

# Colorado

Office of Economic  
Development and  
International  
Trade

Bill Ritter, Jr., Governor  
Don Marostica, Executive Director

**HOUSE FINANCE COMMITTEE**

**SENATE FINANCE COMMITTEE**

**BIOSCIENCE DISCOVERY EVALUATION CASH FUND  
PROGRAM UPDATE**

**April 15, 2010**



**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**

State funds have been targeted to the advancement of bioscience research and the commercialization of that research in Colorado with the aim of creating new companies and quality jobs in the state over the long-run. In terms of economic development, the biosciences take longer to develop than other industries, but the long-term payoff means stronger academic and research institutions, new R&D and manufacturing companies, and high-quality jobs. The Bioscience Discovery Evaluation Grant Program has been praised for its effectiveness in leveraging a limited state investment to move promising commercial technologies to market.

The Program was initiated when HB06-1360 authorized \$2.0 million for the support of bioscience proof-of-concept research at Colorado's research institutions. In 2007, HB07-1060 provided an additional \$2.5 million dollars dedicated to the advancement of the bioscience industry with grants continuing to fund proof-of-concept research with commercial potential, and also early-stage company development for those businesses that had federal Small Business Innovation Research or Small Business Technology Transfer grants and were advancing technologies founded at qualified Colorado research institutions. The Program currently operates under rules established per HB08-1001 that provided \$5,000,000 in funding for State Fiscal year 2008-09. It continues to provide proof-of-concept grants and also supports the development of technologies that originated at qualified Colorado research institutions that are now licensed to early-stage companies, and funds new bioscience commercialization infrastructure to further support the bioscience industry throughout the state.

The Program has been successful in bridging financing gaps to move innovative biotechnologies forward. Especially since venture capital funding for early-stage biotechnologies has subsided in recent years, this state program has become more important since it supports new technologies and getting them closer to clinical studies and the next funding opportunity. Since the first grants were made in mid-to-late 2007, 92 jobs have been created, and 7 new companies have evolved. The most impressive short-term return, however, is the additional capital that has been leveraged in matching funds and the follow-on funding that further advances the subject technologies. Almost \$9,000,000 in state funds has leveraged more than \$11.1 million in matching funds. Results obtained with these project funds have brought in a reported \$19.6 million in additional grants, angel or venture capital - further strengthening Colorado's biotechnology industry.

The following tables summarize the grants and preliminary results over the life of the program in terms of jobs, companies created, follow-on capital and other measures of commercialization advancement.

Bill	Program	Grantee	Primary Investigator (if applicable)	Title	Grant	Match	Status	Jobs Created	Companies Started	Intellectual Property Development	Licenses Issued	Follow-on \$
HB06-1060	POC	Bonifis Blood Center	Ambruso	Transfusion Related Acute Lung Injury Identification Test Kit	\$ 78,275	\$ 78,275	closed	1				\$ 16,800
HB06-1060	POC	Colorado State University	Bartels	Development of a well-engineered proof of concept nonlinear imaging instrument	\$ 78,536	\$ 78,536	closed					
HB06-1060	POC	Colorado State University	Derneil/Gustafson Medford	Evaluation of lymphatic drainage and uptake following intracavitary chemotherapy administration for mammary carcinoma	\$ 61,646	\$ 61,647	closed	2				\$ 350,000
HB06-1060	POC	Colorado State University		Evaluation of photodiodes	\$ 94,000	\$ 94,098	closed	12	1			\$ 7,800,000
HB06-1060	POC	Colorado State University	Monnet	Evaluation of a dynamic external cardiac device for the treatment of functional mitral valve regurgitation	\$ 99,533	\$ 109,377	closed					
HB06-1060	POC	Colorado State University	Puttlitz	Instrumented cervical intervertebral disc space distractor	\$ 107,285	\$ 107,285	closed					
HB06-1060	POC	National Jewish Health	Born	Inhaled anti-T-cell-receptor antibodies for the treatment of airway hyper- responsiveness and inflammation	\$ 54,981	\$ 54,981	closed					
HB06-1060	POC	National Jewish Health	Day	Restoration of lung epithelial lining fluid glutathione	\$ 36,981	\$ 36,981	closed					
HB06-1060	POC	National Jewish Health	Gelfand	Intervertebral Disc Space Distractor	\$ 48,418	\$ 48,418	closed					
HB06-1060	POC	National Jewish Health	Nick	A Method for the Prevention and Treatment of Pseudomonas Biofilm Infections	\$ 34,502	\$ 34,502	closed					
HB06-1060	POC	National Jewish Health	O'Brien	Use of soluble gamma/delta T cell receptors in reducing inflammatory damage	\$ 20,986	\$ 20,986	closed					
HB06-1060	POC	University of Colorado	Anderson	Suppression of irradiation-induced salivary gland dysfunction by IGF	\$ 68,632	\$ 73,369	closed	1				\$ 1,926,022
HB06-1060	POC	University of Colorado	Bowman/Sikes	Redox-initiated Radical Chain Polymerization for the Detection and amplification of biological recognition events	\$ 92,819	\$ 99,223	closed					\$ 300,000
HB06-1060	POC	University of Colorado	Brodsky	In vivo analysis of a cardiac and skeletal muscle stem cell activator	\$ 91,832	\$ 98,169	closed					yes
HB06-1060	POC	University of Colorado	Dempsey	Moving Bryostatin-1 from the lab to the clinic for the treatment of pulmonary hypertension	\$ 58,962	\$ 63,031	closed	2				
HB06-1060	POC	University of Colorado	Duncan	Protein biomarkers to differentially diagnose follicular thyroid carcinoma and follicular thyroid adenoma	\$ 63,314	\$ 67,694	closed	2		patent filed		
HB06-1060	POC	University of Colorado	Graham	Novel biology targeted agent for the treatment of non-small cell lung cancer	\$ 91,831	\$ 98,169	closed	2				yes
HB06-1060	POC	University of Colorado	Hodges/Holmes	Validation of SARS coronavirus antibody technology of influenza virus	\$ 90,382	\$ 90,382	closed	1				
HB06-1060	POC	University of Colorado	Holt	Biomarker enabled development of PARP inhibitors for cancer therapies	\$ 78,916	\$ 84,362	closed	4	1			\$ 139,293
HB06-1060	POC	University of Colorado	Koch	New targeted drug for the treatment of lung cancer	\$ 91,349	\$ 97,651	closed	1				
HB06-1060	POC	University of Colorado	Larson	Device for laser fusion of septal tissue	\$ 46,087	\$ 49,266	closed	1	1			
HB06-1060	POC	University of Colorado	Ross	Hydroquinone anasmycins as novel anticancer Hsp90 inhibitors in pancreatic cancer	\$ 74,788	\$ 81,020	closed					
HB06-1060	POC	University of Colorado	Ross	Hydroquinone anasmycins as novel anticancer NQO1 inhibitors in pancreatic cancer	\$ 14,339	\$ 15,534	closed					
HB06-1060	POC	University of Colorado	Shapiro	Infusion of alpha-1-antitrypsin (ATT) to suppress Human Immunodeficiency Virus Type 1 (HIV) replication in patients	\$ 45,916	\$ 46,979	closed	2	1			

Bill	Program	Grantee	Principal Investigator (if applicable)	Title	Grant	Match	Status	Jobs Created	Companies Started	Intellectual Property Development	Licenses Issued	Follow-on \$
HB06-1060	POC	University of Colorado	Stevens	New treatment for ineffectively treated schizophrenia patients	\$ 91,833	\$ 98,167	closed	1				
HB06-1060	POC	University of Denver	Kutateladze	Encoding and screening of solution phase combinatorial libraries for drug candidates	\$ 80,505	\$ 107,003	closed					
HB06-1060	POC	University of Denver	Shoures	Development of a gait monitor for fall prevention	\$ 80,545	\$ 98,165	closed	3	1	patent filed		
HB06-1060	POC	University of Northern Colorado	Mackessy	a proteomics approach toward the development of drugs from toxins	\$ 52,564	\$ 53,904	closed					
HB07-1360	POC	Colorado State University	Ali	In Planta Degradation of Lignin Using Fungal Enzymes	\$ 42,455	\$ 42,455	open	1		provisional patent filed		
HB07-1360	POC	Colorado State University	Henry	Glucose/Xylose Sensor for Cellulosic Biomass Processing	\$ 17,000	\$ 17,000	closed					
HB07-1360	POC	Colorado State University	McKay	Modification of Camalinal Sativa & Development of Straight Vegetable Oil as Fuel	\$ 87,736	\$ 225,000	open					
HB07-1360	POC	University of Colorado	Gill/Medlin	Molecular Biorefining to Liquid Alkanes and Alcohols	\$ 85,771	\$ 85,771	open	2		patent filed		
HB07-1360	POC	University of Colorado	Weimer	ALD Catalytic Microchannel Reactor - Converting Biosyngas to Biofuels	\$ 86,777	\$ 86,777	open					yes
HB07-1360	POC	University of Northern Colorado	Basu	Copabla for Biodiesel	\$ 49,463	\$ 50,408	open					
HB07-1360	SBIR/ST	BlueSun, Inc.		Journey to Disaster Recovery - web-based trauma adaptation tool	\$ 90,500	\$ 208,430	open	1			yes	
HB07-1360	SBIR/ST	Colorado State University/Advanced MicroLabs, LLC		Microchip Assay for Serum Creatinine, Advanced MicroLabs, LLC	\$ 49,855	\$ 99,710	closed	1				
HB07-1360	SBIR/ST	University/Advanced MicroLabs, LLC		Rapid Determination of Homocysteine by Microchip CE-PAD	\$ 50,700	\$ 101,400	closed	1				\$ 750,000
HB07-1360	SBIR/ST	University of Colorado/Activ	Quinn	Inhalable Vaccine Delivery	\$ 49,990	\$ 99,990	closed	2				
HB07-1360	SBIR/ST	University of Colorado/Apologistic Pharmaceuticals	Bellgrau	Fasaret for Cancer Treatment	\$ 100,000	\$ 674,771	closed					\$ 995,000
HB07-1360	SBIR/ST	University of Colorado/Endoshape	Shandas	Shape memory Polymer TCD Device	\$ 49,500	\$ 134,750	closed	3				\$ 500,000
HB07-1360	SBIR/ST	University of Colorado/Locomotion	Kram	Leg Swing Assist Device	\$ 50,000	\$ 100,000	closed	1				
HB07-1360	SBIR/ST	University of Colorado/Quest Product Development	VonOhlsen	Micro-Flex Surgical Device	\$ 68,980	\$ 151,355	closed	1				\$ 34,003
HB07-1360	SBIR/ST	University of Colorado/Sundrop Fuels	Perkins	Hydrogen Production from Biomass	\$ 62,285	\$ 150,000	closed					
HB07-1360	SBIR/ST	University of Colorado/Sundrop Fuels	Perkins	Syngas Production from Biomass	\$ 75,000	\$ 150,000	closed	17	1			\$ 5,000,000
HB07-1360	SBIR/ST	University of Colorado/Tissue Genetics	Holt	BRCA 2 Breast Cancer Marker	\$ 80,839	\$ 161,678	closed	5				
HB07-1360	SBIR/ST	University of Colorado/Tissue Genetics	Holt	BRCA 2 ovarian Cancer Marker	\$ 27,424	\$ 54,849	closed					
HB08-1001	ESC	Advanced MicroLabs, LLC		Portable perchlorate field analysis device for water supply	\$ 120,837	\$ 120,837	open	1		provisional patent filed		\$ 65,562
HB08-1001	ESC	Apologistic Pharmaceuticals, Inc.		Develop cancer drug - Breceptin	\$ 150,000	\$ 384,430	closed	2				
HB08-1001	ESC	BioAMPS International		Broad spectrum antimicrobial peptide to circumvent bacterial resistance to conventional antibiotic therapy	\$ 100,000	\$ 100,000	open					

Bill	Program	Grantee	Primary Investigator (if applicable)	Title	Grant	Match	Status	Jobs Created	Companies Started	Intellectual Property Development	Licenses Issued	Follow-on \$
HB08-1001	ESC	EndoShape, Inc.		Development of a new generation abdominal aortic aneurysm endograft and related cardiovascular devices	\$ 200,500	\$ 332,203	open	1				
HB08-1001	ESC	HepQuant, LLC		Development of a diagnostic test for hepatic portal circulation to enhance safety and accuracy in assessing liver function	\$ 99,950	\$ 99,950	open					
HB08-1001	ESC	Hibera Corporation		Development of drugs to enhance function on patients with cardiac enlargement	\$ 247,500	\$ 247,500	open	2				
HB08-1001	ESC	Illumasonix, LLC		Ultrasound technique to measure blood flow velocity characteristics for treatment of atherosclerosis and stroke	\$ 248,763	\$ 248,763	open					
HB08-1001	ESC	InDevR, Inc.		Low-density microarray for rapid identification of pathogens in a field portable diagnostic platform. Applications in food safety tests and viruses causing respiratory disease	\$ 99,500	\$ 323,173	open	1				
HB08-1001	ESC	KromaTID Inc.		Developing chromosome analysis products for clinical diagnostics, biomedical research, and biodosimetry	\$ 20,000	\$ 20,000	open	1				
HB08-1001	ESC	MicroPhage, Incorporated		Phage amplification technology for nasal swab sample MRSA screening	\$ 100,000	\$ 100,000	open					\$ 1,530,000
HB08-1001	ESC	Qgenta Inc.		Development of lead compounds for indolequinone classes to pinpoint promising molecules for pancreatic cancer treatment	\$ 150,000	\$ 150,000	open					
HB08-1001	ESC	ValveXchange, Inc.		Implantable heart valve technology with minimally invasive surgery for the replacement of leaflet sets	\$ 250,000	\$ 250,000	open					
HB08-1001	INFR	Colorado Institute for Drug, Device and Diagnostic Development		Technology & Company Commercialization	\$ 1,150,000	\$ 1,150,000	open	2				
HB08-1001	INFR	University of Colorado -CO Initiative in Molecular Biology		Research and education facility linking basic sciences, engineering, clinical practice and industry	\$ 1,400,000	\$ 1,400,000	open					
HB08-1001	POC	Colorado School of Mines	Boyes/Rowe	Nanoscale theragnostic device for cancer research and treatment	\$ 65,000	\$ 65,000	open					
HB08-1001	POC	Colorado School of Mines	Marr/Squier	Microfluidic/optical automated hematology platform for red blood cell, platelet, and differential detection of white blood cell subtypes	\$ 43,490	\$ 58,424	open					
HB08-1001	POC	Colorado State University	Byrne/Zheng	Overcoming the bottleneck of oilseed crop development for biofuels through mutagenesis and interspecies crosses	\$ 6,150	\$ 6,150	open					
HB08-1001	POC	Colorado State University	Duval	Generation of caninized monoclonal antibodies for cancer treatment	\$ 46,444	\$ 46,444	open	1		provisional patent filed		
HB08-1001	POC	Colorado State University	James	Drug eluting osseointegrative coatings for reconstruction implants	\$ 52,822	\$ 52,822	open			2 provisional patents filed		
HB08-1001	POC	Colorado State University	Lapitan/Brummer	Evaluation of Miscanthus as a Bioenergy Crop in Colorado and Development of Genetic Resource	\$ 6,150	\$ 6,150	open	1				
HB08-1001	POC	Colorado State University	Lear/Slaydon	Miniature silicon immunosensor for tuberculosis disease state analysis	\$ 51,035	\$ 51,035	open					
HB08-1001	POC	Colorado State University	Lear/Thamm	Microfluidic cytometry for detecting circulating cancer cells in biofluids	\$ 53,936	\$ 65,696	open			provisional patent filed		
HB08-1001	POC	Colorado State University	Orton	Solid-Phase Tissue Electrophoresis for Bioscaffold Decellularization	\$ 31,573	\$ 40,467	open			provisional patent filed	yes	\$ 36,527

Bill	Program	Grantee	Primary Investigator (if applicable)	Title	Grant	Match	Status	Jobs Created	Companies Started	Intellectual Property Development	Licenses Issued	Follow-on \$
HB08-1001	POC	Colorado State University	Popat	Multifunctional nanostructured interfaces for orthopedic implants	\$ 57,000	\$ 57,000	open					
HB08-1001	POC	Colorado State University	Ray	Validate a new oligonucleotide probe labeling strategy	\$ 44,000	\$ 44,000	open	1				
HB08-1001	POC	National Jewish Health	Cambier	Anti-CD79 antibody as a novel approach to therapy in autoimmune disease	\$ 41,781	\$ 41,781	open	1			non-exclusive license to collaborating firm	
HB08-1001	POC	National Jewish Health	Reisdorph	Validation and optimization of leukotriene E4 (LTE4) assay for asthma diagnosis and therapy	\$ 34,386	\$ 34,386	open					
HB08-1001	POC	National Jewish Health	Saavedra	A method to track cystic fibrosis inflammation from whole blood	\$ 32,118	\$ 32,118	open	1				
HB08-1001	POC	National Jewish Health	Voelker	Suppression of respiratory syncytial virus (RSV) infection by pulmonary surfactant phospholipids	\$ 48,465	\$ 48,465	open	1				
HB08-1001	POC	University of Colorado	Bayer	Development of an investigational new drug for therapy of stroke, global cerebral ischemia, and traumatic brain injury	\$ 79,108	\$ 79,108	open					
HB08-1001	POC	University of Colorado	Duncan/Elias/Byers	A multiplexed panel of protein biomarkers for the early detection of breast cancer	\$ 44,210	\$ 44,210	open					
HB08-1001	POC	University of Colorado	Ford/Zhao	Targeting the Six1/Eya transcriptional complex for anti-breast cancer drug design	\$ 91,742	\$ 91,742	open					yes
HB08-1001	POC	University of Colorado	Gibson/Lai	A microfluidic cell sorter integrated with Coherent anti-Stokes Raman Spectroscopy for medical diagnostics	\$ 91,983	\$ 91,983	open	2		patent filed		
HB08-1001	POC	University of Colorado/CIMB	Schwartz	Liquid Crystal Read-out for DNA Microarrays	\$ 45,000	\$ 45,000	open	1				
HB08-1001	POC	University of Colorado/CIMB	Scott	Photodegradable shape memory polymers	\$ 35,000	\$ 35,000	open					
HB08-1001	POC	University of Colorado	Shandas	Shape Memory Polymer-Based Prosthetic Venous Valves	\$ 46,000	\$ 46,000	open	2				
HB08-1001	POC	University of Colorado	Tan	Multilayer Bionanocomposite Vascular Graft: Early and Long-term Access for Dialysis Patients	\$ 68,688	\$ 68,688	open			patent filed		
HB08-1001	POC	University of Colorado	Watkins	A unique approach for treating chronic pain & increasing the clinical efficacy of opioid analgesics	\$ 100,000	\$ 100,000	open					
HB08-1001	POC	University of Colorado/CIMB	Ahn	Pharmacophore Optimization for Targeted Therapeutics	\$ 121,500	\$ 121,500	open	2				
HB08-1001	POC	University of Colorado/CIMB	Olwin	Stem Cell Repair of Skeletal Muscle	\$ 97,129	\$ 97,129	open	2	1			
HB08-1001	POC	University of Denver	Shoureshi	Non-Invasive brain imaging technology that correlates neural activity to functions of muscle groups in limbs for prostheses	\$ 71,000	\$ 71,000	open			patent filed		\$ 200,000
			87	PROGRAM TOTAL	\$ 8,896,792	\$ 11,109,661		92	7			\$ 19,643,207

## **Narrative – Project Summaries**

As required by the statutes, following are recipients, awards and descriptions of grants made under the Program in calendar 2009. Projects are grouped according to the focus of the research or technology. Program funding supports biotechnology developments with applications in improving human health, agriculture improvements, and biofuels developments. In 2009, the Program funded new developments in the treatment of autoimmune disease, and portable tests for water pollutants and food contaminants. Colorado researchers continue to advance the detection and treatment of lung and heart disease and cancers.

Forty-eight grants were executed in the calendar year, accounting for more than \$6 million in program funds. 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.

### **Atherosclerosis**

Illumasonix, LLC. \$248,763

Grant period: 6/26/2009 – 12/31/2010

Illumasonix is developing a novel ultrasound technique, called Echo PIV, to measure blood flow velocity characteristics in the carotid artery and elsewhere in the vasculature. Clear images of arterial hemodynamics will help reduce the cost of treating atherosclerosis and stroke by aiding in the early identification and characterization of plaque and plaque build-up. The company has used grant funds to develop protocols for clinical studies in the U.S. and U.K. They have worked out regulatory approvals, and will be working on technical improvements and market approval.

### **Autoimmune Disease**

National Jewish Health - Primary Investigator (PI) Cambier. \$41,781

Grant period: 8/04/2009 – 12/31/2010

The goal of this grant project is to develop and advance to human proof the concept that fragments of anti-CD79a/b mAbs (a BCR gene antibody) can prevent and/or reverse autoimmunity in a variety of models. Ultimately, this could improve treatment for autoimmune diseases and transplant outcomes. To-date, progress is being made against the goals, and a nonexclusive license has been issued to a company collaborating on the study.

Colorado School of Mines – PI Marr. \$43,490

Grant period: 5/12/2009 – 5/31/2010

The goal of this project is to develop a low cost hand-held device that distinguishes cells by optical methods, without the use of labeling reagents. This will be a microfluidic/optical automated hematology platform for red blood cell, platelet, and differential detection of white blood cell subtypes. The device will be initially targeted at screening for infectious and autoimmune diseases. Such a device will require only a minimal blood sample by employing cellular mechanical deformability as a cell type marker. The researchers have been successful to-date and are continue to test their method.



### **Biofuels**

Colorado State University – PI, Lapitan. \$6,150

Grant period: 8/04/2009 – 6/30/2011

Under this project *Miscanthus* and *M. sinensis* are being evaluated for agronomic performance in Colorado, and genetic resources to facilitate breeding and cloning are being developed for *M. sinensis* as a biomass resource for fuel. Tests and the identification of DNA markers are moving along. Field tests and further identification of DNA markers are planned. Private industry has shown interest in collaborating on this work, and the researchers have applied for federal grant funds to continue development. One full-time-equivalent position has been created.

Colorado State University – PI, McKay. \$87,736

Grant period: 5/15/2009 – 12/31/2010

The purpose of this grant is to conduct an integrated study of straight vegetable oil feasibility, from oilseed breeding to the assessment of oil performance in a diesel engine. To date, selected lines of camelina and brassica have been evaluated for use. Researchers will test this in the field and later in engines.

Colorado State University – PI, Byrne. \$6,150

Grant period: 8/04/2009 – 6/30/2010

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. Researchers have been growing and evaluating strains of the plant.

### **Brain Injury**

University of Colorado – PI, Bayer. \$79,108

Grant period: 8/24/2009 – 2/28/2011

This project is focused on minimizing off-target effects of tatCN21 and conducting basic toxicology/safety pharmacology for the compound as a treatment for glutamate excito-toxicity and conditions of acute brain damage. These steps will prepare a basis for completing pre-clinical studies required for filing Investigational New Drug (IND) applications with the FDA. This effort could lead to the development of an investigational new drug for therapy of stroke, global cerebral ischemia, and traumatic brain injury. The researchers have made significant progress in maximizing the potency of tatCN21 and minimizing its off-target effects, and will continue efforts in these areas.

### **Cancer**

Colorado State University – PI, Duval. \$46,444

Grant period: 8/04/2009 – 6/30/2010

The goal of this grant is to develop strategies for “caninizing” monoclonal antibodies developed in mice for use in the treatment of canine cancers, and the study of human cancers. The ultimate goal is to develop a caninized antibody targeting the canine insulin-like growth factor (IGF)-1 receptor. The IGF-1 receptor is over-expressed in a variety of human and canine cancers and stimulation of these receptors can contribute to cellular proliferation, invasion, resistance to apoptotic pathways, as well as promoting tumor angiogenesis. The researchers are making progress and have filed a provisional patent for the technology.

Colorado State University – PI, Lear & Thamm. \$53,936

Grant period: 8/04/2009 – 12/31/2010

This proposal furthers the development of a diagnostic technique, optofluidic intracavity spectroscopy (OFIS), for the detection of individual cancer cells in biofluids to permit early cancer detection. This technique relies on spectral analysis which looks for enlargement and increased protein density of the nucleus in cells as a sign of cancer. Work is underway to optimize the experimental apparatus and to collect samples. A new provisional patent has been filed on results on the work. Researchers have discussed working with a Colorado company to commercialize the technology.

Colorado State University - PI, Ray. \$44,000

Grant period: 8/4/2009 – 6/30/2010

The work under this project will further develop fluorescently-labeled probes used to identify specific recurrent point mutations in cancer cells on a cell-to-cell basis. Adapting this technology to high throughput flow cytometry may allow early cancer diagnostic assays to be developed. Research to date has led the team to turn to an alternative technique to improve quantification of identified cells.

Colorado School of Mines - PI, Boyes & Rowe. \$65,000

Grant period: 5/12/2009 - 5/31/2010

This project proposes to develop a nanoscale theragnostic device based on gadolinium nanoparticles which have been surface modified with multifunctional polymers to increase the loading capacity of therapeutics and molecular targeting agents. The proposed platform technology would support the incorporation of new therapeutics, targeting ligands, or commercially available therapeutic products. The device will increase the efficacy per dose and the targeted selectivity of a drug, while providing multimodal imaging and targeting capabilities, bringing major improvements to cancer research and treatment. Researchers are making progress towards pre-clinical studies.

ApopLogic Pharmaceuticals, Inc. \$150,000

Grant period: 10/19/2009 – 3/31/2010

This Grant is focused on advancing a biopharmaceutical product - that was invented at the University of Colorado and that treats cancer - to the point of acceptance as an Investigational New Drug application with the U.S. Food and Drug Administration in order to initiate a human clinical trial. Breceptin is a dimerized peptide-based drug that specifically targets cancers that over-express the bradykinin B2 receptor (BKB2R) and that use bradykinin (BK) as a growth factor. Under the grant, Breceptin was manufactured under non-Good Manufacturing Practice conditions in support of filing an Investigation New Drug application with the FDA. A clinical operations plan was developed, and a comprehensive business plan was developed which has assisted the firm in presenting to investors.

### Breast

University of Colorado – PI, Duncan. \$44,210

Grant period: 8/24/2009 – 8/31/2010

The project aims to develop a clinical assay that will provide sufficient diagnostic power to correctly identify breast cancer based on identifying biomarkers in the analysis of a single blood sample from the patient. The benefits will be reduced cost and improved diagnosis. The ultimate goal is to deliver a panel of biomarkers that offers high sensitivity and specificity in the early detection of breast cancer. Researchers are accruing samples on control and breast cancer subjects, biomarker candidates are being studied. Plans are to gain a larger sample base by collaborating with others.

University of Colorado – PI, Ford. \$92,500

Grant period: 8/24/2009 – 2/28/2011

The goal of this project is to develop novel, tumor-specific chemotherapeutic agents for breast cancer by targeting the Eya2 phosphatase (this enzyme is a member of the Six1 transcriptional complex). Studies have demonstrated that Six1 induces tumorigenesis and metastasis in sites relevant to human breast cancer. Targeting the Six1 transcriptional complex offers significant advancement to standard chemotherapy for breast cancer treatment, as it targets a gene that is not needed for normal function in adult breast tissue, yet promotes metastasis, meanwhile it avoids the destruction of all dividing cells which occurs in standard chemotherapy. Researchers have made progress in elucidating the role of Eya in Six1-mediated tumorigenesis and metastasis. They have also developed a fluorescence-based photphatase assay using a small molecule substrate. This development has allowed them to identify and confirm three preliminary inhibitors of Eya's phosphatase activity. The work has gained additional funding in the form of a NIH grant.

#### Pancreatic

QGenta Inc. \$150,000

12/13/2009 – 08/03/2011

This project is focused on developing lead compounds (indolequinones) that when targeted at the thioredoxin/thioredoxin reductase system will inhibit cell growth, induce cell death, and block angiogenesis. The primary focus is pancreatic cancer, but the compounds also hold promise for treating colon, melanoma and renal cancers. With grant funds the compounds will be formulated, tested, and information for an Investigational New Drug Application with the FDA will be prepared. Also, researchers will investigate the toxicity profile of lead indolequinones, and the activity of lead molecules in non-pancreatic tumors. Market analysis for the molecules will be developed and incorporated into the QGenta business plan.

#### Cardiac Function

Colorado State University – PI, Orton. \$31,573

Grant period: 8/04/2009 – 6/30/2010

This project aims to develop biocompatible scaffolds upon which engineered replacement tissue constructs can be built. The specific interest is the development of a living tissue-engineered heart valve replacement with the ability to regenerate and repair itself. Testing of valves treated by tissue-gel electrophoresis is underway. A provisional patent has been filed on the technology. The research has been licensed to and has received additional funding from a Colorado company.

ValveXchange, Inc. \$250,000

Grant period: 12/21/2009 – 1/31/2011

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. With grant funds the device will be designed, prototyped and demonstrated and business development activities will be carried out. 3D CAD modeling has been started as has been an update of the business plan.

Hiberna Corporation. \$247,500

Grant period: 05/15/2009 – 05/31/2011

The purpose of this grant is to support this early-stage company in advancing the treatment of heart failure by restoring heart function. Grantee will work to develop new drugs that enhance function in patients with cardiac enlargement (hypertrophy) drawing on knowledge gained about cardiac growth in pythons. To date, identified compounds have been tested in mammalian experimental systems and

show several beneficial protective measures. Researchers will be working to validate research compounds in appropriate whole animal models. The company is pursuing several new sources of funding.

University of Colorado - PI, Shandas. \$46,000

Grant period: 8/24/2009 – 8/31/2010

This project aims to use the latest research in prosthetic heart valves and shape memory polymers to develop a next generation, minimally invasive solution to the problem of venous valve incompetence. This condition can be caused by a variety of factors related to aging, diabetes and hypertension, including deep vein thrombosis. Current treatments are either not fully effective or highly invasive. The objective is to create a gently self-expanding conduit that contains the valve without the risk of dissecting through the fragile vein, the ability of the conduit to conform to the typically large changes in vein size and shape that occur due to leg movement, the need for a fully hemocompatible valve material that will not clot even in the presence of low blood flows, and the ability to deliver the valve using small catheters. To date, researchers have discovered the best combination of mechanical fixation and biological glue to produce the best tear-resistance between SMP and venous valve tissue. Polymer material characteristics have been refined using finite element analysis software. Prototype SMP stents and stent-valves have been developed for testing.

EndoShape, Inc. \$200,500

Grant period: 7/07/2009 – 6/30/2010

This grant supports the development of a new generation abdominal aortic aneurism (AAA) endograft and related cardiovascular devices, based upon a unique shape memory polymer (SMP) framework that will improve efficacy as compared to current AAA endografts, be less invasive, increasing safety and reducing costs. AAA's are balloon-shaped bulges found in the wall of the large blood vessel leading from the heart to the lower body. They are both common and lethal in older people, affecting an estimated 2 million Americans with some 200,000 new cases identified each year. The company is refining the endograft and has started developing a new related product from their learning. They have advanced their business plan and manufacturing model, and formulated a cost of goods sold model for the end-product.

### **Chronic Pain**

University of Colorado – PI, Watkins. \$100,000

Grant period: 9/04/2009 – 2/28/2011

This grant supports a unique approach for treating chronic pain & increasing the clinical efficacy of opioid analgesics. Under this project a lead compound for the treatment of chronic pain will be optimized. Opioids are used in treatment, but fail to help 60-80% of patients; while opioids target neurons, the researchers have discovered that non-neuronal cells, called “glia”, are critical in both chronic pain and decreasing opioid pain control. They have proven that attenuating glial activation in animal models resolves chronic pain, enhances opioid analgesia, delays the development of opioid tolerance, suppresses the development of opioid dependence, suppresses opioid reward linked to drug abuse, and suppresses other negative side effects such as respiratory depression, the cause of death with opioid overdose. The research team has discovered a receptor, TLR4, which can be targeted by compounds that can selectively block the glial activation receptor, and have no effect on neurons. The compound of choice is naloxone. This will allow for the development of targeted and effective drugs for chronic pain. The team is making progress in designing, synthesizing and purifying a series of naloxone analogs. The next steps are to identify the most efficacious compounds and study those in animal models.

### **Diagnostics – General Medical**

University of Colorado – PI, Gibson & Lei. \$91,742

Grant period: 08/24/2009 – 8/31/2011

The goal of this project is to develop a novel high-throughput cell sorter based upon microfluidics technology and nonlinear optical spectroscopy. The specific nonlinear optical spectroscopy technology planned for incorporation is Coherent anti-stokes Raman spectroscopy (CARS). The device will improve upon existing commercial flow cytometers used for blood analysis and diagnostics by adding 1) microfluidics which allow for miniaturization, reducing sample volume and cost, and 2) nonlinear optical spectroscopy to provide real-time, nonperturbative measurements on biological samples with chemical specificity, providing more information, and eliminating the need for fluorescent labeling. This device has commercial potential in clinical diagnostics and as a commercial research laboratory instrument. To date, researchers have successfully built and optimized the microfluidic cell sorter platform. Planned next steps include blood sample measurements.

University of Colorado – PI, Schwartz. \$45,000

Grant period: 8/24/2009 – 4/30/2011

The objective of this project is to develop an industrial-quality prototype of a DNA microarray device using liquid crystals that respond to DNA hybridization and the transmission of polarized light to detect the liquid crystal response. The device will be compatible with industry-standard spotting/printing methods and capable of multiplexed analysis of multiple unlabeled genetic targets at femtomole sensitivity and single-base mismatch specificity. This will improve on the current commercial approach to DNA microarrays, used for molecular medical diagnostics, addressing quantitation and reproducibility, time and cost issues. To date, a researcher has been hired and has started to develop the platform.

KromaTiD, Inc. \$20,000

Grant period: 12/08/2009 – 12/31/2010

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. The company is organizing its scientific and business advisory boards.

MicroPhage Inc. \$100,000

Grant period: 12/3/2009 – 7/31/2010

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 methicillin-resistant *Staphylococcus aureus* (MRSA) screening. Key aspects of the formula and sampling process have been optimized, and a key round of clinical studies has been completed to date. The company has secured \$1.5 million from angel investors to advance the subject technology.

### **Drug Development - General**

University of Colorado – PI, Ahn. \$121,500

Grant period: 9/04/2009 – 3/31/2011

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. Specifically, work will be done to identify and optimize pharmacophores for three drug leads for indications in: 1) radiation sensitization; 2) anti-tumor agents; and 3) pain treatment. Progress is being made in each effort.

### **Food Safety**

InDevR, Inc. \$99,500

Grant period: 8/18/2009 – 7/30/2010

This grant supports the commercialization of a new detection technology (ampliPhox™) for low-density microarrays that enables inexpensive and rapid identification of pathogens in a robust and field portable diagnostic platform. The products, specifically the ampliPhox™ reagent kits and associated equipment (e.g., the ampliPHOX Reader™), will be launched for food safety testing or the identification of viruses that cause respiratory diseases. The company has made progress in developing its sales, marketing, and manufacturing systems.

### **Kidney Function**

University of Colorado - PI, Tan. \$68,688

Grant period: 8/24/2009 – 11/30/2010

The project objective is to develop multilayer bionanocomposite material, as an enabling technology, to construct early and long-term vascular access for hemodialysis patients. This objective provides an advancement to expanded polytetrafluoroethylene (ePTFE) arteriovenous (A/V) grafts which are the norm for hemodialysis patients. The drawbacks of ePTFE are a long period for sufficient tissue in-growth of the implant and a high long-term failure rate of the graft (50% fail in 1 year). The proposed graft device has novel multilayer configuration as well as novel material composition and nanostructure. The design is characterized with a multi-tubular structure with a core made from collagen-chitosan nanocomposite and a shell made from fibroin-PCL nanocomposite. The shell provides high strength, ensures low permeability and long-term remodeling signals, while the core provides a blood-compatible and cell-adhesive surface for easy implantation. All the materials are biocompatible and biodegradable. The eventual goal of the device is that cells in vivo will replace graft material over time, and form natural vessels – meaning there will be no need for graft replacement. The multilayer bionanocomposite platform, offers the potential for realizing an easy, long-term grafting platform. Scientists have made progress in optimizing material design and function, and are setting up testing platforms.

### **Liver Function**

HepQuant, LLC. \$99,950

Grant period: 9/30/2009 – 9/30/2010

This grant supports the further development of a new and unique diagnostic test for hepatic portal circulation, thus enhancing safety and accuracy in assessing liver function. It contemplates the funding of Grantee toward clinical trials and FDA approval. To-date, grantee is working to establish supply chain partners. They have identified laboratory space and are securing a patent. They have made progress in marketing the firm as well.

### **Lung Disease**

National Jewish Health – PI, Saavedra. \$32,118

Grant period: 8/04/2009 – 2/28/2011

The goal of this project is to see if TLR2 protein measurements from whole blood may serve as a surrogate for lung inflammation in cystic fibrosis patients. Ultimately, this technology could lead to a novel diagnostic blood assay which would assess lung disease progression or response to therapies in cystic fibrosis patients. A novel assay has been developed and the TLR2 protein is being quantified in currently enrolled patients.

Colorado State University – PI, Lear & Slaydon. \$51,035

Grant period: 8/4/2009 – 12/31/2010

Under this project a biosensor chip is being developed to investigate applications to tuberculosis diagnosis. Researchers are optimizing the sensor chip, and will fabricate them and integrate with microfluidic channels as the next step.

National Jewish Health – PI, Voelker. \$48,465

Grant period: 08/04/2009 – 9/30/2010

The goal of this grant project is to test the efficacy of pulmonary surfactant phospholipids at preventing respiratory syncytial virus (RSV) infection, and alleviating the severity of the disease after infection by the virus. Ultimately, this technology could lead to the development of a treatment for RSV infection and a new therapeutic method. The technology could also potentially be applied to other viruses. Palmitoyl-oleoyl-phosphatidylglycerol (POPG) has been shown effective in the treatment of RSV infection. The researchers are now focusing on the timing of POPG treatment for the prevention of viral infection and delivery mechanisms. One new job has been created, and the technology is being marketed.

National Jewish Health – PI, Reisdorph/Rabinovich. \$34,386

Grant period: 08/04/2009 - 9/30/2010

The goal of this grant project is to determine if the molecule leukotriene E4 (LTE4) or LTE4/FENO can be used as a biomarker to identify likely responders to leukotriene modifying medications and to predict disease worsening. Ultimately, this technology could lead to the development of a diagnostic test to identify asthma patients likely to respond to leukotriene modifiers. Work is progressing, with some instrument difficulties, the project will take longer than originally planned. A Colorado company has shown interest in licensing the technology.

### **Musculoskeletal**

University of Denver – PI, Shoureshi. \$71,000

Grant period: 22/12/2009 – 12/31/2010

This project will further develop a hybrid, non-invasive sensory and control system (the Brain Imager) that integrates Functional Near Infrared imaging, with electromyography (EMG) and electroencephalography (EEG) of the motor cortex to develop a non-invasive brain imaging technology that correlates neural activity to functions of muscle groups in limbs. To date, the Brain Imager has been tested on subjects showing its ability to detect muscle activity. More advanced data analysis should discern the activity being performed. The PI has earned additional grant funding and a patent application has been submitted.

University of Colorado – PI, Olwin. \$97,129

Grant period: 08/21/2009 – 2/28/2011

This project is directed at developing a successful therapy (as none exists today) for replacing pathological loss of muscle function. Specifically, in this project, the researchers will provide proof of principle that human muscle stem cells are capable of repairing skeletal muscle tissue to ameliorate muscular dystrophy in the mouse and to demonstrate in a larger mammal - the dystrophic golden retriever - that muscle stem cell engraftment can restore dystrophin expression and improve muscle function in the hind-limb skeletal muscles. The research team has identified a new stem cell marker believed to be associated with self-renewing stem cells in the mouse, and are testing this ability.

Colorado State University - PI, James. \$52,822

Grant period: 08/04/2009 – 6/30/2010

The objective of this grant project is to develop new phospholipid (phosphatidylserine) and calcium coating systems for metallic orthopedic implants that will enhance bone integration into the implant and locally deliver antibiotics or chemotherapeutics. The proposed approach contemplates a two-layer application of specialized, novel biomaterials that are known to aid in bone healing and localized drug delivery. The proposed thin layer hydroxyapatite (i.e., bone mineral) coatings are durable and provide enhanced bone integration. A new drug-encapsulating layer will accelerate bone healing and can deliver antibiotics or chemotherapy drugs (e.g. after tumor resection) to the local implant site. The research methodologies optimize the coating technologies and assess their initial performance in an animal model. To-date researchers have developed an effective means of coating the implants and filed a provisional patent on the coatings process. Drug elution and cytotoxicity studies are underway.

Colorado State University - PI, Popat. \$57,000

Grant period: 8/4/2009 – 6/30/2011

This project aims to improve orthopedic implants by improving the tissue-material interface for better integration of the implant while allowing for the delivery of drugs at the site of implantation. The investigators have fabricated highly uniform tantalum nanotube films of controllable size, feature geometry, mechanical integrity and uniformity. They have also determined the effect of nanostructured surface morphology (pore size and density, aspect ratio) on the behavior of primary osteoblasts. They will next investigate further biological interactions, as well as, evaluate the drug eluting properties of tantalum nanotube arrays.

### **Psychology**

BlueSun Inc. \$90,500

Grant period: 6/12/2009 – 5/31/2010

The goal of this grant project is to develop the commercial potential for a web-based human adaptation tool for people who have experienced trauma. The tool is based on social cognitive theory, and the underlying biological processing of the experience that occurs within the human being. To date, the company has built up operations and developed a marketing plan and has been demonstrating a commercially viable version of the website tool. The company issued a license on their technology and has been awarded 2 additional grants.

### **Reproduction**

University of Colorado – PI, Scott. \$35,000

Grant period: 8/24/2009 – 2/28/2011

The goal of this proposal is to develop photodegradable shape memory polymer (SMP) materials suitable for a reversible trans-cervical sterilization device (TCD). Researchers are making progress on the aims, and are realizing new market needs in the area and exploring those as well.



### **Water Quality**

Advanced MicroLabs, LLC. \$120,837

Grant period: 6/18/2009 – 6/30/2010

The goal of this grant is to develop a portable perchlorate field analysis device for water supply. Perchlorate has been identified as a human health hazard and is currently regulated in two states. The core technology involves the incorporation of microwires into disposable microchips for electrochemical analysis. Under the grant, a Freedom to Operate assessment has been completed, a provisional patent has been filed, a preliminary regulatory roadmap has been created along with other business development activities. The company has engaged in talks with industrial partners and won additional grant funding from the NIH.

### **Commercialization Infrastructure**

Colorado Institute for Drug, Device and Diagnostic Development. \$1,150,000

Grant period: 12/13/2009 – 12/31/2010

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. As a new organization, operations are being established. A first technology solicitation drew 22 applicants.

Colorado Initiative in Molecular Biotechnology at CU Boulder. \$1,400,000

Grant period: 12/23/2009 – 12/31/2010

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 be applied to equipment, resources and personnel costs of the Integrated Novel Therapeutic Discovery Center (INTDC), and to support architectural, engineering, construction services and equipment costs of the Vivarium Expansion. Staff has begun ordering equipment for the INTDC.

