Sharing equipment and space avoids costs and benefits science: an in-depth case study of the Biochemistry Cell Culture Facility at the University of Colorado Boulder

Christina Greever, B.A.
Program Assistant and Outreach Coordinator for CU Green Labs

University of Colorado Boulder
Objectives

- Identify the driving factors that led to the establishment of the Biochemistry Cell Culture Facility at CU Boulder and how similar conditions can be encouraged at another institution.

- Know the key characteristics of the Biochemistry Cell Culture Facility that were examined for this case study.

- Recognize the many benefits a Facility Manager brings to a shared equipment facility.

- Understand the avoided costs and wide variety of benefits a shared facility or core provides to an institution, both to scientists directly and to the university as a whole.
Managed, shared equipment in collaborative research space benefits scientists and institutions

- Avoided costs
- Saves researchers time (Facility Manager)
- Attracts talent
- Promotes collaboration
- More efficient use of lab space
- Reduced laboratory plug loads
- In compliance with the Federal Register’s Code of Federal Regulations
- In line with campus sustainability goals

Ideal timing for sharing & high demand
BCCF in 1992

- Faculty-led and inspired
- 3 labs
- Biochem Division only
- Renovated bathroom
- Hired a technician and student to support the facility
- 100% funded by PIs and their grant funding

- Never a fee-for-service core
- No mark-ups on supplies
- Supplies ordered in bulk

BCCF in 2016

- 16 labs, 70 active users
- 3 Departments
- 1,554 ft² facility in a newer building
- Full time Facility Manager

- 50% of Facility Manager’s salary funded by the Biochem Division, 50% by PIs/grants

BCCF = Biochemistry Cell Culture Facility
Case study compares the existing BCCF to a hypothetical scenario where 16 labs are conducting cell culture independently.

**BCCF**
- 16 labs sharing space and equipment
- 1,554 ft²

**Hypothetical Scenario:**
- Independent cell culture in 16 labs; no sharing of equipment or space
- 2,220 ft²
Hypothetical Scenario
Individual Cell Culture Space with one biosafety cabinet
12 labs would have this floor plan
133 ft²

Hypothetical Scenario
Individual Cell Culture Space with two biosafety cabinets
4 labs would have this floor plan
156 ft²
Upfront Cost Avoidance Summary

Avoided costs by creating the BCCF on a new build instead of the Hypothetical Scenario

- New Construction: $804,195
- New equipment purchases: $288,344

Total: $1,092,539

Avoided costs by creating the BCCF as a lab building renovation instead of the Hypothetical Scenario

- Renovations: $274,285
- New equipment purchases: $288,344

Total: $562,629
Annual Cost Avoidance Summary

Costs avoided for Biochemistry Division & scientists

- FBS: $26,400
- Media: $33,781
- Salary & Benefits: $127,896
- Promo supplies & recycled ethanol: $6,700

Annual cost avoidance = $194,777

Costs avoided for Facilities Management, JSCBB, & CU Boulder

- Lab space maintenance: $57,842
- Ventilation: $4,964
- Plug loads: $8,300

Annual cost avoidance = $71,106

Total annual cost avoidance made possible by the BCCF = $265,883
Qualitative Benefits of a Facility Manager

- Standardized training of new users
- Mycoplasma testing
- FBS lot testing
- In-house media prep
- Connections & networking
- Expertise
- Equipment maintenance, certifications, repairs
- Ordering, stocking of supplies
Qualitative Benefits of the BCCF

- Many eyes and ears in the facility
- No over-purchasing of consumables
- More efficient use of space
- No abandoned equipment
- Vibrant work environment
- Speed at which a new lab could begin cell culture work
End users appreciate the BCCF (61% responded)

BCCF frequency of use by end users

- Less than 1 day per week: 5%
- 1 - 2 days per week: 37%
- 3 - 4 days per week: 35%
- 5 days per week or more: 23%

Overall satisfaction rating

Use the below scale to identify your overall satisfaction with the BCCF:

- 0
- 1
- 2
- 3
- 4
- 5

Respondents:

- Overall satisfaction rating: 0
- Overall satisfaction rating: 1
- Overall satisfaction rating: 1
- Overall satisfaction rating: 11
- Overall satisfaction rating: 30
Phone survey of biosafety officers at AAU institutions shows individual cell culture is more prevalent than shared, but shared is growing.
Addressing and Overcoming Concerns

- Contamination
- “Tragedy of the commons”
Does a shared cell culture facility still seem out of reach for your campus?

- Consider sharing one Facility Manager between two small facilities in close proximity to one another.

- Think about the financial threshold at which it is cheaper to pay a Facility Manager to take care of cell culture tasks instead of graduate students and post docs.
Cost Analysis 1

KEY:

BCCF Facility Manager
serving 16 labs
Salary & Benefits: $82,620/year
40 hours per week for cell culture

Postdoctoral Researcher
serving a single lab
Salary & Benefits: $65,088/year
9.4 hours per week for cell culture

Graduate Student
serving a single lab
Salary & Benefits: $46,889/year
9.4 hours per week for cell culture

Cost analysis based solely on salary, benefits, and time spent on cell culture-related tasks:

- $82,620/year < $88,151/year
- $88,151/year < $91,774/year
- $91,774/year < $105,258/year
Cost Analysis 2

Analysis 1 plus 30% of the cost avoidance from preparing media in-house, bulk purchasing of FBS, promotions, and ethanol reuse ($20,064/year)

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$82,620/year
$20,064/year
$62,556/year

$66,113/year
$76,478/year
$78,944/year
Cost Analysis 3

**Analysis 2 ($20,064 cost avoidance) plus a cost avoidance of $15,700 as a result of four labs participating in a shared facility together**

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$82,620/year - $35,764/year = $46,856/year

$65,088/year - $55,095/year = $9,993/year

$46,856/year < $9,993/year < $61,184/year

$52,630/year
Conclusions

- Tremendous value (<$265K/year) provided by the BCCF to scientists and the campus
- Numerous qualitative benefits too
- Smaller environmental footprint through the BCCF
- Facility Manager is a critical element to success
- Saves scientists time
Conclusions continued...

- Sharing of space and equipment can be done well
- Institutional support for departments that share can be critical
  - Salary support
  - Admin infrastructure & emergency funding for repairs
  - Breaking down departmental barriers
- Encourages more interdisciplinary research
- More efficient use of time, funds, space, and equipment
Next Steps

- Share the case study widely
- Share this example with additional departments at CU Boulder
- Find additional faculty champions of shared resources
- Give more tours of the BCCF
- This changes culture and normalizes the practice of sharing equipment and using space collaboratively
Acknowledgments

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Questions?
christina.greever@colorado.edu
(303) 735-5612

www.colorado.edu/ecenter/greenlabs/case-study-biochemistry-cell-culture-facility

On our website under “Lab Equipment and Space Sharing”