

# BIOSAFETY OF PLANT RESEARCH IN GREENHOUSES AND OTHER SPECIALIZED CONTAINMENT FACILITIES

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Convion  
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# Objectives

- What constitutes a plant research containment facility?
- Who regulates the facility?
- How do you designate the facility?

# Plant Research Containment Facilities



# Contained plant research includes:

- Transgenics/GMO
- Plant-made pharmaceuticals
- Plant-made industrial compounds
- Exotic organisms
- Noxious weeds
- Plant and insect pathogens
- Insect pests, predators, and parasitoids
- Quarantine materials
- Rare and endangered material
- Dual-use pathogens/Select Agents

# New technologies

CRISPR/cas 9

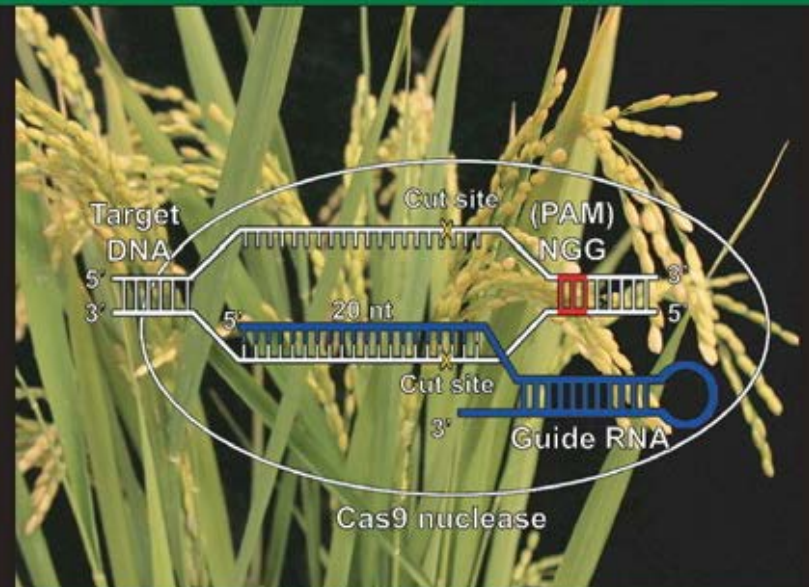
Zinc finger nuclease

TALENS

Meganuclease

# Plant Biotechnology Journal

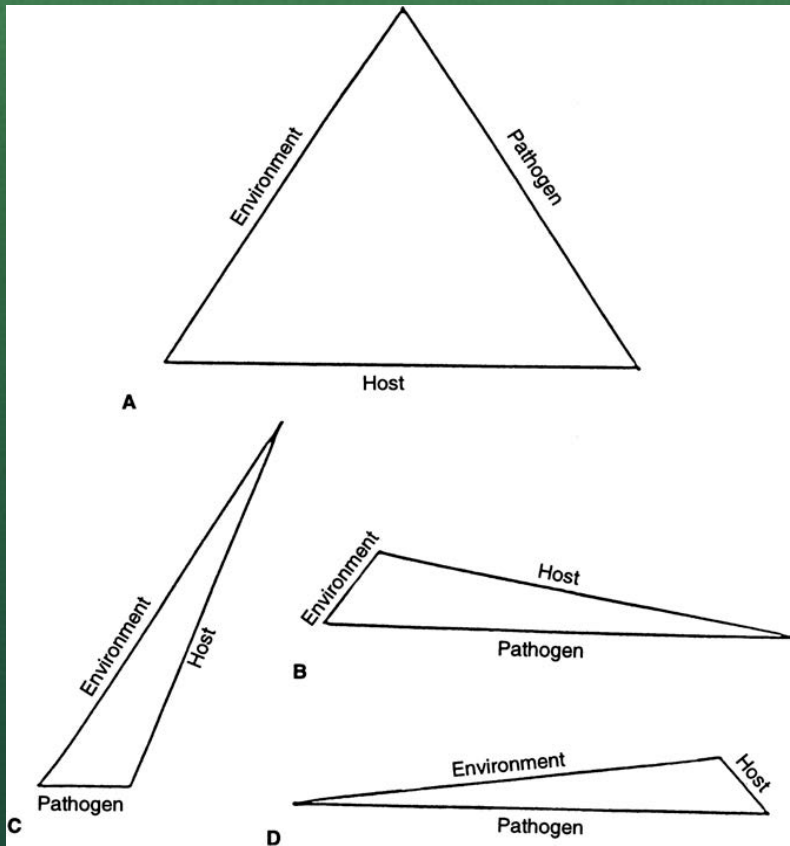
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WILEY  
Blackwell

# Plant Disease



# US Regulators and Oversight Agencies

- **Regulations**

- USDA-APHIS e.g. 7 CFR 330
  - Plant Health (PPQ)
  - Biotechnology (BRS)
  - Agricultural Select Agent Program
- FDA e.g. 21 CFR parts 210/211
- EPA e.g. FIFRA

- **Oversight**

- NIH
- State Departments of Agriculture
- USDA-ARS

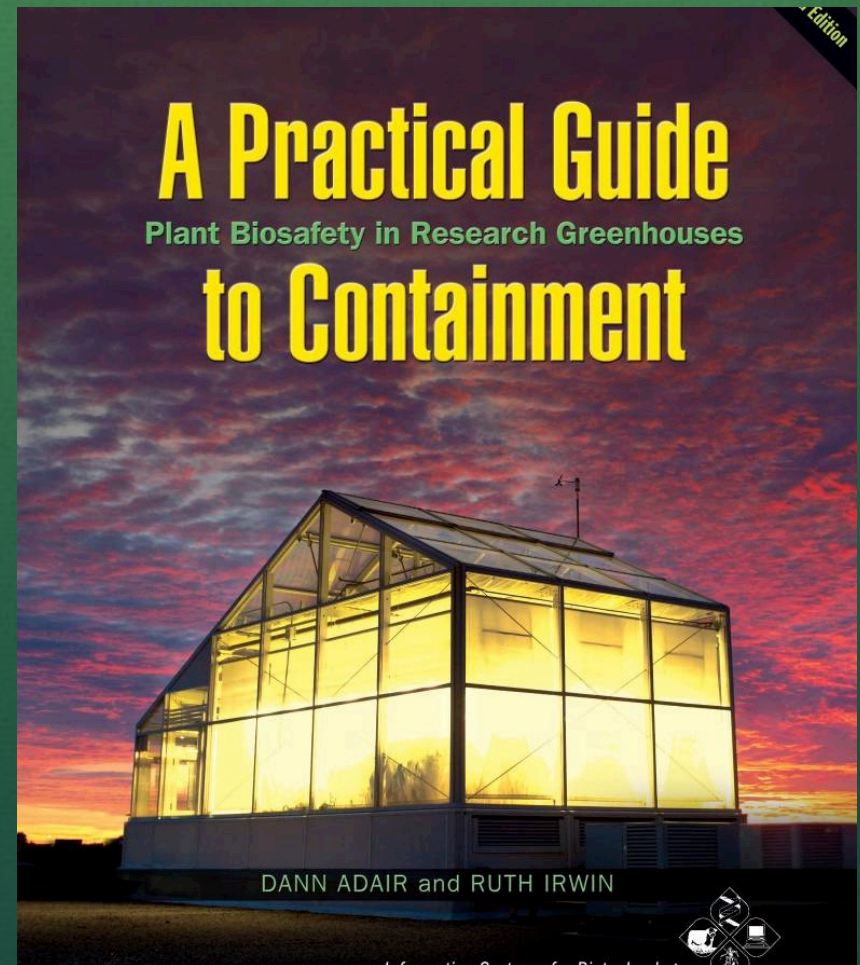
# Published Guidelines

- *USDA-APHIS Containment Facility Guidelines for Plant Pests, Pathogens and for Nonindigenous Organisms*
- *USDA-ARS Facilities Design Standards Chapter 9. Biohazard Containment Design*
- *CFIA Containment Standards for Facilities Handling Plant Pests*
- *NAPPO Guidelines for Construction and Operation of a Containment Facility for Insects and Mites used as Biological Control Agents (RSPM22)*
- *NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules*



# Guidebook

- First published prior to 9/11/2001
- Revised 2008
- Information Systems for Biotechnology
- [www.isb.vt.edu](http://www.isb.vt.edu)
- Built to understand and apply NIH and APHIS guidelines

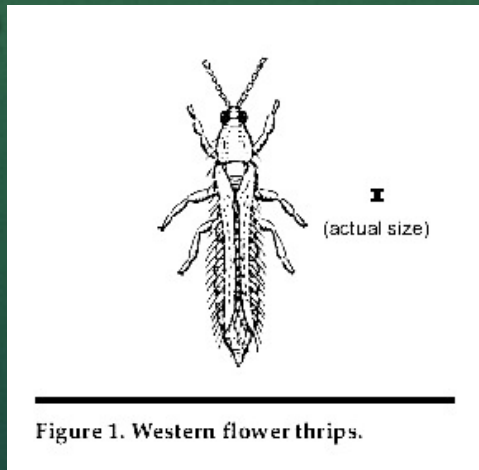


# Containment Objectives

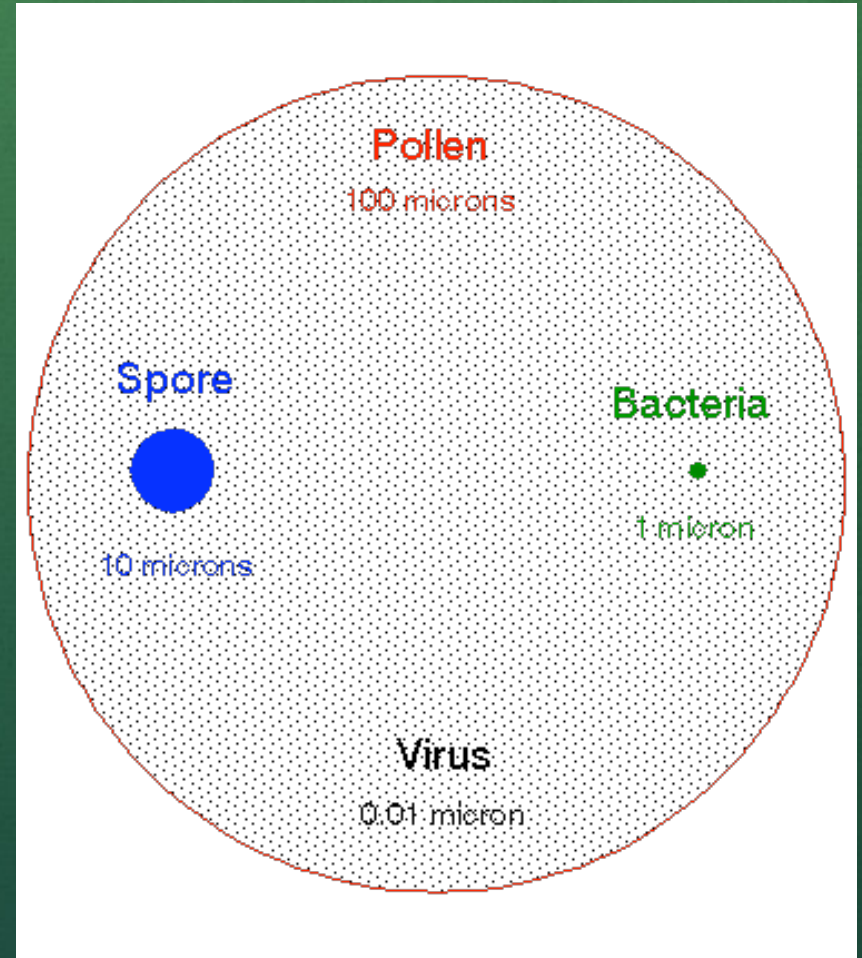
- *App.P-I-A. Avoid unintentional transmission of rDNA (plant or organism)*
- *App. P-I-B. Minimize the possibility of an unanticipated deleterious effect on organisms and ecosystems outside of the experimental facility*
  - *(Minimize) the inadvertent spread of a serious pathogen from a greenhouse to a local agricultural crop*
  - *(Minimize) the unintentional introduction and establishment of an organism in a new ecosystem*

# Losing Containment

- Air
- Water
- Pests
- People



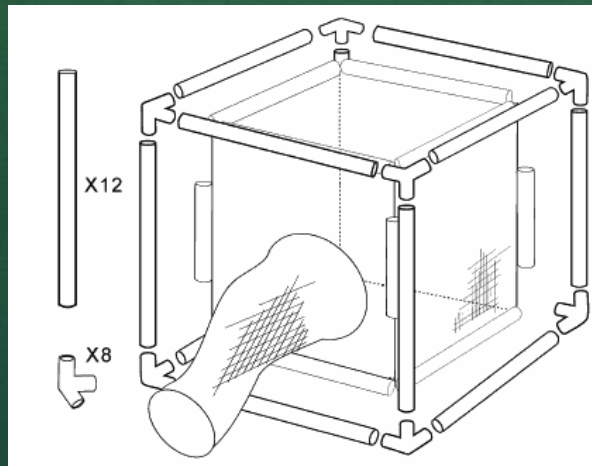
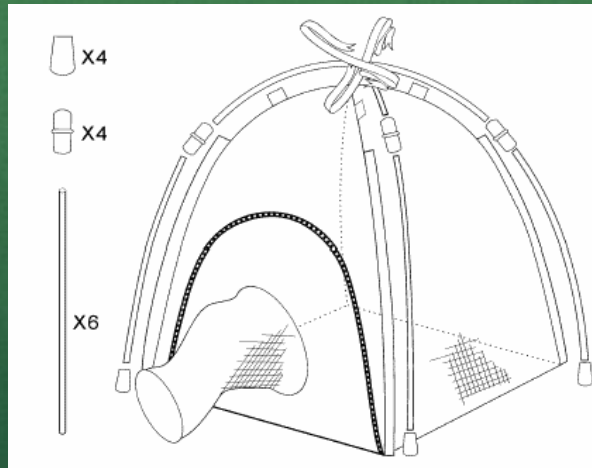
1-14 MM



# Defining Biosafety Levels

- **CDC/NIH (WHO)**
  - BSL1 (through 4)
  - ABSL1 (through 4)
- **NIH Guidelines**
  - BL1 (through 4)
  - *BL1 (through 4)-P*
- **USDA-ARS**
  - BSL-1 (through 4)
    - *BSL-3-Ag*
    - PSL-1 (through 3 for a BSL-3 or BSL-3-Ag facility)
- **USDA-APHIS**
  - *No designators*

# Insect cages / Bug Dorms



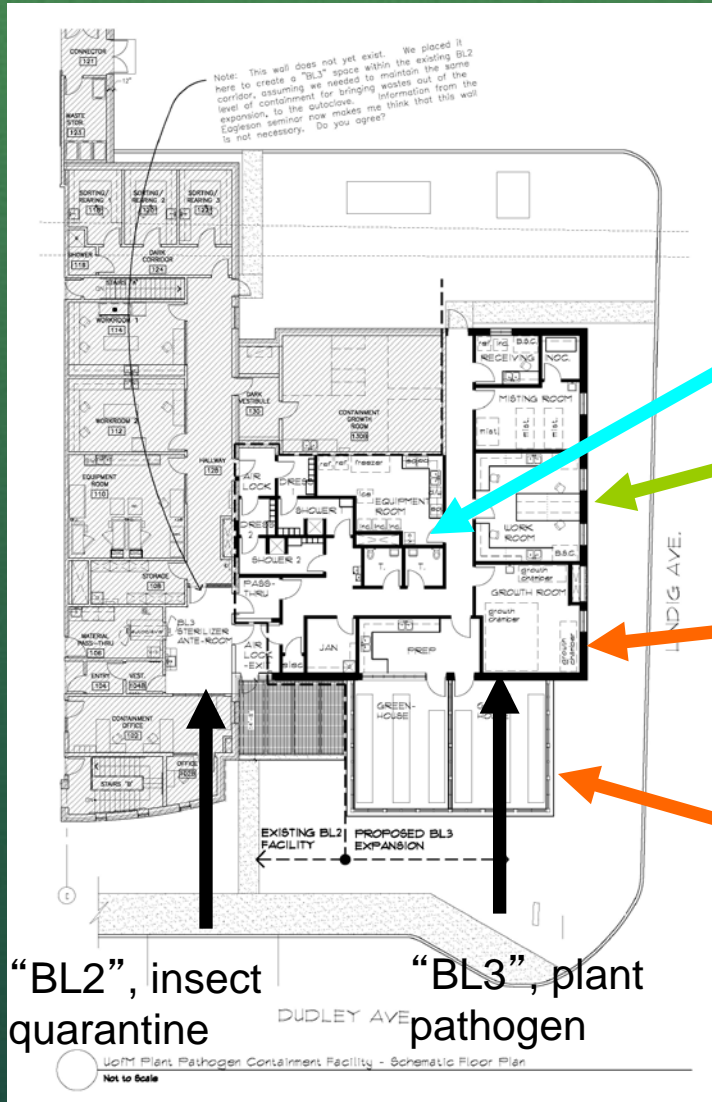
# Physical Containment

- Siting
- Layout
- Structure
- Glazing
- Entry and Vestibules
- Floors
- Drains
- Screening
- Air Filtration and Pressurization
- Cooling, Heating, Ventilation, Humidity
- Benching
- Computer control
- Lighting
- Utilities and piping
- Special hardware

# Containment facility layout



# Pressurization in a 'high containment' facility e.g. APHIS High Security Containment Facility



Shower and changing -1

Work rooms -2

Growth chamber -3

Greenhouses-3



# Universal biohazard symbol



# Biotron Laboratory BL1-P Signage

**BIOSAFETY LEVEL**

**1-P**

**Transgenic Experiment  
in Progress**



Biotron Laboratory  
Controlled Environment Research Center  
University of Wisconsin-Madison





**CONTAINMENT**



