The Role of Risk Assessment in Managing Risk

TUSKEGEE UNIVERSITY

Agricultural Outlook Forum 2005

Arlington, Virginia
Feb. 24-25, 2005

College of Veterinary Medicine, Nursing & Allied Health

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Associate Dean for Research & Graduate Studies

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The Center for Computational Epidemiology, Bioinformatics and Risk Analysis (CCEBRA) *http://compepid.tuskegee.edu*

Multidisciplinary Team… ……and Partnerships

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Center for Computational Epidemiology, Bioinformatics & Risk Analysis (CCEBRA)

The Team

- B. Tameru -Mathematics
- Saul T. Wilson, Epid/Pub. Hlth
- D. Nganwa - Epid/Pub. Hlth
- O. Ayanwale - Epid/Pub. Hlth
- V. Robnett - Scientific Visualiz.
- A. Ahmad - Statistics
- A. Afroze - Computational Sc.
- A. Steele - Databases
- T. Habtemariam - Epidemiology

Collaborators

- USDA/APHIS
- USDA/FSIS, USDA/ORACBA
- USDA/CSREES
- The Harvard Center for Risk Analysis
- NIH, NSF and Others
- University of Maryland - Engineering

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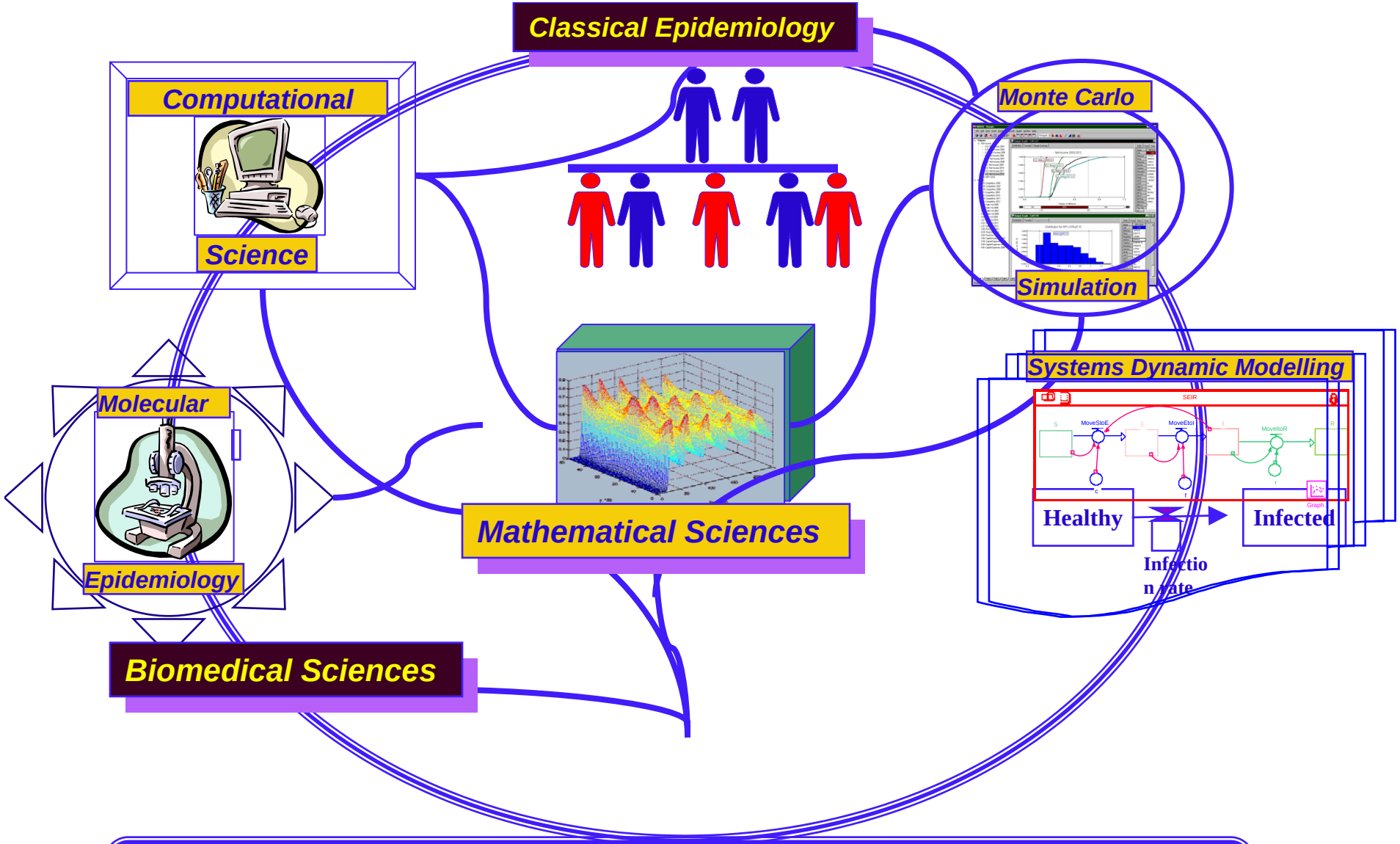

Computational Epidemiology

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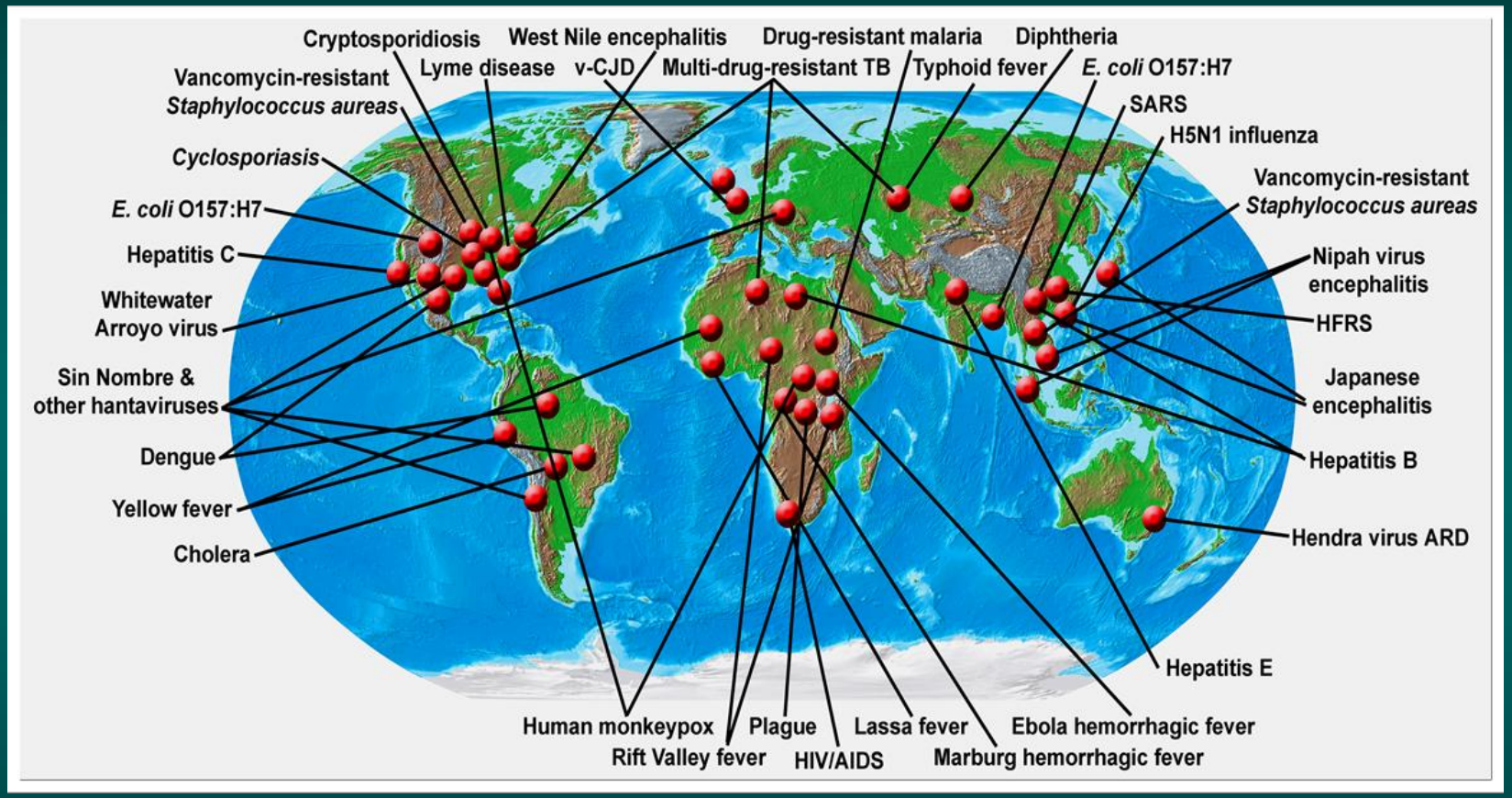
Risk Challenges of the New Century

New, Emerging & Re-emerging Diseases, 2004



"Eleven out of the last 12 human emerging infectious diseases in the world have arisen from animal sources. So what we really need to work on is the relationship between the human health surveillance system and the animal health surveillance system. One very important point of intersection is the laboratories. We have to do more to share our laboratory capacity...."

Dr. Julie Gerberding
Director, CDC
News Conference
Jan 2004

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Global Trade - The WTO & SPS???

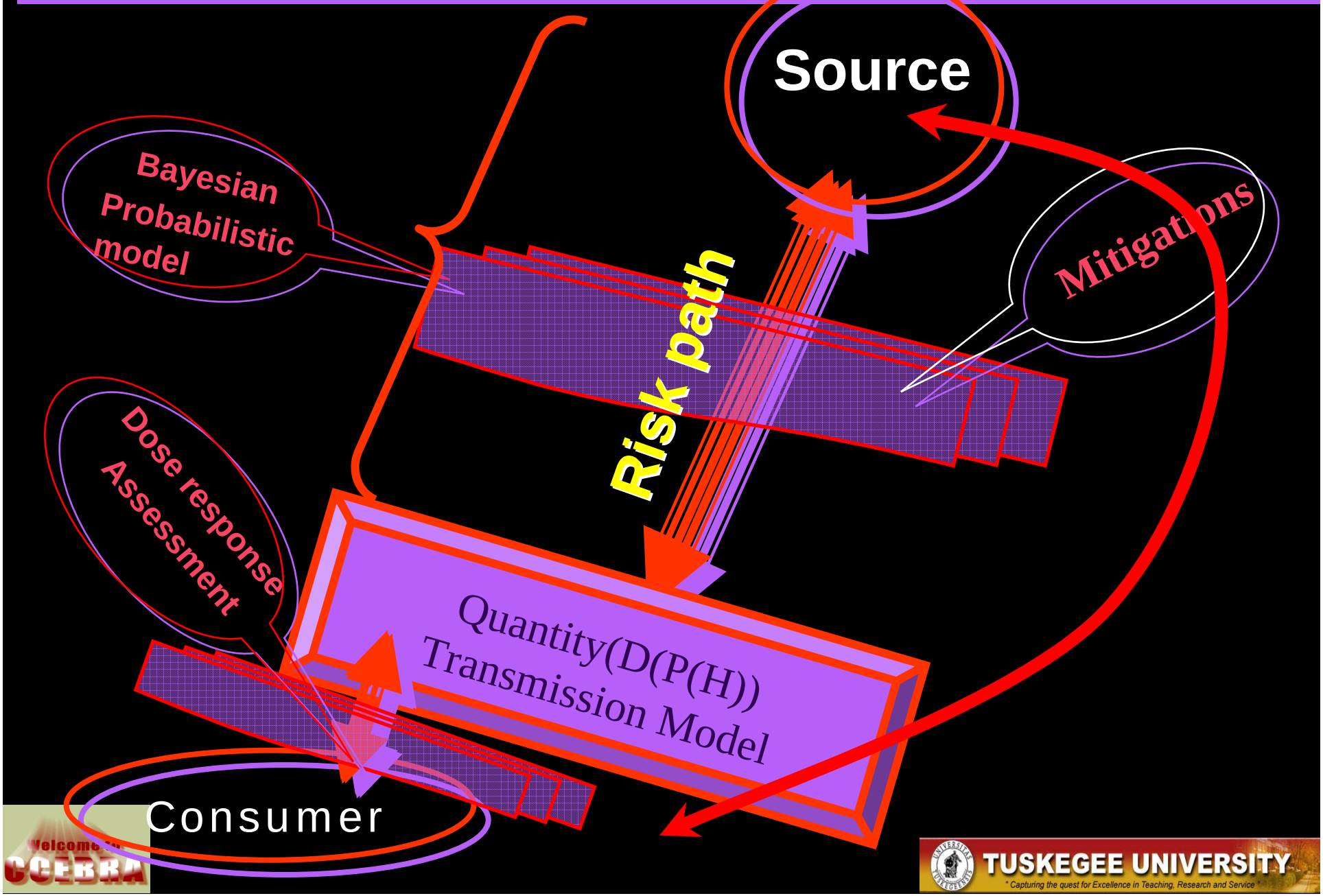
SPS Article 5.1

"Members shall ensure that their SPS measures are based on an assessment… of the risks to human, animal or plant life or health.."

Article 9.1
Technical Assistance

- Members agree to facilitate the provision of technical assistance to other Members, especially developing country Members, either bilaterally or through the appropriate international organizations.

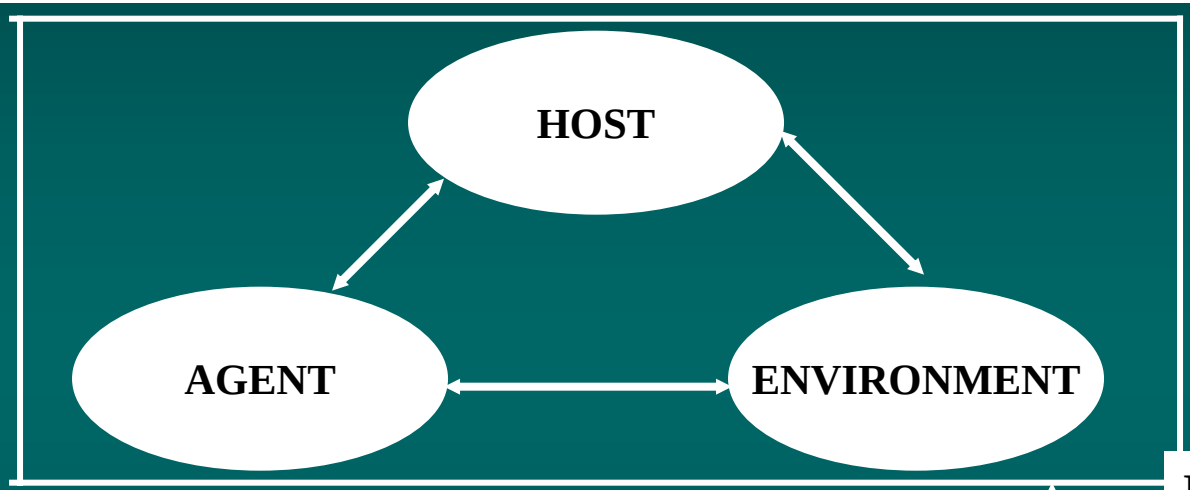
General Risk Modelling Approach



Epidemiologic Problem Solving & Decision Making

The Epidemiological Problem Oriented Approach (EPOA)

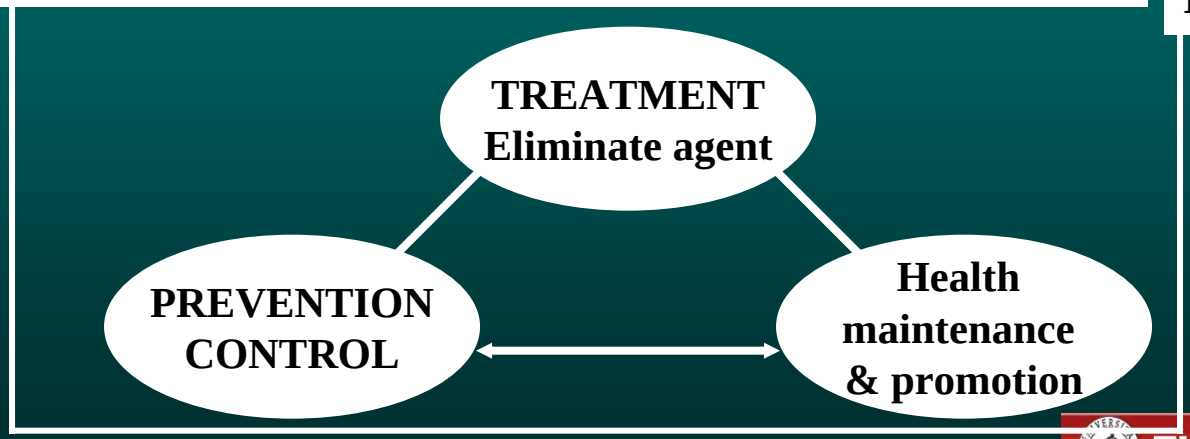
Step 1: Problem Identification (Descriptive) Triad



Diagnostic

Procedure Linkage

Step 2: Management Triad



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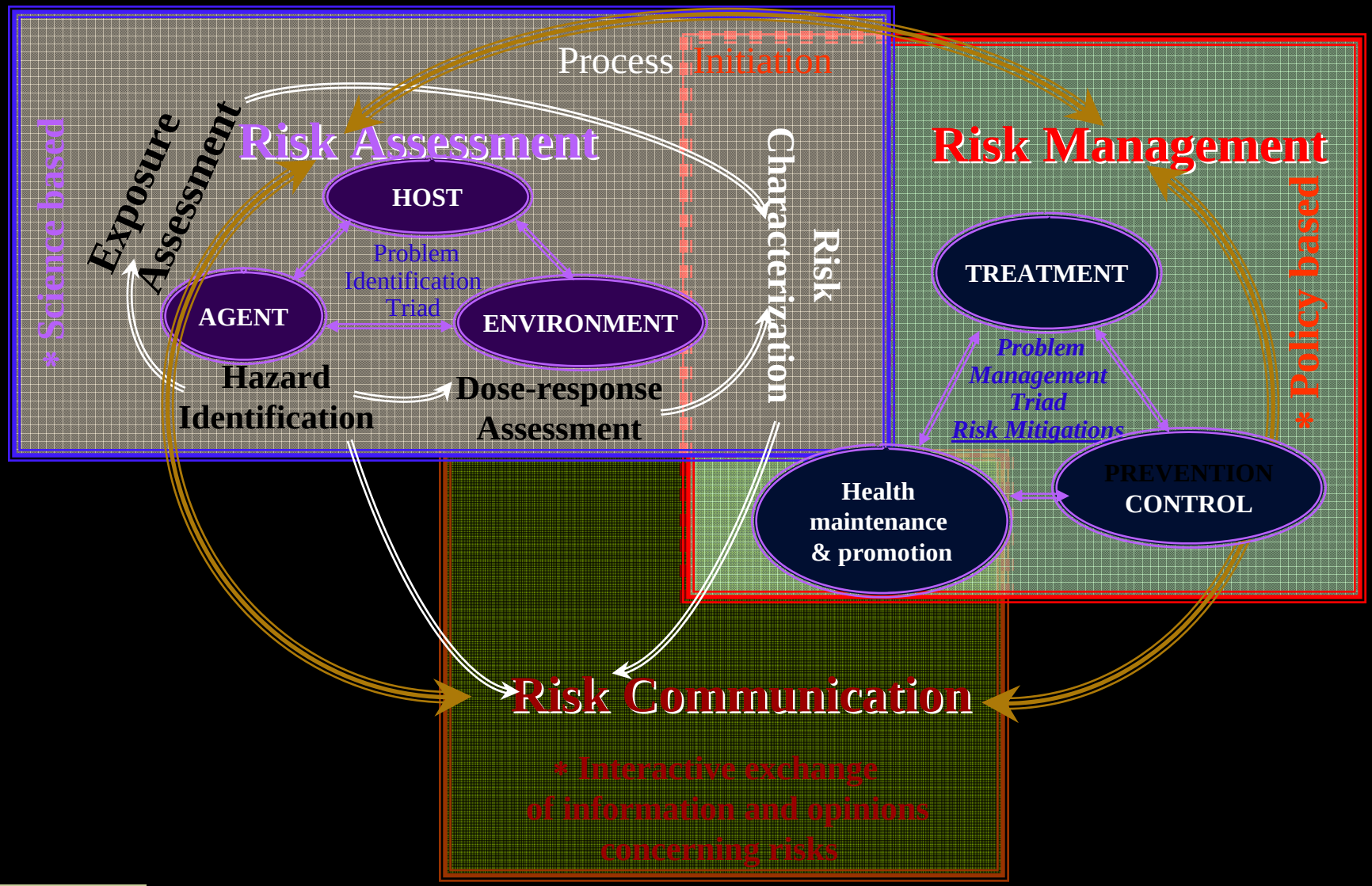
Risk Analysis



Key Issues - Risk Analysis & Modelling

Conceptual Framework

- The Systems Approach…
- Epidemiologic Framework….
- Integrate Time and Space (Use of GIS)

Key Issues

Scientific Evidence: Surveillance & Data Gathering

Risk Modelling Coupled with Epidemiologic Methods

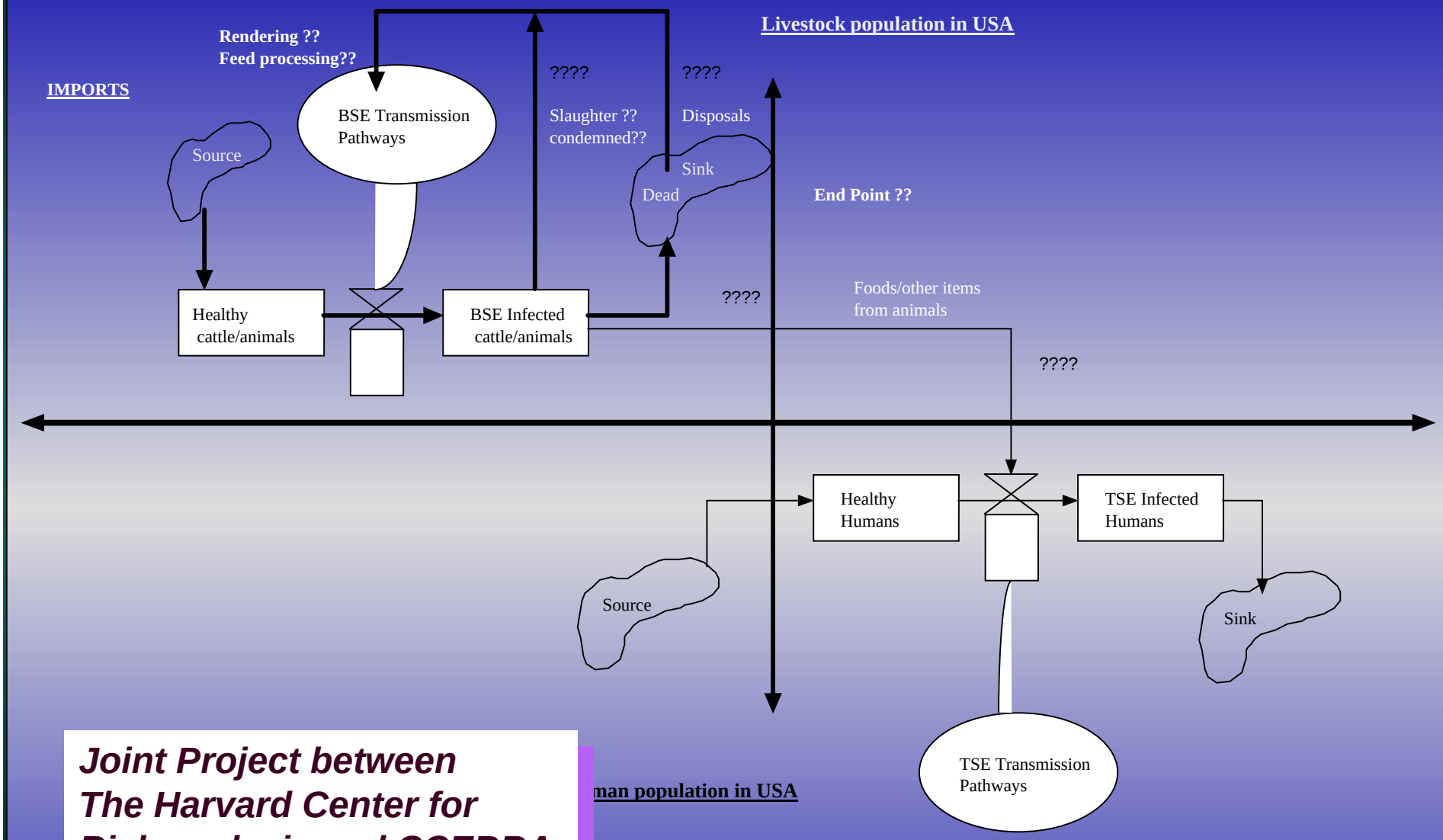
Decomposing Risk Agent Transmission Pathways

Accounting for Mitigations

Case Examples

Link to Model

Conceptual Epidemiologic Framework for Animal/Human Link in BSE



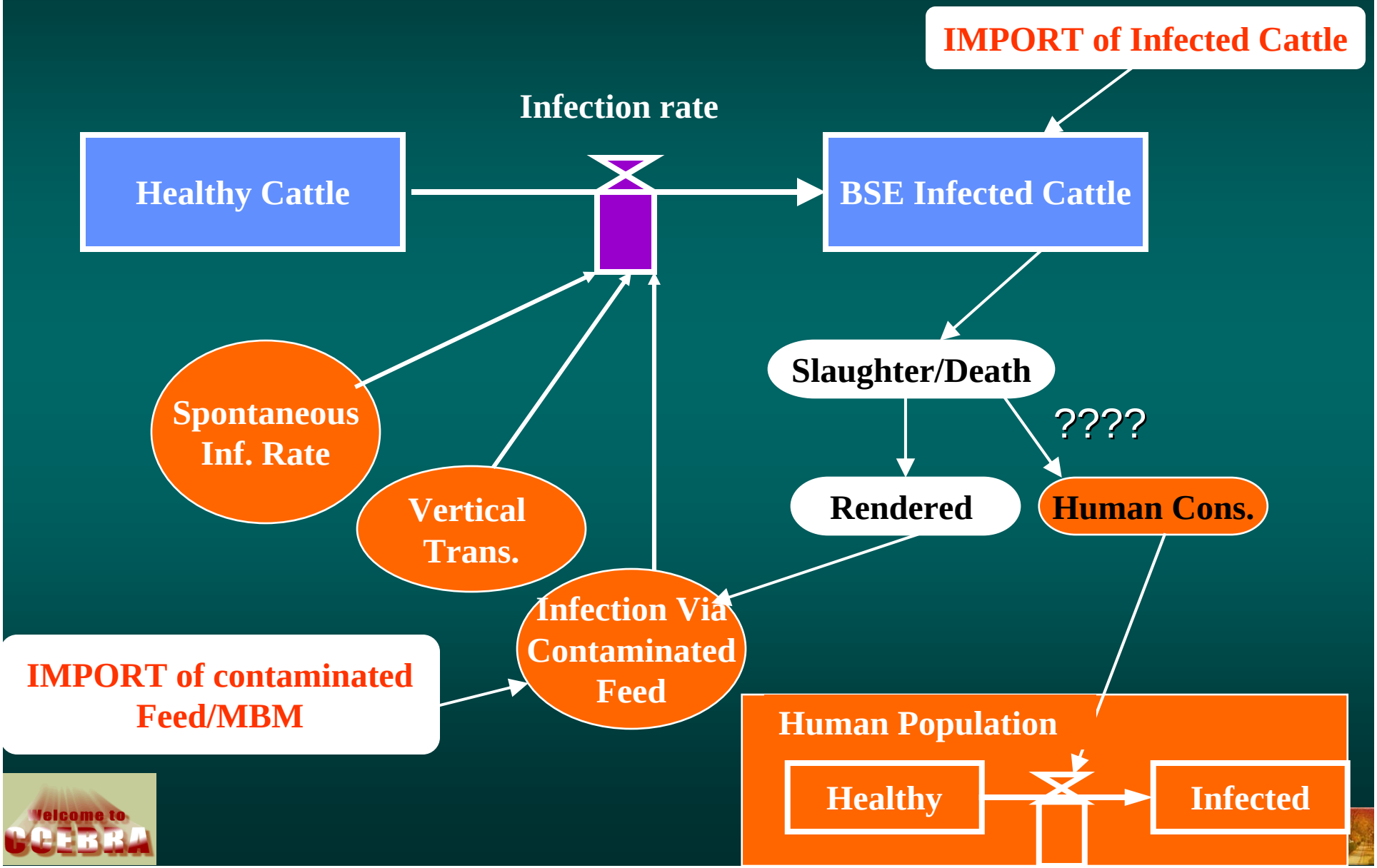
Joint Project between The Harvard Center for Risk analysis and CCEBRA Of CVMNAH

Habtemariam, T., Tameru, B., Nganwa, D., Ayanwale, L., Ahmed, A., Poryang, D., Abdelrahman, H. Gray, G., Cohen, J., Kreindel, S. 2002, *Application of Systems Analysis in Modelling the Risk of Bovine Spongiform Encephalopathy (BSE)*, Kybernetes, The International Jouurnal of Suystems & Cybernetics, Vol. 31, No. 9/10, 1380 – 1390.

Cohen, J., Duggar, K., Gray, G.M., Kriendel, S., Abdelrahman, H., Habtemariam, T., Oryang, D., and Tameru, B. 2001, Evaluation of the Potential for Bovine Spongiform Encephalopathy in the United States, http://www.aphis.usda.gov/lpa/issues/issues.html.

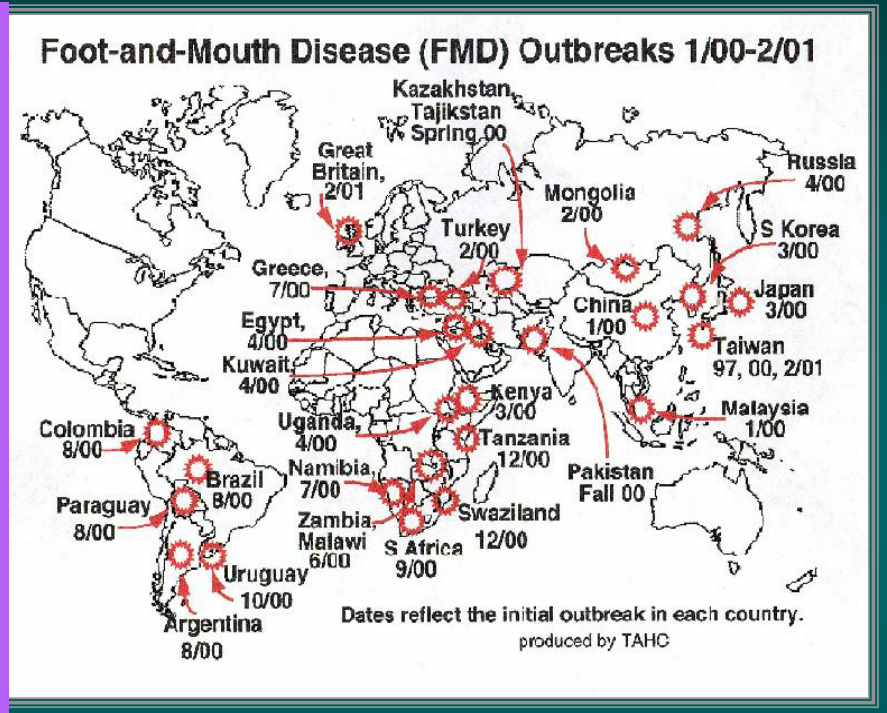
Cohen, J., Duggar, K., Gray, G.M., Kriendel, S., Gubara, H., Habtemariam, T., Oryang, D., and Tameru, B. 2004, A Simulation Model for Evaluating the Potential for Spread of Bovine Spongiform Encephalopathy , In: Prions and Mad Cow Disease, edited by brian K. Nunnaly and Ira S. Krull, Marcel Dekker, inc. NY, NY, pp. 61 – 123, 2004.

Pathway Analysis: How can US Cattle be infected via import of Cattle/Feed from Country X?



Is the USA at Risk to FMD & Others??

The FMD Epidemic



The FMD Outbreak in Great Britain

- Probably up to 10 million cattle were slaughtered during the first 5 months.
- Cost of outbreak estimated to be about 20 billion pounds.
- Severe impact on livestock industry and related areas.

- **US has ten times the livestock population of UK.**

Case Example

The Epidemiologic Framework ...for Risk Assessment

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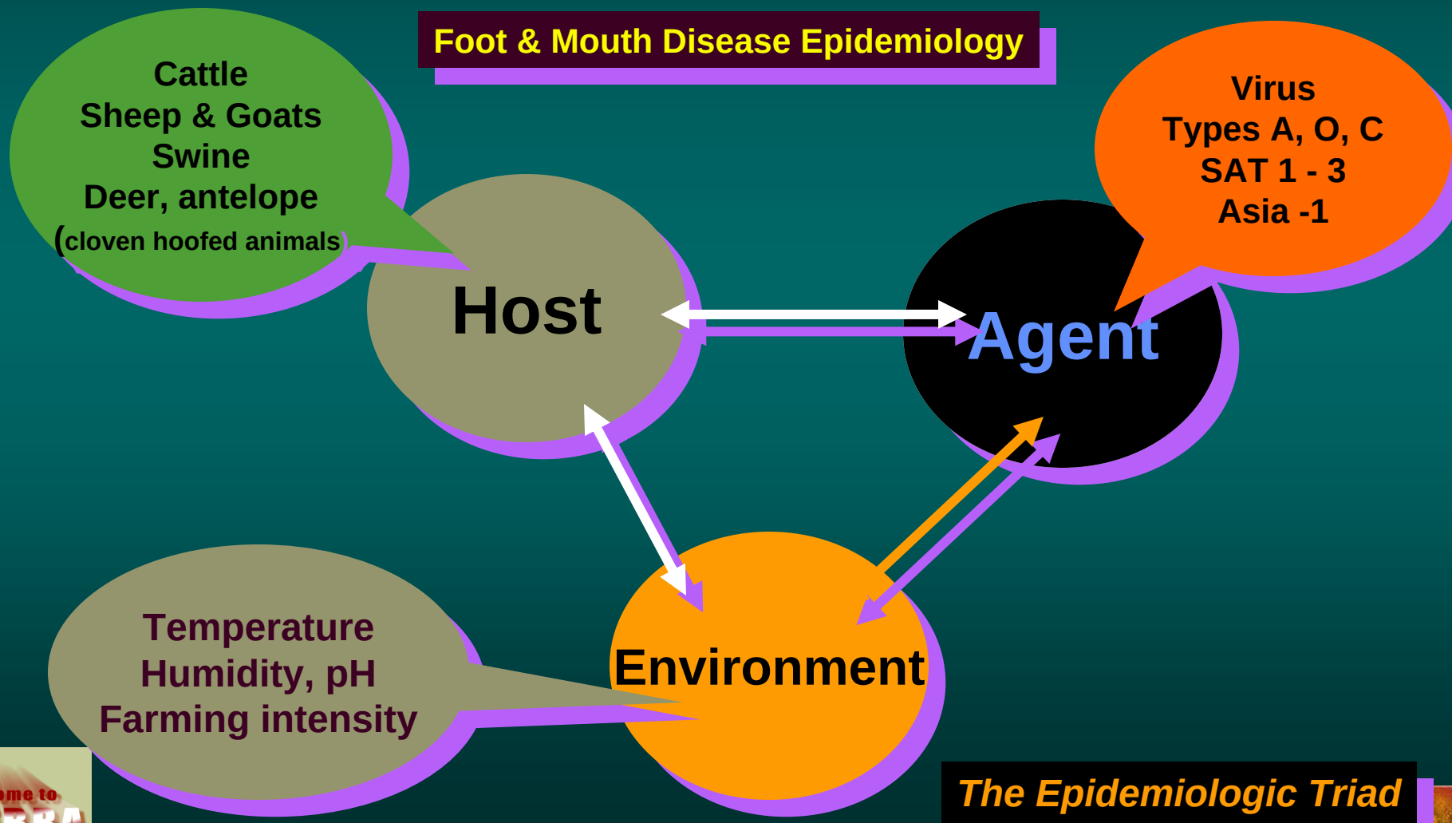
Foot & Mouth Disease Epidemiology



The Epidemiologic Triad

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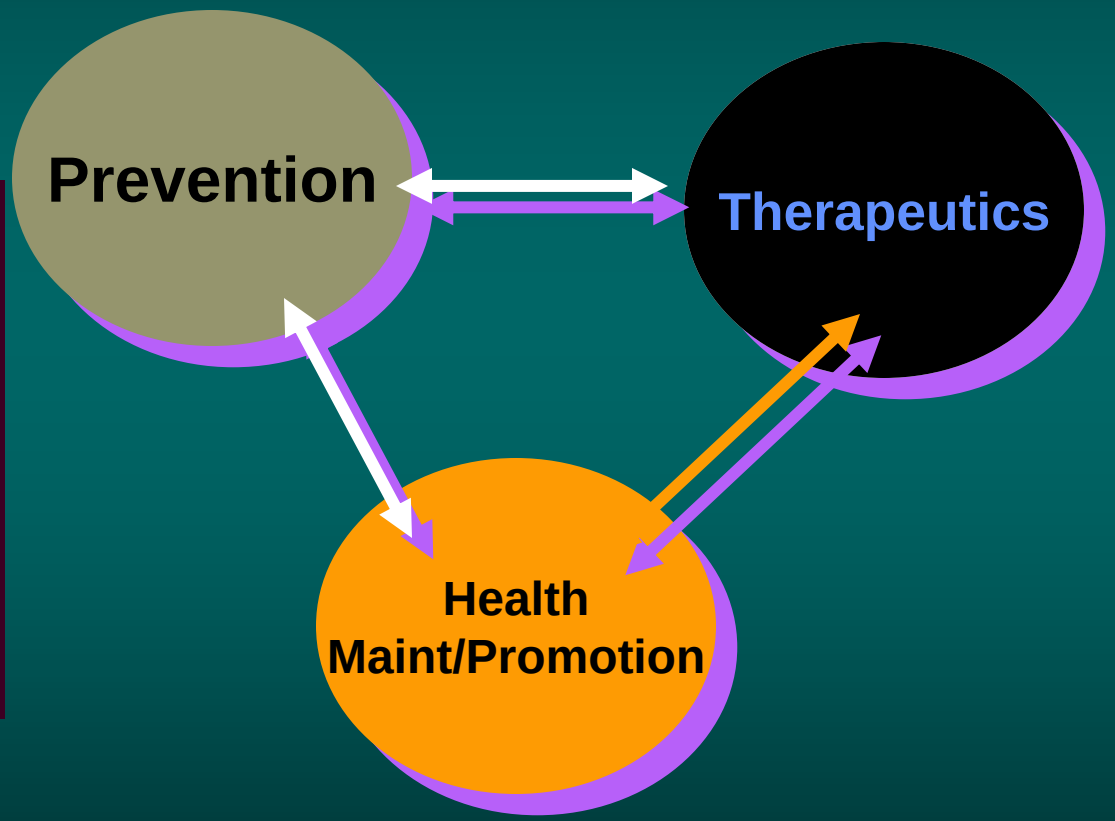
Problem Management Triad
Risk Mitigations

MITIGATIONS

- *Veterinary services*
- *Vaccinations*
- *Surveillance systems*
- *Test systems*

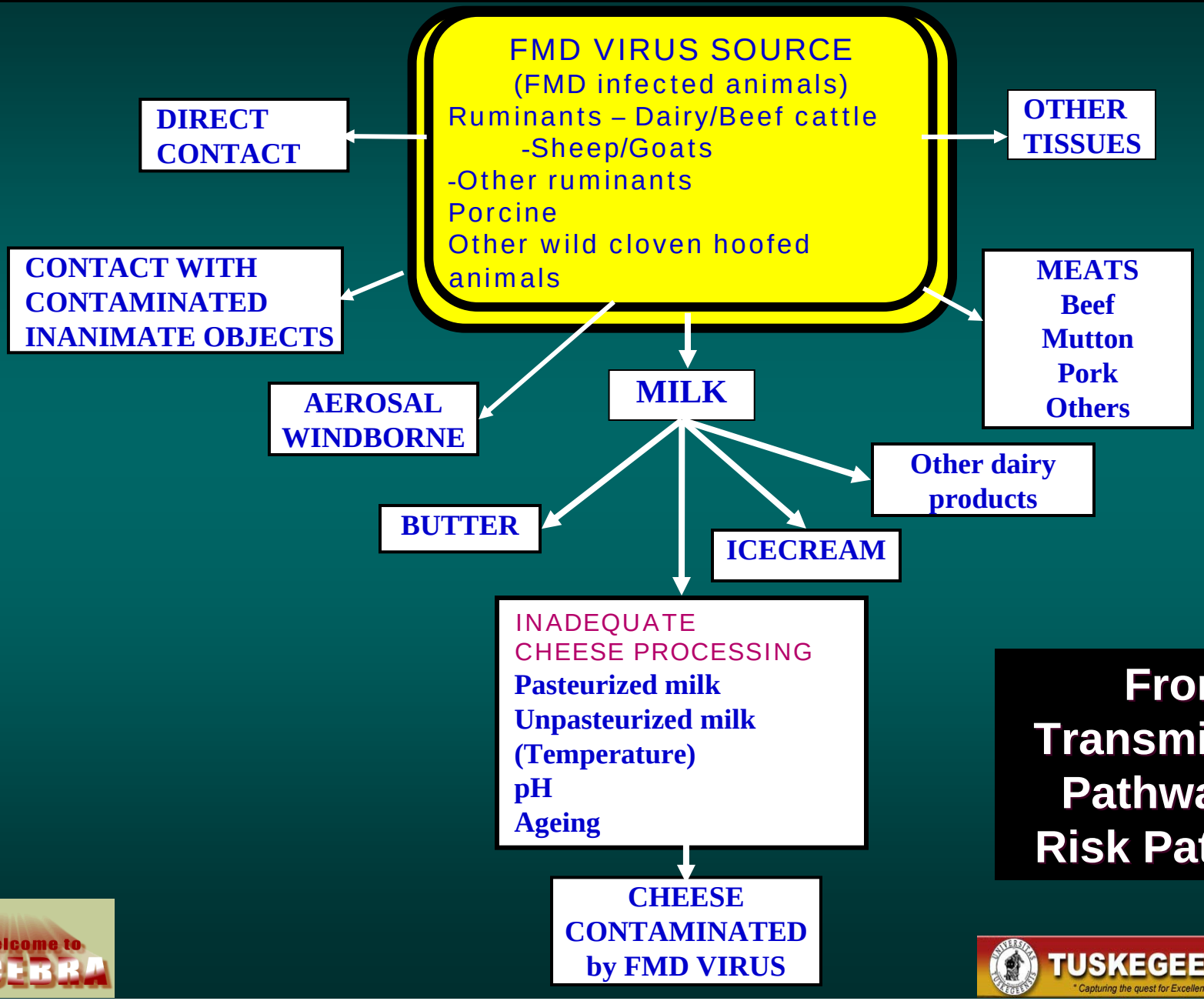
At processing:

- *Ante/post mortem exams*
- *Removal of nodes, bones*
- *Maturation (pH of 5.8)*



Incorporate Risk Mitigations in Model

Transmission Pathway of Foot and Mouth Disease Virus (Emphasis in milk used for cheese production)



From Transmission Pathway to Risk Pathway

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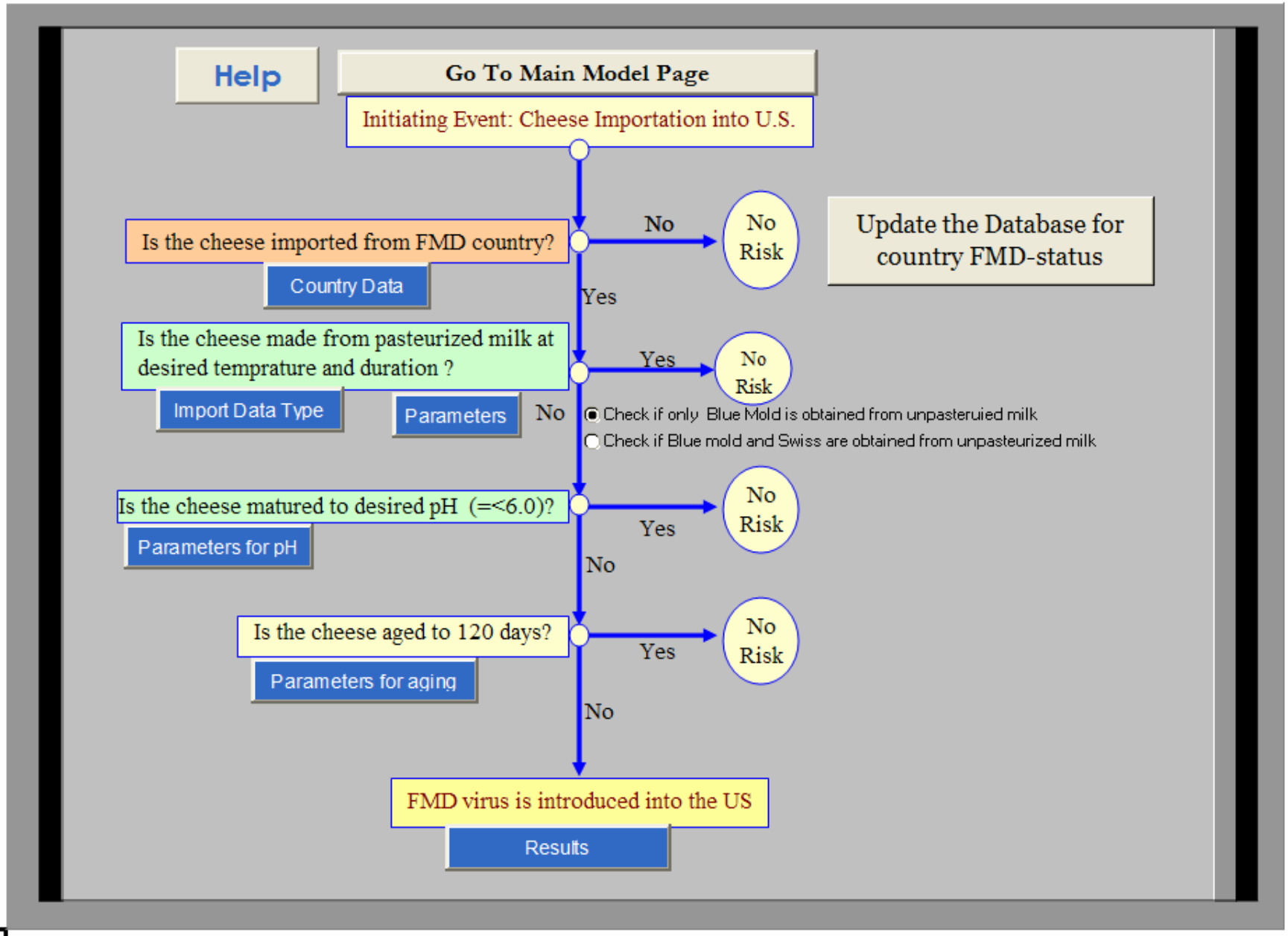
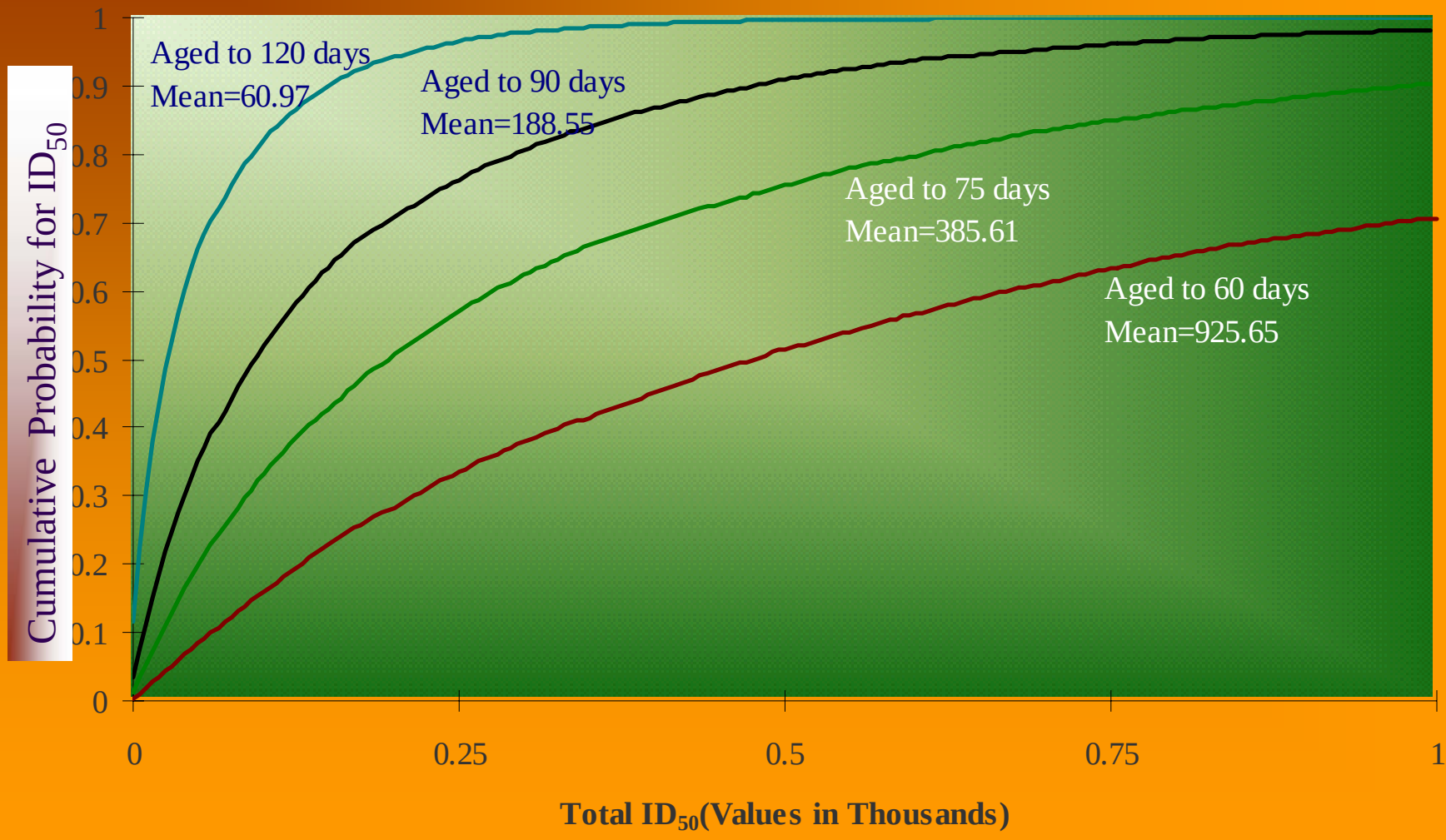
Risk Pathway for FMD Introduction Via Imported Cheese



GUI | Import By Country | Import By_Type (FMD Status) | Import By_Type (BlueMold) | Import By_Type (SWIS

Cumulative distribution of FMD total virus infectivity in terms of ID50 in all imported cheese: scenarios where cheese is aged for 60, 75, 90, and 120 days



QRA Risk of Citrus Importation

Citrus Canker

Citrus Black Spot

Sweet Orange Scab

rward Stop Refresh Home AutoFill Print Mail

http://compepid.tusk.edu/RiskAnalysis/course/riskcourse.htm

Page | Apple Computer | Apple Support | Apple Store | Microsoft MacTopia | MSN | Office for Macintosh

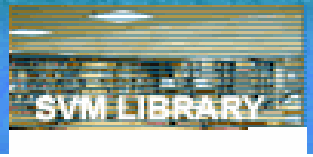
Risk Analysis and Modelling ONLINE COURSE

Short Course Outline | Slide/presentation | Problem/Exercises | Related Courses | Related Links

Chapters/Modules

Website

1. Making Decision
2. An Historical Perpective of Risk Assessment
3. Risk Assessment for Replicating Organisms
4. Introduction to module to Risk Assessments
4.1 Uncertainty and Variability
5. Statistics
6. Pathway Model Event Tree
7 Use of Excel Spreadsheet @Risk Software
8 Propabilistic Scenario Analysis
9 Decision Analysis
10 Risk Management
11 Risk Communication



Workshop in
Addis Ababa, Ethiopia

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Workshop in Accra, Ghana

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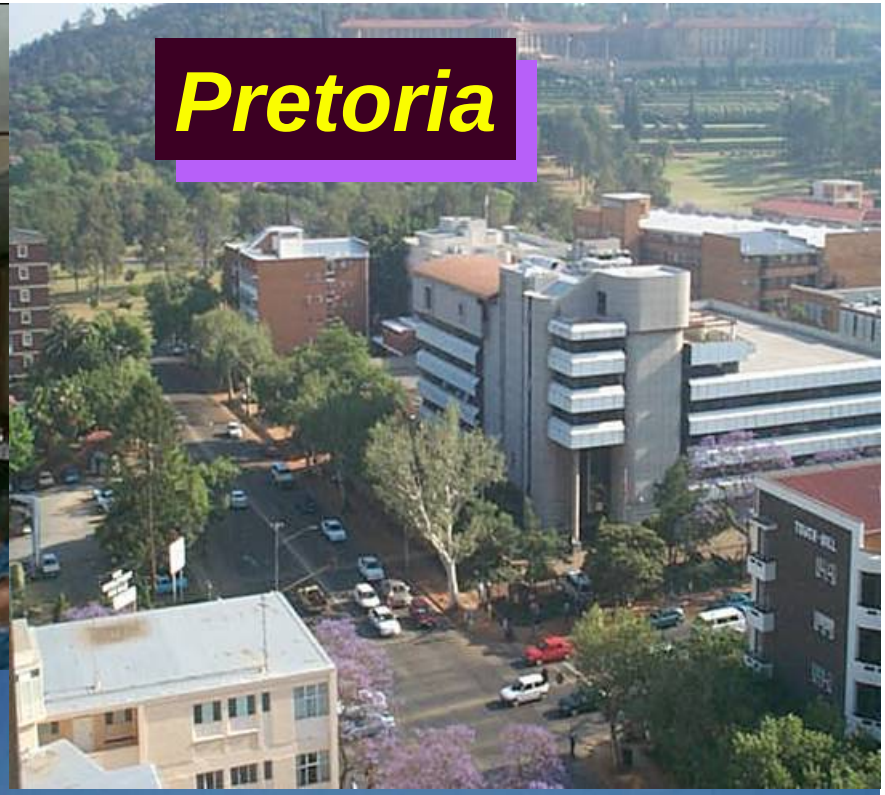

Workshop in Pretoria, South Africa

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Participants - Risk Analysis Workshops

REGION	Country	No. of participants				
		Veterinary Medicine	Plant Science/Health	Food Safety	Others	Total
Eastern Africa (Addis Ababa, Ethiopia)	Kenya	2	2	0	1	5
	Ethiopia	6	4	0	0	10
	Uganda	4	0	0	0	4
	Tanzania	5	0	0	0	5
Sub total	**(Four countries)**	**17**	**6**	**0**	**1**	**24**
Western Africa (Accra, Ghana)	Ghana	0	7	0	1	8
	Nigeria	2	0	2	0	4
	Senegal	0	3	0	0	3
	Mali	1	0	0	0	1
	Ivory Coast	0	2	0	0	2
Sub total	**(Five countries)**	**3**	**12**	**2**	**1**	**18**
Southern Africa (Pretoria, South Africa)	Namibia	1	0	0	1	2
	Zambia	0	1	0	1	2
	Malawi	0	2	0	0	2
	Botswana	1	2	2	2	7
	Swaziland	1	0	0	0	1
	South Africa	3	6	0	2	11
Sub total	**(Six countries)**	**6**	**11**	**2**	**6**	**25**
Grand total	**15 countries**	**26**	**29**	**4**	**8**	**67**

International Training: The Benefits

Building International Coalitions

Reducing Domestic threats Through International Risk Reduction Activities (Training/Tech Transfer)

Assist in identifying and preventing the spread of risk agents at the source

Reducing the risk of invasive species by enhancing risk analysis capabilities

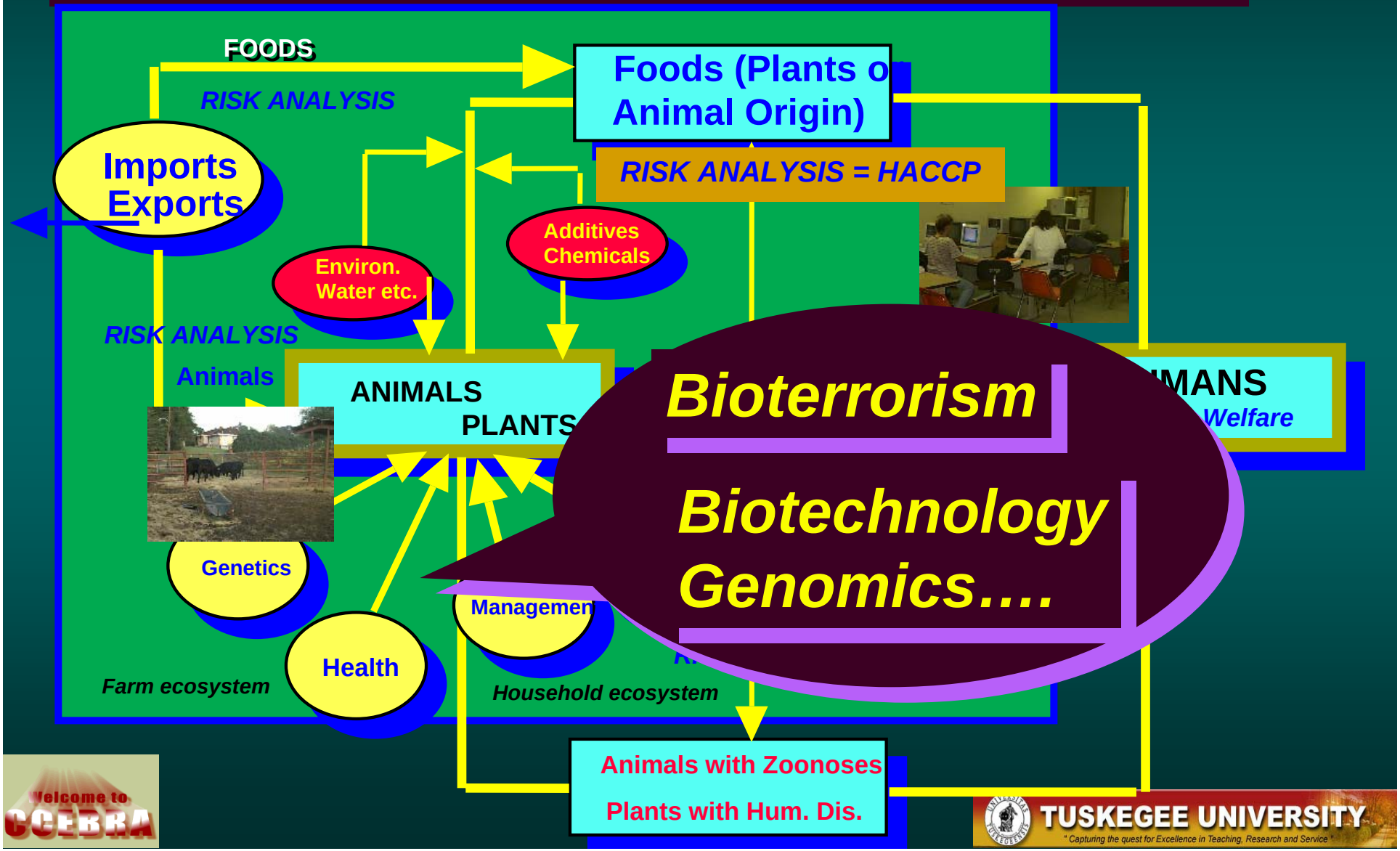
Promote Global Trade

Expanding & Advancing Risk Assessment Tools

Sponsored by USDA & Tuskegee University

A Systems Approach - Linking HACCP and Risk Analysis

The Framework…HACCP & Risk Analysis Linkage



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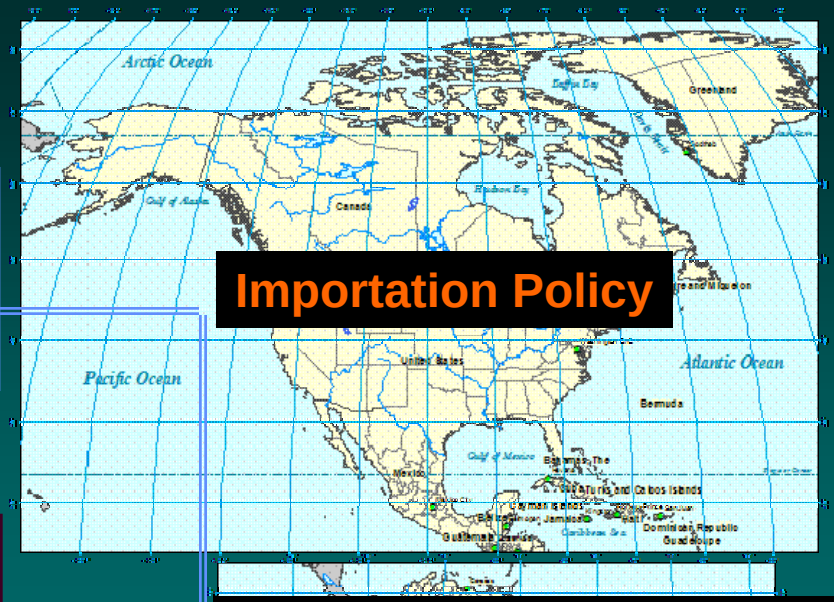
An Integrated Model for Risk Assessment

Systems Dynamics Epidemiologic Model in importing country



Importation Policy

Risk reduction procedures

Risk Assessment Model

Data / information (Global Sureveillance)

Systems Dynamics Epidemiologic Model in exporting country

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Summary: Strategic Challenges & Opportunities

- **Fast Transportation Systems**
- **Interconnectedness**
- **Global Trade (The WTO and SPS Regulations)**
- **Demographic & Ethnic Diversity**

- ***Unintentional Introductions of Agents***
- ***Intentional Introductions - Bioterrorism/Agroterrorism***

1. ***Surveillance! Epidemiologic Intelligence Gathering Supported by Reliable Diagnostic Laboratories!***
2. ***Global Digital Resources for Reporting & Sharing Information Fast Response Teams & Strategies***
3. ***Long Term Commitment to International Training & Technology Transfer***
4. ***Continuous Learning & Expanding/Optimizing Strategic Tools***

A Guiding Philosophy……

"Knowledge cannot start from nothing….
Nor yet from observation. The advance of knowledge consists mainly in the modification of earlier knowledge".

"Karl Popper
In
The Logic of Scientific Discovery"

And FINALLY...

Thank You...
See You in Cyberspace

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Http://compepid.tuskegee.edu

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