

# Biotechnology

## Engineering Technology

MECT 4350

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UH, COT - Center for Life Sciences Technology



# Overview

- Definition
- Applicable Fields
- Development
- Houston Region

# Bio what?

- **Bioassay**
  - Determination of the effectiveness of a compound by measuring its effect on animals, tissues or organisms in comparison with a standard preparation.
- **Bioaugmentation**
  - Increasing the activity of bacteria that break down pollutants by adding more of their kind. A technique used in bioremediation.
- **Biocatalyst**
  - In bioprocessing, an enzyme that activates or speeds up a biochemical reaction.
- **Biochemical**
  - The product of a chemical reaction in a living organism.
- **Biochip**
  - An electronic device that uses organic molecules to form a semiconductor.
- **Bioconversion**
  - Chemical restructuring of raw materials by using a biocatalyst.
- **Biodegradable**
  - Capable of being reduced to water and carbon dioxide by the action of microorganisms.
- **Bioenrichment**
  - A bioremediation strategy that involves adding nutrients or oxygen, thereby bolstering the activity of microbes as they break down pollutants.
- **Bioinformatics**
  - The science of informatics as applied to biological research. Informatics is the management and analysis of data using advanced computing techniques. Bioinformatics is particularly important as an adjunct to genomics research, because of the large amount of complex data this research generates.
- **Biolistic device**
  - A device that shoots microscopic DNA-coated particles into target cells.
- **Biological oxygen demand (BOD)**
  - The amount of oxygen used for growth by organisms in water that contains organic matter.
- **Biologic**
  - A therapeutic or prophylactic derived from a living source (human, animal or unicellular). Most biologics are complex mixtures that are not easily identified or characterized, and many are manufactured using biotechnology. Biological products often represent the cutting-edge of biomedical research and are sometimes the most effective way to prevent or treat a disease.

# And..... Bio-

- **Biologic response modifier**
  - A substance that alters the growth or functioning of a cell. Includes hormones and compounds that affect the nervous and immune systems.
- **Biomass**
  - The totality of biological matter in a given area. As commonly used in biotechnology, refers to the use of cellulose, a renewable resource, for the production of chemicals that can be used to generate energy or as alternative feedstocks for the chemical industry to reduce dependence on nonrenewable fossil fuels.
- **Biomaterials**
  - Biological molecules, such as proteins and complex sugars, used to make medical devices, including structural elements used in reconstructive surgery.
- **Bioprocess**
  - A process in which living cells, or components thereof, are used to produce a desired product.
- **Bioreactor**
  - Vessel used for bioprocessing.
- **Bioremediation**
  - The use of microorganisms to remedy environmental problems, rendering hazardous wastes non-hazardous.
- **Biosynthesis**
  - Production of a chemical by a living organism.
- **Biotechnology**
  - The use of biological processes to solve problems or make useful products.
- **Biotransformation**
  - The use of enzymes in chemical synthesis to produce chemical compounds of a desired stereochemistry.

# Biotechnology

## Definition (s):

- Biotechnology involves using biological processes to produce substances beneficial to agriculture, the environment, industry and medicine. - (Agriculture Canada)
- Using biological sciences as a tool. - (Connaught Laboratory Limited)
- The use of knowledge of biological systems to produce goods and services. - (Canadian institute of Biotechnology)
- Any technique that uses any organism to make or modify products, to improve plants or animals. - (U.S. Congress)

# Biotech Industry Examples

- Biotechnology is responsible for hundreds of **medical diagnostic tests** that keep the blood supply safe from the AIDS virus and detect other conditions early enough to be successfully treated. Home pregnancy tests are also biotechnology diagnostic products.
- Consumers already are enjoying **biotechnology foods** such as papaya, soybeans and corn. Biopesticides and other agricultural products also are being used to improve our food supply and to reduce our dependence on conventional chemical pesticides.
- **Environmental biotechnology** products make it possible to clean up hazardous waste more efficiently by harnessing pollution-eating microbes without the use of caustic chemicals.
- **Industrial biotechnology applications** have led to cleaner processes that produce less waste and use less energy and water in such industrial sectors as chemicals, pulp and paper, textiles, food, energy, and metals and minerals. For example, most laundry detergents produced in the United States contain biotechnologybased enzymes.
- **DNA fingerprinting**, a biotech process, has dramatically improved criminal investigation and forensic medicine, as well as afforded significant advances in anthropology and wildlife management.

„Biotechnology: Knowledge  
Serving Life“



**"Biotechnology: Knowledge  
Serving Life" explores the  
impact biotechnology has on our  
lives and its potential  
to help even more.**

<http://www.bio.org/news/video/greatnewfrontier.aspx>

<http://www.bio.org/>

# The College of Technology

- Center for Life Sciences Technology
  - Consortium (Employers, Ed Institutions, EDO' s, NPO' s)
  - New Baccalaureate program
  - Outreach
  - Articulation agreements w/ CC' s
  - Web-Portal
  - Certificate & Workshop programs
  - TMAC support



# The Technologies and Their Applications

- Bioprocessing Technology
- Monoclonal Antibodies
- Cell Culture
- Recombinant DNA Technology
- Cloning
- Protein Engineering
- Biosensors
- Nanobiotechnology
- Microarrays

# Bioprocessing Technology

- The oldest of the biotechnologies, bioprocessing technology, uses living cells or the molecular components of their manufacturing machinery to produce desired products. The living cells most commonly used are one-celled microorganisms, such as yeast and bacteria; the biomolecular components we use most often are enzymes, which are proteins that catalyze biochemical reactions. A form of bioprocessing, *microbial fermentation*, has been used for thousands of years—unwittingly—to brew beer, make wine, leaven bread and pickle foods.
- In the mid-1800s, when we discovered microorganisms and realized their biochemical machinery was responsible for these useful products, we greatly extended our exploitation of microbial fermentation. We now rely on the remarkably diverse manufacturing capability of naturally occurring microorganisms to provide us with products such as antibiotics, birth control pills, amino acids, vitamins, industrial solvents, pigments, pesticides and food-processing aids.
- Today, recombinant DNA technology is used, coupled with microbial fermentation, to manufacture a wide range of biobased products including human insulin, the hepatitis B vaccine, the calf enzyme used in cheese-making, biodegradable plastics, and laundry detergent enzymes. Bioprocessing technology also encompasses tissue engineering and manufacturing as well as biopharmaceutical formulation and delivery.

# Cell Culture

- Cell culture technology is the growing of cells outside of living organisms.
- **Plant Cell Culture** An essential step in creating transgenic crops, plant cell culture also provides us with an environmentally sound and economically feasible option for obtaining naturally occurring products with therapeutic value, such as the hemotherapeutic agent paclitaxel, a compound found in yew trees and marketed under the name Taxol®. Plant cell culture is also an important source of compounds used as flavors, colors and aromas by the food-processing industry.
- **Insect Cell Culture** Insect cell culture can broaden our use of biological control agents that kill insect pests without harming beneficial insects or having pesticides accumulate in the environment.
- **Mammalian Cell Culture** Livestock breeding has used mammalian cell culture as an essential tool for decades.

# Recombinant DNA Technology

- Recombinant DNA technology is viewed by many as the cornerstone of biotechnology. The term *recombinant DNA* literally means the joining or recombining of two pieces of DNA from two different species. Humans began to preferentially combine the genetic material of domesticated plants and animals thousands of years ago by selecting which individuals would reproduce. By breeding individuals with valuable genetic traits while excluding others from reproduction, we changed the genetic makeup of the plants and animals we domesticated.
- Genetic modification using recombinant DNA techniques allows us to move single genes whose functions we know from one organism to any other. In selective breeding, large sets of genes of unknown function are transferred between related organisms. By 2000 the human genome had been sequenced and today we use recombinant DNA techniques, in conjunction with molecular cloning to:
  - produce new medicines and safer vaccines.
  - treat some genetic diseases.
  - enhance biocontrol agents in agriculture.
  - increase agricultural yields and decrease production costs.
  - decrease allergy-producing characteristics of some foods.
  - improve food's nutritional value.
  - develop biodegradable plastics.
  - decrease water and air pollution.
  - slow food spoilage.
  - control viral diseases.
  - inhibit inflammation.

# Cloning

- Cloning technology allows us to generate a population of genetically identical molecules, cells, plants or animals. Because cloning technology can be used to produce molecules, cells, plants and some animals, its applications are extraordinarily broad.
- **Molecular or Gene Cloning** Molecular or gene cloning, the process of creating genetically identical DNA molecules, provides the foundation of the molecular biology revolution and is a fundamental and essential tool of biotechnology research, development and commercialization. Virtually all applications in biotechnology, from drug discovery and development to the production of transgenic crops, depend on gene cloning.
- **Animal Cloning** Animal cloning has helped us rapidly incorporate improvements into livestock herds for more than two decades and has been an important tool for scientific researchers since the 1950s.

# Protein Engineering

- Protein engineering technology is used, often in conjunction with recombinant DNA techniques, to improve existing proteins, such as enzymes, antibodies and cell receptors, and to create proteins not found in nature. These proteins may be used in drug development, food processing and industrial manufacturing.
- The most pervasive uses of protein engineering to date are applications that alter the catalytic properties of enzymes to develop ecologically sustainable industrial processes.
- Enzymes are environmentally superior to most other catalysts used in industrial manufacturing, because, as biocatalysts, they dissolve in water and work best at neutral pH and comparatively low temperatures.

# Biosensors

- Biosensor technology couples our knowledge of biology with advances in microelectronics. A biosensor is composed of a biological component, such as a cell, enzyme or antibody, linked to a tiny transducer—a device powered by one system that then supplies power (usually in another form) to a second system.
- Biosensors are detecting devices that rely on the specificity of cells and molecules to identify and measure substances at extremely low concentrations.
- Biosensors can, for example,
  - measure the nutritional value, freshness and safety of food.
  - provide emergency room physicians with bedside measures of vital blood components.
  - locate and measure environmental pollutants.
  - detect and quantify explosives, toxins and biowarfare agents.

# Nano biotechnology

- Nanotechnology, came into its own in 2000 with the birth of the National Nanotechnology Initiative, is the next step in the miniaturization path that gave us microelectronics, microchips, and microcircuits.
- The word *nanotechnology* derives from *nanometer*, which is one-thousandth of a micrometer (micron), or the approximate size of a single molecule.
- Nanotechnologists rely on the self-assembling properties of biological molecules to create nanostructures, such as lipids that spontaneously form liquid crystals.
- DNA has been used not only to build nanostructures but also as an essential component of nanomachines. Most appropriately, DNA, the information storage molecule, may serve as the basis of the next generation of computers. As microprocessors and microcircuits shrink to nanoprocessors and nanocircuits, DNA molecules mounted onto silicon chips may replace microchips with electron flow channels etched in silicon.
- Biochips exploit the properties of DNA to solve computational problems; in essence, they use DNA to do math. Scientists have shown that 1,000 DNA molecules can solve in four months computational problems that require a century for a computer to solve.



# Houston Region

- The biotechnology/life science industry in the Houston region is growing, as momentum gathers in commercializing the extraordinary life-science technologies, that have their origins in the Texas Medical Center and the region's academic and other research institutions. Within the region,
  - \$1.4 billion in annual research investment is made in the Houston region, ranking the state 4th nationally in 2004; this research spending has increased 35% since 1999.
  - Houston is home to the Texas Medical Center, the largest concentration of universities, biomedical research facilities, and health care institutions in the world; there is tremendous research infrastructure.
  - The region boasts international leadership in life-science disciplines including biodefense and infectious disease, bioinformatics, health care informatics, cardiovascular medicine, genomics, metabolic disease, oncology, and bio-nanotechnology.
  - There is an upward trend in technology commercialization. In the past five years, in the Houston region there have been:
    - More than 2,500 invention disclosures.
    - More than 2,000 patent applications.
    - More than 780 license agreements.
    - On average, nearly 20 new start ups annually.
  - Within the State, the Houston region is the top center for biotechnology research and development, and its institutions and other cluster participants increasingly work in concert:
  - Nearly 70% of all life-science research in the state of Texas occurs in the Houston region, as does the majority of life science commercialization activity.
  - Houston is home to over 60 life science companies, 12 public companies, and 4 NASDAQ Biotechnology Index companies, and the two largest IPO's in biotech history.
  - Houston has a proven record of accomplishment of private/public and public/public consortiums and alliances, such as the Gulf Coast Consortium, the Alliance for NanoHealth, NASA/JSC-University programs, collaborating with GE Healthcare in the UT Research Park, the recent expansion of programs at UTMB Galveston, and between Lexicon and TAMU College Station.

# Tanox

- **Technology Platform**

Monoclonal antibody technology uses immune-system cells that make proteins called antibodies. We have all experienced the extraordinary specificity of antibodies: Those that attack a flu virus one winter do nothing to protect us from a slightly different flu virus the next year.

- Monoclonal antibodies are biological agents that have exquisite selectivity for their disease targets, thereby offering advantages over conventional “small molecule” drugs in certain disease settings. Despite their relatively recent entry into the marketplace, monoclonal antibodies have enjoyed considerable commercial success, with more than \$8.7 billion in worldwide sales expected to be generated in 2005. Sales are likely to increase in the future, with monoclonal antibodies representing more than 20% of all biotechnology products that are currently in clinical development. In fact, total market revenue for biotech products is expected to reach \$16 billion by 2012.

Tanox is a leader in the development of monoclonal antibodies as therapeutic agents.

# Getting genes into cells

- **Viral vectors**

Currently, the preferred method for delivering genes into cells uses the natural ability of viruses to deliver genetic material to cells, like viral Trojan horses. Different viral vectors have both advantages and disadvantages related to the biology of the virus.

- One aspect of gene therapy that cries out for improvement is the delivery system: the vectors (viral and non-viral) that carry foreign genes into cells. It is clear that gene therapy will fulfill its promise only when gene-delivery systems are developed that can safely and efficiently be introduced into patients. Vectors need to be engineered that will target specific cell types, insert their genetic information into a safe site in the genome, be regulated by normal physiological signals, and be coaxed to work throughout the life of the patient.



## **Zeno Acne Treatment**

**Clinically proven portable, hand-held rechargeable medical device for at-home treatment of individual acne inflammatory pimples. Zeno is an acne clearing device. It is a hand-held, portable electronic medical device that is clinically proven to make pimples disappear fast. In fact, for treating acne pimples, it's the most scientifically advanced and effective device available without a prescription. Zeno is for people with mild to moderate inflammatory acne.**



- **Combining the latest scientific, medical and electronic technology Tyrell, Inc. is a medical technology company focused on the development of medical devices for the treatment of skin lesions. Comprised of experts from both the biological/medical and consumer products industries, Tyrell is dedicated to developing innovative and scientifically effective medical products that are designed to be used without the need for a prescription.**
- **Established in Houston, Texas in September 2002, Tyrell, Inc. is a leading pioneer in an exciting new category of home based medical devices. The company was formed to develop and market ground-breaking new products, the first of which is Zeno™, a product set to revolutionize over-the-counter treatment of acne. Utilizing proprietary ClearPoint™ Technology, this electronic medical device utilizes precisely controlled heat to destroy the bacteria that causes common acne, dramatically reducing the healing time of pimples.**

- **Cyberonics, Inc.** (NASDAQ: CYBX) was founded in 1987 to design, develop and market medical devices for the long-term treatment of epilepsy and other chronic neurological disorders using a unique therapy, vagus nerve stimulation (VNS).
- Stimulation is delivered by the VNS Therapy System, an implantable generator similar to a cardiac pacemaker. The VNS Therapy System delivers preprogrammed intermittent mild pulsed signals to the vagus nerve 24 hours a day. The Company's initial market is epilepsy, which is characterized by recurrent seizures. Epilepsy is the second most prevalent neurological disorder. The FDA approved the Cyberonics VNS Therapy System on July 16, 1997 for use as an adjunctive therapy in reducing the frequency of seizures in adults and adolescents over 12 years of age with partial onset seizures that are refractory to antiepileptic medications.
- The VNS Therapy System is also approved for sale as a treatment for epilepsy in all the member countries of the European Union, Canada, Australia and other markets. To date, more than 32,000 patients in 50 countries have been implanted with the device. These patients have accumulated in excess of 94,000 patient years of experience using this life-enhancing therapy.
- The VNS Therapy System was approved by the FDA on July 15, 2005 "as an adjunctive long-term treatment for chronic or recurrent depression for patients 18 years of age and older who are experiencing a major depressive episode and have not had an adequate response to four or more adequate antidepressant treatments." As part of FDA's approval order, Cyberonics is required to conduct a 450- patient post-market dosing study and a 1,000- patient, five-year patient outcome registry.

In 1984, Dr. Michael DeBakey and Dr. George Noon performed heart transplant surgery on NASA-Johnson Space Center (JSC) engineer David Saucier, following a severe heart attack.

According to American Heart Association statistics, 20,000-40,000 patients in the United States would benefit from a heart transplant. This vascular assist device is a miniaturized heart pump designed to provide increased blood flow (up to 10L/min) from the left ventricle of the heart throughout the body for patients in end stage heart failure.

#### **Design Advantages of the DeBakey VAD®**

**Miniaturized size and light weight** - About 1/10 the size of competitive pulsatile VAD products on the market and weighing less than four ounces, the MicroMed DeBakey VAD® measures 1" x 3".

**Reduced surgical time** - Our current experience shows surgical time to be 1½ hours, about one-half the time of implanting pulsatile devices.

**Cost** - The MicroMed DeBakey VAD® is projected to be less expensive than currently marketed pulsatile VADs, making the process more affordable to a wider group of patients.

**Simplicity of design** - The device only contains one moving part, the inducer/impeller. Third party studies project that the mechanical durability will last in excess of five years.

**Patient quality of life** - The MicroMed DeBakey VAD® is virtually silent when compared to other devices, improving patient comfort while on the device.

Additionally, the VADPAK enables patient mobility to enhance quality of life

As of June 2005, over 330 patients at 46 heart centers in seven countries have been implanted with the device.





- IDev Technologies, Inc. is an Innovator and **Developer** of next generation medical devices for use in the interventional radiology, vascular surgery, and cardiology device marketplace. IDev Technologies, Inc.'s current portfolio contains over thirty technologies exclusively licensed from the M.D. Anderson Cancer Center representing over a \$5.0 billion market opportunity.

The first tier of products launched includes:

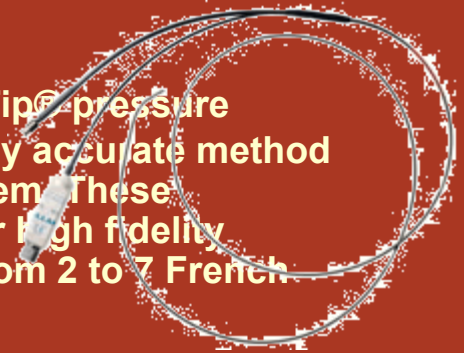
- ***AKónya Eliminator™ - Now Available in the U.S. and Internationally\**** A non-motor driven mechanical thrombectomy device intended for the declotting of synthetic dialysis grafts. The Thrombasket™ can be manipulated to accommodate various dialysis graft sizes. Axial and rotational movements provide the mechanism of action for thrombus maceration.
- ***Texan™ - Now Available in the U.S. and Internationally\**** A foreign body retrieval device intended for use in the removal of inadvertently dislodged objects from distal peripheral vessels of the cardiovascular system. The device features a variable loop design allowing for loop size adjustment within the vessel. Capture or manipulation of a foreign body is possible without having to determine the appropriately sized retrieval device prior to the procedure. The Texan™ is guidewire compatible and radiopaque for easy visualization.
- ***AKónya Eliminator Plus™ - Now Available in the U.S. and Internationally\**** A guidewire compatible, non-motor driven mechanical thrombectomy device intended for the declotting of native arterio-venous (AV) fistula and synthetic dialysis grafts. The Thrombasket™ can be manipulated to accommodate various dialysis graft sizes. Axial and rotational movements provide the mechanism of action for thrombus maceration.

# Millar Instruments, Inc.

- **Millar Pressure-Volume Systems (MPVS)- For Animal Use Only**

The Millar Pressure-Volume Systems (MPVS) simultaneously and continuously measures high-fidelity left ventricular pressure and relative volume from the intact beating hearts of small laboratory animals such as transgenic mice and rats.

- **Cardiovascular Catheters** Millar Mikro-Tip® pressure intravascular catheters provide a simple, efficient and highly accurate method of measuring pressures in the heart or cardiovascular system. These reusable, thromboresistant Mikro-Tip catheters are ideal for high fidelity pressure measurement. Standard catheters range in size from 2 to 7 French and in length up to 140 cm.



- **Urodynamic Catheters** Millar Instruments manufactures a

complete line of solid-state pressure transducer catheters for use in urodynamic testing procedures. Millar catheters are used in a variety of studies such as cystometry (CMG), urethral/bladder pressure measurements, urethral pressure profiles (UPP), pressure/uroflowmetry and gynecological urodynamics. Millar Mikro-Tip® catheters are compatible with virtually all urodynamic systems on the market today.





# Fairway is an integrated medical device development and manufacturing company

## TECHNOLOGIES IN DEVELOPMENT

- **LOIS™ Laser Opto-acoustic Imaging System** - is a platform technology for cancer imaging which, in its breast cancer application it is a superior form of mammography that provides the radiologist with important new diagnostic information. LOIS™ will remove the necessity for a substantial portion of the surgical biopsies performed to detect breast cancer, 80% of which are negative. When biopsies are called for, guidance by LOIS™ will make needle biopsies, which are less invasive than surgical biopsies, highly effective at isolating potentially dangerous tissue. Optoacoustic imaging also promises to be useful for guiding of biopsies to prove or disprove the presence of cancer in the prostate.
- The **VariTrac™ coronary artery atherectomy and stent system** - this technology will potentially provide the next generation in rotational atherectomy products which will provide superior efficiencies in treating difficult coronary artery lesions without requiring bypass surgery. The core of the technology is a compelling tip design which combines adjustable size while it is in the patient and superior flexibility, which improves navigation.
- The **SureCall™ Labor Monitor** - detects changes in the electrical signals in the uterus to identify the onset of true labor. Compared to the currently used Tocodynamometer technology, the **SureCall™** is more conclusive, more convenient for the clinicians and more comfortable for the patient. In addition, the technology involved will allow significant miniaturization of the device, making it particularly suitable for home monitoring.
- The **SureTouch™ Collascope** - uses well-understood fiber optic technology to accurately measure the condition (softening or "ripening"), and therefore the proper function, of the cervix. This information is critical to the management of both routine and premature labor.

# Tympany



The Otogram™ uses artificial intelligence, touch-screen technology, and proprietary hearing testing equipment to allow patients to self-administer the hearing test, after brief instructions from an administrator. The Ambient Noise Management System™, combined with specialized foam ear inserts, allows testing in any quiet examination room, without the need for a sound booth. The test can be conducted in multiple languages, including English, Spanish, Italian, Portuguese, Russian, Mandarin, Cantonese, Vietnamese, and Korean. Upon completion of the test, the patient's results are printed in a standardized, easy-to-read report and can be integrated with electronic medical records and NOAH v.3. Diagnostic interpretative software makes it easy to assess whether a patient's hearing loss is conductive, sensorineural, or mixed.

## What is the Otogram™?

The Otogram™ is a revolutionary hearing testing device that completely automates the hearing testing process and allows hearing testing to be completed accurately in any quiet room.



## What does it do?

The Otogram™ allows patients to conduct automated, self-administered, diagnostic and comprehensive hearing tests.

## Why is it needed?

The Otogram™ is the only product that meets the changing needs of the hearing health market.

The Breast Cancer NAFTest is Power3 Medical's initial breast cancer product developed in collaboration with a major research institute in Houston, Texas. The test utilizes fluids from the breast called nipple aspirates to identify groups of breast cancer proteins. The collection of the nipple aspirate fluid is a non-invasive procedure utilizing a modified breast pump to obtain a drop of fluid from the nipple. The aspirate is analyzed to identify the specific breast cancer protein footprints. Power3 believes this test is the first test of its type that detects breast cancer earlier than any technologies currently allow. The initial proof-of-concept has been completed with remarkable effectiveness and sensitivity. Clinical trial preparation is currently underway.



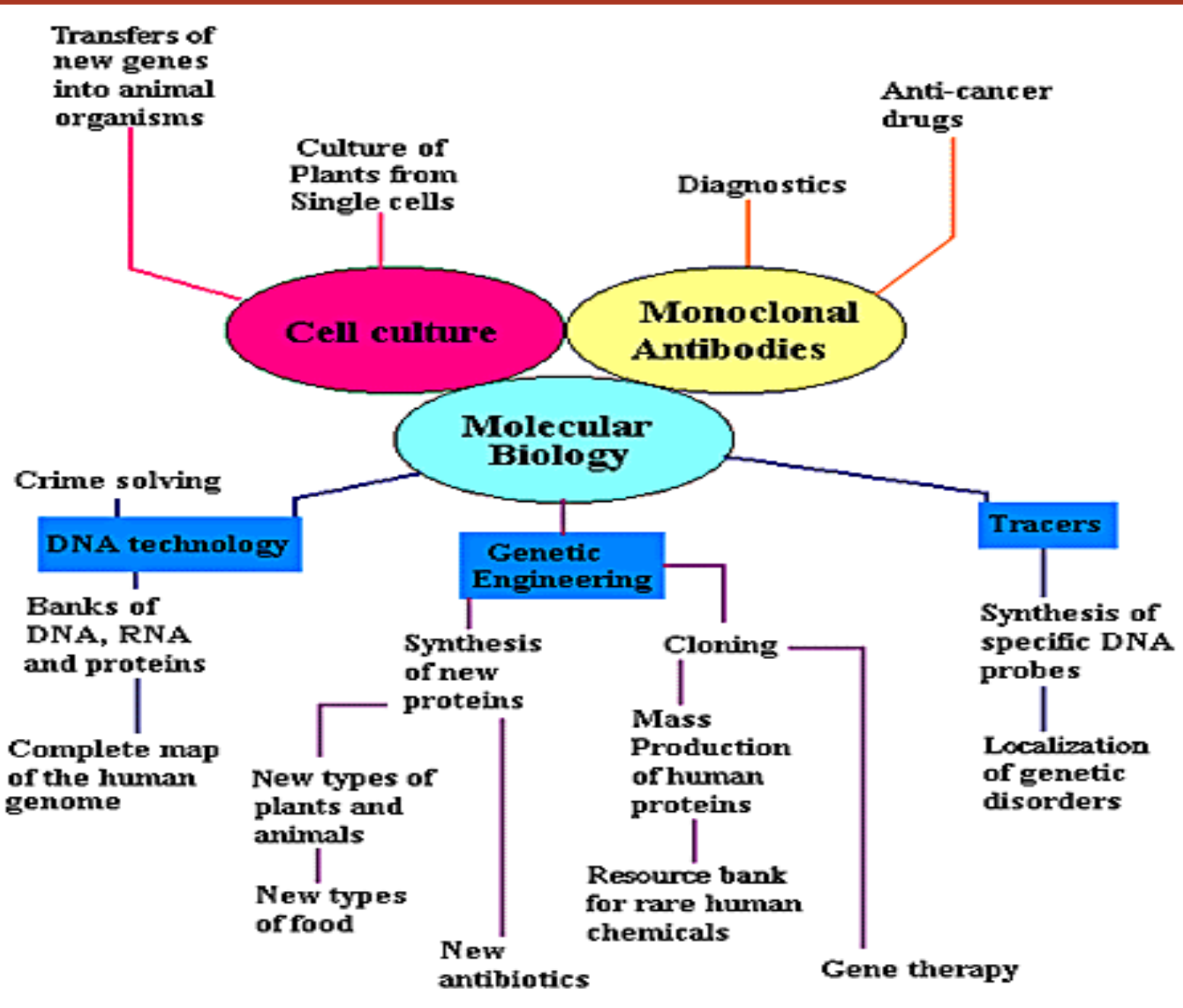
[Click here to see in larger view](#)



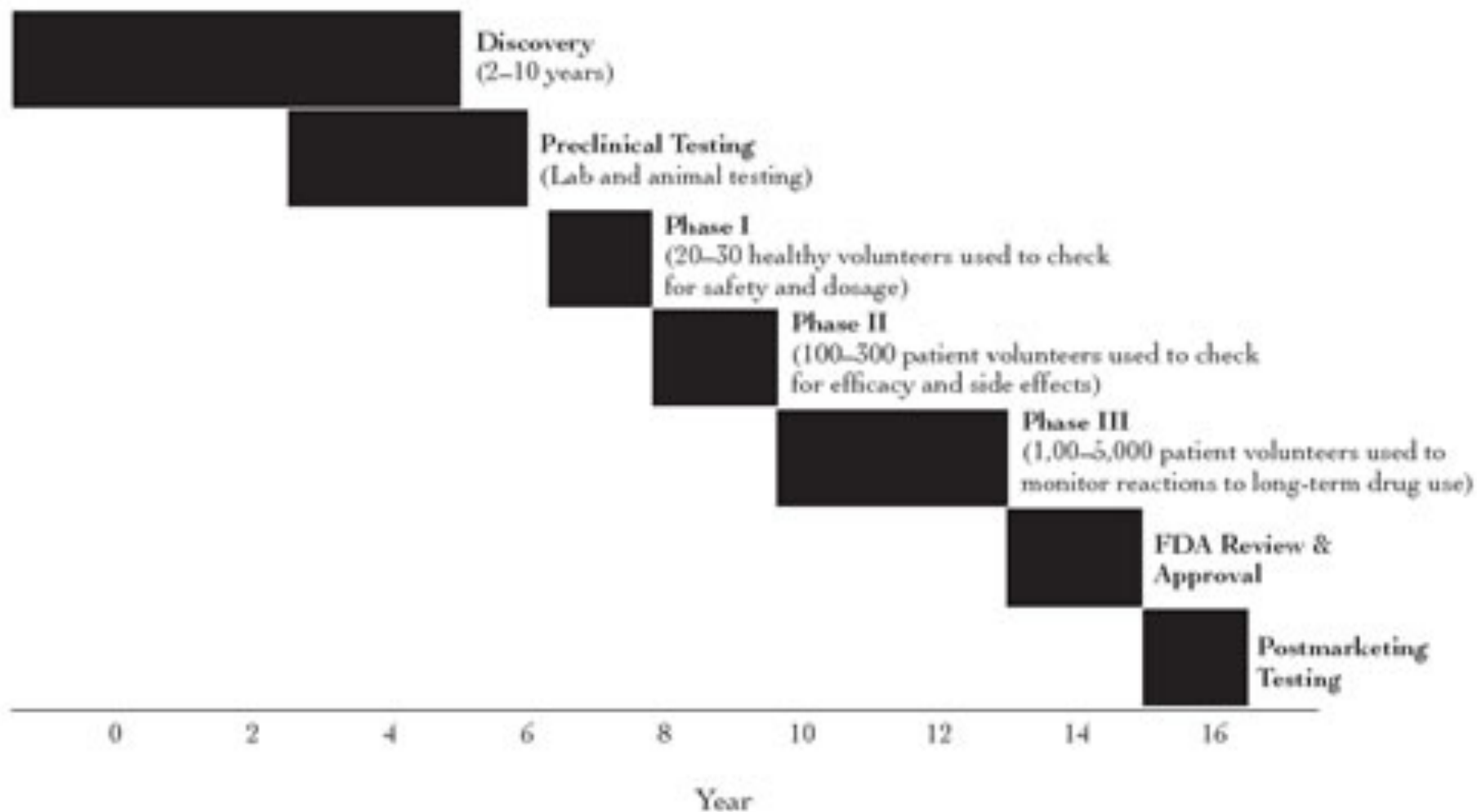
<http://www.power3medical.com/products/naftest.aspx?level=0>

# Overview of Food Biotechnology

- Biotech food, also called genetically modified or genetically engineered, is grown from seeds that carry specific genes to produce desired characteristics. The first biotech food on the market, in the early 1990s, was a tomato that ripened on the vine and could be transported without bruising.
- Today, the products of agricultural biotechnology include plants that are protected from insects or are tolerant to herbicides. Biotech foods have now made their way onto our tables: more than a third of the corn and more than half of the soybeans in the 1999 U.S. harvest were grown from seeds produced using biotechnology.



## Biotech Drug Discovery Process



# Research

- Applied
- Basic
- Clinical
- IT Modeling

# **UH Intellectual Property Management**

- **Technologies Available**
- Training Tools
- Biotech / Medical
- Computers/IT
- Electrical/Electronic
- Energy
- Manufacturing
- Materials
- Photo/Optical



# University of Houston

- **Biotech / Medical ID**      **TITLE**
- 2003-031 Effective Capping Reagents
- 2003-040 Discrete Polymer-Coated Nanoshells
- 2003-044 A Computational and Algorithmic Framework for CT-based Detection of Vulnerable Patients
- 2003-047 Co-Registration and 3D Imaging of Functional Brain Data within a Transparent Talairach Model Brain
- 2003-050 Growth of Oligo- or Poly(ethylene glycol) Films on Silicon Surfaces through Formation of Si-C Bonds
- 2003-051 Hydroxamates as Antimicrobial Agents
- 2003-052 Protein Structure for Drug Design – DadX
- 2004-004 Superconducting Loop, Saddle and Birdcage MRI Coils
- 2004-007 Destruction of Perchlorate in Ion Exchange Brine
- 2004-008 Monitored electrophoretic separation device
- 2004-013 One-Bead-One-Compound from Surface Immobilized Molecules
- 2004-014 A PCR Chip

# UTMB

## Research Technology Support.

- Our **Technical Services** team provides repair, calibration, preventative maintenance and electrical safety checks of research equipment - both under contract and on a "call-in" basis
- Our **Research & Development** team offers engineering support for the design and integration of mechanical devices with electronic systems (such as man-machine interfacing and process control), custom software development, as well as digital signal processing (DSP) applications.
- The **RTS Machine Shop** fabricates, assembles and modifies research equipment – an on-site resource for sophisticated, customized instruments
- Welcome to UTMB's **Research Technology Support**. Follow the links on this page to learn more about the services we provide to the campus research community.
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- **New Technologies**  
**Diagnostics**  
**Medical Devices**  
**Research Tools**  
**Software-Multimedia**  
**Therapeutics-Biotechnology**

# UTMB @ Galveston

- **Technologies > New Technologies**

**A Pharmacological Method to Promote Bcl-2-Induced Cancer Cell Death**

Giulio Tagliatela, Ph.D. and Bryce P. Portier, B.S.

**Animal Restraining Device for Physiological and Pharmacological Studies**

Jeong Han, M.D. and Volker Neugebauer, M.D., Ph.D.

**Chimeric Sindbis-EEEV Vaccines**

Ilya Frolov, Ph.D., Slobodan Paessler, D.V.M., Scott Weaver, Ph.D., and Patricia Aguilar, Ph.D.

**Laser Guide to help reduce Rotational Malreduction during Surgical Procedures to Repair Fractures**

Vinod Panchbhavi, M.D.

**Measurement of Audible and Ultrasonic Vocalizations as Highly Integrated Behavioral Responses**

Jeong Han, M.D. and Volker Neugebauer, M.D., Ph.D.

**Measuring PKA Activity by Pseudosubstrate Affinity Assay**

Kathleen O' Connor, Ph.D. and Adrianna Paulucci, Ph.D.

**Measurement of Virus Entry Using a Modified HIV Protein as a Shuttle for the Luciferase Reporter Gene**

Robert Davey, Ph.D., Mohammed Saeed, Ph.D., and Andrey Kolokoltsov, M.S.

# UTHSC H

- UTHSC-H Technologies
- Biologics/Assays
- Medical Devices
- Pharmacologics
- Software

# UT HSC H

- **Medical Devices by Title**
- **Apparatus for Induction of Inhaled Pharmacologic Agent by a Pediatric Patient**
- **Balloon-tipped Suction Catheter**
- **Blood Pump Apparatus and Method**
- **Combination Anesthetic Mask and Oxygen Transport System Curved Cannula for Continuous Spinal Anesthesia**
- **A Design Modification to Blood Vessel Search Needle to Facilitate Central Venous Cannulation**
- **Device to Reduce/Eliminate Bacterial and Viral Contamination of Dental Air Turbine Handpieces**
- **Elastography: Imaging of Tissue Elastic Properties in vivo for Detection and Evaluation of Breast Cancer and Other Elastic Abnormalities**
- **Electrospray Methods and Apparatus for Trace Analysis**

# MDACC

- **Mission**
- The Office of Technology Commercialization supports the mission of The University of Texas M. D. Anderson Cancer Center to eliminate cancer as a health threat by accelerating the entrance of new drugs, diagnostics, devices and therapies into the commercial marketplace.
- **Our operational vision is to operate the program as a business by:**
  - Prudently investing capital in a patent portfolio
  - Seeking investment partners to share risk and reward
  - Managing operations to maximize financial returns
  - Seeking long term growth in license income and equity portfolio value

# MDACC

## Portfolio Public Companies

- **Macrophage (now Antigenics)** Established in 1987  
Development and commercialization of pharmaceutical products to treat cancer and infectious diseases. The following product is in clinical development: Aroplatin for treatment of colorectal cancer
- **BioQuest (now Adventrx Pharmaceuticals)** Established 1996  
Developing new technologies for anticancer and antiviral treatments that improve the performance of existing drugs and address significant problems such as drug resistance.
- **Introgen Therapeutics, Inc.** Established 1994  
Commercialization and development of gene therapy products to treat a variety of cancers.
- **IDev Technologies, Inc.** Established 2000  
Development of minimally invasive/interventional radiology devices.
- **NanoSpectra Biosciences, Inc.** Established 2001  
Nanotechnology for optical therapeutics
- **Nuvera Biosciences, Inc.** Established 2004  
Developing novel molecular diagnostics that will significantly improve detection and treatment of cancer

# Baylor College of Medicine

Agennix  
EnVivo Pharmaceuticals  
Fairway Medical Technologies  
Kardia Therapeutics, Inc.  
Kryptiq Corporation (acquired RosettaMed)  
Medical Metrics  
MithraGen  
Molecular Logix, Inc.  
PharmaFrontiers  
Prokaryon Technologies, Inc.  
Rejuvenon  
Spectral Genomics

## **ADViSYS**

**Amnion, Inc.**

**Antigenics, Inc. - formerly Aronex Pharmaceuticals, Inc.**(Nasdaq:AGEN)

**Bacterial BarCodes**

**Lark Technologies, Inc** (OTC BB: LDNA.OB)

**Lexicon Genetics, Inc.** (Nasdaq: LEXG)

**MedicaLogic, Inc** (Nasdaq: MDLIQ)

**Smartforce - formerly ForeFront, Inc.** (Nasdaq:SMTF)

**Valentis, Inc. - formerly GeneMedicine, Inc.** (Nasdaq:VLTS)

**WOW! Publications, Inc.**

**Zonagen, Inc.** (Nasdaq: ZONA)



**BCM Technologies (BCMT) is an early stage venture capital firm formed by Baylor College of Medicine (BCM) with a 20-year investment history in the Houston area. Initially, BCMT was funded entirely by BCM and was organized to work exclusively with BCM to form and finance new companies. This first fund (\$20 million) now has 13 portfolio companies and continues to make investments.**

#### **Performance**

- Since its formation in 1983, BCMT has started over 35 companies
- Since 1993, seven BCMT companies or their successors have become public companies listed on Nasdaq.
- Liquidity events include the merger or acquisition of four BCMT companies with a total deal value in excess of \$200 million in 1998-99, and the Lexicon IPO in April, 2000.
- BCMT has reviewed over 300 new inventions originated from the BCM campus over the last three years.
- BCMT formed seven companies in 2000, two in 2001, and three in 2002. These companies and three earlier start ups have raised in excess of \$100 million of private capital.

#### **Portfolio Summary**

- *Agennix Incorporated*-commercializing human lactoferrin, a broad-spectrum antibacterial protein, for use in such treatments as injectable antibiotics, ophthalmic anti-infectives and gastrointestinal antibiotics.
- *Ceros Pharmaceuticals, Inc.*-developing pharmaceutical compounds that promote bone growth in patients with osteoporosis (or patients at risk of developing osteoporosis).
- *EnVivo Pharmaceuticals, Inc.*-developing small-molecule therapeutics for the treatment of central nervous system (CNS) disorders
- *Fairway Medical Technologies, Inc.*-developing proprietary durable and disposable medical products in the areas of interventional cardiology, obstetrics, drug delivery, and medical imaging.
- *Kardia Therapeutics, Inc.*-developing cardiovascular therapeutics derived from proprietary knowledge of the heart failure cascade and novel regenerative cell technologies.
- *Medical Metrics, Inc.*-marketing dynamic imaging software with proprietary analytical software for musculoskeletal diagnosis and evaluation.
- *MithraGen, Inc.*-developing proprietary DNA vaccines for cancer, infectious diseases and autoimmune diseases.
- *Molecular Logix, Inc.*-A drug development company that utilizes next generation computer modeling and protein engineering technologies to create novel therapeutics, initialing concentration.
- *Oncovance Technologies, Inc.*- advancing cancer diagnosis, management, and therapy with proprietary disease-outcome models, molecular markers, and knowledge-based therapeutics.
- *Opexa Pharmaceuticals, Inc.*-developing therapeutics for treating autoimmune diseases, with initial focus on multiple sclerosis.
- *Progression Therapeutics, Inc.*-discovery and development company with a focused mission to treat metastatic cancers by targeting the causes of cancer progression.
- *Prokaryon Technologies, Inc.*-developing products to prevent and control infectious diseases in animals.
- *Rejuvenon Corp.*-designing therapeutics to improve the quality of life in elderly humans.
- *Spectral Genomics, Inc.*-commercializing molecular pathology and genomic information services and related products and software. Acquired Bacterial Barcodes, Inc. in 2004, the company that developed the DiversiLab System™ based on proprietary rep-PCR technology for bacterial strain identification and infection control

