Root Cause Analysis & Environmental Assessments

Karin Hoelzer, DVM, Ph.D.

November 9, 2017
Outline of today’s presentation

- What is RCA & why is it needed?
- Pew’s RCA initiative
- Some lessons learned about RCA
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Why root cause analysis (RCA) is needed?

“It is our view that complex systems almost always fail in complex ways, and we believe it would be wrong to reduce the complexities and weaknesses associated with these systems to some simple explanation. Too often, accident investigations blame a failure only on the last step in a complex process, when a more comprehensive understanding of that process could reveal that earlier steps might be equally or even more culpable.”

Columbia Space Shuttle Accident Investigation Board, 2003
RCA: explain why disaster strikes & how to prevent it

1986: Space Shuttle Challenger disaster Live on CNN
From *Challenger* to *Columbia*: root causes reoccur

- **Challenger investigation**
  - Root causes identified
    - Physical causes
    - NASA history
    - NASA culture
  - Corrective actions suggested
- **Seventeen years in-between**
  - System returned to *status quo*
- **Columbia investigation**
  - Root causes reoccurred
The goals of RCA: prevent disaster reoccurrence

<table>
<thead>
<tr>
<th>Root causes are</th>
<th>RCA focus</th>
<th>RCA approach</th>
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<tbody>
<tr>
<td>• Causal influences</td>
<td>• Learn from past</td>
<td>• Systematic</td>
</tr>
<tr>
<td>• Caused event or</td>
<td>• Why system failed</td>
<td>• Comprehensive</td>
</tr>
<tr>
<td>• Increased impact</td>
<td>• Events</td>
<td>• Physical factors</td>
</tr>
<tr>
<td>• Controllable</td>
<td>• Interactions</td>
<td>• Human factors</td>
</tr>
<tr>
<td>• Manageable</td>
<td>• Root causes</td>
<td>• Organization</td>
</tr>
<tr>
<td>• Within control</td>
<td>• Prevent repeat</td>
<td>• Other</td>
</tr>
<tr>
<td>• Usually &gt; 1 RC</td>
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Systems theory: attributes of complex systems

- Consist of multiple interdependent parts
- Have ‘set points’ shaped by these interactions
- Changes require deep knowledge of interactions
- System is prone to return to ‘set points’
Basic premises
- Humans are fallible
- Errors happen
  - Understand why
  - Adapt conditions
- Understanding is key to prevention

Complex systems have many safety barriers
- Every safety barrier has weaknesses
- Accidents happen when ‘holes’ align
- Need to understand ‘near misses’

James Reason, 2000
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Why is root cause analysis a priority for Pew?

Foundation of a prevention-based food system

Not always done; ineffectively shared; lost opportunities

Improvements require collaborative approach

Alignment among FDA, CDC, FSIS, state & local; industry
### Root cause analysis project approach

<table>
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<th>Research</th>
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<tr>
<td>• Other models (e.g., NTSB, CSB, NuReg)</td>
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<td>• RCA best practices</td>
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<th>Convenings</th>
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<tr>
<td>• RCA value; obstacles; definitions</td>
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<tr>
<td>• Communicating RCA findings</td>
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<td>• RCA best practices</td>
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<th>Outreach</th>
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<tr>
<td>• Conference presentations (IAFP, InFORM)</td>
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<td>• Publication in trade magazine (upcoming)</td>
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Pew’s work on RCA: Goals and objectives

RCA description
- definition
- value
- obstacles

Best practices
- current practice
- other models
- recommendations

Learning from RCA
- challenges
- success stories
- pilot project
Pew’s work on RCA: Goals and objectives

RCA description
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Pew’s work on RCA: Learning from other models

RCA in other high-risk industries

- Transportation, chemical, nuclear industries
- Occupational safety; consumer product safety
- Recreational scuba diving

3 Key research questions

- How are RCAs conducted? (When, why & how)
- How are key findings disseminated & used?
- What is working & what is not?
Three distinct but related types of investigations:

- **Predictive** (before operations)
  - What can go wrong & how to prevent it?
  - Based on risk assessment, fault tree analysis, etc.
  - Site licensing, standard setting, regulations, etc.

- **Operational** (during operations)
  - Are safety measures implemented & adhered to?
  - Based on inspection, surveys, etc.

- **Investigational** (after accident)
  - What went wrong & why? What actually worked?
  - Based on root cause analysis

Key finding: Not every investigation is a RCA.
RCA: learning from past to prevent future

Root cause analysis
- What went wrong and why?
- How to prevent reoccurrence?
- What could create future problems?

Inspection
- Is operation in compliance?
- How to restore compliance?
- How to prevent future issues?
Key finding: Not every event requires a RCA
Key finding: Effective RCAs reconstruct events

Before the accident
- What was the general situation before the event?
- What specific events led up to the event?

During the accident
- What went wrong and why?
- What went right?

After the accident
- How well did the post-event response work?
- What has been learned and what changes have been made?
Key finding: Effective RCAs consider 4 types of factors

- Structures
- Systems
- Impacts
- Policies
- Structures
- Culture
- Performance
- Decision-making
- Communication
- Weather
- Post response
- Regulations
Key finding: Properties of effective RCAs

- Timely investigation
- Frequent stakeholder communications
- Comprehensive & systematic
- Appropriate technical expertise available
- Unbiased & transparent
- Conclusions based on & driven by evidence
- Clearly & concisely reported
Conclusion: RCA valuable for foodborne outbreaks

- Systems-based approach for prevention
- Key in prevention-based food system
  - Understand why outbreak happened
  - Find weaknesses in food system
  - Identify how to prevent reoccurrence
- Other high-risk industries rely on RCA
  - Opportunities to learn from them
Thank you for your time & attention

To continue the discussion beyond today please contact:

Karin Hoelzer, DVM, PhD
Senior Officer, Health Programs
The Pew Charitable Trusts
901 E Street, NW, Washington, DC 20004
p: 202-540-6986 | e: khoelzer@pewtrusts.org | www.pewtrusts.org

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