Characterizing the Challenges of Biological Material Transport on Campus using the Zurich Hazard Analysis Method

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Overview

- The Problem: Biological Material Transport on Campus
- Why We Conducted this Risk Assessment
- Methods
- Results
- Conclusions and Future Initiatives

The Problem

- Emory researchers collaborate with others throughout the metro Atlanta area:
  - CDC Atlanta & Chamblee Campus
  - Georgia Institute of Technology
  - Georgia State University
  - Grady Hospital
  - VA Hospitals
- Also, Emory has multiple campuses across Atlanta:
  - Emory Main Campus
  - Emory Hospital Midtown
  - Yerkes Main Station
  - Yerkes Field Station
  - Many satellite clinics and laboratories

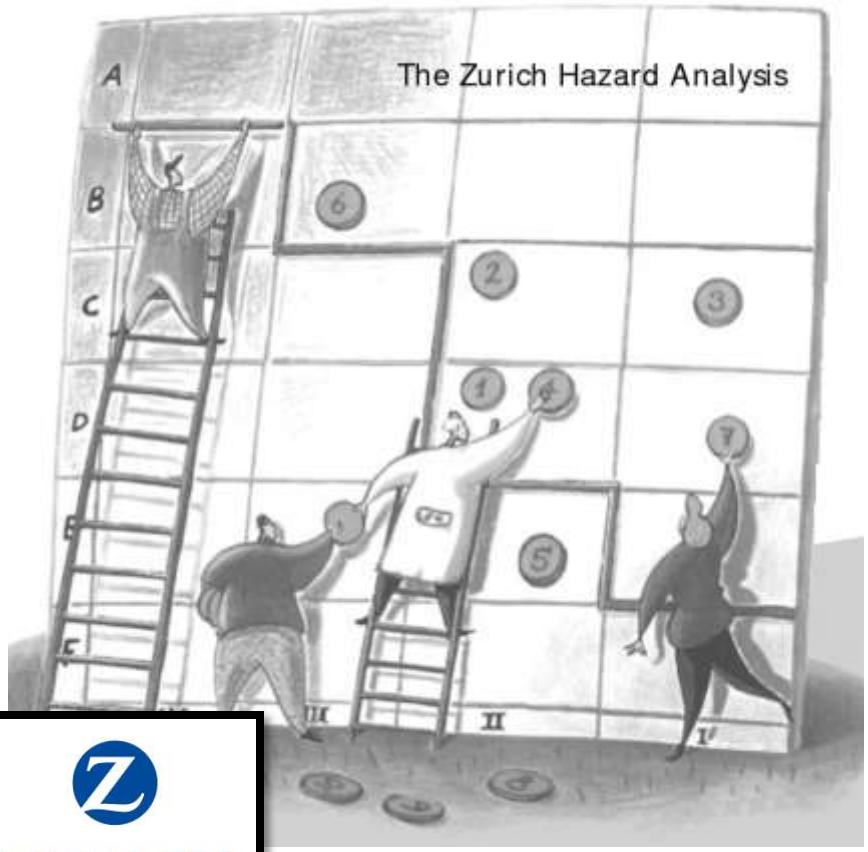
The Problem

- Researchers need to move their materials as they collaborate in different locations
- **Researchers are innovative and they want/need to transport quickly!**
- We were notified that researchers were using shuttle buses as a delivery mechanism for their packages: **Placing items on the bus with no chaperone**

Why we Conducted this Risk Assessment

- This biological samples are moving through and between campuses in four ways:
  - On foot
  - In a personal vehicle
  - On a shuttle bus
  - By an Emory courier
- We wanted to investigate the risks of each of these modes of transport to come up with a solution for the need for these materials to be transported quickly
- **Just saying "you can't do that" isn't a solution!**

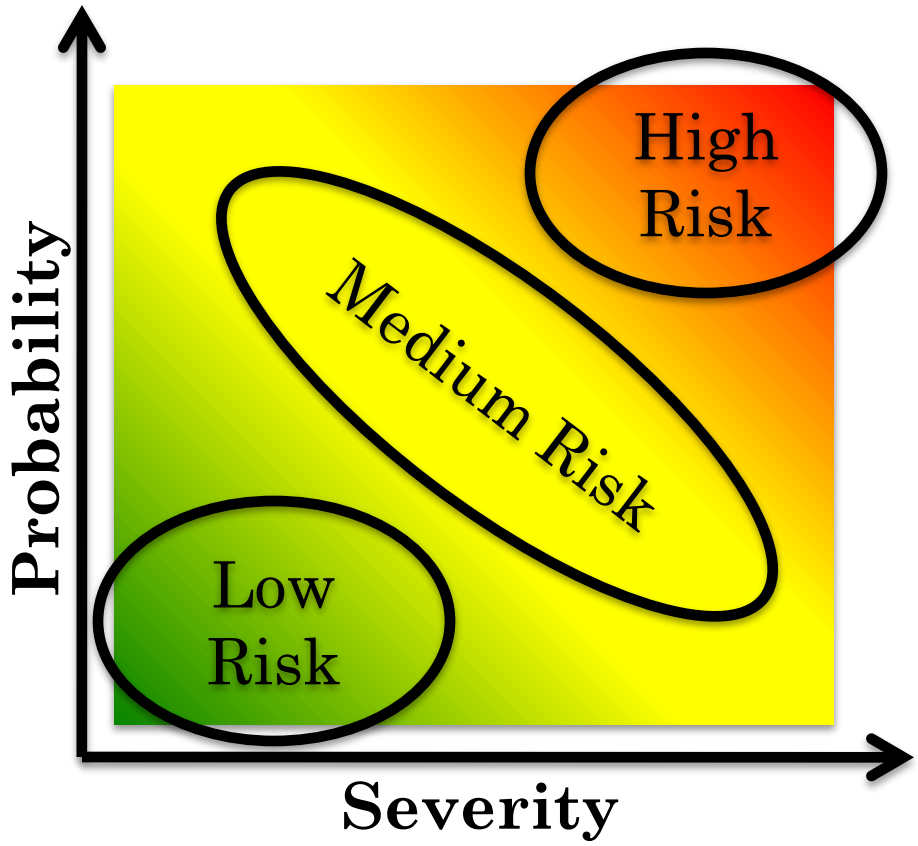
Methods:
Zurich Hazard Analysis (ZHA)



- ZHAs use a team approach to analyze hazards within a specific scope
- They are useful because they take a complex problem or process and analyze risk in a quantitative manner by:
  - Brainstorming hazard scenarios
  - Generating a risk profile
  - Setting tolerance levels

What is Risk?

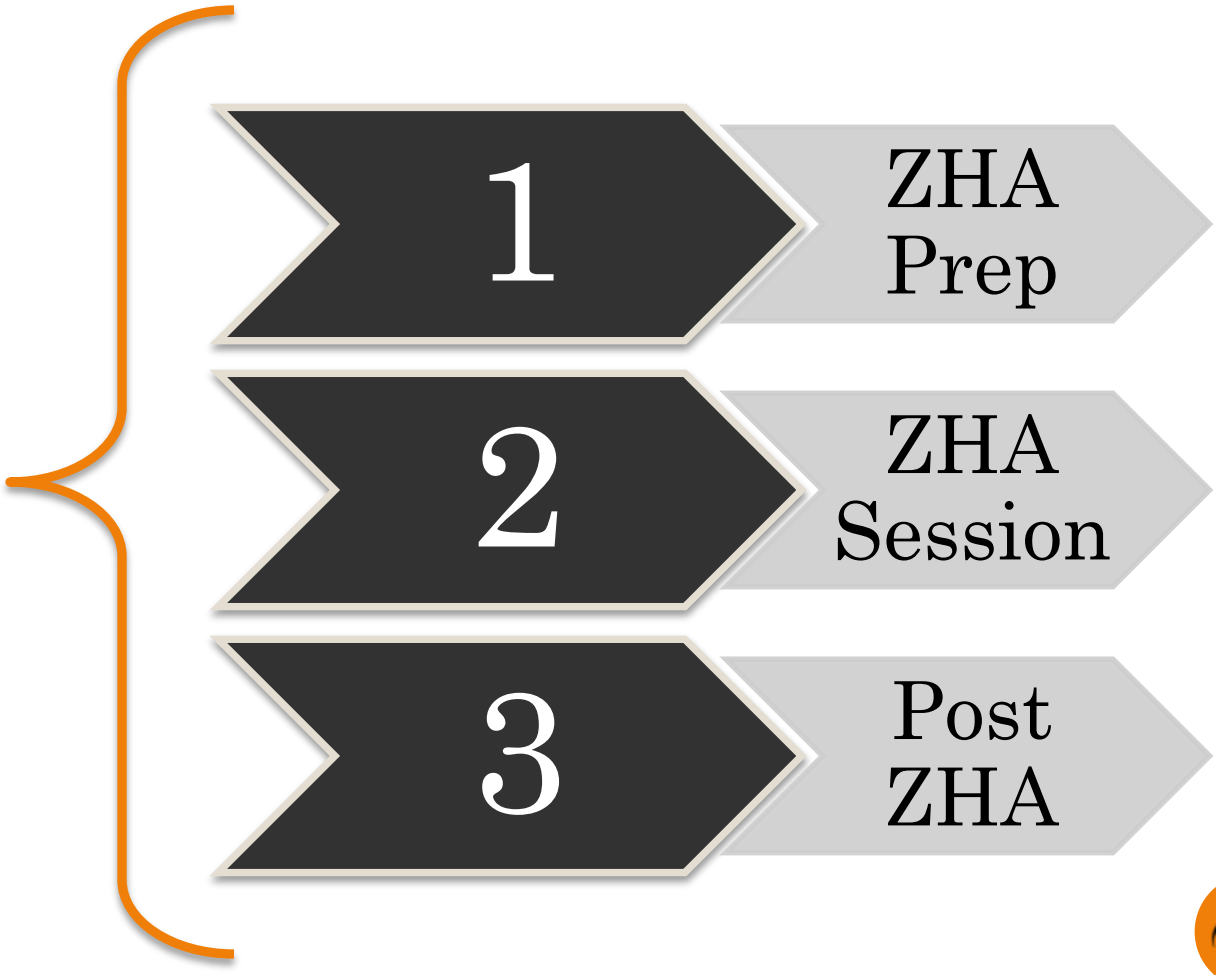
Severity × Probability = Risk



The ZHA method uses graphs like this (Risk Profiles) to quantify risk

Methods

This risk assessment was conducted in three phases



Methods
Phase 1 – ZHA Prep

- ZHA Team Leader Training
- Fact Finding & SOP Development
- ZHA Team Selection
- Process Mapping

ZHA Team Selection

- Representatives of the Stakeholders:
  - EHS Research Safety/Biosafety
  - Yerkes Safety Office
  - Clinical Researchers
  - Infectious Disease Researchers
  - Emory Cliff Shuttle Director

Methods
Phase 2 – ZHA Session

- We used ZHA Works 4.2.1 Quant Software to conduct the risk assessment

- I acted as the Team Leader and led the team through the following ZHA steps:
  - Defining the scope
  - Building the hazard catalog
  - Plotting the risk profile
  - Develop risk improvement actions

Methods
Phase 3 – Post ZHA

1. Generating the ZHA Report
2. Disseminating the Report
3. Implementing Corrective Actions - *In Process*

Results
ZHA Definitions

Scope:

All movement of biologic & infectious material on campus and between campus:

- By foot
- In a personal vehicle
- On a shuttle bus
- By an Emory courier

Hazard Pathways:

- Transport Method
- Sample Preparation/Packaging
- Individual's Knowledge
- Transportation
- Documentation

Results: ZHA Definitions

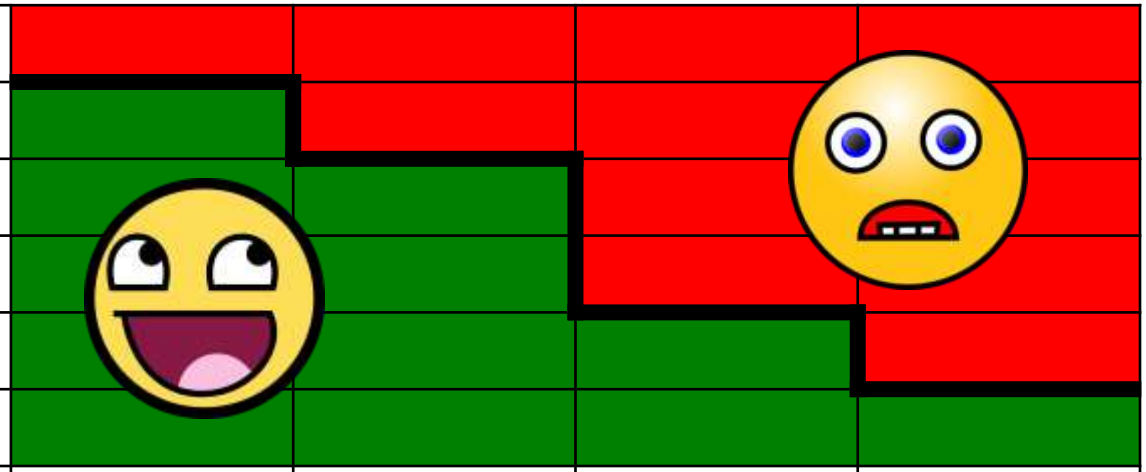
		Severity Level			
		IV Negligible	***III Marginal***	***II Critical***	***I Catastrophic***
Risk Type	***Life, Health, Environment***	Nothing happens	Exposure only (no illness)	Non-life threatening illness	Life threatening illness (hospitalization or death)
	Physical Assets	No financial impact	Loss of sample(s)	Small fines	Loss of funding, high level fines, lawsuit
	Business Continuity	No change	Shuttle out of service, disruption in schedule (research/ shuttle)	Multiple people out of work, road shut down	Loss of business, can't operate
	Reputation	Nothing lost	On the local news	On the national news	Complete loss of integrity and trust

Results
ZHA Definitions

	Probability Level					
	F	**E**	**D**	**C**	**B**	**A**
	Almost Impossible	**Unlikely**	**Remote**	**Occasional**	**Moderate**	**Frequent**
Definition	Once every 50 years	Once every 10 years	Once every 5 years	Once every year	Once a month	Once a week

Results
Setting the Risk Tolerance Level

Probability						
	A	Frequent				
	B	Moderate				
	C	Occasional				
	D	Remote				
	E	Unlikely				
	F	Almost Impossible				
			Negligible	Marginal	Critical	Catastrophic
			IV	III	II	I
			Severity			



Results: The Hazard Catalog

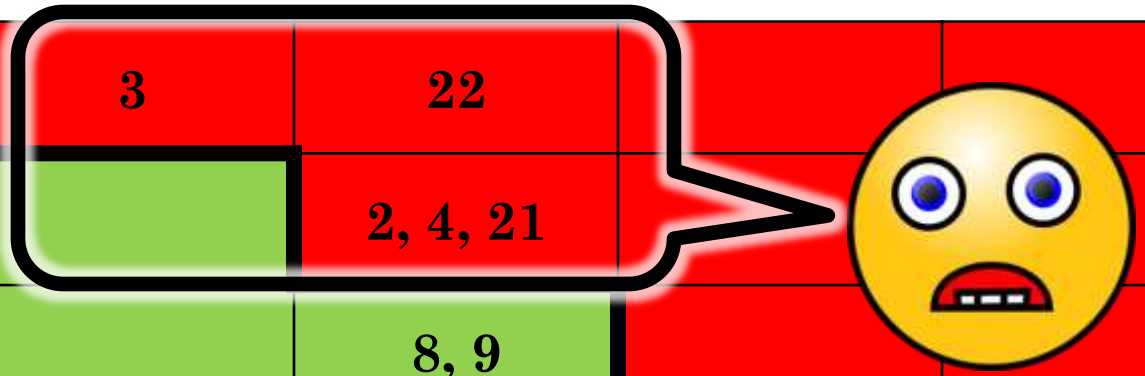
- 22 total hazard scenarios:
  - Pathogenicity of Agent – 9
  - Explosiveness of Dry Ice – 5
  - Violation of Regulations – 5
  - Sharpness of Glass – 1
  - Suspiciousness of the Package - 2

- Example Hazard Scenario:

#	Hazard	Trigger	Effect	Severity	Probability
22	Suspiciousness of the package	Shuttle operator sees package unattended with a warning label AND the operator notifies those in charge at Emory	Loss in trust in staff at Emory	III – Marginal	A - Frequent

Results
Current Risk Profile

Probability			Negligible	Marginal	Critical	Catastrophic
	A	Frequent	**3**	**22**		
	B	Moderate		**2, 4, 21**		
	C	Occasional		**8, 9**		
	D	Remote		**5**		
	E	Unlikely	**12, 19**	**7, 13, 17, 20**	**10, 16, 18**	
	F	Almost Impossible			**1, 6, 15**	**11, 14**
			IV	III	II	I
			Severity			



Hazard Scenario			
#	**Hazard**	**Triggers**	**Effect**
2	Pathogenicity of the agent	Package (Styrofoam container with wet ice) is unattended on the Emory shuttle bus AND bus hits bump in road AND box falls off the seat AND biohazard spill occurs inside the package	Loss of Sample
3	Pathogenicity of the agent	Sample is left on the Emory Shuttle in a package AND the package arrives at the destination AND the intended person picks it up	No exposure
4	Pathogenicity of the agent	Sample is left on the Emory shuttle bus in a package AND the package arrives to the intended destination AND no one picks it up AND the sample is put in lost and found until someone picks it up.	Loss of sample, degraded sample, delay in research
21	Suspiciousness of the package	A person is riding on an Emory shuttle AND they see a package unattended with warning label AND they notify those in charge at Emory	Loss of trust in the community to ride the shuttle
22	Suspiciousness of package	Shuttle operator sees package unattended with a warning label AND the operator notifies those in charge at Emory	Loss of trust in the staff at Emory

Risk Improvement Actions

- For all of the hazard scenarios above the tolerance level, we chose to implement the same risk improvement actions:
  - Develop an SOP for transport on campus that does not permit unattended packages on shuttles
  - Give shuttle drivers the authority to deny unattended packages
  - Train all parties on the SOP
  - Enforce and monitor the program on campus

Results
Target Risk Profile

Probability						
	A	Frequent				
	B	Moderate				
	C	Occasional		8, 9		
	D	Remote		2, 5		
	E	Unlikely	3, 12, 19	4, 7, 13, 17, 20, 21, 22	10, 16, 18	
	F	Almost Impossible			1, 6, 15	11, 14
			Negligible	Marginal	Critical	Catastrophic
			IV	III	II	I
			Severity			

Conclusions

- **Outcomes**:
  - The ZHA tool helped us illuminate program gaps by systematically taking a complex problem and handling it in a quantitative way
- **SOP Development & Training**:
  - Outreach and enforcement of the policy is key!
- **Limitations**:
  - Selection bias during ZHA team selection
    - Unbalanced representation from other groups
  - Hazard Catalog does not include “unknown unknowns”
  - Introverts vs. Extroverts

Next Steps

- Follow up on the implementation of corrective actions
- Set a timeline for recurring risk assessments
- Interacting with collaborating institutions' BSOs

- ZHA Team:
  - Michele Edenfield, MS
  - Rodrick Esaw, MPH
  - Tracey Fountain
  - Aaron Rae
  - Kalpana Rengarajan, PhD, MPH, RBP
  - Hilary Rosenthal
  - Dionna Thomas
  - Samantha Thomas
  - Maureen Thompson, RN