



Seminar on Risk Management and Risk Assessment for CCFH

Risk Assessment of *Campylobacter* spp. In Broiler
Chickens

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Campylobacter Expert Drafting Group:

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Objective

- To generate a risk assessment model for *Campylobacter jejuni* that extends from the farm to consumer
- To provide a framework for a model that could be adapted to individual countries
- To provide insight into potential management strategies to reduce risk



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Approach

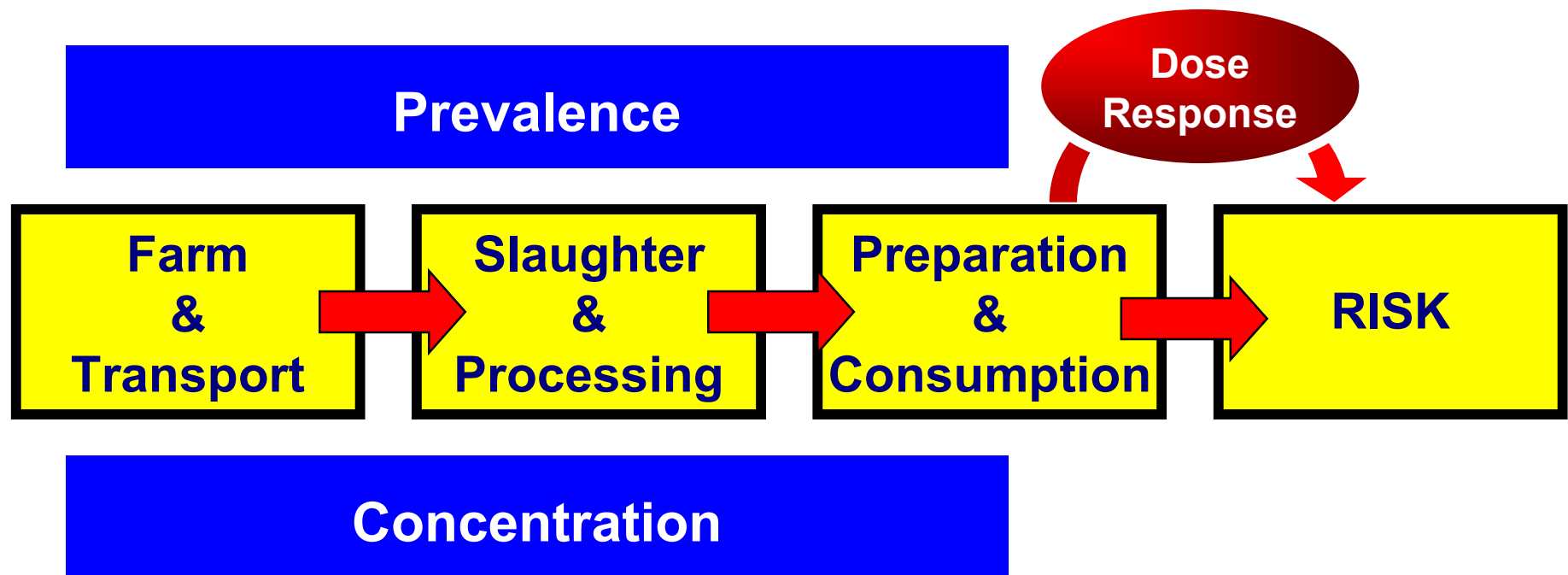
- Review the existing database of information on the issues (including WHO / FAO call for data)
- Evaluate existing national risk assessment models
- Incorporate components if appropriate
- Generate new models where necessary
- Use a modular approach for easy adaptability



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C. jejuni risk assessment model



Results

- Results presented in the form of various scenarios to reflect potential management strategies
- Model does not represent any one location / country
 - Absolute risk estimates are meaningless in the current context
 - Individual countries need to customize with specific data
 - Relative risk comparisons can provide management guidance



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Scenarios

- General
 - change in overall prevalence
 - change in overall level of contamination
- Specific
 - change in farm level flock prevalence and farm level within flock prevalence
 - change in internal and surface contamination before and through processing
 - fresh and frozen chicken impact on risk



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Scenario 1

- What is the effect on relative risk reductions of reducing the prevalence of contaminated chicken going to retail ?
 - Various prevalence levels from 100% to 0% at the exit of process were tested
 - Resulting risk estimates generated
 - Relative mean risk reductions calculated

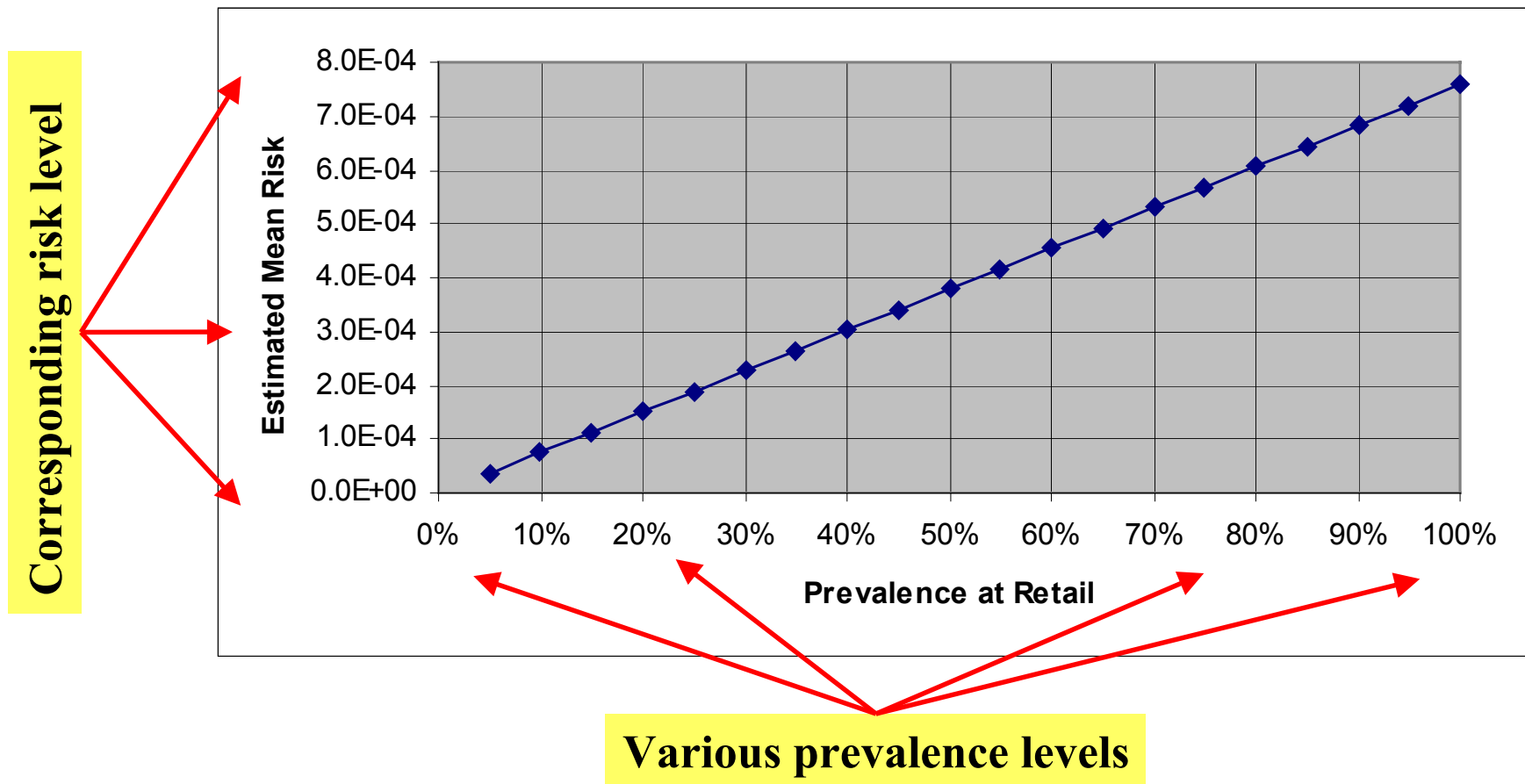


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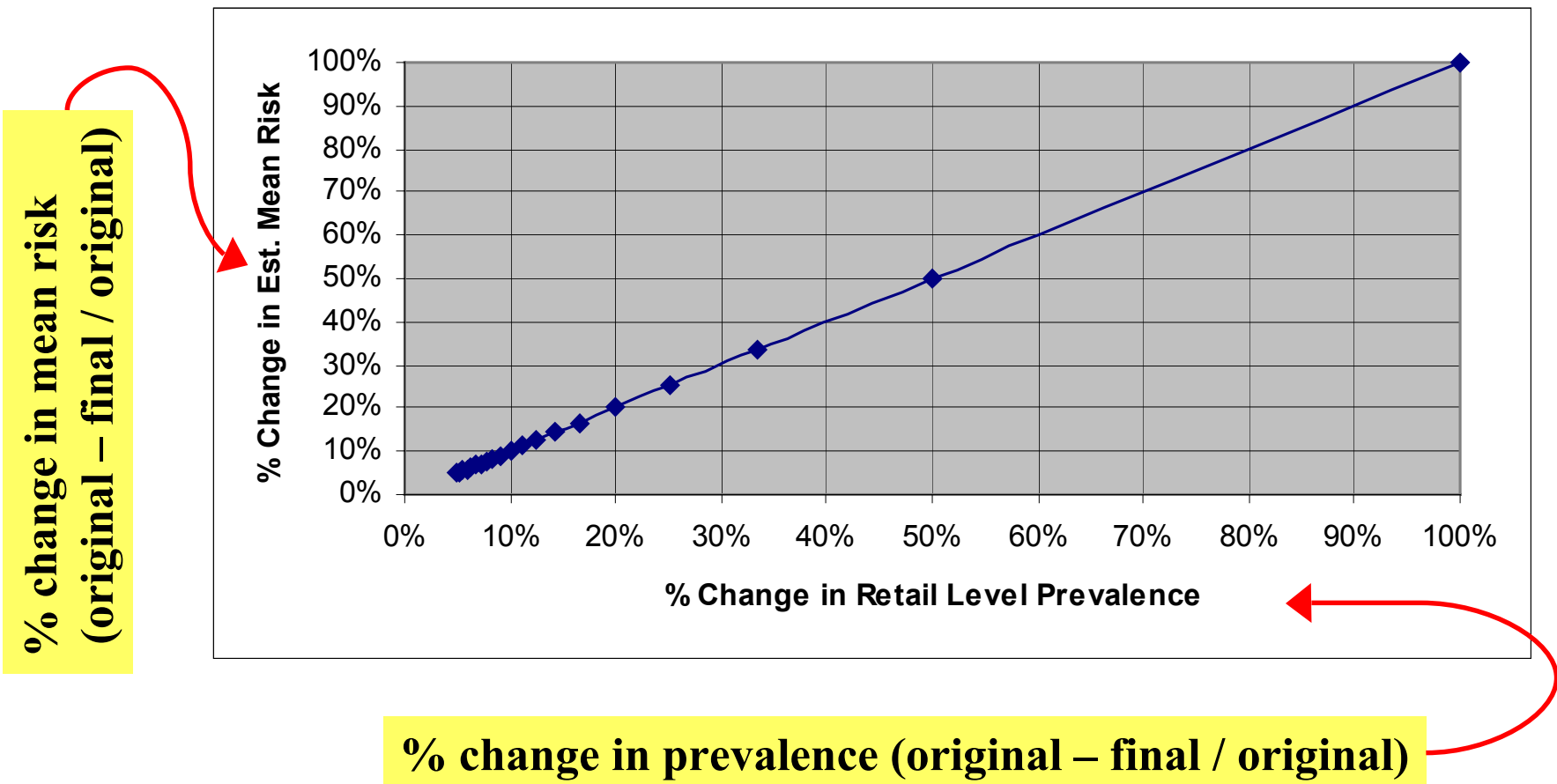
Scenario 1

(Mean Risk vs. Prevalence at retail)



Scenario 1

(% change in risk vs. % change in prevalence)



Scenario 1: Summary

- Relative risk reduction of reducing prevalence of contamination chickens going to retail has a linear (one-to-one) relationship
 - 50% reduction in prevalence of contaminated chickens results in 50% reduction in risk



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Scenario 2

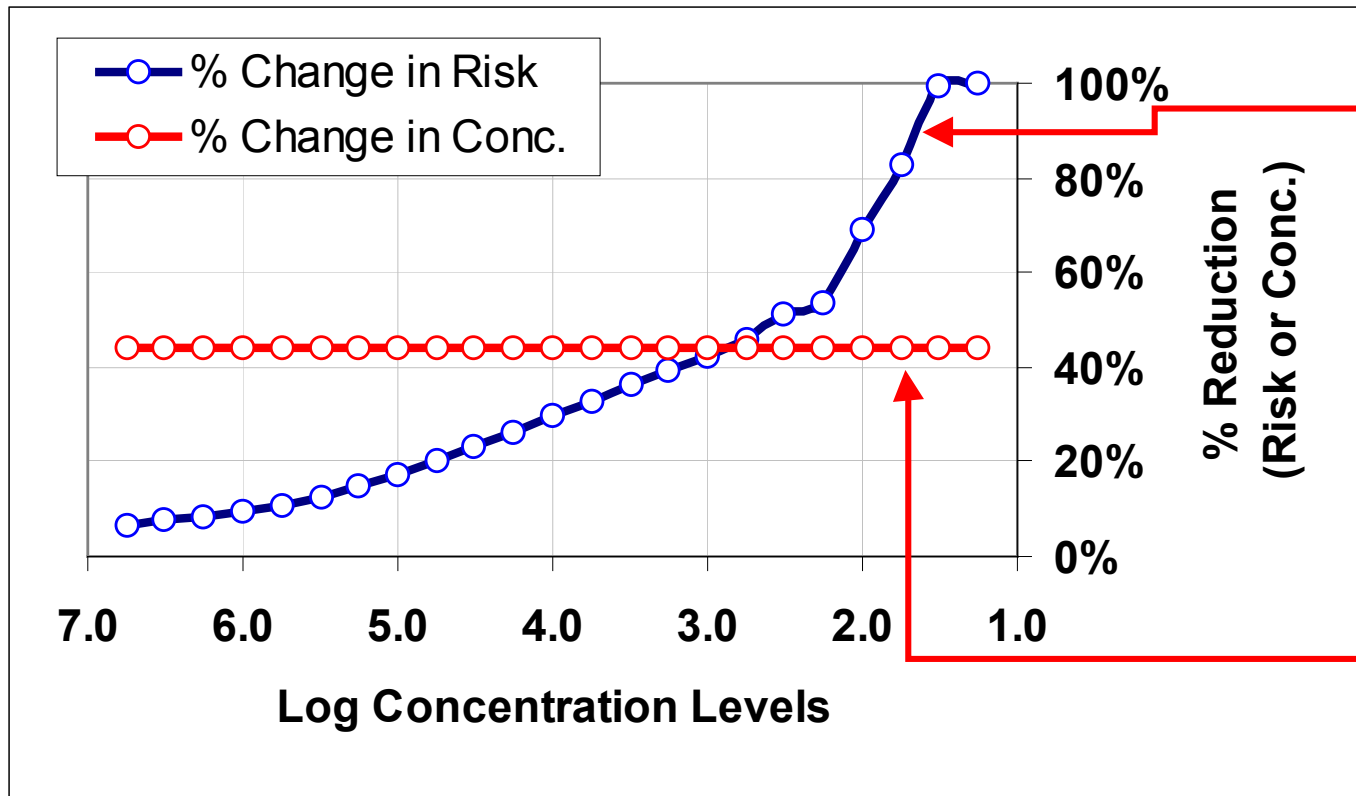
- What is the effect on relative risk reductions of reducing the level of contamination on chicken going to retail ?
 - Various contamination levels tested
 - Resulting risk estimates generated
 - Relative mean risk reductions calculated



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Scenario 2



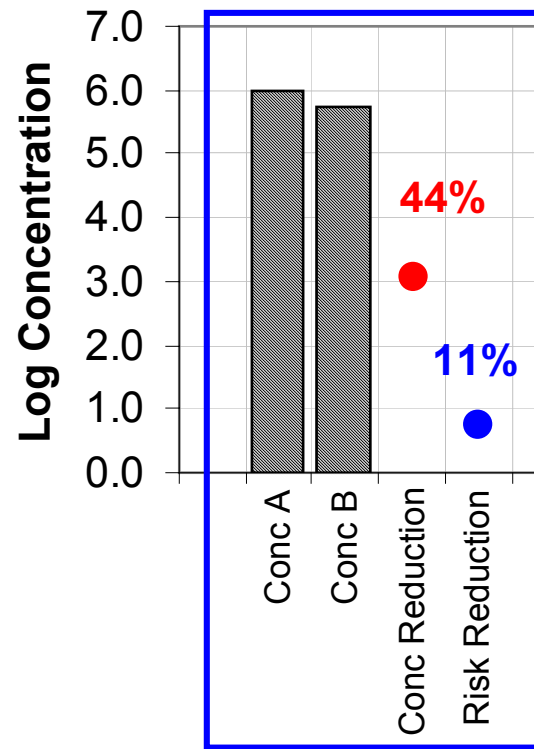
% reduction in mean risk as a result of additional concentration reductions

% reduction in concentration between successive steps



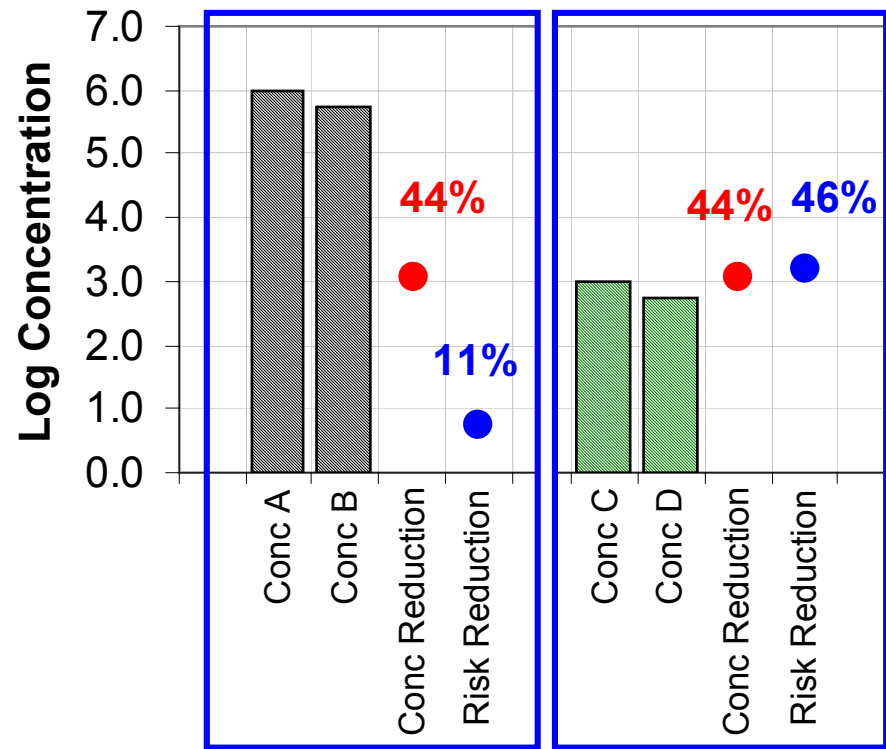
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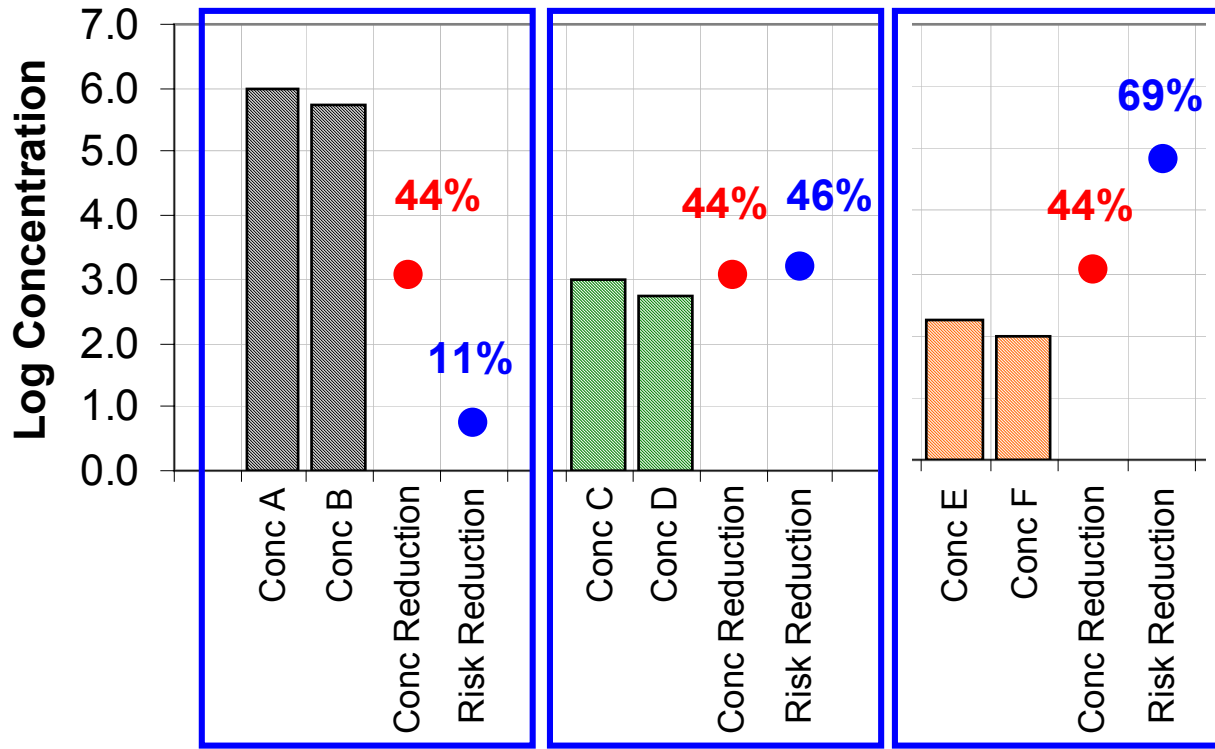
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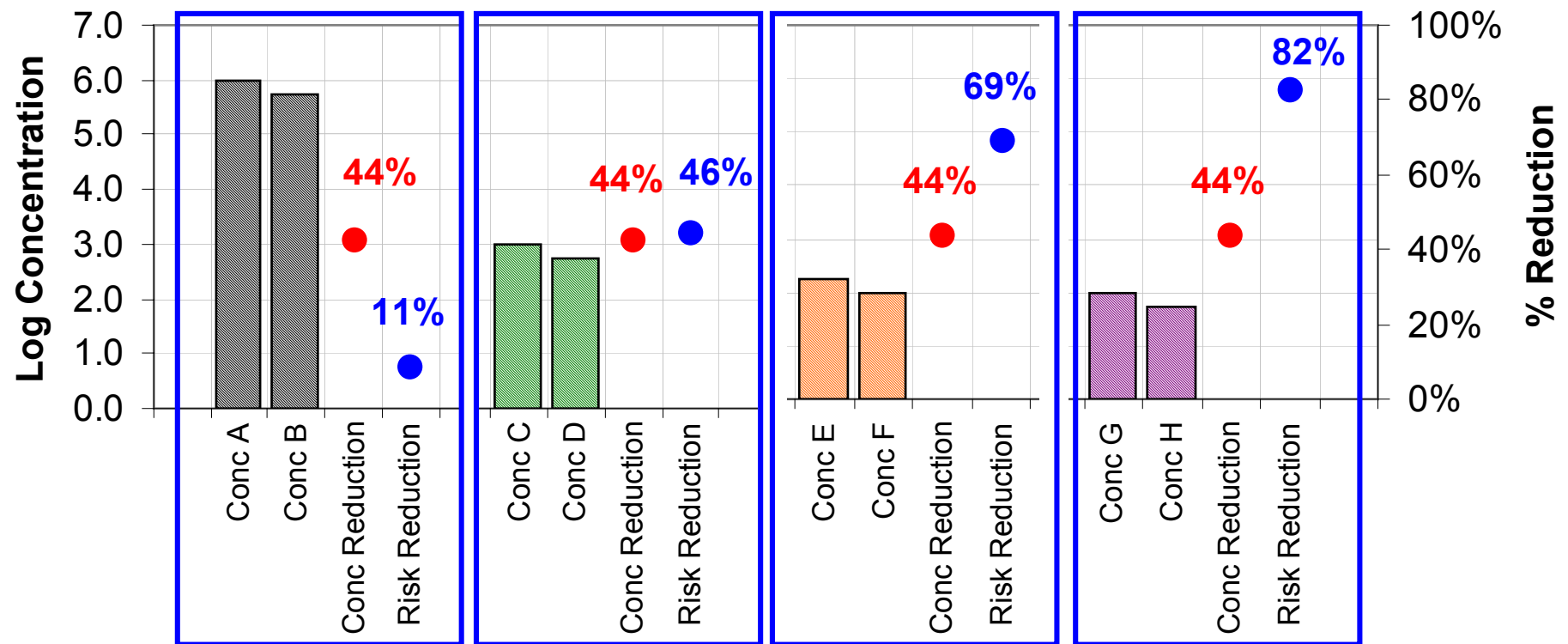
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- Risk reduction by reducing the level of contamination depends upon the initial starting contamination level
 - High contamination levels less than one to one relationship (50% concentration reduction, < 50% risk reduction)
 - Low contamination levels greater than one-to-one relationship (50% concentration reduction, >50% risk reduction)



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Scenario 1 & 2: Summary

- Prevalence going to retail (scenario 1)
 - Any management strategy that alters the prevalence of contaminated chicken at retail is estimated to have a proportional impact on mean risk
- Concentration going to retail (scenario 2)
 - If the level of contamination is high, small additional reductions will have only a small effect
 - If the mean level of contamination is lower, additional contamination level reductions will have greater than proportional effect on risk



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Scenario 3

- What effect does changing between flock or within flock prevalence have ?
 - Between flock prevalence (Prevalence of contaminated flocks at the farm)
 - Example Strategy: Use of colonisation resistant breeds
 - Within flock prevalence (prevalence of contaminated birds within contaminated flocks)
 - Example Strategy: Bio-security measures that delay the introduction of contamination as long as possible prior to farm exit so that not all birds are positive



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Scenario 3

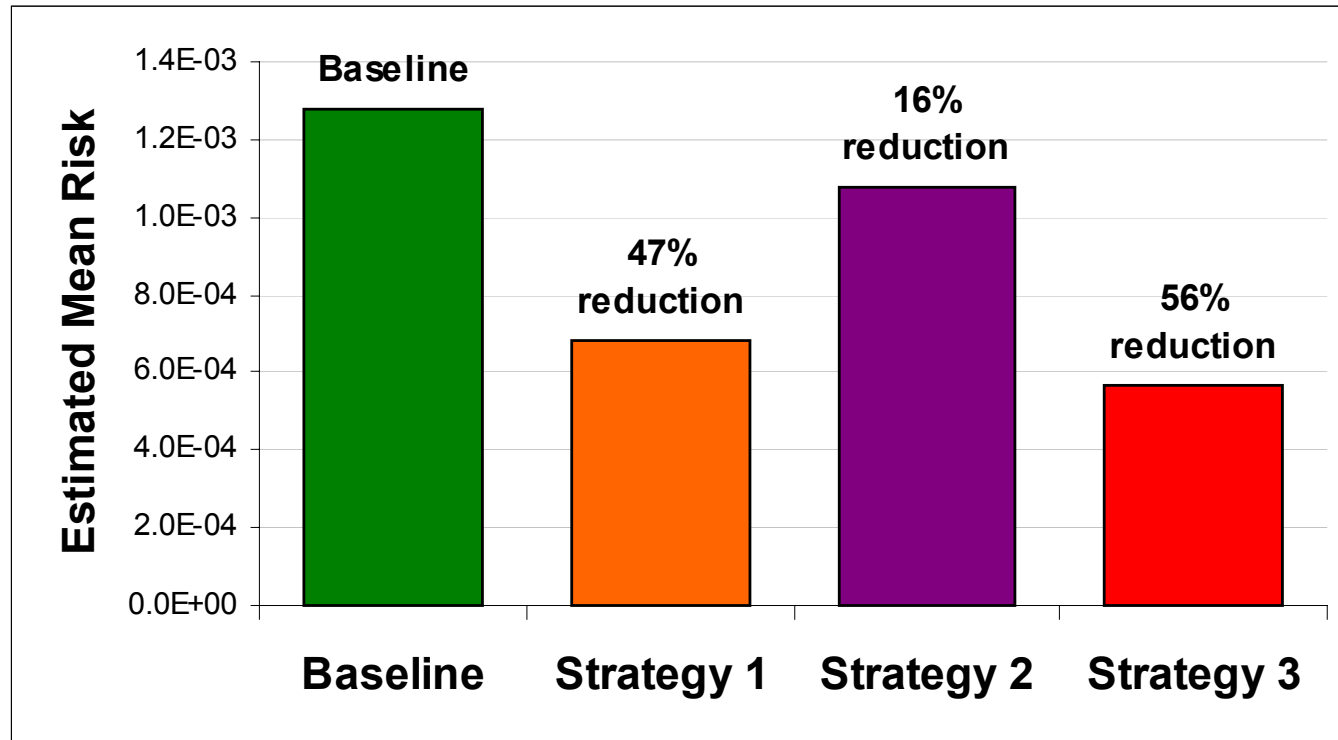
- Three (3) alternative strategies investigated
- Strategies compared to an assumed baseline
 - Baseline: 80% flock prevalence, 100% within flock prevalence
 - Strategy 1: Reduction in flock prevalence to 40%
 - Strategy 2: Reduction in within flock prevalence to 50%
 - Strategy 3: Combination of Strategy 1 and Strategy 2 (reduction in flock prevalence to 40% and within flock prevalence to 50%)



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Scenario 3



- **Baseline:** 80% flock prevalence, 100% within flock prevalence
- **Strategy 1:** 40% flock prevalence, 100% within flock prevalence
- **Strategy 2:** 80% flock prevalence, 50% within flock prevalence
- **Strategy 3:** 40% flock prevalence, 50% within flock prevalence

Scenario 3: Summary

- Significant reductions observed by reducing overall flock prevalence
- Within flock prevalence reductions by themselves have a minimal effect due to cross contamination during transport and processing



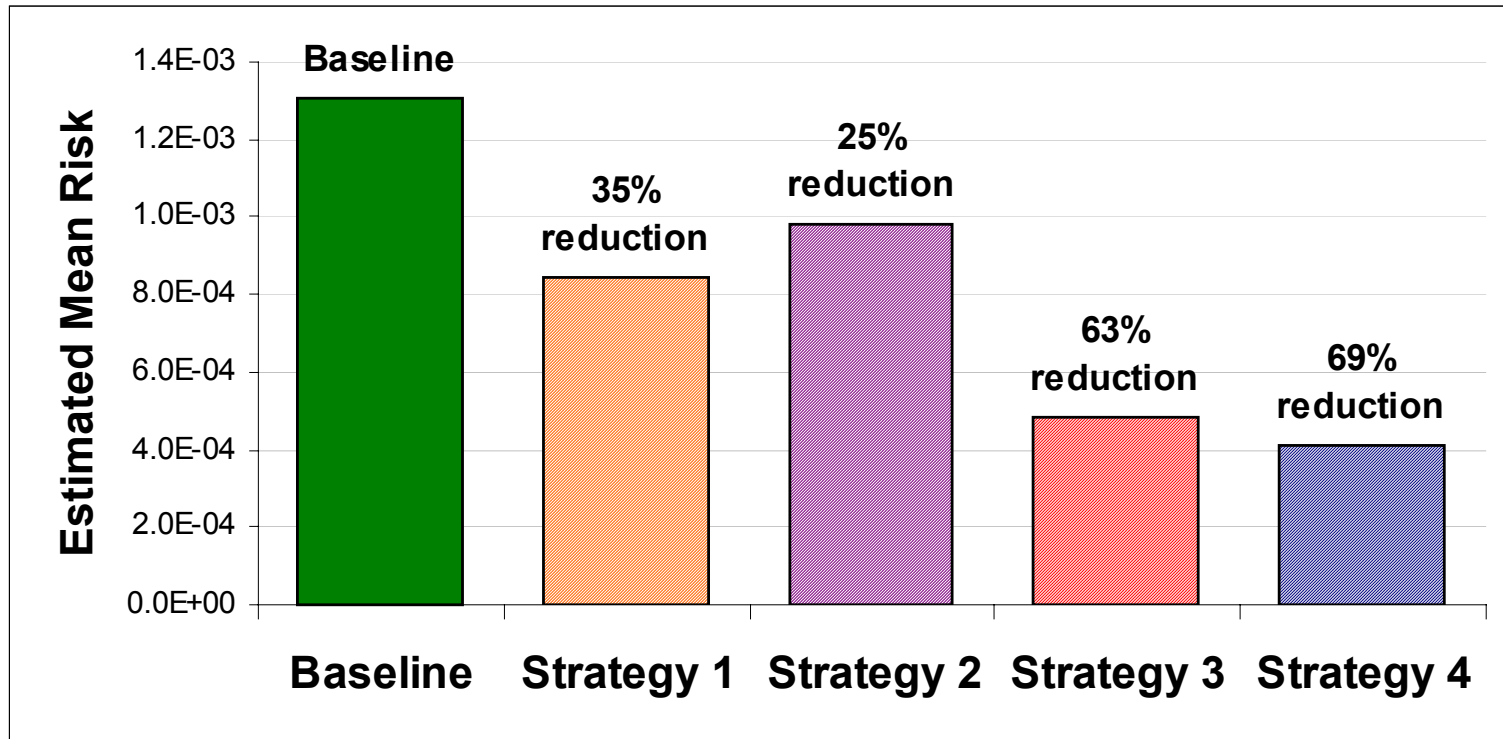
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Scenario 4

- What effect does changing the internal and surface contamination of chickens before and through processing have ?
- Four (4) alternative strategies investigated
 - Strategy 1: 90% reduction in surface contamination level after transport
 - Strategy 2: 90% reduction in levels contaminating carcasses at evisceration
 - Strategy 3: 90% reduction in surface contamination post evisceration
 - Strategy 4: 90% reduction in initial internal contamination levels (overall reduction in contamination entering the system)

Scenario 4



- **Strategy 1:** reduction in surface contamination post transport
- **Strategy 2:** reduction in amount of contamination deposited at evisceration
- **Strategy 3:** reduction in surface contamination post evisceration
- **Strategy 4:** reduction in overall internal colonization and contamination levels

Scenario 4: Summary

- Reducing surface contamination after evisceration can have a significant impact on reducing the risk
 - Reductions of surface contamination prior to this get negated by additional contamination being deposited
- Targeting the internal colonization levels at the farm level has a significant effect on reducing the risk (reducing the overall pool of contamination entering the system)



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Scenario 5

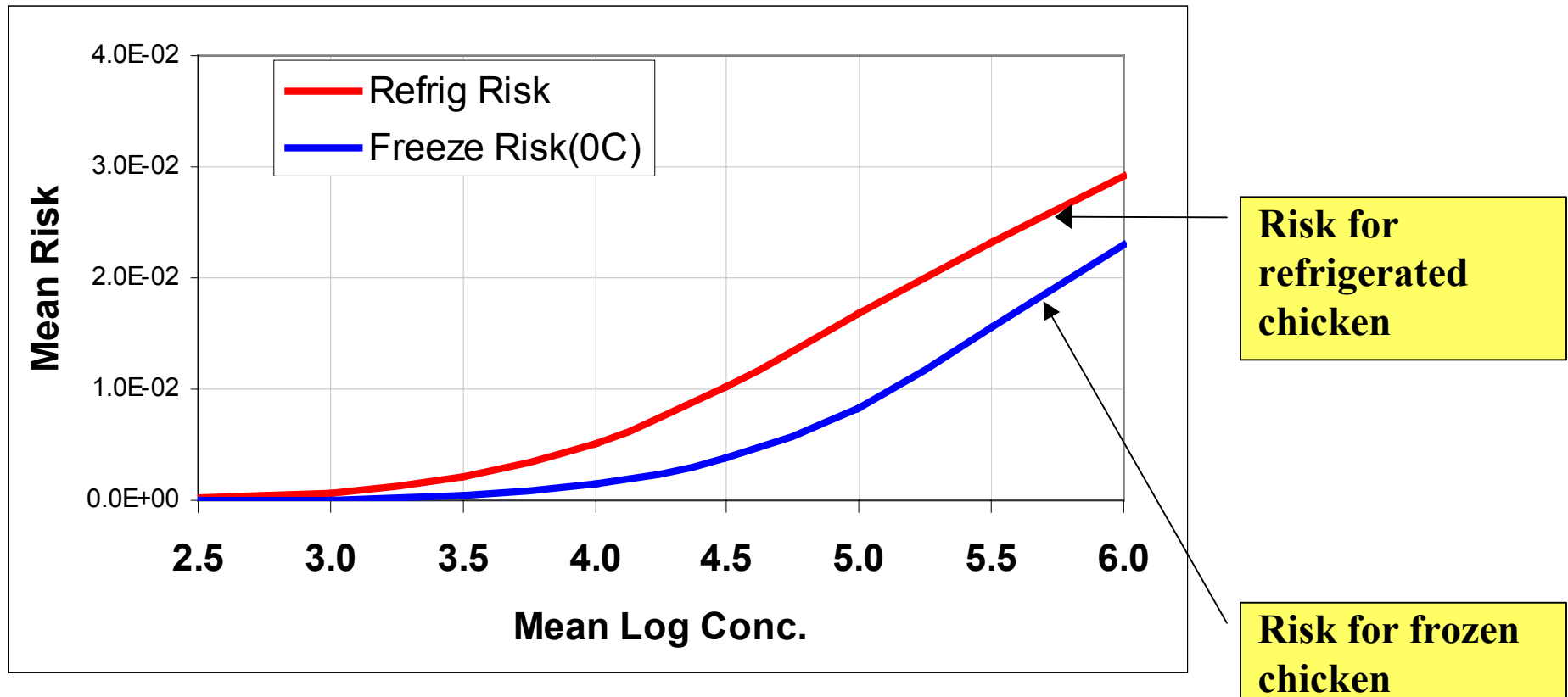
- What is the difference in risk for refrigerated or fresh chicken compared to frozen chicken ?
- Assumptions
 - Refrigerated (0 to 9 days)
 - Frozen (1 day to 6 weeks)



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Scenario 5



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Scenario 5: Summary

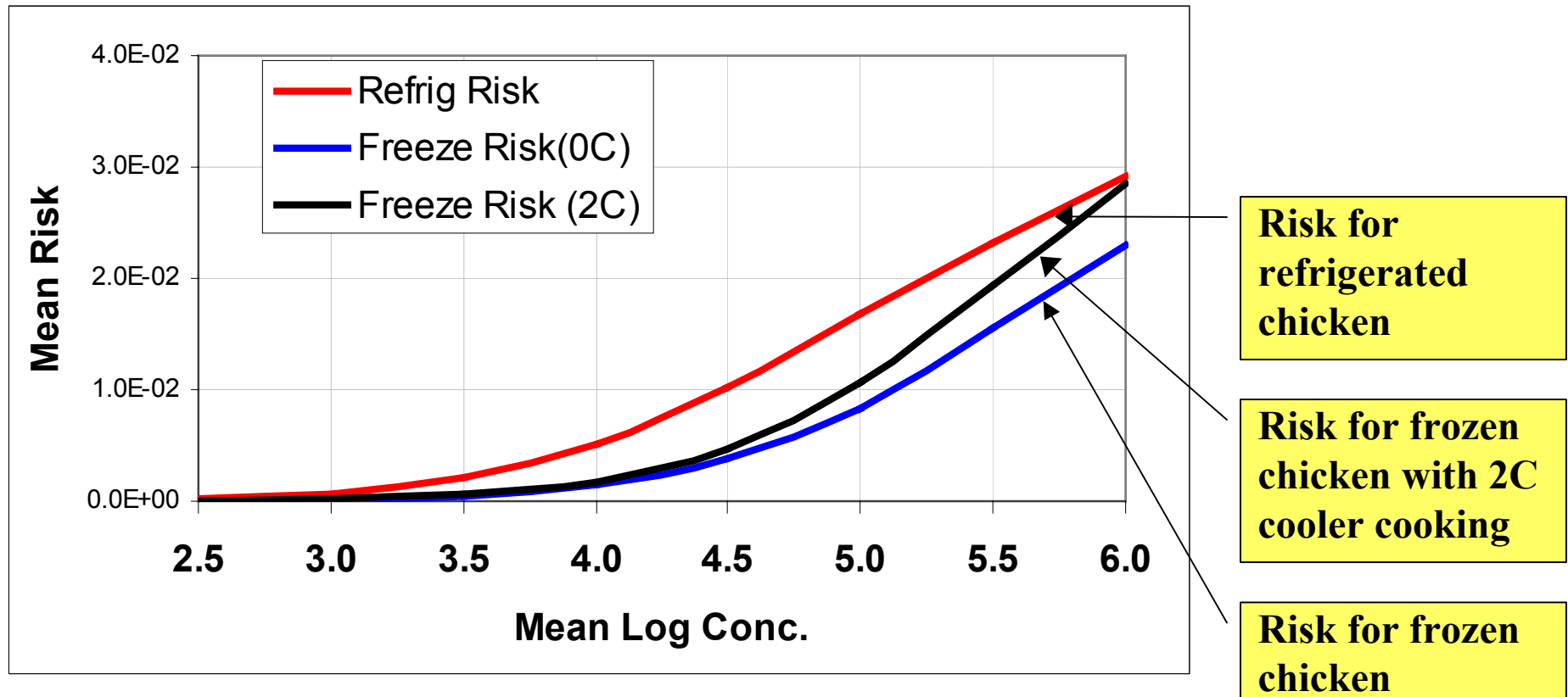
- Frozen chicken is estimated to result in lower risk
- However, these results can be complicated
 - Preparation practices could reverse the effect
 - Example: it is possible that cooking effectiveness could be diminished for frozen chicken compared to fresh chicken
 - **Scenario A:** Final cooking temperature, 2C cooler in cold spots for frozen chicken
 - **Scenario B:** Final cooking temperature, 5C cooler in cold spots for frozen chicken



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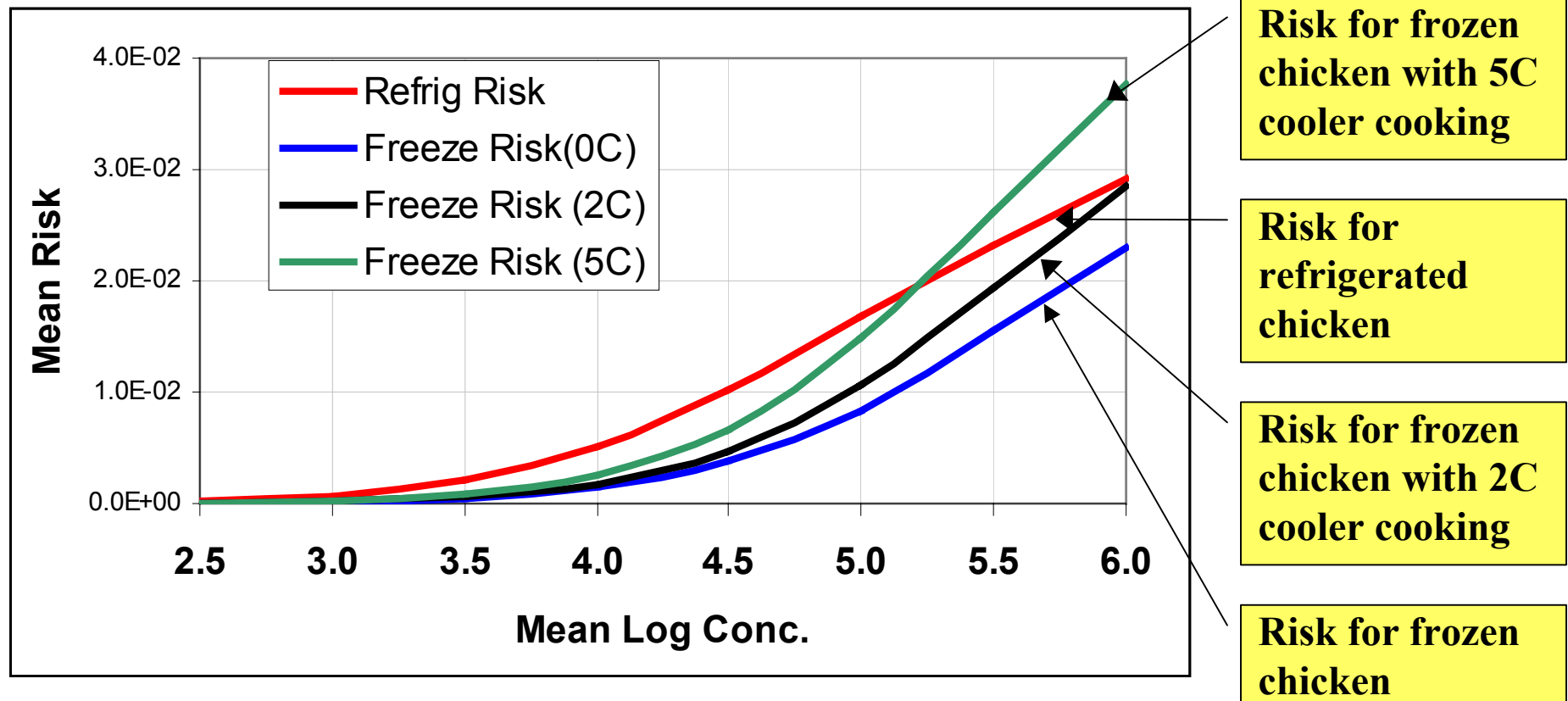
Scenario 5A



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Scenario 5B



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Scenario 5: Summary

- Frozen chicken poses a lower expected risk than refrigerated or fresh chicken
- This may not always apply
 - For instance, inadequate thawing may result in insufficient cooking (cold spots) resulting in greater risk



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Conclusions

- Extensive review of available information was performed
 - Lack of systematic and consistent investigation into some key processes
 - Example
 - Probability and amount of contamination that could be added during water chilling (with or without Cl₂)
 - Relative importance of consumer level exposure pathways (cross-contamination vs. consumption)



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Conclusions

- Cannot create a “Global risk assessment”
 - Differences exist in systems, areas, countries, and regions.
 - Variation in processing or farming practices
 - Variability in broiler contamination
 - Variability in farming practices,
 - Variability in consumer behavior
- Model provides a framework that can be adapted and customized for specific situations



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Conclusions

- Model provides insight into potential management strategies
 - Success of strategies needs to be considered in light of other factors (e.g costs, stakeholder priorities, etc.)
- Risk assessment and the risk assessment process aids the understanding of the system
 - Process modification, risk interventions
 - Research and data collection guidance



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Conclusions

- Risk Manager and Risk Assessor interaction is essential
 - The RM question is important in determining how the RA is conducted
 - Specific and focused questions target the point in the entire chain upon which to focus activity
 - Ensures that the issues of concern to the risk manager are accounted for



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