

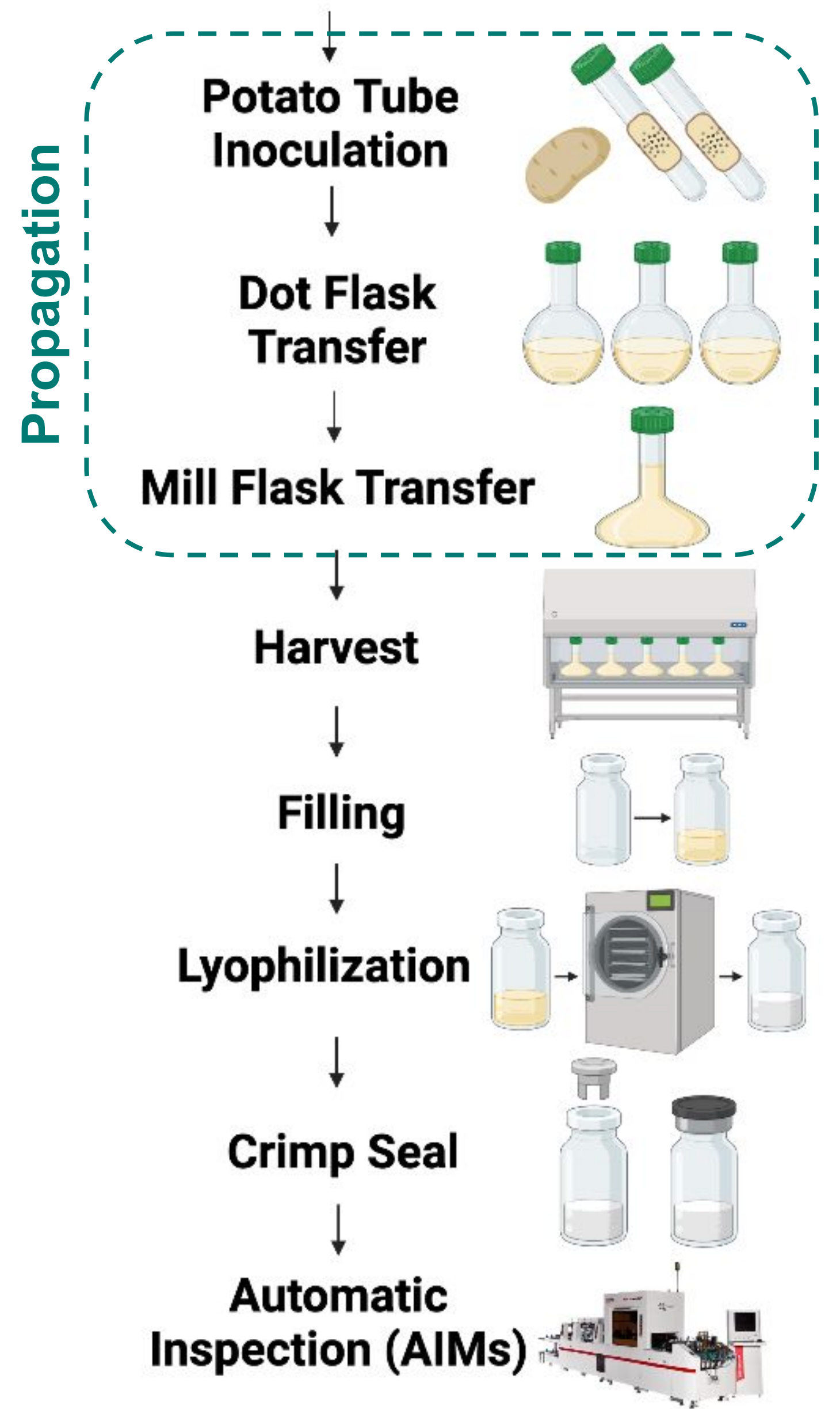
1. Introduction/Project Overview

Goal: Design a new facility to accommodate a three-fold increase in capacity of an existing product. Explore equipment, safety, human resources, and facility space needed for the new process.

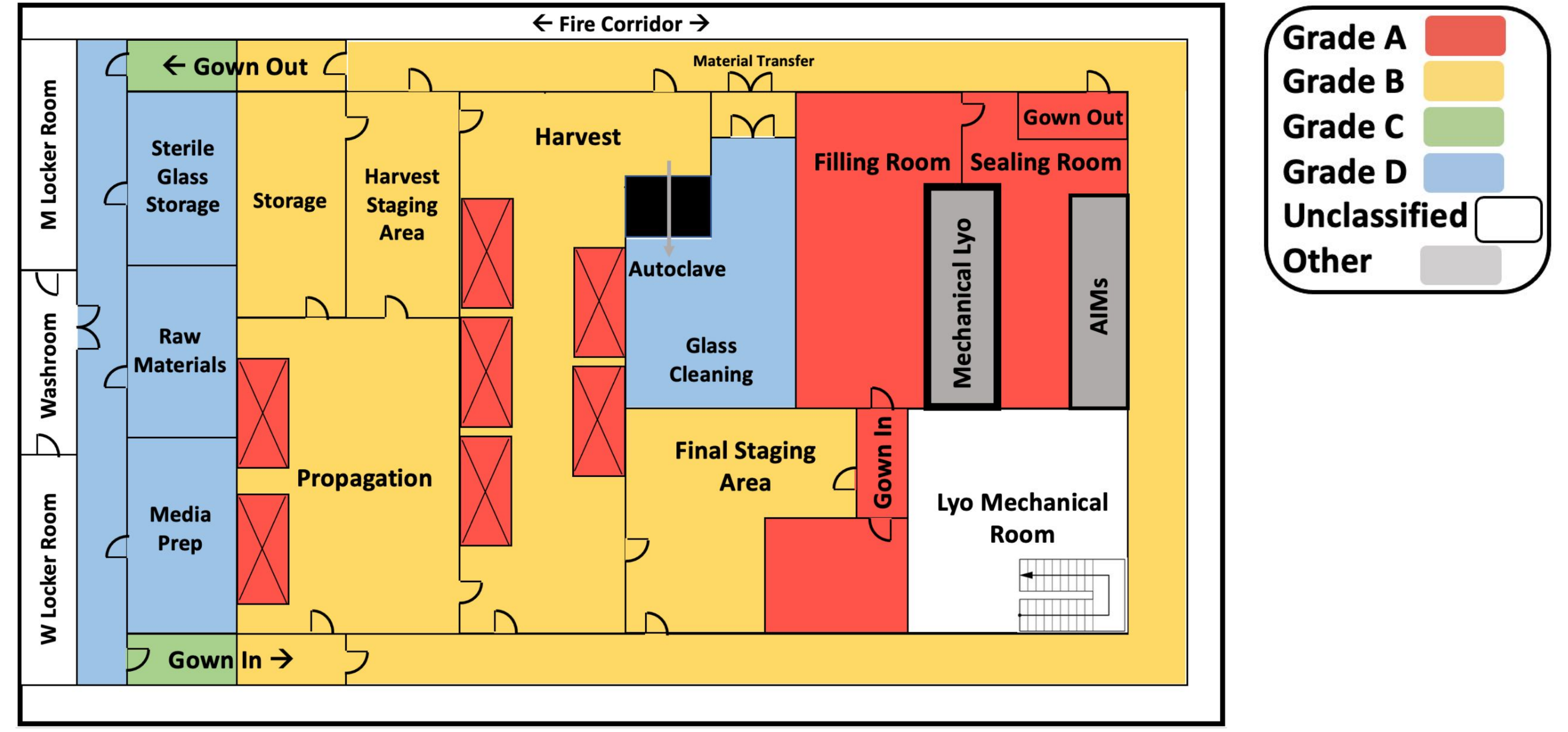
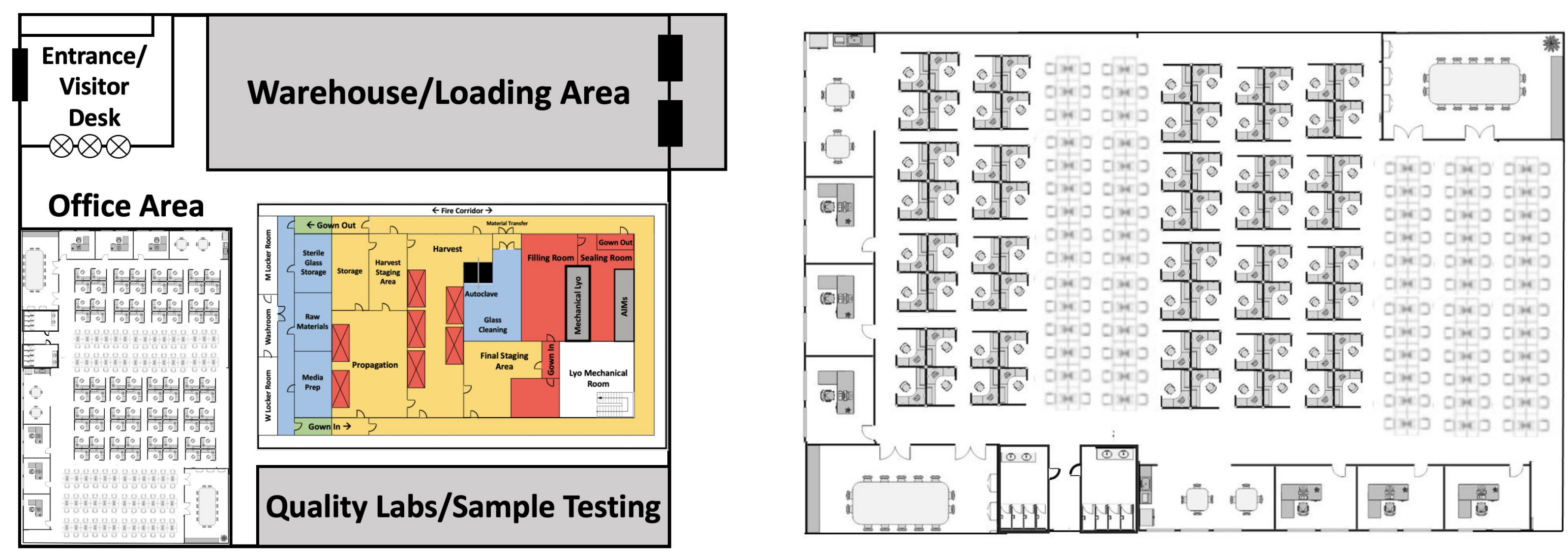
Motivation: With Merck being the sole manufacturer of this product, increasing production capacity will help save thousands of lives.

Challenges: Seamless transfer to new facility utilizing updated technology and equipment

2. Process Flow Diagram



3. Facility Layout



4. Proposed Modifications for Upscale

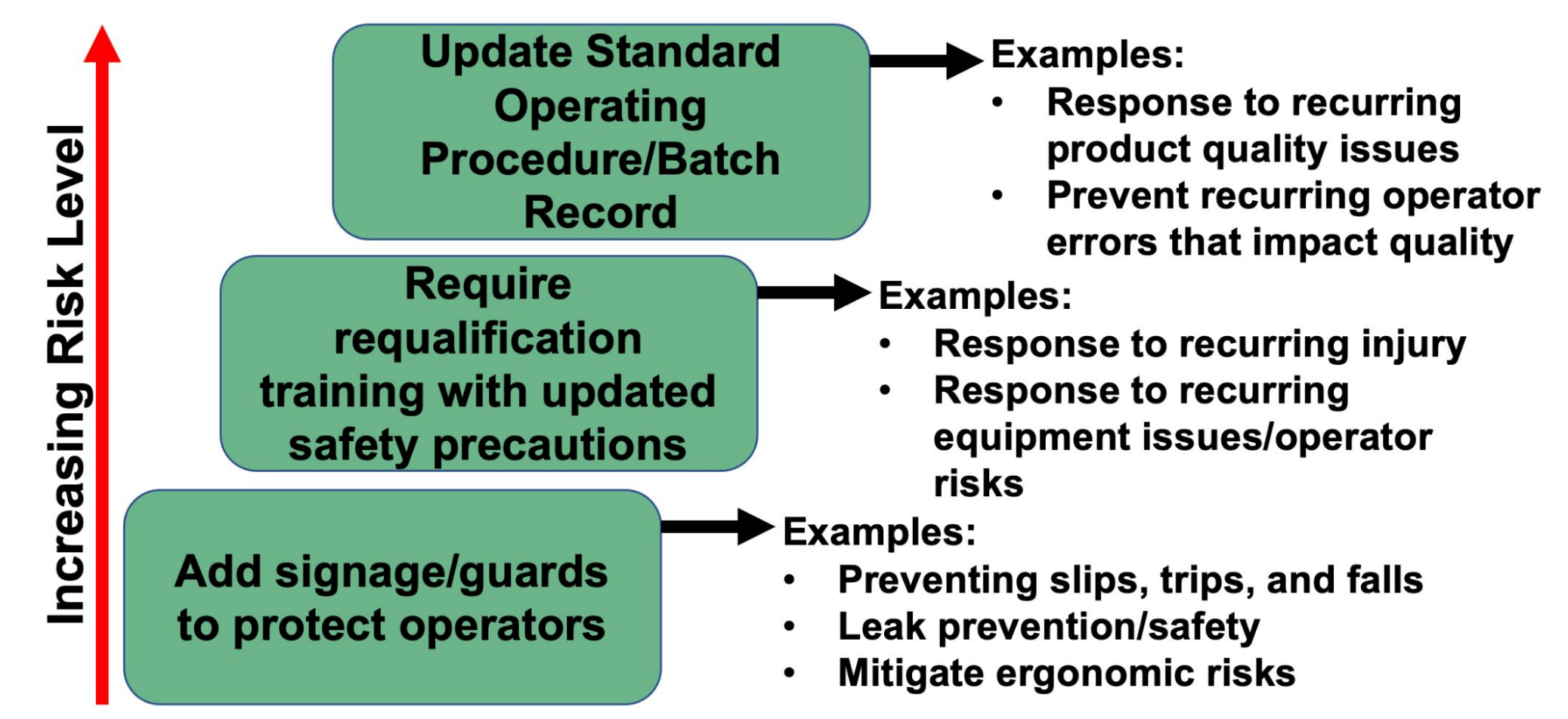
Considered Modifications:

- Single-Use Equipment in Culture Propagation and Harvesting
- Different sizes of Lyophilizers and redundancy to accommodate new production capacity
- Implement new technology to decrease inspection time

Implemented Modifications:

- Use of one lyophilizer, 3x the size of the current production lyophilizer
- Purchasing a backup lyophilizer to account for maintenance and downtime
- Utilize Automatic Inspection Machines (AIMs) to increase efficiency

5. Risk Mitigation Safety Hierarchy



6. Projected Financial Analysis

$$COM_d = 0.180FCI + 2.73C_{OL} + 1.23(C_{UT} + C_{WT} + C_{RM})$$

Cost Category	Cost/yr (USD)
Utility Cost	13,252,359.84
Capital Cost	20,000,000
Direct Labor Cost	1,120,000
Raw Material Cost	1,600,000
Waste Cost	3,008

Cost of Manufacturing: \$ 13,252,360/yr
Net Profit: \$82,747,640/yr

7. Conclusion

- Scaled-up manufacturing process to meet the global demand
- Implemented new technology and equipment such as AIMs and Lyophilizers

Acknowledgments

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