Colorado
Office of Economic Development and International Trade

John W. Hickenlooper, Governor
Kenneth W. Lund, Executive Director

HOUSE FINANCE COMMITTEE

SENATE FINANCE COMMITTEE

BIOSCIENCE DISCOVERY EVALUATION GRANT PROGRAM UPDATE

June 30, 2012

1625 Broadway, Suite 2700 • Denver, Colorado 80202 • Telephone: 303-892-3840 • Facsimile: 303-892-3848 • www.AdvanceColorado.com

Legislative Report to House and Senate Finance Committees
per CRS 24-48.5-108
Bioscience Discovery Evaluation Grant Program
By the Colorado Office of Economic Development and International Trade

The Bioscience Discovery Evaluation Grant Program (BDEGP) and Cash Fund was first created in statute in 2006. In its sixth year, fiscal year 2011-12, the current program consists of three targeted grant programs to support the Colorado bioscience industry. Commercialization Infrastructure grants support joint efforts of industry and academia to create resources that were lacking but needed to grow the industry. The Proof of Concept grants continue to substantiate research at Colorado research institutions with commercial applications. Early-Stage Company grants provide needed funding to companies commercializing technologies from Colorado research institutions by backing research, testing, and business development activities that will prepare them for additional third-party financing.

The BDEGP has been praised for its effectiveness in leveraging a limited state investment to move promising commercial technologies to market and supporting the biotechnology industry in Colorado. Since the first grants were made in mid-to-late 2007 through fiscal year 2012 the program has awarded 145 grants to researchers at Colorado research institutions to bring their cutting-edge technologies closer to market. Forty-eight grants have helped companies further these technologies as they complete studies, secure intellectual property, and develop their approach to bring their products to market. In addition, the program has supported four new bioscience technology organizations, under the commercialization infrastructure program, that identify and manage technologies, and support collaboration to bring necessary expertise together to advance novel Colorado biotechnologies to commercialization.

						Results During Grant Period					Additional Results Following Grant Close			
Status	Program	Number	$ Awarded	$ Spent to date	$ Matched to date	Jobs Created	Companies Created	Follow-on Capital	Intellectual Property Advancements	Licenses Issued	Jobs Created	Companies Created	Follow-on Capital	Intellectual Property Advancements
Closed Grants	Early Stage Company	21	3,062,100.00	2,968,453.34	4,772,525.00	31.8	2	15,086,681.00	12	3	39.5	0	$13,524,045	
	Infrastructure	2	1,800,000.00	1,799,617.68	183,648.00	25.0	1	1,094,000.00	0	1				
	Proof of Concept	77	4,688,789.00	4,582,670.22	5,099,457.34	88.4	21	20,610,209.00	41	15	7	5	$2,912,211	3
	Company Grants SBIR/STTR	12	755,073.00	755,073.00	2,128,497.00	27.5		31,015,857.00	6	6	31	0	$5,499,246	
Active Grants	Early Stage Company	15	2,705,000.00	511,447.98	617,275.00	8.8	1	2,800,000.00	5	0				
	Infrastructure	8	6,579,743.00	3,589,609.00	737,582.00	18.0		807,594.00	0	0				
	Proof of Concept	68	4,345,273.50	1,214,621.96	994,013.78	31.8	7	1,768,951.00	14	8				
TOTALS		**203**	**$ 23,935,979**	**$ 15,421,493**	**$ 14,532,998**	**231.3**	**32**	**73,183,292**	**78**	**33**	**77.5**	**5**	**$21,935,502**	**3**

The State leverages this investment in the industry by requiring a one-to-one match for both Proof of Concept and Early-Stage Company grants. The economic benefit is realized near-term in the strengthening of our research institutions, the jobs required to fulfill the grant work, and the products and services purchased to complete grant work. Longer-run payouts come in the form of additional capital investment into the technologies and companies, the creation of new companies, and growing businesses adding high quality jobs. Almost $24 million from the

BDEGP Cash Fund has been granted and will garner at least an equal amount in matching funds (excluding Commercialization Infrastructure grants). Of 203 grants made or approved under the program by the end of fiscal year 2012, 112 have completed work while the others are in process. The chart above shows returns realized during the grant term, and those that continue to accrue as the technologies become closer to and actually enter the market-place. To date, the program successes include the creation of 37 new Colorado companies and the direct creation of approximately 309 jobs. Additionally, these funds have helped the technologies acquire an additional $95 million dollars in grants and investments to further commercialize these bioscience technologies.

The remainder of this report focuses on Program investments in fiscal year 2012. The program's statute requires an allocation of at least 30% of the funds to Proof of Concept grants, 30% of the funds to Early-Stage Company grants, and up to 40% of the funds to Commercialization Infrastructure.

Narrative – Project Summaries

The Bioscience Discovery Evaluation Grant Program provides gap funding to advance promising research from Colorado's outstanding research institutions into the market place. The bioscience industry in Colorado is strengthened by such efforts, resulting in long-term job creation and company formation. Thirty-three projects were approved for funding in fiscal year 2012. Total grant funds awarded to these projects exceeded $5.2 million dollars. In addition to grant funds, matching funds are invested into the projects and technologies.

As required by the program's statute, following are recipients, awards and descriptions of grants made under the Program in fiscal 2012. Projects are grouped according to the focus of the research or technology to highlight the practical application of the work. Program funding supports biotechnology developments with applications in improving human health, agriculture improvements, and biofuels developments. In 2012, the Program funded new treatment developments for cancer, hearing and vision impairments, and respiratory disease. Several technologies advancing biofuels production were also supported. Colorado researchers are developing cutting-edge biological technologies in many areas to treat and cure human disease and to convert non-ag crops into fuel.

Autoimmune Disease

National Jewish Health – Cambier. $39,194
Researchers will create a robust human CD79 expressing mouse model for in vivo preclinical experiments to optimize anti-CD79 antibody therapy and facilitate the commercialization of the anti-CD79 therapeutic drug developed by the primary investigator. This work is an effort to develop an effective therapy for autoimmune diseases.

National Jewish Health – Ramamoorthy and Reynolds. $39,209
The goal of this project is to develop and validate a comprehensive genetic test panel for PIDD composed of 225 genes. This test will be offered with established immunological and complement tests in conjunction with clinical decision support thereby creating an integrated clinical diagnostic test panel for Primary ImmunoDeficiency Disease (PIDD). People born with

genetic defects of the immune system may be afflicted by PIDD diseases that are wide-ranging in their severity, and are characterized by infections that can often be chronic, recurring, debilitating and even fatal.

Biofuels

Carbo Analytics, LLC. $250,000

This grant supports the commercial development of an online sugar monitor with immediate application for more cost effective biofuels production. The monitoring technology was founded at Colorado State University, and is being used here to bring valuable and timely information, cost-effectively to the transformation of biostocks into fuels.

Colorado School of Mines – Liang. $73,112

This project aim is to determine the structural characteristics of super coagulation agents, as well as synthetic protocols to prepare the agents for dewatering microalgae with nanoparticle-pinched polymer brushes. The technology is intended to make algae biofuels economically feasible.

Colorado School of Mines – Liberatore. $63,762

Project work involves identifying polymers and delivery mechanisms to induce flocculation of algae in an optimized and cost efficient manner to facilitate full scale cellulosic refining of biofuels.

Biologics Production

University of Colorado – Bowman. $66,519

The goal of this project is to develop a multivalent human papillomavirus (HPV) vaccine by combining recombinant viral capsid subunits (capsomeres) from HPV types 16, 18, 31, 33, and 45.

AmideBio, LLC. $250,000

The grantee's technology involves the creation of unique recombinant fusion constructs for robust expression of peptides, followed by selective chemical cleavage to produce the native peptide while eliminating the potential for certain chemical modifications that are common to chemical solid-phase synthesis processes. In addition, only simple chemicals are utilized for the cleavage step and no proteolytic enzymes are required, representing a significant advantage in cost and process simplicity over standard recombinant methods for peptide production. Project work involves full development and demonstration of the CAP-CLIPTM on-column production technology; full demonstration of the technology will help attract additional pharmaceutical partners.

Cancer

National Jewish Health – Jacubzik. $39,209

Grant work involves designing a vaccine that could provide long-lasting or permanent remission of a cancer without requiring radiation, chemotherapy, or other treatments with adverse long-term effects. The vaccine will target and stimulate endogenous anti-tumor dendritic cells to promote anti-tumor immunity.

University of Colorado – Yin. $100,000

The goal of this project is to create an in vitro cancer metastasis detection system using unnatural cyclopeptides that select for shed lipid vesicles and reveal the occurrence of cancer metastasis.

University of Colorado – Thorburn. $51,223
The goal of this project is to create a validated, commercially viable diagnostic test that can be used to identify tumors that over express Six1. The outcome would help physicians to better prescribe cancer treatment.

University of Colorado – Leinwand. $66,518
The goal of this project is to define the cardio-protective role of AQP7 via its ability to regulate mammalian heart cell size, function, and gene expression.

OnKure, Inc. $250,000
This grant supports OnKure's efforts to determine whether combinations of distinct histone markers and gene expression profiles that track dose-responsive cytostatic responses can be used to develop a set of molecular determinants for stratifying sensitive and resistant tumor cell lines as well as patient tumor explants for HDAC therapy. OnKure is working to develop a novel HDAC inhibitor for the treatment of cancerous tumors.

SuviCa Inc. $125,000
SuviCa will develop its lead compound, SVC-101, for orphan oncology solid tumor indications, and follow-on NCE, SVC-112, for oncology indications with larger market share (non-small cell lung cancer and melanoma). Grant work includes biomarker identification and characterization of the lead compound.

Diabetes
University of Colorado – Wagner. $87,528
The goal of this project is to identify a lead compound and any additional patentable compounds for treatment of type-1 diabetes and other autoimmune diseases. Researchers will buffering systems, determine breakdown, and conduct dosing experiments.

Food Safety and Water Quality
Colorado School of Mines – Voorhes. $99,156
Project work will demonstrate the feasibility of using listeria-specific phages and surface enhanced Raman spectroscopy lateral flow immunoassays for application in commercial monitoring of contamination in food processing facilities. A rapid, cost-effective detection system for onsite sampling and diagnostic identification of L. monocytogenes does not exist.

Hearing
Sophono, Inc. $250,000
This company has a bone conduction hearing technology, and is adapting it for the under-age-5 market using technology licensed from the University of Colorado that will allow the company to re-design the device effectively. The CU technology will also allow the company to train providers for proper implantation.

Infectious Disease
Crestone, Inc. $250,000

The company is developing a novel antibiotic for the treatment of serious Gram-positive bacterial infections including skin infections and pneumonia. Project work includes: 1) improve compound potency while maintaining metabolic stability and biochemical selectivity using medicinal chemistry and bioassays; 2) assess the enzyme inhibitory potency and mechanism of the TZU analogs using University of Colorado technology - DNA polymerase holoenzyme assay; 3) conduct In vitro screening for metabolic stability and toxicity; 4) conduct *in vivo* pharmacokinetics, efficacy and toxicity; 5) perform detailed microbiological profile necessary for an Investigational New Drug candidate compound; and 6) business development including intellectual property development., grant writing, and partnership development.

University of Colorado – Garcea. $66,519
The goal of this project is to develop a multivalent human papilloma virus (HPV) vaccine by combining recombinant viral capsid subunits (capsomeres) from HPV types 16, 18, 31, 33, and 45.

Kidney
University of Colorado – Johnson. $87,449
The goal of this project is to develop a therapeutic for acute kidney injury (AKI) to target the underlying mechanism for contrast nephropathy. The researchers have intellectual property around their discovery that the inhibition of fructokinase is shown to prevent AKI following contrast or cardiovascular surgery.

Oral Disease
University of Colorado – Wang. $99,994
The goal of this project is to optimize local Tat-Smad7 protein delivery in animal models to treat severe, painful oral blisters (oral mucositis), leading to Tat-Smad7 commercialization for treatment of severe oral mucositis in patients undergoing chemo-/radio-therapy or organ transplant. The researchers have created the Tat-Smad7 recombinant protein that has therapeutic effects on oral mucositis in mice.

Parkinson's
Colorado State University – Tjalkens. $50,000
The goal of this project is to evaluate a novel class of synthetic triterpenoid structures that have discreet modification to optimize anit-inflammatory activity in neural cells for the treatment of Parkinson's Disease.

Respiratory
National Jewish Health – Nakamura and Voelker. $39,210
The aim of this project is to better understand POPG and PI as novel types of anti-viral agents for medical treatment of respiratory syncytial virus (RSV). RSV is the most common cause of hospitalization for respiratory illness in young children; 90% of children under age 2 are infected with RSV. RSV is one of the major causes of acute exacerbations of asthma and COPD.

Colorado State University – Fisk. $75,000

The goal of the current project is to develop sensors for the detection of active tuberculosis infections using phage-based biological reagents in paper microfluidic devices. The outcome will be a point of care diagnostics for active tuberculosis infection.

Spine

Colorado State University – Prawel. $74,737

This work applies PS coatings to PEEK spinal fusion cages to enhance bone integration of the implant. Improved osseointegration of the implant will improve the clinical outcome and quality of life for patients who undergo spinal fusion for conditions such as tumor, spinal fracture, degenerative disc disease, scoliosis and other spinal deformities, by improving the degree and rate of integration of new bone into the PEEK fusion cages and reducing the risk of adverse clinical outcomes such as pseudoarthrosis and failed back syndrome.

Surgical Tools

Colorado State University – Bellezzo. $75,000

This grant supports the development of a state of the art abdominal surgical simulator, providing the most life-like system available for medical training. Work includes: gather data relevant to the anatomy and gross pathological anatomy of several different surgical diseases of abdominal organs; obtaining body scans of individual abdominal organs; designing a framework for the abdominal chassis and the fluid circuit; assembling the abdominal chassis along with organs and fluid circuit.

Trauma Care

Flashback Technologies. $50,000

This grant supports Flashback's business development efforts toward the commercialization of two platforms for non-invasive resuscitation monitoring. One is based on BMEYE's Nexfin hardware platform and the other is based on the Sotera Wireless ViSi hardware platform. Flashback's software technology for resuscitation monitoring will be licensed to both of these companies, with anticipated royalties for sales to military and civilian markets.

Vision

Shape Opthalmics, LLC. $150,000

This company developed out of technologies founded at the University of Colorado. Grant work will move a punctual plug into design freeze stage as the first step toward and FDA 510(k) submission. The punctual plug is a novel and cost-effective clinical treatment for dry-eye syndrome. The company is also developing a drug-eluting component for the punctual plug as a glaucoma treatment.

University of Colorado – Kahook. $99,360

The goal of this project is to compare a non-invasive glaucoma treatment device to the efficacy of laser trabeculoplasty in a cohort of patients with open angle glaucoma. This non-invasive treatment alters the protein expression in the drainage system of the eye through streatching of the trabecular meshwork cells.

University of Colorado – Kompelia. $98,280

The goal of this project is to perform non-GLP efficacy and safety studies of endotoxin free transferrin-tumstatin (Tf-T) in preclinical models. Success will justify more expensive GLP studies prior to an Investigation New Drug application to the Food and Drug Administration. Tf-T, a new therapeutic fusion protein, is being used to treat wet age related macular degeneration (AMD). AMD is the most common cause of irreversible vision loss in elderly patients.

Wound Healing

Colorado State University – Reynolds. $73,375

This work involves evaluating an innovative class of new biodegradable polymers – bio-bandaids – for their ability to treat infection and to promote wound healing. Studies to be conducted under this grant will give a better fundamental understanding of the performance of bio-bandaids compared to current products. A comprehensive data set will be produced to support the application of these new materials to overcome the lingering problems associated with wound healing.

Commercialization Infrastructure

Five years of commercialization infrastructure funds were committed to 4 projects, with the following 3 receiving new grants with each fiscal year allocation through 2013.

Colorado State University Ventures - Colorado Center for Drug Discovery. $547,381

This grant supports the Colorado Center for Drug Discovery (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. C2D2 supported 7 inter-institutional projects with funding and resources. C2D2 has more than 300 compounds it offers to investigators through its screening library. C2D2 also offers services on a fee basis.

Colorado Institute for Drug, Device and Diagnostic Development. $845,952

The Colorado Institute for Drug, Device and Diagnostic Development (CID4) is managing life science discoveries from Colorado research institutions and Colorado start-ups and early-stage businesses with the goal of creating bioscience jobs in Colorado. Grant Funds support operations of the CID4 and the development and management of life-science discoveries adopted as Projects of the CID4. The CID4 currently has worked with 5 early stage companies guiding their commercialization efforts and connecting with investors.

Biofrontiers Institute at CU Boulder. $696,667

This grant supports the Biofrontiers Institute in developing 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 support equipment, resources and personnel costs to develop the core facilities of the institute.