



Overview and Summary of Recent Initiatives

In 2004, the Iowa Department of Economic Development (IDED) commissioned the development of a strategy for growing the state's bioscience economy. *Bioscience Pathways for Development* proposed the following four strategies:

- Building Iowa's bioscience research capacity around selected technology platforms focusing on investments in talent, facilities and equipment
- Encouraging and facilitating the commercialization of bioscience research and development (R&D) to enhance opportunities for start-up, emerging, and existing Iowa firms
- Fostering a business environment that supports, sustains, and encourages the growth and sustainability of bioscience firms in Iowa
- Investing in and branding Iowa's bioscience talent pool.

IDED has created an advisory committee, the **Biosciences Alliance of Iowa (BAI)**, to oversee implementation of the strategy and to advise the department on investments in key bioscience areas. BAI members represent the state's universities and colleges, bioscience companies, the agricultural community, local economic development, and government. A proposal has been made to create a statewide commercialization entity that would be funded at the level of approximately \$3 million. A separate \$5 million seed fund that would be managed by the commercialization entity is also under consideration.

Funding to implement the actions proposed in the strategy is coming, in part, from the Grow Iowa Values Fund, which was created in 2005. (Legislation was initially passed in 2003, but legislation had to be passed in 2005 to re-establish the fund after a legal challenge.) The Grow Iowa Values Fund will provide \$500 million over a 10-year period to support technology-based economic development and other economic development initiatives. The fund is being tapped to make investments in building the state's R&D base and in creating an infrastructure to ensure that university research discoveries make it into the market, leading to new firm formation and high-wage jobs for Iowa citizens. In addition to the biosciences, Iowa has developed strategies for growing its advanced manufacturing and information technology sectors.

Building Bioscience R&D Capacity

The Iowa Board of Regents has requested \$20 million in 2006 and a total of \$50 million over the next 3 years to fund research infrastructure, including facilities, faculty, and commercialization activities. The Governor has included this amount in his FY 2007 budget request.

Recent state investments in facilities

The BAI has invested in the following projects:

The creation of a **Human Nutrition Wellness Center at Iowa State University (ISU)** will allow existing Iowa companies, commodity groups, and university researchers the opportunity to collaborate on projects to evaluate foods and nutritional supplements on human health. All three Regent institutions will collaborate in the research conducted by the center.

A new **High-Throughput Animal Model Facility at the University of Iowa (UI)** will provide both large- and small-animal researchers at UI and ISU the opportunity to create and characterize animal models of human diseases. This facility will provide companies with cost-effective disease-related animal research.

The third investment by BAI is in equipment for the **UI proteomics capabilities**. A noted leader in the field, the UI has an opportunity to bring new companies to Iowa based on a U.S. Department of Defense contract requiring the research made possible only through the purchase of needed equipment and supporting software.

Research programs

Another project approved for funding, in conjunction with BIOWA and Genencor International, is a **feasibility study on the launching of a corn-based biorefinery** in Iowa. (BIOWA is a nonprofit organization that facilitates collaboration between agricultural producers, scientists, entrepreneurs, and government that leads to the production and manufacturing of bio-based products in Iowa that satisfy market demands.) The objective of this project is to build the nation's first fully integrated, corn-based biorefinery in Iowa. Such a biorefinery will turn corn starch, corn fiber, distillers dried grains, and corn stover into ethanol and other bio-based products.

Encouraging Academic/Industrial Interaction

The **Center for Biocatalysis and Bioprocessing (CBB)** at UI supports biotechnology-related academic and industrial research development, training, and technology transfer. State-of-the-art, pilot-scale facilities provide fermentation purification services to companies on a global basis. Recently, the State of Iowa awarded the CBB \$3 million for construction of a cGMP facility to ferment and purify materials suitable for Phase I/Phase II clinical trials. This new operation compliments the existing GLP Fermentation/Bioprocessing laboratories. The CBB is actively working with more than 50 clients to help reshape the agricultural, chemical, nutritional, and pharmaceutical industries by combining the intellectual talents of top scientific faculty with the practical delivery of new technologies. Approximately 60 faculty members and 300 researchers, representing eight university departments, work with the CBB.

The **Division of Pharmaceutical Service** is part of UI's College of Pharmacy. This FDA-approved pharmaceutical manufacturing facility maintains cGMP operations and offers a wide range of services, from the manufacturing of sterile injectables to solids manufacturing and dosage formulation.

The **Center for Advanced Drug Development (CADD)** at UI works with industry by performing a wide range of assays to obtain data for preapproved active pharmaceutical ingredients, new molecular entities, drug products, and excipients. Stability testing is conducted according to client-approved protocols and International Conference for Harmonisation guidelines. Stability studies are performed for active ingredients, early development formulations, and clinical trial materials.

ISU's **Plant Sciences Institute** comprises research centers encouraging academic/industrial interaction. The institute receives \$5 million annually through the general university appropriation. The centers that comprise the Plant Sciences Institute include the following:

- Center for Bioinformatics and Biological Statistics
- Center for Plant Genomics
- Center for Plant Transformation and Gene Expression
- Center for Plant Breeding
- Center for Designer Crops
- Center for Plant Responses to Environmental Stresses
- Center for Designing Foods to Improve Nutrition
- Seed Science Center.

The **Center for Crops Utilization Research (CCUR)** at ISU has made pilot plants available to industry to test new products and processes. Services include equipment rental, technical assistance with equipment usage, cooperative research contracts, and proprietary agreements. Equipment rental and support staff payment can take a number of forms, including equipment donation and in-kind services. Firms have contracted with CCUR for technical services that include grain quality analysis, starch and protein separation and analysis, oil extraction, spray or tray drying, centrifugation, extrusion, test kitchen food preparation, sensory analysis, and a host of related activities.

The **Iowa Biologics Facility** at ISU will be a dedicated manufacturing facility for non-animal-sourced proteins suitable for clinical trials or industrial applications. The facility will have tissue processing, extraction, and separate purification suites. In addition, there will be support facilities including a quality control laboratory. GLP and GMP certifications are planned. The facility will break ground in summer 2006.

The **Ag-Based Industrial Lubricants (ABIL) Research Program** at the University of Northern Iowa (UNI) works with industrial clients throughout the state providing testing services for developers and users of bio-based lubricants. Specifically, the program brings together research and testing to identify soybean oil characteristics and match them to appropriate industrial uses. ABIL develops soy products, like grease and hydraulic fluids, and works to commercialize technology through the introduction of these new products into the marketplace.

Moving Technology into the Marketplace

Commercializing university technology

The Grow Iowa Values Fund is providing \$5 million to the three universities under the control of the Board of Regents to expand infrastructure in the areas of technology commercialization, entrepreneurship, and business development. In FY 2006, UI and ISU will receive \$1.9 million and UNI will receive \$950,000. These funds will be used to support the following activities:

- ISU has created a grant program to provide funding for proof-of-concept activities. The fund, capitalized with \$825,000 this year, will make awards in the range of \$25,000 to \$200,000. Projects are expected to be completed in 12 to 18 months and require a 1:1 match, which can be cash or in-kind contributions. In February, ISU announced its first nine awards. ISU will use \$600,000 of its funds to strengthen its existing commercialization infrastructure, which includes the John Pappajohn Entrepreneurial Center (JPEC), the ISU Research Park, and the Institute for Physical Research and Technology. ISU will use its remaining funds to support projects to develop new products and new companies.
- UI will use \$1.4 million of its funding to support competitively selected commercialization projects based on the university's or partnership companies' IP. The remaining funds will be used to promote entrepreneurship and build new networks among people with technical, financial, and business expertise.
- UNI will use its funds to support its technology transfer and business incubation efforts; continue support for the MyEntreNet program (a rural accelerator program); provide market research for Iowa companies; build the capacity of regional economic development organizations; and expand the technical capabilities and staff resources of the National Ag-Based Lubricants (NALC), a national leader in the development of bio-based lubricants.

Technology Commercialization Acceleration (TCA) was originally established by IDED and ISU to focus on commercializing university technology. This program is continuing through the ongoing efforts of ISU. TCA's goal is to increase technology transfer and to help entrepreneurial business projects that will lead to the creation and growth of start-up companies. As part of its role, ISU assists with the testing, marketing, and development of commercially viable products. TCA is administered by the **Institute for Physical Research and Technology**, which helps Iowa companies solve technical problems, create new products, increase productivity and quality, and launch start-up companies.

The **University-Based Research Utilization Program** has been established by IDED to encourage the utilization of university-based research in new or existing businesses. Under the program, a business that utilizes a technology developed and patented after July 1, 2003, by an employee at one of the state's three public research universities may apply for a tax credit. If approved, the business as well as the university employee responsible for the development of the technology is eligible for a tax credit. For the business, the value of the tax credit is equal to 30 percent of its tax liability, with the total value not to exceed \$225,000 in 1 year and \$600,000 over 5 years. For the university employee, the value of the tax credit is equal to 10 percent of the tax liability of the business, with the total value not to exceed \$75,000 in 1 year and \$200,000 over 5 years. Ten million dollars in tax credits are available annually.

Supporting bioscience entrepreneurs and emerging companies

The **John Pappajohn Entrepreneurship Centers** seek both to encourage entrepreneurship and to provide support to entrepreneurs and start-up companies. The JPECs are located at Drake University in Des Moines, at ISU in Ames, at Northern Iowa Area Community College in Mason City, at UNI in Cedar Falls, and at UI in Iowa City. Each center offers entrepreneurial educational programs and provides business assistance services.

In 2005, Iowa initiated a program to provide state support to a network of accelerators, three of which are operational and four of which are funded but have not begun operations. The accelerators are expected to propel Iowa's entrepreneurial efforts into successful businesses by leveraging the expertise of experienced professionals. The three operational accelerators are the **Economic Development Council** in Cedar Rapids, **NewVentures** in Davenport, and one operated by the **Northern Iowa Area Community College** in Mason City. The accelerators are nonprofit corporations and can take equity in companies and/or charge management fees to cover some of the cost of the services they provide.

The BAI also supports entrepreneurs and start-ups. For example, BAI has provided funding for a project to aid in **tracking animal movement** across the country, a topic that has taken on national significance for both economic and biosecurity reasons. The BAI, with assistance from the Iowa Veterinary Medical Association and ISU, is funding research necessary for a small Iowa company to develop the software programs and interactive equipment necessary to enhance their current product line and capture this new market.

Making Capital Available

Pre-seed and seed capital

IDED administers the **Entrepreneurial Ventures Assistance (EVA) Program**, which provides financial and technical assistance to early-stage technology companies. The program provides technical assistance and financing to entrepreneurs for start-up and early-stage companies and existing companies that are developing a new product or new technology. The EVA Program encourages the development of entrepreneurial venture planning and managerial skills in conjunction with the delivery of a financial assistance program for business start-ups and expansions. EVA funds may be used to finance up to 50 percent of the total project costs, not to exceed \$250,000 maximum. Bioscience businesses are a prime example of this.

Also authorized in 2002 are several tax credits designed to encourage investment in entrepreneurial start-up companies. Individuals who invest directly in a qualified business or in a community-based seed capital fund are eligible for a tax credit equal to 20 percent of his or her investment. Investors are limited to five credits per year, and the maximum amount of one investment cannot exceed \$50,000. For companies to qualify, they must have (1) operations in Iowa; (2) been in business for 6 years or less; (3) successfully completed an entrepreneurial training program, such as those offered by the JPECs, or demonstrated experience, training, or education; (4) not exceeded \$10 million in net worth; and (5) secured, within 24 months, total equity or near equity of \$250,000. Taxpayers who invest in venture capital funds can receive a credit equal to 6 percent of the individual's equity investment.

The **Value-Added Agricultural Products and Processes Financial Assistance Program** seeks to increase the innovative utilization of Iowa's agricultural commodities. It accomplishes this by investing in the development of new agricultural products and new processing technologies. Many of its projects are based on commercialization of biotechnology-based products.

Venture capital

In 2002, the Iowa Legislature enacted legislation creating a **Fund of Funds** that includes a provision for continent tax credits of up to \$100 million to be available to investors if their investment fails to achieve a designated ROI. The Fund of Funds will invest in privately managed venture capital funds that agree to have a physical presence in Iowa and commit to making a good faith effort to find and make equity investments in Iowa businesses.

In June 2005, the Fund of Funds received its first commitment through a \$10 million revolving loan fund provided by West Bank of West Des Moines to provide working and investment capital to the Fund of Funds program. Wells Fargo of Des Moines has committed to financing an additional \$5 million to support the investment program. The Fund of Funds plans to raise \$95 million and to invest \$2 million to \$5 million in as many as 15 funds over the life of the Fund.

To date the Fund of Funds has invested in funds managed by the following:

- Prolog Ventures, an early-stage venture-capital firm focused on life science investments that is based out of St. Louis
- Richland Ventures, based out of Nashville, Tennessee, that provides expansion capital for healthcare service companies, medical devices and technology, and other diversified service companies
- Tonka Bay Equity Partners, based out of Minnetonka, Minnesota, that provides capital to small and medium-sized businesses for growth, acquisition, and management buyouts.

The Fund of Funds will seek to invest in funds focused on areas of technology of interest to Iowa such as alternative energy and agbiotechnology and will include in its portfolio funds that invest at varying levels, including at least one fund that would invest at the \$250,000 to \$500,000 level.

To facilitate private investment in the Fund of Funds and minimize the need for public appropriations, the Legislature authorized the issuance of contingent tax credits to guarantee, at least partially, investments in the Fund of Funds. Redemption of the tax credits will be contingent on certain criteria developed by the Iowa Capital Investment Board and is limited to \$100 million in the aggregate and \$20 million in any fiscal year. The tax credits are transferable, but can be used as a credit against taxes owing to the State of Iowa only if the investor does not receive the specific return on its investment, to the extent of the guarantee. If not depleted, the tax credits may be carried forward for a maximum of 7 years after the date of maturity of the investment.

The **Iowa Agricultural Finance Corporation (IAFC)** is a farmer-owned investor in Iowa-based, value-added agricultural businesses, especially ventures involving agricultural producers in ownership or other benefits of growth. IAFC was started with a \$25 million loan from the State of Iowa and created the **tecTERRA Food Capital Fund** to invest in value-added processing and biotechnology businesses.

Providing Space for Bioscience Companies

Incubators

Three incubators affiliated with ISU service biotechnology companies:

- The **Iowa State Innovation System** is a technology incubator operated by the ISU Research Park. In affiliation with the incubator, a multitenant building has been constructed that houses an 8,000-square-foot wet-lab incubator facility.
- The **Roy J. Carver Co-Laboratory Business Incubator**, affiliated with the Plant Science Institute, is a new, 45,000-square-foot, \$13 million center for biotechnological research. Housed within the facility is 1,600 square feet of business incubator space.
- The **CCUR** assists small businesses through its small business incubator program. Resident businesses are accommodated as space becomes available for relatively short periods (up to 2 years) to network with faculty and access expertise and other services.

The **Technology Innovation Center (TIC)**, the UI business incubator, fosters the development of new business ventures that make use of advanced technology. The Technology Innovation Center is located on the 500-acre UI Oakdale Campus in Coralville, about 10 minutes from the main campus in Iowa City. The center occupies much of the 20,000-square-foot TIC building, and office and laboratory space in other buildings.

NewVentures Initiative is an 18,000-square-foot incubator located in Davenport. The facility includes Class A office space as well as areas that can be built out to meet laboratory needs. NewVentures, a nonprofit organization that manages the incubator, provides a comprehensive array of commercialization services to entrepreneurs and start-up companies.

Under development

The **Cedar Valley TechWorks** project is a plan to reuse the buildings and land that John Deere has donated as part of its \$127 million redevelopment of the Waterloo Works manufacturing facilities. The TechWorks project is expected to include four programs, including a BioProducts Merchandise Mart, a TechWorks Manufacturing Mall, a TechWorks Education Center, and an Ag-Tourism Exhibit Center. The TechWorks Manufacturing Mall will focus on facilitating the commercialization of new products and the development of new businesses. The program will include a bio-based incubator and commercialization center.

Facilities financing

A portion of the **Iowa Values Fund** has been dedicated to direct business development and assistance financing. Specifically, \$220.5 million over the next 7 years has been allocated for funding to be utilized for current and new programs administered by IDED, with a focus on business start-ups, expansions, modernization, attraction, retention, and marketing. Some of the bioscience projects approved by the Board include Trans Ova Genetics, which was approved for a \$9 million award to create 315 jobs; Integrated DNA Technologies, which was approved for a \$5 million award to create 207 jobs; New Link Genetics, Inc., a start-up company, which was approved for a \$6 million award to create 350 jobs; and Fort Dodge Animal Health, which was approved for a \$3.5 million award to create and retain 1,041 jobs.

Bioscience research parks

Although no research parks are dedicated exclusively to the biosciences in Iowa, multipurpose research parks at the state's research universities are hosts to a wide array of biotechnology companies:

- The **Iowa State University Research Park** is a 230-acre development with more than 270,000 square feet of building space located south of the ISU campus. Established in 1987, ISU

Research Park plays a key role in the economic development activities of ISU as it relates to technology transfer, business formation, and development assistance with established technology firms. The park has been in existence for 15 years and currently hosts 42 tenant companies and university centers that employ more than 800 people.

- The **Oakdale Research Park at UI** occupies the northern one-third of the university's 500-acre Oakdale campus. The 189-acre park offers leased building sites and a private multibuilding complex, the Myriad Technology Plaza, which serves clients who prefer to lease existing office and laboratory space. Located on the campus are the University Hygienic Laboratory, Institute for Agricultural Medicine and Occupational Health, Technology Innovation Center, Obermann Center for Advanced Studies, and the CADD, as well as other university research laboratories. The complex is approximately 200,000 square feet, with more than 20,000 square feet of wet-lab space.

Addressing Talent Needs

Specialized postsecondary programs

Iowa Bioprocessing Training Center and Fermentation Facility is a state-of-the-art educational facility operated by Indian Hills Community College and designed specifically to serve the bioprocessing industries of Iowa. . Indian Hills Community College, through its **Iowa BioDevelopment Center**, operates training courses on ethanol fermentation, bio-diesel, genetic engineering and fermentation, and advanced fermentation. New graduate-credit courses available the summer of 2006 in cooperation with Morningside College will include Forensics, Genetic Engineering, Biotechnology and Bioethics, Renewable Fuels, and Fermentation. Special features of the center include a large, dividable, multipurpose classroom/meeting room; separate training laboratories for bioprocess technology and process control; and a fermentation pilot plant. The fermentation pilot plant provides companies access to equipment for developing or scaling up new products, on-site expertise, and personnel for consultation.

AgrowKnowledge, the National Center for Agriscience and Technology Education, is funded by the National Science Foundation and headquartered at **Kirkwood Community College**. The goal of the center is to strengthen the nation's agriculture technology curriculum and instruction by working with business, industry, education, government, and professional associations to improve the math, science, and technical competencies of agriculture technology students across the country.

K-12 outreach programs

The following education providers are working to enhance K-12 science education:

The **Iowa State University Office of Biotechnology** has been assisting K-12 educators since 1988. Opportunities to update biotechnology content and laboratory skills are offered through summer training courses. Teachers who attend one or more courses are supported by free equipment and supplies.

In 2005, **Heartland Area 11 Education Agency**, in cooperation with several life science companies, developed an 800-square-foot mobile laboratory. This expandable unit is equipped with state-of-the-art laboratory equipment and modern-day experiments. Science teachers must be certified in the use of the laboratory and curriculum before the mobile laboratory is scheduled into their respective school districts.

Contacts

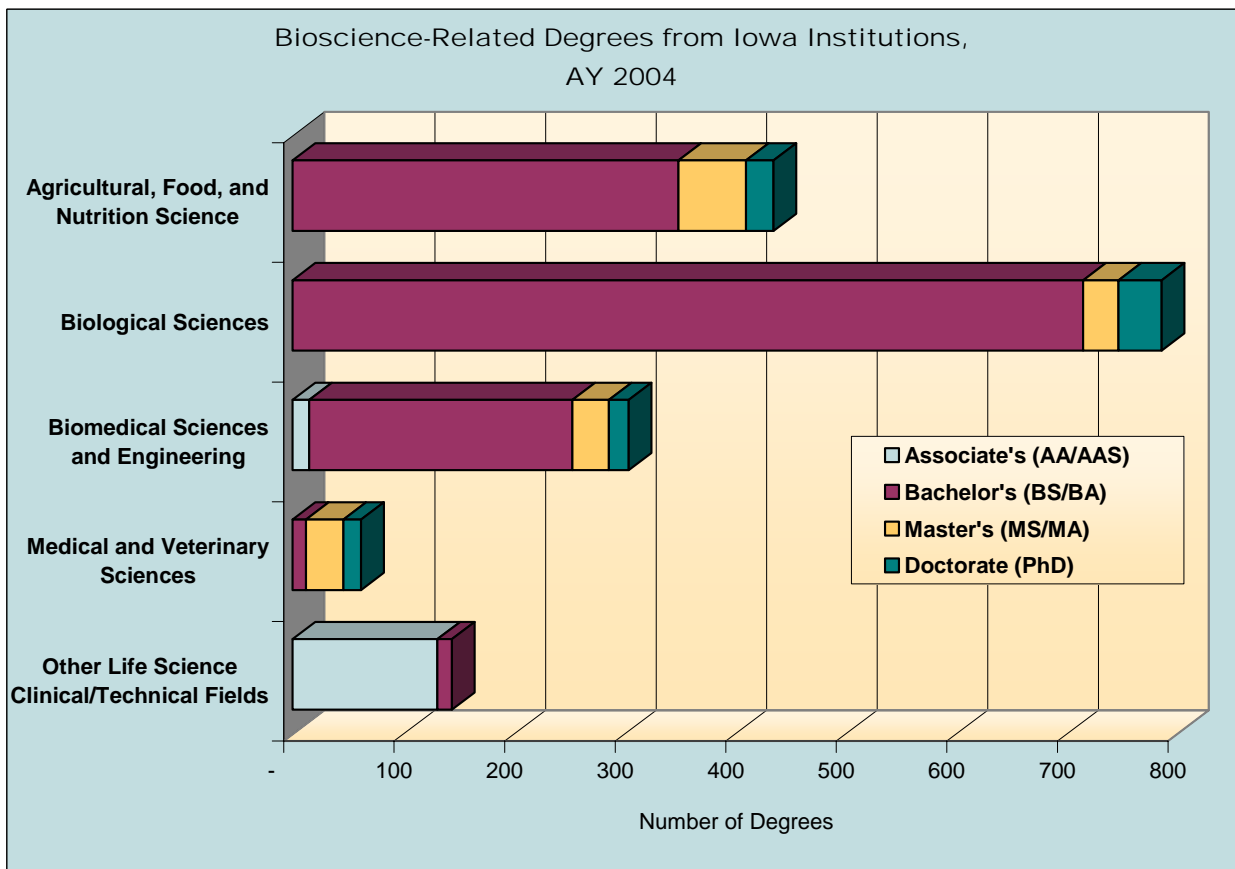
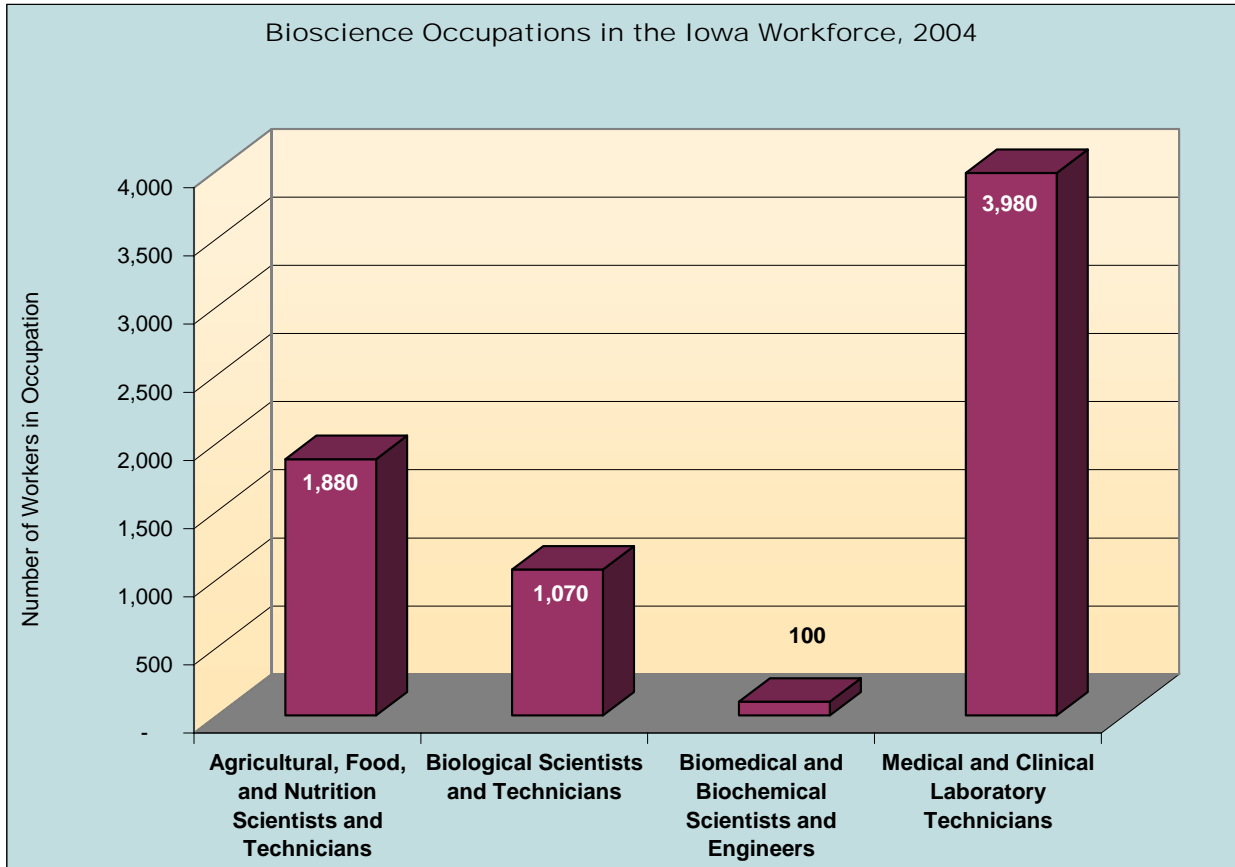
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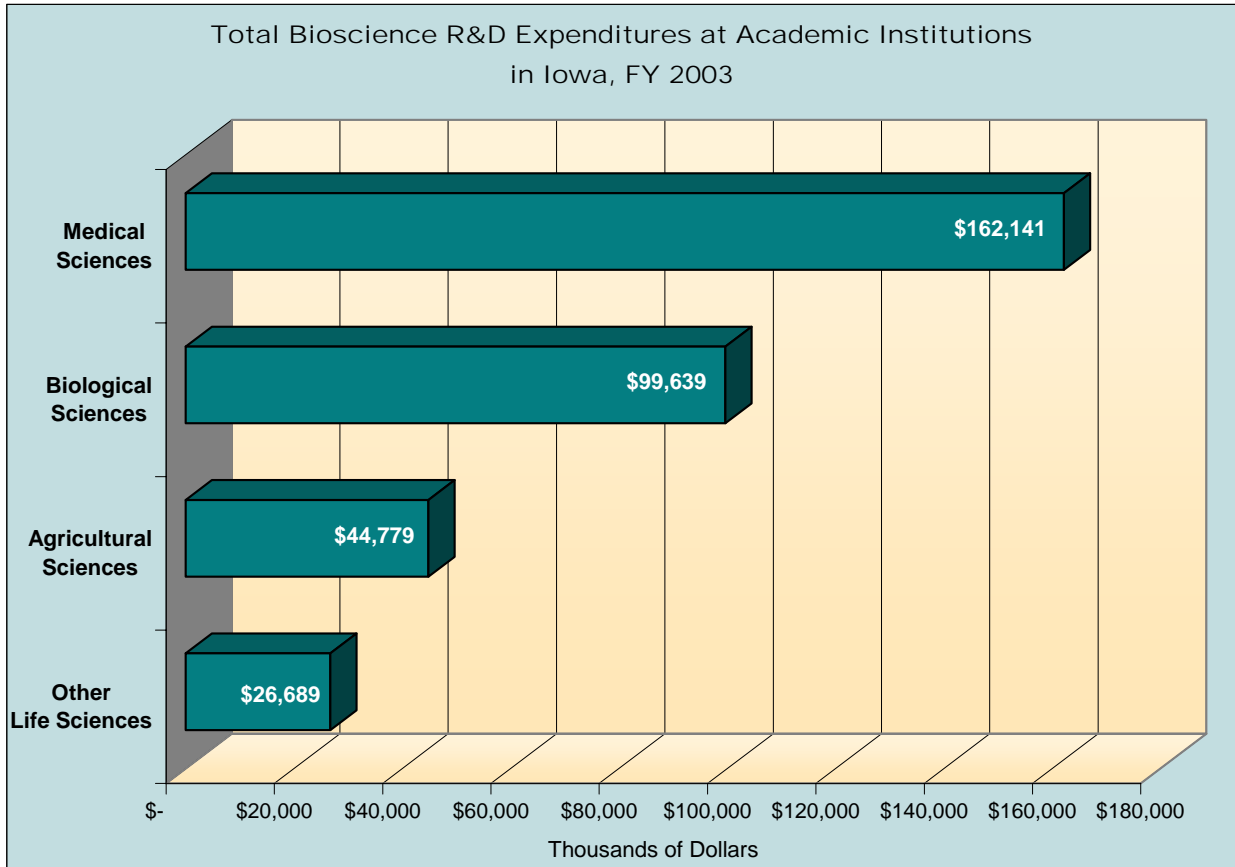
The Iowa Biotechnology Association (IBA) was formed in 1994 to advance opportunities in Iowa for the improvement of the human environmental and economic well-being through the development and application of value-added technologies in the life sciences.

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Industry Subsector	Iowa	United States
Agricultural Feedstock & Chemicals		
Establishments 2004	97	2,111
2001-2004 Establishment % Change	-3.4%	0.4%
Employment 2004	5,744	104,893
2001-2004 Employment % Change	-0.4%	-6.9%
Share of U.S. Employment	5.5%	100.0%
Location Quotient	5.01	n.a.
Average Annual Wage 2004	\$57,380	\$63,383
Direct-Effect Employment Multiplier	7.51	10.91
Total Employment Impact	43,133	1,212,094
Drugs & Pharmaceuticals		
Establishments 2004	41	2,589
2001-2004 Establishment % Change	-2.4%	-0.6%
Employment 2004	2,589	313,207
2001-2004 Employment % Change	8.1%	2.7%
Share of U.S. Employment	0.8%	100.0%
Location Quotient	0.76	n.a.
Average Annual Wage 2004	\$48,417	\$79,303
Direct-Effect Employment Multiplier	3.73	9.51
Total Employment Impact	9,669	2,731,321
Medical Devices & Equipment		
Establishments 2004	142	15,190
2001-2004 Establishment % Change	3.3%	0.2%
Employment 2004	1,853	411,460
2001-2004 Employment % Change	-3.7%	-3.6%
Share of U.S. Employment	0.5%	100.0%
Location Quotient	0.41	n.a.
Average Annual Wage 2004	\$34,068	\$56,449
Direct-Effect Employment Multiplier	2.05	4.56
Total Employment Impact	3,797	1,817,705
Research, Testing, & Medical Laboratories		
Establishments 2004	186	20,565
2001-2004 Establishment % Change	11.7%	19.4%
Employment 2004	1,870	413,550
2001-2004 Employment % Change	34.5%	8.2%
Share of U.S. Employment	0.5%	100.0%
Location Quotient	0.41	n.a.
Average Annual Wage 2004	\$46,848	\$65,414
Direct-Effect Employment Multiplier	1.95	3.15
Total Employment Impact	3,643	1,272,936
TOTAL PRIVATE SECTOR		
Establishments 2004	86,041	8,156,137
2001-2004 Establishment % Change	0.8%	4.8%
Employment 2004	1,194,950	109,249,195
2001-2004 Employment % Change	-0.6%	-0.7%
Share of U.S. Employment	1.1%	100.0%
Location Quotient	n.a.	n.a.
Average Annual Wage 2004	\$31,670	\$39,003

Source: Battelle calculations -- based on Bureau of Labor Statistics QCEW data from the Minnesota Implan Group, RIMS II Employment Multipliers from the Bureau of Economic Analysis, and the Census Bureau's Economic Census.
 Note: n.a. = metric is not applicable.





	Iowa	United States	Rank
University R&D Expenditures, FY 2003			
Total (\$ thousands)	\$498,669	\$40,104,621	26
Life Science R&D (\$ thousands)	\$334,640	\$24,062,088	25
Percent of Total R&D	67.1%	60.0%	
Life Sciences Per Capita	\$113.67	\$82.74	
Change in Life Sciences FY 1999–2003	39.9%	52.7%	
NIH Support to Institutions, FY 2004			
Total (\$ thousands)	\$196,495	\$22,556,459	26
Per Capita Expenditures	\$66.74	\$77.56	
Change in Expenditures FY 2000–2004	44.1%	53.2%	
Higher Education Degrees in Bioscience Fields, AY 2004	1,731	111,329	24
Bioscience Occupations in the Workforce, 2004	7,030	616,140	26