BIOSCIENCES ALLIANCE OF IOWA (BAI)

DEVELOPING **IOWA'S BIOSCIENCES INDUSTRY**

BAI
Background – Why Biosciences?

- Iowa's Bioscience Pathway For Development
  - Research commissioned by the Iowa Department of Economic Development
  - Intended to assist the department, the business community, and the state universities (UNI, UI, ISU) in determining the areas of university research that would provide opportunities for economic growth for Iowans
- Report emphasized the incredible promise for Iowa's emerging biosciences industry
- Implementation Plan was completed in 2004

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Background – IDED Response

Biosciences Alliance of Iowa (BAI) was established as an IDED advisory committee to:

- secure Iowa's role in the emerging innovation economy
- focus state investments and efforts in key bioscience areas

BAI
Background – IDED Expectations

BAI members will represent:

- universities,
- the agricultural community,
- the business community,
- community colleges,
- private colleges and universities,
- local economic developers,
- government

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Background – IDED Expectations

Alliance Executive Committee

- No more than eleven voting members
- Majority must be actively engaged in the management of a specific Iowa bioscience businesses
- Chair and Vice-Chair of the Board of Directors, one of whom must be engaged in bioscience business
  - One each from the Board of Regents and the Iowa Department of Economic Development
  - Two at-large members actively engaged in bioscience business
  - Three state university presidents

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Background – IDED Expectations

Board of Directors

Includes members from:

- Business
  - Biotechnology and Bioprocessing;
  - Drugs and Pharmaceuticals;
  - Biorenewable Fuels;
  - Biorenewable Chemicals or Fiber Products;
  - Food Processing;
  - Agricultural Processing;
  - Agricultural Production;
  - Medical Devices, Sensors, and Imaging Equipment;
  - Biosecurity;
  - Utilities
- The State Chief Technology Officer
- Seven Platform Academic Leaders
- Board of Regents
- Director of the IDED
- Iowa Association of Business and Industry
- Vice Provost/President for Research from each of the Regent Universities
- Private colleges and universities
- Community Colleges
- Chair of the Iowa Capital Investment Board
- Board President of the ICIC
- Iowa Business Council
- Professional Developers of Iowa
- Iowa Biotechnology Association
- BIOWA

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Background – IDED Expectations

The Alliance will provide guidance to the IDED for
- the development of Iowa's biosciences industry
- state funding of university bioscience initiatives, i.e.: capital projects, commercialization projects

The Alliance will assist in coordinating university and industry approaches to the development of the biosciences specific to economic opportunities

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Background – IDED Expectations

BAI primary objective is job and wealth creation from seven platforms:
- BioEconomy,
- Advanced Food Products,
- Animal Systems,
- Integrated Post-Genomic Medicine,
- Integrated Drug Discovery,
- Integrated Biosecurity,
- BioMedical Imaging

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Background - Timeline

- Each of the seven platforms has developed a Platform Leadership Team composed of business leaders and academics
- Each of these teams has been asked to submit for review proposals for funding for projects showing a positive impact on the Iowa economy by January 1, 2006
- Potential projects may include:
  - Bricks and mortar projects as necessary to the advancement of the biosciences platforms
  - Development of commercialization services
  - University/industry collaborations leading to commercialization of a product

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Background – Benchmarks and Measures

- The first benchmark is October, 2005, when the BAI will submit to the IDED BOD specific plans for funding projects
- Indicators of a transformed economy include:
  - Iowa's per capita personal income compared to the national average,
  - growth in targeted biosciences businesses; new and expanded
  - ability to attract and retain an educated workforce measured by the percentage of population growth within the age group of 18 to 45

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Platform - BioEconomy

The conversion of agricultural crops and byproducts into biobased products and bioenergy.

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Platform - BioEconomy

Examples

including but not limited to:
- biofuels,
- biomaterials and biocomposites,
- chemicals,
- polymers,
- plastics,
- oils,
- starches,
- adhesives,
- enzymes,
- fibers

Market
- World energy demand is expected to increase by 59% by 2020
- Lubricant sales is a $5.1 billion market
- Composite materials are a $14.6 billion market
- Paints and coatings represent a $43 billion market
- Plastics have a $77 billion market
- A cluster of 10 biorefineries in Iowa would create 22,000 jobs, have an $11.6 billion economic impact, and generate $367 million in taxes

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Platform – Advanced Food

Foods that will improve the functioning of the immune system, reduce cancer risks, or help prevent disease.

Glossary

Functional foods – any food or food ingredient that may provide a health benefit beyond the traditional nutrients it contains (Institute of Medicine)

Nutraceuticals – any substance that may be considered a food or part of a food and provides medical or health benefits, including the prevention or treatment of disease (Iowa State University Extension)

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Platform – Advanced Food

Examples

including but not limited to:

- botanical or herbal fortified beverages,
- soybean products,
- fiber- and vitamin- fortified products,
- probiotic (friendly bacteria) products,
- value-added Iowa processed products

Market

- 60% of processed foods in supermarkets contain genetically modified (GM) ingredients such as soy, corn, and canola
- In 2002, GM food market was worth approximately $60 billion
- Nutraceuticals are predicted to reach $74.7 billion by 2007
- Worldwide demand for nutraceutical chemicals will increase by 6.2% annually reaching $8.6 billion by 2006
- The functional food market in the U.S. was valued at $18.5 billion in 2002

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Platform – Animal Systems

Transgenic animals, also called bioreactors, allow for the development of animals to produce specific proteins and pharmaceuticals; production of animals with improved genetics to produce better products; development of animal models to study and find cures for human disease.

Glossary

Transgenic – Of, relating to, or being an organism whose genome has been altered by the transfer of a gene or genes from another species or breed

Animal models - development of models using pigs, or companion animals to help solve diseases

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Platform – Animal Systems

Examples

including but not limited to:

- cloning and production technologies to improve animal production
- molecular farming – using livestock to produce medicines, nutraceuticals, and tissues for human use,
- improved egg, meat and milk quality,
- Improved food safety
- new food products for consumers
- development of animal models to study and cure human disease

Market

- Many diseases and disorders with a high level of unmet need can be treated successfully with drugs created from transgenic animals
- The world market for antibodies and recombinant proteins has been estimated at over $14 billion
- Improvement in production efficiency will save producers and consumers over $100 million annually
- Development of new vaccines and treatments for animal and human diseases
- New and healthier food products
- Reduced animal waste and improved environmental conditions

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Platform – Integrated Post-Genomic Medicine

Medical discoveries based on the understanding of human genes and proteins and their relationships to disease and disorders.

Glossary

(Bio)informatics – the sciences concerned with gathering, storing, classifying, analyzing, and distributing (biological) information derived from sequencing and functional analysis

Pharmacogenomics - medications designed for an individual's genetic makeup

Proteomics - the study of proteins

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Platform – Integrated Post-Genomic Medicine

Examples

(including but not limited to):

- identifying new potential targets of intervention for disease,
- pharmacogenomics,
- proteomics,
- genetic tests,
- gene therapy,
- bioinformatics,
- new drugs, biologics, therapuetics, vaccines, etc., passing into integrated pipeline

Market

- Pharmacogenomics market anticipated to approach $3.5 billion by 2005
- Pharmacogenetic services and gene-based diagnostics could reach $6 billion
- Functional genomics market was estimated to be worth $940 million in 2002 and projected to grow to $2.2 billion by 2007
- Proteomics is projected to grow from a $565 million market in 2001 to over $3.3 billion in 2006
- Application of bioinformatics/informatics applications has the potential to drive growth in the worldwide pharmaceuticals drug market from $240 billion today to $3 trillion by 2020

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Platform – Integrated Drug Discovery

Full name: Integrated Drug Discovery, Development, and Production

Pharmaceutical companies are leveraging new research and new development and production techniques to reduce costs and become more efficient.

Glossary

Biologics - new drug therapies produced by live, genetically modified microbial or animal cells

Monoclonal – Of or relating to a protein from a single clone of cells, all molecules of which are the same

Recombination – A combination of genes in progeny that were not present in the parents

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Platform – Integrated Drug Discovery

Examples

including but not limited to:

- drugs,
- biologics,
- gene therapy agents and vaccines

Market

- In 2000 the world pharmaceutical market was valued at $317 billion and projected to grow to $3 trillion by 2020
- Fermentation and cell culturing services will generate the largest outsourcing revenues based on the complex manufacturing and high investment requirements of recombinant proteins and monoclonal antibodies
- Personalized medicine is expected to reach $3.5 billion by 2005

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Platform – Integrated Biosecurity

Protection of human life and plant and animal production, processing and distribution.

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Platform – Integrated Biosecurity

Examples

including, but not limited to:

- vaccines,
- diagnostics,
- drugs and therapies,
- biodecontamination microbes,
- environmental monitoring products

Market

- Demand for bioterrorism equipment and services is projected to grow by 16% annually through 2008, reaching $10 billion
- Vaccines are predicted to be the fasted growing segment, 54% annually from $286 million in 2003 to $2.5 billion in 2008
- The second fastest growing segment will be biodetection equipment, increasing from $345 million in 2003 to $1.9 billion in 2008
- USDA proposed $2.4 billion budget for agrosecurity and food supply safety in 2004

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Platform – BioMedical Imaging

Providing new insights into disease processes and methods for the design, assessment and application of novel interventions.

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Platform – BioMedical Imaging

Examples

including, but not limited to:

- products for image aided detection and diagnosis
- software for quantitative image analysis,
- image data archiving and retrieval,
- image-based outcomes and safety assessment for new drugs and devices,
- multi-center trials coordination,
- software and associated hardware for image guided interventions

Market

- In the US, more than 300 million diagnostic imaging procedures were performed in 2004.
- The global imaging market is approximately $13B with CT alone representing over $2B in equipment sales excluding services. Annual CT procedure volumes exceed 40M in the USA.
- In 2004, the worldwide computer-aided diagnostic (CAD) imaging products market was valued at $15 billion; in the same year, the U.S. CAD imaging products market was est. at $7B
- There are approx. 13,000 new investigational drugs in over 17 critical therapeutic areas. Nearly half are beyond the pre-clinical/discovery phase and are part of phase I, II, or III clinical trials. Imaging (particularly CT imaging) is becoming an increasingly critical assessment tool. Core lab (centralized CT imaging services) is emerging as a critical market.

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Message – World Provider

The development of the biosciences industry builds on Iowa's tradition as a provider to the world

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Message – World Provider

- **But how can we compete with other states? Using our strengths to provide new sources of energy and enhancing human and animal health, we continue our proud heritage.**

Iowans Work Ethic

Quality of Science Workforce

National rankings of university programs

Quality of research

Collaborations between business community and universities

Class A farm ground

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Message – Build on Iowa's Investments

The development of the biosciences industry builds on Iowa's past investments

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Message – Build on Iowa's Investments

- Iowa's universities are leaders in bioscience research and development
  - The University of Iowa ranks 10th among universities for National Institute of Health funding
  - Iowa State University is the 5th most-cited university in the world for research in agricultural and life sciences, ranks second in licenses and options executed on intellectual property, and ranks third in licenses and options yielding income
  - The University of Northern Iowa's Ag-Based Industrial Lubricants Research (ABIL) Program is nationally recognized as a leader in the development and commercialization of soybean-based industrial lubricants
- Industry-driven programs at community colleges provide Iowa businesses and students with the tools necessary to succeed in today's high-tech world
- Since July 2003 the Department of Economic Development has invested in 275 Iowa companies including
  - new locations, start-ups and expansions
  - creating or retaining 18,008 jobs
  - infusing $3 billion of capital investment into the state
  - over 56 percent of the department's total investment has been awarded to bioscience companies

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Message – Economic Opportunities

The development of the biosciences industry gives back to Iowa and Iowans

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Message – Economic Opportunities

- The bioscience industry is a tremendous source of well-paying jobs. The average salary of a bioscience worker was more than $10,000 more than the statewide average wage in 2002
- Data from the Institute for Decision Making indicates that the impact of new biobased business and biorefineries by 2020 could reach
  - 22,000 new jobs
  - over $12 Billion in economic impact
- Iowa Workforce Development:
  - In 2004, 111,730 Iowans employed in the biosciences industry with an average annual wage of $42,163
  - In 2004, a two-year degree in bio processing from Indian Hills Community College earns a starting salary of $35,000.
  - In 2004, biosciences Industry employment accounts for 30% of all targeted industry employment

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Success Stories

- Our farmers are building ethanol and biodiesel plants and our researchers are building companies to market their innovations.
- Our educational institutions, from K through PhD, are responding.
- Our state is already showing the world just what we can become. A few examples….

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Success Story – IAgen

Background

- IAgen is a research and development laboratory established to explore **development of new biocatalysts** for the bioproducts industry and the **development of a new generation of peptide nucleic acid** (PNA) building blocks for use in gene therapy treatments
- IAgen was established in 2003 by Eric Zirbes and is located in The University of Iowa Oakdale Research Park in Coralville

Glossary

Biocatalyst – A substance, especially an enzyme, that initiates or modifies the rate of a chemical reaction in a living body

Biomass – Crops, trees, grasses, and crop and forest residues

Bioproducts – Products made from the molecular building blocks of biomass

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Success Story – Integrated DNA Technologies Incorporated

Background

- Integrated DNA Technologies (IDT) is a world leader in the **development and manufacture of short strands of synthetic DNA** for use in clinical and therapeutic genetic research applications
- The information systems division **develops sophisticated custom applications and manages systems**
- The bioinformatics group **designs and builds computational tools** for genetic research
- IDT was established in 1987 by Dr. Joseph Walder and is located at The University of Iowa Oakdale Research Park in Coralville
- The company recently announced a 5-year, $26.5 million capital expansion program that will add 40,000 square feet of manufacturing space and create 200 additional jobs

Innovation & Precision In Nucleic Acid Synthesis

IDT®

INTEGRATED DNA TECHNOLOGIES

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Success Story – Integrated Sensors Technologies

Background

- Integrated Sensor Technologies Inc. (ISTI), is focused on **creating integrated oxygen/ organic light-emitting device, or OLED, sensors**
- Technology commercialization specialists at Iowa State University's Institute for Physical Research and Technology helped ISTI obtain a Small Business Innovation Research grant from the National Institutes of Health and set up a cost sharing program and found matching funds from within the university
- President and CEO of ISTI, Ruth Shinar, is a chemist at ISU's Institute for Physical Research and Technology's Microelectronics Research Center
- The technology is developed from research performed by Joseph Shinar and members of his research group at the U.S. Department of Energy's Ames Laboratory
- The company is located in Ames

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Success Story – Naturally Iowa & NatureWorks PLA

Background

- Naturally Iowa, an organic milk company, is **using bottles made from polylactic acid**, or PLA
- The plastic, called NatureWorks PLA and developed by Cargill Dow, **uses corn as the raw material**.
- Cargill Dow **developed a process that uses fermentation to make PLA**, which greatly drives down its cost so it's competitive with traditional plastics
- Besides using a renewable agricultural crop as the raw material, products made from PLA are also biodegradable: they reportedly degrade in commercial composting conditions in 75 to 80 days
- Naturally Iowa received a $75,000 investment from the Department of Economic Development in 2004, in addition to funds from the USDA, the Iowa Corn Promotion Board, and the Iowa Agriculture Innovation Center
- Naturally Iowa was established by William Horner and Steve Williams in 2002 and is located in Clarinda

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Success Story – NewLink Genetics Corporation

Background

- NewLink is **researching disease-related proteins on the surface of cancer cells** in the hope of **developing drugs** that could
  - inhibit defective proteins,
  - provide missing proteins, or
  - prompt the human immune system to fight cancer
- NewLink was founded by Dr. Charles Link and is located in the Iowa State University Research Park in Ames
- The company was promised $14.2 million in state incentives, including $6 million from the Iowa Values Fund and has $20 million in private investment
- NewLink owns 15 patents
- It currently has 40 employees and eventually plans to have 350

NewLink GENETICS

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Success Story – Soy Biodiesel

Background

- The Institute for Physical Research and Technology's (IPRT) Center for Catalysis is teaming with West Central Cooperative to **find a more efficient way to produce soy diesel** from soy oil
- The effort is the focus of a major grant from the U S. Department of Energy and U.S. Department of Agriculture
- IPRT's Center for Catalysis is a part of Iowa State University in Ames
- The West Central Cooperative is a major grain company in North America and has been in the soybean processing business since 1942.

WEST CENTRAL

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Success Story – SoyTrak

Background

- **SoyTrak is a biodegradable soybean oil used as an alternative to petroleum-based grease for lubricating railroad tracks**
- SoyTrak was developed by the University of Northern Iowa's Ag-Based Industrial Lubricant (ABIL) Research Program
- A new company-Environmental Lubricants Manu., Plainfield, Iowa-was formed to produce and market the rail curve grease and other biobased lubricants.
- Norfolk Southern Railway converted its entire operation to SoyTrak in 2003, then accounting for more than one-fifth of the 9 million pound market for rail greases
- Field demonstrations indicate that SoyTrak
  - performs 20 percent better than conventional greases
  - adheres better to metal surfaces
  - does not thin down at high temperatures
  - carries up to two miles further on the gauge face

ELM

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Success Story – Vibroacoustic Solutions Inc.

Background

- Vibroacoustic Solutions Inc. (VSI) is **developing an active/passive natural fiber composite material embedded with noise control technology** - the material has the potential to be incorporated in the manufacture of quiet machines and appliances
- VSI received a $100,000 grant from the National Science Foundation and assistance from Iowa State University Pappajohn Centers in Ames and Cedar Falls and the ISU Research Park
- VSI is collaborating with Creative Composites of Brooklyn, Iowa, a manufacturer of natural fiber and plastic composites, and other companies in its endeavors
- The company was started in 2003 by Ken Budke, a dentist in Cedar Falls, and Atul Kelkar, a professor of mechanical engineering at Iowa State University

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Success Story – VIDA Diagnostics

Background

- VIDA Diagnostics **develops and markets software solutions for the detection, staging, treatment planning and follow-up for acute and chronic lung disease**, such as emphysema, chronic obstructive pulmonary disease (COPD), asthma, lung cancer and interstitial lung disease
- VIDA Diagnostics was founded by four University of Iowa faculty members: Dr. Eric Hoffman, Dr. Geoffrey McLennan, M.D., Dr. Joseph M. Reinhardt, and Dr. Milan Sonka
- VIDA's patent-protected technology was developed at the UI and licensed to VIDA Diagnostics by The University of Iowa Research Foundation (UIRF)
- The company is located at The University of Io In Io

VIDA Diagnostics