

University of South Florida

College of Medicine

Department of Molecular Medicine



<http://molecularmedicine.health.usf.edu>

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10-2006

PROGRAM OVERVIEW:

The Biotechnology Industry Organization defines biotechnology as the “application of biological knowledge and techniques to develop products and services”. It is obvious that in this general view biotechnology has to be considered as old as mankind itself. From its early days “biotechnology” was, for example, applied to produce or preserve food or to improve health. Modern biotechnology, however, is literally ages apart from those basic principles and has experienced strong boosts from advances in space science, computer science and biomolecular sciences including the multiple genome projects. Today, biotechnology is a collection of diverse technologies through which scientific results are translated into specific products or improved services in medicine, engineering, agriculture and environmental management. The commercialization of biotechnology has added a strong business aspect to this discipline and with it the need for a highly trained work force.

Faculty from several departments at USF have recognized the potential and importance of biotechnology and have already developed courses that introduce students to its potential and myriad applications. Now these efforts are coordinated and consolidated in the development of a "Masters Program in Biotechnology" that brings together the knowledge and experience from different disciplines and departments at USF.

The USF Master’s Program In Biotechnology represents a multi-college partnership and a truly interdisciplinary collaboration. Participating colleges will include the College of Medicine, the College Of Engineering, the College Of Public Health, the College of Arts And Sciences and the College of Business Administration. The program is designed to meet the increasing demand for trained people in this exploding area, which crosses the traditional fields of biological, chemical, engineering, health and computer sciences. It therefore builds on and complements the current strengths of the university.

The Master’s Program In Biotechnology is designed for 35 credit hours that can be obtained during three semesters of study. The program will be available for full -time and part-time enrollment. Core courses will provide the foundation and basics before advanced work, including electives plus an internship, that will be designed to match the student’s interests and future plans, will be pursued.

The core courses include introductory courses in biochemistry, molecular and cellular biology, introduction to biotechnology, bioinformatics, biotechnology and bioethics, business and regulations in biotechnology and a seminar on current topics in biotechnology. Most of these courses are part of the current graduate curricula in the involved colleges

Student will have the option to choose four electives out of a total of 22 electives that are contributed by five participating colleges. The electives are organized in four different categories i.e. science, engineering, public health and business/law and the students will be free to select according to their interests and career plans.

CURRICULUM

The goal of the Masters Program in Biotechnology is to provide students enrolled in the program with high quality training and education that will prepare them for careers in science, engineering, industry, health care and education. The curriculum has been designed accordingly and provides the theoretical background, the practical training and, with the internships, the “real life” experience, which will equip students with the essential tools for a successful career in the field of biotechnology.

The Masters Program in Biotechnology is designed for 35 credit hours, which can be obtained in 3 semesters of study. The program will be available for full -time and part-time enrollment. Seven core courses will provide the foundation and basics before advanced work, including four electives, and an internship will be pursued. The curriculum is flexible and can be tailored to the individual student’s background, interests and career goals.

University of South Florida
Master's Of Science In Biotechnology

CURRICULUM

Fall Semester

GMS 6200: Biochemistry and Molecular and Cellular Biology	5 cr
GMS 7930: Introduction to Biotechnology	3 cr
BCH 6888: Bioinformatics	3 cr

Spring Semester

BCH 7930: Translational Biotechnology	3 cr
GMS 7930: Biotechnology and Bioethics	2 cr
GMS 7930: Graduate Seminar -	1 cr
EIN 6106: Technology and Law	3 cr
Elective:	3 cr

Fall Semester

Elective:	3 cr
Elective:	3 cr
Elective	3 cr

GMS 7930: Internship (140 contact hrs minimum) with internship report & literature review	3 cr
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Students must maintain an overall average of 3.0 ("B") in all courses

The Biotechnology Master's Program is available for full time and part time enrollment.

ELECTIVES

Science:

BCH 6411	Biomedical Genomics and Genetics	4
BCH 6746	Proteomics And Structural Biology	3
BCH 6135	Methods In Molecular Biology	4
GMS 6889	Advanced Bioinformatics	3
GMS 7930	Stem Cells In Brain Repair	3
BCH 6627	Metabolic and Genetic Basis of Human Diseases	3
GMS 6513	Principles of Pharmacology and Therapeutics	3
GMS 7930	Aging and Neuroscience	3

Engineering:

BME 6107	Biomaterials I: Material Properties	3
BME 6108	Biomaterials II: Biocompatibility	3
BME 6034	Biotransport Phenomena	3
ECH 6417	Bioseparations	3
ECH 5740	Theory and Design of Bioprocesses	3
BME 5040	Pharmaceutical Engineering	2
ENV 6667	Environmental Biotechnology	3

Public Health:

PHC 6310	Environmental Occupational Toxicology	3
PHC 6050	Biostatistics I	3
PCH 6051	Biostatistics II	3
PHC 6000	Epidemiology	3
PHC 6017	Design and Conduct of Clinical Trials	3

Business/Law:

GEB 6930/EIN 6935	Strategic Market Assessment for New Technologies	3
GEB 6115	New Venture Formation	3
GEB 6116	Business Plan Development	3
6EB6930	Fundamentals of Venture Capital and Private Equity in Entrepreneurship	3
GMS 7930	Principles of Intellectual Property	3

DESCRIPTIONS OF CORE COURSES:

GMS 6200 **Biochemistry, Molecular and Cellular Biology**

The overall objective of this course is to provide students with a solid foundation of the principles that underlie normal cellular and physiological processes.

GMS 7930 **Introduction to Biotechnology**

This course is designed to provide the students with an overview about the applications of modern biomedical sciences and engineering in institutional and industrial settings for the development of diagnostics, therapies, drugs and food and the production of devices for medicine, engineering and life styles advancements.

BCH 6888 **Bioinformatics**

Bioinformatics is designed to introduce students to the diverse applications of bioinformatics and computational biology software in probing both DNA and protein structure-function relationships. Students will develop familiarity with a broad range of algorithms designed to facilitate DNA sequence assembly and manipulation, protein structure analysis, motif identification, evolutionary alignments and structure prediction. Examples focus on major software applications that are routinely in biochemistry and molecular biology.

GMS 7930 **Translational Biotechnology**

Course objective is to provide an overview of the translation of biomedical research results into applicable products and procedures. Course topics include studies on risk assessment and public health, biotech regulations and the overseeing agencies, clinical trials, and business aspects of biotechnology including patenting, licensing and new venture formation. Also included are site visits to local non-profit and for profit biotech institutions

GMS 7930 **Biotechnology and Bioethics**

This course is designed to provide with an overview about the ethical and legal issues related to modern medical sciences and biotechnology. Topics will include subjects such as genetic screening, gene therapy, scientific and medical use of stem cells, genetically manipulated food and animal cloning

EIN 6106 **Technology and Law**

Selected topics related to the relationships between and among technology, law and social policy, including governmental regulation, products liability, professional liability, contract negotiation and formation, and developments and trends affecting engineering professionals.

GMS 7930 **Graduate Seminar - Current Topics in Biotechnology**

In this weekly seminar series faculty, students and representatives from industry and business will present topics related to medical sciences and biotechnology. Subject areas will include presentations on microbiology and bioterrorism, stem cell therapy,

gene therapy, drug and gene delivery, entrepreneurial opportunities in biotechnology, gene chips and applications, funding opportunities for new ventures.

DESCRIPTIONS OF ELECTIVE COURSES:

SCIENCE:

BCH 6411 Biomedical Genomics and Genetics

The course is designed to introduce students to multiple features of biomedical genomics and genetics such as genome composition and evolution, gene expression, genetic instability, mapping and identification of genes, and susceptibility to Mendelian and complex diseases. Applications of genomics and genetics in therapeutic treatments including gene therapy, stem cell therapy and pharmacogenomics will also be discussed.

BCH 6746 Proteomics and Structural Biology

The course will provide a solid foundation and breadth understanding in proteomics and structural biology that will facilitate applications to current and future research problems.

BCH 6135 Methods in Molecular Biology

This practicum teaches state of the art methods and techniques that are applied in molecular biology such as PCR, RT-PCR, immunoprecipitation western (immuno-) blotting, gel mobility shift assays, Northern, site-directed mutagenesis, sequencing

GMS 6889 Advanced Bioinformatics

Advanced Bioinformatics is designed to provide an in depth analysis of DNA and protein function using information derived from both current DNA and protein sequence databases. Advanced algorithms will be used to survey gene/protein functions and construct 3-dimensional protein models that will be used for rational ligand design.

GMS 7930 Stem Cells In Brain Repair

The course will discuss the use of stem cells for the treatment of diverse neurodegenerative diseases and brain disorders.

BCH 6627 Metabolic and Genetic Basis of Human Diseases

The objectives of this course are: (i) to provide a thorough understanding of the principles that underlie inheritance and expression of genetic information; (ii) to present a wide variety of genetic diseases, based on their different modes of inheritance and the different nature of the gene products responsible. .

GMS 6513 Principles of Pharmacology and Therapeutics

This course is designed to familiarize students with basic principles of pharmacology and therapeutics. Students will be exposed to classical concepts of pharmacology such as drug-receptor interactions as well as modern techniques such as gene therapy.

GMS 7930 Aging and Neuroscience

This course is designed to cover current topics in Neuroscience with particular emphasis on neurodegenerative diseases, aging, and experimental therapeutic approaches. The course is taught by faculty members of the Center for Aging and Brain Repair and affiliated faculty. The format of the course consists of lectures and interactive sessions led by faculty members. By the completion of the course, students should have a working knowledge of major issues that drive research in Neuroscience and Aging.

ENGINEERING:

BME 6107 Biomaterials I: Material Properties

Physical and chemical properties of biomaterials, failure mechanisms, performance in vivo, interfacial phenomena and biocompatibility, including host response to implants. Also will discuss the regulatory aspects of biomaterials

BME 6108 Biomaterials II: Biocompatibility

This is the first in a two-semester sequence on biomaterials, biocompatibility, and related issues. The first semester focuses on materials that do not naturally occur within the body, but are used for biomedical applications. Such materials include ceramics/glasses, metals, polymers, and textiles. We will examine the bulk properties and surface properties of such materials and other aspects critical to successful biomedical applications. A number of applications will be covered during the semester, along with relevant special topics such as sterilization/sanitation, test procedures, etc.

BME 6034 Biotransport Phenomena

Analysis and applications of biofluids, including nonnewtonian and particulate systems, bioheat transfer, including energy balances, and biomass transport, including mass balances and membrane processes.

ECH 6417 Bioseparations

Design and analysis of bioseparation processes, including crystallization, membrane separations, chromatography, liquid-liquid extraction, electrophoresis, and emerging technologies. Open to non-majors with CI.

ECH 5740 Theory and Design of Bioprocesses

Introduction to biotechnology, including applied microbiology, enzyme technology, biomass production, bioreactor design, and transport processes in biosystems.

BME 5742 Pharmaceutical Engineering

Introduction to pharmaceutical engineering, including dosage forms (tablets, capsules, powders, liquids, topical forms, and aerosols), recipients, regulatory issues, clinical studies, and good manufacturing practices.

ENV 6667 **Environmental Biotechnology**
Study of biochemical relations and processes in treatment of pollutants with emphasis on control of effluents for the protection of water quality.

PUBLIC HEALTH

PHC 6310 **Environmental Occupational Toxicology**
A study of the nature of industrial and environmental toxins and toxic by-products, generated and distributed, leading to disease, disability, or death, and the control measures available. Lecture and appropriate laboratory methods are used.

PHC 6063 **Biostatistics I**
Concepts, principles, and methods of statistics applied to public health issues.

PHC: 6051 **Biostatistics II**
Intermediate level statistical methods appropriate for health and epidemiological studies. Emphasis on 2x2 tables, analysis of variance, multiple linear regression, methods of survival analysis, logistic regression, and Cox regression.

PHC 6000 **Epidemiology**
Study of epidemiological methods to evaluate the patterns and determinants of health and diseases in populations.

PHC 6017 **Design and Conduct of Clinical Trials**
The course will familiarize students with the issues in the design and conduct of clinical trials. Factors involved in organizing a trial, randomizing subjects, implementation, and analyzing data from the study will be considered.

BUSINESS / LAW

GEB 6930/EIN 6935 **Strategic Market Assessment for New Technologies**
This course focuses on development of techniques for assessing technology merit of new innovations (including development of an appreciation and understanding of intellectual property) and development of strategic frameworks to commercialize new products. It uses classroom discussions, field projects and technology assessment tools to evaluate investigators' intellectual property portfolios at USF to help create high value licensing opportunities and new venture creations as spinouts from USF. Works in co-operation with the USF Research Foundation. permit required for EIN

GEB 6115 **New Venture Formation**
An introductory entrepreneurship course. Students learn to develop venture ideas, evaluate venture opportunities and understand financial, marketing, and managerial needs of a venture.

GEB 6116 Business Plan Development

Course is designed to enable students to prepare and present a business/venture plan. Students can prepare a plan for their own venture or a "client organization."

LIS 6630 Information Sources and Services in Science and Technology

Study of representative reference sources in pure and applied sciences with equal attention given to typical problems encountered in scientific and technological reference service.

GEB 6930/EIN 6934 Fundamentals of Venture Capital and Private Equity in Entrepreneurship

The course focuses on critical skills necessary to develop appropriate financing strategies for new venture creation and growth. Students will use case studies and team projects in course studies.

GMS 7930 Principles of Intellectual Property

A course, currently under development, which will review in detail the fundamentals and principles of patents, trademarks, copyrights, and trade secrets; including aspects of the legal standards and requirements both domestically and internationally, appropriate uses in corporate and product development strategies, and review of appropriate case-based material. This course will include a practicum to be completed at the USF Division of Patents and Licensing. This material is currently taught in different segments of the Strategic Markets Assessment for Technologies, New Venture Formation, and Advanced Product Development courses.

ADMISSION REQUIREMENTS:

The USF Biotechnology Master's Program will be available for full -time and part-time enrollment. In order to be considered for admission to the Master's Program in Biotechnology, applicants must fulfill the following requirements:

Administrative Pre Requirements:

- A bachelor's degree
- A minimum undergraduate GPA of 3.0 on a 4.0 scale
- A minimum GRE test score of at least 500 verbal and at least 600 quantitative
- Three letters of recommendation
- Statement of purpose, indicating how the program would suit the student's interests and serve his/her professional goals
- Complete transcripts of undergraduate work and any previous graduate work
- A completed USF Application to Graduate Studies

Program Pre Requirements:

A bachelor's degree in either the biological or chemical sciences or at least one year of studies in those disciplines would be the optimal preparation for admission to the USF Master's Program in Biotechnology. However, the faculty of the USF Biotechnology Program is aware that not all applicants who are interested in pursuing this degree will have this formal background. Instead, some might have accumulated substantial knowledge in one of these disciplines during their work as laboratory technicians, engineering assistants or environmental or public health service providers. Those students would be ideally suited to start their graduate education with a Graduate Certificate in Biotechnology that is offered by the Department of Molecular Medicine in the College of Medicine.

<http://www.outreach.usf.edu/gradcerts/certinfo.asp?ccode=XBT>

The Biotechnology Graduate Certificate Degree has less stringent entrance requirements (a GRE is not required) but its successful completion will serve several purposes:

- a) it will provide the students with a certificate of advanced studies independent of prospective additional studies in the Biotechnology Master's Program,
- b) it will serve as a complete package of fulfilled pre requirements for admission into the Biotechnology Master's Program,
- c) 12 credit hours of the Biotechnology Certificate Program can be transferred into the Master's Program.

Applicants to the Biotechnology Master's program who come from a non-science related background and would like to obtain a graduate degree in biotechnology without having to obtain a BS in science first will have to take some classes in biology, biochemistry or chemistry first. In those cases, after evaluation of the official transcripts, an admissions committee will either meet with the student and/or conduct a telephone interview to evaluate the student's background. Depending on this conversation, the committee will recommend courses that the students will have to take successfully before program admission can be granted. The student will have to provide documentation from the course director(s) indicating that the course(s) has (have) been passed with a minimum grade of B.

Courses that the Admissions Committee of the USF Biotechnology Program requires to be taken for pre requirement fulfillment can be taken during the semester(s) or summer preceding the anticipated program entrance (depending on availability). Especially for students applying from outside Tampa, pre requirement courses do not have to be taken at USF. However, for non-USF courses the student will first have to submit the syllabi of the selected courses to the Biotechnology Admissions Committee before the courses can be approved as sufficient to fulfill the pre requirements for program admission to the Biotechnology Master's Program.

For students with little or no science background, combinations of the following courses that are currently offered at USF or equivalent courses from outside USF will be recommended according to the students background and schedule:

University of South Florida

CHM 2210/2210L Organic Chemistry I (with lab) (3/2)
CHM 2211/2211L Organic Chemistry II (with lab) (3/2)
BCH 3023 Introductory Biochemistry (3)
PCB 1511 Molecular and Human Genetics (3)
PCB 3063 General Genetics (3)
PCS 3063L General Genetics Laboratory (1)
BSC 2010 Biology I Cellular Processes (3)
BSC 2010L Biology I Cellular Processes Laboratory (1)
BSC 2011 Biology II Diversity (3)
BSC 2011L Biology II Diversity Laboratory (1)
PCB 3023 Cell Biology (3)
PCB 3023L Cell Biology Laboratory (1)

Tampa University

D300 General Genetics (laboratory included) (4)
320 Molecular Genetics (laboratory included) (4)
350 Cell Biology (laboratory included) (4)
320 Biochemistry (3)

St. Leo University

BIO 240 Cell Biology (4)

BIO 324 Biochemistry (4)
BIO 421 Genetics (4)
CHE 311 Organic Chemistry I (4)
CHE 312 Organic Chemistry II (4)

Please note: Not all courses are offered in each semester.

Some courses require the fulfillment of prerequisite courses. In selected cases, dependent on prior training of the student, course instructors might waive some pre requirements. After prescreening of student applicants, faculty members of the Biotechnology Program will be happy to support this request, if necessary.

GRADUATION REQUIREMENTS:

Internship and Review Article (Alternative Master's Comprehensive Exam):

As an alternative to a Master's Comprehensive Exam, biotechnology Master's students will have to complete a practical and theoretical assignment which will both require the successful application of the knowledge they have acquired during their formal training,.

Required are:

- a) an internship with a written and an oral internship report and
- b) a review paper providing an overview of recent advancements in an area of biotechnology of the student's choice.

A) Internship:

One of the requirements for graduation from the USF Master's Program in Biotechnology is a successful internship experience in an institution that provides insight into one or several aspects of biotechnology such as a scientific research laboratory, a pharmaceutical or device manufacturing company, an office for intellectual properties or a department related to biotech business administration. The minimum onsite contact for the internship is 140 hours. These hours do not include the time for preparation such as researching the literature to become familiar with the assigned topic or initial onsite training before certain tasks can be mastered independently. The arrangement of the internship will be left to the student and the internship institution, i.e. depending on the nature of the assigned task it will have to be decided if it would be most appropriate to attend the internship in one concentrated block session between semesters or if it would serve the educational interest of the student and the benefit for the hosting institution equally well if the internship were spread over several weeks during the semester.

The intern is expected to compose an extensive internship report in which he/she describes the assignment in detail, describes what approach(es) have been taken and why, if the project has been completed or if it has been developed to a point at which others could easily take over. In the later case, the student will have to point out what additional steps will have to be taken to finish the task. In our experience those reports easily accumulate to a 30-page document.

The internship mentor will be the first to review the report and possibly modify statements that could be in conflict with institute/company issues of confidentiality. In addition, the internship mentor will be asked to provide a short written evaluation of the student's internship performance and internship report and to document the total contact hours the student has spent onsite. Three faculty members from the Biotechnology Program who the student has selected as his/her Graduation Committee will grade the report. The Graduation Committee will attend an oral presentation on the internship

experience that may be aided by any audiovisual tools the student might find helpful such as PowerPoint, videos, models etc. The internship report and the oral presentation will contribute equally to the internship grade.

Evaluation of Internship for assurance of academic and ethical standards:

In our experience an internship is most beneficial to the student if he/she has a chance to locate an internship site of his/her choice. If students do not succeed in finding an appropriate organization in a reasonable time period, the student's Graduate Committee will make recommendations and/or make initial contacts according to the student's interest. In either case, the internship organization will be evaluated and approved by the student's Graduate Committee. To this end, the contact person at the chosen organization will be asked to fill in a short internship questionnaire that will help validating that the organization as well as the prospective work assignment will meet the ethical and academic standards of the Biotechnology Program. In addition, if the internship has been established, the student will be required to contact at least one advisor of his graduate committee on a regular basis during the internship to assure his well being and proper progress. Should these short communications not indicate a satisfying experience for the student and not meet the committee's expectations, the internship will have to be terminated and a new internship site will have to be located.

B) Review Article

As a second part of their final graduation requirements, Biotechnology Master's students will have to write a review article that describes recent advancements in a sub discipline of biotechnology of their choice. After consultation with their Graduation Committee, students are expected to research the literature and compose an overview (5 pages plus references) of a topic of their interests such as for example:

- " Nature In Business - Recent Regulations On The Patenting Of Natural Processes And Compounds".
- " Proteomics Applications In Healthcare"
- " Business Friendly Environmental Protection"
- " Recent Advancements In Forensic Biotechnology"

The members of the Graduation Committee will read and grade the review.

APPLICATION AND ADMISSION

In order to be considered for admission, a first time graduate student or a student transferring from a graduate program at another university must fulfill the following requirements:

General Admissions requirements:

- A bachelor's degree
- Must fulfill the prerequisites as stated in the curriculum
- A minimum undergraduate GPA of 3.0 on a 4.0 scale
- A minimum combined GRE general test score of 1100 (verbal and quantitative portions), not older than 5 years
- Three letters of recommendation
- Statement of purpose
- Complete transcripts of undergraduate work and any previous graduate work
- A completed USF Application to Graduate Studies

The general guidelines of the USF Graduate School apply:
<http://admissions.grad.usf.edu/criteria.html>

Financial Aid:

For inquiries about financial aid please visit:
<http://usfweb2.usf.edu//finaid/grad.htm>

Fellowships and Grants:

<http://www.grad.usf.edu/newsite/diversity/fellowships.asp>

Application deadlines:

Domestic Students	Fall	June 1
	Spring	October 1
International Students who are NOT in the United States:		
	Fall	January 2
	Spring:	June 1
International Students who are currently IN the United States:		
	Fall:	March 1
	Spring:	August 1

Late admission is possible in selected cases.

For answers to questions regarding the international admissions process, please go to <http://web.usf.edu/iac/admissions/faq.html>.

Application Material:

Domestic Application to Graduate Studies:
http://www.grad.usf.edu/newsite/admissions/grad_app.asp

International Application to Graduate Studies:
<http://web.usf.edu/iac/admissions/>

Send a hard copy of the online application and all additional documentation to:

Biotechnology Program
Dr. Inge Wefes,
Department of Molecular Medicine
College of Medicine,
University of South Florida
12901 Bruce B. Downs Blvd./ MDC Box 7
Tampa, FL. 33612-4799

Contact:

Inge Wefes, Ph.D., iwefes@hsc.usf.edu (813) 974-5360

FLORIDA BIOTECHNOLOGY COMPANIES

"Through an extensive research and interviewing process, Enterprise Florida developed a database of Florida-based biotechnology companies. There are currently **over 80** Florida companies that apply biological knowledge and techniques pertaining to molecular, cellular, and genetic processes to develop products and services, including applications in medicine, agriculture, and environmental management. This database does not include biotech services companies."

<http://www.eflorida.com/keysectors/bio/bio.asp?level1=22&level2=115&level3=365&level4=116®ion=nw>

Also, "the Scripps Research Institute is establishing a major science center in Palm Beach County, Florida, focusing on biomedical research, technology development and drug design

Abc Research	Corp Gainesville
Accentia Biopharmaceuticals	Tampa
Altor Bioscience Corp	Miramar
Aphton Corporation	Miami
Applied Genetic Technologies Corp	Alachua
Applied Genetics Laboratories, Inc.	Melbourne
Aquagene, Llc	Alachua
Argonide Nanomaterial Technologies/ (The Argonide Corporation)	Sanford
Axogen, Inc	Gainesville
Banyan Biomarkers	Alachua
Bc International Corp	Alachua
Berna Products	Coral Gables
Bio Nucleonics Inc.	Miami
Bioavailability Systems, Llc	Cocoa Beach
Biodyne Inc.	Sarasota
Bioheart, Inc.	Weston
Biomed Immunotech	Alachua
Biomedtech Laboratories, Inc	Tampa
Bioresource Technology, Inc.	Lauderhill
Cardiovascular Sciences, Inc	Orlando
Copharos, Inc.	Ponte Vedra Bch
Custom Biologicals	Boca Raton
Custom Synthesis Inc.	Delray Beach
Cygene, Inc.	Coral Springs
Cytorex Biosciences Inc	Weston
Daimonion Diagnostics Llc	Gainesville
Dnaprint Genomics Inc	Sarasota
Dor Biopharma	Miami

Dyadic International	Jupiter
Ecoarray Llc	Alachua
Encor Biotechnology Inc	Alachua
Exactech, Inc.	Gainesville
Forseti Biosciences, Inc.	Delray Beach
Geneex Inc	Plantation
Global Laboratories, Inc.	Alachua
Gmp Companies, Inc Ft.	Lauderdale
Goodwin Biotechnology, Inc	Plantation
Integrated Plant Genetics Inc	Alachua
Ivigene Corp	Alachua
Ixion Biotechnology, Inc	Alachua
Life Sciences, Inc.	St. Petersburg
Molecular Meds	Alachua
Morphogenesis Inc	Oldsmar
Nabi Biopharmaceutical	Boca Raton
Nanobac Life Sciences	Tampa
Nanomedex	Alachua
Nanosystems Research, Inc	Alachua
Nanotherapeutics	Alachua
Neurostem (Formally Regenmed)	Alachua
Novamin	Alachua
Oglesby Plant Laboratories Inc	Altha
Oragenics Inc	Alachua
Osprey Biotechnics	Sarasota
Osprey Pharmaceutical Company	Ponte Vedra B.
Pasteuria Biosciences Llc	Alachua
Quick-Med Technologies, Inc.	Gainesville
Regeneration Technologies Inc	Alachua
Saneron Ccel Therapeutics, Inc	Temple Terrace
Smith & Nephew Inc	Largo
Somatocor Pharmaceutical Inc	Alachua
Source Molecular Corporation	Miami
Sunol Molecular Corporation	Miramar
Tequesta Marine Biosciences	Boca Raton
Toxin Technology, Inc.	Sarasota
Transdermal Technologies	Lake Park
Transgenex Therapeutics Inc	Tampa
Tutogen Medical, Inc.	Alachua
Usbiomaterials	Alachua
Vaxdesign Corporation	Orlando
Vicor Technologies Inc	Boca Raton
Viragen, Inc	Plantation

FLORIDA PHARMACEUTICAL COMPANIES

“There are currently 81 companies, employing more than 4,000 Floridians in the pharmaceutical and medicine manufacturing industry. The state’s pharmaceutical companies tend to be clustered along the high tech corridor (particularly in the Tampa bay area) and in south Florida. The industry can further be broken down into the following sub-categories:”

<http://www.eflorida.com/keysectors/bio/bio.asp?level1=22&level2=115&level3=363&level4=117>

- *Medicinal And Botanical Manufacturing (Naics 325411)
- *Pharmaceutical Preparation Manufacturing (Naics 325412)
- *In-Vitro Diagnostic Substance Manufacturing (Naics 325413)
- *Biological Product Manufacturing (Naics 325414)

A Healthy Alternative Inc.	Punta Gorda
Advanced Nutrients Science Int'l.	Largo
Arnet Pharmaceutical Corp.	Fort Lauderdale
Aurora Laboratories Inc.	Palm City
Balassa Laboratories Inc.	Port Orange
Bausch & Lomb Pharmaceuticals	Tampa
Beach Products Inc.	Tampa
Bgs Medical Products Inc.	Venice
Bodyne Inc.	Sarasota
Bio-Nucleonics Inc.	Miami
Biotelemetrics Inc.	Boca Raton
Cardinal Health Inc.	St. Petersburg & Winter Haven
Cargill Inc.	Auburndale
Central Admixture Pharmacy	Hialeah
Conseal International Inc.	Longwood
Coronet Industries Inc.	Plant City
Dci Biologicals	Dunedin
Florida Supplement Corp.	Hollywood
Great American Natural Pdts	St. Petersburg
Gulf Coast Nutritionals Inc.	Greens +Vero Beach
H V S Labs Inc.	Naples
Health & Nutrition Systems	Naples
Healthlink	West Palm Beach
Hill Dermaceuticals Inc.	Jacksonville
Horizon Worldwide Export Corp.	Sanford
Innovative Health Products Inc.	Miami
Ion Laboratories Inc.	Largo
	Clearwater

Ivax Baker Norton	Miami
Ivax Corp.	Miami
Kato Sales Inc.	Altamonte Springs
King Pharmaceuticals Inc.	St. Petersburg
Kirk Pharmaceuticals Inc.	Fort Lauderdale
Kos Pharmaceuticals Inc.	Hollywood
Kos Pharmaceuticals Inc.	Miami
Lex Inc.	Miami
Life Extension Foundation	Hollywood
Life Sciences Inc.	St. Petersburg
Millenium Natural Health Inc.	Miami
Montco Research Products Inc.	Hollister
Monticello Drug Co	Jacksonville
Nabi Biopharmaceuticals	Boca Raton
Nature's Path Inc.	North Port
Nature's Products Inc.	Fort Lauderdale
Naturopathic Laboratories Intl.	Clearwater
Naturopathic Research Labs	North Port
Nephron Pharmaceuticals Corp.	Orlando
North Amer Biopharmaceuticals	Hollywood
Nutraceuticals Corp.	Fort Lauderdale
Nutrition Formulators Inc.	Miami
Optimum Nutrition Inc.	Sunrise
Osprey Biotechnics Inc.	Oneco
Pal Laboratories Inc.	Miami
Peak Performance Nutrients Inc.	Boca Raton
Pegasus Laboratories Inc.	Pensacola
Pet Net Pharmalogic Llc	Fort Lauderdale
Pharmakon Laboratory Inc.	Tampa
Plantation Botanicals Inc.	Felda
Prostahelp Inc.	Coral Gables
Protech Manufacturing & Packg	Clearwater
Quest International Inc.	North Miami
Re-Vita Manufacturing Co	Orange Park
Rexall Sundown Inc.	Boca Raton
Saw Plmtto Berries Coop Of Fla	Naples
Schering-Plough Corp.	Hialeah
Schleicher & Schuell Microscience	Riviera Beach
Sentry Supplement Co Inc.	Opa Locka
Smith & Nephew Inc.	Largo
Southern Botanicals	Clearwater
Star Pharmaceutical Inc.	Pompano Beach
Swiss Caps Usa Inc.	Miami
Synergy Nutritional Industries	Fort Walton Beach
Thermadrol.Com	Fort Lauderdale
Transdermal Technologies Inc.	West Palm Beach

Trim International
Unico Holdings Inc.
Viragen Inc.
Vista Pharm
Vitarich Laboratories Inc.
Watson Laboratories Inc.
Zirin Laboratories Intl.

Pensacola
Lake Worth
Plantation
Largo
Naples
Hialeah
Pembroke Pines

“The Bioscience Industry is emerging as one of the key technology sectors in Florida and, with its continued growth, is playing a vital role in the economic diversification of our state. BioScience is one of the most viable, dynamic industry sectors in the world. With the continued support of and collaboration among our public and private leaders, Florida is poised for rapid growth and national leadership in this important industry.”

Governor Jeb Bush
(<http://www.bioflorida.com/>)

**University of South Florida
College of Medicine
Department of Molecular Medicine**

MASTER'S DEGREE IN BIOTECHNOLOGY

**<http://molecularmedicine.health.usf.edu>
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