

ON THE VERGE OF GREATNESS: COLORADO GRANTS DEVELOP INNOVATIVE RESEARCH



HB 1001 PROOF-OF-CONCEPT GRANTS COLORADO SCHOOL OF MINES

INVESTIGATOR: Brajendra Mishra, PhD

TITLE: Biocompatibility study of oxide-coated titanium alloys for dental implants

RESEARCH: This grant supports research to better understand the osteo-integration of titanium and its alloys, specifically in the oral cavity for the commercial potential of oral prostheses.

IMPACT: If successful, this project will point to some alloys that can be used to improve upon the stability, longevity and strength of dental implants.

INVESTIGATOR: Keith Neeves, PhD.

TITLE: Microfluidic flow assay for diagnosing bleeding and thrombotic disorders

RESEARCH: The strategic objective of this project is to validate a microfluidic-based flow assay that can diagnose bleeding and thrombotic disorders and eventually predict risk for bleeding. There are currently no methods that can accurately predict bleeding disorders.

IMPACT: Would be the first blood test to take place as the blood is flowing and could screen for multiple conditions. If successful it could replace and/or complement traditional hematological assays.

The Bioscience Discovery Evaluation Grant Program (BDEGP) began in 2006, when the state began to realize the importance of supporting the thriving bioscience industry. The support came into effect through a matching grant program that offered support to researchers trying to establish proof of concept.

Success shown by the state's initial funding allowed Colorado's legislature to expand the program in 2008, creating a five year and 26.5 million dollar matching grant program. The BDEGP now helps the industry by providing matching grants in three key areas: proof of concept for Colorado's research institutions, early-stage companies, and to build infrastructure for the growing industry.

As we embark on the fourth year of the Bioscience Discovery Evaluation Grant Program (BDEGP), we realize that the research and innovations being conducted by Colorado's bioscience community will never cease. The following tables showcase the research and companies that have been awarded grants from the fourth quarter of 2008 until now.

NATIONAL JEWISH HEALTH

INVESTIGATOR: David Lynch, MB and Russell Bowler, MD, PhD.

TITLE: Textural approach to quantification of diffuse lung disease on CT

RESEARCH: Under this grant, a new commercially viable, clinically valid, set of texture-based tools for CT image analysis of chronic obstructive pulmonary disease and idiopathic pulmonary fibrosis will be developed with the aim of quantifying diffuse lung disease. Quantification will allow for appropriate novel treatment.

IMPACT: CT scans are commonly performed, yet the information and abnormalities are described in only vague terms. This project will provide a novel approach to the challenge of identifying features of lung disease on CT, allowing for a more precise description of any abnormalities found in a scan.

INVESTIGATOR: Laurel L. Lenz, PhD.

TITLE: Therapeutic activation of Natural Killer cells for treatment of haematological cancers

RESEARCH: The aim of this work is to develop E415 and “second generation” derivatives of E415 as potential commercial Natural Killer cell activating therapeutics.

IMPACT: Developing a novel therapeutic that would activate NK cells which would target and kill certain haematological cancer cells.

INVESTIGATOR: Vijaya Nagabhusanam, PhD and Ronald J. Harbeck, PhD

TITLE: Immortalization of basophils towards the development of the next generation assay for the laboratory diagnosis of autoimmune chronic urticaria

RESEARCH: The aim of this work is to develop an immortalized basophil-like cell line that will replace the need for individual human donor basophils for the evaluation of anti-Fc epsilon R1alpha antibodies that assist in the laboratory diagnosis of autoimmune chronic urticaria.

IMPACT: Developing a diagnostic assay for chronic urticaria. This disorder is defined as the presence of hives lasting for at least six weeks. Autoimmune urticaria is triggered by auto antibodies to the high affinity immunoglobulin E (IgE) receptor, Fc R1, present in serum of affected individuals. These antibodies bind to Fc R1 on basophils and trigger degranulation and thereby symptoms.

INVESTIGATOR: Carl W. White, MD.

TITLE: Thioredoxin as mucolytic agent for cystic fibrosis.

RESEARCH: The goal of this grant is to identify a novel thioredoxin that disrupts cystic fibrosis sputum without causing or enhancing inflammation in cystic fibrosis lung disease or disease models.

IMPACT: Cystic fibrosis (CF) is the most common fatal genetic disease among Caucasians. The main cause of death in the disease is chronic lung infection, caused by the inability to clear thick sputum from the airways. This discovery will utilize a naturally occurring agent, thioredoxin, which can break down the sputum.

COLORADO STATE UNIVERSITY

INVESTIGATOR: Nora Lapitan, PhD and B Joe E. Brummer, PhD

TITLE: Evaluation of Miscanthus as a Bioenergy Crop in Colorado and Development of Genetic Resource

RESEARCH: The goal of this project is to evaluate Miscanthus and *M. sinensis* for agronomic performance in Colorado and develop genetic resources for *M. sinensis* to facilitate breeding and cloning of genes for biomass and other traits including adaptability and drought tolerance. The long-term objective is to develop Miscanthus cultivars adapted to Colorado and the western U.S. as a biomass resource for fuel.

IMPACT: Not only is Miscanthus a viable crop for bioenergy, adapting the grass to grow prolifically in land unable to support other crops leads to additional crop sources and income for farmers.

INVESTIGATOR: Patrick F. Byrne, PhD and Shusong Zheng, PhD.

TITLE: Overcoming the Bottleneck of Oilseed Crop Development for Biofuels through Mutagenesis and Interspecies Crosses.

RESEARCH: The goal of this project is to identify key traits – dwarf stature, improved stem strength, and altered oil profiles – in *Brassica juncea*. This plant is targeted as an oilseed biofuel crop suitable for Colorado.

IMPACT: Stable and reliable crop suitable for biodiesel production in Colorado.



INVESTIGATOR: George Collins, PhD

TITLE: Water Plasma for Tooth Surface Texturing, Functionalization and Biofilm Removal

RESEARCH: This work advances a room temperature water-plasma device to generate chemically active species for tooth surface texturing and functionalization. The technology avoids generating hazardous components to surrounding tissues. The grant work will focus on the selective removal of layers deposited on teeth including proteins and biofilms associated with periodontal disease.

IMPACT: Replacement of current technology which utilizes toxic and carcinogenic materials.

INVESTIGATOR: Jessica G. Davis, PhD

TITLE: Harnessing the Sun for On-farm Fertilizer Production

RESEARCH: Grantee will develop a low-cost bio-fertilizer production system that will reduce fossil fuel use and greenhouse gas emissions from fertilizer production and transportation. Bio-fertilizer technology is an untapped solution to food security, energy, and soil fertility issues worldwide. Using technology developed through this research, farmers will be able to use bacterial nitrogen (N) fixation to harness the sun's energy and create fertilizer from the air we breathe.

IMPACT: Bio-fertilizers will contribute to the sustainability and competitiveness of small to mid-sized farms by decreasing costs and energy needs.

INVESTIGATOR: Lawrence D. Goodridge, PhD

TITLE: A Multiangle Light Scattering Biosensor for Rapid Detection of Waterborne Viruses

RESEARCH: The objective of this proposal is the development of a Multiangle Light Scattering Biosensor for Rapid Detection of Waterborne Viruses. In this method, viruses in large (10-50 L) volumes of water are concentrated using anionic exchange resin beads. The beads (with viruses attached) are added to a tissue culture flask, which contains a suitable cell line. The viruses will infect the cells, and after an incubation period of several hours, an aliquot of the infected cells is analyzed for viral infection using multiangle light scattering, which is a technique capable of detecting changes in virus infected cells relative to non infected cells (control). The method is simple to complete and is expected to lead to much faster detection times than currently used methods.

IMPACT: Rapid and accurate detection of pathogenic viruses has worldwide implications for safety of water and food supplies.

INVESTIGATOR: Matt J. Kipper, PhD

TITLE: Development of Nanoparticle Optical Trap-Base Biosensor

RESEARCH: Build a prototype optical trap based biosensor, evaluate its performance by measuring limits of detection for bacteriophage (or a another suitable target analyte), and design experiments to test a mathematical model describing the optical trapping phenomenon. The goal is to develop a more rapid and sensitive technique for detecting food-borne and water-borne pathogens.

IMPACT: Better and more rapid detection of pathogens means a safer food supply.

INVESTIGATOR: Kenneth F. Reardon, PhD

TITLE: Multichannel Optical Biosensor for Detection of Contaminants in Water and Food

RESEARCH: This project advances the technological state of an optical enzymatic biosensor platform by using biological and engineering approaches to increase the biosensor lifetime, improving the multichannel optoelectronic hardware system used for measuring analytes in mixtures, and developing multichannel calibration and measurement protocols. The multichannel optical biosensor will be used to detect contaminants in water and food.

IMPACT: The ability to easily and accurately monitor water and food supplies for contaminants has tremendous health and economic benefits.

INVESTIGATOR: Melissa Reynolds, PhD

TITLE: Universal Biocompatible Coating Process for Medical Devices

RESEARCH: This project is focused on investigating the viability of novel metal-organic frameworks (MOF) as delivery materials for use in biomedical coatings.

IMPACT: The coatings will mimic the function of healthy living cells and be a more natural and safe approach to healing.



INVESTIGATOR: Ronald B. Tjalkens, PhD

TITLE: Development of Neuroprotective Compounds for Treating Parkinson's Disease

RESEARCH: The neurological symptoms of Parkinson's disease (PD) are caused by the degeneration of neurons in the midbrain but there are no approved drugs that slow this process, only those that treat the symptoms caused by neuronal loss. The objective of this project is to characterize the efficacy and safety of a novel series of anti-inflammatory compounds to test their suitability as a new treatment for blocking the progression of PD.

IMPACT: Successful application of these compounds will block the neuroinflammation caused by PD in order to halt the disease rather than just controlling the symptoms.

INVESTIGATOR: John D. Williams, PhD and Ketul Popat, PhD

TITLE: Evaluation of Hydroxyapatite Coatings Deposited Using Novel Plasma Based Deposition Techniques for near Term Implementation in Dental and Orthopedic Implants

RESEARCH: Develop optimized coatings that are needed to improve the longevity and effectiveness of load-bearing hip arthroplasty components. Project work involves characterizing plasma based ion implantation and deposition (PBII&D) and plasma enhanced chemical vapor deposition (PECVD) as novel techniques for applying thin film hydroxyapatite (HA) coatings onto titanium, titanium alloy, and next-generation titanium -alloy implantable biocompatible materials.

IMPACT: Creation of better coating techniques so as to avoid revision surgery due to loosening or infection within the patient's lifetime.



INVESTIGATOR: Kristi Anseth, PhD

TITLE: Acute full-thickness wound healing; custom therapeutics, bio-responsive thiol-enes.

RESEARCH: The strategic objective of this project is to complete a pre-clinical efficacy study of the performance of a novel biomaterial system in promoting wound healing in a human equivalent large animal model. Bioresponsive thiol-ene hydrogels are designed to increase the efficiency of wound closure and reduce scarring.

IMPACT: More effective treatment for severe wounds such as diabetic ulcers.

INVESTIGATOR: Stephanie J. Bryant, PhD.

TITLE: Mechanically trained engineered cartilage for craniofacial reconstruction.

RESEARCH: The goal of the project work is to create new therapies for treating patients who are in need of craniofacial reconstruction.

IMPACT: Cartilage for craniofacial reconstruction that can be formed from a patient's own cells rather than artificial materials.

COLORADO INSTITUTE OF MOLECULAR BIOTECHNOLOGY

INVESTIGATOR: Natalie Ahn, PhD

TITLE: Pharmacophore Optimization for Targeted Therapeutics

RESEARCH: The goal of this project is to develop a medicinal chemistry core resource whereby identified lead compounds will be optimized, using the expertise of medicinal chemistry in an iterative processes, for the treatment of chronic pain and cancer.

IMPACT: Develop new composition of matter intellectual property for therapeutic drug candidates associated with proprietary drug screen assays at CU.

INVESTIGATOR: Xuedong Liu, PhD.

TITLE: Targeting mitotic kinase Mps1 for cancer therapy

RESEARCH: Develop patentable potent sub-nanomolar small molecule compounds against TTK/Mps1 and test the efficacy of these inhibitors in human cancer cell lines and xenograft models. The outcome will improve the results of oncology drugs.

IMPACT: Current anti-mitotic cancer therapies have severe side effects on healthy, non-cancerous cells. This project seeks to further develop novel drugs for the treatment of cancer, with a primary focus on lung cancer.

UNIVERSITY OF COLORADO

INVESTIGATOR: Sean Colgan, PhD.

TITLE: IBD-DIFF: Commercial Development of a CD116-based assay to distinguish irritable bowel syndrome from inflammatory bowel disease.

RESEARCH: Development, validation, and commercialization of a diagnostic blood test named “IBDiff”, to distinguish between inflammatory bowel disease and irritable bowel syndrome. IBDiff relies on identifying the GM-CSF receptor, CD116, on circulating leukocytes as a specific biomarker in distinguishing IBS from IBD. Symptoms of IBS and IBD are similar while treatment is quite different, the ability to easily distinguish the two conditions improves treatment and reduces costs associated with testing for IBD.

IMPACT: Will allow lower cost and more precise diagnosis with earlier and more efficacious treatment of both IBD and IBS patients.

INVESTIGATOR: Thomas Flaig, MD.

TITLE: DT-EGF for the treatment of bladder cancer.

RESEARCH: The goal of the project is to advance the clinical development of DAB389EGF for the treatment of bladder cancer. DAB389EGF is being explored as a targeted toxin that will bind to tumor cells and kill the targeted cell. Additional pre-clinical data will be developed to support a pre-IND meeting.

IMPACT: Add an alternative therapy to the 50% of bladder cancer patients that are not benefited by standard of care.

INVESTIGATOR: Ryan T. Gill, PhD.

TITLE: Molecular biorefining for sustainable gasoline.

RESEARCH: The goal of this project is to demonstrate a new pathway for the sustainable production of fungible gasoline from cellulosic biomass.

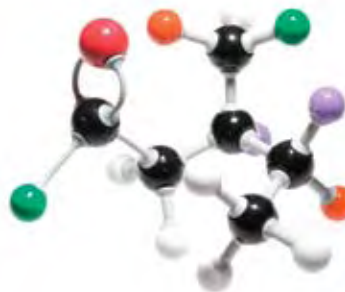
IMPACT: Potential for cost-competitive production of gasoline from biomass rather than fossil fuel sources.

INVESTIGATOR: Malik Kahook, MD.

TITLE: KSCO: Keep Schlemm’s Canal Open

RESEARCH: The primary goal of the work is to design, develop and test a novel shape memory polymer based device for maintaining fluid communication between the anterior chamber and collection channels of the eye. Such a device would improve outcomes for glaucoma patients.

IMPACT: Allow for more sustainable, lower cost treatment of the symptoms associated with glaucoma.



INVESTIGATOR: Jeff Olson, MD.

TITLE: Zip Clip – Microsurgical suturing device.

RESEARCH: The goal of this project is to position the “Zip Clip” for first-in-human use. The “Zip Clip” is a surgical system consisting of a minimally invasive deployment tool designed to accurately and safely deliver a nitinol clip to suture in the setting of complex ophthalmic microsurgical procedures, wherein conventional suturing is either impractical or critically time-intensive.

“510(k)” refers to Section 510(k) of the Food, Drug and Cosmetic Act which requires device manufacturers to notify the Food and Drug Administration of their intent to market a medical device.

IMPACT: Lower the cost, time, and improve outcomes in ophthalmologic surgery.

INVESTIGATOR: David Ross, PhD.

TITLE: Novel benzoquinone ansamycins. Hsp90 inhibitors with decreased toxicity

RESEARCH: The goal of this project is to limit toxicity of an anticancer agent (Hsp90 inhibitors). Hsp90 inhibitors allow a combinatorial inhibition of multiple pathways that drive the oncogenic process and are an attractive anticancer targeting strategy; however, the Hsp90 inhibitors being developed are benzoquinone ansamycins which have a dose limiting toxicity. Under the project, 19-substituted benzoquinone ansamycins will be evaluated for effectiveness and decreased toxicity.

IMPACT: A more effective cancer drug with fewer toxic side effects.

INVESTIGATOR: David H. Wagner, PhD.

TITLE: A novel small therapeutic peptide prevents and reverses autoimmune diseases

RESEARCH: The project goal is to identify lead candidate peptides proving efficacious treatment options in delaying/preventing/reversing diabetes.

IMPACT: Slowing or halting the progression of autoimmune disease before permanent organ or joint damage occurs.

UNIVERSITY OF DENVER

INVESTIGATOR: Rahmat Shoreshi, PhD.

TITLE: Adaptive cast for enhanced healing and reduced cost.

RESEARCH: Under this grant, a semi-permanent, reusable cast for diabetic patients suffering from peripheral neuropathic foot ulcers will be developed. It is intended to be a safer, more effective means of healing foot injuries while reducing costs.

IMPACT: This Adaptive Cast has the potential to have healing efficiency while also providing features that include forced compliance (semi-permanent design), early detection of new ulcers and immediate pressure reduction in new ulcer area, active control system for off-loading, skin toughening subsystem to reduce immediate onset of new ulcers after removal of the cast, simpler application and no requirement for specialized technicians.

EARLY STAGE COMPANY AWARDS – 2009 TO PRESENT

2C TECH CORPORATION, LONGMONT

Develop, validate and commercialize “QuantumCharge”, 2C Tech’s proprietary intraocular implant as a next-generation, in vivo system for stimulating degenerated retinal cells and restoring vision.

BIOAMPS INTERNATIONAL, LLC, AURORA

This grant builds on a prior grant under the BDEGP to identify a drug solution or solutions to the problem of gram-positive and gram-negative bacteria resistance to conventional antibiotics through the introduction of an antimicrobial technology with no known route of drug resistance.

CLARIMEDIX INC., BOULDER

The goal of this grant is to further the development of a proprietary medical device technology with the ability to non-invasively trigger and modulate the production of nitric oxide to treat Alzheimer’s disease.

FLASHBACK TECHNOLOGIES, LLC, LONGMONT

The goal of this grant is to develop an improved prototype device, building on prior work, for estimating a patient’s blood volume loss and the conditions for cardiovascular collapse. This will offer a non-invasive device to provide a real time estimate of a patient’s volume of blood loss, and a real time estimate of when a patient will experience cardiovascular collapse so that medical personnel can quickly and accurately identify and manage bleeding patients.

HEPQUANT LLC, AURORA

This grant builds on a prior grant under the BDEGP to further the development of a diagnostic test for hepatic portal circulation which will enhance the safety and accuracy of assessing liver function. Under this grant HepQuant will initiate FDA clinical trials of “HepQuant-Dual”.

INDEV, INC. BOULDER

This grant supports the commercialization of a new detection technology (Phox™) for low-density microarrays that enables inexpensive and rapid identification of pathogens in a robust and field portable diagnostic platform. The products, specifically the Phox™ reagent kits and associated equipment (e.g., the IntelliChip Reader™), will be launched for food safety testing or the identification of viruses that cause respiratory diseases.

KROMATID, INC., FORT COLLINS

KromaTiD is working to create the next generation of chromosome analysis products, which will have valuable application in clinical diagnostics, biomedical research, and biodosimetry. This grant supports the evaluation of the technology’s market opportunity in a formal business plan.

MICROPHAGE, INC., LONGMONT

The main objective of the project is to increase the sensitivity of phage amplification technology via optimization of amplification (AMP) reagents and sample processing to meet the increased performance demands of the nasal swab sample for MRSA screening.

ONERON FMR, INC., IDAHO SPRINGS

The main objective of the project is to improve Oberon’s process for converting food-processing byproducts into Single Cell Protein for animal feeds by increasing protein content and reducing protein content variability.

POLYNEW INC., AURORA

The grantee is developing next-generation bioplastics for food and beverage containers, and must test the technology for large industrial application.

QUEST PRODUCT DEVELOPMENT CORP., WHEAT RIDGE

With grant funds the company will establish a dedicated thin-film actuator fabrication line. Quest is developing MicroFlex Technology for digitally controlling the shape of an endoscope by using advanced shape memory alloy micro-actuators fabricated as thin film assemblies using integrated circuit manufacturing techniques. MicroFlex technology will allow endoscopes that are far more flexible, thinner and guidable, enabling access, visualization and treatment at currently inaccessible locations.

SNOASIS MEDICAL, INC., DENVER

Evaluate two different Human Platelet Morphogen (HPM) processing methods and specify top line requirements for a pilot manufacturing facility. Research developed will support an NIH Phase II grant application. HPM holds great potential for use in dental surgery to speed healing and improve outcomes.

VALVEXCHANGE, INC., AURORA

The grantee is developing a novel implantable heart valve technology allowing for minimally invasive surgery for the replacement of leaflet sets. This combined with patient specific heart models will allow for an optimal valve exchange procedure.



INFRASTRUCTURE AWARDS

COLORADO INSTITUTE FOR DRUG, DEVICE AND DIAGNOSTIC DEVELOPMENT

The Colorado Institute for Drug, Device and Diagnostic Development will manage life science discoveries from Colorado research institutions and start-up companies through feasibility, pre IND studies, and initial clinical trials with the goal of creating viable new Colorado bioscience companies supporting quality jobs.

CSU – COLORADO CENTER FOR DRUG DISCOVERY

The Colorado Center for Drug Discovery (C2D2) fills a gap in drug-discovery at CO research universities. The C2D2 provides medicinal chemistry, pharmacokinetics, and consulting resources to create new patent-protected compounds useful for validation of novel drug discovery targets and drug candidates for clinical development by Colorado biopharma companies and others. This grant supports the C2D2 as a resource to faculty at Colorado research universities, bringing biology and chemistry faculty together to use chemical libraries, computational resources, bioinformatics, cheminformatics, database support, virtual high throughput screening, and Computer Aided Drug Design to pharmacologically validate drug candidates with patent-protected chemical matter and innovative therapeutics for unmet medical needs.

Furthermore, the infrastructure and framework of expertise created by C2D2 across Colorado research universities will expand opportunities for emerging Colorado bioscience companies to access critical expertise and resources that would be difficult to establish within these companies.

CU – COLORADO INITIATIVE IN MOLECULAR BIOTECHNOLOGY

This grant supports the development of a state-of-the art research and education facility that links the basic sciences, engineering, clinical practice, and industry at the University of Colorado's Boulder campus to support breakthrough developments in areas such as engineering human tissues, RNA enzyme and aptamer based pharmaceutical, biorefining, and genetics. Grant funds will applied to equipment, resources and personnel costs of the Integrated Novel Therapeutic Discovery Center, and to support architectural, engineering, and construction services (as per policy of the State of Colorado's Office of the State Architect), and equipment costs of the Vivarium Expansion.

CU – DRUG DEVELOPMENT CENTER HIGH THROUGHPUT SCREENING CORE

This grant supports the establishment of a Core Facility for high throughput screening of small molecule libraries against molecular targets, open to users within Colorado. A gap in capability for many current researchers in Colorado is the inability to perform HTS screens against a particular molecular target to identify hit molecules. Hit molecules can be developed into lead molecules which often form the basis for intellectual property, subsequent company formation and economic development.



P/RMA

Pharmaceutical Research & Manufacturers of America
Disease is our enemy. Working to save lives is our job.