

Host Factors and Biosafety: A Survey of Participants on the Relevance of a Course on *Host Defenses and Susceptibility to Microorganisms* in a Biosafety Education Program

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Host Factors and Biosafety

Introduction

Microorganisms

- The oldest form of life on Earth. Some types have existed for billions of years.
- Life on Mars?



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Host Factors and Biosafety

New strains and organisms are emerging

- Drug resistant strains
 - Methicillin-resistant Staphylococcus aureus (MRSA)
 - Vancomycin-resistant Enterococci (VRE)
- Severe Acute Respiratory Syndrome (SARS), H5N1 Avian Influenza Virus.....



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There are 1,407 recognized human pathogen species, 58% of which are zoonotic. Of the total, 177 (13%) are regarded as emerging or reemerging:

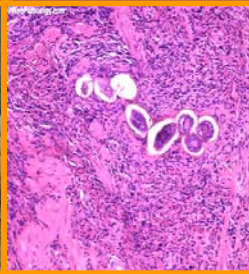
- **208** are **viruses or prions** [77 (37%) regarded as emerging or reemerging]. 37% are RNA viruses (HIV, SARS coronavirus).
- **538** are **bacteria** [54(10%) regarded as emerging or reemerging]
- **317** are **fungi** [22 (7%) regarded as emerging or reemerging]
- **57** are **protozoa** [14 (25%) regarded as emerging or reemerging]
- **287** are **helminths** [10 (3%) regarded as emerging or reemerging]

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Host Factors and Biosafety

Microorganisms and Humans

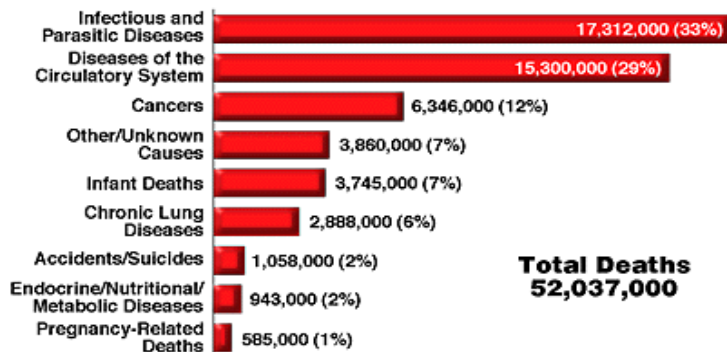
Through entire human history



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Worldwide Causes of Death



Source: The World Health Report 1997, WHO

Host Factors and Biosafety

- No host and no microorganism
- The strategy to fight against pathogenic microorganisms
- The strategy to manage biosafety issues
- Host factors are the critical component of biosafety risk assessment

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Host Factors and Biosafety

"The complex nature of the interaction of microorganisms and the host presents a significant challenge even to the healthiest immunized laboratory worker, and may pose a serious risk to those with lesser resistance. The laboratory worker's immune status is directly related to his/her susceptibility to disease when working with an infectious agent".

BMBL 4th, Section V

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Microbiological risk assessment

"Other factors that should be considered

- Potential outcome of exposure*
- Natural route of infection*
- Presence of a suitable host"*

Laboratory Biosafety Manual-WHO, 2004

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Host Factors and Biosafety

"Classification of Human Etiologic Agents on the Basis of Hazard, is based on the potential effect of a biological agent on a healthy human adult and does not account for instances in which an individual may have increased susceptibility to such agents, e.g., preexisting diseases, medications, compromised immunity, (pregnancy) or breast feeding (which may increase exposure of infants to some agents)".

NIH Guidelines Section II-A-2. April 2002

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"Ensure that all personnel know whether they have medical conditions or receive medical treatment that renders them more susceptible to or more likely to transmit infections, so that they can follow recommendations to greatly reduce their risk of transmitting or acquiring infections"

Guideline for infection control in health care personnel, 1998

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"Host factors

In the sequence of infection, the worker or host immune status and behavior also play a critical role in whether there will be an infection."

*Epidemiology of laboratory-Associated Infection
Biological Safety Principles and Practices 3th*

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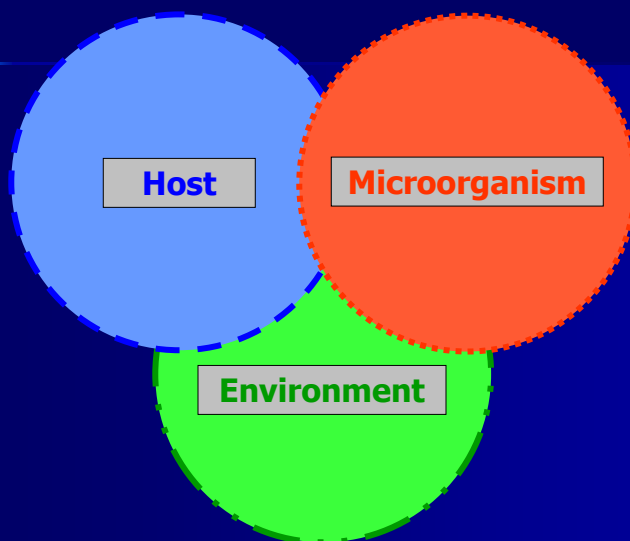
Host Factors and Biosafety

■ Microorganisms and Humans

- The relationship is complex, dynamic and challenging
 - Different people can respond differently after being infected by the same pathogen
 - Individual innate and adaptive immunities are not permanent
 - Variation in susceptibility
 - Opportunistic pathogenic agent
 - Animal pathogen can become a human pathogen
 - Infectious dose

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Interactions



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Biosafety Program

- Individual safety in a research laboratory
- Public and environmental safety
- Biosafety education and a training program play a very important role in a biosafety program

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■ Biosafety Education Programs:

- American Biological Safety Association Programs
 - Twice a year
 - Pre-conference Courses
 - *Principles and Practices of Biosafety*
- RCE (Regional Center of Excellence for Biodefense and Emerging Infectious Diseases Research) Programs
 - MRCE-WU
 - MARCE-UM Baltimore
- University
- Private

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Host Factors and Biosafety

- Agendas in the biosafety education program:
 - Microorganisms
 - Biocontainment
 - Risk assessment
 - Disinfection (Decontamination)
 - Shipping
 - Biosafety procedures and management
 - Select agents
 - Biosecurity
 - Biosurety

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- We believe
 - Educational course or material on the subject of host condition and microorganisms is important.
 - Biosafety professionals and biomedical research scientists would benefit from a better understanding of the dynamic and complex relationships between microorganisms and the host and the importance of medical surveillance and an immunization program in biosafety.

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- Initial questions that need to be answered
 - Is the course of host factors valuable for the biosafety education program?
 - Does the course of host factors improve biosafety knowledge and professional skills for biomedical research scientists and biosafety professionals?
 - Have the courses of host factors or similar courses been provided by biosafety education programs?

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Host Factors and Biosafety

- Survey design
 - Biosafety education program for the research scientist
 - Third annual biosafety education program
 - Sponsored by the Midwest Regional Center of Excellence for Biodefense and Emerging Infectious Diseases Research (MRCE)/Washington University School of Medicine
 - Five day program
 - Participants
 - Biomedical research scientists
 - Biosafety professionals
 - National and international scientists
 - Fee
 - Free

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Host Factors and Biosafety

- Survey design
 - Course of Host Factors and Biosafety
 - One hour
 - First time developed and introduced to the program
 - Survey questions were specifically designed
 - Survey procedures
 - Survey questions were given to all attendants before the course and collected after the course
 - Voluntary and anonymous

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Control bias

- The course was included in the program agenda only after completion of all program registration
- The 2 of 21 attendants did not response to the survey due to their administrative positions for the program
- Voluntary and anonymous
- Data analysis from the views of two different professions

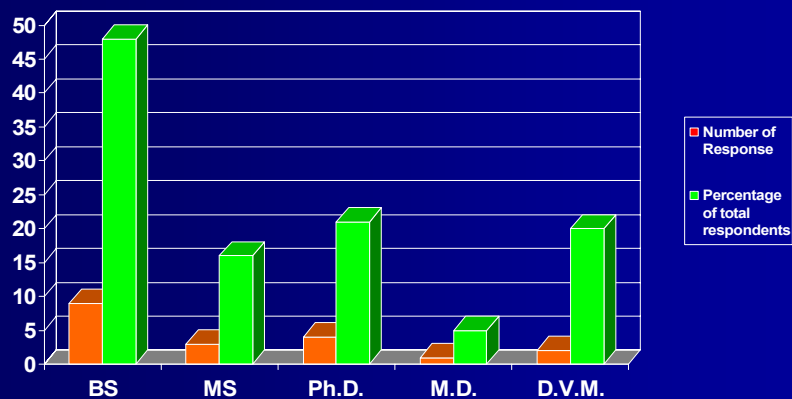
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- Data analysis
 - There were 19 responses (19/21)
 - Results

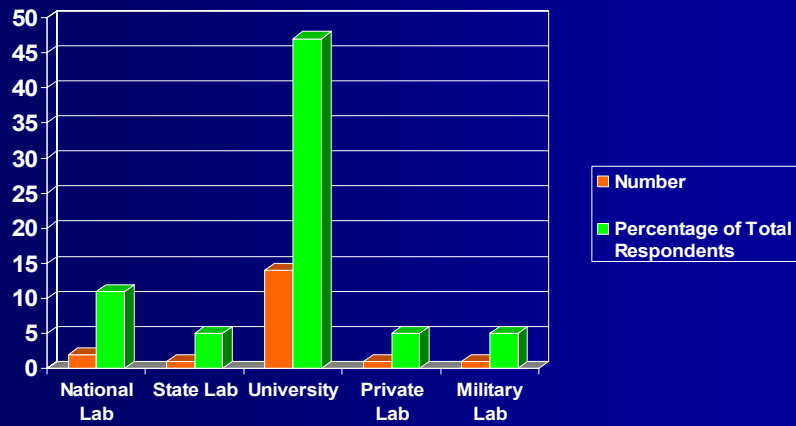
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Education Level of Respondents



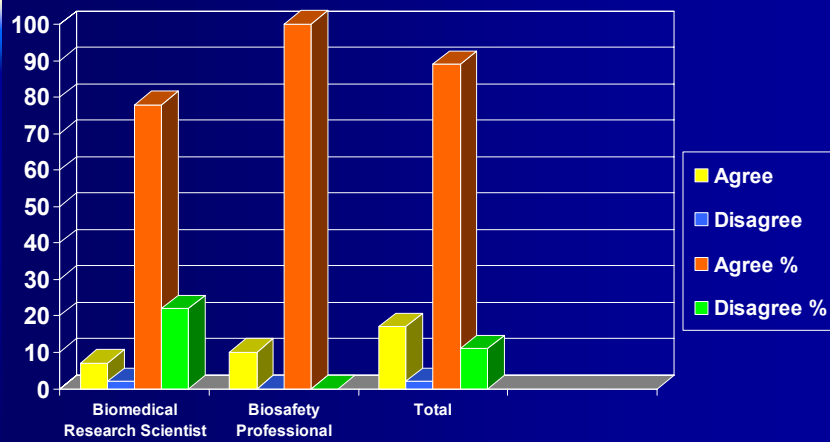
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Employment Venue of Respondents



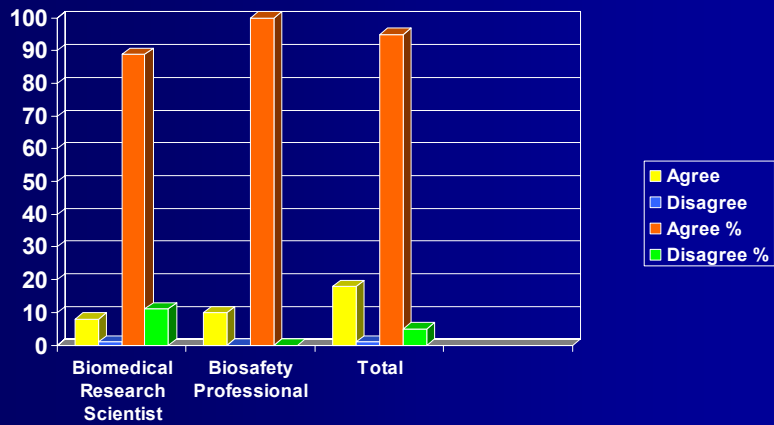
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Is the Course of *Host Defenses and Susceptibility to Microorganisms* Proper for the Biosafety Education Program?



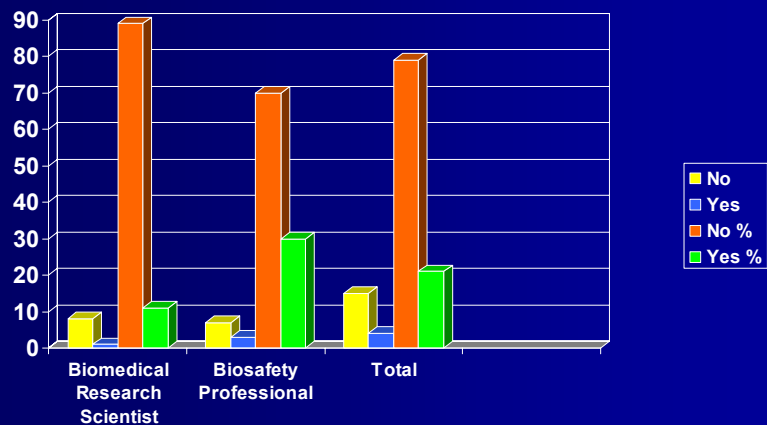
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Is the Course of *Host Defenses and Susceptibility to Microorganisms* Helpful for Your Profession in the Biosafety



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History of Attendance in the Similar Course of *Host Defenses and Susceptibility to Microorganisms*



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Summary:

- Most biosafety professionals and biomedical research scientists recognize that education about host defenses and susceptibility to microorganisms is valuable for a biosafety education program. Respondents indicated that the course meaningfully improves their biosafety knowledge and professional skills
- Most biosafety professionals and biomedical research scientists have never attended a similar course.

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Conclusions:

1. Based on our findings, we believe that the subject of host conditions as it relates to microorganisms is a challenging topic for biosafety professionals.
2. Host conditions should be addressed in a biosafety education program.
3. Currently, the host condition issue has been largely ignored in biosafety education programs.

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Questions?

Contact Information

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Biosafety Education for the Research Scientist **Course**

September 18-22 2006 at the Chase Park Plaza Hotel,
St. Louis, MO

http://mrce.wustl.edu/biosafety_program.html