



## TESTIMONY OF ROBERT A. ROSENBAUM

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### **TEDCO Operations**

Mr. Chairman, members of the Committee, thank you for the opportunity to appear before you to discuss TEDCO's FY2016 budget request. This particular testimony and panel will focus on TEDCO's budget pertaining to our traditional programs. I am joined by John Wasilisin, TEDCO EVP/COO.

Following us will be officials from our Maryland Innovation Initiative, the Maryland Stem Cell Research Fund and the MIPS program.

I would like to thank Jody Sprinkle for her cooperation in working together over the last year.

While many of you are very familiar with TEDCO, for the benefit of others not so familiar, TEDCO was created by the legislature in 1998 to assist in the transfer of research and technology from Maryland universities and federal laboratories into the commercial marketplace. With that backdrop, I'd like to offer the following highlights of the many accomplishments that TEDCO has accomplished over the past year. Data is of December 31, 2014.

### **Technology Commercialization Fund (TCF)**

The TCF provides up to \$100,000 for initiation of technology transfer projects that involve collaborations between a Maryland company and a university in Maryland or any federal laboratory, participant companies in our Rural Business Innovation Initiative, ACTiVATE/INNOVATE participants or tenant companies in Maryland's technology incubators. Funds are used to defray direct costs of developing early-stage technology.

- 260 companies in portfolio
- TEDCO funding (completed projects) = \$15.2M
- Follow-on funding received by companies = \$680M
- **Leverage of TEDCO funding = \$44.6 : \$1**
- ***Entrepreneur Magazine: TEDCO was ranked the #1 seed/early-stage investor in the nation for 5 consecutive years***
- 24 companies have paid TEDCO back in full
- 86% of invested companies are still in business

### **Maryland Innovation Initiative (MII)**

The Maryland Innovation Initiative (MII) was passed in the 2012 General Assembly session. The bill designates TEDCO to be the administrator of the MII.

The purpose of the MII is to promote and accelerate the rate of commercializing research conducted in the five Maryland research universities (Johns Hopkins, Morgan State, University of Maryland-College Park, University of Maryland-Baltimore and University of Maryland-Baltimore County). This includes encouraging qualifying universities to partner on commercialization proposals, strategies, and funding sources, including with federal laboratories located in Maryland, and facilitate technology transfer from university labs to start-up companies. The goal is to create start-up companies that are based upon technologies developed in these universities.

MII program status:

- Applications received-279
- Awards made-110
- New companies created-20 (10 from JHU technologies, 7 from UMCP technologies, 3 from UMB technologies)
- Award distribution by school-JHU (49), UMCP (24), Morgan (3), UMB (24), UMBC (10)

### **Joint Technology Transfer Initiative (JTTI)**

A federal technology transfer initiative for TEDCO is with the Department of Homeland Security (DHS) and the U.S. Army Medical Research and Materiel Command (USAMRMC). Technology development projects will be considered within the scope of the JTTI if a company can show how the proposed technology will meet the needs of DHS and/or USAMRMC (spin-in) and/or the commercialization of DHS or USAMRMC technologies (spin-out).

JTTI awards of up to \$75,000 will be made to for-profit small businesses in support of technology development projects that fall within the scope of the JTTI. Assistance in identifying whether or not a technology meets DHS or USAMRMC needs and in forming technology transfer collaborations will be available from TEDCO.

### **Relationships with Federal Labs and Institutions**

- Aberdeen Proving Ground, Science & Technology Board  
(Covers approximately 12 R&D tenant organizations, including the Army Research Lab)
- Johns Hopkins University Applied Physics Lab
- NASA Goddard Space Flight Center; provides access to *all* NASA labs
- National Institute of Standards and Technology
- National Institutes of Health  
(Specific Partnership Intermediary Agreement with National Cancer Institute)
- National Security Agency
- Naval Air Warfare Center Patuxent River
- Naval Medical Research Center

- National Cancer Institute
- Naval Surface Warfare Center Carderock Division
- Naval Surface Warfare Center Indian Head Division
- Naval Surface Warfare Center Crane Division
- United States Army Medical Research and Materiel Command  
(Includes six medical research labs and institutes)
  - 1) U.S. Army Aeromedical Research Laboratory (USAARL)
  - 2) U.S. Army Institute of Surgical Research (USAISR)
  - 3) U.S. Army Medical Research Institute of Chemical Defense (USAMRICD)
  - 4) U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID)
  - 5) U.S. Army Research Institute of Environmental Medicine (USARIEM)
  - 6) Walter Reed Army Institute of Research (WRAIR)
- United States Department of Agriculture, Agricultural Research Service  
(Includes over 100 national research locations and the Forestry Service)
- TechLink  
(Department of Defense and NASA technology transfer partner)

### **Technology Business Incubators**

Since introducing the “Maryland Technology Incubator Program” in 2001 as part of TEDCO’s statutory requirements, successful programs have been created and investments have been made in the State’s technology business incubators. Programs have included the Incubator Development Fund (capital incubator projects requiring a minimum 1:1 match), Feasibility Study Grants (to study potential new or expanded facilities; grants require a minimum 1:1 match), Business Assistance Grants (to provide incubator managers with discretionary funding to provide needed and direct assistance to tenant companies), and other grants and programs supporting the annual Incubator Company of the Year Awards and activities of the Maryland Business Incubation Association. The annual Incubator Company of the Year Awards has honored and recognized the superb efforts of the incubator managers and their staff, as well as the finalists and winners of these coveted awards. For eleven years running, hundreds of incubator companies have been deemed, by a committee of distinguished economic development and venture capital professionals, as the best in their respective categories, whether a new or graduate incubator company, or expert in their field of technology.

### **Entrepreneurial Development**

TEDCO also provides a variety of assistance programs for entrepreneurial development, including the Maryland Rural Business Innovation Initiative (RBI<sup>2</sup>) and the Achieving the Commercialization of Technology in Ventures through Applied Training for Entrepreneurs (ACTiVATE) in conjunction with the University of Maryland, Baltimore County.

An important mission for TEDCO is to assist in the development of entrepreneurs throughout the State of Maryland. The RBI<sup>2</sup> is designed to enhance technology commercialization activities and provide technical and business assistance to small companies and early-stage companies in rural Maryland. Assistance to companies is provided by local business mentors contracted by TEDCO. Each region has a local mentor, whose responsibility is to evaluate potential clients, provide resources, consulting services and technical management assistance. Providing technical and

general business assistance is a cornerstone of this program that helps small businesses gain access to general business resources, federal laboratory and university research opportunities.

In an attempt to promote and celebrate entrepreneurship in Maryland, TEDCO held the 4th Annual Maryland Entrepreneur Expo on November 12, 2014 (in conjunction with Global Entrepreneurship Week) to bring together the various entities that have a vested interest in the development of entrepreneurs. The Maryland event was one of 10 nationally-recognized by Global Entrepreneurship Week. **This event attracted over 600 people** comprised of new and seasoned entrepreneurs, investors, students, legislators, service providers, inventors, tech transfer officers and economic development professionals. Due to its success, TEDCO is planning to continue the Entrepreneur Expo in 2015.

### **TEDCO Capital Partners**

TEDCO's efforts with TEDCO Capital Partners has continued to progress and has reached several milestones during the last 12 months. Work has continued with the Propel Baltimore Fund and the Veterans' Opportunity Fund. Work on the Orange Knocks Cyber Fund and the Chesapeake Regional Innovation Fund has been put on hold.

### **Propel Baltimore**

The Propel Baltimore Fund has continued on its mission to invest in early-stage technology companies in Baltimore City. During the year four new foundations invested a total of \$900,000, bringing the total size of the fund to \$5.2 million. The fund has now made nine investments, nearly exhausting the available dollars.

The success of the fund and the fact that it will make its last new investment before June of this year has prompted discussions about a second Propel Baltimore Fund. The original two investors in the fund have expressed an interest in participating in Propel Baltimore II and have made introductions to additional potential investors.

### **Veterans' Opportunity Fund**

The Veterans' Opportunity Fund has raised limited funds to date and made one investment with a second in final due diligence. It is expected the second investment will close within the next 60 days.

### **Benefits to TEDCO**

TEDCO benefits from the activities of both Propel Baltimore and the Veterans' Opportunity Fund in multiple ways.

- Both funds first look to the State-funded TEDCO portfolio for deal flow. To date, all but three companies the funds have invested in are TEDCO portfolio companies. This is private capital being invested in these companies to increase their likelihood of success leading to job growth, tax base and community enhancement.
- TEDCO will share in the long-term profits of both funds. These profits, generated by managing private capital, will be funds that TEDCO will put into its core economic development mission.
- TEDCO's involvement in these private capital funds has allowed access to other private investor groups, leading to increased engagement in other TEDCO activities. This engagement and the ability to make these later-stage investments have also increased

TEDCO's visibility and impact on the early-stage innovation community around the state.

**Management and Administration**

As you are aware, TEDCO is required by statute to seek an independent audit of its yearly financial statements. **For the fifteenth consecutive year, TEDCO received an unqualified (clean) audited financial statement.**

I would like to thank members of this Committee for their courtesy toward me and TEDCO, and for your strong support of our programs.



## **Maryland Stem Cell Research Fund**

The Maryland Stem Cell Research Fund (MSCRF) was established by the Governor and the Maryland General Assembly during the 2006 legislative session and created the Maryland Stem Cell Research Fund. This fund is continued through an appropriation in the Governor's annual budget.

The purpose of the Fund is to promote state-funded stem cell research and cures through grants and loans to public and private entities in the State.

All MSCRF applications are evaluated by a scientific peer review committee comprised of an independent panel of experts from around the country (excluding Maryland). The impact on biotechnology in Maryland and relevance to regenerative medicine (the repair or replacement of diseased and damaged cells, tissue, and organs) and stem cell based therapy are key criteria in evaluating applications for funding.

The Commission reviews the peer review rankings and comments and then makes funding recommendations to the TEDCO Board for their final approval. The annual grant review provides feedback to applicants so they can improve and resubmit previously unfunded proposals.

The MSCRF serves as a catalyst for new collaborations, building the scientific knowledge base and spurring the discovery of improved diagnostics, effective preventions, and long-awaited cures.

**The MSCRF supports diverse research projects** - have addressed Parkinson's Disease and Huntington's Disease, Alzheimer's, Crohn's, Gaucher's and ALS, known as Lou Gehrig's Disease. They have researched heart damage, brain damage, bone damage, spinal cord damage and skin damage, immune deficiency and bone marrow failure, looking at mechanisms for healing wounds, a process that specifically marshals the natural stem cells that are in our body. Our researchers have looked at arterial disease, kidney disease, liver disease, sickle cell disease and retinal disease. At Multiple Sclerosis, Diabetes (which diagnosed and undiagnosed affects 17% of the US population), and Stroke. At Autism, Down's Syndrome and Schizophrenia. Multiple studies have focused on various cancers -- Cancers of the brain, breast, lung, pancreas and blood, among others.

**Delivering cure** - Dr. Robert Brodsky and others have been using stem cells to rapidly enhance bone marrow for marrow transplants and has been having success in the clinic transplanting sickle cell patients from a new class of half-matched donors who could not previously be used due to the threat of rejection. In related research with great future promise, Dr. Curt Civin's team and colleagues at CIRM (our California equivalent) are developing methods to cure Sickle Cell Anemia by autologous (self) transplant of the patient's own blood-forming stem cells after correction of their inherited disease-causing mutation using new genomic editing tools. In

cooperation with MaxCyte, a Maryland biotechnology company, they can efficiently introduce "genetic scissors" directly into stem cells to fix mutations or cause other therapeutic benefit. Many more disease specific examples are available.

**2010 and 2013 Study finds the MSCRF to have a major economic impact**

In the last three years DLS recognizes the progress did not recommend budget cuts to the program

<i>Type of Impact</i>	<i>Employment</i>	<i>Labor Income (\$millions)</i>	<i>Business Sales (\$millions)</i>
Direct	250	\$21.8	\$35.5
Indirect	104	\$5.5	\$14.9
Induced	160	\$6.8	\$20.9
Total	514	\$34.1	\$71.3

Source: Sage

	Output (\$s)	Labor Income (\$s)	Employment	State/Local Tax	
				Revenue (\$s)	Federal Tax Revenue (\$s)
<b>Total Impact</b>	<b>\$19,894,369</b>	<b>\$8,878,832</b>	<b>128</b>	<b>\$826,554</b>	<b>\$937,447</b>

**The MSCRF funding for university researchers has helped raise Maryland’s national leadership position.** – from 2009 to 2012, Maryland raised its level of NIH funding support from \$40.3 million to \$114.4 million, from eighth in the nation to third in the nation for NIH funding of stem cell research.

Source: Battelle

**Supporting companies** - In our first pre-clinical grant, Dr. Lew Schon, professor of orthopedic surgery at Johns Hopkins School of Medicine and practicing Orthopedic Surgeon is testing a new stem cell laced orthopedic suture in animals to promoting wound healing and healing after surgery with the goal of FDA approval for use of the technique in human patients.

**Economic impact** – Cell Therapy is the 4<sup>th</sup> Pillar of Healthcare, adding to pharma, biotech and medical devices. Several economic reports estimate that repair or replace tissue or organs and stem cells could reach \$75-\$150 billion industry by 2020. However, the high risk of early stage clinical trials prevent investors and large companies from investing in these promising technologies. Early stage State investments are the de-risking factor this industry need.

**New Companies creation** - In 2015 16 MD based start-up companies around stem cell technology submitted Letters of Intent to the Fund. This is a great new direction and the Commission will discuss how to continue helping this industry sector.

To View a list of all the Awardees and read personal stories here:

<http://www.msccf.org/content/awardees/index.cfm>, or watch a short video

(<https://www.youtube.com/watch?v=Q-kXWV-s0Pw>).



Good afternoon Chairwoman Jones, Vice-Chairman Barnes and distinguished Members of the committee. It is an honor to appear before you today to discuss funding of the Maryland Stem Cell Research Fund.

First, I'd like to thank this committee for its steadfast support of the Maryland Stem Cell Research Fund's mission: promoting state-funded stem cell research and cure through grants and loans to public and private entities in the state. As a hub for the biotechnology industry, this funding has helped fund 320 grant requests during the past 9 years. From large employers such as pharmaceuticals/biotechnology companies to the small startup, Maryland is a place where innovation is taking place. Not only does this innovation support the state economy through job creation, it puts Maryland at the forefront of building cutting edge healthcare.

The Maryland Stem Cell Research Fund (MSCRF) has played a critical role in enabling and accelerating stem cell-based research and clinical translation. The MSCRF has facilitated the development of novel therapies through grants and loans throughout the state. My own company, MaxCyte, Inc., has been the recipient of two grants from MSCRF in collaboration with leading stem cell researchers at Johns Hopkins and the University of Maryland. These grants are helping to translate basic research from these esteemed institutions, moving us closer to the potential development of life-saving treatments for Marylanders, Americans, and others worldwide. We have the MSCRF to thank.

There are many others throughout the state of Maryland who also have been fortunate enough to receive funding from MSCRF. And, just from the letters of intent, 2015 looks to be another strong year for stem cell research in Maryland. Recently, MSCRF announced that it received 240 Letters of Intent in response for the FY 2015 funding cycle. The high response features a record 16 Maryland companies applying for funding, seven Letters of Intent for direct clinical work, and 144 Letters of Intent for translational work. Among those who intend to apply for grants are Maryland universities, prestigious research institutions, hospitals, and for-profit companies, all of whom want to conduct research in Maryland to advance medical therapies. Honored Members, these grants translate into employment in our great state as well as continuing to keep Maryland at the forefront of cutting edge healthcare. There are few other places where these groups can go for cutting edge funding and if not received, many promising therapies will go unexplored.

Even without the two grants MaxCyte received, my company has benefited. Many of the grant and loan recipients use MaxCyte's technology, which means my company has been able to grow, bringing revenue and jobs to Maryland.

Members of the committee, I ask you to make sure Maryland continues to see economic growth from large pharmaceutical companies and small biotechnology companies like mine. The FY2006 budget introduced by Governor Larry Hogan includes a \$1 million cut to the MSCRF, funding it with \$9.4 million, the lowest amount in its 9 year history. We are putting future job creation and future economic investment at risk.

This legislature has always been supportive of stem cell research in Maryland. I ask you to continue that support. Funding of the MSCRF can only result in more biotechnology companies moving to Maryland and the development of more novel treatments that will benefit people worldwide.

## **Maryland Industrial Partnerships (MIPS) Funding**

February, 2015

Market-driven new technology and innovation leads to new products and new jobs. Creating jobs in innovative Maryland companies is what the Maryland Industrial Partnerships (MIPS) program has been doing for 27 years: bringing the inventive minds and extensive laboratory resources of the University System of Maryland to bear on creating the new products that feed the growth of Maryland businesses. Since last year, MIPS-enabled products have increased sales further, bringing our total impact from \$28.1 B to \$30.3 B. MIPS is nationally recognized by the U.S. Small Business Administration as a model program for best practices in transferring technology and is a proven program that contributes significantly to job creation and high tech product development in Maryland.

Companies look to Maryland's public universities for help in solving critical problems in developing new products, while the universities are expected to contribute to economic development and job creation. MIPS projects are not basic research, but rather are translational work that leads to new products. These are products of any Maryland company willing to create jobs, including but not in any way limited to, products based on the universities' intellectual property.

MIPS provides funding, matched by participating companies, for university-based research projects that help the companies develop new products. The program is administered at the flagship campus at the University of Maryland, College Park, and works throughout the 12 member institutions of the University System of Maryland, plus Morgan State University and St. Mary's College. In these academic-industrial, public-private partnerships, MIPS connects the resources of the Maryland public universities to businesses from all parts of Maryland.

MIPS is unique among Maryland's innovation and economic development programs in its combination of (1) requiring the companies involved to pay part of the project costs upfront, which ensures that company proposers are very serious about the project and its importance to the company and have the business acumen to raise at least the funds needed to meet the MIPS cash match requirement, (2) engaging university faculty, students, and laboratory facilities in R&D of immediate interest to a company's future, and (3) allowing projects to further develop company-owned intellectual property (I.P.), not only university-owned I.P. These factors combine to create a highly effective program.

With the MIPS matching funding as the incentive, companies can leverage the facilities, resources and expertise of the USM campuses to create new products and new opportunities for high-tech jobs. In the 27 years since the program started, 411 faculty researchers have worked with more than 541 Maryland companies to help develop new products. These products have generated over \$30 B in revenues and Maryland companies have directly created more than 6,600 new, high-paying, long-term, high-tech jobs throughout the state.

MIPS has a proven track record of success in helping companies develop many new products, resulting in substantial revenues and jobs in Maryland. Among the many successful products in which MIPS played an early, key role are:

- HughesNet: Internet via satellite, \$13.7 B cumulative revenues, 400 high tech jobs in MD
- MedImmune: Synagis – vaccine to prevent a respiratory infection that can be fatal in premature and sickly infants - \$13.6 B cumulative revenues, 3000 jobs in MD and expanding in MD since its \$15.6 B acquisition by AstraZeneca in 2007.

- Martek Bioscience: nutritional supplements for baby formula - \$2.9 B cumulative revenues, 200 jobs in MD

- WellDoc Communications: BlueStar™ for management of diabetics – \$20 M annual revenues and 100 new jobs in Baltimore City, raised \$50M in direct investment;

- CSA Medical: Spray Cryotherapy – medical device to treat pre-cancerous disease of the esophagus and lungs as an outpatient procedure – now used in 72 hospitals; 45 new jobs in Baltimore City; raised \$55M in direct investment;

How does MIPS work? Hughes Network Systems of Montgomery County looked to a professor at University of Maryland College Park to develop the communications systems that led to the company's HughesNet® product, which delivers Internet via satellite all over the world. Hughes created 400 new jobs, and says that the MIPS project created a whole new industry, and they are the world leader, with sales in excess of \$13.7 B.

In 2005 Pixelligent Technologies worked with a professor at the University of Maryland College Park on nanocrystal additives for increasing the resolution of photolithography. Since then the company has raised over \$23M in equity investment. Today the company has expanded its footprint in Baltimore to more than 13,000 sq. ft. and is increasing its workforce by 150%. Pixelligent is poised for growth as its nanocrystal additives are being adopted for use by leading electronics and lighting companies in manufacturing LED panels as well as the new OLED digital displays and lighting solutions. MIPS provided early funding for Pixelligent's product development.

Another Baltimore City success story involves WellDoc Inc., which came to MIPS for help in testing their BlueStar System. The MIPS-supported clinical trial at UM Baltimore enabled WellDoc to attain FDA clearance for their diabetes management system, among the first such FDA approvals for any mobile health app. They now have relationships with AT&T, Samsung and many others, delivering telemedicine care. Importantly, they have hired 100 people in high-salary, technology-based, new jobs in Baltimore City.

Earth Networks (EN), the company that produces the WeatherBug app and website, is headquartered in Germantown. They partnered on a MIPS project with a professor at the University of Maryland College Park to develop the thermodynamic models behind their new WeatherBug Home product, which increases residential energy efficiency by combining EN's big weather data with sophisticated analytics. This model makes it possible to shift HVAC-related loads away from utilities' peak load, seamlessly delivering optimized energy while ensuring occupant comfort. WeatherBug Home is proving effective and being quickly adopted by the market, enabling EN to add significant jobs in Germantown.

Recently, MIPS announced 15 new projects, teaming Maryland companies and university faculty to develop new high technology and biotechnology commercial products. Projects featured during this round include a brain trauma therapeutic, a universal biosensor system, unmanned surface vessel controls, an improved feedstock for fish farming, a new type of high-efficiency engine for electricity production, a real-time chronic disease mobile platform, a cord blood collection device, a system for field-detection of narcotics, a method of assessing juveniles at risk of violent behaviors, an emotion detection app for improving public speaking, an oyster sorting and grading machine, a crab picking machine, and products to improve water quality in the Chesapeake Bay by efficiently harvesting algae and algae blooms for crude oil and other products.

For this round of projects, companies made cash contributions to the university projects of \$157,000 and MIPS provided \$659,000. Our long-standing state partner, the Maryland Department of Natural Resources, provided additional supporting funding for products that will improve Chesapeake Bay water quality.

The result is new Maryland products and true high-technology job creation. These are the kinds of jobs that will propel Maryland forward in the innovation economy and position us to compete on the global stage.

MIPS' unmatched track record of proven success makes the program more than self-funding.

The thousands of jobs that have been created through MIPS projects result in state tax revenues that pay the program back many times over every year.

The Jacob France Institute of the University of Baltimore conducted a study for our 25th year of MIPS. That independent study showed that the economic impacts associated with MIPS-supported technology are now generating an estimated \$87.3 million in state tax revenues each year. These estimated annual state tax revenues significantly exceed the \$44 million lifetime costs of the MIPS program. An estimated \$70.6 million in annual local government revenues is also generated by MIPS-supported technologies. With state taxes derived from the new jobs and revenues it has created, the MIPS program more than pays for itself, and in fact has historically shown long-term returns of 40:1 to the State of Maryland treasury.

The MIPS program is exactly where the State should be placing resources right now. Why? As a market-driven, job creation program, MIPS is extremely cost-effective and consistently delivers high impact. By funding the next generation of new Maryland products, the MIPS program leads to new technology, new products and new job creation—just what Maryland needs right now to propel us forward in today's innovation economy.

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