Farm Biosecurity: A Reassessment of Feasible Benefits in an Outbreak

Richard Horwitz

Committee on Foreign and Emerging Diseases
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Message

• Biosecurity makes sense and works . . . to a point.

• More stringent ≠ more effective. It depends.

• Have a Plan B, for when containment and germicide fail.

• Consider:

  Biosecurity, Infection-Control, and Continuity of Dairy Operations in FMD Response

with Project Reports on the NESAAASA website: nesaasa.weebly.com
Prompt – PED, HPAI . . . FMD?

States and Farms with Confirmed PEDV 2014-2015

223 Detections Reported

48,091,293 Birds Affected

States and Farms with Confirmed HPAI 2014-2015
Prompt – Farm Experience + Pareto

Pareto Curve: Results by Effort

Pareto Principle:
“20% of the input [resources, time, effort] accounts for 80% of the output [results, rewards].”

Point of Diminishing Returns
Cultural Differences

Academia/Science

• Accountability: professional standards; peers, students, funding agencies
• Ideal end: path-breaking contribution
• Ideal mode: skeptical, deliberate, uncompromising
• Better novel than prudent

Government

• Accountability: public laws and regulations; supervisors, officeholders, the electorate
• Ideal end: popular, effective policy
• Ideal mode: pragmatic, calm, compromising
• Better prudent than novel
Stereotype

The facts are coming! The facts are coming!

THE BUREAUCRAT

CITIZEN KANE

THE NUTTY PROFESSOR
Biosecurity – Concept / Ideal

Bio-Security:

**Bio-exclusion:**
- Keeping infectious organisms from entering a facility or population

**Bio-containment**
- Keeping infectious organisms from leaving a facility or population
Poor biosecurity in US ‘has helped spread bird flu’

From www.worldpoultry.net - July 5, 5:53 AM

“Poor biosecurity and airborne infection have played a key role in the spread of high pathogenic avian influenza in the US this year, a report from the country’s Animal and Plant Health Inspection Service (Aphis) has suggested.”
Biosecurity – Set of Practices

A. Secure Perimeter
B. Clean & Disinfect
C. Monitor Herd Health
## Biosecurity Objectives and Risks in Benchmarks for Milk Movement Permits

<table>
<thead>
<tr>
<th>OBJECTIVE</th>
<th>BENCHMARK</th>
<th>RISK</th>
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<tbody>
<tr>
<td>What is the main aim of biosecurity in SMS permitting?</td>
<td>How high should the bar be set to allow milk movement?</td>
<td>What hazard lies on the “safe side” of error?</td>
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<tr>
<td><strong>DISEASE CONTROL</strong></td>
<td><strong>HIGH and FIRM</strong></td>
<td><strong>TOO DISRUPTIVE</strong></td>
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<tr>
<td></td>
<td>Up to a standard that best eliminates risk of infection</td>
<td>Shut down too many operations</td>
</tr>
<tr>
<td><strong>BUSINESS CONTINUITY</strong></td>
<td><strong>FLEXIBLE</strong></td>
<td><strong>TOO PERMISSIVE</strong></td>
</tr>
<tr>
<td></td>
<td>Up to a standard that a critical mass of stakeholders can meet</td>
<td>Shut down too few operations</td>
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Ideal Readiness

- **Business Continuity Ideal**: 100%
- **Ideal Preparedness**: Average: 1.0
- **Disease Control Ideal**: Range: 1.0 - 1.0

Graph shows the share of farms at or above rating for readiness, with a rating scale from 0 to 1 and percentage scale from 0% to 100%.
Readiness Measured in Region - 2015

Range: .12 - .97
Average: .61
Defense of Flexible, Feasible Tactics

• Limits in resources for prevention and response
• Limits in “science” on specific, real-world practices
• Diminishing returns of decon and containment
• Benefits of preparing for trade-offs
• Toward a better Plan A . . . and Plan B
Researcher: ‘The Science Sucks!’

He said, “Blah blah blah, says a recent study, but some experts disagree.

He said, “Blah blah blahblah. Blah blah blah!”

She said, “Definitely not blah blah. Not blah, blah blah blah blah!”

He said, “More Blah blah blah blah. Blah blah blah blah!”

She said, “Absolutely not! Not blah, blah blah blah blah!”

More research should tell. Maybe.

Maybe we’re all screwed.
Limits in Science of Biosecurity Risk Assessment and Remediation

• Not much data from the workaday world.
• Coverage is uneven.
• Much of the analysis is anecdotal or speculative.
• Tactical implications tend to be biased.
Lessons from Human Healthcare Facilities and HAI Experience

• More field-tested data and more science.
• Recommendations graded by quality and relevance of science.
• Tactics chosen for proven health benefits (vs. sentinel data).
• Tactics adapted to diminishing returns.
Limits of Containment and Germicide

• Tactics best target direct (vs. indirect) transmission.
  • Benefits of environmental decon are elusive and short-lived.
  • Expect no more than about 50% compliance from trained staff.
  • Long dwell times for disinfectant may be impractical and ineffective.
  • Detergent may be better than disinfectant, anyway.
• Adapt tactics to evolutionary and ecological dimensions of pathogen-host relations.
Plan A: Improve Readiness

- Better engage producers, employees, and suppliers
- More tactical and site-specific preparations and plans
- More consistent standard precautions in ordinary operations
- Increase traceability in the food supply chain
- Better surveillance of the most virulent diseases
Knowing that Plan A may fail . . .

- Increase ability to suspend and restart animal movement
- Increase ability to contain losses within each facility
- Increase ability to depopulate and dispose of carcasses
- Increase genetic diversity of stock and microbial environment
Biosecurity for the Future: Beyond Containment and Germicide

• Decrease density of livestock
• Decrease dependence on long-distance service
• Increase genetic diversity of herds
• Aim to live with a dynamic microbial environment
Intensification: Elevating Biosecurity AND Risk
Biosecurity: Beyond Containment and Germicide

High density
- Increases transmission
- Reduces immunity

Low genetic diversity
- Selects specialized pathogens

High turnover
- No possibility to transmit resistance

High trade of live animals and products
- Favour long-distance transmission

Probability of Transmission + Degree of Virulence
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Thanks!
Contact Information

Richard P. Horwitz, Ph.D.

Planning, Research, and Outreach Consultant
Senior Fellow, Coastal Institute, University of Rhode Island
Professor Emeritus, American Studies, University of Iowa

19 Joann Drive, Barrington, RI 02806-2260, USA
Phone/FAX: (401) 289-0198; Mobile: 497-3991
E-mail: rhorwitz@cox.net
Web: myweb.uiowa.edu/rhorwitz

On-line at NESAASA.weebly.com