blood cancer diagnosis create a critical need for molecular methods which can be applied in less specialized medical settings such as community hospitals. To address this need, we will employ very simple 'DNA barcoding' approach to detect chromosome rearrangements in blood cancers. This method will be as accurate, but much quicker and substantially less costly than, all existing alternatives. This technology can significantly improve outcomes for patients in underserved populations

**University of Virginia's College at Wise**
**Principal Investigator: Steven Shell, Ph.D.**
**Grant Award: $38,745**
**Grant Title: *Mass Spectrometry Analysis of the Human XPA-XPC Complex***

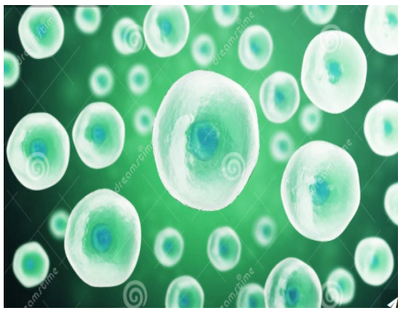
Many chemotherapeutics work by inducing DNA damage in cancer cells. Therefore, understanding the molecular mechanisms of DNA repair is vital to pharmaceutical development. One such process is the Nucleotide Excision Repair pathway. NER relies on a series of protein-protein complexes to repair DNA. Two proteins, XPC and XPA, act early in the human NER pathway. We hypothesize that XPA forms a direct physical complex with XPC necessary for establishing an efficient NER response. We propose using mass spectrometry footprinting to identify the molecular surfaces on each protein responsible for mediating the interaction. Chemical labeling will be used to identify all surface-exposed lysine residues on each protein and the protein complex. Residues protected from modification in the complex will be mapped onto structural models for each protein. Computational docking will be used to create a model of the complex. These results will provide targets for future functional studies in human cells.

**University of Virginia**
**Principal Investigator: Martin Wu, Ph.D.**
**Grant Award: $100,000**
**Grant Title: *Are persister cells culprits of recurrent Clostridium difficile infections?***

*Clostridium difficile* infection (CDI) causes mild to life-threatening diarrhea. It poses a major healthcare burden to the global population primarily affecting individuals treated with antibiotics. The biggest challenge facing CDI is the high rate of treatment failure or recurrence, which has increased remarkably in the past two decades. Persister cells (dormant or slow-growing bacteria) are known to survive antibiotic treatment. However, whether they are a major cause of recurrent CDI remains unclear. We hypothesize that persister cells play an important role in recurrent CDI. Specifically, we aim to 1) determine whether the presence and abundance of persister cells are significant risk factors for CDI recurrence, 2) determine the genetic basis of persistence by sequencing genomes of the persister cells. This study will be the first to quantitatively determine whether persister cells are significant risk factors for recurrent CDI and therefore has the potential to shift the paradigm in therapeutic strategies.

**University of Virginia**
**Principal Investigator: Chongzhi Zang, Ph.D.**
**Grant Award: $100,000**
**Grant Title: *Aberrant CTCF binding as an epigenetic signature of cancer***

CTCF is a protein that can function as a chromatin insulator and facilitates chromatin looping. Disruption of individual CTCF binding sites in the human genome have been reported in several cancers that associate with altered chromatin structure and dysregulation of genes in the chromatin domains. Our preliminary studies show that cancer-specific CTCF binding events are common in many cancers, and the level of aberrant CTCF binding in each cancer type is correlated with clinical outcome. We hypothesize that CTCF binding aberration is an epigenetic signature of cancer. In this project, we propose to use novel integrative computational genomics approaches to systematically characterize aberrant CTCF binding events in the genome in several human cancer systems and their function in gene regulation.



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## Commonwealth Health Research Funds available for FY 2020/2021 Grant Awards

Pursuant to *Virginia Code* §32.1-162.28(E), (CHRF) Grant funding is calculated by an amount not to exceed six percent of the moving average of the market value of the CHRF calculated over the previous five years on a one-year delayed basis, net of any administrative fee assessed pursuant to subsection E of § 51.1-124.36.

**Funds available:**
**2020/2021 Grant Awards**

| Calendar Year | | Market Value as of 12/31/xx | |
|---|---|---|---|
| January 1 - December 31, 2014 | Year 1 | $34,600,580.37 | Source: VRS Finance Division Activity Report through December 31, 2014 |
| January 1 - December 31, 2015 | Year 2 | $34,052,161.12 | Source: VRS Finance Division Activity Report through December 31, 2015 |
| January 1 - December 31, 2016 | Year 3 | $35,296,332.08 | Source: VRS Finance Division Activity Report through December 31, 2016 |
| January 1 - December 31, 2017 | Year 4 | $38,776,234.09 | Source: VRS Finance Division Activity Report through December 31, 2017 |
| January 1 - December 31, 2018 | Year 5 | $36,998,370.93 | Source: VRS Finance Division Activity Report through December 31, 2018 |
| | Total | $179,723,678.59 | |
| | Average Market Value | $35,944,735.72 | |
| Funds available for 2020 grants based on 5% of the average market value | 5.00% | 1,797,236.79 | |
| **Less Administrative Expenses:** | | | |
| Less Operating Expenses | | 278,312.66 | |
| Less VRS Administrative Fees | | 2,600.00 | |
| Total Administrative Expenses | | 280,912.66 | |
| Funds Available for 2020/2021 grants less estimated expenses: | | 1,516,324.13 | |

## Commonwealth Health Research Board (CHRB)
## Summary of FINAL FY 2020/2021 Administrative and Grant Expenses:

### FY 2020/2021 Revenue and Cash Balance

| | |
|---|---|
| CHRB Revenue and Cash Balance as of June 30, 2021 | **$ 583,954.49** |

### FY 2020/2021 Final Expenses

| FY 2020/2021 | Approved Budget | FINAL Expenses as of June 30, 2021 | Difference | Expenses as a % of Budget | Notations |
|---|---|---|---|---|---|
| Administrative | $278,312.66 | $229,054.59 | $49,258.07 | 82% | Majority of difference related to COVID-19 such as virtual meeting versus in-person meetings |
| Grants | $1,517,067.00 | $1,337,799.00 | $179,268.00 | 88% | Majority of funds disbursed in July 2020 and November 2020 for initial and ongoing grant payments. |

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## Commonwealth Health Research Board (CHRB) Members

| Effective<br>December 10, 2015 to October 31, 2020 | Effective<br>November 1, 2020 to present |
|---|---|
| Cynda A. Johnson, M.D., M.B.A., Chair<br>Robert W. Downs, Jr., M.D., Vice Chair<br>Eric Lowe, M.D.<br>Thomas W. Eppes, Jr., M.D.<br>Julia Spicer | Robert W. Downs, Jr., M.D.,, Chair<br>Eric Lowe, M.D., Vice Chair<br>Thomas W. Eppes, Jr., M.D.<br>Cynda A. Johnson, M.D., M.B.A.<br>Julia Spicer |

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