



# International Center of Biotechnology

TRADE  
DEVELOPMENT  
ALLIANCE  
*of*  
GREATER  
SEATTLE



The Greater Seattle region has emerged as one of the top biotechnology centers in the United States. Top notch research institutions such as the University of Washington and Fred Hutchinson Cancer Research Center, coupled with Greater Seattle's spirit of entrepreneurship and innovation, have attracted talent and biotech companies to the region. Fundamental breakthroughs and applications are taking place in Greater Seattle every day.

[Research and Training](#)

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## RESEARCH AND TRAINING

Research centers and institutions are the most important factor in incubating high-tech industries. The Greater Seattle area has many leading educational and research institutions providing top-notch education and training for biotechnology employees. Among those, two form the technology foundation for Washington state's biotechnology industry: the [University of Washington](#) (UW) and the [Fred Hutchinson Cancer Research Center](#) (the "Hutch").

Many companies trace their lineage directly to the University of Washington. The School of Medicine is among the top ten institutions in the country in technology transfer. The University has licensed to corporations hundreds of new technologies that form the basis of commercial processes and products in use today. It has licensed intellectual property rights for 130 new start-up companies, the majority of which are located in the Greater Seattle area. The list includes such well-known corporate names as Advanced Technology Laboratories, [Optiva](#), and [ZymoGenetics](#). The Hutch's office of technology transfer has also parented biotechnology firms, including Immunex (now [Amgen](#)), [Targeted Genetics](#) and [Rosetta Inpharmatics](#). Research at these institutions has created thousands of new jobs in the state and spawned major new industries.

According to the Brookings Institution, Greater Seattle's research and development alliances are worth \$692 million, the fifth largest in the country. In addition, the region can boast of more than 1,800 life scientists.

### **Harborview Medical Center**

Managed by the University of Washington, Harborview is a respected teaching and research center. The medical center attracts more than \$40 million annually in public and private research funds.

The University of Washington Academic Medical Center Research and Training Building was completed in 1999 on the Harborview campus. The new facility added 179,000 square feet of space for research activities based at Harborview. Basic science programs in the Research and Training Building cover a broad spectrum of research related to the mission of Harborview.

These include trauma, HIV/AIDS, heart disease, as well as several others.

### **Children's Hospital and Regional Medical Center**

[Children's](#) is the pediatric teaching hospital for the University of Washington School of Medicine, with the Department of Pediatrics based at Children's. The Hospital is at the forefront of research in areas such as nonintervention technology in assessment of cardiac function, the effect of antimetabolites in AIDS infections and the effect of recombinant colony-stimulating factors in cyclic neutropenia (a blood disorder characterized by low levels of certain white blood cells called neutrophils).

### **Seattle Biomedical Research Institute (SBRI)**

The mission of [SBRI](#) is to conduct basic research leading to the prevention, diagnosis and cure of infectious diseases responsible for the majority of deaths worldwide. It

studies pathogens, parasites, tropical and opportunistic diseases using molecular biology and genomics approaches. The Institute has active programs on malaria, tuberculosis, AIDS, leishmaniasis, Chagas' disease, trypanosomiasis, candidiasis, toxoplasmosis and listeriosis. In 1999, SBRI received a \$5 million grant for the identification of antigens for a malaria vaccine. Other programs on tuberculosis and yeast infections were also expanded through new grant support. The two HIV vaccine projects underway involve viral proteins and dendritic cells in monkeys. A research program, which began in 2000, studies food-borne pathogens, while research on parasite genomics has increased scientists' DNA sequencing and bioinformatics capability.

### **Institute for Systems Biology**

[The Institute for Systems Biology](#) commenced operations in January 2000. Systems biology studies the complex interaction of numerous gene, protein and cell elements that form informational networks and systems. Led by Dr. Leroy Hood, former professor of biomedical sciences at the University of Washington and founder of the University's Department of Molecular Technology in 1992, the Institute's goal is to unite biologists, chemists, computer scientists, engineers, mathematicians and physicists in the endeavor of unraveling biological codes.

### **Benaroya Research Institute at Virginia Mason (BRI)**

The research laboratories at [BRI](#) focus on molecular and cellular biology of the human immune system and on genetics of human diseases. Scientists at BRI developed a DNA test to identify patients at risk for rheumatoid arthritis. BRI scientists also participate in teaching and graduate programs at the UW School of Medicine including an active post- and pre-doctoral program for research training. BRI has a clinical research program which supports more than 150 studies each year, primarily Phase II-III medication and device trials, in 25 different subspecialty areas. Specialized clinical research units provide expertise in diabetes, arthritis and cancer related studies. BRI's new facility, the 113,000 square-foot Benaroya Research Institute, houses research in molecular genetics, immunogenetics, diabetes, immunotherapy and immunobiology, with a staff of over 100.



## UNIVERSITY OF WASHINGTON

Greater Seattle's University of Washington (UW) is regarded as one of the top public research and development universities in the nation. Graduates from the UW and other regional institutions become the work force for the region's biomedical and biotechnology companies.

In federal support for research, the University ranks second only to Johns Hopkins University. Since 1974, UW has been the number one public university in America to receive federal support for research and training. Federal agencies provide about 82 percent of the University's grant and contract support.

The UW Medical Center is considered one of the top ten teaching hospitals in the nation. The Medical Center has internationally-recognized programs in cancer treatment, cardiac surgery and videoendoscopic surgery. The 2002 U.S. News and World Report annual listing of best medical schools ranked the UW School of Medicine number one in the nation in family medicine, number one in rural medicine, number five in AIDS research, number ten in top medical schools for research and number one in top medical schools for primary care. The UW School of Nursing ranks number one in the nation for its master's degree programs. The UW School of Public Health and Community Medicine offers advanced training in biostatistics, epidemiology, environmental and occupational health, community medicine and research on health care delivery systems.

The [UW Genome Center](#) (UWGC), which lured famed scientist Leroy Hood to Seattle in 1992, is one of the best in the nation. Its objective is to identify the nucleotide sequence of all genes and other DNA material that make up the genetic script written out along all the chromosomes. Joint funding for the UWGC comes from the National Institutes of Health (NIH) and the US Department of Energy, and local software billionaire Bill Gates provided much of the \$12 million needed for the program.

Among UW medical scientists, three are Nobel Prize winners, 20 have been elected to the National Academy of Sciences and 25 are members of the Institute of Medicine.

Since 1985, Greater Seattle has incurred a 0.9% increase in NIH funding for medical schools, the most in the country. The Brookings Institution cites the University of Washington as the third-largest recipient of NIH grants.

## FRED HUTCHINSON CANCER RESEARCH CENTER

The Fred Hutchinson Cancer Research Center is an independent, nonprofit organization whose mission is to eliminate cancer as a cause of human suffering and death. The Basic Sciences Division investigates the fundamental causes of cancer at the cellular level and awards a graduate degree in Cellular and Molecular Biology jointly with the University of Washington. The Clinical Research Division, a pioneer in the development of bone marrow transplantation, continues the search for better treatments. The Public Health Sciences Division studies the occurrence of cancer in human populations. The Human Biology Division expedites the translation of laboratory advances into clinical applications and public health programs. The Center employs more than 2,200 scientists and staff, more than 500 of whom hold either master's or doctoral degrees.

Since 1975 the Hutch has treated 6,000 patients, including people from 46 countries. Today, 28,000 patients a year undergo marrow transplants around the world, with a fifth of the transplants (a treatment pioneered by Nobel Laureate and Hutch scientist, Dr. E. Donnall Thomas) performed in Seattle. The Center has trained most of the physicians who perform bone marrow transplants at more than 200 centers worldwide.

Hutch scientists continue to achieve national recognition for their breakthrough discoveries in cancer and related diseases. Dr. Effie Petersdorf received the Presidential Early Career Award for Scientists and Engineers. The 1999 Elizabeth Glaser Scientist Award was presented to Julie Overbaugh and three others for their breakthroughs in HIV/AIDS research. Hutch president and UW professor, Dr. Lee Hartwell, was awarded the Nobel Prize in Medicine.

In order to foster the transfer of information for all kinds of cancer-related diseases, the Hutch has formed the [Seattle Cancer Care Alliance](#) (SCCA) with the University of Washington and Seattle Children's Hospital. The Alliance consolidates the adult and pediatric medical oncology clinical programs. Adult inpatient facilities are at the University of Washington, while the outpatient facility is on the Hutch's campus.

The Hutch has one of the largest and most world-renowned public health sciences divisions, with 70 faculty experts, in identifying genetic susceptibility in the population to all the common diseases. The Cancer Prevention Research Program is the largest in the world, with more than half a million people around the globe participating in studies. It is also the largest recipient of grants from the National Cancer Institute. Recently, the National Cancer Institute named the Hutch to lead an \$8 million, four-year project aimed at cutting the nation's colon cancer rate, and boosting pancreatic cancer survival.

In early 2001, the National Institutes of Health (NIH) formed the HIV Prevention Trials Network, a \$30 million international organization to study non-vaccine prevention strategies for HIV, the causative agent of AIDS. The Hutch received \$5 million to house the network's Statistical and Data Coordinating Center, under the direction of Dr. Thomas Fleming, an investigator in the Public Health Sciences Division. In addition, NIH's Institute of Allergy and Infectious Disease announced follow-up results confirming last summer's preliminary findings of the HIVNET 012 trial, which showed that a single dose of the antiviral drug Viramune (nevirapine) almost halves the incidence of mother-to-child HIV transmission. The Hutch houses the statistical and clinical coordinating center for HIVNET, an international effort for AIDS prevention established by NIH in 1994. The coordinating center is now named Statistical Center for HIV/AIDS Research and Prevention (SCHARP).

## INDUSTRY

The Greater Seattle area has one of the most significant concentrations of biotechnology companies in the United States. The region is now becoming increasingly well known as one of the premier biotechnology centers in the world. This is due to the area's world-class research institutions, entrepreneurial spirit, governmental assistance and the region's dynamic economy.

There are nearly 160 companies dedicated to biotechnology in Washington, most in the Greater Seattle area. Statewide, 51% of these companies pursue the research and development of therapeutic products, 32% focus on diagnostics, 12% on contract manufacturing and genetic testing, 4% on plant, agriculture and animal research, and 1% on natural resources. Since 1995, local companies have attracted more than \$400 million in venture capital investment and produced more than \$500 million in research partnerships with biotech and pharmaceutical companies.

### Much Growth Ahead

Deloitte & Touche's Fast 50 List ranks the 50 fastest-growing technology companies in Washington state based on percentage revenue growth over the past five years. In 2000, number one went to [Icos](#), developer of drugs for acute and chronic conditions, which had five-year revenue growth of 5,207 percent. Targeted Genetics, spawned from Immunex and known for integrated gene and cell therapies for treatment of acquired and inherited diseases, came in fifth with a 3,821 percent growth. Immunex Corporation, which merged with Amgen to form the world's largest biotechnology company, reported significant income gains, largely from the sale of Enbrel (etanercept) approved by the FDA in 1998 for the treatment of rheumatoid arthritis. By early 2003, the former Immunex will have a larger Seattle research and development facility on Elliott Bay. In addition, the Bothell plants will continue to be used and Amgen plans to boost charitable contributions focusing on the Pacific Science Center, science education programs and community and social service.

As a whole, the state's 15 publicly-traded biotechnology firms reap 3.6% of the sector's market value and 4.3% of total venture capital investments in biotechnology. Approximately 7,100 people statewide are employed in the industry, nearly two-thirds of them in smaller companies with fewer than 50 employees.

### Entrepreneurial Spirit

Many organizations have sprung up to assist in the creation of biotechnology companies. The Alliance of Angels, a private economic development group, aims to improve the interactions among investors and emerging local technology companies seeking funding. The [Technology Alliance](#), a consortium of Washington state technology businesses, their trade associations and research institutions, offers members the opportunity to network and learn from each other. The [Washington Technology Center](#), funded by the State, provides grants to professors to encourage them to team up with entrepreneurs. Since 1995, Seattle has ranked sixth in the nation for National Institutes of Health (NIH) support, attracting more than \$500 million annually in federal research grants. The close proximity of application-driven research institutes, innovative medium-sized

businesses and new high-tech firms offer real potential for the establishment of future orientated technological solutions.

Between 1975 and 1999, more than 870 biotechnology related patents were obtained in Greater Seattle. The Brookings Institution ranks the area sixth based dollar amount of venture capital investment.

### **State Government Initiatives**

The State of Washington has taken an active part to promote the biotechnology industry. Washington has no corporate or personal income tax. The state sales tax is 6.5%, and some local sales taxes range from 0.5% to 2.0%. Capital investments for qualified high-technology firms are exempt from the state sales tax and receive a credit against business and occupation taxes for their research and development expenditures.

### **Skilled Workforce**

A cutting-edge, high-technology economy is nourished by an educated workforce. A skilled workforce does not happen by accident. Greater Seattle boasts many excellent educational and research institutions, offering the scientists and technicians of tomorrow the best education possible. From [Seattle Central Community College's](#) biomedical technology program to the University of Washington's training program in virtual-reality software development, graduates learn from instructors at the forefront of the field.

### **Impact of Research on People's Lives**

All biotechnology companies in the Greater Seattle area have at least one thing in common - they are committed to saving lives and preventing diseases. ZymoGenetics has expertise in protein cloning and expression. Therapeutic protein discoveries and innovations include: thrombopoietin; antibodies to platelet-derived growth factor (PDGF); PDGF for diabetic foot ulcers (Regranex); Factor VII (NovoSeven); and the process for production of human insulin.

Targeted Genetics has programs on inherited genetic diseases such as cystic fibrosis and hemophilia A, cancer and infectious diseases. Cell Therapeutics, Inc. (CTI) recently received FDA grant approval for TRISENOX to treat acute promyelocytic leukemia (APL). CTI is evaluating the potential of this drug in both hematological and solid cancers. Another area of research involves the study of the mucosal epithelial and immune cells in health and disease by Amgen, with the aim of identifying potential new therapies for treatment of intestinal disorders such as gastrointestinal problems associated with some cancer chemotherapies or inflammatory bowel disease. These are only a few examples of products from Greater Seattle's biotechnology industry.

## Contacts

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