Colorado
Office of Economic Development and International Trade

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HOUSE FINANCE COMMITTEE

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BIOSCIENCE DISCOVERY EVALUATION GRANT PROGRAM UPDATE

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Legislative Report to House and Senate Finance Committees
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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. Now, 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. 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 calendar year 2011 the program has awarded 130 grants to researchers at Colorado research institutions to bring their cutting-edge technologies closer to market. Forty-four 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	17	2,667,100	2,577,454	4,281,228	25.8	2	15,011,681	10	3	39.5	0	$13,524,045	
	Infrastructure	2	1,800,000	1,799,885	183,648	25.0	1	1,094,000	0	1				
	Proof of Concept	65	4,012,630	3,933,513	4,409,847	80.4	16	19,986,209	32	11	7	5	$2,912,211	3
	Company Grants SBIR/STTR	12	755,073	755,073	2,128,497	27.5		31,015,857	6	6	31	0	$5,499,246	
Active Grants	Early Stage Company	15	2,425,000	631,554	702,337	10.8	1	3,025,000	5	1				
	Infrastructure	8	6,579,743	3,118,659	737,582	18.0		807,594	0	0				
	Proof of Concept	65	3,848,931	1,430,690	1,218,673	37.3	9	2,092,951	21	11				
TOTALS		**184**	**$ 22,088,477**	**$ 14,246,828**	**$ 13,661,811**	**224.8**	**29**	**73,033,292**	**74**	**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. Approximately $22.1 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 184 grants made or approved

under the program by the end of 2011, 96 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 34 new Colorado companies and the direct creation of 302 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 calendar year 2011. The BDEGP Cash Fund was appropriated $5,499,321 in fiscal year 2010-11 and $4,320,967 in fiscal year 2011-12. 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. Twenty-four projects were approved for funding in calendar year 2011. Total grant funds awarded to these projects are close to $5.6 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 calendar 2011. The program is actually funded and managed by the state's fiscal year, so some research institutions actively participating in the program are not listed below because their projects were officially approved outside of calendar year 2011.

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 2011, the Program funded new developments in the treatment of cancer and autoimmune disease, along with tests for food and water safety, and the advancement of biofuels production. 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

Colorado State University – Schweizer. $9,955

This grant supports an effort to facilitate the distribution of biological materials to the scientific community and their continued development by 1) producing quality-controlled stocks of the most requested plasmids and bacterial strains; 2) evaluating their use on non-antibiotic glyphosate resistance markers in drug resistant bacteria; and 3) developing an electronic database that can be used to track available materials and supporting information.

Colorado School of Mines – Ayers. $35,501

The Project aims to scale up current lab bench combustion synthesis technology to small volume production for multiphasic calcium phosphate (McaP) combustion synthesis to demonstrate process scalability to potential customers. McaP are materials that can be formulated to mimic features of bone, and may provide a novel method for enhancing bone tissue healing.

Cancer

SuviCa Inc. $125,000

Under the grant, SuviCa, commercializing technology from the University of Colorado, is to take an identified family of compounds (anti-ribosomals) that enhance the therapeutic effects of radiation in cancer and develop their potential to be used in combination therapy with standard agents in the treatment of a variety of human cancers. They will: 1) complete market analysis, business modeling, and IP protection on SVC-101, their anti-robosomal agent; 2) develop follow-on anti-ribosomals with distinct safety, distribution and efficacy profiles through sub-

contracts with academic labs; and 3) complete preclinical efficacy and safety assessments for SVC-101. The company has created one new job and has moved to protect the intellectual property internationally.

Colorado State University – Avery. $25,000
This researcher is developing a commercially viable blood based diagnostic test for a common canine tumor and demonstrating the feasibility of whole genome sequencing for the rapid development of such tests. Research in canine cancer treatments can advance human treatment. Grant work involves: 1) sequencing the hemangiosarcoma genome and normal tissue counterpart, and 2) developing PCR assays to detect the translocations identified.

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.

Diagnostics

Colorado School of Mines – Neeves. $72,841
The Project objective is to conduct a head-to-head comparison between a novel microfluidic flow assay (MFA) and conventional assays for the measurement of dysfunction in hemostasis, dosing of antithrombotic drugs, and evaluation of novel antithrombotic targets. The MFA is a global assay for measuring bleeding potential as it integrates coagulation, platelet function and flow.

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.

Colorado State University – Roesner. $54,056
The project objective is to demonstrate that a simple, low energy input graywater reuse system comprising storage with disinfection will produce a water supply for toilet flushing that poses no health threat to users. Grant funds will allow the researchers to characterize the graywater quality and to run tests on the disinfection quality of the system.

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

BioAMPS International, Inc. $50,000

BioAMPS is working to develop drugs that treat hospital acquired pneumonia due to infection by gram-negative bacteria based on a discovery at the University of Colorado. Under the grant, they will: 1) identify a peptide with the best combination of in vitro efficacy, hemolysis, cytotoxicity, metabolic activity and protein-binding characteristics; 2) synthesize and purify sufficient quantities of the lead peptide to conduct initial formulation and analytical development research and in vivo toxicity and antimicrobial efficacy work; 3) determine the tolerable in vivo dose levels of the lead peptide to advance into dosing efficacy research. The company has received an additional $250,000 to advance their technology, and has further developed their intellectual property.

Colorado State University – Slayden. $5,961

The Project objective is to identify novel compounds that impact the effect of P. aeruginosa via drug efflux pumps either at the transcriptional level or at the protein level. The hypothesis is that identified novel compounds can provide additional therapeutic options for the treatment of disease caused by P. aeruginosa, a drug-resistant pathogen that has a mechanism to "pump" antibiotics out of its structure, making it highly resistant.

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.

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.

Tissue

Mosaic Bioscience, LLC. $250,000

Mosaic is working to commercialize versatile tissue regeneration technology developed at the University of Colorado at Boulder. This technology provides a mechanism for creating a synthetic extracellular matrix that can be used to expedite natural healing and tissue regeneration processes. Mosaic's initial focus is on wound healing applications with future applications directed toward the regeneration of other tissues. The goal of the grant work is to generate the data necessary to complete a Seris A Financing that will fund clinical trials for a first wound

healing product. Grant funds will allow the company to: 1) generate preclinical safety data; 2) generate preclinical efficacy data in a human equivalent model; 3) scale-up manufacturing process for product production, and develop necessary analytical and quality control procedures; 4) generate and secure intellectual property, and 5) solicit investors. Since grant inception, Mosaic has received an additional $300,000 investment, and has added 1.5 full-time-equivalent employees.

Vision

2C Tech Corporation. $150,000

The company is creating bioengineered therapeutics for blinding diseases by developing validating, and commercializing SeeQ, a proprietary intraocular implant for stimulating degenerating retinal cells and restoring vision. The base technology was discovered at the University of Colorado. Grant work involves testing the ability of quantum dots to prevent progressive decline in the electrical activity of the retina; determining whether intraocular-delivered SeeQ particles can reverse the electrophysiologic decline in the photoreceptors; and testing the ability of the SeeQ particles to restore functional vision. They will assess the local and systemic histological changes that occur after SeeQ is injected intraocularly. The company has received an additional $150,000 investment since the start of this grant.

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.

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. $497,558

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 has established a grant system and supported 6 inter-institutional projects with funding and resources in 2011. In addition to these, C2D2 is providing medicinal chemistry resources to two other investigators, and is expanding its services on a fee basis.

Colorado Institute for Drug, Device and Diagnostic Development. $895,604

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 5 Projects, or companies, under its guidance and has fostered those to create 27 jobs (including indirect) and garnered an additional $1.5 million for these businesses.

Biofrontiers Institute at CU Boulder. $696,581
This grant supports the Biofrontiers Institute, formerly the Colorado Initiative in Molecular Biotechnology, 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. The institute is set to open in 2012.