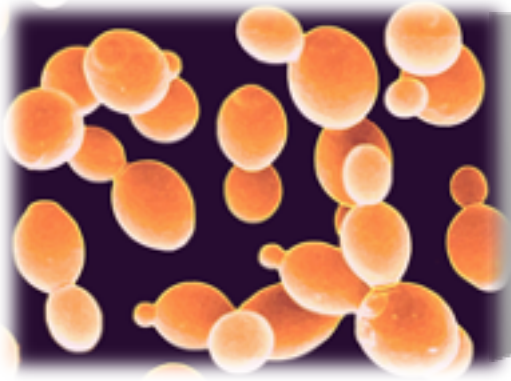


What is Bioindustrial Manufacturing?

sugar, nutrients



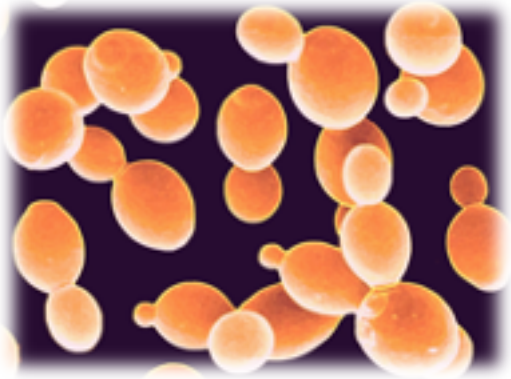
Useful chemicals
(and other stuff)



200,000 L Fermentation tanks at Amyris' Brazil Production Facility

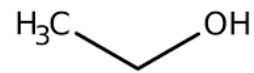
Industrial fermentation has deep roots

sugar, nutrients

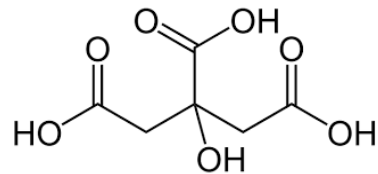


Useful chemicals
(and other stuff)

**Primary
metabolites**

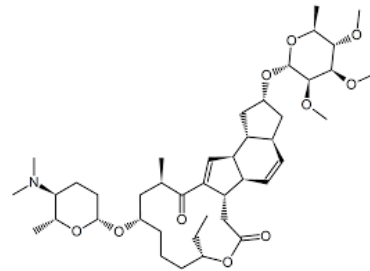


ethanol

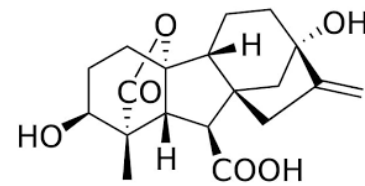


citric acid

**Secondary
metabolites**

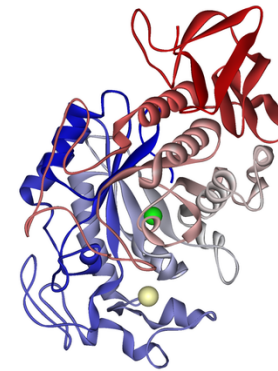


spinosin



gibberellin

Proteins

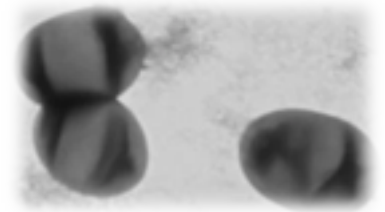


Amylase

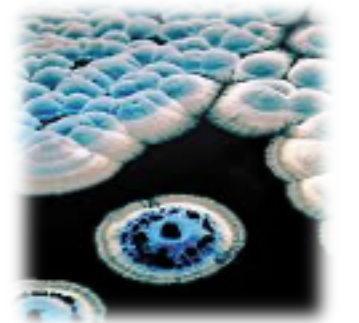


Chymosin

Cells



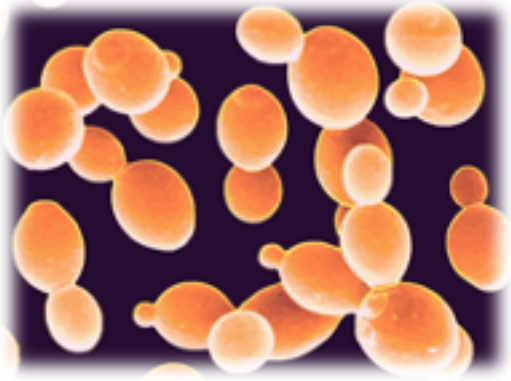
***Rhizibium* spp.**



***Streptomyces* spp.**

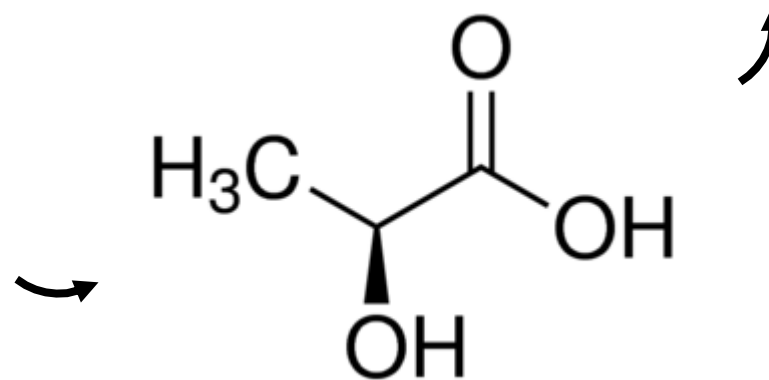
Bioind. manufacturing is expanding into new markets

sugar, nutrients



Useful chemicals
(and other stuff)

Recently developed products of Bioindustrial Manufacturing



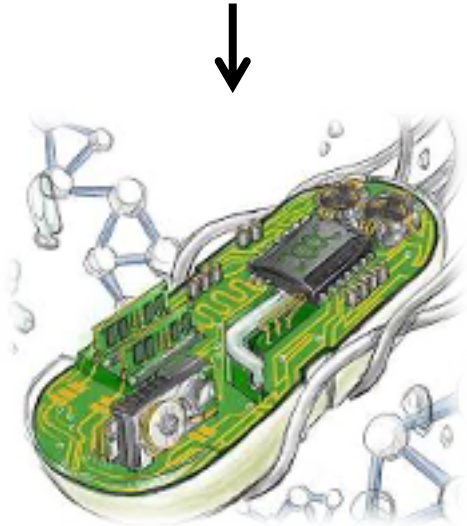
Advances in Synthetic Biology allow us to reprogram complex processes in living cells



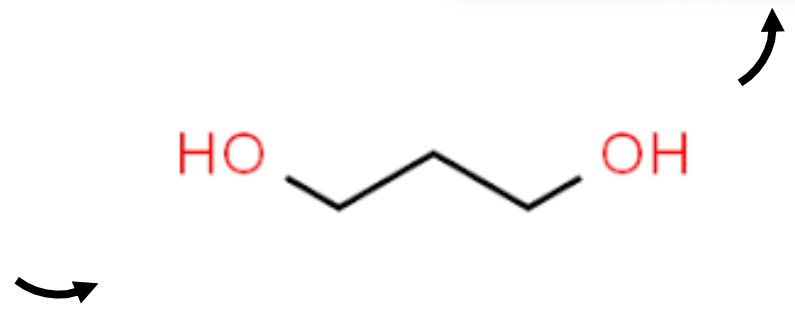
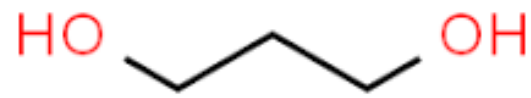
Bioind. manufacturing is expanding into new markets

sugar, nutrients

Recently developed products of Bioindustrial Manufacturing

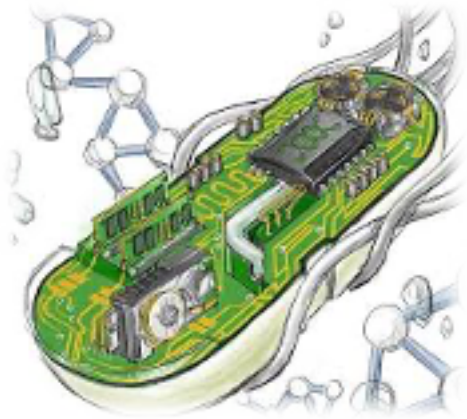


Useful chemicals
(and other stuff)



Bioind. manufacturing is expanding into new markets

sugar, nutrients

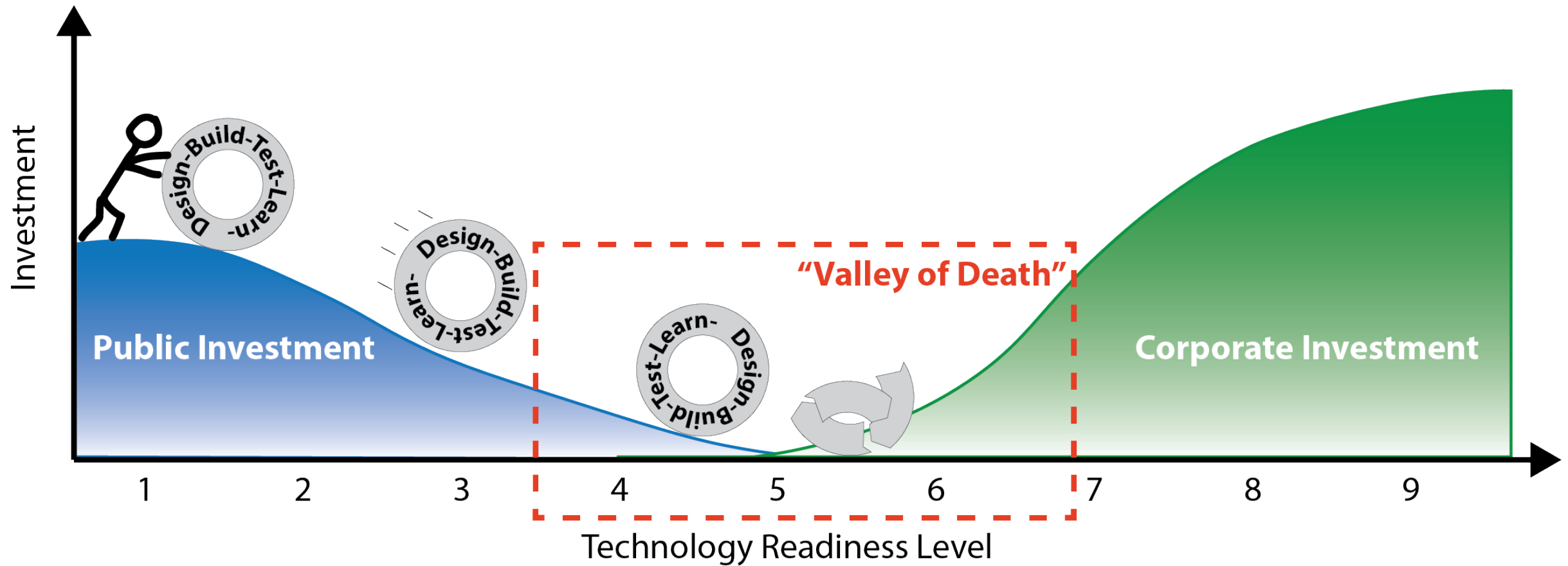


Useful chemicals
(and other stuff)

Recently developed products of Bioindustrial Manufacturing



Technology Readiness Levels track the maturity of new processes





Microbial Cell Production Facility Feasibility Study Findings

Budget 5 Meeting
October 14, 2019



UNIVERSITY OF MINNESOTA

Driven to DiscoverSM

Business Opportunity

BRC provides education and research support through contract manufacturing.

Currently production is at capacity and cannot expand

Product is building block for many companies and industries, has and will remain constant over time.

College has 30 years of experience in this type of manufacturing

**Why
investment
makes sense**

**Self-funding business model
pays for debt service towards capital
project.**

**Fits mission of the
BioTechnology Institute**

**Supports local biotech
entrepreneurship**

**Long-term revenue generation
for the College of Biological Science**

Our services



We have expertise in projects using bacteria, yeast, algae, and fungi

Customized (non GMP) microbial fermentation

Downstream purification

Professional education and training

Current Conditions

Can't fit between reactors

Can't use all equipment
simultaneously

Can't keep production going
when cleaning

Can't add capacity

Can't teach and run reactors
at the same time



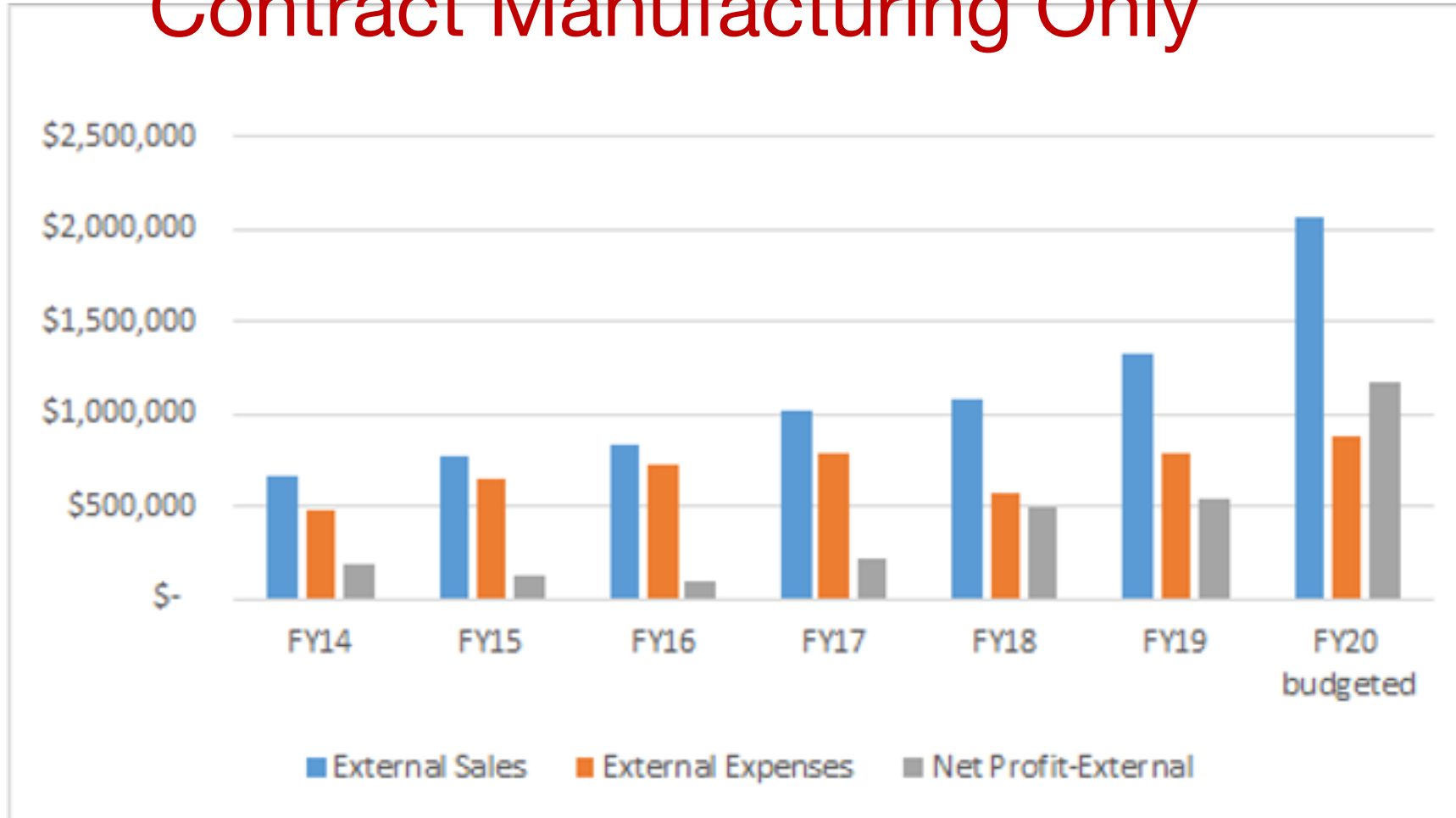
Sources of demand:

Observed trend of demand for cell production services beyond existing capacity

Variations in size of company, sector represented and geographic location of clients: balances risk

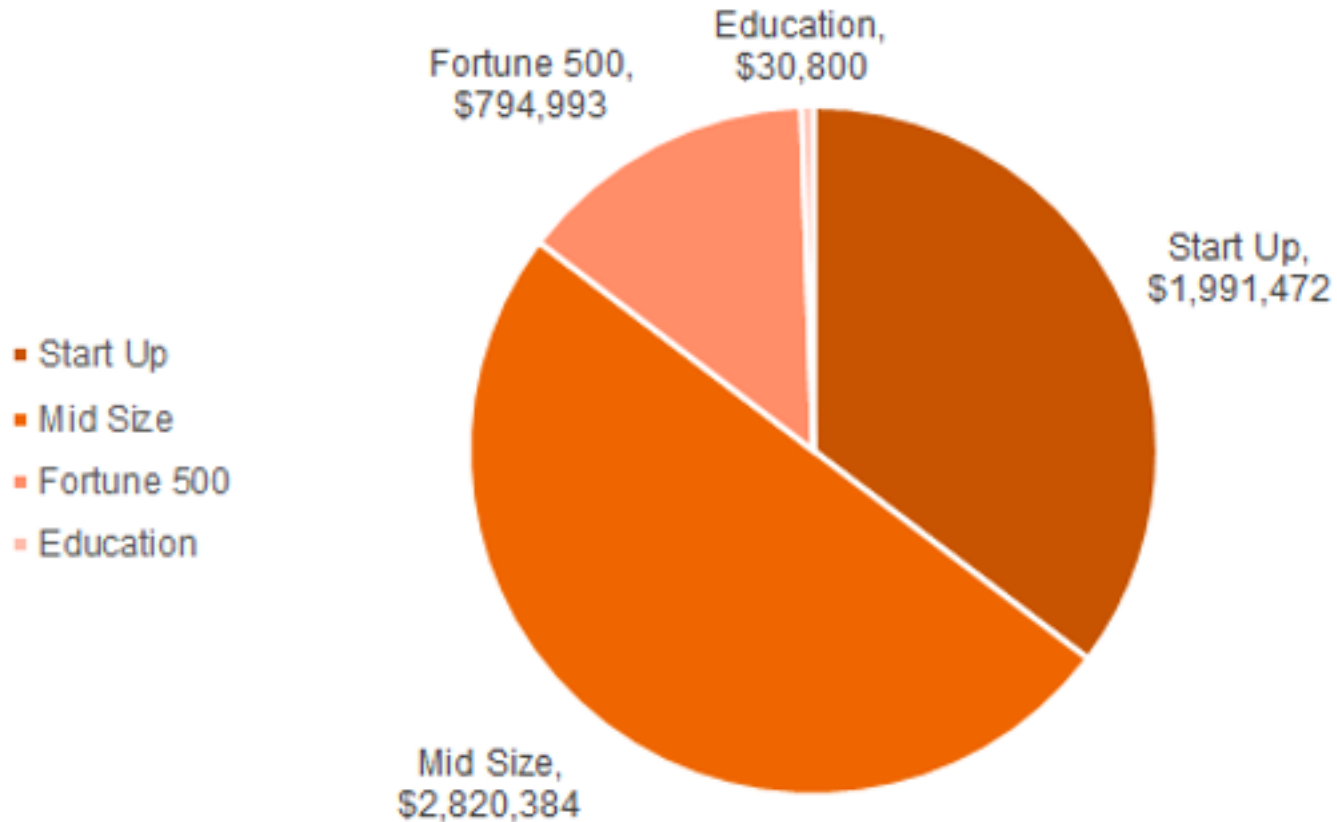
Engaged market research at national and regional level, indicates strong future demand and limited competition from others

BRC Financial Operations Contract Manufacturing Only

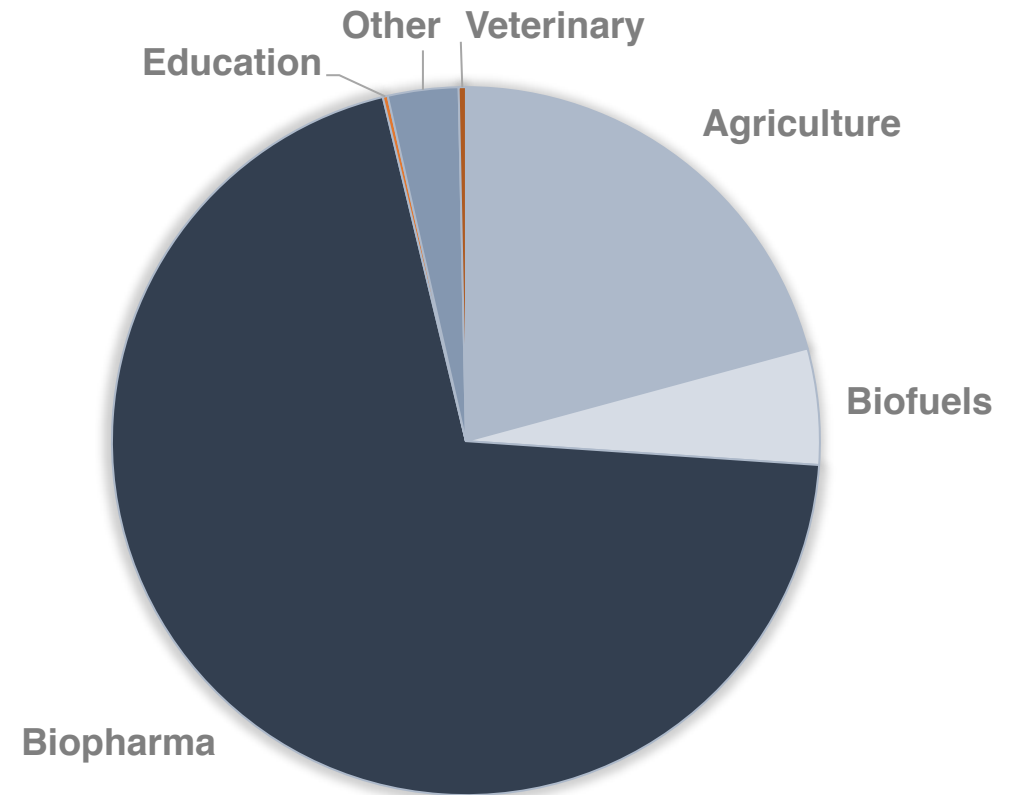


Manufacturing Revenues FY14-FY19

Revenue by Company Type

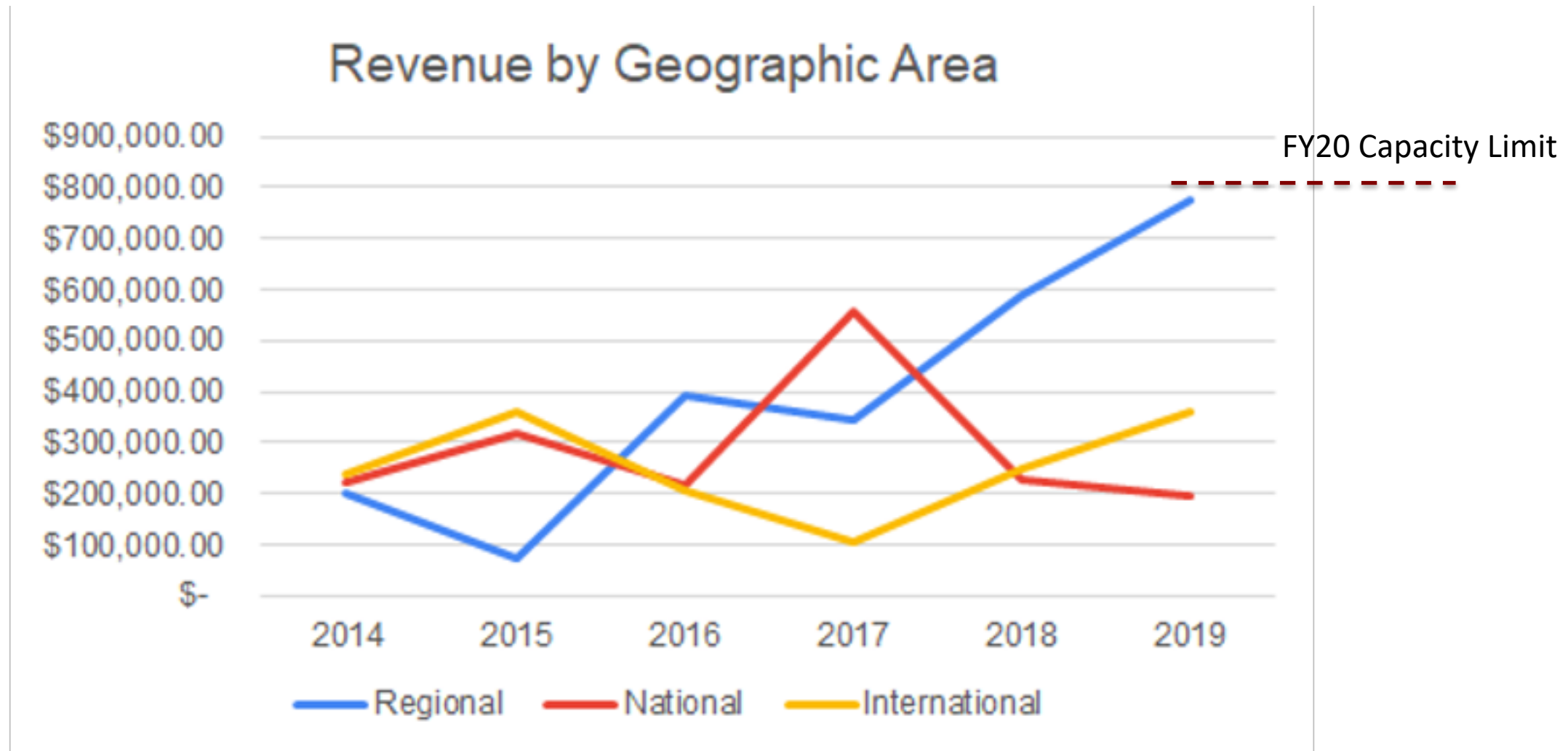


Revenue by Industry

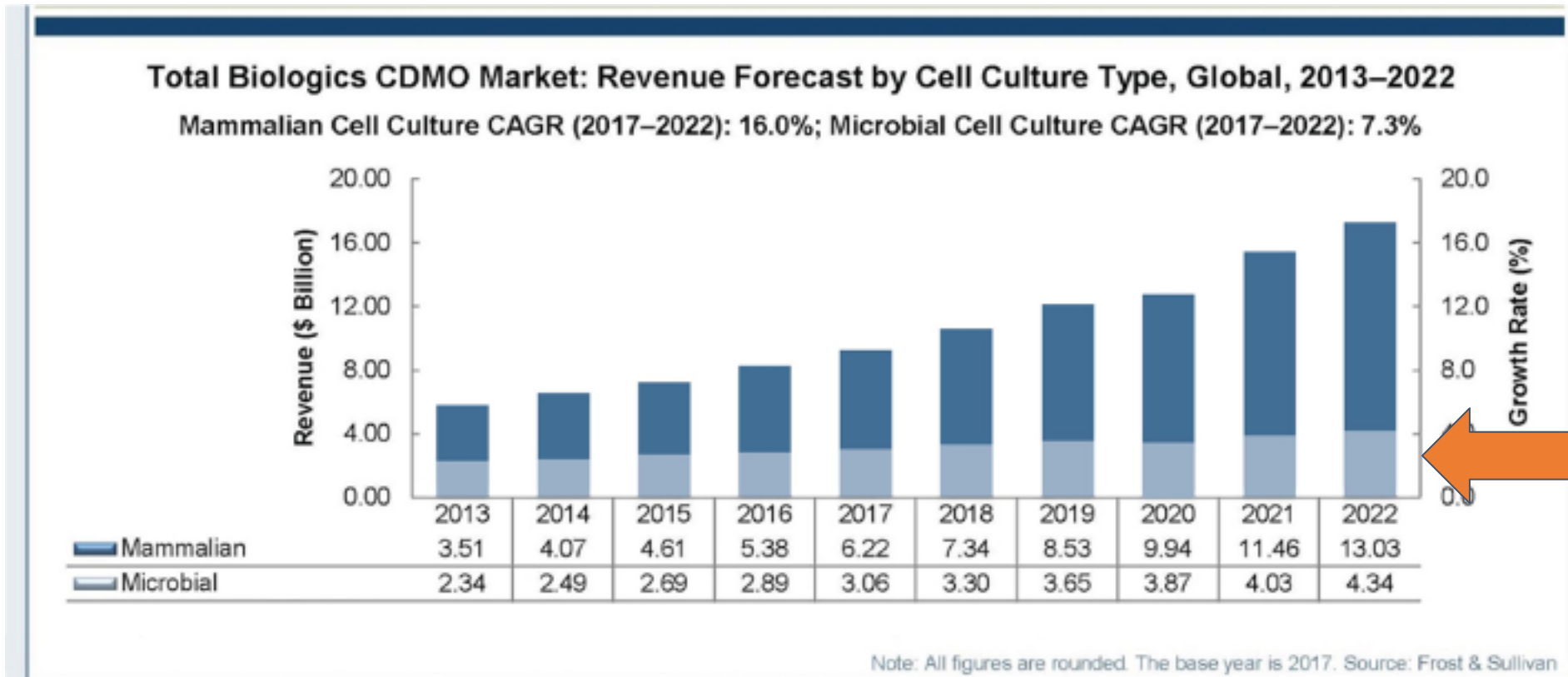


data represents cumulative revenue over last 6 years

Manufacturing Revenues FY14-FY19



Revenue Forecast for Contract Manufacturing



BRC's Niche



"Across the globe, there are hundreds of university research parks, and we have found that the stronger the university connection, the stronger the ability of the park to leverage the competitive advantage of its university or region."

"Contributions and Challenges", Site Selection Magazine, Eileen Walker

-

"Universities have enormous capabilities and purchasing power, particularly because they are often able to issue bonds."

*-Cameron McCoy, Executive Director, Corporate Engagement Office
University of Oklahoma Research Campus*

Today, universities have expanded their economic development roles and are partnering with government, industry and academia to form a powerful "triple helix." University research parks stand at the center of this activity, enabling effective, fruitful cooperation among them.

"Contributions and Challenges", Site Selection Magazine, Eileen Walker

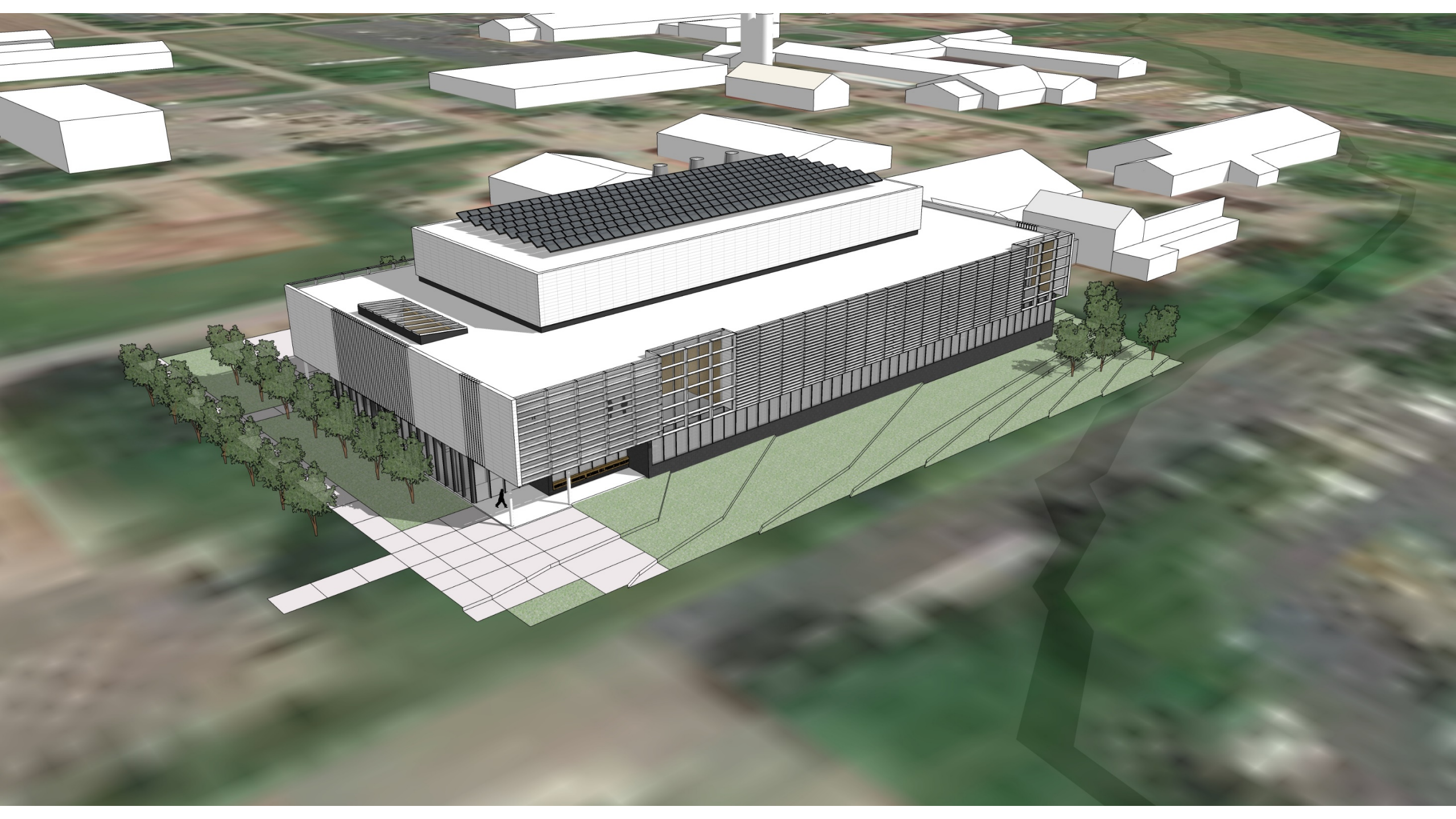


2020 Activity

Request for Expression of Interest (RFEI) issued to **“build and enhance a biotechnology and biomanufacturing ecosystem on the University of Minnesota Campus.**

Potential partners may range from large industrial or agricultural corporations to smaller innovative labs that are looking to bring sustainable technologies from conceptual design to real-world applications. “

Due date 8/14/2020



1. St Paul Biotechnology Quadrant



A MCPF

The Microbial Cell Product Facility (MCPF) will expand the manufacturing capacity of the College of Biological Sciences' Biotechnology Resource Center. The BRC's microbial cell products serve companies in the veterinary, agriculture, biofuels, biopharma, and industrial biotechnology sectors

Total Site Area: 63,400 SF
Total Gross Sq. Ft. (GSF): 40,715 GSF

B BioMADE

The BioIndustrial Manufacturing And Design Ecosystem (BioMADE) will co-occupy the same facility as MCPF to leverage MCPF capabilities and facilitate collaboration. The Engineering Biology Research Consortium, in partnership with CBS, is submitting a DOD proposal to establish this new BioIndustrial Manufacturing Innovation Institute, and the award is expected in Fall 2020

Total Site Area: 63,400 SF
Target GSF: up to 40,000 GSF

C Potential Partnership Facility

New facility to support collaborative institutional research with biotech manufacturing partner

Total Site Area: 56,000 SF
Target GSF: 56,000 to 90,000 GSF

2. Towerside Innovation District aka “Malcolm Yards”

Partnership with St. Paul Port Authority acting as broker



St.Paul Port Authority Partnership

SPPA can provide/access:

- New Market Tax Credits
- Access to DEED funding without tax issues
- Access to developer's financing
- More land options than are available at UMN



Feedback from UMN and Industry Member

“UMN-[XYZ] collaboration presents an exceptional educational opportunity for on-site training of graduates and undergraduates in biologics manufacturing and translational research.”

-UMN faculty review group

“[XYZ] views academic partnership as a key pillar of the company’s unique mission and vision. We plan to build a robust, dynamic, and diverse Academic Alliance Network across the nation that brings together the best and brightest minds to develop next-generation capabilities and to build the workforce of the future.”

-Name, PhD, CEO



Next steps

The University of Minnesota scientists are in agreement that both are major opportunities for our science, our research, our students (graduate and undergraduate) and for our community.

