DRIVING GROWTH IN BIOTECH
AN OUTSIDE PERSPECTIVE ON WHAT OTHER CLUSTERS ARE DOING, and STATE OF THE REGION: PROGRESS TOWARDS THE 2023 VISION

Richard Bendis
President & CEO
BioHealth Innovation
BioHealth’s Time is Now!

- Health care spending in North America is expected to increase on an average 4.9% during 2014-2018
- Pharmaceutical segment is expected to generate an all time high revenue of $1.23T.
- The global biotech segment is expected to post revenues of $288.7B in 2014. Revenues are projected to grow at an annual 9% up to 2019.

Source: Deloitte, 2015 Global Life Sciences Outlook
BioHealth Drivers

- Aging population
- Lengthening life expectancy
- Increase in chronic diseases
- Population growth
- Rising wealth
Healthcare Innovation Is Key to Controlling Costs

Health Costs as Percent of GDP

Source: PricewaterhouseCoopers Health Research Institute
BioHealth Market Size

- Biotech: $289 billion
- Pharma: $1.23 trillion
- Med tech: $364 billion
What is BioHealth?

- Therapeutics
- Diagnostics
- Medical Devices
- Healthcare Services
- E-Health
- Mobile Health
- Electronic Medical Records
- Health Informatics
- BioHealth Cyber Security
BioHealth Capital Region™

Advancing Science. Accelerating Innovation.

- Unrivaled Research Assets -
- Unfulfilled Commercial Promise -
- 800+ BioHealth Companies -
Regional Assets
Major Regional BioHealth Companies
BioHealth Commercialization Highlights in Virginia

- Merck announces $168M expansion
- Teva wins $170M vaccine manufacturing contract
- Leidos lands $4.3B contact for HER
- Gencia partners with Takeda
- Inova Center for Personalized Health launched at former global HQ campus of Exon Mobile in Fairfax
Major BioHealth Clusters in the US
Updated Genealogies of Central Maryland BioHealth Companies

A Report to the Economic Alliance of Greater Baltimore and BioHealth Innovation

MFBS LLC
2015

CENTRAL MARYLAND BIOHEALTH INNOVATION INDEX
FULL OF OPPORTUNITY
BioHealth Capital Region Cluster Fundamentals

- Home to more than 800 life sciences companies
- 70 federal labs including NIH and FDA
- More than 275,000 people in the region work in BioHealth industries.
- Region is densely concentrated with BioHealth degree holders and BioHealth professionals.
- Universities in the Region spend more on research and development than most peer markets.
- Small businesses in the BioHealth Capital Region earned over $92 million through government-funded SBIR and STTR awards in 2013. $1 billion was invested in BioHealth companies by venture firms between 2010 and 2014
- Three BioHealth firms have held IPOs in the last two years
## Central Maryland BioHealth Innovation Index Ranking

<table>
<thead>
<tr>
<th></th>
<th>Baltimore/CMD</th>
<th>Boston</th>
<th>New York</th>
<th>Philadelphia</th>
<th>Pittsburgh</th>
<th>Raleigh-Durham</th>
<th>San Diego</th>
<th>San Francisco</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talent</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>7</td>
<td>8</td>
<td>5</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>8</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Entrepreneurship</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Capital</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>7</td>
<td>8</td>
<td>4</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

### BioHealth Innovation Index

<table>
<thead>
<tr>
<th></th>
<th>BioHealth Innovation Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>
Innovation Index: Talent

- Percent of Residents with a Bachelor’s Degree or Higher
- Percent of Residents with a Graduate or Professional Degree
- Percent of Residents with BioHealth Degrees
- Number of BioHealth Workers
- Density of BioHealth Workers
- Young Professional Population
- Young Professional with a Bachelor’s Degree or Higher
- Population Growth
Results

Percent of Residents with a Bachelor’s Degree or Higher

2013

- Pittsburgh
- Philadelphia
- San Diego
- New York
- Baltimore/CM
- Raleigh-Durham
- Boston
- San Francisco

Percent of Residents with a Graduate or Professional Degree

2013

- Pittsburgh
- San Diego
- Philadelphia
- New York
- Raleigh-Durham
- San Francisco
- Baltimore/CM
- Boston

Source: American Community Survey, US Census Bureau
Innovation Index: R&D

- BioHealth Research and Development Expenditure at Universities
- BioHealth Research and Development Expenditure at Universities per Graduate
- Student Invention Disclosures at Universities
- Invention Disclosures at Universities per $100 of Sponsored Research
- Patent Awards at Universities Patent Awards at Universities per $100 of Sponsored Research
- Utility Patent Awards
- Utility Patent Awards per 10,000 Residents
Innovation Paradigm Shift

PROOF OF CONCEPT
(Technological Feasibility)
Laboratory Push
“It Works!”

PROOF OF COMMERCIAL RELEVANCE
(Market Pull)
“It Works To Solve A Problem”
“I’ll Buy It”
License Income at Universities
per $100 of Research Expenditure, 2013

Source: Association of University Technology Managers
Universities in the region spent over $1.7 billion on BioHealth R&D in 2013.
BioHealth Commercialization Highlights in Virginia

- VCU Engineering School leads the Medicine for All initiative reinventing small molecule drug manufacturing
- Ceres Nanoscience offers first direct antigen test for Lyme Disease
- Hemoshear lands $20M in SBIR funds
- Three Virginia companies, Dynport Vaccine, Leidos and TASC, share lead in $900M Medical Product R&D contract with DOD
Innovation Index: Entrepreneurship

- Startups at Universities
- Startups at Universities per $100 of Sponsored Research
- License Income at Universities
- License Income at Universities per $100 of Sponsored Research
- Health and IT Firms on the Inc. 5000
- Health and IT Firms on the Inc. 5000 per 10,000 Residents
Entrepreneurship in the BioHealth Capital Region

• Region has 121 of the fastest-growing private companies on the Inc. 5000 list

• 36 of the fast-growing companies in the region are Health and IT Services companies
Famous Regional Entrepreneurs

- Wayne T. Hockmeyer
- William Haseltine
- Martine Rothblatt
- Kevin Plank
- Sergey Brin
- Brendan Iribe
MedImmune Impact on the BioHealth Ecosystem

- Corvidia
- Nextcure
- MedImmune Ventures
- Corridor Pharmaceuticals
- ReveraGen BioPharma
- Sucampo Pharmaceuticals
- Novartis
- Macrogenics
- GlaxoSmithKline
- Amplimmune
- Lonza
- Genstar Capital
- Astrazeneca
- NEA
- Zyngenia
Incubators/Accelerators

RELEVANT HEALTH

Dreamit Health

ALEXANDRIA LAUNCHLABS™

MACH37™

1776 WHERE REVOLUTIONS BEGIN

FAST FORWARD

beta amore

BioHealth Capital Region Forum

Advancing Science. Accelerating Innovation.
Innovation Index: Capital

- SBIR and STTR Award Funding per 10,000 Residents
- NIH SBIR and STTR Award Funding per 10,000 Residents
- Total BioHealth Venture Capital Investment
- Average BioHealth Venture Capital Deal Size
- Total BioHealth Seed and Early Stage Venture Capital Investment
- Average BioHealth Seed and Early Stage Venture Capital Deal Size
- Initial Public Offerings
- Initial Public Offerings per 10,000 Residents
- BioHealth Initial Public Offerings
- BioHealth Initial Public Offerings per 10,000 Residents
- Market Capitalization of BioHealth IPOs on First Day of Trading
Public BioHealth Companies Headquartered in the Region
## Innovation Capital Valley of Death

<table>
<thead>
<tr>
<th>Stage</th>
<th>POR / Pre-Seed</th>
<th>Seed/Start-Up</th>
<th>Early</th>
<th>Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Founders, FFF</td>
<td>Angels, IBED, SBIR</td>
<td>Venture Funds</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bootstrapping</td>
<td>Accelerator Seed Funds</td>
<td>M&amp;A, IPO</td>
<td></td>
</tr>
<tr>
<td>Demand</td>
<td>$0K</td>
<td>$500K</td>
<td>$2M</td>
<td>+$5.0M</td>
</tr>
</tbody>
</table>

**“VALLEY OF DEATH”**

Funding Gap
Key VC Investment Criteria

• Disruptive Innovation.
• Large Clinical or Critical Unmet Need.
• Freedom-to-Operate / Large Barriers to Entry.
• Technology Proof-of-Concept Established.
• Investing in the gap between seed financing and Series A/B financing.
• High caliber Management with relevant domain expertise.
**Total Venture Capital Investment in BioHealth**

in Millions of Dollars, 2010-2014

- Pittsburgh
- Raleigh-Durham
- Baltimore/CMIO
- Philadelphia
- New York
- San Diego
- Boston
- San Francisco

**Average Venture Capital Deal Size in BioHealth**

in Millions of Dollars, 2010-2014

- Pittsburgh
- Philadelphia
- Baltimore/CMIO
- Raleigh-Durham
- New York
- San Diego
- San Francisco
- Boston

Source: Pricewaterhouse Coopers MoneyTree, EAGB Analysis
Large Number of Regional Companies are Underfunded

<table>
<thead>
<tr>
<th>Sector</th>
<th>Number of Companies</th>
<th>Number of Companies Funded</th>
<th>Percentage of Companies Funded</th>
<th>Amount of Funding ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare IT</td>
<td>104</td>
<td>11</td>
<td>10.58%</td>
<td>$228.4M</td>
</tr>
<tr>
<td>Therapeutics</td>
<td>78</td>
<td>38</td>
<td>48.72%</td>
<td>$1,139.5M</td>
</tr>
<tr>
<td>Diagnostics</td>
<td>94</td>
<td>25</td>
<td>26.60%</td>
<td>$310.0M</td>
</tr>
<tr>
<td>Medical Devices</td>
<td>66</td>
<td>12</td>
<td>18.18%</td>
<td>$238.6M</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>342</strong></td>
<td><strong>86</strong></td>
<td><strong>25.15%</strong></td>
<td><strong>$ 1.917B</strong></td>
</tr>
</tbody>
</table>

Proprietary BHI analysis from 2003-2014. Investments are any non-public investment in a private company larger than $1M.
BioHealth Commercialization Highlights in Virginia

- The state, Carilion Clinic and Virginia Tech announce investments of $70M to double the size and capacity of VTCarilion Research Institute
- UVA forms a $5M seed fund and $20M Series A fund
- Inova announces $100M investment fund
- Sentara HealthCare’s 3rd Core ramps up investments and partnerships that improve health through innovation
- VCU launches a Commercialization of Research Fund
- Venture Capital Assn, PWC name Charlottesville nation’s top growing MSA in venture funding
- Virginia approves a new state bond issue financing over $150M in bioscience R&D facilities at VCU, UVA and Virginia Tech
Recent Venture Capital Investments
BioHealth Capital Region Index

Key Findings

• Central Maryland compares well in Talent present and Research conducted

• Improvement is needed in Commercialization measures such as capital investment, university startups, and invention disclosures

• Region is not lacking for human capital or technologies required to form an innovation hub. Rather the region needs additional Capital to invest in catalyzing the next generation of Entrepreneurs
The Time is NOW for the

BioHealth Capital Region™

Advancing Science. Accelerating Innovation.

We will get there sooner if we collaborate and leverage existing resources.

We will become a **TOP 3** by 2023!