



# Site Selection for BIOTECH

## Healthy fatty acids from plants

Researchers at BASF Plant Science have succeeded in genetically optimizing canola (oil seed rape) plants to make them capable of producing unsaturated omega-3 fatty acids. These fatty acids have a positive effect on human health because they lower the risk of stroke and cardiovascular disease.

PRESS PHOTO BASF

By James H. Renzas

# NOLOGY Companies

**In 1919, the term “Biotechnology”** was created to describe the interaction of biology with human technology. Today, the term is broadly applied to an industry that uses knowledge of organisms and biological systems, and the ability to manipulate those systems at the molecular level, to create, develop and market new techniques and products. The Life Sciences sector is divided into a number of distinct industry sub-groups which encompass products that fall into the following categories:

| Sector                                    | Example  |
|---|--|
| Health Care                               | Drugs, Vaccines, Devices, Diagnostics  |
| Ag Biotech                                | Genetically Modified Organisms and Food Safety                               |
| Industrial and Environmental Applications | Biofuels and Biomaterials  |
| Biodefense                                | Vaccines, Biosensors   |
| Research Tools                            | DNA Fingerprinting, Bioinformatics, Microarray Technology and Nanotechnology |

*(Continued on page 32)*



**Better, healthier crops**

Soybean seedlings are being prepared for genetic transformation using an agrobacterium-mediated transformation method. For this, one seed leaf, a so-called cotyledon, and the first expanding leaves are removed to expose the cells intended for DNA delivery. The explants are immersed in a solution containing agrobacterium, a common soil bacterium that has developed the ability to cleanly transfer genetic material into plants. This process is one way to introduce favorable traits such as disease resistance into soybean. PRESS PHOTO BASF

According to the Biotechnology Industry Association, the United States is home to 1,473 biotechnology companies, of which 344 are publicly traded. Biotechnology revolutionized drug design and development by using specific scientific knowledge about living organisms, including genetic information that guides development and function.

Prior to the creation of biotechnology, pharmaceutical companies produced drugs and vaccines without the genetic and molecular information that is available today. Since many pharmaceutical companies now apply the same techniques utilized by biotechnology compa-

nies, the term “Life Science” is used to describe both industries.

The biotechnology industry touches all aspects of our lives and can be divided into several sectors on techniques and products. According to the National Biotechnology Advisory Committee, the Life Sciences industry can be divided into six segments of biotechnology and biomedical manufacturing:

**1. Agricultural Biotech Sector**

For thousands of years, farmers have used “selective breeding” to enhance preferred traits in animals and plants. Now, genetically modified organisms (GMOs) are created through the introduction of desired traits via genetic engineering. Desired traits may include increased nutritional value, faster growth, higher yields, and disease and pest resistance. Plants and animals may also be modified to produce human therapeutics.

**2. Industrial Biotechnology Sector**

This sector uses living organisms to manufacture a variety of products that result in the reduction of pollution, resource consumption and waste. Silk worms have been engineered to produce human collagen. Products include bioethanol, industrial enzymes, biological fuel cells, enzymes for bioremediation, biodegradable plastics and much more. Wood pulp is the by-product of paper production. Conventional methods of reducing the pulp use heat and chemicals. The use of fungi to break down the wood cellulose could result in an energy savings of 30 percent and a cleaner environment.

**3. Medical Devices**

Devices include pacemakers, cochlear implants, catheters, contact lenses, prostheses, hearing aids and more. Biosensors translate biological variables such as movement, chemical concentrations, etc. into electrical signals. These devices

can be miniaturized and used to internally monitor biological systems. Diagnostics include a variety of testing equipment and techniques, including micro arrays and test kits (HIV, pregnancy, drugs and genetic). Genetic testing aids in the early diagnosis of disease and possible prevention.

#### 4. Medical Equipment and Supplies

This industry is made up of establishments which are primarily engaged in manufacturing medical equipment and supplies, including grinding eyeglasses and hard contact lenses to prescription, on a factory basis.

These establishments produce products such as laboratory balances, hypodermic needles and syringes, bandages and dressings, lab furnaces, blood transfusion equipment, lab furniture, catheters, contact lenses, dental chairs, medical and related instruments, orthopedic devices, dental furniture, prosthetic devices, safety appliances and equipment, gut sutures, sunglasses, hospital furniture and wheelchairs.

#### 5. Pharmaceuticals and Related Manufacturing

There are currently 198 FDA-approved vaccines and drugs on the market and more than 390 in clinical trials. Pharmaceuticals include prescription, generic and over-the-counter drugs. Biologics are classified by the FDA as “products derived from living sources” as opposed to

a chemical process. Biological products include bacterial and viral vaccines, human blood products, skin grown for burn victims, and gene therapy.

#### 6. Research Services

Research tools support discovery and development of technologies used in biotechnology endeavors. Tools such as gel electrophoresis, thermocyclers, DNA and protein sequencers, and microarrays have revolutionized the industry. Research tools may also include the production of media to support cell growth, plasmids for use in genetic engineering, and the synthesis of DNA and protein molecules.

#### Industry Trends

According to the Tufts Center for the Study of Drug Development (SCDD), the estimated cost, on average, of developing and winning market approval for a new drug in the United States is currently over \$800 million. Discovery and pre-clinical trials take anywhere from one to four years of work and costs up to \$200 million, before Phase I trials begin. Once a product survives to Phase I, it can cost up to \$500 million before products are proven on animal and human patients and take six to eight years. Finally, FDA approval and post-market testing can run the average cost of bringing a new product to market to over \$800 million and 14 to 16 years post inception.

Few investors can withstand this type

of financial risk given the global credit crisis precipitated by the meltdown of capital markets on September 15, 2008. Consequently, many companies in the biotechnology industry are in a desperate shortage of cash to complete promising clinical trials, which would result in the introduction of significant new drugs which would benefit all of mankind. Because of the time required to bring a new human treatment to the marketplace, in addition to the capital crisis, there has been a significant shift in the research and development emphasis of many biotech firms.

Many researchers in the industry have shifted focus to the world of alternative energy, with algae research being one of the most promising sources of renewable fuels generation. Recently, for example, ExxonMobil announced that it will enter an agreement with Synthetic Genomics (SGI) to research and develop next-generation biofuels from photosynthetic algae.

The companies’ “advanced biofuels” will be produced by photosynthetic algae and will, allegedly, be compatible with gasoline and diesel fuels. If the program meets the research and development milestones set, XOM will spend more than \$600 million, including \$300 million in internal costs and possibly more than \$300 million to SGI. Algae is considered a sustainable source for second-generation biofuels. These products represent a signif- (Continued on page 35)



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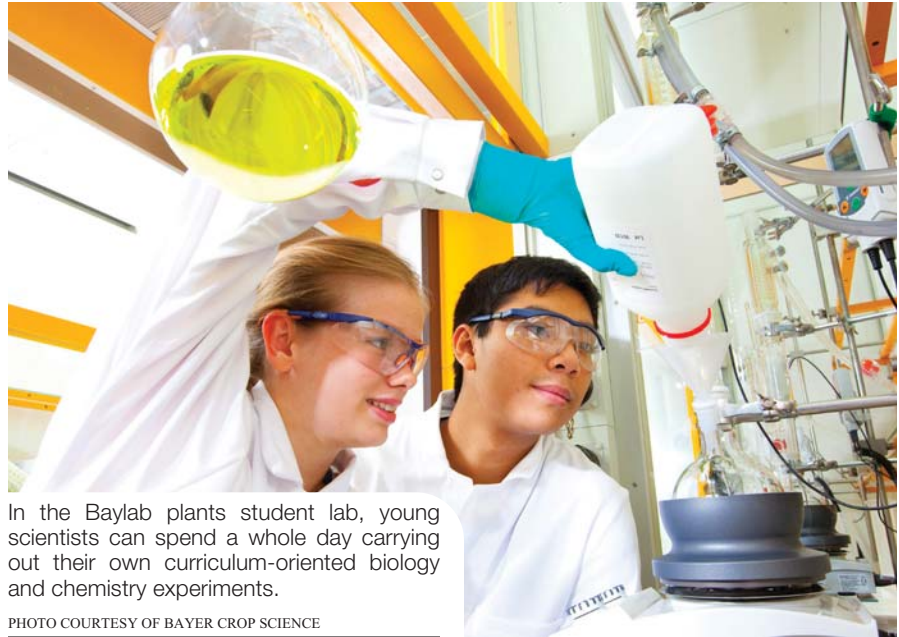
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**Medical Devices Expand**

While some segments of the biotech industry are contracting or entering new markets, the medical device industry seems to be expanding as the population continues to get older. In November 2009, one of the global leaders in heart valves and hemodynamic monitoring, Edwards Lifesciences, announced that in anticipation of future growth, the company will be developing a new state-of-the-art manufacturing facility in Draper, Utah, which will enable it to significantly expand its manufacturing and research capability. Edwards has accepted incentives from the state of Utah totalling more than \$11.5 million based on the current 228 jobs to be retained and the more than 1,000 new jobs in manufacturing, engineering and business that are expected to be created in the next 15 years. The company also accepted an incentive from the City of Draper for approximately \$3 million based on capital investments and employment rates over a seven-year period.

In Texas, Cardiovascular Systems Inc. (CSI) recently announced that it will begin manufacturing its Diamondback 360 PAD System in Pearland, Texas in a 48,000-square-foot facility. The company has accepted an offer from the Texas Enterprise Fund for up to \$7 million, with



In the Baylab plants student lab, young scientists can spend a whole day carrying out their own curriculum-oriented biology and chemistry experiments.

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\$3.5 million paid in cash upon signing of a 10-year lease for the facility in Pearland.

**Other Developments**

Bayer Crop Science recently announced an expansion of its corporate facilities in Kansas City, Missouri. The new facility will create 140 new jobs with average annual salaries of \$70,000. Many of the new positions will require workers who have degrees in science or engineering or have specialized technical expertise. Kansas City is providing an estimated \$37.2 million of the \$44.2 mil-

lion total incentive package and will issue \$200 million in Chapter 100 bonds to finance the facility, which will actually be owned by the city and leased back to the company. Bayer will have about 2/3 of normal sales and property taxes abated until the Chapter 100 bonds are repaid, which should be in 20 years. The state of Missouri is providing another \$7 million in incentives to fund employee training and provide subsidies for low interest loans.

In April, 2009 the Oregon Health & Science University's Vaccine and Gene Therapy Institute (Continued on page 36)



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signed a deal to design and build its new \$30 million laboratory in the Tradition development west of Interstate 95 in Port St. Lucie, Florida. The building is on target to be completed in May 2011, said Andrew Favata, vice president for Tradition's developer, Core Communities LLC. VGTI Florida, as the campus has been dubbed, will be built on eight acres at Core Communities' Florida Center for Innovation at Tradition, a fledgling research park that's home to another biotech outfit, the Torrey Pines Institute for Molecular Studies.

VGTI intends to use its local labs to research ailments such as cancer, HIV and West Nile Virus, said Mark Williams, interim chief operating officer at VGTI Florida. "If you're going to do research into West Nile, you have to have a facility that does not permit even a microbe to get in or out," he said. "That's the level of security that these facilities

require." VGTI plans to buy about \$10 million worth of equipment before it even builds the facility. The building will be financed separately, using tax-exempt bonds issued by Tradition's Community Development District. VGTI Florida now has six employees who are working from leased space at the Torrey Pines Institute. By June 2018, VGTI must have created at least 200 jobs in Port St. Lucie, according to its contract with the state.

### States Expand their Support of Biotechnology

Despite troubled times, there is general faith among state governments that biotechnology will survive and come out stronger. In the face of the downturn in 2008, the biotech industry continues to advance with interest in clean technologies, especially renewable energy sources accelerating. If stability can indeed return, that will be the biggest benefit to

the biotechnology industry.

There are many domestic programs geared towards helping the life sciences industry with its expansion. (See sidebar for a list of some of those programs.)

### Site Selection Methodology

Too often, executives do not evaluate all of their options prior to committing their companies to a long-term location. They fail to thoroughly explore labor market, real estate, utilities and incentives programs that can make the difference between enterprise success and failure. On the other hand, some executives allow one factor, such as incentives, to drive the entire location decision. Neither of these approaches is correct.

The best site selection approach for medical device manufacturers is to first identify the key criteria necessary for the success of the proposed facility, as well as the project's (Continued on page 38)

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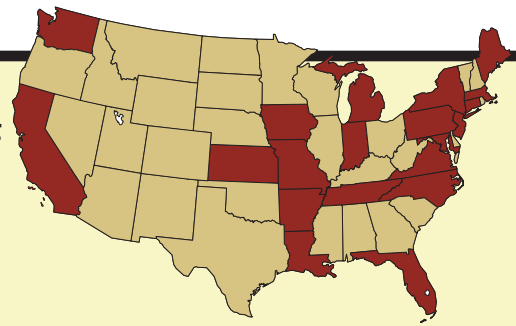
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# States Expanding their Support of **Bio**technology

Among the domestic programs geared towards helping the life sciences industry with its expansion are the following programs:

- **Arkansas** – The University of Arkansas expanded an incubator called BioVentures, funded by a federal grant, to convert Arkansas’ medical and biotechnology research into new companies.
- **California** – Extended the Net Operating Loss carry forward from 10 years to 20 years. California Institute for Regenerative Medicine has provided over \$500 million to institutions to perform stem cell research.
- **Connecticut** – Connecticut BioSeed Program, a \$5 million fund, provides seed capital to support the initial financial needs of the sciences start-up companies.
- **Florida** – Launched in early 2008, the Florida Institute for Commercialization of Public Research (FICPR), designed as a “one-stop shop” for venture capital funds and companies to consider technologies available for commercialization.
- **Illinois** – The Illinois Science + Technology Park will turn a scientific research hub to an economic engine for bioscience technologies by generating \$1.8 billion annually in state-wide economic activity.
- **Iowa** – Created a \$100 million Iowa Power Fund that will fund research on clean energies, including next generation biofuels.
- **Kansas** – Created the Kansas Bioscience Authority and a funding mechanism based on the growth of state income tax withholdings from employees of bioscience related companies.
- **Louisiana** – Committed \$102 million to create the Louisiana Cancer Research Consortium to advance cancer research and construct a new 175,000-square-foot research center.
- **Maine** – Committed \$50 million to the Maine Technology Asset Fund (a competitive fund for investment in R&D and commercialization that is open to all research entities and companies in Maine).
- **Maryland** – Unveiled a \$1.1 billion, 10-year, nine-point plan, with \$222 million in biotechnology tax credits, funding for capital projects at research institutions, and \$219 million for stem cell research.
- **Massachusetts** – Signed a \$1 billion life sciences incentives bill, including provisions for commercial tax incentives, research grants, seed money, training programs and infrastructure improvements.
- **Michigan** – Launched a return-oriented Michigan Pre-Seed Capital Fund, which by March 2008 had invested \$5 million in 22 companies.
- **Missouri** – Facilitated the creation of the \$335 million Lewis and Clark Discovery Fund which funds life sciences facilities and infrastructure.
- **New Jersey** – Awarded \$250 million for stem cell R&D facilities to house stem cell researchers.
- **New York** – Significant investments in bioscience facilities through the Centers of Excellence program, which funded the 150,000-square-foot Center of Excellence in Bioinformatics and Life Sciences.
- **North Carolina** – Committed \$5 million for a biofuels center to identify next-generation crops and processes for biodiesel and ethanol.
- **Pennsylvania** – Established the Life Science Greenhouses fund totalling \$100 million, which makes investments of between \$200,000 to \$500,000 in early-stage life sciences companies.
- **Tennessee** – Committed \$72 million over five years to the University of Tennessee Biofuels Research Initiative, which includes funding for a pilot cellulosic ethanol plant.
- **Virginia** – Created the GAP BioLife Fund which makes \$50,000 to \$100,000 equity investments in Virginia-based life sciences companies.
- **Washington** – The Life Sciences Discovery Fund makes \$350 million in grants over 10 years from tobacco settlement proceeds which funds advanced research in human health.



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8:55 AM from web

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location drivers. Some examples of location drivers include the following:<sup>1</sup>

1. Availability of highly educated/abundant pool of scientists and other skill sets
2. Venture funding availability
3. Near universities and research labs
4. Opportunity for excellent networking and collaborative opportunities within the life sciences sector
5. Opportunities for continuing education
6. Suitable industrial land and buildings and favorable construction costs
7. State and local incentives
8. Located in a growing market area
9. Reasonable taxes and regulations
10. Abundant professional cultural and recreational opportunities
11. Vigorous business community with supporting business services
12. Availability of housing at reasonable cost
13. Modern and effective school systems
14. Good social and physical environments
15. Airport service and frequency.

Once these key drivers are identified, a company is better positioned to conduct a thorough analysis of potential site locations. Oftentimes a search can encompass multiple states or countries. Each state, area and country has thousands of elements of information that could be important in the site selection process, and the sheer volume of such information can be overwhelming to the site-seeking executive. By identifying key requirements up front, it is possible to focus due diligence efforts on those factors that are most important to the success of the proposed project.

There are a variety of state and local incentives available to the biotech industry depending on the geographic location, type of operation, investment, employment, and

tax impact of the company's facilities. Such incentives include tax rebates, exemptions, moratoriums, reductions, credits, deductions, infrastructure improvements, relocation and cash grants, which can be used to offset both start-up costs as well as the cost of ongoing operations.

Total benefits provided to a company in a given region can range from a low of several thousand dollars per employee to cases in which employers have been offered incentives packages that amounted to millions of dollars per employee. Whether a company will be on the lower or higher end of this range – and whether available incentives are collected at all – will depend to a large extent on the knowledge and skill a company brings to the negotiating table. **T&ID**

<sup>1</sup> Source: The RSH Group, Survey of Southern California Bio Tech Companies, 2007

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