

## Sector Profile

# Biotechnology

### What is Biotechnology?

The biotechnology sector is best understood as a group of diverse industries with a common link — the application of biological scientific knowledge. Biotechnology harnesses cellular and biomolecular processes to develop technologies and products that combat debilitating and rare diseases, reduce our environmental footprint, feed the hungry, use less and cleaner energy, and have safer, cleaner and more efficient industrial manufacturing processes.<sup>1</sup>

The sector represents a mix of five industry clusters:

- Agricultural Feedstock & Chemicals
- Drugs & Pharmaceuticals
- Medical Devices & Equipment
- Research Testing & Medical Laboratories
- Bioscience-related Distribution

### INSIDER PERSPECTIVE

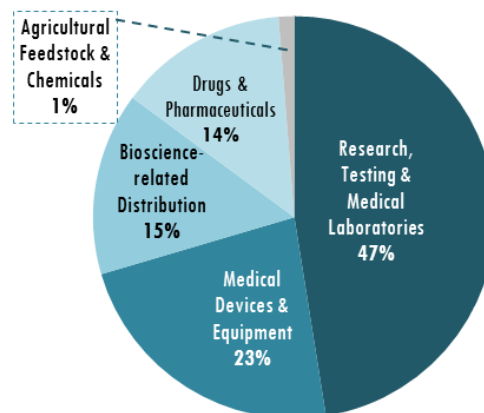
“States and regions are targeting the bioscience sector because it is a source of high-wage, high-skill jobs. But policymakers also realize that biosciences development holds great promise in its ability to address global problems, from human health to food generation and security to environmental sustainability and clean energy. Bioscience development pays huge social and quality of life dividends for the U.S. and the world.”

— Mitchell Horowitz, Vice-President  
Technology and Partnership Practice, Battelle

### Quick Facts

- California has the largest biotechnology employment base in the U.S. with more than 228,000 jobs, a figure which has steadily grown and outpaced the nation.
- California’s largest biotechnology subsector, Research, Testing and Medical Labs, has increased employment by 36% since 2001 and maintained strong job growth even during the recent recession years.
- The average California biotechnology job paid \$96,962 in 2010; \$44,426 more than the average private sector job.
- \$4.7 billion in biotechnology-related venture capital (VC) investments were made in California in 2011, accounting for one of every three VC dollars invested in the state.

**BIOTECHNOLOGY INDUSTRY CLUSTERS BY EMPLOYMENT**  
CALIFORNIA, 2010



### Why Biotechnology?

The biotechnology sector has demonstrated that it is a strong and steady job generator, growing jobs over the past decade at a pace well above the national average. It also has fared much better than the overall economy through the recent U.S. recession and into the first year of the recovery. When compared with other major knowledge economy industries, which are critical for advancing high quality jobs, the biotechnology industry has led in job creation during the 2001 to 2010 period.

A primary reason for the resiliency of biotechnology is the diverse set of markets it serves. These markets span: biomedical drugs; diagnostics and devices; agricultural products from animal health to seeds and crop protection; and bio-based industrial products such as enzymes for industry chemical processes and bio-remediation, bio-fuels, and bio-plastics.

Total CA Bioscience Industry Employment	228,700
CA Bioscience Industry Location Quotient <sup>2</sup>	1.26
CA Biosciences Industry Establishments	7,468

- National employment in the bioscience industry totaled 1.61 million in 2010, with these jobs spanning over 70,000 individual business establishments.

<sup>1</sup>The Battelle/BIO State Bioscience Industry Development report (2012) is the primary source for the data found in this sector profile.

<sup>2</sup>Battelle/BIO, 2012. An LQ >1.0 indicates an industry with a greater share of the local area employment than in the reference area. In this case, California’s biotech industry (1.26) is compared to the nation (1.0).

## What is Driving Growth?

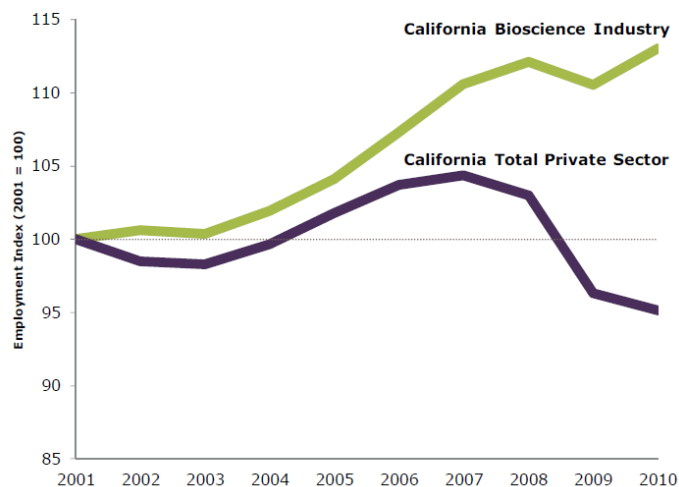
The biotechnology sector offers California a high value economic driver. It stands out in its creation of high quality jobs, the breadth of markets it serves, its innovation and entrepreneurial strength, and its research and development intensity. An excellent example of how this all comes together is what has been accomplished with the human genome project in the U.S. This \$10.4 billion investment in basic sciences during the 1993 to 2010 period drove \$796 billion in economic impact, and created 3.8 million job-years of employment over this period.

Just as important, it launched the genomic revolution whose technologies, tools and basic biological knowledge have found applications across a wide range of economic activities beyond human healthcare, including agriculture and veterinary medicine; environmental remediation; biofuels; and other industrial applications.

Some key drivers of biotechnology growth are:

- Venture capital investments in major bioscience development initiatives.
- Development of the agricultural bioscience, bioenergy and bioproducts industry subsectors.
- Building research and development capacity and advancing commercialization of research discoveries.
- Continuing to address bioscience companies' needs for early-stage capital.
- Enacting tax policies that are supportive of bioscience companies.

**BIOSCIENCE & PRIVATE SECTOR EMPLOYMENT**  
CALIFORNIA, 2001-2010



Source: Battelle/BIO, 2012

## Challenges to Biotechnology Growth

To determine the issues of most concern to California biotechnology and bioscience companies, a survey was conducted jointly by the California Healthcare Institute, BayBio and PricewaterhouseCoopers in 2012. Respondents were asked to identify threats to the growth of the industry. The issue selected as most threatening by 56% of respondents was "FDA regulatory environment." "Access to capital" was identified as the second most threatening issue by 39%.

## What Industry Clusters are Growing?

The biotechnology sector in California accounts for over 228,700 jobs and 7,468 firms. Among the five industry clusters of which the industry is comprised, the Research, Testing and Medical Laboratories cluster is the largest with nearly 76,000 jobs, nearly 3,000 establishments and 36% growth in employment from 2001-2010. The next largest cluster is Medical Devices and Equipment with over 59,000 jobs and nearly 1,000 establishments. However, this cluster actually lost 7% of its workforce from 2001-2010. The Bioscience-related Distribution cluster experienced nearly 20% growth in employment over the 2001-2010 period, leading to a total of 47,535 jobs in 2010.

Biotechnology Industry Cluster	2010 Employment	2001-2010 Change	2007-2010 Change	# of Establishments
Research, Testing & Medical Laboratories	75,907	36.3%	13.8%	2,986
Drugs & Pharmaceuticals	43,162	10.2%	(1.8%)	466
Medical Devices & Equipment	59,450	(7.1%)	(2.5%)	995
Bioscience-related Distribution	47,535	19.9%	(3.5%)	2,985
Agricultural Feedstock & Chemicals	2,645	(31.6%)	(11.2%)	126

Source: Battelle/BIO, 2012

## Broader Impacts of Biotechnology: Employment Multipliers

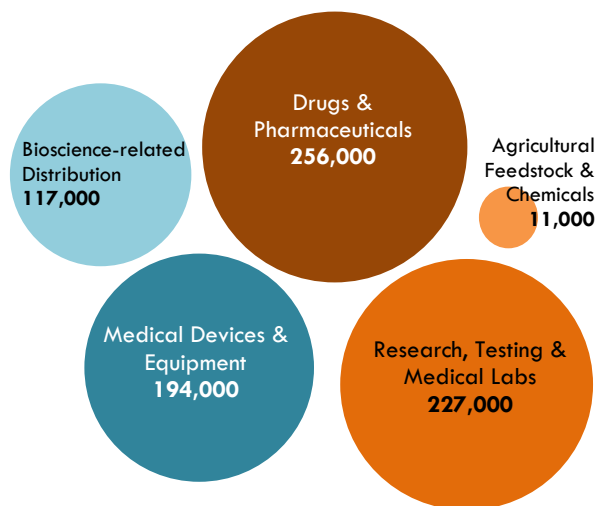
Biotechnology, like other industry sectors, has interdependent relationships with suppliers of other goods and services. The sector both supports and depends upon other entities to supply everything from business services to commodity inputs. As a result, the industry has a regional and national economic reach and impact that is greater than its total direct employment or earnings might suggest.

Employment in the biotechnology sector not only strengthens the biotechnology workforce, but also has impacts on employment in other industries. Using an employment multiplier provided by the Bureau of Economic Analysis (BEA), Battelle calculated the employment impact for the five biotechnology clusters to be a total of 805,000 jobs.<sup>3</sup>

### Where are the "Hot Spots"?

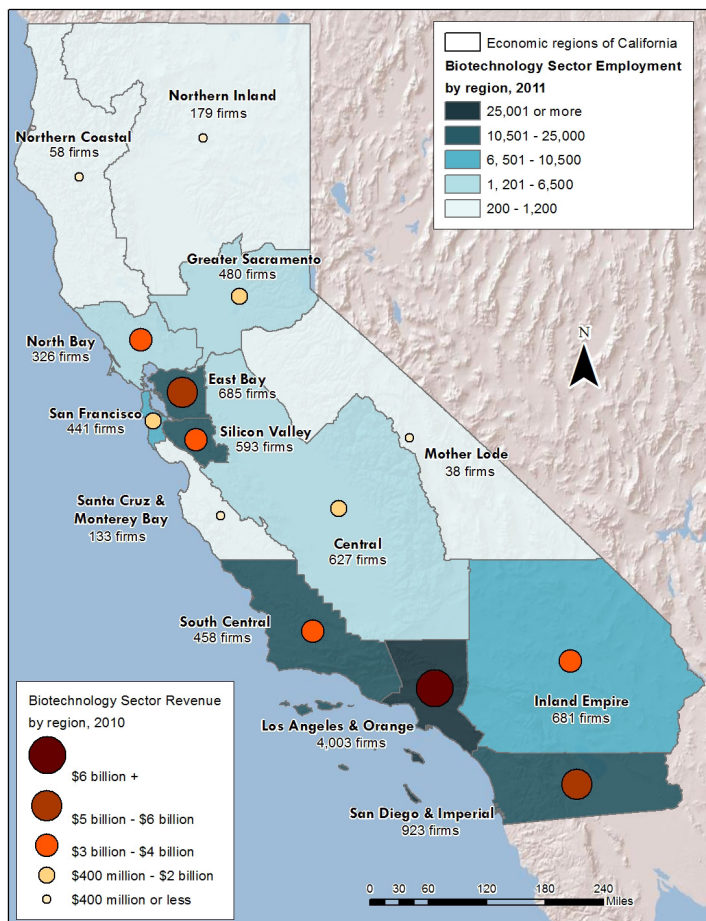
In the biotechnology sector, there are three regions that stand out based on employment and revenue — Los Angeles/Orange, greater San Francisco Bay Area, and San Diego/Imperial. The Los Angeles/Orange region accounts for about 41% of the businesses and has the most employees in the biotechnology sector with over 80,800 jobs as well as the highest sales revenues at more than \$23.6 billion.

### TOTAL EMPLOYMENT IMPACT BY BIOTECH INDUSTRY CLUSTER CALIFORNIA, 2010



Source: Battelle/BIO, 2012

### BIOTECHNOLOGY EMPLOYMENT & REVENUE BY REGION



### LOCATION OF BIOTECHNOLOGY FIRMS



<sup>3</sup>The multipliers represent the total change in number of jobs in all industries (direct, indirect, and induced effects) that result from a change of one job in the corresponding industry sector (Battelle/BIO, 2012).

## How Much Does It Pay?

Robust demand for today's high skilled bioscience workforce yields a significant wage premium and one that continues to widen with strong wage growth in recent years. Average wages paid to California bioscience industry workers reached \$96,962 in 2010, more than \$44,000 or 85% greater than the average paid in the private sector. Bioscience wage growth well outpaces that for the private sector, increasing by 15.4% in real (inflation-adjusted) terms since 2001 compared with just a 4.1% increase among all industries.

### AVERAGE EARNINGS IN BIOTECHNOLOGY SECTORS

CALIFORNIA, 2010



## What Jobs are in Demand?

Biotechnology sector jobs that are expected to be in high demand in the next three years represent various levels of required education and skills. However, the majority of the top 10 occupations in this sector require either moderate-term on-the-job training or an Associate Degree. Six of the top 10 biotechnology occupations listed below are projected to grow by 6% or more during the 2012-2015 period. Sales representatives (1,697) and Inspectors, Testers, Sorters (1,331) will have the most job opportunities (new and replacement jobs) over the next three years in the sector. Data in the table below is sorted by the number of job openings, which includes new and replacement jobs.

Between November 2012 and February 2013, there were over 10,549 online job postings for the 10 identified Biotechnology occupations in California. Individual totals are shown in the column on the far right. Although the majority of vacancies advertised were for first-line supervisors/managers of production and operating workers, entry-level occupations requiring community college credentials were also in the mix. Not shown in the table but deserving honorable mention were quality control analysts and clinical research coordinators with 382 and 373 postings, respectively.

### TOP JOB OPPORTUNITIES FOR BIOTECHNOLOGY TECHNICIANS & OPERATORS

CALIFORNIA, 2012-2015

Job Title	2012 Jobs	3-year Change	% Change	Openings	Median Hourly Wage	Minimum Education Level	Online Job Postings
Sales Reps., Whse. & Mfg., Tech. & Scientific Products	10,085	968	10%	1,697	\$36.84	Bachelor's degree	962
Inspectors, Testers, Sorters	7,660	640	8%	1,331	\$17.71	Moderate-term OJT	2,384
Medical and Clinical Laboratory Technicians	4,126	557	13%	799	\$19.62	Associate degree	1,244
Natural Sciences Managers	2,333	134	6%	561	\$68.74	Bachelor's or higher	145
Biological Technicians	3,128	199	6%	521	\$22.27	Bachelor's degree	153
Chemical Technicians	3,101	285	9%	464	\$21.08	Associate degree	99
Mixing & Blending Machine Operators	2,467	48	2%	330	\$15.57	Moderate-term OJT	49
Industrial Engineers	3,241	8	0.2%	275	\$44.23	Bachelor's degree	1,938
First-line Supervisors of Production Workers	4,087	77	2%	261	\$25.34	Related work experience	3,550
Life, Physical and Social Science Technicians	1,109	46	4%	188	\$23.73	Associate degree	25

Employers with the most job postings over the November 2012 to February 2013 period included: Johnson & Johnson (575); Genentech (302); Baxter (266); Roche (253); Amgen (150); Quest Diagnostics (148); Life Tech (127); Medtronic (126) and Novartis (120).

**Data notes and sources:** Data and information included in the Sector Profile were compiled from the following public and proprietary sources: Battelle/BIO State Bioscience Industry Development, 2012; 2012 California Biomedical Industry report (CA Healthcare Institute, BayBio and PriceWaterhouseCoopers); Bureau of Labor Statistics, CA Employment Development Department; Economic Modeling Specialists, Inc.; The Conference Board - Help Wanted Online; Burning Glass - Labor Market Insight; and the California Department of Finance.