Agricultural Biotechnology

Title: SBIR Phase II: Atlantic Cod Nodavirus Vaccine

Award Number: 0724041
Program Manager: F.C. Thomas Allnutt

Start Date: July 15, 2007
Expires: June 30, 2009
Total Amount: $499,393

Investigator: Eric Anderson, mainebiotek@hotmail.com
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Abstract:

This Small Business Innovation Research (SBIR) Phase II project of develops a recombinant vaccine for the prevention of nodavirus disease of cultured Atlantic cod, fisheries of growing importanct to New England and Atlantic Canada. The recombinant technology used to build the vaccine is economical, safe and results in a potent and efficacious product that improves cod health. The research addresses recombinant antigen synthesis, formulation, safety, potency and efficacy. After translational development, manufacturing and regulatory approval, the vaccine will be available to cod producers for the prevention of nodavirus disease.

The broader impacts of this research will be to enable more facile development of the nascent cod aquaculture industry in respect to methods of viral disease control through vaccination. This is in concert with the desire of the nation to increase aquacultural production significantly by 2020 without impacting the ocean environment negatively.

Title: SBIR Phase II: Device for In-ovo Targeting and Delivery to the Early Chicken Embryo

Award Number: 0522040
Program Manager: George B. Vermont

Start Date: September 1, 2005
Expires: August 31, 2007
Total Amount: $494,265

Investigator: Phillip Rybarczyk, prybarczyk@embrex.com
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Abstract:

This Small Business Innovation Research (SBIR) Phase II project integrates the imaging system developed in Phase I with a smart-sensor injection system that can inject or sample from the cavity underlying the early chicken embryo with high levels of accuracy accompanied with improved hatch when compared to manual methods. The Phase I work showed that it was possible to image and detect the blastoderm in the presence of a biological membrane with high levels of accuracy (94%). The Phase II project will focus on the technology required to build an injection system using smart sensors that can detect and then move to the fluid cavity to inject (or to sample). The system will thus provide a totally automated solution to early embryo detection and manipulation, with movement in all three dimensions, while still sustaining hatchability of the developing chicken. This research would advance the state of the art for the production of chimeric chickens with superior traits or for producing transgenic chickens for the avian pharmaceutical industry.

The commercial application of this technology is in two large, important industries. In the commercial poultry industry, chimeric chickens could be created in a high-throughput system that possess desired traits like disease resistance (for example, to diseases such as Marek's, Newcastle and Coccidiosis), increased tolerance to stress, and the ability to digest certain feed compounds such as phosphates. Secondly, in the avian pharmaceutical industry, therapeutic proteins used for manufacturing drugs could be created much more cheaply by using a transgenic chicken that can produce transgenic proteins in its eggs. Many therapeutics for diseases like cancer and leukemia are manufactured in mammalian or bacterial systems that face bottlenecks in supply and are extremely expensive to produce. The proposed device advances the state-of-the-art in early embryo injection beyond the limits of the manual method so as to allow a faster, more accurate way of producing transgenic chickens and proteins.

Title: SBIR Phase II: Developing Crop Plants with Wide-Spectrum Disease Resistance

Award Number: 0450162
Program Manager: George B. Vermont

Start Date: September 1, 2005
Expires: August 31, 2007
Total Amount: $462,138

Investigator: Karen Century, kcentury@MendelBio.com
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Abstract:

This Small Business Innovation Research (SBIR) Phase II project focuses on developing genetically engineered, broad -spectrum disease resistance in plants. An Aribdopsis transcription factor, TDR1, has been identified that causes resistance to three pathogens when overexpressed in transgenic plants. However, constitutive expression of TDR1 or any of three related genes causes growth retardation. Phase I research demonstrated that using tissue specific or inducible promoters to drive the TDR1 genes confers resistance with reduced side-effects. The research objectives of the Phase II project are to test the limits of TDR technology by assaying a broad range of pathogens, optimize the TDR phenotype by mutagenesis, demonstrate TDR function in a crop plant (tomato), and use microarray analysis to correlate gene expression patterns with specific pathogen resistance spectra in Arabidopsis. The results will establish the commercial utility of TDR technology.

The commercial application of this research will be to engineer wide-spectrum disease resistance in crops such as soybean and maize. Chemically based disease management is expensive, harmful to people and the environment, and not always effective. Breeding has long been used for developing resistant cultivars, but the gene pool is limited by reproductive barriers, the technique is slow, and the resistance is generally narrow in scope and often not durable. There clearly is a market for genetically-engineered, durable disease resistance. The main societal benefit of this project is expected to be a decrease in the use of toxic fungicides, which will positively impact the environment and human health.

Title: SBIR Phase II: Quantitative Detection of Bacterial Pathogens in Seeds by Use of a Novel Enrichment Technique Coupled with Automated Real-Time PCR

Award Number: 0450649
Program Manager: George B. Vermont

Start Date: May 1, 2005
Expires: April 30, 2007
Total Amount: $500,000

Investigator: Parm Randhawa, randhawa@calspl.com
Company: California Seed and Plant Lab., Inc.
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Elverta, CA 95626
Phone: (916)655-1581

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims to develop a highly sensitive PCR-based diagnostic kit for the detection of pathogens in crop seeds. Seed health testing is important in order to identify infected lots that should be excluded from seed sales. Because only a few seeds in a seed lot are usually infected, highly sensitive test methods are needed. The standard method consists of extracting the pathogen into a buffer followed by plating on selective media to isolate the pathogen or identification by PCR. A major limitation of this method is that only a small sample (0.1 ml) can be tested on an agar plate, which gives a maximum sensitivity of only 10 cells per ml. In this project, a novel device called Ampli-disk, has been developed, that allows testing of a 4 ml sample. Further, this Ampli-disk can be stored and used, as needed, unlike agar plates that require fresh preparation for each use. Prior Phase I research has shown that pathogens from seed extracts can be successfully detected and quantified by using Ampli-disk coupled with real-time PCR. In the Phase II project, the objective is to develop Ampli-disks and real-time PCR primers and probes into diagnostic kits for ten most important bacterial pathogens of vegetable crops.

The commercial application of this project will be in agriculture. The proposed technology will be useful to the seed industry and in other bacterial disease diagnostics.

Title: SBIR Phase II: Microbial Enhancement of Soybeans for Salmonid Diets

Award Number: 0449453
Program Manager: Michael R. Ambrose

Start Date: February 15, 2005
Expires: January 31, 2007
Total Amount: $499,400

Investigator: Clifford Bradley, cbradley@montana.com
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Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims to develop a process for enhancing the nutritional value of soybeans to replace fishmeal as the primary ingredient in farmed trout and salmon feed. Fishmeal creates environmental and economic constraints for the aquaculture industry. Plant-derived proteins are a good alternate feed source, but do not meet the nutritional requirements of many farmed fish species including trout and salmon. Prior Phase I work demonstrated that a combination of a selected fungal strain with innovations in solid substrate culture (SSC) would increase the protein content, eliminate the non-digestible carbohydrates and reduce anti-nutritional factors in soybeans. This Phase II project will test pilot-scale SSC technology to determine engineering design and economics for a commercial process to manufacture the bio-enhanced soy protein, and to demonstrate the feed value of this protein in trout feeding trials.

The commercial application of this project will be in the aquaculture industry. The use of fishmeal creates economic, market and water pollution issues for fish farmers, and consumer concerns regarding environmental impacts (for example, there are reports of PCBs, dioxins, and other pesticides detected at higher levels in farmed salmon that have been fed fishmeal based diets). Replacing fishmeal with plant based proteins will promote health through increased fish consumption and will alleviate environmental and economic constraints facing the aquaculture industry.

Title: SBIR Phase II: Implementation of Sex Pheromone-Based Systems to Suppress Populations of Soybean Aphids

Award Number: 0450032
Program Manager: Michael R. Ambrose

Start Date: January 15, 2005
Expires: December 31, 2006
Total Amount: $499,223

Investigator: Junwei Zhu, jwzhu@iastate.edu
Company: MSTRS Technologies Inc.
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Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop sex pheromone-based techniques for monitoring, mass trapping, and mating disruption of the soybean aphid. Since its first appearance in North America, infestations of the newly invasive soybean aphid, Aphis glycines Matsumura, have continued to cause a significant soybean yield loss due to either direct feeding damage or the vectoring of plant viruses by the aphid. In 2003, the total acreage with soybean aphid infestation was estimated at over 8 million, with yield loss ranging from 32% - 45% in the three biggest soybean growing states in the U.S. (Illinois, Iowa and Minnesota). This project will investigate novel suppression strategies to reduce populations of this pest, thereby reducing the size of the subsequent populations feeding on soybeans.

The commercial application of this project will be to manage aphids in the soybean crop. The research aims to increase knowledge of the chemical ecology of aphids, as well as provide a new understanding of how to use these novel aphid sex pheromone-based control strategies most effectively. This will help growers in the U.S., the world's largest soybean exporting country, to improve crop quality and yield at a minimal cost for soybean aphid management, thereby increasing their competitiveness in the world market.

Title: SBIR Phase II: A Gene Targeting System for Plants

Award Number: 0422159
Program Manager: Om P. Sahai

Start Date: August 1, 2004
Expires: July 31, 2006
Total Amount: $499,999

Investigator: David Wright, wright@phytodyne-inc.com
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Phone: (515) 296-5513

Abstract

This Small Business Innovation Research (SBIR) Phase II project will develop a non-transgenic approach for genetic improvement of crops by using a zinc-finger nuclease strategy for homologous recombination in plants and a strategy for selection of non-selectable phenotypes. The commercial application of this project will be to enable the production of new crop varieties, including those that better withstand pests, have enhanced food value, and produce compounds of industrial importance.

The proposed approach is expected to produce genetically modified (GM) plants requiring less regulatory oversight than existing technologies for plant genetic engineering, facilitating faster and less expensive marketing of GM plants.

Title: SBIR Phase II: Nematode Intestinal Proteins as Anthelmintic Targets

Award Number: 0349756
Program Manager: Om P. Sahai

Start Date: February 1, 2004
Expires: January 31, 2006
Total Amount: $461,021

Investigator: Michelle Hresko, hresko@divergence.com
Company: Divergence, LLC
893 North Warson Road
St. Louis, MO 63141
Phone: (314)812-8024

Abstract

This Small Business Innovation Research (SBIR) Phase II project proposes to develop transgenic roots that are resistant to nematode infection, through expression of small proteins, protein domains or peptides which when ingested by the nematode interfere with the function of essential proteins of the nematode intestine. The longer term goal of the project is to develop transgenic crops (soybeans, corn and cotton), that are resistant to parasitic nematodes. In Phase I research, essential proteins exposed in the nematode intestinal lumen were identified as outstanding targets for anti-nematode agents produced by plants. These proteins are accessible to the environment since the lumenal membrane of the intestine is the surface through which nutrients are absorbed by the nematode. This Phase II project is expected to show that transgenic expression of nematode intestine-toxic peptides at the site of infection would create inhospital host plants for plant parasitic nematodes and would result in resistant crops which do not require application of toxic chemicals for nematode control.

The commercial impact of this project will be on nematode control in major crops. Plant parasitic nematodes are reported to cause $80 billion in crop yield damage annually. The current chemical solutions are limited, environmentally damaging, and toxic to the applicators. Transgenic resistance to nematodes will provide an economically competitive and environmentally safe alternative.

Biochips/Biosensors

Title: SBIR Phase II: Multi-Marker Prognostic Test for Breast Cancer Outcome

Award Number: 0750452
Program Manager: Gregory T. Baxter

Start Date: June 1, 2008
Expires: May 31, 2010
Total Amount: $481,960

Investigator: Steven Linke, slinke@predict.net
Company: Prediction Sciences, LLC
9404 Genesee Ave Suite 210
La Jolla, CA 92037
Phone: (858) 404-0404

Abstract:

This Small Bbusiness Innovation Research (SBIR) Phase II project aims to continue the validation of a set of markers for predicting recurrence and guiding the selection of treatment in stage I-III breast cancer patients. Upon removal of their primary stage I-III operable tumors, breast cancer patients must decide whether or not to receive adjuvant therapy such as chemotherapy, or hormone therapy. Currently, the physician and patient can arrive at the decision by relying on several published guidelines whose accuracy is limited by the fact that they are based on general clinicopathologic data such as tumor size and grade. Thus the majority of patients are recommended to receive adjuvant therapy, although only a small fraction of them benefit from it. Availability of a set of reliable markers that can predict recurrence of tumors would allow tailoring of adjuvant therapy for each patient and is thus likely to reduce the chances of under-treatment and over-treatment. As such, it would be of great benefit to cancer patients, as well as to oncologists.

Title: SBIR Phase II: Vertical Perifusion System for Cell Culture and Monitoring

Award Number: 0750508
Program Manager: Gregory T. Baxter

Start Date: April 15, 2008
Expires: March 31, 2010
Total Amount: $495,224

Investigator: Michael Varney, mvarney@tautheta.com
Company: TauTheta Instruments LLC
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Boulder, CO 80301
Phone: (720) 226-0614

Abstract:

This Small Business Innovation Research (SBIR) Phase II research develops tools to monitor live cells in a model system capable of maintaining the cells over extended periods in near normal conditions. The perfusion chamber allows one to interrogate the metabolic response of cells in real-time in a non-invasive manner. Potentially, this technology could open a number of tissues to examination in further detail for research and as an alternative to live animal testing. The broader impacts of this project include significant advances in the science of cell physiology and behavior, mechanistic pathways of diseases, and improved understanding of cellular signaling, growth and death. Rational design of more effective drugs depends on ever improving fundamental knowledge of cellular mechanisms. Commercially this innovation will lower the cost of drug development, testing and clinical trials, thereby providing broad benefit to the US healthcare industry.

Title: SBIR Phase II: Early Growth Metabolic Responses of Mycobacteria

Award Number: 0750054
Program Manager: Gregory T. Baxter

Start Date: January 1, 2008
Expires: December 31, 2009
Total Amount: $429,080

Investigator: Ronald Rieder, Ronald, rieder@biosensetech.com
Company: BioSense Technologies Inc.
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Woburn, MA 01801
Phone: (781) 933-3635

Abstract:

This Small Business Innovation Research (SBIR) Phase II research project develops a new rapid, nonmolecular method for quickly testing the drug susceptibility of Mycobacteria tuberculosis, the bacterium causing the epidemic disease tuberculosis (TB). Currently, all measurements for determining drug susceptibility - essential for prescribing effective treatment - rely exclusively on detecting changes in the slow growing bacterial population after exposure to drugs known to kill the bacterium. Phase I demonstrated this technology's approach to drug susceptibility testing provides commensurate information without time consuming measurements of growth. Susceptibility results were obtained in only a few hours compared to currently used methods requiring several weeks to obtain the same information. In addition, resistant strains were easily distinguished from sensitive strains inferring the ability to identify drug resistant TB infections in only a few hours time. With this information in hand quickly, physicians will be able to prescribe antimicrobial therapies with confidence because the treatments will be targeted and not empirical. The broader impacts of this research are the reduced spread of drug-resistant infections, increasing of the effective lifespan of drugs now known to cure disease, and lower healthcare costs associated with more successful patient outcomes. Rapid testing will enable better control over the spread of tuberculosis and the management of effective domestic and global policies. This will leave the United States and all other countries better prepared to mount an adequate defense in the event of an epidemic or intentional widespread exposure.

Title: SBIR Phase II: Immunological Tools for Trimetasphere Fullerenes

Award Number: 0724380
Program Manager: F.C. Thomas Allnutt

Start Date: September 1, 2007
Expires: August 31, 2009
Total Amount: $499,955

Investigator: Roger VanTassell, vantassellr@lunainnovations.com
Company: Luna Innovations, Inc.
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Roanoke, VA 24016
Phone: (540)769-8400

Abstract:

This Small Business Innovation Research (SBIR) Phase II research develops antibodies and immunoassays for studying therapeutics based on carbon-based nanomaterials. This research will expand the immunological tools developed in Phase I to focus on detailed characterization of anti-fullerene antibodies and validate and down-select immunoassays and reagents for validated commercial formats. Commercial formats will include enzyme-linked, immunosorbant assays (ELISAs) for medical and environmental applications, neutralization schemes for mitigating potential toxicity of fullerene/nanotubes and biosensors platform for long-term monitoring systems. Biosensor platforms based on fullerene antibodies as affinity ligands will include the quartz crystal microbalance and surface acoustic waveguide.

The broader impacts will be to provide a full spectrum of immunological tools for studying the medically-related nanomaterials and monitoring nanowaste by-products during manufacturing processes. These will be new to the marketplace and enable monitoring of the use of products based on these nanomaterials to asssure their safe application.

Title: STTR Phase II: Microfluidic CD Biochips for Enzyme-Linked Immunosorbent Assays

Award Number: 0548716
Program Manager: Ali Andalibi

Start Date: December 15, 2006
Expires: November 30, 2008
Total Amount: $500,000

Investigator: Wei-Cho Huang, wchuang@bioloc.net
Company: BioLOC LLC
1381 Kinnear Road #100
Columbus, OH 43212
Phone: (614)481-9135

Abstract:

The Small Business Technology Transfer Research (STTR) Phase II project will develop a low-cost and mass-producible lab-on-a-chip platform for molecular and biological analyses. The platform is a microfluidic CD for Enzyme-Linked Immunosorbent Assays (ELISA) that reduces cost, accelerates results, and improves reliability of analyses for food borne contaminants, cancer diagnoses and environmental contamination.

The CD-ELISA technology platform merges two scientific areas - polymer microfabrication and biotechnology - and can substantially reduce manufacturing costs, improve device performance, and enable the production of low-cost and high-efficiency devices. Moreover, as such a device would be more affordable it will enable point-of-use results for a broader spectrum of molecular and biological testing.

Title: SBIR Phase II: Toxic Mold Sniffer

Award Number: 0548727
Program Manager: Ali Andalibi

Start Date: September 21, 2006
Expires: September 30, 2008
Total Amount: $471,421

Investigator: Debra Mlsna, dmlsna@seacoastscience.com
Company: Seacoast
2151 Las Palmas Drive
Carlsbad, CA 92009
Phone: (760)268-0083

Abstract:

The Small Business Innovation Research (SBIR) Phase II project will develop a small, battery-powered sensor for the detection of toxic chemicals produced by molds responsible for "sick building syndrome," and for the detection of such toxic molds in infested buildings. The company's MEMS chemicapacitor technology utilizes an array of surface-micromachined capacitors coated with chemo-selective materials. The proposed device will detect toxic compounds produced by indoor molds, as well as associated volatile organic compounds.

The detection and isolation of suspect molds is a major indoor environmental concern. The sensor technology proposed for use in the company's sensor system can be packaged for single-use home detection kits, or can be incorporated into reusable detection units for surveillance by commercial interests.

Title: SBIR Phase II: Microchip Assay for Glycosylated Hemoglobin

Award Number: 0548744
Program Manager: F.C. Thomas Allnutt

Start Date: March 1, 2006
Expires: February 29, 2008
Total Amount: $480,024

Investigator: Dale Willard, dale.willard@colostate.edu
Company: AML
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Fort Collins, CO 80524
Phone: (970)491-4064

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims at developing the next generation of diabetic monitoring devices that will allow the measurement of multiple markers of disease regulation and progression using an innovative lab-on-a-chip technology. The project will develop the first integrated microchip CE device for measurement of an important maker of diabetes.

This technology will impact patient monitoring for disease progression and therapeutic efficacy by following biomarker more efficiently as well as being used at the point of care. This eliminates the time and cost currently required to perform follow up laboratory tests. The technology approaches the chemistry of biomarkers from a non-traditional sensor mechanism and shows great promise for the detection and use of biomarkers for specific diseases.

Title: SBIR Phase II: Biosensor for Rapid Whole Blood Assays using Magnetic Labels and Giant Magnetoresistive Sensors

Award Number: 0548638
Program Manager: Errol Arkilic

Start Date: January 23, 2006
Expires: January 31, 2008
Total Amount: $466,710

Investigator: Curt Bilby, curt.bilby@seahawkbio.com
Company: Seahawk Biosystems
3000 Bryker Drive
Austin, TX 78703
Phone: (512)459-7063

Abstract:

This Small Business Innovation Research (SBIR) Phase II project advances the general state of diagnostics research in the veterinary and security/defense markets using whole-blood assays. This Phase II project will develop (1) an automated Open Assay Development Platform for rapid assay prototyping; (2) whole blood assays for canine immunity assessment and canine thyroid test (T4); and, (3) multiplexed, canine whole blood assays. The approach uses magnetic beads to label biomolecules captured onto a receptor-patterned microchip that contains an embedded array of magnetic microsensors. The magnetic microsensors are wire-like structures that display giant magnetoresistance (GMR). When coupled with controlled fluidic force discrimination - an innovation that greatly reduces unwanted background signal - rapid identification of biomolecules with high sensitivity and specificity is achieved. A prototype system has been developed for both immunoassays and nucleic acid assays, with immunoassays (1 ng/mL) saturating in less than 10 minutes and unmodified DNA detected at 10fm in less than 20 minutes.
Seahawk is responding to the clinical and financial challenges veterinarians face by developing a multi-use, multiplexed instrument and associated disposable cartridges.

This technology platform offers veterinarians superior performance (faster, more accurate, easier to use) and greater profitability than existing products. Initially, the platform will include cartridges for two applications: (1) individualized immunity assessment and (2) disease diagnostics, both specifically for dogs and cats. The system provides an in-clinic, quick turnaround, cost-effective and accurate test of an animal's immune system to determine what, if any, vaccine boosters need to be administered at that time. This provides the veterinarians with three key benefits: (1) improving the quality of care - providing revaccinations only when needed and tailored to each animal; (2) generating additional or replacement revenue due to changes in revaccination protocols; and, (3) replacing annual revaccinations as the impetus for customer compliance with scheduling office visits for physical exams.

Title: SBIR Phase II: Ultra-High Sensitivity Surface Plasmon Resonance (SPR) Sensor for Real-Time Botulinum Detection

Award Number: 0522014
Program Manager: George B. Vermont

Start Date: August 15, 2005
Expires: July 31, 2007
Total Amount: $499,800

Investigator: Paul Melman, melmanp@newtonphotonics.com
Company: Newton Photonics
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Phone: (617)928-1221

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop a prototype botulinum toxin detector based on a novel ultra-sensitive Surface Plasmon Resonance (SPR) technology. The botulinum toxin will be detected by means of the specific cleavage of a peptide substrate attached to the sensor surface. The system will provide results in a fraction of the time and at a much lower cost compared to currently available methods. The feasibility of this technology was successfully demonstrated in Phase I. The research in Phase II will include assay optimization for detection of botulinum types A and B, development of a toxin extraction protocol from complex solutions, and construction of an instrument for multiplexed detection of botulinum toxins. The developed instrument will have the capability for ultrasensitive detection of Botulinum A and B (comparable to the sensitivity of the mouse LD50 assay) on a single chip.

The principal commercial application of this project will be in the detection of biothreat agents. The proposed work, though initially aimed at rapid detection of botulism in individuals and in foods, will be extendable to other biothreat agents such as anthrax and mycotoxins. Additional applications are expected in drug discovery and biomedical research, and for potency testing of botulinum products in medical and cosmetic applications.

Title: SBIR Phase II: Sensor for Real-Time pH Measurements in Gases

Award Number: 0522325
Program Manager: Michael R. Ambrose

Start Date: August 1, 2005
Expires: July 31, 2007
Total Amount: $500,000

Investigator: Jeffery Schipper, jeff@sierramedical.com
Company: Sierra Medical Technology Inc.
13670 Danielson Street
Poway, CA 92064
Phone: (858)679-2300

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims to develop and market the trademarked Dx-1 pH Measurement System. This medical device integrates the breath pH sensor studied in the Phase I research with an ambulatory, telemetry based data recorder, and data analysis software to provide a non-invasive pH diagnostic tool required by physicians. This pH sensor actively condenses a moisture film on the sensor surface, creating a conduction path across its sensing electrodes. During Phase II, the company plans to complete all technical and regulatory activities in order to gain FDA clearance for product introduction.

The commercial application of this project is in the area of medical devices. The proposed sensor technology will offer a new tool for clinicians to more effectively diagnose and treat respiratory diseases, particularly for children and infants who cannot readily undergo alternative diagnostic procedures.

Title: SBIR Phase II: Kits for the Detection of Bioterror Pathogens

Award Number: 0450469
Program Manager: George B. Vermont

Start Date: April 1, 2005
Expires: March 31, 2007
Total Amount: $499,257

Investigator: Brenda Spangler, brenda.spangler@sensopath.com
Company: Sensopatch Technolgoies, Inc.
2100 Fairview Drive
Bozeman, MT 59715
Phone: (406)585-8192

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop field deployable kits for the detection of bio-terror pathogens. These kits would consist of fluorescent-labeled antibodies directed against protein toxins expressed by bio-terror pathogens, relying for detection on strong antibody-antigen interactions and fast chromatographic discrimination using simple chromatography strips supplied with inexpensive pre-measured reagents. In Phase I project, new water soluble blue-emitting reporter fluorophores were synthesized that were extremely photo-stable and could be easily visualized under any type of light conditions. These fluorophores were conjugated to an antibody against Bacillus anthracis as the initial proof-of-concept, and methodology was developed to attach these reporter fluorophores to monoclonal, polyclonal or recombinant antibodies. The objectives of Phase II project are to optimize reagents and chromatography, to synthesize new fluorophores for multiplexed pathogen detection, to design and assemble prototype kits, and to test and validate the kits.

The commercial application of this project will be in the area of homeland security. The proposed kits are expected to be inexpensive, versatile, and easy to use by relatively untrained first responders (such as police, firefighters, paramedics, hazmat personnel, other emergency response teams).

Title: SBIR Phase II: Novel Bioaerosol Concentrator/Sampler for Enhanced Biosensor Performance

Award Number: 0450612
Program Manager: George B. Vermont

Start Date: March 1, 2005
Expires: February 28, 2007
Total Amount: $469,973

Investigator: Steve Wright, wright@novafilter.com
Company: Innovatech Inc
6320 Angus Dr Suite C
Raleigh, NC 27617
Phone: (919)881-2197

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop a robust, generic, front-end, bio-sampler that when combined with either a wet or dry biological detector, will result in more accurate and rapid detection of hazardous airborne biological agents. While most current systems require samples to be delivered in a fluid for analysis, emerging dry detection technologies facilitate near-real time detection, reduce sampling errors and allow for unattended operation. The prototype bio-sampler developed in Phase I demonstrated very high efficiency in the dry collection mode. This Phase II project has the following objectives: (a) to optimize sampling performance for particles at the low end of the range (<2 micron), (b) to maintain high bio-viability of collected organisms, (c) to function efficiently in the wet or the dry mode, (d) to demonstrate self-cleaning / decontamination features, (e) to evaluate scalability to larger air volumes and, finally, (f) to demonstrate enhanced overall performance in an integrated biological detection system.

The commercial application of this project will be in the area of homeland security and public safety. The proposed technology will enhance the performance of both the detection systems that are presently deployed and that of the advanced biological detectors that are currently under development. Additional applications will be in the monitoring of the environment and of industrial air quality.

Title: SBIR Phase II: X-ray Microscope for In-Vivo Biological Imaging

Award Number: 0450518
Program Manager: George B. Vermont

Start Date: February 1, 2005
Expires: January 31, 2007
Total Amount: $494,620

Investigator: Charles Gary, cgary@adelphitech.com
Company: Adelphi Technology, Inc
981B Industrial Rd
San Carlos, CA 94070
Phone: (650)598-9800

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims to develop a sub-micron x-ray tomography scanner capable of providing in-vivo and high resolution images of specimens from mice to bacteria. In this era of molecular medicine, where disease and developmental disorders are being re-defined by their peculiar molecular, genetic or cellular profiles, there exists a significant disparity between the type of information gleaned from histological methods and that obtained from conventional non-invasive imaging modalities. With a resolution that is better than these imaging modalities and more than ten times higher than that of current x-ray imaging systems, the proposed device will generate images of development and disease not possible by current methods. The Phase II research will concentrate on the development of the x-ray optical system, including beam conditioning, tomographic imaging capability, and the imaging x-ray lens, and will result in a table-top commercial prototype computerized tomographic imager with 400 nm resolution.

The commercial application of this project will be in the area of medical research. When compared to existing in-vivo imaging technologies, the higher resolution of the proposed x-ray imager will translate to improved sensitivity and specificity of morphologic changes associated with growth and disease. Researchers will be able to use this tool for investigations of a number of medical conditions, including tumor angiogenesis, atherosclerosis, osteoporosis and arthritis.

Title: SBIR Phase II: Electronic DNA Biosensor

Award Number: 0450472
Program Manager: Michael R. Ambrose

Start Date: February 1, 2005
Expires: January 31, 2007
Total Amount: $499,715

Investigator: Richard Murante, rmurante@integratednano.com
Company: Integrated Nano-Technologies LLC
999 Lehigh Station Rd
Henrietta, NY 14467
Phone: (585)334-0170

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop a portable, rapid, fully - automated, non-Polymerase Chain Reaction (PCR) based, electronic DNA identification device for field use that is capable of accurately detecting low concentrations of biological agents in a broad range of samples. Prior Phase I work demonstrated the feasibility of using palladium-catalyzed nickel to form conductive DNA wires for use in constructing this device. The Phase II project will further advance the DNA detection technology by refining the metallization protocol and integrating the technology into an automated, easy to use format.

The commercial application of this project will be for use by the military and / or for homeland security. The proposed biosensor system is expected to be readily incorporated into existing nuclear, biological and chemical (NBC) detection and reporting systems, enhancing total force protection by enabling the rapid identification, containment and neutralization of biological agents.

Title: SBIR Phase II: ELISA Biosensor for Rapid Bioterrorism Related Agent Diagnosis

Award Number: 0450635
Program Manager: Michael R. Ambrose

Start Date: January 1, 2005
Expires: December 31, 2006
Total Amount: $468,453

Investigator: Winston Ho, winstonho@maxwellsensors.com
Company: Maxwell Sensors Inc.
10020 Pioneer Blvd., Suite 103
Santa Fe Springs, CA 90670
Phone: (562)801-2088

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop a self-contained enzyme-linked immunosorbent assay (ELISA) biochip for rapid and confirmatory clinical diagnosis of multiple bio-threat pathogens such as antigens, antibodies, toxins, and viruses. The ELISA chip utilizes microfluidic technology to automate and simplify the assay process on a small chip platform. The plastic chip (reagent pre-loaded) will be affordable and ready for use, and will eliminate the need for a network of tubing connected to bulky external reservoirs and pump systems used in current large clinical laboratory systems. Prior Phase I work successfully developed the microfluidic chip platform and the reader system, and performed assays with anthrax toxin protective antigen (PA) and Francisella tularensis. The Phase II project will focus on system optimization, integration and panel tests, and will result in a prototype to be refined into a commercial product in Phase III.

The commercial application of this project will be in the area of homeland security, for detecting biological warfare agents (BWA) and in managing BWA suspected patients. The ELISA based biochip has the potential to be used as a rapid testing standard to quickly yield preliminary data in advance of microbiology tests. The system, with its extreme sensitivity and specificity, also offers commercial opportunities in the field of clinical diagnostics.

Title: SBIR Phase II: Rapid Detection of Bacterial Contaminants Using Micro-Fluidic Biochips

Award Number: 0422150
Program Manager: Michael R. Ambrose

Start Date: November 1, 2004
Expires: October 31, 2006
Total Amount: $417,574

Investigator: Laila Razouk, laila.razouk@biovitesse.com
Company: Biovitesse, Inc.
1608 Crow Court
Sunnyvale, CA 94087
Phone: (408)738-4655

Abstract:

This Small Business Innovation Research (SBIR) Phase II project will develop a microfluidic based system for the detection of viable pathogens using dielectric concentration of bacteria as an intermediate step. This system would use a first-stage concentrator, followed by dielectrophoretic concentration, and finally by culturing in media with integrated impedance measurements to detect culture growth.

The commercial application of this project will be on the detection of waterborne microorganisms in biopharmaceutical manufacturing operations. The proposed method would electronically detect the viability of microorganisms in water samples in less than 3 hours, unlike the current technology that takes 2-7 days to yield results.

Title: SBIR Phase II: A Biochip for DNA Detection

Award Number: 0422246
Program Manager: Om P. Sahai

Start Date: September 15, 2004
Expires: August 31, 2006
Total Amount: $499,989

Investigator: Kristian Scaboo, kscaboo@genorx.com
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3916 Trust Way
Hayward, CA 94545
Phone: (510)732-9100

Abstract

This Small Business Innovation Research (SBIR) Phase II project proposes to develop an inexpensive, automated, highly sensitive biosensor chip that would detect small quantities of nucleic acids directly without the need for either a reporter molecule reaction or a PCR expansion reaction. It is expected that the proposed molecular detection platform will provide unparalleled specificity and sensitivity while decreasing sample preparation time by a factor of twenty five, capital costs by a factor of twenty, and the cost of disposables, including the chip, by a factor of five.

The commercial application of this project will be in a number of markets, including biological and biomedical research, diagnostics and forensics.

Title: STTR Phase II: Novel Lipid Deposition for Biosensor Surfaces

Award Number: 0422010
Program Manager: Om P. Sahai

Start Date: September 1, 2004
Expires: August 31, 2006
Total Amount: $460,789

Investigator: Roger Van Tassell, vantassellr@lunainnovations.com
Company: Luna Innovations, Incorporated
PO Box 11704
Blacksburg, VA 24062
Phone: (540)552-5128

Abstract

This Small Business Technology Transfer Research (STTR) Phase II project will use the LPG (Long Period Grating) technology to interrogate the interactions between drugs and G-Protein coupled receptors (GPCRs). To effectively study these interactions, one has to stabilize the GPCRs by immobilizing them to lipid layers. This Phase II project will focus on optimizing the lipid selection, composition, and attachment to the GPRCs and to the surface of the sensor. The development of stabilized lipid based GPCR coating for the LPG biosensor will provide a valuable tool in the area of drug discovery.

The commercial application of this project will be in the area of new high throughput proteomics instrumentation to aid in the development of new therapeutic products.

Title: SBIR Phase II: Nanoelectronic Capnography Sensors

Award Number: 0421966
Program Manager: Om P. Sahai

Start Date: August 15, 2004
Expires: July 31, 2006
Total Amount: $498,969

Investigator: Alexander Star, astar@nano.com
Company: Nanomix, Inc.
5980 Horton St.
Emeryville, CA 94608
Phone: (510)428-5302

Abstract

This Small Business Innovation Research (SBIR) Phase II project will develop a carbon dioxide sensor, using polymer modified carbon nanotudes, for patients receiving anesthesia. The sensor technology relies on two important areas of expertise : the nanotube transducer platform and gas analyte recognition layers. The Phase II project objectives will include optimizing the platform and recognition chemistries that were developed in Phase I. Once a technically suitable recipe is known, sensor chips will be fabricated at the wafer level for large scale testing. The capnography sensors will be packaged and embedded in disposable adapters that fits directly into the patient airway. Hardware and software systems will be designed and integrated with the adapter to deliver sensor information to the end user. At the culmination of Phase II, the capnography sensor system will be validated in a clinical environment and positioned for FDA approval and subsequent market introduction.

The commercial application of this project will be in the area of healthcare. The proposed sensor will have the attributes of low power, small size and low cost.

Title: SBIR Phase II: Portable BioDetection Platform for Rapid Identification of Multiple Biological Agents

Award Number: 0422085
Program Manager: Om P. Sahai

Start Date: August 1, 2004
Expires: July 31, 2006
Total Amount: $499,911

Investigator: Ihab Abdel-Hamid, iabdel-hamid@mesosystems.com
Company: MesoSystems Technology, Inc.
1001 Menaul Blvd.
Albuquerque, NM 87107
Phone: (509)222-2000

Abstract

This Small Business Innovation Research (SBIR) Phase II project will develop a portable automated biosensor for detection of proteins, viruses and/or pathogens in liquid and air samples. This technology is based on the integration of highly-specific immunodiagnostics with ultra-sensitive electrochemical sensors in a multiplexed microfluidic format that allows the measurement of up to three proteins, two viruses and two bacteria simultaneously. The biosensor is expected to have low detection limits (that is, of less than 0.5 ng/ml for proteins, 1000 PFU/ml for viruses and 700 CFU/ml for bacteria), with an overall assay time of less than 30 minutes. This system will be tested for detection of potential biological threat agents such as Staphylococcal Enterotoxin B (protein/toxin), Influenza (virus) and Bacillus anthracis (bacteria).

The commercial application of this project will be in the areas of homeland security, clinical diagnostics, food quality control and general environmental monitoring.

Title: SBIR Phase II: A Microfluidic-Based Biosensor for Food Pathogen Detection

Award Number: 0422088
Program Manager: Om P. Sahai

Start Date: August 1, 2004
Expires: July 31, 2006
Total Amount: $488,054

Investigator: Xiao-Li Su, xsu@virtual-incubation.com
Company: BioDetection Instruments, Inc.
21 West Mountain
Fayetteville, AR 72701
Phone: (479)571-2592

Abstract

This Small Business Innovation Research (SBIR) Phase II project will develop a portable, rapid and specific capillary channel based immuno-sensing system for food pathogens. The tests will be able to detect concentrations of <10 cfu/ml of various microorganisms (Salmonella, Listeria, Escherichia Coli) in less than 1 hour in contrast to current methods that typically require 24 to 48 hours for preliminary data to become available and typically 3-7 days for definitive results. The capability of the proposed instrument to achieve this significant leap forward in performance was demonstrated by the Phase I results. The Phase II objective is to further refine the instrument with the high performance, ease of use, and low per sample cost needed by the food processing industry.

The commercial application of this project will be in the areas of food safety and bio-defense. Microbial contamination of food products by pathogenic bacteria is a major concern of our society. Contaminated food is estimated to cause 76 million illnesses, 325,000 serious illnesses resulting in hospitalization, and 5,000 deaths in the United States each year. The economic impact of food-borne illnesses has been estimated as high as $10 billion annually. Recent events have also made it clear that the threat from pathogens intentionally introduced into the nation's food supply can be real, with significant economic implications.

Title: SBIR Phase II: Continuously Operating Sensor for Detection of Nerve Agent Contamination in Aqueous Solutions

Award Number: 0422090
Program Manager: Om P. Sahai

Start Date: August 1, 2004
Expires: July 31, 2006
Total Amount: $487,768

Investigator: Markus Erbeldinger, markus@agentase.com
Company: Agentase LLC
3636 Blvd of the Allies
Pittsburgh, PA 15213
Phone: (412)209-7298

Abstract

This Small Business Innovation Research (SBIR) Phase II project is to develop a continuously operating water monitoring device for the detection of chemical warfare agents and hazardous chemicals. Prior Phase I work demonstrated the feasibility of this method and resulted in the construction of a bench-top model that could respond rapidly to contamination, that was resistant to environmental and chemical interference, and that could operate for extended periods of time without user intervention. In Phase II, this model will be modified into a small, self-contained, inexpensive prototype. Several optimized prototypes will be constructed for field trials under operational conditions.

The commercial application of this project will be in the area of bioterrorism.

Title: SBIR Phase II: Nanostructured Optical Fiber Breathing Sensors

Award Number: 0349441
Program Manager: Om P. Sahai

Start Date: March 1, 2004
Expires: February 28, 2006
Total Amount: $500,000

Investigator: Jeffrey Mecham, jmecham@nanosonic.com
Company: Nanosonic Incorporated
P.O. Box 618
Christiansburg, VA 24068
Phone: (540)953-1785

Abstract

This Small Business Innovation Research (SBIR) Phase II project will develop and commercialize optical fiber sensors for the quantitative measurement of humidity and air flow for breathing diagnostics. Prior Phase I work has demonstrated that these physically small and mechanically robust sensors respond over a wide range of relative humidities with a response time of microseconds, and are orders of magnitude faster than commercially available devices. The Phase II project will develop sensor thin film chemistries with improved response time, design and fabricate an optical fiber sensor optoelectronic support instrumentation system, and beta-test the sensors and systems with clinicians and physicians. The primary commercial impact of this project will be on home health care and clinical research. Additional applications will be in the industrial gas flow, automotive and transportation areas.

Title: SBIR Phase II: Anthrax Detector for Mail Sorting Systems

Award Number: 0349687
Program Manager: Om P. Sahai

Start Date: January 15, 2004
Expires: December 31, 2005
Total Amount: $505,985

Investigator: Stuart Farquharson, stu@rta.biz
Company: Real-Time Analyzers
87 Church Street
East Hartford, CT 06108
Phone: (860)528-9806

Abstract

This Small Business Innovation Research (SBIR) Phase II project will develop two prototype anthrax detector systems designed to screen mail entering a postal facility and/or to identify and to stop distribution of anthrax containing mail as it passes through a sorter. These systems will be able to detect 2 micrograms of spores captured from a letter containing as little as 100 micrograms, as well as similar concentrations on contaminated surfaces. The Phase I project demonstrated feasibility by successfully developing a vacuum/filter collection system that captured Bacillus cereus spores from an envelope passing through a mail sorter, which were detected by Raman spectroscopy. Some 23 micrograms of B. cereus spores were measured in 9 seconds using 1064 nm excitation, with an estimated limit of detection of 10 micrograms or 1 million spores in 10 seconds.

The Phase II project will complete the design of the anthrax detector system, with improved sensitivity nd selectivity. The broader impact of this project will be on the safety and security of mail handling and delivery across the United States.

Bioinformatics

Title: SBIR Phase II: Permanent Attachment of Antimicrobial Peptides to Central Venous Catheters.

Award Number: 0822959
Program Manager: Cynthia A. Znati

Start Date: August 15, 2008
Expires: July 31, 2008
Total Amount: $499,923

Investigator: Christopher Loose, crloose@gmail.com
Company: Semprus Bioscience Corporation
107 Gore St #4
Cambridge, MA 02141
Phone: (857) 363-0218

Abstract:

This Small Business Innovation Research (SBIR) Phase II project continues SteriCoat's development of a permanent antimicrobial coating for use on central venous catheters. Current leaching antimicrobial technology does not possess the duration of efficacy required to protect these devices over the lifetime of implantation, especially for peripherally inserted central lines (PICCs). Research during this Phase II project will focus on the integration of proprietary polymer technology with tethered antimicrobial peptide (AmP) technology developed in Phase I to maximize the efficacy and bioavailability of the immobilized AmPs in vivo. Work will also be performed to ensure the manufacturability of SteriCoat's coating technology, including prototype production. After transitioning this formulation to the intra- and extraluminal surfaces of a polyurethane tube, efficacy and biocompatibility will be demonstrated both in vitro and in vivo. By the end of this Phase II project, SteriCoat will have an antimicrobial CVC model with efficacy proven in vivo using the models designed by industry thought leaders and will be ready for scale-up and manufacturing. This SBIR Phase II project addresses the hospital infections afflicting 1.7 million patients and killing 99,000 in the US annually, the majority of which are associated with medical devices. Existing slow-release antimicrobial coatings are insufficient in addressing device infection. They have a limited lifespan and concerns over drug resistance and toxicity because the drug gets distributed in the bloodstream. SteriCoat is developing a permanent coating using antimicrobial peptides (AmPs) to prevent bacterial colonization of central venous catheters (CVCs), a $350M market. The goal of this project is to deliver a polyurethane-based antimicrobial CVC model which incorporates a surface functionalization with AmPs and to test the ability of this approach in resisting bacterial colonization. By the end of this phase II project, SteriCoat will have verified in vivo efficacy of prototype catheters and be positioned to begin GLP studies for FDA product approval. In addition, achievement of the technical objectives of this Phase II will open up avenues for additional investigation in the field of bioactive ligand presentation as the developed technology could lend to the efficacy of many biomaterial applications in addition to antimicrobials.

Title: STTR Phase II: Improving Privacy and Security in Biometrics

Award Number: 0750485
Program Manager: Ian M. Bennett

Start Date: March 1, 2008
Expires: February 28, 2010
Total Amount: $479,685

Investigator: Walter Scheirer, Scheirer@securics.com
Company: Securics Incorporated
1867 Austin Bluffs Parkway
Colorado Springs, CO 80918
Phone: (719) 387-8660

Abstract:

This Small Business Technology Transfer Research (STTR) Phase II project aims to make fundamental advances in Biotopes -- cryptographically secured privacy-enhanced fingerprint and face-based technologies. The project will develop prototypes to support beta testing in commercial applications and pursue large-scale government testing. The development effort introduces the concept and will develop/demonstrate bi-directional biometric verification, whereby both the sensor and DB receive match confirmation. This is critical for remote/web-based biometric usage and improves security and privacy with match-on-card solutions. It will develop a new Biotope which uses, but never stores, multi-spectral data not obtainable from existing databases or from latent prints, providing a sustainable non-spoofable secured identity tokens that match in encoded form and change on every transaction. It will explore improving accuracy with 'negative' minutiae and PCA-based feature enhancements. To improve reuse of existing minutia-based algorithms and hardware, the effort seeks to develop a minutiae-to-minutiae mapping approach with the same security/privacy protection of existing Biotopes. For face-based biometrics, the project develops new multi-view approaches for face-based verification from non-cooperative subjects in complex unstructured environments. Additionally, the project addresses privacy protection, with a non-searchable technology that still supports a privacy-protecting image-storage for fraud prosecution, and will extend other research work in the area of continuous verification by improving the online verification for distance education and other applications. The broader impact starts with its unique focus on simultaneously improving privacy and security rather than trading one for the other. At a time when citizens feel their privacy is traded for the mere promise of security, this effort is an investment in privacy. The project will transition fundamental research into testing with commercial partners. It directly addresses reasons that other researchers have said cause the perpetual gap between predicted and realized commercial growth in biometrics. It will enhance biometrics, providing 'revocability' and transactional uniqueness to support biometric-based commerce without fear of phishing, hacking or insider access. The project will impact the distance education market for example, by focusing on improving effectiveness of state training for those in need while protecting their privacy and dignity. The projected outcomes also open the potential for passports/IDcard that allow individuals to prove their identity without allowing others to use that data to search for them. It will support smart-card based solutions that allow for biometric-verified yet 'anonymous' transactions. It addresses the often overlooked biometric dilemma, that wide-spread deployments of biometrics today may ultimately increase identify theft and also limit biometrics security value tomorrow.

Title: SBIR Phase II: Shape Memory Polymer Based Orthopedic Fixation Devices

Award Number: 0750247
Program Manager: Cheryl F. Albus

Start Date: January 1, 2008
Expires: December 31, 2009
Total Amount: $499,826

Investigator: Jack Griffis, jack.griffis@medshapesolutions.com
Company: MedShape Solutions, Inc.
1575 Northside Drive
Atlanta, GA 30318
Phone: (404) 583-6889

Abstract:

The Small Business Innovation Research (SBIR) Phase II project includes the design, development and commercialization of shape memory polymer orthopedic soft-tissue fixation devices. Current soft tissue fixation devices are primarily metal or plastic screws used to attach tissue grafts to bone in repair of torn anterior cruciate ligaments (ACL). These threaded devices commonly damage the tendon during insertion; reducing the effectiveness of the surgery. Shape memory polymers are a superior solution in that they can provide a simpler, stronger, and less damaging fixation method for these tendon grafts. Essentially, a shape memory polymer device can be; (1) delivered into the body in a compacted and less invasive state, (2) self-deploy at body temperature and (3) do so without sharp edges that might damage the tissue. The proposed work has immediate commercial potential and direct societal benefit in the field of sports medicine with a significant market on the order of $210 million in ACL repair devices annually. Furthermore, the biomaterial developed for ACL reconstruction should have long-term impact on the 1.6MM orthopedic procedures performed each year to repair tendons and ligaments in knees, shoulders, and ankles and by reducing the invasiveness of surgery and improving the outcomes.

Title: SBIR Phase II: Physiologic High Throughput Screening of Bioengineered Tissues

Award Number: 0724445
Program Manager: F.C. Thomas Allnutt

Start Date: August 15, 2007
Expires: July 31, 2009
Total Amount: $499,956

Investigator: Herman Vandenburgh, hvandenburgh@myomics.com
Company: Myomics
4 Richmond Square, STE 500
Providence, RI 02906
Phone: (401)861-9770

Abstract:

This Small Business Innovation Research (SBIR) Phase II research develops an innovative high-throughput/high content drug screening platform that utilizes three-dimensional human skeletal muscle tissue constructs that mimic in vivo skeletal muscle to quantify muscle force generation. Significant demands exist for new drugs to treat contractility disorders involving skeletal muscle. Myomics' proposed drug testing platform will contribute to significant reductions in time and costs associated with bringing new drugs to market by discovering drug candidates and eliminating ineffective compounds earlier than currently possible. Unlike existing systems, this approach incorporates biomechanics into drug discovery using mechanical sensors to detect contraction of multiple identical tissue samples over extended time periods. Significant socioeconomic and quality-of-life impacts will result for patients with contractility disorders (sarcopenia, atrophy, or Duchennes muscular dystrophy). While most drug screening protocols test one protein pathway at a time, this platform provides a unique physiological screening system and protocol which quantifies contraction as the result of multiple protein pathways interacting over time.

The broader impacts of this research will be to enhance muscle contractility disorder/disease research and provide new tools to the pharmaceutical and biotechnology industries for drug discovery. Upon successful development, the sensing mechanism will potentially be used to develop treatments for several contractile tissues relevant to a range of important human contractile disorders and diseases contributing to improved outcomes for these diseases.

Title: SBIR Phase II: A Bioinformatics System for GCxGC-MS (Comprehensive Two-Dimensional Gas Chromography)

Award Number: 0450540
Program Manager: George B. Vermont

Start Date: February 1, 2007
Expires: January 31, 2007
Total Amount: $493,692

Investigator: Qingping Tao, qtao@cse.unl.edu
Company: GC Imaging
216 N 11th St, Ste 302
Lincoln, NE 68508
Phone: (402)310-4503

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to use bioinformatics to transform complex data produced by comprehensive two-dimensional gas chromatography with mass spectrometry (GCxGC-MS) to usable chemical information. GCxGC-MS is an emerging technology for chemical separations that provides an order-of-magnitude increase in separation capacity over traditional GC. Results from Phase I demonstrated the feasibility of using bioinformatics to automatically identify chemical components in complex matrices analyzed by GCxGC-MS. Phase II will carry out further theoretical and experimental research to develop solutions that will enable broader use of GCxGC-MS system. The key project objectives include (a) developing a hybrid method that combines three approaches for chemical identification from GCxGC-MS data, (b) establishing the mathematical foundation and practical algorithms for co-elution analysis in GCxGC-MS, and (3) developing new XML technologies for shared and distributed GCxGC-MS data, metadata, and information.

The commercial impact of this project will be to develop information technologies for a new generation of analytical instruments. GCxGC-MS system is likely to capture a significant share of the existing gas chromatography market, currently in excess of $ 1 billion per year, and to open new markets in applications requiring superior separations. These applications with important societal benefits, would include environmental monitoring of air, water, and soil; development and processing of foods, flavors, fragrances, and essential oils; processing of petroleum and industrial chemicals; health-care assays of blood, urine, milk, and breath samples; and analysis and discovery of drugs and medicinal herbs.

Title: SBIR Phase II: Bioinformatic Data Mining for AIDS Resistance Genes

Award Number: 0450627
Program Manager: George B. Vermont

Start Date: September 15, 2005
Expires: August 31, 2007
Total Amount: $499,961

Investigator: Walter Messier, wmessier@evolgen.com
Company: Evolutionary Genomics, LLC
6840 N. Broadway
Denverm CO 80221
Phone: (303)429-5800

Abstract:

This Small Business Innovation Research (SBIR) Phase II project focuses on the use of novel evolution-based data mining software to discover targets for the development of human therapeutics for currently intractable diseases. Phase I demonstrated that the evolution-based data-mining software was useful for dramatically narrowing the search for proteins that make chimpanzees resistant to the progression of AIDS after infection by HIV-1. In Phase II, the impact on in-vitro HIV-1 infectivity of a human cell line transfected with the gene encoding one of the adapted chimpanzee proteins will be assessed. Screening of other chimpanzee homologs of genes differentially regulated in human cells upon HIV-1 infection will continue to ensure that all potential AIDS resistance proteins have been identified. The adapted chimpanzee genes/proteins will be compared to those from humans in which HIV-1 infection has not progressed to AIDS for at least 10 years to see if there are any commonalities.

The commercial application of this technology is in the battle against AIDS disease. The identification of proteins that have undergone adaptive evolution should lead to drugs to mediate the progression of HIV-1 infection. This same approach may have broader impact against several other intractable diseases for which non-human primates are less susceptible than humans. This includes hepatitis-C, sepsis, type-1 diabetes, and certain cancers.

Biomaterials

Title: SBIR Phase II: BP 1 - Microwaveable Bioplastic Packaging

Award Number: 0822999
Program Manager: Gregory T. Baxter

Start Date: August 1, 2008
Expires: July 31, 2010
Total Amount: $500,000

Investigator: Laura Hollingsworth, lauraohollingsworth@hotmail.com
Company: PolyNew Incorporated
1021 18th Street
Golden, CO 80402
Phone: (303) 277-9033

Abstract:

This Small Business Innovation Research (SBIR) Phase II research develops innovative nanotechnology to allow the use of bioplastics for food packaging. Polylactic acid (PLA) is an environmentally beneficial bioplastic made from renewable resources; however, the properties of PLA are limited. This makes it unsuited for use in microwaveable food packaging. In Phase I, university expertise resulting from earlier NSF funding was used to formulate a bioplastic with suitable properties, including cost. In Phase II, a viable manufacturing route towards food packing trays will be demonstrated at the pilot plant level working in close collaboration with a large industrial manufacturing partner. The broader impacts of this Phase II SBIR research will be manifold. The new bioplastics are quantitatively more environmentally benign that petroplastics. Bioplastics are made form renewable resources and therefore simultaneously help decrease dependence on foreign oil while providing environmental benefits. Using a domestic biomass resource provides a competitive advantage against low labor cost manufacturers like China helping to stem job losses in the plastics industries. Presently, polystyrene is largely used for tray applications and foamed with 3-5 weight percent hydrocarbons. PLA can be foamed with carbon dioxide so the new technology has the additional benefit of displacing at least 1 million pounds per year of the pollutant volatile organic carbons (VOCs).

Title: SBIR Phase II: Shape memory polymer AAA Endograft

Award Number: 0823015
Program Manager: Cynthia A. Znati

Start Date: July 1, 2008
Expires: June 30, 2010
Total Amount: $450,989

Investigator: Craig Lanning, clanning@endoshape.com
Company: EndoShape Inc
1408 Kingwood Pl
Boulder, CO 80304
Phone: (303) 652-7338

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims to continue the development of novel endografts for percutaneous treatment of abdominal aortic aneurysms (AAA) using unique and proprietary shape memory polymer (SMP) technology. Abdominal aortic aneurysms are both common and lethal in the older population, affecting between 7 and 13 % of older persons (> 60 years), accounting for between 13,000 and 18,000 deaths per year in the US alone, and increasing in diagnostic prevalence as both diagnostic techniques improve and the population ages. Endovascular treatment using covered stainless steel or Nitinol stent-grafts is now the preferred option for AAA treatment. However, current devices are far from perfect, and complications from endovascular repair such as endoleaks, continued growth of the aneurysm, device migration, arterial dissections, and other problems persist at very high (> 25-35%) rates. Most if not all these problems can be traced to the inherent limitations of the materials used in current devices. We propose to continue the highly promising Phase I work with particular focus on four areas: finalize polymer formulation; develop methods to manufacture patient-specific endograft designs; finalize biocompatibility evaluation; and evaluate endografts in acute and chronic animal studies. Anticipated deliverables at the end of the Phase II project are a finalized polymer formulation particularly suitable for endografts, complete ISO 109993 biocompatibility evaluation, methods to manufacture patient-specific endografts, and comprehensive data on the acute and chronic vascular response of the shape memory polymer endografts. The broader impacts of this work lie in the development of the next generation of medical devices using advanced materials with characteristics that can be customized to the patient. The successful development of useful devices from such technologies should pave the way for a plethora of commercial opportunities including tissue-engineering applications whereby the "seeds' of new tissues or organs can be incorporated into shape memory polymer devices and delivered using minimally invasive methods into the target site to eventually grow healthy tissue. The ability to fuse shape memory polymer technology with advanced three-dimensional imaging and automated manufacturing methods, such as rapid prototyping and stereo-lithography, promises to open up the exciting prospect of creating patient-specific devices within the operating suite; devices that once manufactured can be compacted in situ into a catheter and delivered immediately into the patient. Lastly, successful completion of the overall project should have immediate impact on a disease that is the 13th leading cause of death in the US, and consequently on human health.

Title: SBIR Phase II: Fire-Retardant Phase Change Materials from Fats and Oils

Award Number: 0750470
Program Manager: Gregory T. Baxter

Start Date: April 15, 2008
Expires: March 31, 2010
Total Amount: $500,000

Investigator: Mark Sutterlin, rusty@renewablealternatives.com
Company: Renewable Alternatives, LLC
4009 Day Flower Ct.
Columbia, MO 65203
Phone: (573) 884-0562

Abstract:

This Small Business Innovation Research (SBIR) Phase II research focuses on a new type of phase change material(PCM)that can meet performance goals of being fire-retardant, non-toxic, and renewable. This project will advance the state of understanding of fat/oil chemistries. It will also advance our understanding of non-ideal mixture behavior. Applications that will benefit include such things as clothing, building construction and HVAC systems. Fat and oil based PCMs currently produced by the company both out-perform paraffin-based PCMs and cost less. While customers have overwhelmingly accepted these renewable PCMs, they overwhelmingly expressed their desire that fire-retardant phase change materials be developed. The broader impacts of this research includes the incorporation of PCMs into applications that would have impacts for both general public and the military/emergency response personnel. Phase change materials find a range of applications, including clothing, construction materials, and food containers. The introduction of lower-cost fire-retardant phase change materials will have broader impacts through improved utilization in consumer products. Applications not previously pursued will be open to use of these materials because of reduced risk of fire. When used in buildings, the phase change materials can reduce energy costs year-round. An improved understanding of the associated fat and oil chemistry will likely find other applications in the fat and oil industries.

Title: SBIR Phase II: Novel Titanium Tantalum Materials for Improved Biomedical Implants and Medical Devices

Award Number: 0724433
Program Manager: Cheryl F. Albus

Start Date: August 1, 2007
Expires: July 31, 2009
Total Amount: $500,000

Investigator: Harvey Fisher, hfisher@dynamettechnology.com
Company: Dynamet Technology, Inc
Eight A St
Burlington, MA 01803
Phone: (617)272-5967

Abstract:

This Small Business Innovation Research (SBIR) Phase II project will use Titanium-Tantalum (Ti-TA) alloys, with the objective that these materials will become commercial alloys used in orthopaedic and stinting devices. Ti-30Ta has potential as a highly biocompatible implant alloy with a modulus closer to that of bone (thus mitigating bone shielding), and is potentially less notch-sensitive than standard titanium implant alloys. This project will also demonstrate that advanced powder metallurgy can produce novel titanium alloys that are extremely difficult and prohibitively expensive to produce by other means. Critical material property data of these alloys will be generated that will lead medical device manufacturers to incorporate these alloys into specific devices and to conduct the necessary testing and clinical trials for commercial product release.

The broader impacts from the use of Ti-Ta alloys will enable the development of improved medical devices that will last longer; are less invasive, promote faster patient recovery times and minimize the risk of adverse reactions. Advances in orthopedic and cardiovascular products will also significantly reduce short-term and long-term health care costs associated with such medical conditions and surgical procedures. Ti-Ta materials will also offer advantages for non-biomedical applications, in regard to mechanical properties as well as to shape memory and superelastic properties. For example, such materials can be expected to also offer improved properties such as resistance to corrosion, oxidation and high temperatures. Thus, availability of these alloys will be applicable to a wide variety of industrial, consumer and aerospace products in addition to biomedical applications, resulting in significant commercial potential.

Title: STTR Phase II: Variable Diameter Fiber Reinforced Biopolymers for Minimally Invasive Orthopedic Implants

Award Number: 0548663
Program Manager: Rathindra Dasgupta

Start Date: September 20, 2006
Expires: September 30, 2008
Total Amount: $499,849

Investigator: James Mason, grangeng@comcast.net
Company: Granger Eng
PO Box 845
Granger, IN 46530
Phone: (574)272-0552

Abstract:

The Small Business Technology Transfer Research (STTR) Phase II project will develop a new ceramic fiber technology for reinforcing injectable bioplastics used in orthopaedic applications. The main goal of this research project is to achieve a significant increase in strength and stability of the proposed product over current injectable polymer based biomaterials through a combination of variable diameter fibers and new cements.

The proposed product would result in the enablement of new surgical techniques. In addition, the research might be applicable to injection molding of mass produced plastics which could significantly strengthen many products.

Title: SBIR Phase II: All Natural Biobased High Performance Composites for Industrial Applications

Award Number: 0518940
Program Manager: George B. Vermont

Start Date: September 1, 2005
Expires: August 31, 2007
Total Amount: $450,117

Investigator: N Hecht, bhecht@acrtucson.com
Company: Advanced Ceramics Research, Inc
3292 E Hemisphere Loop
Tucson, AZ 85706
Phone: (520)573-6300

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to optimize and commercialize the manufacturing of all natural biobased composites from renewable resources. Phase I research demonstrated the technical feasibility of fabricating soybean oil based composites using a selected fiber/resin polymer composite combination. The Phase II project will focus on optimization and scale-up of the fabrication approach and process to improve the performance of the biobased composites. Further, with the help of commercial partners, Phase II work will develop a number of full scale prototype products with the following features: (1) the products contain 80% or more natural fibers and resins; (2) the products rely on economical and environmentally friendly tooling and manufacturing processing; and (3) the products comply with performance, safety, durability, and cost requirements set by end-users.

The commercial applications of this project will be in a number of areas, including low cost building materials for industrial and household furniture, packaging materials, piping for remote areas and aquaculture systems. The proposed biobased composites are expected to have higher value-in-use industrial applications than their petroleum counter-parts (that is, to be available at a lower cost while offering the same functionality).

Title: SBIR Phase II: Advanced Controlled-Impedance Transfemoral Knee/Ankle Prosthesis

Award Number: 0450632
Program Manager: Michael R. Ambrose

Start Date: January 15, 2005
Expires: December 31, 2006
Total Amount: $500,000

Investigator: Edwin Iversen, ed@utaharm.com
Company: Motion Control, Inc.
2401 S 1070 W # B
Salt Lake City, UT 84119
Phone: (801)978-2622

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims to develop a transfemoral prosthesis which will allow wearers to walk and run more smoothly, with greater stability and less effort. Typically, transfemoral amputees have difficulty achieving a natural gait, thus causing discomfort and greater energy expenditure. It is expected that the development of this advanced prosthesis will greatly enhance the function and comfort of amputees and bring new technology to the prosthetic industry. In Phase I research, a unique engineering model of the knee and the ankle was developed, implementing the pneumatic compliance (spring) and electrically-controlled hydraulic damping. In Phase II, complete prototypes of the microprocessor-controlled knee/ankle prosthesis will be developed, with the following features: (a) compliant (elastic, rather than stiff) knee flexion during stance phase, which will return energy to the wearer and improve comfort, (b) co-ordination of knee and ankle impedance to match desired walking cadence, and minimal energy expenditure by tuning the spring rate to the natural frequency; and (c) myoelectric control of knee impedance. In addition, high-performance features will be integrated into the prosthetic device, including adaptive swing phase knee impedance, and automatic control of stance phase impedance.

The commercial application of this project will be in the area of prosthetic devices for use by people with knee and foot (transfemoral) amputation. The proposed product will allow the amputees to wear their prosthesis for a longer time period, with less effort and more safety, and to walk on more rugged and uneven terrain. Estimates of revenues resulting from this project show gross sales starting at $750,000 per year, growing rapidly after 5 years to over $8,000,000.

Title: SBIR Phase II: Tissue Engineered Cartilage for Drug Discovery

Award Number: 0422194
Program Manager: Om P. Sahai

Start Date: August 1, 2004
Expires: July 31, 2006
Total Amount: $498,843

Investigator: Brian Pfister, bpfister@articular.com
Company: Articular Engineering, LLC
1818 Skokie Blvd. Suite 158
Northbrook, IL 60062
Phone: (847)498-9634

Abstract

This Small Business Innovation Research (SBIR) Phase II project is to develop scale-up production technology to produce engineered cartilage for drug discovery using a proprietary Alginate Recovered Chondrocyte (ARC) method. This method stimulates adult human cartilage cells to form a cartilaginous tissue with proper compositional and functional properties. ARC cartilage tissue is expected to offer a cost-effective alternative to current culture systems and expensive animal studies while utilizing human tissue.

The commercial application of this project will be in the area of drug discovery for cartilage-related problems such as rheumatoid arthritis.

Title: SBIR Phase II: Scalable Synthesis and Processing of Nanocrystalline Hydroxyapatite

Award Number: 0349884
Program Manager: Om P. Sahai

Start Date: February 15, 2004
Expires: January 31, 2006
Total Amount: $499,999

Investigator: Edward Ahn, eahn@angstrommedica.com
Company: Angstrom Medica, Incorporated
150 California Street
Newton, MA 02458
Phone: (617)454-3620

Abstract

This Small Business Innovation Research (SBIR) Phase II Project proposes to use a newly developed synthetic nanocrystalline hydroxyapatite (HAP) bone material to produce high-strength, resorbable synthetic bone implants for anterior cruciate ligament surgeries. This material solves the problem of current orthopedic implants (made of polymer and/or metal) which either permanently reside as foreign material in the body or quickly degrade into a formless mass of non-ossified, non-load bearing tissue. The objectives of the Phase II work are to concurrently scale up manufacturing processes for HAP to near-commercial levels while developing an anterior cruciate ligament (ACL) prototype product for testing in vivo.

The commercial impact of this project will be in the area of orthopedics. The proposed technology will help decrease the time of healing in surgeries requiring implants (fractiures, ACL) and will minimize the need for second surgeries to remove the screws and/or to correct for morbidities.

Biomedical Devices and Instrumentation

Title: STTR Phase II: Magnetohydrodynamic-based Circular Liquid Chromatography

Award Number: 0822723
Program Manager: Gregory T. Baxter

Start Date: August 1, 2008
Expires: July 31, 2010
Total Amount: $499,923

Investigator: Christine Evans, ceevans@sfc-fluidics.com
Company: SFC Fluidics, LLC
535 W Research Blvd, Suite 135,
Fayetteville, AR 72701
Phone: (479) 571-2592

Abstract:

This Small Business Technology Transfer Research (STTR) Phase II project develops a circular chemical separation system on a small (~1 inch x 1 inch) chip. This chip and the associated instrument will separate complex mixtures for biological, chemical, medical, and industrial applications. Based on magnetohydrodynamic (MHD)-driven liquid flow, liquid chromatographic (LC) separations will be accomplished in a circular, closed-loop format. Typically, LC separations require a sample containing multiple analytes to flow in a single direction along a fixed-length, linear column with detection performed after the analytes elute from the column. In the circular LC system, miniaturization is possible because samples are instead circulated around a closed-loop chromatographic column thus, the effective column length is not limited to small chip dimensions. Very few methods can provide the mobile-phase pumping in a closed-loop that is required for practical application of circular LC. The MHD-based circular LC system envisioned will be small, portable, and designed for laboratory as well as field use. The sealed LC chip will contain the stationary phase, mobile phase, and all in situ MHD pumps needed to conduct the separation of complex samples. This prototype LC instrument will be designed and fabricated with a built-in fluorescence detector for monitoring analyte separation directly on the chromatographic column. The broader impacts of this research are highlighted by the ability of the proposed circular separation system to miniaturize a valuable analytical tool, liquid chromatography (LC). Samples of interest include human blood serum, saliva, and urine, with component analytes of interest that are equally diverse (e.g. proteins, pharmaceuticals, and small molecular biomarkers). Many analytes in these complex mixtures have similar properties and cannot be separated and analyzed using a very short chromatographic column, which has limited the miniaturization of this important analytical tool. This limitation is overcome using circular LC, where the effective column length is not limited by the small chip sizes that are essential for portable LC instrumentation. SFC Fluidics' core technology makes possible the miniaturized, closed-loop pumping required for implementation. This method has broad implications for the portable LC systems for field deployment or point-of-care applications. The market opportunity is expected to be significant, particularly when considering that applicability extends beyond the traditional instrumentation market into the worldwide point-of-care diagnostics market.

Title: SBIR Phase II: Optical Spectroscopy for Colon Cancer Screening without Colonoscopy

Award Number: 0823064
Program Manager: Cynthia A. Znati

Start Date: July 15, 2008
Expires: June 30, 2010
Total Amount: $500,000

Investigator: Andrew Cittadine, andrew.cittadine@americanbiooptics.com
Company: American BioOptics, LLC
1801 Maple Ave
Evanston, IL 60201
Phone: (847) 467-0628

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims to develop a commercial grade optical probe and system for FDA clinical trials and subsequent commercialization of a population-wide colon cancer screening test. An interdisciplinary research team of engineers, biologists, and clinicians has developed low-coherence enhanced backscattering (LEBS), an optical technique which enables sensing tissue microarchitectural correlates of the genetic/epigenetic changes in otherwise histopathologically normal mucosa. The preliminary animal and human studies demonstrated the potential of LEBS to detect subtle alterations in histologically normal-appearing tissue that occur with the presence of precancer in a different part of an organ, a consequence of the well-established concept of field carcinogenesis. This opens a possibility to detect colonic adenomas by means of LEBS analysis of rectal tissue, which is readily accessible using a rectal probe and without the need for colonoscopy or bowel preparation. Indeed, ex vivo human studies and a small-scale trial of the in vivo LEBS probe from Phase I research demonstrate that rectal LEBS is remarkably accurate for predicting neoplasia anywhere in the colon. In continued close collaboration with the research team, American BioOptics endeavors in Phase II to refine the prototype LEBS probe into a medical-grade probe for use in a patient without bowel preparation and to develop a low-cost LEBS optical system for multi-center FDA trials and subsequent commercialization. LEBS has the potential to become the first truly population-wide test for colon cancer screening performed during an annual exam by a primary care physician, without colonoscopy or bowel preparation to determine the need for colonoscopy. The proposed test would be simple, inexpensive, minimally intrusive and highly accurate without the need for bowel cleansing. Colon cancer is the second leading cause of cancer deaths in the U.S. largely because of especially poor screening participation relative to other major cancers. Only a small fraction of eligible population (90 million Americans over age 50) undergoes screening colonoscopy due to a variety of reasons including expense, patient reluctance, complications, and insufficient number of endoscopists. Development of a minimally invasive test to identify patients who do and do not harbor colonic adenomas is of crucial importance to enable, for the first time, population-wide screening for this disease. Currently, no such initial screening test is available. Based on the results of the LEBS test, the physician could recommend either no colonoscopy (the majority of cases) or need for colonoscopy (which the patient will be more compliant with). Thus, with a readily available LEBS screening test developed in Phase II and subsequent FDA approval, more patients with colonic neoplasia will undergo colonoscopy. The LEBS test would not only prevent many more colon cancer deaths by screening a larger part of the population, but it would also reduce costs/complications of screening in the majority of the population who are not destined to develop neoplasia.

Title: SBIR Phase II: Automated Analysis of Body Fluid Chemistry Using MHD-Based Microfluidics

Award Number: 0750328
Program Manager: Gregory T. Baxter

Start Date: February 15, 2008
Expires: January 31, 2010
Total Amount: $500,000

Investigator: Christine Evans, ceevans@sfc-fluidics.com
Company: SFC Fluidics, LLC
535 W Research Blvd, Suite 135,
Fayetteville, AR 72701
Phone: (479) 571-2592

Abstract:

This Small Business Innovation Research (SBIR) Phase II Proposal develops a suite of labs-on-a-chip that can be used to establish the metabolic health of an individual in real-time from a finger-prick sample of blood. Each disposable chip will contain all reagents necessary to run the assay and all waste will be stored on the chip. These sealed, self-contained assay chips will be based on magnetohydrodynamic microfluidics and microelectrochemical detection and will allow for the simultaneous quantization of multiple biomarkers. The biomarkers chosen for this project have been linked to an individual?s metabolic health in a broad range of high importance areas, including aging, cardiovascular health, neurochemical health, and prepregnancy health. The ability to quantify the biomarkers simultaneously will allow for assessment of an individual?s metabolic status and determination of an intervention strategy within the time scale of a single visit to the doctor. Any necessary follow-up visit will provide immediate feedback on success or failure of the intervention strategy. This point-of-care testing platform will allow both doctor and patient to take a more proactive stance in the management of an individual?s metabolic status. The broader impacts of this research meet a need for improved preconception care. This technology can be expanded to include additional biomarkers that will allow for convenient, inexpensive screening of a number of health issues, including pernicious anemia, renal disease, neurochemical health and cardiovascular health that could broaden its impact on improving the Nation's healtcare.

Title: SBIR Phase II: High-Throughput In-Situ Crystallography Screening System

Award Number: 0750353
Program Manager: Gregory T. Baxter

Start Date: February 15, 2008
Expires: January 31, 2010
Total Amount: $499,393

Investigator: Steve Wang, youngkreisler@gmail.com
Company: Xradia
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Concord, CA 94520
Phone: (925) 288-1818

Abstract:

The Small Business Innovation Research (SBIR) Phase II project aims to develop a high throughput crystallography screening system aimed at accelerating and automating crystal growth for structural studies. X-ray crystallography is the primary method for determining the molecular structure of biological macromolecules, including proteins and nucleic acids. Yet, although crystals are an ideal material for analyzing the structure of solids, growing crystals of sufficient quality for diffraction studies has heretofore been a tedious and labor-intensive undertaking. Thus, the development of a platform that allows automation, miniaturization and parallelization for obtaining crystals of optimal quality would be a significant step forward in crystallography and would accelerate structural studies. An improvement in this area would therefore be of interest not only to academic scientists engaged in structural studies, but also to pharmaceutical researchers who are interested in the structural relationship of drugs and their targets.

Title: SBIR Phase II: Non-Contact Optical Stethoscope for Neonatal Patients

Award Number: 0724449
Program Manager: Muralidharan S. Nair

Start Date: July 15, 2007
Expires: June 30, 2009
Total Amount: $500,000

Investigator: Andrey Vyshedskiy, andrey@stethographics.com
Company: Stethographics
21 Wayside Road
Westborough, MA 01581
Phone: (508)320-2841

Abstract:

This Small Business Innovation Research (SBIR) Phase II research project will develop a non-contact optical stethoscope for use in Neonatal Intensive Care Units (NICU). Premature babies in NICU require monitoring for signs of lung congestion and heart disease. Currently NICU medical personnel use acoustic stethoscopes. The use of acoustic stethoscope has a number of highly undesirable side effects including withdrawal response, flinching, apnea, hypoxemia, change in sleep state, and possibility of contamination. During Phase I a prototype non-contact optical stethoscope, capable of recording good quality heart and lung sounds was developed. The non-contact stethoscope is based on a standard technique of interferometry with a novel fiber optic design. The fiber optic design avoids the use of glass components - mirrors, lenses, splitters, and prisms - and yields a light, rugged and inexpensive interferometer.

The non-contact optical stethoscope based on the fiber optic interferometer could greatly improve the quality of care for neonates, burn victims, immuno-suppressed patients, and in those cases where direct contact should be avoided. A laser interferometer based on a novel fiber optic design has been developed. The interferometer based on fiber optics is light, inexpensive, and rugged as it does not require component alignment. The handheld point-and-listen microphone based on the fiber optic interferometer can be ideally positioned to enter the existing laser interferometry market and to open new markets including medical, preventive maintenance of rotating machinery, military urban and rescue operations, as well as law enforcement surveillance.

Title: SBIR Phase II: POINT - Precision Optical Intra-Cellular Near-field Technology

Award Number: 0548768
Program Manager: Ali Andalibi

Start Date: September 25, 2006
Expires: August 31, 2008
Total Amount: $338,122

Investigator: Joanne Ebesu, doconnell@oceanit.com
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Honolulu, HI 96813
Phone: (808)531-3017

Abstract:
This Small Business Innovation Research (SBIR) Phase II project proposes to develop a novel high-resolution instrument capable of penetrating live cells. Currently there are no methods that allow the inside of a living cell to be imaged down to 50 nm resolution or less. Confocal microscopes, MRI and ultrasound cannot image to this resolution and the use of electron microscopes destroys the cells. The potential to develop nanosensors capable of penetrating a cell without destroying its natural environment may provide new information about the molecular makeup of a cell. The proposed Precision Optical Intra-cellular Near-field Technology (POINT) is an innovative adaptation of Near-Field optical microscopy using solid emersion lens (SIL) technology coupled with a sub-wavelength aperture probe. The goal of the Phase I project was to research the feasibility of developing a near-field probe and solid immersion lens combination that would be useful for biological research by providing nanometer scale resolution and enhanced light throughput to image inside intact cells. A small optical excitation volume is provided by a near-field probe, circumventing the diffraction limit to obtain sub-wavelength spatial resolution. This new capability offers higher sensitivity and resolving power than is presently available in microscopy, and could provide a more detailed understanding of molecular processes underlying mutations that lead to any of a number of diseases such as cancer. Solid immersion lenses were successfully fabricated in house by grinding and polishing commercially available ball lenses and validation experiments were then carried out. It was demonstrated that a tighter focused laser spot and narrower spectral width were achieved when using a SIL. This corresponds to higher light coupling to a probe placed at the bottom of the SIL. Successful probe fabrication was achieved based on optical modeling for optimum light throughput.

In phase II we will develop the platform needed to use this SIL/Probe optical tool in conjunction with a regular microscope. The use of a nanoposition stage for precise alignment and extremely small motion of the probe will be integrated as well as a feedback mechanism that signals when physical contact is achieved, such as the probe penetrating a cell's membrane. Various SIL/Probe designs will be characterized including a custom SIL with phase grating for laser wavelengths in the blue. The work in Phase II is a direct follow-on from what was achieved under the Phase I effort.

Title: SBIR Phase II: Microelectrochemical Assays for Malaria Parasites

Award Number: 0548742
Program Manager: F.C. Thomas Allnutt

Start Date: February 16, 2006
Expires: February 29, 2008
Total Amount: $518,000

Investigator: Zoraida Aguilar, zoraida.aguilar@vegrandis.com
Company: Vegrandis
535 West Research Blvd
Fayetteville, AR 72701
Phone: (479)571-2592

Abstract:

This Small Business Innovation Research (SBIR) Phase II project focuses on the development of an automated, high-throughput, sensitive and specific assay for the micorelectrochemical detection of malaria parasites. The use of microelectrochemical assay will allow for the detection of malarial parasites with a combination of attributes, such as all four species to the level of one parasite per microliter of blood without sample preparation.

This technology will impact the current blood donor screening guidelines that call for the deferral of potential donors for one year following travel to malaria endemic regions. Not only do cases of fatal transfusion-transmitted malaria occasionally occur, but also the availability of the blood supply is reduced. This technology will aid the blood banking industry by providing an inexpensive, high-throughput, low detection limit malaria test as blood donor screening tool.

Title: SBIR Phase II: Hybrid Inorganic/Organic Ion Exchange Material for the 227Ac/223Ra Generator

Award Number: 0450581
Program Manager: George B. Vermont

Start Date: April 15, 2005
Expires: March 31, 2007
Total Amount: $452,553

Investigator: Hariprasad Gali, hari.gali@lynntech.com
Company: Lynntech, Inc
7607 Eeastmark Dr Ste 102
College Station, TX 77840
Phone: (979)693-0017

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims to develop a generator to produce pure radium-223 for use in cancer therapy. The alpha-emitter Ra-223 has a longer half-life than the other alpha-emitting radioisotopes (213 Bi, 212Bi and 211At) that are currently being evaluated for use in radio-immunotherapy (RIT), and has been shown to have higher bone uptake than the commercially available beta-active bone seekers. This makes it very attractive for Ra-223 to be developed further for radiopharmaceutical applications and for use as a pain palliation agent. However, the research and clinical application of this isotope are hindered by the limited availability of pure Ra-223. A simple technique to produce the isotope is a generator where a suitable parent, in this case Ac-227, is immobilized on an ion exchanger column and Ra-223 is eluted when required. Current separation methods frequently use organic resins, which tend to degrade under ionizing radiation and thus the product may contain impurities. Prior Phase I work developed new hybrid inorganic/organic ion exchange materials with high affinity for actinium, but low affinity for radium and good resistance against radiation. The Phase II project will optimize the exchanger performance and fabricate a prototype of the Ra-223 generator.

The commercial application of this project will be in the area of cancer therapy. It is expected that the easy - to - use generator, which poses a smaller radiation hazard to personnel, will be used at medical research centers, radio - pharmacies and hospitals to produce pure radium - 223 to treat patients with bone metastases and other small solid tumors.

Title: SBIR Phase II: Detection and Identification Instrument for Single Molecule Analysis

Award Number: 0450539
Program Manager: George B. Vermont

Start Date: March 1, 2005
Expires: February 28, 2007
Total Amount: $500,000

Investigator: Arieh Karger, AKarger@RMDInc.com
Company: Radiation Monitoring Devices Inc
44 Hunt Street
Watertown, MA 02472
Phone: (617)668-6801

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop a novel, low cost laboratory instrument for genetic analysis and single molecule studies. The technology is suitable for the detection and identification of DNA and RNA through fluorescent hybridization probes without the need for Polymerase Chain Reaction (PCR) amplification, or for proteins and small molecules through fluorescence immunoassays. The general scheme is based on single molecule detection (SMD) and utilizes the two-color cross-correlation spectroscopy (TC-FCCS) technique with coincident detection analysis scheme to simultaneously probe ten focal regions of a microfluidic assay. High efficiency single photon detectivity Geiger mode microavalanche photodiode (uAPD) arrays will function as detection elements.

The commercial application of this project will be on biological and medical research, and on the drug development process. Examples of potential applications range from the study of conformational dynamics and interactions of macromolecules to biochemical kinetics of single molecules.

Title: SBIR Phase II: Three-Dimensional (3D) Laparoscope

Award Number: 0422102
Program Manager: George B. Vermont

Start Date: March 1, 2005
Expires: February 28, 2007
Total Amount: $428,918

Investigator: Kurtis Keller, kurtis@inneroptic.com
Company: Inneroptic Technology Incorporated
106A N. Churton St.
Hillsborough, NC 27278
Phone: (919)962-1746

Abstract:

This Small Business Innovation Research (SBIR) Phase II project is to develop a fully functional prototype 3-D laparoscope, which will be superior to the 2-D laparoscopes currently used in surgeries, based on laser illuminated miniaturized projector for computer generated light patterns and two cameras for acquisition of color and depth.

The commercial application of this project will be in surgical operations. This device will have the capacity to provide depth and computer enhanced view of the surgical domain more akin to open surgery. This would allow for more precision in surgical procedures, thereby eliminating hand-eye coordination issues and reducing mistakes and accidents.

Title: SBIR Phase II: Novel Nanosized Magnets for Highly Sensitive Multiplexing Bio-Molecular Detection

Award Number: 0450641
Program Manager: George B. Vermont

Start Date: February 1, 2005
Expires: January 31, 2007
Total Amount: $497,185

Investigator: Ted Sun, ted@ls-tek.com
Company: LS Technologies
44160 Old Warm Springs Blvd
Fremont, CA 94538
Phone: (510)651-1329

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop and validate highly sensitive contrasting agents in-vivo, for magnetic resonance imaging (MRI) diagnosis, based on a series of novel nano-sized ferromagnets. Prior Phase I work used combinatorial chemistry to synthesize magnetic nanoparticles with significantly enhanced magnetic resonance signal and sensitivity than currently available paramagnetic contrasting agents. The specific objectives of Phase II research are to further optimize the nano-magnet cores with combinatorial chemistry , to functionalize their surfaces for in-vitro imaging of cells, to validate the newly developed contrasting agents in comparative animal MRI studies against products in use, and to evaluate their toxicity effects.

The commercial application of this project will be in the area of whole-body imaging techniques. The proposed technology will enable superior medical images to be taken at significantly higher throughput and sensitivity, and at a lower cost. Further, it may allow for new medical diagnosis-imaging applications using magnetic resonance (for example, in the early detection and prevention of cardiovascular disease).

Title: SBIR Phase II: Catheters with Anticoagulation and Fibrinolytic Properties

Award Number: 0422181
Program Manager: Michael R. Ambrose

Start Date: November 1, 2004
Expires: October 31, 2006
Total Amount: $510,774

Investigator: Jun Du, Ydu@spirecorp.com
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1 Patriots Park
Bedford, MA 01730
Phone: (781)275-6000

Abstract:

This Small Business Innovation Research (SBIR) Phase II project will develop blood-compatible biomaterials for end-stage renal dialysis (ESRD) catheters through an integrated biological coating (IBC) that combines protein passivation, anticoagulation, and fibrinolytic mechanisms on the surface. Phase II work will build on the Phase I demonstration that internal and external surfaces of BaSO4-loaded polyurethane catheters were activated by an electron cyclotron resonance (ECR) process that promoted uniform deposition of an IBC coating. In the Phase II project, the coating process will be optimized and deposition equipment will be upgraded to enhance reliability and repeatability. Finished catheters will be produced and evaluated for blood compatibility through in vitro human blood testing and ex vivo sheep shunt model experiments. Finished IBC catheters will also undergo rigorous mechanical, biocompatibility, and toxicity testing to show compliance with FDA standards.

The principal commercial application of this project will be on the catheter industry. The proposed technology will also find applications in coatings for other blood-contacting devices such as grafts, polymeric stents , valves and by-pass systems.

Title: SBIR Phase II: Robotic Scrub Technician

Award Number: 0422114
Program Manager: George B. Vermont

Start Date: November 1, 2004
Expires: October 31, 2006
Total Amount: $491,500

Investigator: Michael Treat, mt23@columbia.edu
Company: Robotic Surgical Tech, Inc.
5141 Broadway
New York, NY 10034
Phone: (212)932-4520

Abstract:

This Small Business Innovation Research (SBIR) Phase II project will develop a robotic scrub technician that anticipates a surgeon's request for an instrument during surgery using robotics technology. Phase II research will build upon the success achieved in Phase I work , and will implement cognitive architecture over the current physical and sensory system of the robot. To validate the cognitive architecture, the robot will assist surgeons while performing operations on a physical simulator and in experimental animals. In this way, errors both robotic and human will come into play. The robot's actions will be judged using criteria for speed and clinical appropriateness, and the cognitive architecture will be modified to eliminate undesired behaviors. It is expected that the robot will perform in a clinically acceptable way.

The commercial impact of this project will be in the area of healthcare. The proposed work addresses the issue of critical shortage of nurse technicians, and could reduce personnel costs in hospitals. Furthermore, the use of robots for this environment may free up human technicians to do more critical tasks.

Title: SBIR Phase II: Multipass Second Harmonic Generation

Award Number: 0421974
Program Manager: Om P. Sahai

Start Date: September 15, 2004
Expires: August 31, 2006
Total Amount: $492,690

Investigator: Guido Knippels, gknippels@picarro.com
Company: Picarro, Inc.
480 Oakmead Parkway
Sunnyvale, CA 94085
Phone: (408)962-3919

Abstract

This Small Business Innovation Research (SBIR) Phase II project is to develop low-cost, 20-50 mW blue and green lasers for bioinstrumentation applications. The Phase II program objectives are to : (1) design, assemble and test 20 mW 505 nm laser prototypes; (2) to validate laser performance in a commercial bio-instrumentation application; and, (3) to assemble, test, and validate 50 mW blue-green laser prototypes using a higher efficiency second harmonic generation (SHG) architecture.

The commercial application of this project will be the availability of inexpensive laser light sources for researchers in cellular biology and DNA sequencing.

Title: SBIR Phase II: Automated Monitoring and Alarming for Elder Care

Award Number: 0422154
Program Manager: Om P. Sahai

Start Date: September 1, 2004
Expires: August 31, 2006
Total Amount: $481,203

Investigator: Rajeev Sharma, rsharma@advancedinterfaces.com
Company: Advanced Interfaces, Inc.
403 South Allen Street
State College, PA 16801
Phone: (814)867-8977

Abstract

This Small Business Innovation Research (SBIR) Phase II project will develop an automated monitoring system for residents living in elder care facilities. This system will enable the facility staff to quickly respond to any event or behavior requiring intervention, such as an accidental fall, using computer vision for tracking and behavior analysis. Prior Phase I research demonstrated the feasibility of this approach for fall detection and behavior analysis with the help of a laboratory prototype. This work also highlighted several challenges, such as dealing with changing lighting conditions and complex behaviors. Phase II research will focus on addressing these challenges and creating twelve beta sites in actual elder care facilities to further develop and test the algorithms.

The commercial application of this project will be on institutions linked to the care of the elderly. With over 50% of the growing population of seniors staying in independent / assistive living facilities or nursing homes, injuries and deaths resulting from unattended falls represent a serious societal and economical problem. Over 1.8 million seniors fall each year, with each fall costing an average of $9,400 in hospitalization. The proposed work could lead to a solution that provides a way for quickly responding to falls, saving hospitalization costs up to 26% and more importantly, reducing the likelihood of death by as much as 82%. It would also help in generating a feeling of security for the elders and their care givers, without a substantial increase in healthcare costs.

Title: SBIR Phase II: MicroElectroMechanical Systems (MEMS) Wavefront Correction Device for Ophthalmic Adaptive Optics

Award Number: 0421965
Program Manager: Om P. Sahai

Start Date: August 15, 2004
Expires: July 31, 2006
Total Amount: $492,983

Investigator: Steven Rodgers, steve.rodgers@memx.com
Company: MEMX, Inc.
2620 Augustine Drive
Santa Clara, CA 95054
Phone: (408)764-0185

Abstract

This Small Business Innovation Research (SBIR) Phase II project proposes to develop a MEMS wavefront correction device for ophthalmic adaptive optics. The use of adaptive optics in ophthalmics shows great promise, but the lack of suitable cost-effective solutions has hindered the advance of research and the development of associated commercial markets. The proposed work will leverage the most sophisticated surface micromachining technology available to design and deliver, for the first time, a MEMS wavefront correction chip that addresses all of the requirements specified by the vision science community. The commercial application of this project will be in the area of ophthalmology. Ophthalmic equipment suppliers need low cost wavefront correction devices for use in next generation phoropters and autorefractors, LASIK preview systems, and high resolution fundus imaging systems.

The ophthalmic market for low cost wavefront correction devices, once such devices are available, is projected to be at least $20 million per year. Such devices may also have utility outside of ophthalmics. Optical coherence tomography, confocal microscopy, portable military imaging systems, free space optical communication systems, and semiconductor lithography are other potential application areas for wavefront correction devices.

Title: SBIR Phase II: Mouthrinse Generator for Plaque and Halitosis Control

Award Number: 0349689
Program Manager: Om P. Sahai

Start Date: March 1, 2004
Expires: February 28, 2006
Total Amount: $492,100

Investigator: Charles Tennakoon, charles.tennakoon@lynntech.com
Company: Lynntech, Inc
7607 Eastmark Drive, Suite 102
College Station, TX 77840
Phone: (979)693-0017

Abstract

This Small Business Innovation Research (SBIR) Phase II will develop and commercialize electrochemically operated devices that will revolutionize the oral hygiene industry by providing an on-demand generation of mouthwash in a portable device and in an irrigator. The mouthwash generated in these devices will be effective in controlling halitosis and dental plaque and will also provide tooth whitening. In the Phase I study, all of the proposed objectives and specified criteria of success were accomplished to amply establish the proof of concept and feasibility of the project. In Phase II, further optimization of the parameters will be followed by the design and fabrication of prototypes in conjunction with a prominent company dealing with turnkey manufacturing, and the testing of 100 portable units in a clinical setting.

The commercial impact of this project will be in the area of oral hygiene products. It is broadly estimated that up to 85 million Americans have halitosis, and over 35 million suffer from periodontal disease. Thus, the cost effective devices to be developed in this project are expected to have a large market potential in the $ 4.7 billion oral care industry.

Title: SBIR Phase II: Novel Breath Diagnostic Instrument for Detection of Disease

Award Number: 0349782
Program Manager: Om P. Sahai

Start Date: February 1, 2004
Expires: January 31, 2006
Total Amount: $490,293

Investigator: Douglas Baer, d.baer@lgrinc.com
Company: Los Gatos Research
67 East Evelyn Avenue, Suite 3
Mountain View, CA 94041
Phone: (415)965-7772

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop a carbon isotope ratio analyzer based on Off-Axis Integrated Cavity Output Spectroscopy to measure the ratio of the isotopic abundances of 13C to 12C in exhaled breath. The compact analyzer will serve as a medical diagnostic instrument and will operate in a point-of-care setting. The instrument combines robust telecommunications-grade diode lasers with Off-Axis ICOS, an innovative technology that provides extremely long optical paths (several kilometers typical) for ultrahigh sensitivity. The instrument will be inexpensive, portable and easy to use and report measurements of 13CO2/12CO2 with sufficient sensitivity and precision to replace mass spectrometry in 13C-labeled breath tests for diagnosis of several diseases. Prior Phase I work has successfully demonstrated a laboratory instrument with a precision of 0.24 per mil (0.024%) in less than 6 minutes. In Phase II, a prototype instrument capable of autonomous operation, will be developed and tested in on-going clinical trials.

The commercial impact of the project will be significant, as the proposed instrument will aid in quick diagnosis of gastrointestinal diseases at the doctor's office, thereby enhancing rates of patients' compliance with treatment regimens.

Bioprocessing and Industrial Bioproducts

Title: SBIR Phase II: Room Temperature Medical Waste Treatment

Award Number: 0750056
Program Manager: Gregory T. Baxter

Start Date: February 15, 2008
Expires: January 31, 2010
Total Amount: $505,999

Investigator: Czeslaw Golkowski, cg18@cornell.edu
Company: Super Pulse
227 Durfee Hill Rd
Ithaca, NY 14850
Phone: (607) 255-6474

Abstract:

This Small Business Innovation Research (SBIR) Phase II research develops a novel, reliable, affordable, technology for effective decontamination/sterilization of medical waste. The technology is based on an air/gas sterilant produced in a non-thermal plasma source powered by a standard microwave oven magnetron. The simplicity and the affordability of the technique to produce an effective gas sterilant capable of sterilizing a wide range of materials and surfaces at low-temperature and with low energy requirements provides technology suitable for a low cost decontamination/sterilization device for medical and dental offices/clinics. This technology is free of chemical residue, low maintenance, and simple in operation. The broader impact of this research is to improve the safety of doctors' offices and hosptials through on-site sterilization of biohazardous and infectious wastes. The technology provides a significant power saving and decreases the number of medical waste incinerators that contribute harmful emissions to the environment.

Title: SBIR Phase II: High Performance Cement Additive from an Agricultural Byproduct

Award Number: 0724463
Program Manager: F.C. Thomas Allnutt

Start Date: September 15, 2007
Expires: August 31, 2009
Total Amount: $500,000

Investigator: Rajan Vempati, chkgroup@worldnet.att.net
Company: ChK Group, Inc.
11700 Audelia Road
Dallas, TX 75243
Phone: (972)234-6744

Abstract:

This Small Business Innovation Research (SBIR) Phase II project develops the manufacturing process for a cement additive from an agricultural biomass waste to be used in the production of High Performance Concrete (HPC), and blended cement. This additive imparts increased strength and durability to concrete; therefore will mostly be used in high-rise buildings, highway construction, and infrastructures built in severe environmental conditions, e.g. petrochemical plants and marine structures. This project will generate increased revenues to the US farmers by selling their byproduct at a higher price and will create jobs in rural areas. Also, potential exists to license the technology to several emerging economies, where there is an urgent need to build transportation-, energy- and building-infrastructures.

The Broader Impacts of this research will be increased and higher value use of this agricultural waste in high strength cement. Utilization of this improved product will reduce pollution caused by the current alternatives in both air and at landfill sites. This research is intended to provide a profitable alternative to farmers producing this crop and create rural jobs.

Title: SBIR Phase II: Development of Resonant Waveguide-Grating Elements for High Throughput Screening of Proteins

Award Number: 0724407
Program Manager: Muralidharan S. Nair

Start Date: July 15, 2007
Expires: June 30, 2009
Total Amount: $500,000

Investigator: Debra Wawro, wawro@resonantsensors.com
Company: RSI
202 E. Border Street
Arlington, TX 76010
Phone: (817)300-8297

Abstract:

This Small Business Inovation Research (SBIR) Phase II research project applies a new sensor principle to develop commercial High-Throughput Screening (HTS) systems for drug-development applications. The advantages of the Guided-Mode Resonance (GMR) sensor concept for such applications reside in its inherent physical characteristics including polarization diversity, materials independence, choice of spectral regions, angular-addressing flexibility, and associated compact system configurations. These properties enable tag-free sensor technology with high sensitivity, high accuracy, and multi-parameter detection. A major objective is the development and verification of GMR-sensor HTS commercial system prototypes in standard formats. Integrated analysis software will present data on biomolecular binding events, including background density and molecular accumulation dynamics, to the user. An additional main thrust is the development of attachment chemistry and methods for sensor activation where a set of protocols and processes for example measurands will be optimized to maximize detection sensitivity. Finally, by applying transmission sensor formats with shaped input light beams and integrated detector matrices, the next-generation compact system designs for massively parallel screening of drug compounds will be provided.

This research project will stimulate progress in drug discovery. Guided-mode resonance sensors operate without chemical tags permitting observation and study of unperturbed biochemical processes, as no foreign substance is introduced. Therefore, these sensors provide enhanced understanding of chemical and biomolecular reactions and may lead to advances in chemical process development and drug discovery and design. Moreover, this class of biosensors has other potential applications including medical diagnostics, proteomics, genomics, environmental monitoring, and homeland security. Application of this technology to microfluidics, lab-on-a-chip, and wireless integrated sensors for homeland security and environmental monitoring may provide new tools for accurate and cost-effective detection of biotoxins, explosives, and hazardous materials.

Title: SBIR Phase II: An Innovative Photobioreactor for Commercial Production of Astaxanthin from Genetically Improved Haematococcus Pluvialis Strains

Award Number: 0724411
Program Manager: F.C. Thomas Allnutt

Start Date: July 1, 2007
Expires: June 30, 2009
Total Amount: $499,866

Investigator: Fan Lu, LF1230NC@yahoo.com
Company: Algaen
3488 Bramlet
Clemmons, NC 27012
Phone: (336)577-4354

Abstract:

This Small Business Innovative Research (SBIR) Phase II research develops an innovative biotechnology for commercial production of natural astaxanthin using genetically improved microalgal strain(s) grown in a proprietary large-scale photobioreactor, and to demonstrate the effectiveness of the new strains in improving bioavailability of astaxanthin. The proposed R&D efforts aim to overcome the major weakness inherent in the present production of astaxanthin-enriched Haematococcus: poor bioavailability of astaxanthin for humans and animals. The company will use several genetically modified Haematococcus strains with remarkably improved bioavailability of astaxanthin. The major objectives of the Phase II research are to design, construct, and evaluate an innovative large-scale photobioreactor system for sustainable mass culture of these new strains. The improved production system will increase astaxanthin productivity by 1.5- to 2-fold with at least 30% cost reduction.

The broader impacts of this technology will be to overcome two major hurdles for the Haematococcus-based astaxanthin industry. The application of this biotechnology will lead to major increases in astaxanthin sales by 2015. It will also result in job expansion in the Haematococcus-astaxanthin production and related industries (e.g., cosmetic, pharmaceutical, and nutraceutical). Reduction in the production costs will lead to decreasing prices, making astaxanthin more affordable to allow more people to take advantage of astaxanthin as a strong antioxidant for improving health and well-being.

Title: SBIR Phase II: Development of a BioAcoustic Mixing Platform

Award Number: 0646562
Program Manager: F.C. Thomas Allnutt

Start Date: March 15, 2007
Expires: February 28, 2009
Total Amount: $500,000

Investigator: Todd McAdams, lcfarrar@resodyn.com
Company: Resodyn Corporation
130 N Main St Ste 600
Butte, MT 59701
Phone: (406)497-5252

Abstract:

This Small Business Innovation Research (SBIR) Phase II research project develops a mixer based on sound waves applicable for use in bioreactors for cell culturing and fermentors. Cell culturing and fermentation are large markets where significant growth is forecast over the next several years. This research will establish the optimal design and operating conditions for this non-invasive and non-destructive mixing technology. It is anticipated that performance for many applications can be enhanced by 50% or greater over state-of-the-art technology using this novel agitation technology.

The broader impact will be to reduce the costs of pharmaceutical production, when such production is based on biological feedstocks. Media and process development for biological production of pharmaceuticals is costly and time-intensive and performed using stirred-tank bioreactors due to the limitations of orbital shake-flask and cell culture flasks. A mixing technology that could unify laboratory-scale and pilot-scale experiments would be highly valuable in speeding the pace of process development. Low-frequency acoustic energy will dramatically enhance gas-liquid mass transport without increasing hydrodynamic shear stress. The research project will enhance the scientific understanding of low frequency acoustic mixing processes by quantifying the impact of acoustic frequency on oxygen transfer rates and cellular growth. The significance to society that the successful development is a dramatic increase in the pace of biotechnological process development. This will lead to more rapid commercialization of and lower prices for pharmaceutical products that enhance overall quality of life.

Title: STTR Phase II: Engineering Geobacter for Enhanced Electricity Production

Award Number: 0548633
Program Manager: F.C. Thomas Allnutt

Start Date: September 25, 2006
Expires: September 30, 2008
Total Amount: $499,665

Investigator: Christophe Schilling, cschilling@genomatica.com
Company: Genomatica Inc.
5405 Morehouse Dr. Suite 210
San Diego, CA 92121
Phone: (858)824-1771

Abstract:

This Small Business Technology Transfer Research (STTR) Phase II project aims to develop commercially viable bacterial strains (Geobacter sulfurreducens) for use as biocatalysts in microbial fuel cells. The research genetically manipulates these bacteria to enable the utilization of alternative substrates and increase current generation through the expression of an energy consuming futile cycle. The rates will be increased and alternative cheaper substrates utilized during this project.

The broader impact of this research will result in development of novel microbial fuel cells that can convert renewable resources such as biomass and agricultural wastes to electrical energy in an efficient fashion with varied commercial applications.

Additionally, innovative the metabolic engineering strategy that is developed could be applied to other industrially relevant microorganisms. In addition, there are significant societal and educational components of this program. One example would be a microbial fuel cell that harnesses electricity from organic waste can be valuable in electrifying remote rural communities in developing countries by decentralizing power generation while protecting the environment.

Title: SBIR Phase II: Continuous Spray-Capture Production System

Award Number: 0620389
Program Manager: Rosemarie Wesson

Start Date: September 21, 2006
Expires: September 30, 2008
Total Amount: $467,005

Investigator: Piechocki Piechocki, JPiechocki@ABN-Corp.com
Company: ABN
7155-H Columbia Gateway Drive
Columbia, AL 21046
Phone: (410)730 8600

Abstract:

This Small Business Innovation Research (SBIR) Phase II project will develop a technology that allows the stabilization of live probiotic bacteria for incorporation into food products outside the dairy case. ABN proposes a novel microencapsulation solution that involves pumping viscous liquids through a spray nozzle, followed by the capture of the resultant particles in a cross-linking fluid. The Phase II objectives are to complete the commercial acceptability of this novel process by modifying the system to make all processes steps compliant with current Good Manufacturing Processes and by designing and fabricating the final critical drying step for the microencapsulated probiotics. This final step will provide a product that is stable enough to be used by the food and feed industries to allow the use of probiotics in products that do not need to be refrigerated.

The manufacturing technology proposed herein is an enabling technology that will open many new commercial opportunities for a number of industries. Stabilization of the probiotics and incorporation into nutritional bars, beverages, cereals, and other food products that do not require refrigeration will greatly expand the commercial potential, and choices for consumers who will benefit from these gut-friendly bacteria. The same technology could also be used for the stabilization and delivery of enzymes, vaccines, and other small molecules whose oral delivery is limited by gastric digestion.

Title: STTR Phase II: A New Hyperspectral Imaging Spectrometer

Award Number: 0620581
Program Manager: F.C. Thomas Allnutt

Start Date: August 24, 2006
Expires: October 31, 2008
Total Amount: $479,219

Investigator: Rand Swanson, swanson@resonon.com
Company: Resonon
619 North Church Ave Suite 3
Bozeman, MT 59715
Phone: (406)586 3356

Abstract:

This Small Business Technology Transfer Research (STTR) Phase II research project develops a macroscopic fluorescent scanner that utilizes hyperspectral imaging with enhanced capability for reading microarrays, multiwell plates, and two dimensional (2D) gels. The system utilizes novel optical design to provide more efficient light gathering and less aberration for better imaging versus conventional hyperspectral optical designs. The anticipated technical benefits include improved signal-to-noise (greater sensitivity) and the better dye multiplexing (enabling the use of multiple dyes to detect of multiple analytes simultaneously).
The broader impact of this research will be to enable more rapid advancement of scientific discovery by providing enhanced tools for study of the complexity of biological signaling, metabolic and response networks using non-radioactive optical detection methods to improve safety and reduce waste problems with optical detection.

Title: SBIR Phase II: Dynamic Signal Processing and Information Extraction for E-Noses

Award Number: 0522225
Program Manager: George Vermont

Start Date: November 30, 2005
Expires: November 30, 2007
Total Amount: $506,000

Investigator: Neil Euliano, neil@conveng.com
Company: Convergent Engineering
4817 SW 34th Street, Suite 4
Gainesville, FL 32608
Phone: (352)378 4899

Abstract:

This Small Business Innovation Research (SBIR) Phase II project focuses on the development of electronic nose signal processing and dynamic pattern recognition systems specifically tuned to the properties of odors. This advanced e-nose signal processing toolbox should improve current selectivity by an order of magnitude. A prototype exhaled-breath propofol (anesthetic) monitor for use in measuring depth of anesthesia in patients undergoing surgery will be built and demonstrated.
The initial commercial application of this project will be in the medical surgery area where the product should provide more accurate patient dosing during anesthesia. The technology, however, may be broadly applicable to such key areas as medical diagnostics, illicit drug detection, glucose monitoring, etc.

Title: SBIR Phase II: Designer Cellulases for Biomass Conversion

Award Number: 0522310
Program Manager: Michael R. Ambrose

Start Date: October 1, 2005
Expires: September 30, 2007
Total Amount: $500,000

Investigator: William Coleman, wcoleman@kairos-scientific.com
Company: Kairos Scientific Inc.
10225 Barnes Canyon Rd., A110
San Diego, CA 92121
Phone: (858)626-8170

Abstract:

This Small Business Innovation Research (SBIR) Phase II project will develop new technology to improve the high-temperature performance of endoglucanase, which can be used to manufacture pulp from wood chips and other biomass. Producing pulp for papermaking via thermomechanical pulping (TMP) of biomass is a highly energy intensive process that is performed at high temperatures. Research is proposed to demonstrate the feasibility of using a directed evolution strategy and high-throughput, solid-phase enzyme library screening to engineer a new endoglucanase variant with significantly improved thermoactivity, thermostability and resistance to inhibitors. This enhanced enzyme will be sold as an additive to manufacturers who produce pulp and paper via the TMP process. Major benefits include energy savings and improvement of paper quality.

The commercial application of this project will be on the pulp and paper industry. New screening technology will be used to engineer an enhanced enzyme that will modify pulp fibers under high-temperature conditions. This enzyme additive will accelerate the pulp refining process and thereby lower production costs by reducing the amount of electricity needed to complete the conversion. Any significant reduction in the energy input will be very economically attractive to the pulp producers. If introducing an effective enzyme treatment could eliminate even a modest 10% of the current energy expenditure, the potential worldwide savings could total nearly US$500 million per year. The enhanced enzyme will be able to create a new market by offering these significant savings to the pulp producers. In addition, the information gained from this study could be applied to other similar enzymes to expand the market for thermostable biocatalysts and broaden the understanding of protein structure-function.

Title: SBIR Phase II: New Approaches to Using Renewable Biomass Derived Materials in Epoxy and Vinyl Ester Resin Products to Reduce Styrene and Other Petroleum Based Raw Materials

Award Number: 0521976
Program Manager: George B. Vermont

Start Date: September 1, 2005
Expires: August 31, 2007
Total Amount: $499,993

Investigator: Earl Wagener, ewagener@bellsouth.net
Company: Tetramer Technologies, L.L.C.
657 S Mechanic Street
Pendleton, SC 29670
Phone: (864)653-4339

Abstract:

This Small Business Innovation Research (SBIR) Phase II project seeks to reduce the levels of styrene in commercial vinyl ester-styrene resin formulations and other polymers by replacing all or a portion of the high VOC (Volatile Organic Compounds) toxic monomer with a biomass-derived material. Prior results have shown that the styrene content can be reduced from 45% to 35% or lower without increase in cost or the loss of polymer physical properties. Phase II work will entail commercial development with three customers, scale-up process engineering to commercial levels and expansion of the technology into the broader thermoset market.

The commercial application for this technology is in polymer and resin markets where styrene and other petroleum based, high VOC monomers are used. These are huge markets, and the products are used in hundreds of applications. Successful introduction of these replacements will reduce our dependence on imported oil, promote the use of domestic, crop-based resources, and reduce the use of high VOC pollutants.

Title: SBIR Phase II: Low Cost, Needleless Drug Injection System

Award Number: 0450559
Program Manager: George B. Vermont

Start Date: February 15, 2005
Expires: January 31, 2007
Total Amount: $483,086

Investigator: James Scherer jjscherer@novawavetech.com
Company: Novawave Technologies
900 Island Dr Ste 101
Redwood City, CA 94065
Phone: (650)610-0956

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop a cheap and novel needleless injector (NI) that uses a ceramic-based electrokinetic pumping mechanism together with suitable nozzle arrays. The Phase II effort will focus on building numerous prototype pump / nozzle systems and determining the ability to achieve performance adequate for subcutaneous and intramuscular injections. Models for predicting the temporal response of the pump / nozzle systems will also be refined and compared to experimental results.

The commercial application of this project will be for delivering therapeutics such as vaccines and drugs for both human and veterinary markets. The ability to precisely control the injection temporal profile with the proposed device will enable injection site pain and trauma to be significantly reduced, thereby increasing effectiveness of NI drug delivery as well as reducing the probability of cross - contamination.

Title: SBIR Phase II: Characterization of the Metabolic Competency of Centrifugal Bioreactors

Award Number: 0421962
Program Manager: Om P. Sahai

Start Date: October 1, 2004
Expires: September 30, 2006
Total Amount: $500,000

Investigator: Heath Herman, hherman@kbi-usa.com
Company: Kinetic Biosystems, Inc.
430 Tenth Street, N.W.
Atlanta, GA 30318
Phone: (404)607-7331

Abstract:

This Small Business Innovation Research (SBIR) Phase II project is to develop a pilot-scale Centrifugal Bioreactor (CBR) for the continuous cultivation of hybridoma cells. The commercial application of this project will be in the biopharmaceutical industry for cell culture production of therapeutic agents. It is expected that the technology will reduce the scale and capital costs of commercial animal cell culture equipment and improve the quality and consistency of the secreted protein product.

Title: SBIR Phase II: A Novel Resonant-Enhanced Crystallization (REC) Process

Award Number: 0349704
Program Manager: Om P. Sahai

Start Date: January 15, 2004
Expires: December 31, 2005
Total Amount: $512,000

Investigator: Fangxiao Yang, fxyang@resodyn.com
Company: Resodyn Corporation
1901 South Franklin
Butte, MT 59701
Phone: (406)723-2222

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop a novel Resonant-Enhanced Crystallization (REC) process for pharmaceutical and biotechnology industry applications. REC technology is expected to be superior to the conventional crystallization process that incorporate impeller stirring for crystallization, due to its enhanced mass and heat transfer, lower shear (or reduced crystal breakage), and improved crystal size distribution.

The commercial impact of the project would be on pharmaceutical and biotechnology industries. REC technology will make the crystallization process more attractive to pharmaceutical separation and purification operations.
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Environmental Biotechnology

Title: SBIR Phase II: Photochemical Treatment of Dioxin-Furan Compound Emissions from Industrial Processes

Award Number: 0822985
Program Manager: Gregory T. Baxter

Start Date: August 1, 2008
Expires: July 31, 2010
Total Amount: $490,912

Investigator: John Richards, john.richards@aircontroltechniques.com
Company: Air Control Techniques, P.C.
301 East Durham Road
Cary, NC 27513
Phone: (919) 460-7811

Abstract:

This Small Business Innovation Research (SBIR) Phase II research will advance the use of photochemistry for the control of toxic air pollutants emitted from industrial sources such as furnaces, boilers, and kilns. The types of ultraviolet lamp sources now used successfully for wastewater treatment, water purification, and air stream disinfection will be adapted for use in the more challenging environment of industrial process effluent gas streams. This research program concerns a photochemical system designed to destroy highly toxic compounds called dioxin-furans, which are unintended byproducts of some industrial processes. During an extended test program at an industrial facility, the researchers will evaluate: (1) long-term ultraviolet lamp energy efficiency in hot, dust-laden gas streams, (2) dioxin-furan destruction efficiencies during routine variations in source conditions, (3) reaction product characteristics, and (4) reductions in pollutants in addition to the targeted dioxin-furans. The broader impacts of this research will include an improved understanding of the chemical reactions of dioxin-furan compounds at the gas temperatures and pollutant concentrations typical of industrial gas streams. The results will help assess the applicability of photochemical systems to provide high efficiency air pollution control while reducing emissions of greenhouse gases produced by existing control techniques. Photochemical systems that destroy toxic air pollutants will provide an attractive alternative to systems that retain the toxic compounds on adsorbents disposed in landfills. The development of ultraviolet light technology will result in reduced air emissions of persistent toxic pollutants that bio-accumulates in the food chain and cause adverse human health effects.

Title: SBIR Phase II: A Portable Dissolved Oxygen Delivery System for Rapid Treatment of Organic Spills

Award Number: 0750402
Program Manager: Gregory T. Baxter

Start Date: April 1, 2008
Expires: March 31, 2010
Total Amount: $494,416

Investigator: Clay Thompson, clay.thompson@blueingreen.biz
Company: Blueingreen
535 W. Research Ctr. Blvd.
Fayetteville, AR 72701
Phone: (479) 571-2592

Abstract:

This Small Business Innovation Research (SBIR) Phase II project completes the design, construction, and testing of the largest readily portable Supersaturated Dissolved Oxygen (SDOXTM) injection system developed in smaller scale in Phase I. During the first year of the project, the SDOX will be used to study the effect of dissolved oxygen addition on water quality and fish health in the tailrace of a hydroelectric dam. In the second year of this project, the SDOX will be used in the prevention of spills and remediation of waterbodies impacted by organics and phosphorous. The effects of the SDOX on removing DO as the limiting component in aquatic ecosystems will be studied during all four seasons of the year. The broader impacts of this research are the ability use of a portable SDOX 400 on aquatic ecosystem restoration that has previously been impractical or impossible. This technology benefits an improved environment for aquatic species, minimized environmental impact from hydroelectric dams, and more economic and efficient wastewater treatment. The technology could positively impact drinking water, recreation, irrigation and other aqueous ecological services important to the public and the environment.

Title: STTR Phase II: Plant Bioreporters for Arsenic

Award Number: 0548751
Program Manager: F.C. Thomas Allnutt

Start Date: September 25, 2006
Expires: September 30, 2008
Total Amount: $500,000

Investigator: Mark Elless, elless@edenspace.com
Company: Edenspace
15100 Entp Ct Suite 100
Chantilly, VA 20151
Phone: (703)961-8700

Abstract:

This Small Business Technology Transfer Research (STTR) Phase II project will develop plant bioreporters for arsenic which is widely dispersed in the environment. Detecting and monitoring arsenic in soil and water, particularly in large or remote areas, is often cost-prohibitive due to the expense of sample collection and analysis. This research will lead to an innovative, cost-effective, real-time system to monitor water and soil quality offering high spatial resolution, stand-off reporting, ready scaling to large treatment areas, and continuous in place reporting of bioavailable arsenic. Applications for this technology include detection and investigation of arsenic contamination and risk assessment during remedial activities at contaminated sites.

The broader impact of this technology will be to enable more extensive use of in place environmental cleanup methods such as phytoremediation, assist efforts to monitor and clean the environment, and reduce environmental health hazards posed by arsenic. Improving the ability to accurately assess arsenic contamination will improve awareness of contaminated areas and make affordable arsenic monitoring by homeowners, farmers, and industry. Of particular usefulness would be the ability of farmers and gardeners to detect the potential bioavailability of arsenic to food crops as a result of arsenic in biosolids and pesticides.

Title: SBIR Phase II: Water Purification Technology for Removal of Chemical and Biological Contaminants

Award Number: 0620568
Program Manager: Errol Arkilic

Start Date: August 25, 2006
Expires: July 31, 2008
Total Amount: $499,997

Investigator: Lisa Farmen, farmen@yahoo.com
Company: CCT
3933 N.E. Royal Court
Portland, OR 97232
Phone: (503)544-2330

Abstract:

This Small Business Innovation Research (SBIR) Phase II research project develops a low-cost, water purification technology for removal of biological and chemical contaminants. In combination with research at the University of Oregon and technology licensed from the University of Texas, a proprietary surface-modified mineral adsorbents will sequester high concentrations of chemical contaminants, such as arsenic, lead, mercury, PCE, TCE and MTBE. The current effort will: a) optimize specific bifunctional ligands and mineral substrates capable of removing heavy metals to meet the EPA drinking water standards; b) demonstrate alternative ligand/substrate combinations capable of selective removal of contaminates from a water stream; c) demonstrate qualification to EPA and California drinking water requirements of a CCT water filter and ultra-violet lamp combination; d) field test the solution in an underdeveloped location.

Currently two-thirds of the world's population does not have access to clean water and one-third lack access to a reliable source of water. In certain parts of the world, mostly the underdeveloped world, water is already the most precious necessity. From the executive summary of the World Water Assessment Program sponsored by the United Nations under UNESCO: "In 2000, the estimated mortality rate due to water sanitation hygiene-associated ... diseases.. was 2,213,000." That equates to one person every 15 seconds. In the U.S., an 2001 EPA report estimates that over two million Americans get sick from contaminated water each year. In China, over one billion people lack acceptable water resources. At the completion of the Phase II effort, CCT will have a complete solution, using both passive and active technologies, for a low cost, sustainable water purification module.

Title: SBIR Phase II: Environmental Neurotoxicity Using Zebrafish

Award Number: 0548657
Program Manager: F.C. Thomas Allnutt

Start Date: February 7, 2006
Expires: January 31, 2008
Total Amount: $512,000

Investigator: Catherine Willett, kptnkate@phylonix.com
Company: Phylonix Pharm Inc
100 Inman St Suite 300
Cambridge, MA 02139
Phone: (617)441-6700

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims at developing a large-scale quantitative assay procedure for the evaluation and detection of potential developmental neurotoxic environmental pollutants. The assay will use zebrafish as the model to investigate the presence of these potential pollutants and as such, will be a relatively simple, fast and cost effective method to evaluate and prioritize potential chemicals for subsequent testing.

The ability to detect, evaluate and determine levels of potential developmental neurotoxic compounds in ground water and other industrial sites will provide for a more comprehensive understanding of potential hazards that industrial runoff may have. To date, very few chemicals that are being tested have been assayed for their potential neurotoxic effects. This assay will provide such a method for testing and will have an impact on environmental pollution and public health.

Title: SBIR Phase II: Field Demonstration of a Novel Biotechnology for In-Situ Bioremediation of Methyl Tert-Butyl Ether (MTBE) in Groundwater

Award Number: 0450486
Program Manager: Michael R. Ambrose

Start Date: May 1, 2005
Expires: April 30, 2007
Total Amount: $499,999

Investigator: Fatemeh Shirazi, fshirazi@microvibiotech.com
Company: Microvi Biotech LLC
11966 W 119TH ST
Shawnee Mission KS, 66213
Phone: (913)696-9934

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims to develop a novel process for in-situ bioremediation of methyl tert-butyl ether (MTBE) in groundwater. The Environmental Protection Agency (EPA) considers MTBE a potential human carcinogen. Currently, MTBE's Maximum Contaminant Level (MCL) in drinking water has been set for 18 parts per billion. It is estimated that the cost of cleaning up MTBE contamination nationwide is $29 billion and growing. Bioremediation holds a great promise for destruction of MTBE in groundwater. The key problems with currently used bioremediation methods for MTBE are (1) the inability to establish high densities of MTBE- degrading bacterial, (2) the inability to maintain contact between the degrading bacteria and MTBE, and (3) the upsets and losses of key bacteria. Prior Phase I work has successfully demonstrated the effectiveness of a new technical approach called Biological Permeable Barrier (BPB) that uses encapsulated MTBE-degrading bacteria for removal of MTBE in water. The primary objective for the Phase II project is to assess the long-term performance of a BPB field pilot unit to remove MTBE at Port Hueneme Navy site, and to assess the cost and performance of the BPB / MicroBeads system for longer periods of time under field conditions. The novelties of this technical approach are four folds : (1) the proposed system will deliver high cell density of MTBE-degrading bacteria right to the zone of contamination; (2) the proposed system will create the perfect environment for bacteria with a high degree of degradation and stability; (3) the proposed system will protect the bacteria against environmental stresses; and, (4) the proposed system will prevent wash out of key bacteria. It is anticipated that the proposed BPB pilot scale unit at Port Hueneme will effectively degrade MTBE and other contaminants in groundwater to non-detectable levels.

The immediate commercial application of this project will be on the bioremediation of MTBE in groundwater. However, the proposed technology holds promise for effective, controlled and cost efficient cleanup of groundwater at sites contaminated with other toxic and polluting chemicals as well. Other potential applications include the treatment of industrial wastewater and drinking water.

Title: SBIR Phase II: An Automated Water Pathogen Monitoring System

Award Number: 0450613
Program Manager: George B. Vermont

Start Date: March 1, 2005
Expires: February 28, 2007
Total Amount: $512,000

Investigator: Zoraida Aguilar, zoraida.aguilar@vegrandis.com
Company: Vegrandis, LLC
535 W. Research Blvd.
Fayetteville AR, 72701
Phone: (479)571-2592

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims to develop an automated instrument for rapid and specific detection of waterborne pathogens in municipal water supplies using methods combining immunoassay with electrochemistry. Although the disposable cartridges for this instrument could be specified for nearly any pathogen of interest, this project will focus primarily on the detection of Cryptosporidium parvum oocysts. C. parvum is a threat to the nation's water supply, does not respond to common antibiotics and resists water purification treatments.

The commercial application of this project will be on the monitoring of drinking water supplies for pathogens. This would include testing of water at the source, in distribution networks, and at bottling and packaging facilities. The proposed device would eventually be adapted for emergency field use, for home use by safety conscious consumers, and for medical, industrial, recreational and combat purposes.

Title: SBIR Phase II: The Use of Halophytic Plants and Fish for the Bioremediation of Coal Bed Methane Discharge Waters

Award Number: 0422222
Program Manager: Om P. Sahai

Start Date: September 15, 2004
Expires: August 31, 2006
Total Amount: $500,000

Investigator: John Woiwode, woiwodejon@cs.com
Company: AquaMatrix International, Inc.
270 Veronica Lane, Suite D
Jackson, WY 83001
Phone: (307)739-7185

Abstract

This Small Business Innovation Research (SBIR) Phase II project is to develop a process that uses halophytic plants and aquaculture effluent to treat highly saline coal bed methane (CBM) discharge water. Vast volumes of water are a necessary though unwanted byproduct of the gas drilling process. The saline discharge is widely viewed as an environmental liability. Discharges into streams are essentially forbidden, while indiscriminant surface discharge causes soil salination. Prior Phase I work has shown that halophytic plants may be successful in sequestering significant amounts of sodium when irrigated with CBM discharge waters. This Phase II project will confirm Phase I greenhouse data with field trials of plants irrigated with CBM water and fish effluent when compared with controls under otherwise normal farming practices. Soil impacts and tilth will also be examined in great detail.

The commercial application of this project will be to alleviate the negative impact of CBM discharges on the environment in Wyoming, and to open up huge areas of land for responsible CBM exploration and recovery.

Genomics

Title: SBIR Phase II: Automated culture and differentiation of human Embryonic Stem Cells

Award Number: 0823027
Program Manager: Gregory T. Baxter

Start Date: October 1, 2008
Expires: September 30, 2010
Total Amount: $500,000

Investigator: Veit Bergendahl, vbergendahl@stemcell-products.com
Company: Stem Cell Products Inc.
525 Science Dr.
Madison, WI 53711
Phone: (608) 310-5105

Abstract:

This Small Business Innovation Research (SBIR) Phase II research is focused on methods to utilize blood precursor cells derived from human embryonic stem (HES) cells. The project uses a new defined differentiation system which allows automation and scale-up production of this important cells. There is a significant demand for these cells from research and drug discovery. Increased availability and batch-to-batch reproducibility of HES cell-derived blood cells, resulting from the defined genetic background of the starting material and this standardized, automated culture system, make this technology invaluable model systems for basic research and drug development. Based on the automated pilot system for handling and scale-up production of HES cells developed in phase I of this SBIR project we will transfer our current culturing protocols into robust automated production procedures to provide a reproducible quality of CD34 positive cells The broader impacts of this research will be improving the process of drug discovery and development and in the long term by providing revolutionary new applications for medical treatment to improve public health. Nearly 98% of a multi-million dollar stem cell market is currently consumed by blood and immune system treatments. We anticipate that the proposed research will lead to the faster integration of HES cell biology into biomedical research. It will help to provide a variety of other blood cell types in quantities required for basic research, drug development, high throughput screening, biochemical characterization and potential medical treatment of blood related disease.

Title: SBIR Phase II: Development of Agents to Promote Cellular Ga-67 (Gallium-67) Uptake

Award Number: 0450618
Program Manager: George B. Vermont

Start Date: October 1, 2005
Expires: September 30, 2007
Total Amount: $499,992

Investigator: Takuji Tsukamoto, taku@chemica.com
Company: Chemica Technologies Inc
325 S.W. Cyber Dr.
Bend OR, 97702
Phone: (541)385-0355

Abstract:

This Small Business Innovation Research (SBIR) Phase II project focuses on the development of new pharmaceutical agents to selectively enhance tumor imaging using gallium 67. A photo-degradation product of nifedipine, nitrosipine, has been found to selectively enhance the uptake of Ga67 by tumor cells. A specific derivative of nitrosipine has an even better selective uptake of the radioactive imaging agent. This project will synthesize and test other nitrosipine derivatives and determine the efficacy of Ga67 uptake in animal models using these complexing agents.the commercial application of this technology is in the area of diagnostic imaging. The use of Ga67 in tumor imaging is currently very limited due to poor selectivity of the agent for tumor cells. Enhanced uptake in tumor cells relative to normal cells would expand the types of tumors that could be effectively imaged and possibly replace the more costly and complex PET scan imaging using radioactive fluorinated sugars.

Title: SBIR Phase II: Development of Anticancer Drugs Using Novel Drug Delivery Systems

Award Number: 0521900
Program Manager: George B. Vermont

Start Date: September 15, 2005
Expires: August 31, 2007
Total Amount: $500,000

Investigator: C.J. Yu, yucjyu@aol.com
Company: GlyPort, Inc.
118 S. Berkeley Ave.
Pasadena CA, 91107
Phone: (626)844-7896

Abstract:

This Small Business Innovation Research (SBIR) Phase II project focuses on the enhancement of water solubility and efficacy of sparingly soluble anticancer drugs. Many of the clinically accepted anticancer drugs have side effect problems because of the dosages that must be used to overcome low solubility and bioavailability properties. A new delivery vehicle has been developed, which, when attached to known chemotherapeutic agents , increases water solubility and improves the drugs anticancer activity in in-vitro tests. The Phase II goals are to evaluate further enhancement of solubility with modified delivery segments, do in-vivo evaluations in mice with human tumor xenografts, and to do pharmacokinetic studies of the drugs in the rat model.

The commercial application of this technology is in cancer chemotherapy. Increased solubility and bioavailability should reduce the quantity and side effects of the expensive drugs that are currently used. Furthermore, certain drugs that could not be used previously because of poor cellular uptake, might now be made available using this mode of delivery.

Title: SBIR Phase II: Software for Micro RNA Detection and Analysis

Award Number: 0522270
Program Manager: George B. Vermont

Start Date: August 15, 2005
Expires: July 31, 2007
Total Amount: $405,905

Investigator: Gary Fogel, gfogel@natural-selection.com
Company: Natural Selection Inc
3333 N Torrey Pines Ct Ste 200
La Jolla CA, 92037
Phone: (858)455-6449

Abstract:

This Small Business Innovation Research (SBIR) Phase II project will develop machine learning tools for RNA gene detection. Prior Phase I research resulted in the successful development of artificial neural networks for the discrimination of functional RNA (fRNA) coding regions from non-coding regions in four model eukaryotes. The Phase II project will focus on (1) refinement of best evolved neural networks for 10 key eukaryotes capable of discriminating fRNA coding from non-coding sequence information, (2) experimental verification of predicted fRNA coding regions in human and mouse, (3) development of machine learning algorithms capable of discriminating between eukaryotic fRNA subtypes, (4) extension of the approach to include machine learning tools capable of discriminating between fRNA subtypes and to evaluate this potential for additional functionality, and (5) development of a user-friendly graphical user interface (GUI) for the product.

The commercial application of this project will be to identify a new class of targets for drug design and discovery for the pharmaceutical industry. The educational aspects of the proposed work will be to assist in dissemination of knowledge about the importance of fRNAs to the next generation of scientists.

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Title: SBIR Phase II: Development and Manufacture of High-Density Plate Washer

Award Number: 0450448
Program Manager: Michael R. Ambrose

Start Date: January 15, 2005
Expires: December 31, 2006
Total Amount: $500,000

Investigator: Richard Kris, richardkris@earthlink.net
Company: NeoGen, LLC
2602 E Avenida De Posada
Tucson AZ, 85718
Phone: (520)906-2002

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims to develop a plate washer capable of washing very high-density plates, such as 1536 well plates, for ELISA and high-throughput screening assays. Currently, there are automated plate washers for 96 and 384 well plates, but there are none available for plates with ultra-high density. This is because currently available washer technology, employing a nozzle system, cannot be made reliable enough to allow dispense and aspirate nozzles to properly reach within each of the many, very small wells, and because the thin nozzles needed can get easily clogged using many standard buffers. In contrast, the proposed system uses a steady stream or sheet of solution, making the system less likely to clog.

The commercial application of this project will be to allow use of high-throughput screening assays by industrial and academic researchers involved in genomics and drug discovery research. The proposed technology will enable additional use of fluorescent chemical compounds, that typically require a wash step to remove interfering substances, for screening.

Title: SBIR Phase II: Development of a Microfluidic Device for Rapid Analysis, Sorting, and Collection of Biological Particles Using Photonic Forces

Award Number: 0422059
Program Manager: Om P. Sahai

Start Date: September 1, 2004
Expires: August 31, 2006
Total Amount: $499,940

Investigator: Jonathan Diver, jdiver@genoptix.com
Company: Genoptix, Inc.
3398 Carmel Mountain Road
San Diego, CA 92121
Phone: (858)523-5003

Abstract

This Small Business Innovation Research (SBIR) Phase II project will develop a fluorescence activated cell sorter (FACS) that uses optical forces to move cells and to sort cell sub-populations. The specific Phase II objectives are : (1) to build an integrated prototype cell sorter with flexibility to configure multiple lasers and detectors, (2) to develop a self contained microfluidic cartridge that can handle 1,000-100,000 cells/sample and sort with purities greater than 95% and total recovery rates greater than 80%, (3) to develop microfluidic flow assays, and (4) to validate that the mechanical and optical stresses do not adversely affect cells.

The proposed work will result in a prototype cell sorter, self-contained microfluidic cartridges, and a panel of assays that demonstrate the broad utility of the instrument. The commercial application of this project will be in the area of cell-based assays for use in biological and biomedical research.

Marine Biotechnology

Title: SBIR Phase II: Innovative control of ectoparasites: key to expansion of open ocean fish farming

Award Number: 0822862
Program Manager: Gregory T. Baxter

Start Date: August 15, 2008
Expires: July 31, 2010
Total Amount: $499,910

Investigator: Jennica Lowell, jennica@kona-blue.com
Company: Kona Blue Water Farms, LLC
P.I. Box 4239
Kailua Kona, HI 96745
Phone: (808) 331-1188

Abstract:

This Small Business Innovation Research (SBIR) Phase II research targets innovative means for controlling ectoparasite pests in open ocean aquaculture. Offshore fish farming offers tremendous growth opportunities. Adaptive fish health management offshore remains a challenge for environmentally sound expansion of this potentially lucrative industry. PEDICURe (Passive Ectoparasite Device In Counter-current Underwater Reservoir) prototypes showed great efficacy in treating ectoparasite pests in marine fish in tank trials. Phase II research will refine therapeutic treatments, PEDICURe designs and protocols for use. Commercial-scale prototypes will be deployed and tested in offshore cages. PEDICURes could be sold or licensed to fish farms worldwide. PEDICURes could also provide compelling competitive advantages to drive expanded production in Hawaii, U.S. waters, or globally. The broader impacts of this research are in increasing the environmentally sound means for optimizing fish health in open ocean aquaculture, and thereby aiding the growth in this innovative, exciting and potentially lucrative industry. Offshore farms can produce high-value marine fish without significant impacts on water quality, benthic habitats or other ocean user groups. Cost savings to a $1 billion U.S. offshore farming industry could be $115 million p.a. There are potential applications worldwide.

Title: STTR Phase II: Commercialization of an Innovative Green Technology for Controlling Zebra Mussels

Award Number: 0750549
Program Manager: Gregory T. Baxter

Start Date: March 1, 2008
Expires: February 28, 2010
Total Amount: $500,000

Investigator: Pamela Marrone, pmarrone@marroneorganics.com
Company: Marrone Organic Innovations, Inc.
2121 Second Street
Davis, CA 95618
Phone: (530) 750-2800

Abstract:

This Small Business Technology Transfer Research (STTR) Phase II research project is focusing on the development and commercialization of a new, environmentally safe biopesticide for the control of zebra and quagga mussels. These freshwater, invasive bivalves foul water pipes and cause severe economic and ecological harm throughout North America and Europe. Marrone Organic Innovations, a leader in biopesticide commercialization, is partnering with biological control experts at the New York State Museum who have discovered a bacterium, Pseudomonas fluorescens, that produces a natural compound that is selectively lethal to these pest mussels. The microbial biopesticide developed in this project will be an environmentally safe alternative to the polluting, non-selective chemicals that infested facilities, due a lack of alternatives, are currently forced to rely on to control mussel infestations. The broader impacts of this research include both economic and ecological benefits to society. Mussel infestations cause hundreds of millions of dollars in additional expenses every year, and the chemical methods currently used to control them are known to be harmful to other aquatic organisms. The proposed research will advance a project of national significance and reach across numerous scientific disciplines, including biochemistry, microbiology, and invertebrate zoology, serving as a model in the effort to reduce the use of polluting pesticides. Training and learning will be fostered by involving postdoctoral, graduate, and undergraduate students. Because of its extraordinary safety, this bacterial biopesticide will serve as an example of a green technology that will benefit the environment as well as industrial and recreational users of freshwater.

Title: SBIR Phase II: Compact genetic assessment using the Infrarray SNAP (Simple Nucleic Acid Profiler)

Award Number: 0724423
Program Manager: Ali Andalibi

Start Date: September 15, 2007
Expires: August 31, 2009
Total Amount: $499,986

Investigator: Steve Savoy, ssavoy@nanohmics.com
Company: Nanohmics
6201 East Oltorf St.
Austin, TX 78741
Phone: (512)389-9990

Abstract:

This Small Business Innovation Research (SBIR) Phase II research project aims to further develop a microfluidic device for the detection of nucleic acids for a variety of studies where genetic analysis and identification of target sequences are required. The instrument proposed is designed to be compact and capable of reading a disposable cartridge on which sample preparation, amplification, and multiplex detection, with a modest-sized microarray, are performed. The proposed instrument is enabled by direct imaging of a PhotoGenerated Reagent (PGR) microarray, with an image sensor positioned near the face of the microarray. It is also enabled by the use of up-converting phosphors as the label, which are in turn excited by infrared radiation that passes through the silicon microarray.

The development of and inexpensive, fully integrated and automated microfluidic device for use in genetic analysis would give individuals in academic, commercial and defense settings access to affordable microarray analysis. The availability of such a versatile platform would allow the development of arrays for any nucleic acid target, as well as easy multiplexing. With such a platform, production of custom arrays and off-the-shelf ones will be achieved with great facility. Moreover, the integrated platform will reduce the cost and effort associated with microarray analysis.

Title: SBIR Phase II: Novel Labeling Method for Multicolor Fluorescence in situ Hybridization (FISH) Probes

Award Number: 0724876
Program Manager: Ali Andalibi

Start Date: September 1, 2007
Expires: August 31, 2009
Total Amount: $500,000

Investigator: Joan Aurich-Costa, joan@onecell.com
Company: One Cell Systems Inc
100 Inman St Ste 200
Cambridge, MA 02139
Phone: (617)868-2399

Abstract:

This Small Business Innovation Research (SBIR) Phase II research project aims to further develop a panel of multicolor oligonucleotide fluorescence in situ hybridization (FISH) probes for performing preimplantation genetic diagnosis (PGD) and detecting aneuploidies in eggs used for in vitro fertilization (IVF) protocols. The use of oligonucleotides offers advantages such as enhanced specificity and sensitivity, shorter hybridization times as well as a reduction in manufacturing cost when compared to currently available genomic DNA derived probes. The panel that the company plans to develop will cover 8 chromosomes known to be particularly susceptible to deletions and rearrangements and would allow simultaneous detection of any abnormalities that may be associated with them.

The development of a panel of probes for the detection of genetic abnormalities in preimplantation embryos will increase the success rate of IVF procedures and thus reduce the financial and emotional cost associated with them. Moreover, use of the proposed labeling method can be useful in a variety of areas outside of PGD, including basic research, clinical diagnostics and cytogenetic testing.

Title: SBIR Phase II: Rapid and Automated Differential Gene Expression Profiling

Award Number: 0548750
Program Manager: Ali Andalibi

Start Date: September 21, 2006
Expires: September 30, 2008
Total Amount: $499,995

Investigator: Jian Tajbakhsh, jtajbakhsh@maxwellsensors.com
Company: MSI
10020 Pioneer Blvd Suite 103
Santa Fe Springs, CA 90670
Phone: (562)801 2088

Abstract:

The Small Business Innovation Research (SBIR) Phase II project will develop a rapid and automated microarray expression profiling chip and system for gene expression profiling. As part of this project a miniaturized automated system will be developed to integrate key steps in target synthesis, labeling and hybridization.

The use of the integrated system will enhance the reproducibility and cost of running microarray experiments.

Title: SBIR Phase II: Enabling High Output Metabolism in Plant Cells

Award Number: 0548640
Program Manager: F.C. Thomas Allnutt

Start Date: January 11, 2006
Expires: December 31, 2007
Total Amount: $511,937

Investigator: Michele Champagne, kasllc@hawaii.rr.com
Company: KAS
2800 Woodlawn Dr. Suite 281
Honolulu, HI 96822
Phone: (808)753 2693

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims to develop and validate a novel chloroplast transformation vector for protein expression in chloroplasts. The research project will broaden scientific understanding of the parameters of chloroplast transformation by addressing stoichiometric expression of multiple transgenes for effective engineering of pathways such as carotenogenesis, feedback regulation and expression of multimeric proteins.

The commercial impact of this technology will provide an enabling strategy for expression of genes of interest in chloroplasts to potentially increase the production of high value nutraceutical and pharmaceutical compounds. Application of this technology for stable, high output metabolism with regulatory compliance will reduce production cost and increase the reliability for downstream processing and eventual commercialization.

Title: STTR Phase II: Engineering of Non-leaching Antibacterial Non-woven Textiles

Award Number: 0450527
Program Manager: George Vermont

Start Date: October 21, 2005
Expires: October 31, 2007
Total Amount: $505,450

Investigator: Nina Lamba, cclbiomed@verizon.net
Company: CCL Biomedical, Inc.
224 North Washington St.
Havre de Grace, MD 21078
Phone: (410)939-9356

Abstract:

This Small Business Technology Transfer Research (STTR) Phase II project proposes the development of a unique family of biocidal polymers that have been shown to be non-leaching, and do not require regeneration or refreshment of activity. The Phase I study demonstrated the synthesis of these polymers containing potent broad-spectrum biocides. The polymers were spun into nanofiber webs using electrospinning techniques. The webs were challenged with bacteria and a 99% reduction in bacterial viability in one hour was demonstrated. The Phase II program will continue to explore the electrospinning processing of the polymers. The polymers will be optimized for activity against bacteria, viruses and molds. Microscopic and mechanical tests will be performed on materials to identify structure-property relationships.

The commercial application of this technology will be in textile products where antimicrobial protection is critical, e.g., homeland security (biodefense) garments, first responders emergency clothing, hospital garments and supplies, etc. Current systems are water leachable and use can lead to reduced protection.

Title: SBIR Phase II: A Novel Resonant-Enhanced Crystallization (REC) Process

Award Number: 0349704
Program Manager: Om P. Sahai

Start Date: January 15, 2004
Expires: December 31, 2005
Total Amount: $512,000

Investigator: Fangxiao Yang, fxyang@resodyn.com
Company: Resodyn Corporation
1901 South Franklin
Butte, MT 59701
Phone: (406)723-2222

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop a novel Resonant-Enhanced Crystallization (REC) process for pharmaceutical and biotechnology industry applications. REC technology is expected to be superior to the conventional crystallization process that incorporate impeller stirring for crystallization, due to its enhanced mass and heat transfer, lower shear (or reduced crystal breakage), and improved crystal size distribution.

The commercial impact of the project would be on pharmaceutical and biotechnology industries. REC technology will make the crystallization process more attractive to pharmaceutical separation and purification operations.

Pharmaceutical Drug Delivery

Title: SBIR Phase II: Multivariate Analysis of Heterologous Protein Expression

Award Number: 0750206
Program Manager: Gregory T. Baxter

Start Date: March 15, 2008
Expires: February 28, 2010
Total Amount: $500,000

Investigator: Mark Welch, mwelch39@comcast.net
Company: DNA Twopointo Inc
1430 O'Brien Drive
Menlo Park, CA 94025
Phone: (650) 853-8347

Abstract:

This Small Business Innovation Research (SBIR) Phase II research develops methods to improve the manufacture of recombinant protein products produced in foreign hosts. Cost-effective production of proteins generally utilizes organisms that are well-suited for protein engineering and large-scale production. Establishing a suitable production system for a protein is often a time-consuming, trial-and-error-based process and can be a significant barrier for the commercialization of a protein. In cases where production systems are found, they are often far from optimized due to the time and cost required as well as our current limited understanding of the critical parameters. In Phase I several gene design variables were assessed for their importance to protein expression in the bacterium Escherichia coli, a commonly used production organism. Data suggested novel means for gene optimization that were unexpected from conventional wisdom. In Phase II relevant gene design variables suggested by Phase I will be explored toward development of a refined model of the relationship of gene design to protein expression in E. coli as well as in other useful production organisms. The broader impacts of this research are improved manufacturing techniques for recombinant protein based products. Protein products constitute a currently >$40 billion and rapidly growing world-wide market including industrial enzymes, diagnostic enzymes and protein pharmaceuticals. The tools developed from this project will drastically improve the speed, reduce the cost, and remove the uncertainties of modern protein manufacturing, which significantly limit this market. Improved production will also accelerate the study of proteins with therapeutic or otherwise marketable potential, expanding the field of candidate proteins for commercialization.

Title: SBIR Phase II: Lantibiotic Synthesis Using Differentially Protected Orthogonal Lanthionines

Award Number: 0749884
Program Manager: Gregory T. Baxter

Start Date: February 15, 2008
Expires: January 31, 2010
Total Amount: $500,000

Investigator: Jeffrey Hillman, jhillman@oragenics.com
Company: Oragenics Corporation
13700 Progress Blvd.
Alachua, FL 32615
Phone: (386) 418-4018

Abstract:

The Small Business Innovation Research (SBIR) Phase II project aims to develop differentially protected orthogonal lanthionine technology (DPLOT) to synthesize novel antibiotics. Lanthionines are found in nature and have been isolated from a variety of sources. Although amino acids, lanthionines are not components of proteins. They are however, constituents of a group of naturally occurring peptide antibiotics called lantibiotics, which includes nisin (a food preservative), subtilin, epidermin (an anti staphylococcus and streptococcus agent), and ancovenin (an enzyme inhibitor). Due to their mechanism of action, resistance to lantibiotics is uncommon and as such they can be of value for treating antibiotic resistant bacterial infections. The technology under development would allow the synthesis of novel lantibiotics that may be effective against the growing number of antibiotic resistant bacteria and would expand the therapeutic arsenal available for treating such infections. It would therefore have a profound impact on public health and the control of infectious diseases caused by bacteria.

Title: SBIR Phase II: Disposable pL Fluid Transfer/Microarray Printing Device

Award Number: 0646638
Program Manager: F.C. Thomas Allnutt

Start Date: March 15, 2007
Expires: February 28, 2009
Total Amount: $498,437

Investigator: Robert Haushalter, bob@parallel-synthesis.com
Company: PSTI
3054 Lawerence Expy
Santa Clara, CA 95051
Phone: (408)749-8308

Abstract:

This Small Business Innovation Research (SBIR) Phase II project provides an inexpensive disposable polymer tool that will perform extremely accurate fluid transfer in the picoliter to nanoliter range. Research efforts have already demonstrated that the costs associated with fabricating molds employing a combination of silicon micromachining and electroforming will allow these tools to be disposable. Fabrication processes will be transitioned to injection molding by adapting the micromachined/electroformed molds to the injection process. The research will design the final generations of the printing and fluid transfer pin designs, use silicon micromachining and electroforming to prepare the injection molds for the 96 and 384 pin printheads, design new collimator / printheads for both microarray printing and fluid transfer applications and redesign and scale up the chemical surface treatment process to treat thousands of pins simultaneously. Because the polymer pins can be manufactured so inexpensively compared to current technology, the number of laboratories around the world that can utilize this nanoscale fluid handling will dramatically increase.

The broader impacts of this project will be to provide disposible plastic parts at less than ten percent of the least expensive current technology thereby enabling reductions in costs for high throughput technologies important to drug discovery and diagnostics. This could improve the delivery of healthcare to the nation and reduce its overall cost.

Title: SBIR Phase II: Chiral Polymers for Pharmaceutical Purification

Award Number: 0620587
Program Manager: F.C. Thomas Allnutt

Start Date: August 8, 2006
Expires: July 31, 2008
Total Amount: $496,939

Investigator: Alexander Gorkovenko, agorkovenko@materialmethods.com
Company: Material Methods
30 Hughes, Suite 205
Irvine, CA 92618
Phone: (949)206-0967

Abstract:

This Small Business Innovation Research (SBIR) Phase II project develops new chiral stationary phases for pharmaceutical purification. Drug manufacturers seek new chiral stationary phases with high throughput, extended chiral selectivity, high loading capacity, with the ability to tolerate a wide range of mobile phases. To meet this need, artificial saccharides will be synthesized and polymerized into a 100% stereo specific chiral stationary phase for liquid chromatography of enantiomers. These polymers have remarkable propertie such as stereo specificity, five asymmetric centers, functionality for tailoring phase/ligand recognition, extensive crosslinking capability, and ether bonding. This chemistry was demonstrated in Phase I and in Phase II will lead to a new family of chiral polymers to speed drug discovery and reduce the cost of drug manufacture.

The broader impact of this research will be to provide artificial polysaccharides to provide novel activities versus the natural products currently sold. Polysaccharides have multiple, chiral centers, unparalleled optical integrity; and the highest density of functional groups of all known molecules. Artificial polysaccharides are most readily functionalized and tailored to form desired chiral selectors. This project will molecularly design chiral selectors. The impact of this research extends beyond drug purification to sugar separations, high performance fibers, tissue scaffolds, and nano machinery.

Title: STTR Phase II: Antibacterially-Active Nanoparticles

Award Number: 0620572
Program Manager: F.C. Thomas Allnutt

Start Date: August 3, 2006
Expires: July 31, 2008
Total Amount: $499,977

Investigator: Seyoung Jang, syjang77@hotmail.com
Company: Nanopharma
3802 Spectrum Blvd.
Tampa, FL 33612
Phone: (813)469-7107

Abstract:

This Small Business Technology Transfer Research (STTR) Phase II research project develops a novel nanoparticle delivery system for treatment of antibiotic-resistant infections. This extends previous findings using antibacterially active polyacrylate nanoparticles to animal infection models. Penicillin containing nanoparticles are the intial focus due to the clinical importance of penicillin in treating bacterial infections and the extreme sensitivity penicillin has to degradation by proteins produced by methicillin-resistant Staphylococcus aureus (MRSA). The research will determine the stabilities of penicillin nanoparticles under various chemical and biological conditions, evaluate potential in vitro and in vivo toxicity of the nanoparticles, examine the biodistribution of the two most active nanoparticles in healthy mice, and assess the effectiveness in treating early stage (skin) and advanced (systemic) MRSA infections in mice. The results from this project will provide both fundamental data to the scientific community on these polyacrylate nanoparticles as a drug delivery platform, as well as animal testing data needed to advance this nanoparticle technology towards IND and FDA approval.

The broader impact of this research will be to demonstrate that nanoparticle technology can be applied to treatment of MRSA infections and provide essential data on the use of polyacrylate nanoparticles as a drug delivery platform. Use of nanoparticles in anti-infectives is essentially unexplored. These novel nanoparticles will enable characterization of the properties for creating FDA guidelines on the use of nanoparticles in medicine. In addition, the training of students at the graduate and undergraduate level in bio-nanotechnology is a central element of this joint project between industry and academia. The precipitous loss in the ability of antibiotics to treat bacterial infections is already having enormous societal implications. The number of deaths and serious illnesses due to clinical complications from drug-resistant infections is staggering. This research will establish a new treatment protocol for these types of infections through use of cutting-edge nanotechnology, both as a drug-delivery platform and as an effective way to recover the therapeutic effectiveness of antibiotics like penicillin. There are currently no existing technologies like this in the anti-infectives area, indication of an unmet health need and a large commercial market.

Title: SBIR Phase II: High-Density Microcapillary Bioplate

Award Number: 0548332
Program Manager: Ali Andalibi

Start Date: February 7, 2006
Expires: February 29, 2008
Total Amount: $500,000

Investigator: Joseph Krans, jak@incomusa.com
Company: Incom Inc
PO Box G
Southbridge, MA 01550
Phone: (508)765-9151

Abstract:

This Small Business Innovation Research (SBIR) Phase II research project will aid in the development of high-density glass microcapillary bioplates that will offer complete flexibility in the choice of diameter and thickness of the capillaries. These features are not currently available in an exiting product. Through an innovative low-cost fabrication approach, the disposable bioplate will allow for massive parallel experimentation that is crucial for large-scale high-integrity measurements.

The proposed research will provide for a dramatic and cost effective increase in high-throughput screening programs in all phases of drug discovery and target validation. The ability to accelerate the analysis of targets in a cost effective manner will provide for more effective screening programs.

Title: SBIR Phase II: Device for the Activation of Nanoparticle-Based Cancer Therapies

Award Number: 0548741
Program Manager: F.C. Thomas Allnutt

Start Date: February 7, 2006
Expires: January 31, 2008
Total Amount: $500,000

Investigator: Patrick O'Neal, poneal@nanospectra.com
Company: Nanospectra Bio, Inc.
8285 El Rio St Suite 130
Houston, TX 77054
Phone: (713)842-2720

Abstract:

This Small Business Innovation Research (SBIR) Phase II project aims at developing a minimally invasive, image-guided cancer therapy for the optimum activation of nanoparticle based, photo-thermal cancer therapies. This will allow for the treatment of deep-seated tumor, irregular shaped tumors as well as regional metastatic spread and tumors situated near or within sensitive tissues.

This technology will impact the current therapies for cancers, especially those of the brain and other sensitive areas. The technology will provide a minimally invasive therapy with a high safety profile that allows treatment of poorly defined tumors margins without damage to surrounding, often sensitive tissues. This would make the treatment not only more effective but will also limit damage to healthy tissue and as such, limit side effects and other organ dysfunction. Additionally, this therapy is compatible with and potentially synergist with existing treatment modalities.

Title: SBIR Phase II: A New Biotherapeutic Approach to Combating Unwanted Bacteria

Award Number: 0421991
Program Manager: Om P. Sahai

Start Date: July 15, 2004
Expires: June 30, 2006
Total Amount: $498,903

Investigator: Hideki Suzuki, hsuzuki@conjugon.com
Company: ConjuGon, Inc.
505 South Rosa Rd, Suite 29
Madison, WI 53719
Phone: (608)441-2890

Abstract:

This Small Business Innovation Research (SBIR) Phase II research project will develop a commercial biotherapeutic using a unique bacterial conjugation technology to deliver cytotoxic genes and their products to bacterial pathogens. The Phase I work successfully demonstrated proof of concept by effectively killing multi drug resistant bacteria in vitro. The Phase II project will optimize the technology further to create a treatment for nosocomial (hospital acquired) urinary tract infections.

The commercial application of this project will be in the area of anti-infective therapy. The proposed work provides a unique therapeutic approach that can compliment standard antibiotic therapies as well as reduce the dire problem of the burgeoning development of antibiotic-resistant bacteria in the clinic.

Proteomics

Title: SBIR Phase II: Proteome Epitope Tags-Based Antibody Arrays for High-Throughput, Proteome-Wide Kinase Pathway Profiling

Award Number: 0522303
Program Manager: George B. Vermont

Start Date: September 1, 2005
Expires: August 31, 2007
Total Amount: $500,000

Investigator: Neal Gordon, ngordon@epitomebiosystems.com
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100 Beaver Street
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Abstract:

This Small Business Innovation Research (SBIR) Phase II project will develop a novel antibody microarray for high-throughput, multiplexed profiling of a large number of signaling proteins from multiple pathways by measuring protein phosphorylation. The antibody array will simultaneously measure kinase activities in Ras effector pathways including the Raf-MEK-ERK pathway, the P13K-Akt pathway, the p38 and JNK pathways. Current kinase profiling technologies such as Western blotting of flow cytometry are low throughput, not quantitative and difficult to multiplex and standardize. This novel technology (Proteome Epitope Tag or PET) creates antibodies with pre-defined specificity that can be multiplexed using standardized assays on antibody microarrays for measuring protein phosphorylation. The PET approach will be further developed to construct highly multiplexed antibody arrays for simultaneous measurement of a large number of kinase protein activities from multiple pathways. The ability to measure all signaling proteins from interconnected pathways will provide an unprecedented opportunity to decipher the complexity of cell signaling.

The commercial applications of this technology will be in large scale protein analysis relevant to basic biological research, drug discovery, and clinical medicine. Protein biochips hold great promise for biomarker discovery which is important in all these areas. Large-scale protein biochips capable of standardized and high-throughput protein measurement on differentially perturbed biological systems do not exist today. This is due primarily to the lack of highly specific antibodies for all human proteins predicted by gene sequences. The PET technology addresses this urgent, unmet need by generating antibodies for highly specific peptide tags of defined sequences in a proteome, representing a universal method for producing antibodies and standardized chip-based assays for any protein of interest. PET chips for profiling kinase signaling networks will have enormous utility for drug discovery by better characterizing drug efficacy, side effects and potential toxicity.

Title: SBIR Phase II: High Speed Sequencing and Structure Analysis

Award Number: 0450640
Program Manager: George B. Vermont

Start Date: May 15, 2005
Expires: April 30, 2007
Total Amount: $462,352

Investigator: Jack Syage, jsyage@syagen.com
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Tustin CA, 92780
Phone: (714)258-4400

Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop new methods for achieving high-speed sequencing and structure analysis of drug and biological molecules . The benefits of high-speed Molecular Sequencing (MSn) will be broadly applicable to end users through compatibility with ion trap MS instruments in general and specifically for the proposed QitTof MS (quadrupole ion - trap, time - of - flight mass spectrometry), which will provide the highest potential analysis speeds. The technical objectives for Phase II research are to (a) to develop high-speed MSn algorithms, (b) to optimize accurate mass neutral loss performance, (c) to develop CE / ESI (capillary electrophoresis / electrospray ionization) interface, and (d) to demonstrate CE / ESI / QitTof MS/MS for high-speed peptide sequencing. The final outcome of this Phase II work will be an instrument that will clearly achieve the highest speeds for peptide sequencing and overall protein identification.

The commercial application of this project will be in the area of proteomics. The proteomics market is forecasted to grow from $ 0.7 billion to $ 5.8 billion over the next 5 years. There is a tremendous need to develop automated methods for the analysis of proteins and peptides linked to specific cells and tissues, in order to better understand global biological function for improved drug therapy and early detection of diseases such as cancer.

Title: SBIR Phase II: Membrane Protein Microarrays

Award Number: 0450262
Program Manager: George B. Vermont

Start Date: April 1, 2005
Expires: March 31, 2007
Total Amount: $500,000

Investigator: Athena Guo, athena@memsurface.com
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Abstract:

This Small Business Innovation Research (SBIR) Phase II project proposes to develop a product platform based on polymer cushion coated glass slides with controlled surface charge density for membrane protein microarray fabrication. The key technical objectives for Phase II research are : (a) to complete quantitative studies on surface charge density in the formation of supported phospholipid bilayer (SPB) from charged lipids , (b) to develop the chemistry for the grafting / adsorption of polymer cushions, (c) to measure the activities of membrane proteins in SPBs, and (d) to fabricate membrane protein microarrays based on surface pre-patterning using soft lithography techniques.

The commercial application of this project will be in the area of protein microarrays for use in disease diagnostics and for drug discovery research. The proposed technology will enable development of therapeutics aimed at membrane protein targets.

Title: SBIR Phase II: Overexpression of Membrane Proteins from Hyperthermophilic Bacteria - Refinement of a Novel Expression System

Award Number: 0349777
Program Manager: Om P. Sahai

Start Date: February 15, 2004
Expires: January 31, 2006
Total Amount: $500,000

Investigator: Hiep-Hoa Nguyen, hiephoa@its.caltech.edu
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145 N. Sierra Madre Blvd.
Pasadena, CA 91107
Phone: (626)536-0691

Abstract:

This Small Business Innovation Research (SBIR) Phase II Project proposes to continue the development and refinement of a novel membrane protein expression system utilizing a unique group of bacteria capable of synthesizing a vast amount of membrane proteins and supporting extensive internal membrane structures. Membrane proteins are of significant medicinal importance. However, efforts to study membrane proteins are often hampered by their low level of biosynthesis. An efficient membrane protein overexpression system will facilitate their biochemical and biophysical characterization. This will allow for the economical mass production of membrane proteins essential for large-scale structural genomics effort as well as for industrial applications.

The commercial impact of the project will be on drug discovery work by biotechnology and pharmaceutical companies. Additional impact will be in areas of biology and physiology where processes are modulated by membrane proteins (for example, in agriculture).

Title: SBIR Phase II: Innovative Protein Microarrays

Award Number: 0349712
Program Manager: Om P. Sahai

Start Date: February 1, 2004
Expires: January 31, 2006
Total Amount: $499,807

Investigator: Andrzej Drukier, akd@biotraces.com
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13455 Sunrise Valley Dr. Ste 200
Herndon, VA 20171
Phone: (703)793-1550

Abstract:

This Small Business Innovation Research(SBIR) Phase II project proposes to develop a novel supersensitive multiphoton detection system for protein chips (P-chip/MPD) for applications in drug discovery and in early detection of prostate cancer and breast cancer. The commercial impact of the proposed work will be in the area of diagnostic proteomics. The diagnostics industry is large, currently estimated at around 10 billion dollars per year. The most profitable and dynamically growing fields are those that permit early detection of cancer and therapy monitoring, or provide toxicity assays for new drugs.

It is expected that the P-Chips/MPD developed in this project will eventually capture a significant share of the diagnostic proteomics market.