

Glove Safety Exposed: Solutions for Food Safety Heroes



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Glove Safety Exposed: Solutions for Food Safety Heroes

- **Journal of Food Protection:** Peer Reviewed
 - **Microbial, Chemical & Physical Contamination**
- **Cost of Doing Nothing:** Profit vs Safety
- **Incorporating Gloves in HACCP plans**



“Potential for Glove Risk Amplification via Direct Physical, Chemical, and Microbiological Contamination”

Michaels, B.S., Ayers, T., Brooks-McLaughlin, J., McLaughlin, R.J., Sandoval-Warren, K., Schlenker, C., Ronaldson, L., Ardagh, S., Potential for Glove Risk Amplification via Direct Physical, Chemical, and Microbiological Contamination, *Journal of Food Protection* (2024) doi: <https://doi.org/10.1016/j.jfp.2024.100283>



Journal of Food Protection.

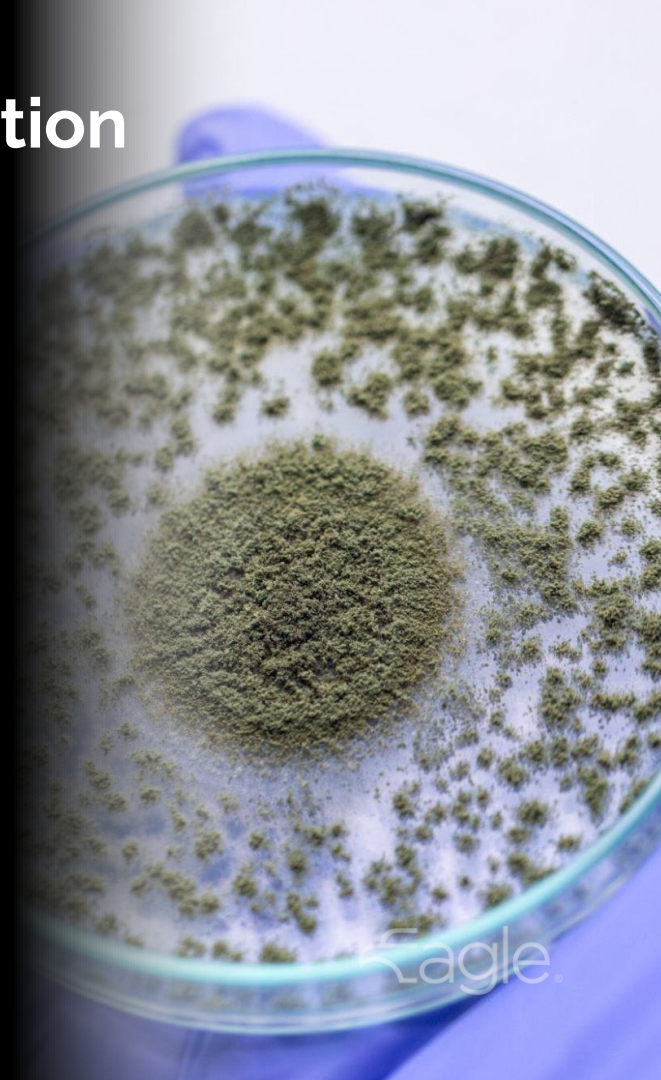
Glove Microbial Contamination

*“...enterotoxigenic strains of **Bacillus cereus** and **B. anthracis**, (...) **Listeria monocytogenes**, **Clostridoides difficile**, **Staphylococcus aureus**, **Pseudomonas aeruginosa**, and **Streptococcus pneumoniae**, isolated from unused, disposable gloves.”*

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Glove Microbial & Fecal Contamination

2,800+ gloves (new & unused) tested

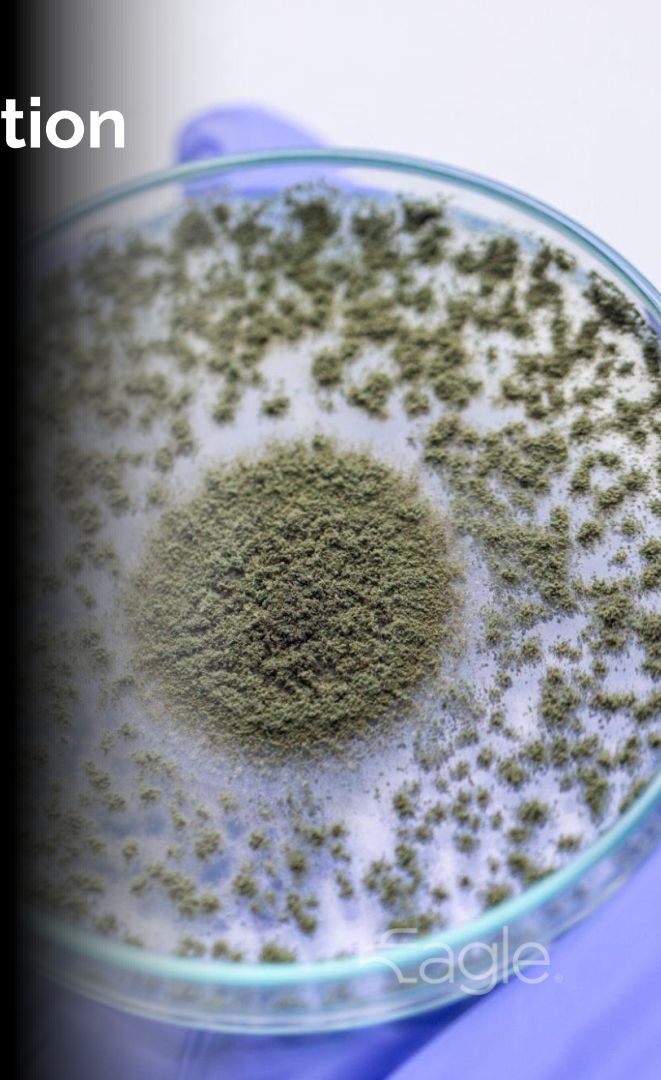


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260 unique & viable Microbes detected:

E. Coli

Salmonella

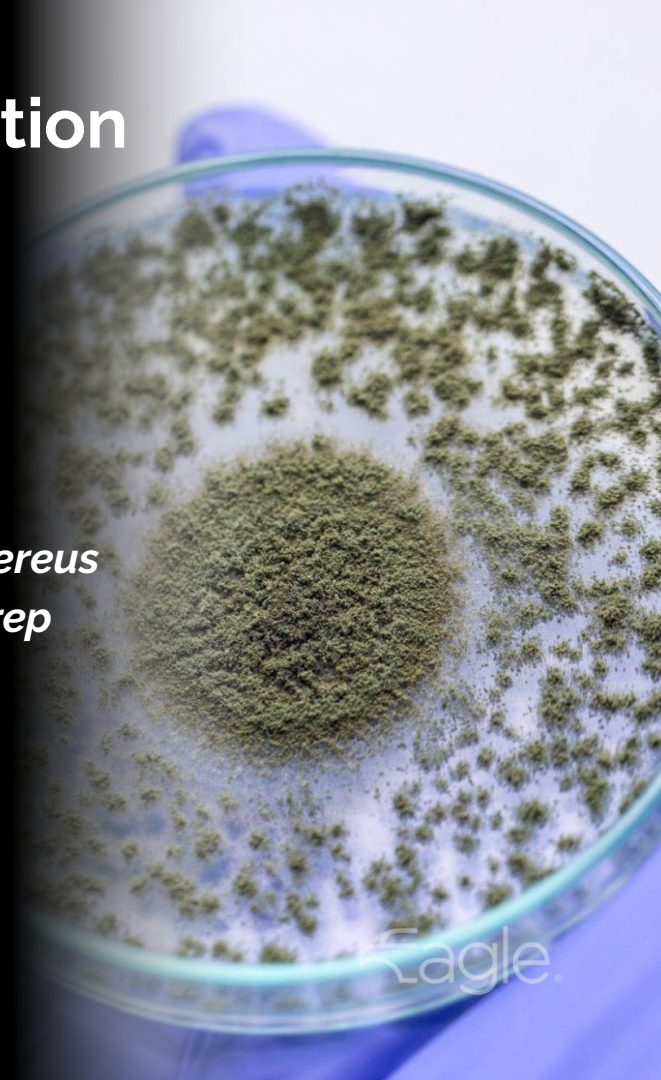
Aspergillus sp.

Listeria

Anthrax

Bacillus cereus

Staph/Strep



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Listeria

Bacillus cereus

Salmonella

Anthrax

Staph/Strep

Aspergillus sp.

50% of samples contained fecal indicator organisms



Glove Contamination Is Invisible The Consequences Are Not!



Glove Chemical Contamination

*"...**gloves** have been identified as sources of potentially **toxic, poisonous, and deleterious chemicals** that can be **introduced into food**, and **cause dermal problems** via solubilization of glove chemicals within gloves via sweat"*

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Glove Chemical Contamination

Chemical Contamination

- Case Study - **Freya Farms** OPP Carcinogen
"The gloves were the last thing we tested, we just never imagined something sold as food safe could transfer such nastiness. The discovery was just the beginning... recalls are costly in more ways than one."
- Without the benefit of Inspection
"...there are instances where investigations into adverse events related to glove use revealed chemical additives not listed in manufacturing statements."



Glove Physical Contamination

*“with (...) **punctures in new, unused gloves**, that can develop into significant rips and tears, not only can **direct physical food contamination** occur, but **chemical and microbiological contamination** can find their way into food.”*

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Physical (Foreign Material) Contamination

- **Glove Pieces (ripped gloves)**

"...the physical glove pieces shed into food, larger slugs of liquified soils amplify this hazard in a visible and hard to ignore fashion that will trigger recalls."

- **Microbial & Chemical Contamination**

"While glove pieces are dramatic, the incessant time-dependent, drop-by-drop result of a leak or many leaks from all food workers on shift can have significant consequences as a single puncture can represent liquid bridge to whatever is contacted."



How Does Glove Contamination Happen? Lax Manufacturing Hygiene & QA

- Toxic raw materials
- Dirty factory environment
- Contaminated water source & filtration
- Sub-standard leach & wash tanks
- Packing cross-contamination
- Fraudulent supply chain



How Does Glove Contamination Happen? Lax Import Regulations

FDA (21 CFR 177) compliance for food handling

- One-off test
- No expiration date



How Does Glove Contamination Happen? Lax Import Regulations

FDA (21 CFR 177) compliance for food handling

- One-off test
- No expiration date
- **Chemical migration tests only**
- **Not tested for bioburden, cleanliness or performance**
- **No AQL (Acceptable Quality Level)**





Hands (Gloves) Foundation of Food Safety

- Ripped gloves cause contamination
- Quality control
 - Foreign material & toxins
- **Non-compliance** due to ripped gloves
- **Decrease ROI; Worker risks and inefficiencies**

The Cost of Doing Nothing: Profit vs Safety

- **58% of companies impacted by food recalls**
 - **6% had 11-20 recalls**



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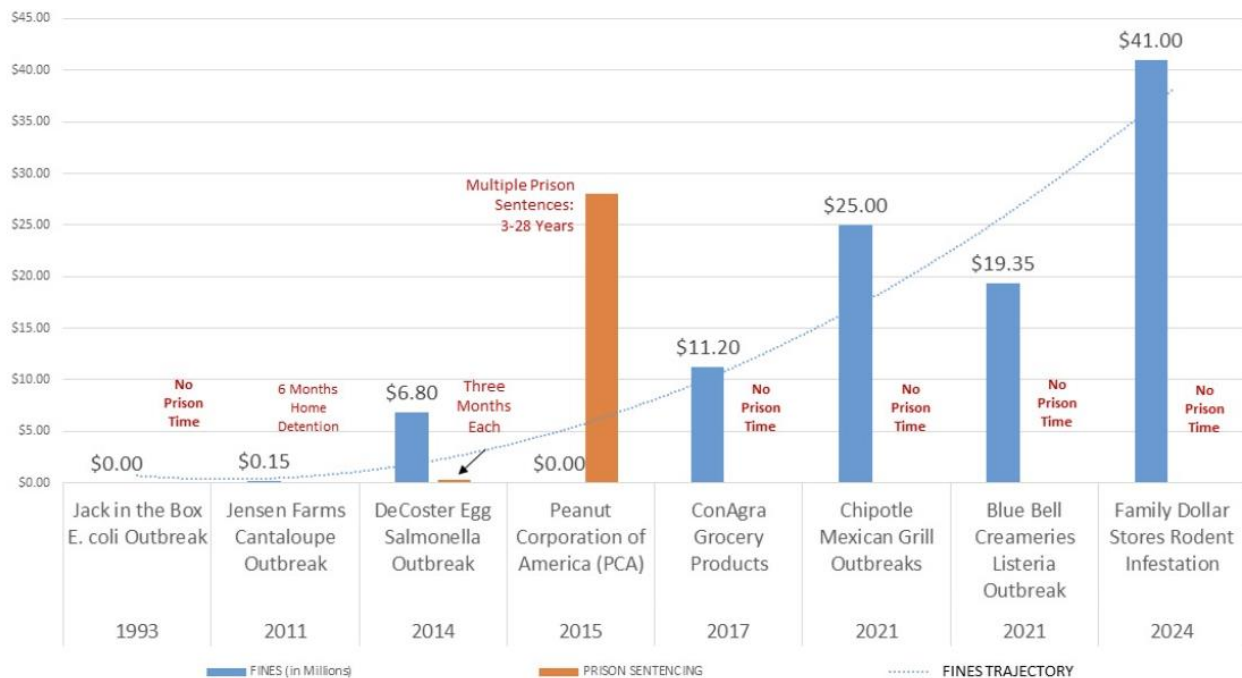


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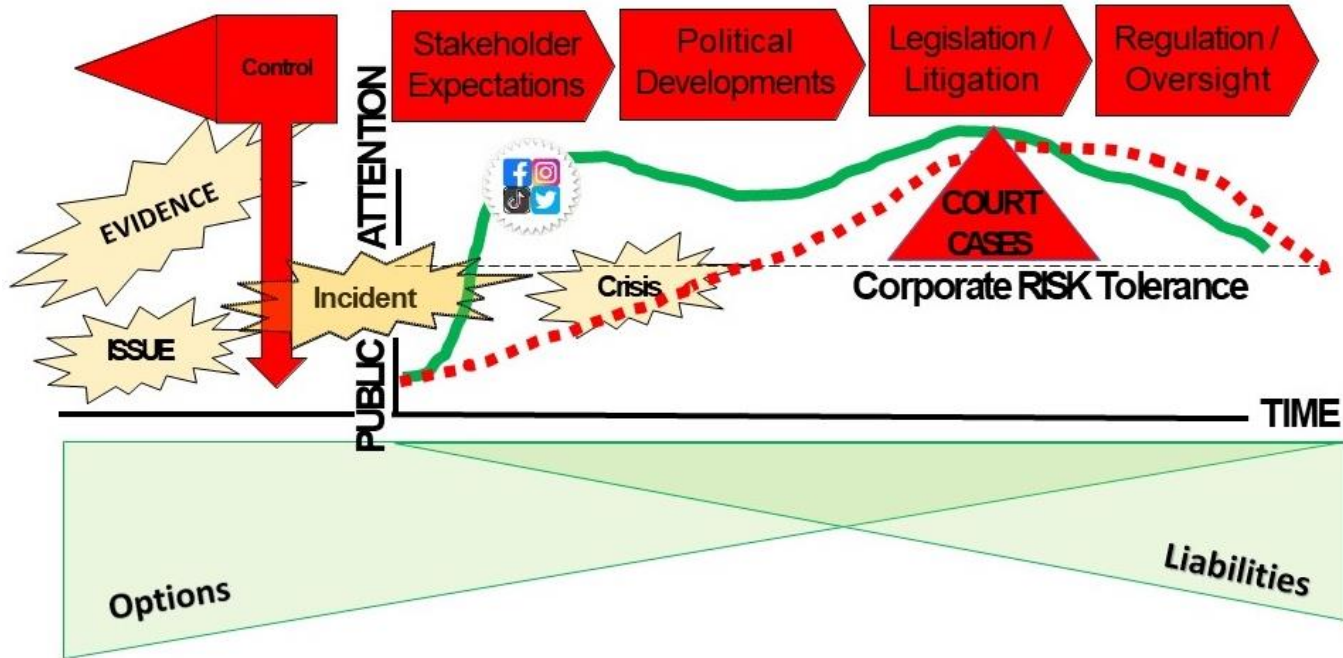
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- 2021-22: food recalls spiked 700%
 - including foreign material contamination
- \$10M average direct company cost of food recalls
- **\$100M direct & indirect costs to 5% of companies**



Chart of Food Safety Failure Events & Fines / Prison Sentencing



Predicting the Next Major Food Safety Failure



Immediate Solutions: In Your Hands Now

- **Gloves ROI significant**
 - Productivity & work efficiency
 - Worker & consumer health



Immediate Solutions: In Your Hands Now

- **Gloves ROI significant**
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- **Evidence based, ethical & traceable purchasing**



Immediate Solutions: In Your Hands Now

- **Gloves ROI significant**
 - Productivity & work efficiency
 - Worker & consumer health
- **Evidence based, ethical & traceable purchasing**
- **Solutions to glove risks**
 - Traceability
 - Delta Zero™ third-party glove testing



Immediate Solutions to Glove Risks

- Traceable supply chain
- Delta Zero™ third party glove testing
- Incorporating in HACCP plan





Delta Zero™ proprietary multi-layered, lot tested:

- 1. Safe Ingredients**
 - FTIR & Py-GC-MS
- 2. Cleanliness**
 - MPN microbial counts & 16S metagenomic sequencing
- 3. Structural Integrity**
 - AQL, strength & elongation
- 4. Dermal Compatibility**
 - Mitochondrial function & mitotic index

Incorporating in HACCP Plan

*“With their (gloves) treatment as simple consumable commodities by food industry procurement staff, there is **a lack of validation or verification of safe and acceptable performance that should be pre-requisite program elements in adherence to HACCP and FSMA principles**”*

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Thank You!
Questions?

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