

Profile of Biomedical Research and Biotechnology Commercialization

Washington-Baltimore Consolidated Metropolitan Statistical Area

Overview and History of Biotechnology in Washington-Baltimore

The Washington, D.C., and Baltimore, Maryland, metropolitan area benefits from the region's wide array of research institutions, including Johns Hopkins University, located in Baltimore, and the National Institutes of Health (NIH), located in Montgomery County, Maryland. The critical role that the federal government plays in funding and setting priorities for medical research and in regulating the development and use of new diagnoses and therapies means that the region has strong connections to the biotechnology industry. A large number of scientists and professionals have extensive experience in the industry, and Washington is home to the industry's principal trade association, BIO.

Washington and Baltimore have a large number of research institutions; Johns Hopkins University is the leading recipient of NIH research funding. Many of the biotechnology firms in the region are located in Montgomery County and are suppliers of services, equipment, and products to NIH and to other biotechnology establishments. The region is a leader in mapping the human genome and is home to the publicly funded Human Genome Project and to two leading private firms, Celera and Human Genome Sciences, all of which develop and distribute genetic information that other biotech and pharmaceutical companies use in their research. Celera was started by Craig Venter, a former NIH gene researcher. The area's strength in genomics led another company, Gene Logic, to relocate its operations to the area from New Haven, Connecticut.

The Washington-Baltimore Consolidated Metropolitan Statistical Area had a year 2000 population of 7.6 million, making it the fourth-largest metropolitan area in the United States. During the 1990s population in the Washington-Baltimore area grew by more than 13 percent. The consolidated metropolitan area includes Baltimore, Washington, and adjacent metropolitan counties in Maryland, Virginia, and West Virginia.

Biomedical Research Activity in Washington-Baltimore

The Washington-Baltimore metropolitan area is a hub for biomedical research activity. Of the nine metro areas studied, the Washington-Baltimore area has the most life scientists—more than 6,600. There are 12 biological institutions granting life science PhDs; one of these institutions is ranked among the top 20 nationally in life sciences research. Total NIH financial support flowing to the Washington, D.C., area is more than \$952 million annually.

Table 1. Washington-Baltimore: Indicators of Biomedical Research

Biomedical Research Indicators	Year	Washington-Baltimore, DC--MD--VA--WV CMSA
Life Scientists Employed	1998	6,670
Institutions Granting Life Science PhD Degrees	1999	12
Life Science PhDs Granted	1999	241
Universities Ranked among the Top 20 Nationally in Life Sciences Research	1982	1
Total NIH Financial Support	2000	\$952,835,848
NIH Funding for Medical Schools	1985	\$230,969
	1990	\$365,016
	1995	\$504,357
	2000	\$678,905
Biotechnology Patents	1975–79	121
	1980–89	470
	1990–99	2,162

Johns Hopkins University in the Washington-Baltimore area ranks first in the list of research institutions granted research funding by the National Institutes of Health; it received \$419 million in NIH funds in 2000. Other Washington-Baltimore institutions that receive funding from NIH rank relatively low: Georgetown University and the University of Maryland at Baltimore received about \$150 million together.

**Table 2. Washington-Baltimore:
Principal NIH–Funded Research Institutions, 2000**

Rank	Institution	Research Grants	Grant Amount (in millions)	Total NIH Support (in millions)
1	Johns Hopkins University	924	\$378.2	\$419.3
45	University of Maryland, Baltimore	268	\$75.8	\$90.3
72	Georgetown University	169	\$55.3	\$58.9

Source: National Institutes of Health

The main patent holders in the Washington-Baltimore area are public institutions and federal government agencies. The top two patent holders are the U.S. Department of Health and Human Services, of which NIH is a part, and John Hopkins University. These two institutions account for almost 800 patents during the 1990s. Human Genome Sciences, Inc., began to register patents in the 1990s and holds 58 patents to date.

Table 3. Washington-Baltimore: Top Biotechnology-related-Patent Holders, by Decade, 1975–1999

Rank	Company Name	1970s	1980s	1990s
1	United States of America, Health & Human Services	12	110	588
2	Individually Owned Patents	14	84	201
3	John Hopkins University	5	19	181
4	Human Genome Sciences, Inc.			85
5	University of Maryland		4	69
6	Life Technologies, Inc.		6	59
7	United States of America, Navy	2	4	47
8	United States of America, Army	4	32	43
9	United States of America, Department of Agriculture	11	31	42
10	Becton, Dickinson and Company	2	8	37
11	W.R. Grace & Co., Connecticut	10	19	35
12	Georgetown University		6	34
13	Fuisz Technologies, Ltd.			31
14	Gillette Company	1	5	21
15	Guilford Pharmaceuticals, Inc.			21
16	Asgrow Seed Company			18
17	GPI Nil Holdings, Inc.			18
18	Akzo N.V.		1	15
19	Martek Corporation			13
20	Monsanto Corporation			13

Source: U.S. Patent & Trademark Office, 2001

Biotechnology Commercialization in Washington-Baltimore

The Washington-Baltimore area is the least entrepreneurial region among the nine studied. The area has attracted more than \$85 million in venture capital investment in biopharmaceutical firms since 1995. Investments have been made in 20 new firms, despite the region's lack of venture capital companies. The area has had two initial public offerings by biotech companies since 1998 and has attracted more than \$17 million in pharmaceutical-biotech research alliances since 1996. The area has 23 publicly traded biotech companies with an aggregate market capitalization of nearly \$23 billion. The industry includes 23 firms with more than 100 employees, and 61 firms are members of the national Biotechnology Industry Association.

Table 4. Washington-Baltimore: Indicators of Biotechnology Commercialization

Indicator		Washington- Baltimore, DC--MD--VA--WV CMSA
Venture Capital Investment, 1995–2001	Number	20
	Amount	\$ 85,150,000
	Share	1%
Venture Capital Firms among the 50 Most Active in Biopharmaceutical Investment	1995–2001	-
Number of Initial Public Offerings by Biotech Companies	1998–2001	2
Value (in millions) of Research Alliances between Pharmaceutical Companies and Local Biotechnology Companies	Prior to 1990	\$17
	1990–1995	\$260
	1996–2001	\$358
Number of Publicly Traded Biotechnology Companies	2001	23
Market Capitalization (in millions) of Local Biotechnology Companies, 2001	2001	\$23,062
Local Biotechnology Firms Established	through 1980	13
	1981–1990	45
	1991–2001	23
	Not Available	2
	All Firms	83
Local Biotechnology Firms with More than 100 Employees	2001	23
NAICS 3254: Pharmaceuticals	Establishments	25
	Employment	1,750
NAICS 5413: Life Sciences R&D	Establishments	284
	Employment	7,499
Number of Members of the Biotechnology Industry Organization (BIO)	2001	61

The Washington-Baltimore area's largest biotechnology firms are EG and G Inc. and Life Technologies, which is also a prolific patent holder (59 patents in the 1990s).

Table 5. Washington-Baltimore: Principal Biotechnology Firms

Company	City	Employment	Segment
EG and G Inc.	Gaithersburg	4,200	Equipment; Reagents; Human Clinical Diagnostics; Environmental Testing/Treatment; Immunological Products; Testing
Life Technologies Inc.	Rockville	1,700	Reagents; Equipment; Cell Culture; Production/Fermentation; Veterinary
Alpharma, U.S. Pharmaceuticals Division Inc.	Baltimore	807	Therapeutics; Drug Delivery; Cosmetics/Health/Beauty Products
MedImmune Inc.	Gaithersburg	664	Therapeutics; Vaccines; Production/Fermentation; Immunological Products
Bio Reliance	Rockville	427	Testing/Analytical Services; Production/Fermentation; Gene Therapy; Toxicology
BioWhittaker Inc.	Walkersville	425	Reagents; Cell Culture; Specialty Chemicals; Clinical Diagnostics
Human Genome Sciences Inc.	Rockville	415	Therapeutics; Clinical Diagnostics; Vaccines
Genetics and IVF Institute	Fairfax	378	Clinical Diagnostics; Cell Culture; Bioinformatics; Medical Devices; Testing/Analytical Services
Celera Genomics Corporation	Rockville	359	Bioinformatics
Meridian Medical Technologies Inc.	Columbia	340	Drug Delivery Systems; Therapeutics

Source: Institute for Biotechnology Information, 2001

Venture capital investment in biotechnology firms in the Washington/Baltimore area has generally been less than \$10 million per year, except for a surge in investment in 2000.

Table 6. Washington-Baltimore: Venture Capital Investment in Biopharmaceutical Firms, 1995–2001

Year	Venture Capital
1995	\$3,500,000
1996	\$ 9,000,000
1997	\$ 3,000,000
1998	\$ 9,000,000
1999	\$ 5,000,000
2000	\$ 49,450,000
2001*	\$ 6,200,000

Source: PriceWaterhouseCoopers, 2001 (* Six Months)