

# Seriously, an insectary at a primate center?

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# 18

## INTRODUCTION

- *Anopheles mosquitos* are a critical component to study human malaria. The nonhuman primate (NHP) model replicates the natural progression of the disease in humans.
- Resources for the *Anopheles mosquitos* were no longer available to researchers.
- This led to the discussion, could we provide this resource at the Yerkes National Primate Research Center. (see Fig. 1)

Recruited subject matter experts, researchers, biosafety professionals, entomologists, and facilities personnel

Determined feasibility of renovating existing NHP facilities to serve as a mosquito insectary using the Arthropod Containment Level-2 guidelines

Identified a NHP testing space (ABSL-2) that could be retrofitted to accommodate the mosquito insectary

Figure 1. Process


## METHODS

- A preconstruction risk assessment included mosquito control, construction near NHP housing, and security. (see Fig. 2)

**Mosquito Control**


- Double door entry
- Air Curtains
- Screened door
- Mesh on vents

- Dynotraps
- Zappers
- Pest control



**Construction Concerns**

- Wall to separate from NHP
- Increase monitoring of animal stress
- Additional enrichment provided



**Security**

- at entry
- to feeding room
- to rearing room

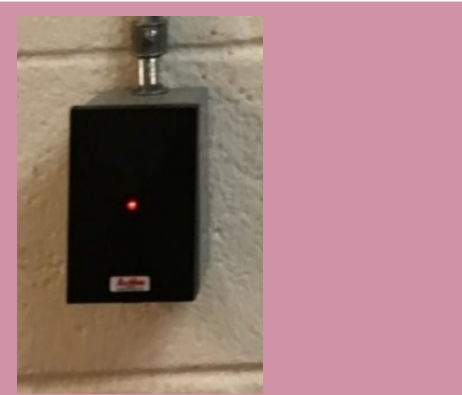


Figure 2. Pre-construction risk assessment

- Facility was renovated. (see Fig. 3)

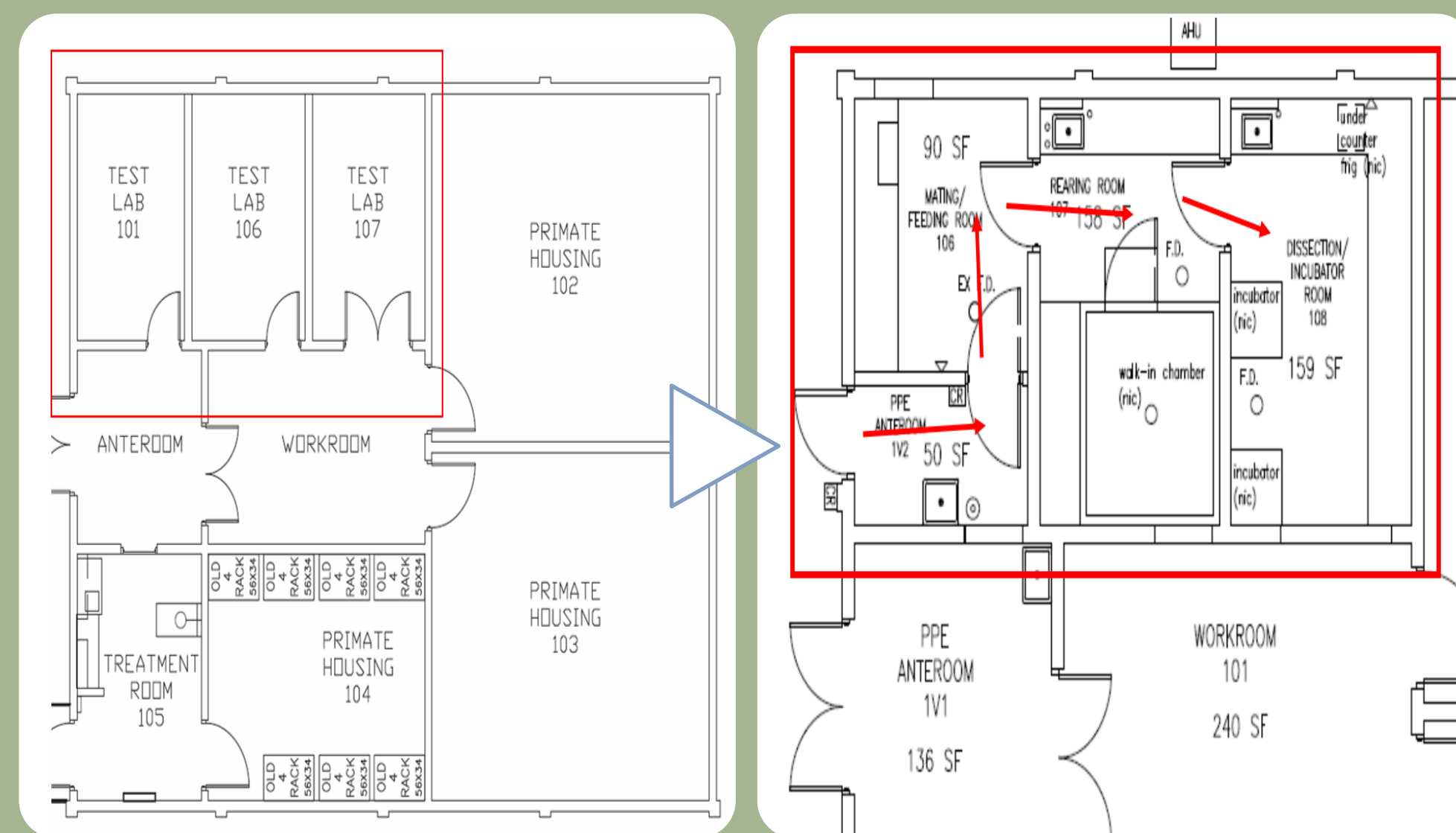


Figure 3. Renovation of NHP testing facility into a mosquito insectary

- Research risk varied in each room. (see Fig. 4)

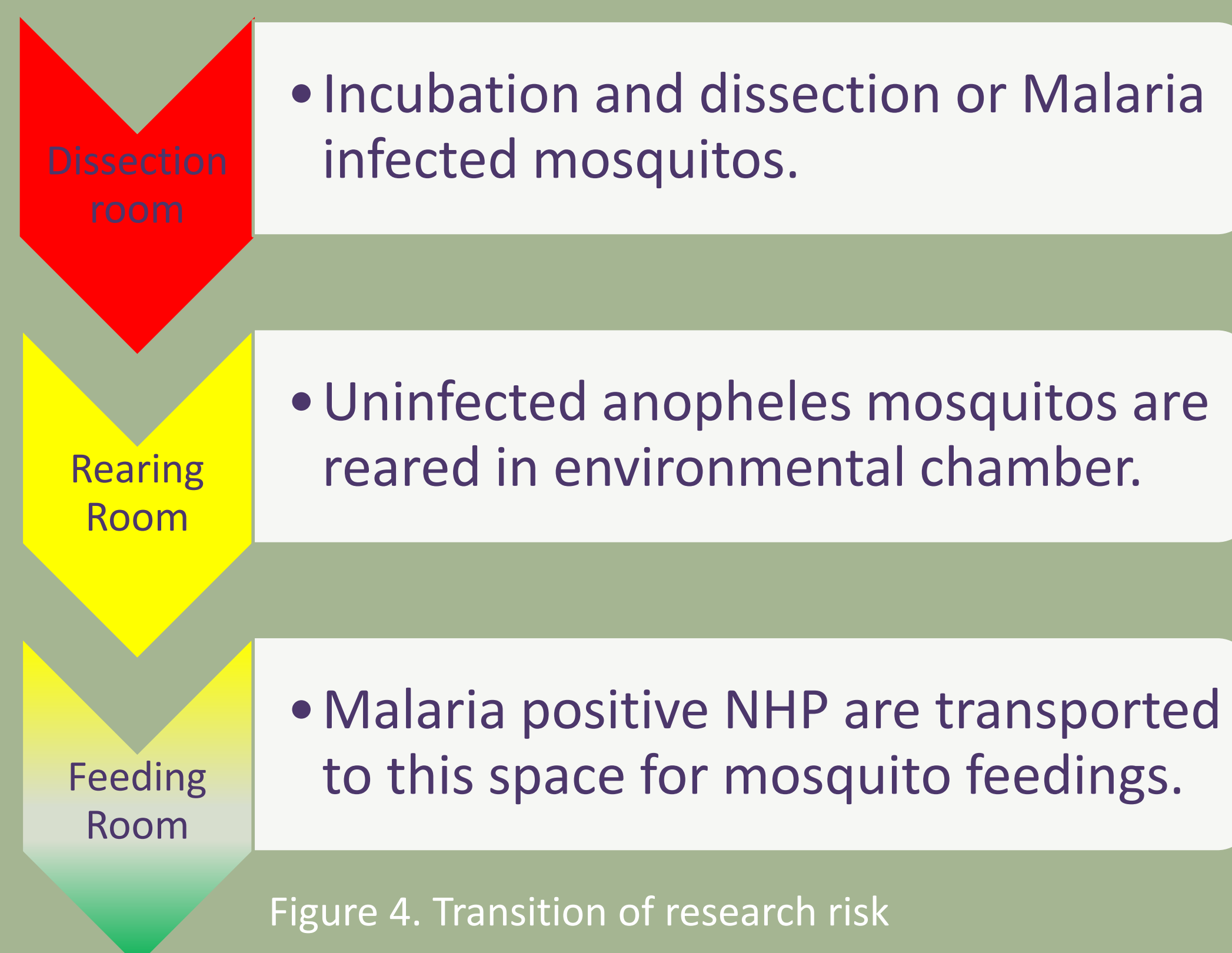
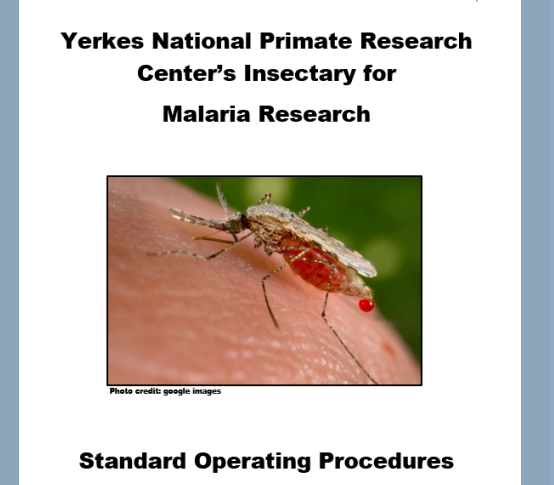



Figure 4. Transition of research risk

The risk assessment process was used again to develop standard operating procedures, determine personal protective equipment, and training requirements. (see Fig. 5)

**SOPs**



**PPE**







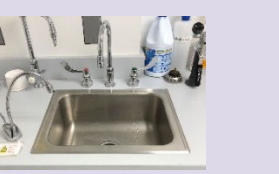

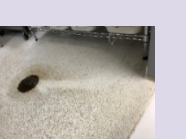
**Training**

- Training for feeding room access only.
- Additional training for entering rearing room or dissection room.

Figure 5. Post construction risk assessments

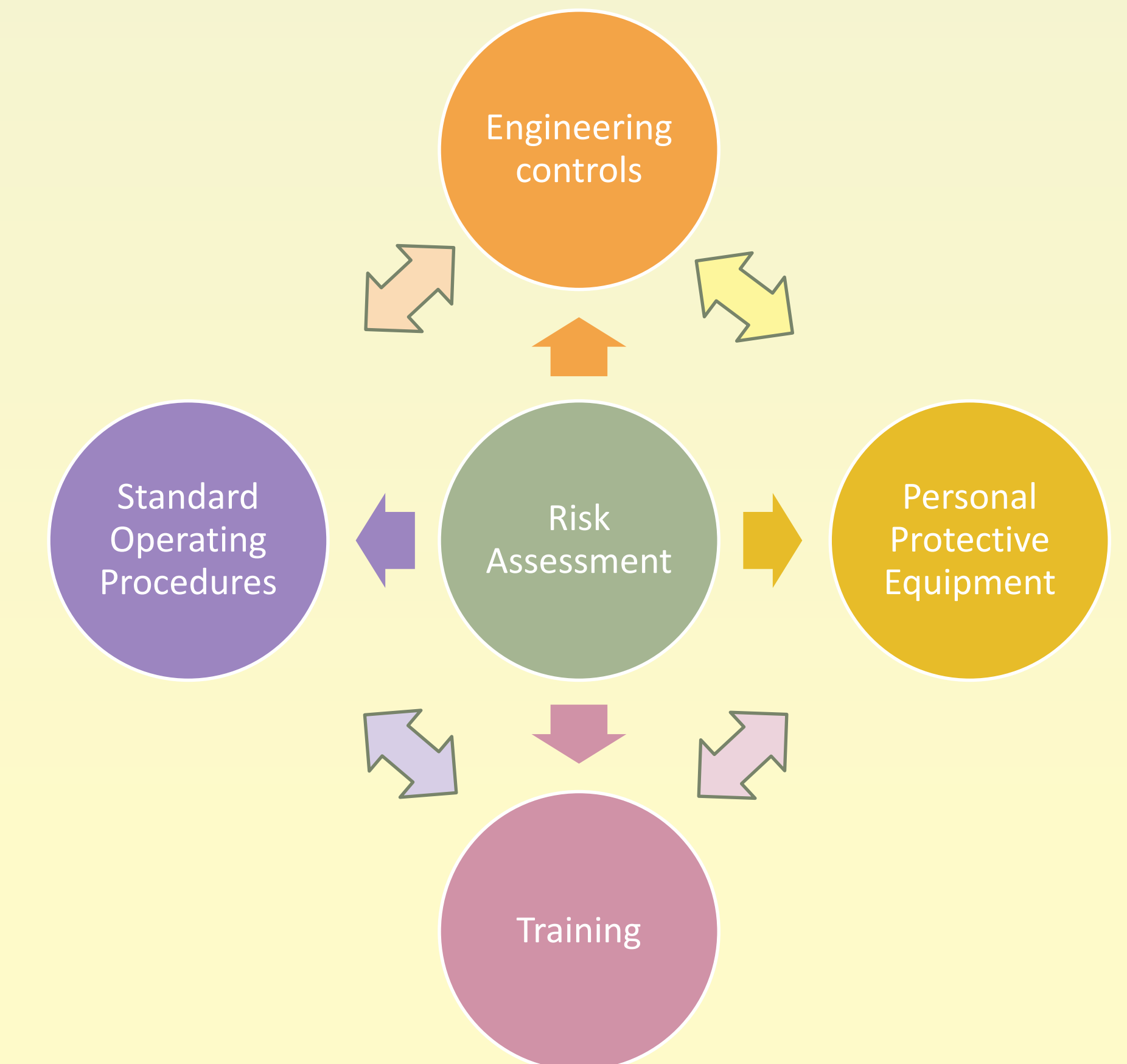
- Project challenges. (see Table 1)

### Table 1. Problems Encountered

<p><b>Large equipment</b></p> 	<ul style="list-style-type: none"> <li>• Size of incubators were too large to fit through doors.</li> <li>• A larger doorway was added (then sealed) to the feeding room to fit incubators.</li> </ul>
<p><b>Level floors</b></p> 	<ul style="list-style-type: none"> <li>• Doors were not level therefore, sweepers would get caught when door opened.</li> <li>• SOPs and training reflected that each door had to be closed before another could be opened.</li> </ul>
<p><b>Screened vents</b></p> 	<ul style="list-style-type: none"> <li>• Screens on inside of vents did not allow for easy visual inspection and cleaning.</li> <li>• Addition screens put on outside of vents.</li> </ul>
<p><b>Feeding larvae</b></p> 	<ul style="list-style-type: none"> <li>• Corn syrup used for feeding initially caused fruit flies.</li> <li>• A change to a graduated sugar mixture eliminated the fruit flies.</li> </ul>
<p><b>Small sinks</b></p> 	<ul style="list-style-type: none"> <li>• Sinks were too small to disinfect rearing trays.</li> <li>• Large sealed plastic container used to disinfect trays, until sinks can be replaced.</li> </ul>
<p><b>Controlling humidity</b></p> 	<ul style="list-style-type: none"> <li>• Incubators were not connected to a water source, water is required to maintain humidity.</li> <li>• Temporary fix, lab using carboy for water source.</li> </ul>
<p><b>Clogged drains</b></p> 	<ul style="list-style-type: none"> <li>• Clogged drain in environment chamber.</li> <li>• Facilities addressed drainage problem.</li> </ul>

## RESULTS

- Risk assessments were a valuable tool used to determine:
  - The feasibility, location and research risk.
  - Engineering controls, standard operating procedures, and training.
  - Best solutions to address construction and implementation challenges throughout the process.



## CONCLUSIONS

- A mosquito insectary is possible at a nonhuman primate center with the use of risk assessments throughout the process.
- The mosquito insectary at Yerkes National Primate Research Center was fully operational as of March 2018.

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