Laboratory Acquired Infections

and

Activities to Reduce Them

U.S. Army Laboratory----1970

University of Texas National Lab---2007

Our International Family

Grandchildren

Nikolas Franz, Samara, Russia

Anna Franz, Hunan Province, China

Historical Data from US Warfare Program

Detrick Infections: 1943 - 1969 -- 456

Tularemia*	153	Shigellosis	6
Brucellosis*	94	RMSF	5
Q Fever*	55	Newcastle	3
VEE*	43	BHF	1 **
Psittacosis*	32	Chikunguna	1
Anthrax*	31 **	Plague	1
SEB*	12	Salmonella	1
Coccidioidomycosis	9	Tuberculosis	1
Glanders	7	Blastomycosis	1

Bot Toxin* - 0

* Major Effort

**Lethal

Four Laboratory Deaths at Fort Detrick

3 Anthrax and 1 Machupo Virus

Four men are verified as having died while in service at Camp and Fort Detrick. In 1944, a young Army lieutenant died instantly in Building 201 when a pump exploded. No further information has been obtained on the incident, which was handled quietly.

Mr. William Allen Boyles, a 46-year-old microbiologist, contracted anthrax and died November 25, 1951. Boyles Street was named in his memory.

On July 5, 1958, Mr. Joel Eugene Willard, 53, an electrician with the facilities engineer, also died of pulmonary anthrax. Willard Place was named in his honor.

Mr. Albert Nickel, 53, an animal caretaker, died after being bitten by an animal infected with Machupo Virus. Nickel Place was named in his honor.

Historical Biosafety

1940s – 1960s

- Lessons learned from US offensive biological warfare program
  - Dr. Arnold G. Wedum (Camp Detrick)

- Biosafety in Microbiological and Biomedical Laboratories (BMBL)
  - *Facilities, Equipment & Procedures*

1st Edition
1984

http://www.cdc.gov/biosafety/publications/bmbl5/BMBL.pdf

Positive Impact of the Biosafety Program of Dr. Wedum

The inflexible safety rules sometimes irked scientists, who felt that the required procedures delayed their research projects ... Dr. [Ira] Baldwin refused to permit any relaxation of the safety rules that, as he emphasized, were designed as much for the protection of the community as for the safeguarding of the health researchers.

Dr. Wedum spoke to a national media organization in 1958 and emphasized the media's preoccupation with safety at Fort Detrick while neglecting safety records of industry.

He said that tremendous successes had been achieved in reducing disabling occupational illness at Fort Detrick between 1943 and 1958. For technical personnel the rate was 55 such illnesses per million man hours from 1943-45. That improved to 11.45 illnesses per million man hours in 1958. He pointed out these figures concern personnel who were greatly at risk, working with organisms for which vaccines existed for only a few.

Workers are vaccinated when vaccines are available, but we do not have effective vaccines for all the diseases we study. One of the most effective medically prophylactic measures depends upon early diagnosis of illness ... [We] consider every illness in an employee exposed to an infectious risk to be an occupational illness until it is proved otherwise.

Occupational illness

Non-traumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain (For example, exposure to toxins, poisons, fumes); or other continued and repeated exposures to conditions of the work environment over a long period of time. Includes any abnormal physical or psychological condition or disorder resulting from an injury, caused by long-or short-term exposure to chemical, biological, or physical agents associated with the occupational environment. (Source: Department of Army Pamphlet 385-40 Army Accident Investigations and Reporting)

Biological Spill/Leak within Laboratory

Accidental spills or leaks of any biological material within a laboratory. This includes dropped tissue culture plates. (Source: USAMRIID Safety Division)

Equipment Malfunction

Equipment malfunctions that prompt involved personnel to seek a medical evaluation by Occupational Medicine. Equipment includes all engineering controls and personal protective equipment, with the exception of positive pressure encapsulating suit/glove mishaps. (Source: USAMRIID Safety Division)

Contusions/Abrasions

This type includes injuries caused by a pinch/struck against or by an object/rubs or abrasions. (Source: USAMRIID Safety Division)

Burn

All electrical and thermal burns. (Source: USAMRIID Safety Division)

Lacerations

Skin/eye lacerations that are caused by any type of sharp object. (Source: USAMRIID Safety Division)

2012

USAMRIID INCIDENTS IN BSL-3 & 4 Laboratories: 2010, 2011, and 2012

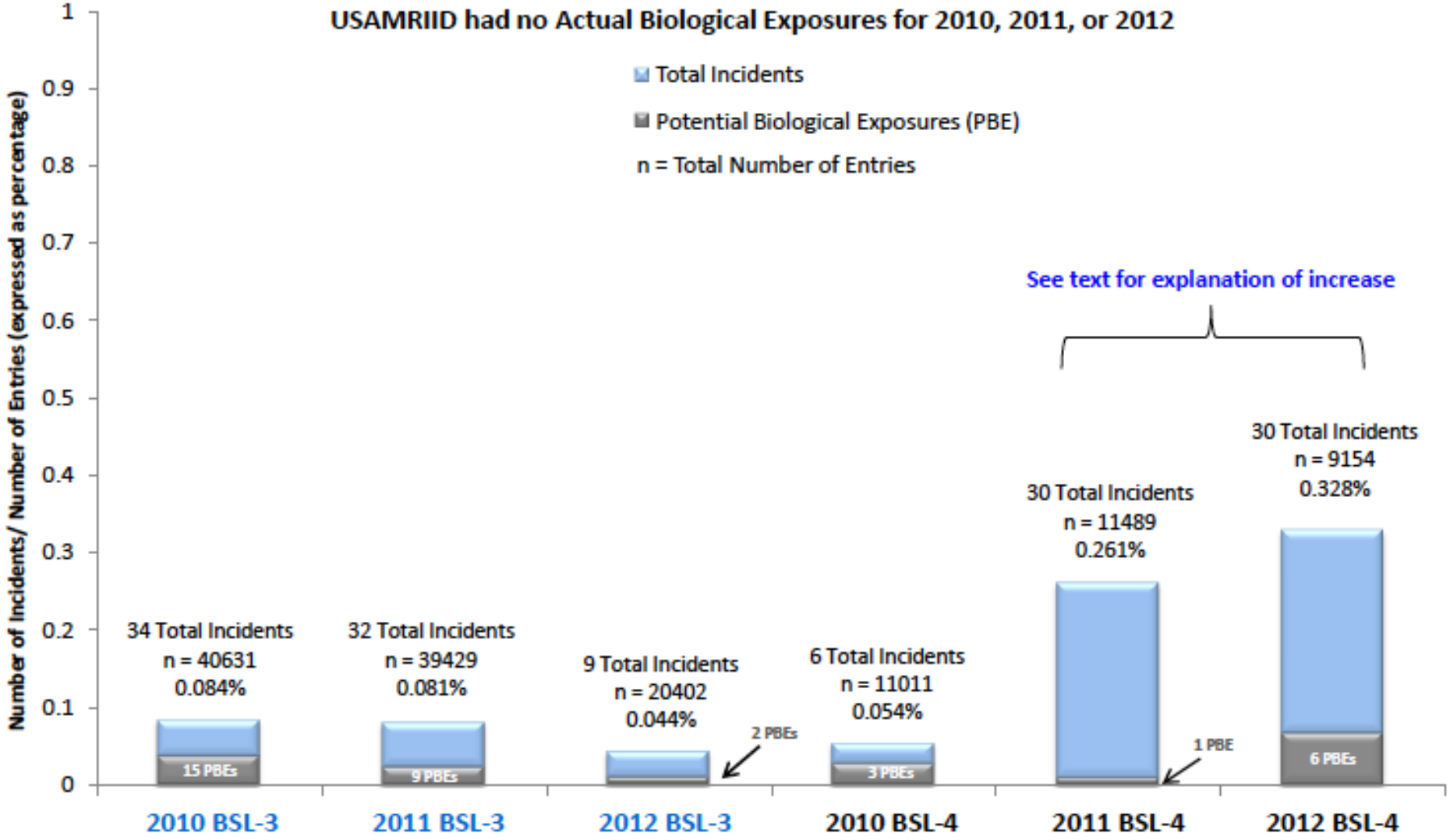
	BSL-3			BSL-4		
Incident Type	2010	2011	2012	2010	2011	2012
Occupational Illness	0	0	0	0	0	0
Biological Spill/Leak within Laboratory	6(2)	11(5)	2(2)	1(0)	0	0
Chemical Leak or Spill	0	4(0)	0	0	0	0
Positive Pressure Encapsulating Suit (non-glove) Mishap	0	0	0	2(2)	9(1)	14(6)
Positive Pressure Encapsulating Suit - Glove Mishap	0	0	0	2(1)	16(0)	16(0)
Equipment Malfunction (Does not include Positive Pressure Encapsulating Suit/Glove Mishaps)	14(9)	3(2)	1(0)	1(0)	2(0)	0
Splash – Potential Skin Contact (Includes all biologicals)	2(2)	2(1)	0	0	0	0
Contusions/Abrasions	3(0)	1(0)	2(0)	0	1(0)	0
Burn (Includes thermal and electrical)	0	0	0	0	0	0
Lifting/Bending	1(0)	1(0)	1(0)	0	0	0
Lacerations	5(0)	8(1)	1(0)	0	1(0)	0
Needlestick	3(2)	1(0)	0	0	0	0
Slips/Trips/Falls	0	1(0)	0	0	1(0)	0
Animal Bite	0	0	1(0)	0	0	0
Animal Scratch	0	0	1(0)	0	0	0
Total:	34(15)	32(9)	9(2)	6(3)	30(1)	30(6)

For entries where a number is followed by a superscript, or smaller number in parentheses (#), this represents the total number of incidents for that category, followed by the number of incidents within that category that were assessed as Potential Biological Exposures. A superscript of zero indicates there were no PBEs for that category. A Potential Biological Exposure means that there was some risk of exposure to infectious agents and/or toxins, and that the personnel involved were placed on medical surveillance as a precaution. In all of these cases, no symptoms were reported and there were no signs of disease resulting from these incidents.

Number of Incidents per Number of Entries (%) for BSL-3 & 4 Suites

Potential Biological Exposures shows as subset of Total Incidents

USAMRIID had no Actual Biological Exposures for 2010, 2011, or 2012



USAMRIID security tracks the number of times our employees enter BSL-3 and BSL-4 laboratory suites. As one indicator of our overall safety performance, we can look at the number of incidents compared against the total number of suite entries in a given time period.

A PBE means that some risk of exposure to infectious agents and/or toxins may have occurred, resulting in Occupational Health staff placing the personnel involved on precautionary medical surveillance. In each of these cases during 2010, 2011, and 2012, no illness or disease occurred.

— Safety Report Information —

In the interest of transparency, USAMRIID has compiled data from safety incident reports, which are filed whenever a laboratory mishap occurs. This information is updated on the USAMRIID website annually.

In order to properly assess safety performance over time, USAMRIID compares the number of incidents to the number of times employees entered BSL-3 and BSL-4 laboratories in a given year. It is important to note that in every incident from 2010-2012, no symptoms were reported and there were no signs of illness.

For instance, in 2012, USAMRIID had 20,402 entries into BSL-3 laboratories. During that time, there were 9 safety incidents within those laboratories; 2 were Potential Biological Exposures (PBE). A PBE means that some risk of exposure to infectious agents and/or toxins may have occurred, resulting in Occupational Health staff placing the personnel involved on precautionary medical surveillance. No illness or disease occurred in either case. The 2012 incident rate for BSL-3 laboratories was 0.044 percent.

Looking at BSL-4 laboratories, USAMRIID had 9,154 entries during 2012, with a total of 30 incidents including 6 Potential Biological Exposures (PBE). A PBE means that some risk of exposure to infectious agents and/or toxins may have occurred, resulting in Occupational Health staff placing the personnel involved on precautionary medical surveillance. In every case, no illness or disease occurred. The 2012 incident rate for BSL-4 laboratories was 0.328 percent. To view a bar graph of the incidents/total lab entries for 2010 through 2012, **click here**

The University of Texas

utmb Health
Galveston National Laboratory

Community Update

VOL. 10, SUMMER 2012

Staying in Touch

WELCOME TO THE SUMMER 2012 EDITION of our Galveston National Laboratory (GNL) Community Update. Members who attended the most recent Community Advisory Board meeting on May 8, 2012 received updates on UTMB's family campaign, campus construction and revitalization, and long-term planning. Also featured were updates on some of the research activities ongoing in the world class laboratory facilities on campus. Thanks to all who attended. Your interest in UTMB and our activities is sincerely appreciated.

BIOSECURITY SYMPOSIA SERIES SPRING SESSIONS FOCUS ON INTERNATIONAL COLLABORATION

https://www.utmb.edu/gnl/safety/index.shtml

Incident Report

- Safety & Security
- NBTC
- Incident Report
- BSL4 "Stickman"
- Biosafety Committee

Published reports on laboratory-associated exposures to infectious agents in high-containment research laboratories are few and far between. However, UTMB encourages faculty and students to routinely report any unusual event in the laboratory – and in the interest of transparency, we make these reports available to you.

Given the multiple redundant containment layers in a BSL3 or BSL4 laboratory, and the fact that almost all of the infectious agents worked on in these labs are not transmissible between humans, any such exposure poses by far the greatest risk to the laboratory worker involved. In the unusual situation where the possible exposure involved a virus or bacterium that is reasonably capable of being transmitted from one person to another, that fact is noted in the table.

We invite you to review the history of possible occupational exposures to infectious agents at all of UTMB's research laboratories online.

History of Possible Exposures to Known Pathogens in Research Laboratories, 2002 to the Present
The University of Texas Medical Branch
For additional information please see http://www.utmb.edu/eho/labsafety/default.htm

Date of Incident	Agent or Toxin Potentially Involved	BSL Level of Agent or Toxin	Select Agent or Toxin	Human Pathogen	Transmissible Person to Person	Description	Report of Clinical Illness**	Reportable to CDC/DSAT or MHCDSA	Regulatory Form Submitted	Additional Comments
2002										
November 12, 2002	West Nile virus	3	No	Yes	No	Employee reported a rash on their neck and suspected it was due to exposure to West Nile virus. Employee later said it was a simple rash.	No	No	N.A.	No exposure vehicle identified. No history of exposure.
2003										
	None									
2004										
February 23, 2004	Cercopithecine herpes virus 1	2*	Yes*	Yes	Yes	Employee reported she cutting left hand on broken spray bottle in lab.	No	No	N.A.	Laboratory work did not involve Cercopithecine herpes virus 1. Species known for being a reservoir. Subsequent serological testing was negative.
April 1, 2004	Leptospira interrogans	2	No	Yes	No	Employee reported a cut thumb on glassware that was possibly contaminated with Leptospirosis.	No	No	N.A.	
August 12, 2004	West Nile virus	3	No	Yes	No	Employee reported possible exposure to West Nile virus after needle stick to his finger.	No	No	N.A.	
September 14, 2004	Rickettsia conorii	3	No	Yes	No	Employee reported, while injecting Rickettsia, that inoculum sprayed on face and possibly in eye.	No	No	N.A.	
September 15, 2004	West Nile virus	3	No	Yes	No	Employee reported punctured finger with scissor while processing birds for West Nile virus.	No	No	N.A.	
October 19, 2004	Herpes simplex virus	2	No	Yes	Yes	Employee reported a mouse bite. Mouse was infected with HSV.	No	No	N.A.	
2005										
April 8, 2005	Rickettsia conorii	3	No	Yes	No	Employee reported needle stick.	No	No	N.A.	
2006										
July 11, 2006	Bacillus anthracis	3***	Yes	N.A.	No	Employee received a needle stick while dosing a mouse with Ciprofloxacin. Mouse had been dosed with Bacillus anthracis on June 30, 2006, but post exposure had received six days of antibiotic regimen.	No	No	Yes	Called CDC on July 12. CDC did not consider this a potential exposure. Even though not required by CDC, sent letter on July 14, 2006
July 29, 2006	Bacillus anthracis	3***	Yes	N.A.	No	Employee reported that, when injecting infected animal (anthrax) with Levofloxacin, and noticed a possible puncture mark on finger, but did not observe or feel a needle stick. Examination showed glove not punctured.	No	No	N.A.	No actual exposure to anthrax identified.
September 15, 2006	Human immunodeficiency virus I	2	No	Yes	Yes	Employee reported knife cut while working on frozen HIV+ section.	No	No	N.A.	
September 15, 2006	Mucambo virus	3	No	Yes	No	Employee reported a possible exposure to Mucambo virus. When placing a sample in the incubator the inner door hit the plate, causing liquid to drip on her cover gown.	No	No	N.A.	
October 2, 2006	Herpes simplex virus	2	No	Yes	Yes	Employee reported a possible exposure to HSV to her eye when she rubbed her eye with glove after working with the virus.	No	No	N.A.	
October 16, 2006	Adeno-associated virus	2	No	No	No	Employee reported a needle stick while injecting mice.	No	No	N.A.	
2007										
Date of Incident	**Agent or Toxin Potentially Involved**	**BSL Level of Agent or Toxin**	**Select Agent or Toxin**	**Human Pathogen**	**Transmissible Person to Person**	**Description**	**Report of Clinical Illness****	**Report to CDC or NIH Required**	**Regulatory Form Submitted**	**Additional Comments**
January 6, 2007	West Nile virus and vaccine	3	No	Yes	No	Hamster bit thumb during administration of Cyclophosphamide. Hamster was vaccinated WNV vaccine, then 31 days before bite challenged with wild type WNV.	No	No	N.A.	

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 60 / No. 7
February 25, 2011

Published, so that others can learn…

Fatal Laboratory-Acquired Infection with an Attenuated *Yersinia pestis* Strain — Chicago, Illinois, 2009

On September 18, 2009, the Chicago Department of Public Health (CDPH) was notified by a local hospital of a suspected case of fatal laboratory-acquired infection with *Yersinia pestis*, the causative agent of plague. The patient, a researcher in a university laboratory, had been working along with other members of the laboratory group with a pigmentation-negative (pgm-) attenuated *Y. pestis* strain (KIM D27). The strain had not been known to have caused laboratory-acquired infections or human fatalities. Other researchers in a separate university laboratory facility in the same building had contact with a virulent *Y. pestis* strain (CO92) that is considered a select biologic agent; however, the pgm- attenuated KIM D27 is excluded from the National Select Agent Registry (*1*). The university, CDPH, the Illinois Department of Public Health (IDPH), and CDC conducted an investigation to ascertain the cause of death. This report summarizes the results of that

Case Report

On September 10, 2009, the researcher, a man aged 60 years with insulin-dependent diabetes mellitus, was evaluated at an outpatient clinic for fever, body aches, and cough of approximately 3 days duration. A clinic physician suspected influenza or other acute respiratory infection and referred the patient to an emergency department (ED) for further evaluation; however, the patient did not seek further care at that time. On September 13, the patient was brought by ambulance to a Chicago hospital ED because of fever, cough, and worsening shortness of breath. Paramedics recorded an oxygen saturation level of 92%, and oxygen was administered via mask.

Upon arrival at the ED, the patient was noted to be alert and able to converse, with a temperature of 100.9°F (38.3°C), pulse of 106 beats per minute, respiratory rate of 42 breaths per

Centers for Disease Control and Prevention
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virulent *Y. pestis*
biologic agent; h
excluded from th
university, CDPH
(IDPH), and CD
the cause of death

Postmortem examination revealed no evidence of pneumonic plague. A postmortem diagnosis of hereditary hemochromatosis was made on the basis of histopathologic, laboratory, and genetic testing. One possible explanation for the unexpected fatal outcome in this patient is that hemochromatosis-induced iron overload might have provided the infecti g KIM D27 strain, which is attenuated as a result of defects in its ability to acquire iron, with sufficient iron to overcome its iron-acquisition defects and become virulent (*2*). Researchers should

Case Report

On September 10, 2009, the researcher, a man aged 60
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seek further care
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Volume 12, Number 2—February 2006

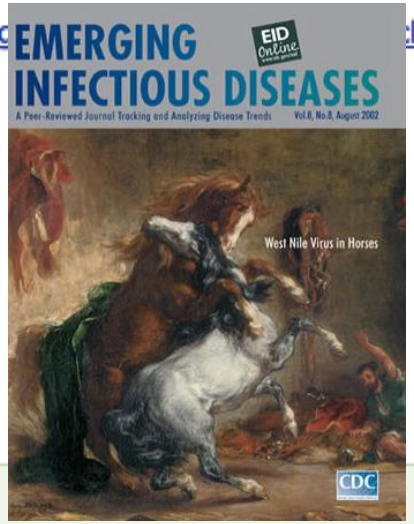
Research

Epizootiologic Parameters for Plague in Kazakhstan

Michael Begon* ✉ **, Nikolay Klassovskiy†, Vladimir Ageyev†, Bakhtiar Suleimenov†, Bakhyt Atshabar†, and Malcolm Bennett***

Author affiliations: *University of Liverpool, Liverpool, United Kingdom; †Kazakh Scientific Centre for Quarantine and Zoonotic Diseases, Almaty, Kazakhstan

Sugg…cle



Article Contents

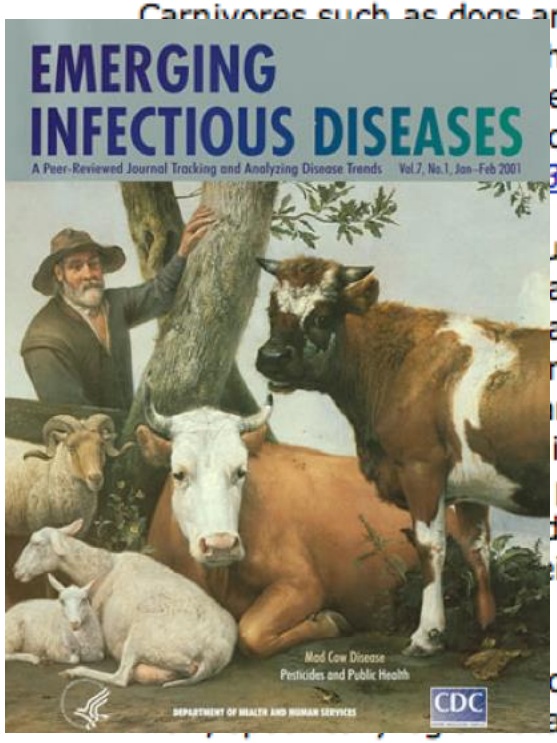
Abstract

Reliable estimates are lacking of key epizootiologic parameters for plague caused by *Yersinia pestis* infection in its natural reservoirs. We report results of a 3-year longitudinal study of plague dynamics in populations of a maintenance host, the great gerbil (*Rhombomys opimus*), in 2 populations in Kazakhstan. Serologic results suggest a mid-summer peak in the abundance of infectious hosts and possible transmission from the reservoir to humans. Decrease in antibody titer to an undetectable level showed no seasonal pattern. Our findings did not support the use of the nitroblue-tetrazolium test characterization of plague-infected hosts. *Y. pestis* infection reduced survival of otherwise asymptomatic hosts.

Letter

Serologic Survey of Plague in Animals, Western Iran

To the Editor: Plague has been one of the most devastating infectious diseases in human history. The etiologic agent, *Yersinia pestis*, primarily affects rodents and is usually transmitted to humans through infective flea bites. Endemic plague foci result from circulation of the plague bacillus in its rodent reservoir, the source of human plague cases (1). Carnivores such as dogs and foxes, which prey on n carcasses, are valuable e serosurveillance in ough their infections are 3).



used loss of human life in various parts of Iran. During an, 9 human epidemics occurred and caused 156 deaths. ague was reported in 1966 (4). Field investigations nt species as *Y pestis* reservoirs; 2 were resistant (*M.* nd the other 2 (*M. tristrami* and *M. vinogradovi*) were infection (4,5). The epidemiologic investigations plague epizootic cycle in Iran (5). The last official report of dates back to 1978, in Sarab County in the East Azarbaijan illance was ignored for more than 3 decades and then

o investigate plague among resident animals in western alities along the border between the Kurdistan and Hamadan Provinces, where plague in wildlife has been repeatedly reported (enclosed by 47.900° and 48.284° north latitude and 35.4616° and 35.7829° east longitude). The epidemiologic team was based at the Akanlu Research Center of the Pasteur

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American Society of Microbiology

October 2013

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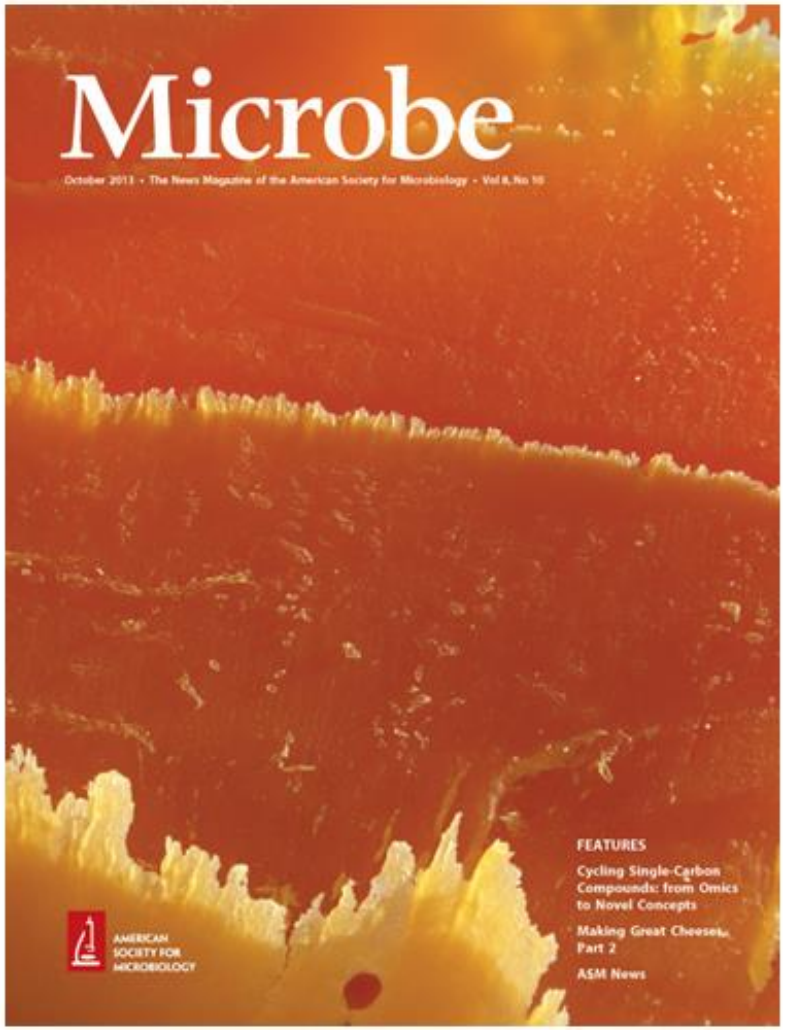
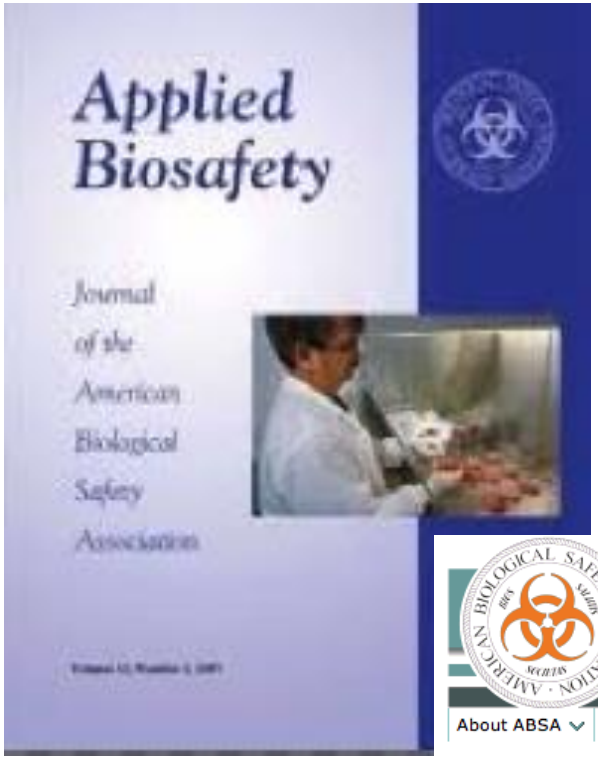
October 2013



ASM Links

- ASM.org
- Journals
- Meetings
- MicrobeWorld
- Education Resources
- MicrobeLibrary
- ASM eStore

American Biosafety Association



WWW.ABSA.ORG

American Biological Safety Association

The American Biological Safety Association (ABSA) was founded in 1984 to promote biosafety as a scientific discipline and serve the growing needs of biosafety professionals throughout the world. The Association's goals are to provide a professional association that represents the interests and needs of practitioners of biological safety, and to provide a forum for the continued and timely exchange of biosafety information.

On this official website of the American Biological Safety Association, you can find information about the **ABSA Annual Conference, ABSA Review Course, Principles and Practices of Biosafety Course** and other educational offerings. There is also extensive information about ABSA's two credentials, the **Certified Biological Safety Professional (CBSP)** credential, and the **Registered Biosafety Professional (RBP)** credential. The site also contains important biosafety publications such as the **Anthology of Biosafety** series and **Applied Biosafety: Journal of the American Biological Safety Association**. If you are interested in becoming an ABSA member, please see ABSA's **membership information and membership application**. There is also other important biosafety information on this site including: **the Risk Group database, Biosafety Links, Biosafety Listserv, White Papers, Job Opportunities**, and more. Please e-mail **info@absa.org** if you have any questions or would like additional information.

ABSA News **ABSA Calendar ›**

Renew Your ABSA Membership! ›

NEW **2013 ABSA Election Results ›**

ABSA Kansas City
56th Annual Biological Safety Conference
October 17-23, Kansas City, MO

Registration will remain open throughout the Conference! You may register online or onsite.

Register Now! ›

Laboratory Acquired Infections (LAIs)

The following slides kindly used with the permission of:

Vijayasmitha Rayadurg, DVM, PhD, SM [NRCM], CBSP
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'Smitha'

Definition

- **LAI**
  - **All infections acquired through laboratory or laboratory-related activities regardless whether they are symptomatic or asymptomatic in nature.**

INGESTION

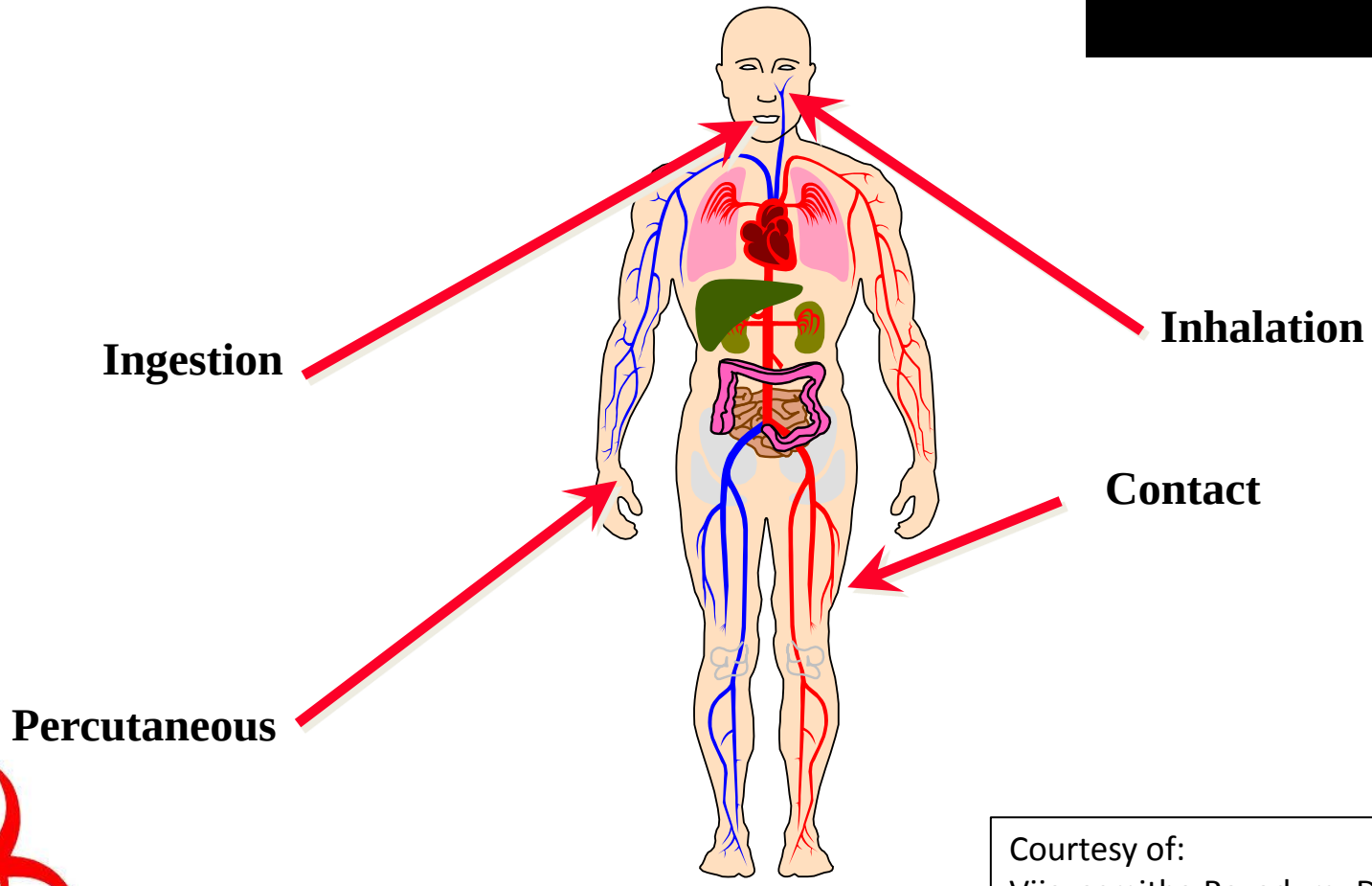
INHALATION

MUCOUS MEMBRANE CONTACT

DIRECT INOCULATION

CONTACT WITH ANIMALS & VECTORS

Common Routes of Exposure



Courtesy of:
Vijayasmitha Rayadurg, DVM, PhD, CBSP
Biosafety & Export Control Officer

Risk Assessment

Influenced by:

- **activities performed with the agent**
- **experience of the laboratory worker**
- **the infectious agent itself**
- **Personal Risk Factors**
  - **factors related to the immunocompetency**
  - **factors related to behavior patterns and attitudes**

Courtesy of:
Vijayasmitha Rayadurg, DVM, PhD, CBSP
Biosafety & Export Control Officer

Assess gaps in your labs !!!!!

- **Identify *problems* with Biorisk Management. These problems could be associated with assessment, mitigation or performance.**

Courtesy of:
Vijayasmitha Rayadurg, DVM, PhD, CBSP
Biosafety & Export Control Officer

Hierarchy of Risk Management

- Assigning the Biosafety Level
- Elimination or Substitution
- Engineering Controls
- Administrative Controls
- Practices and Procedures
- Personal Protective Equipment

Courtesy of:
Vijayasmitha Rayadurg, DVM, PhD, CBSP
Biosafety & Export Control Officer

Risk Management

- **The basic approach**
  - **– Practice universal precautions**

- **Develop and implement a Safety Plan**
  - **– to handle accidental spills of infectious material**
  - **– or releases of infectious microorganisms**
  - **– for Sharps handling**
  - **– plan for waste management and disposal**

Courtesy of:
Vijayasmitha Rayadurg, DVM, PhD, CBSP
Biosafety & Export Control Officer

Management of Lab accidents

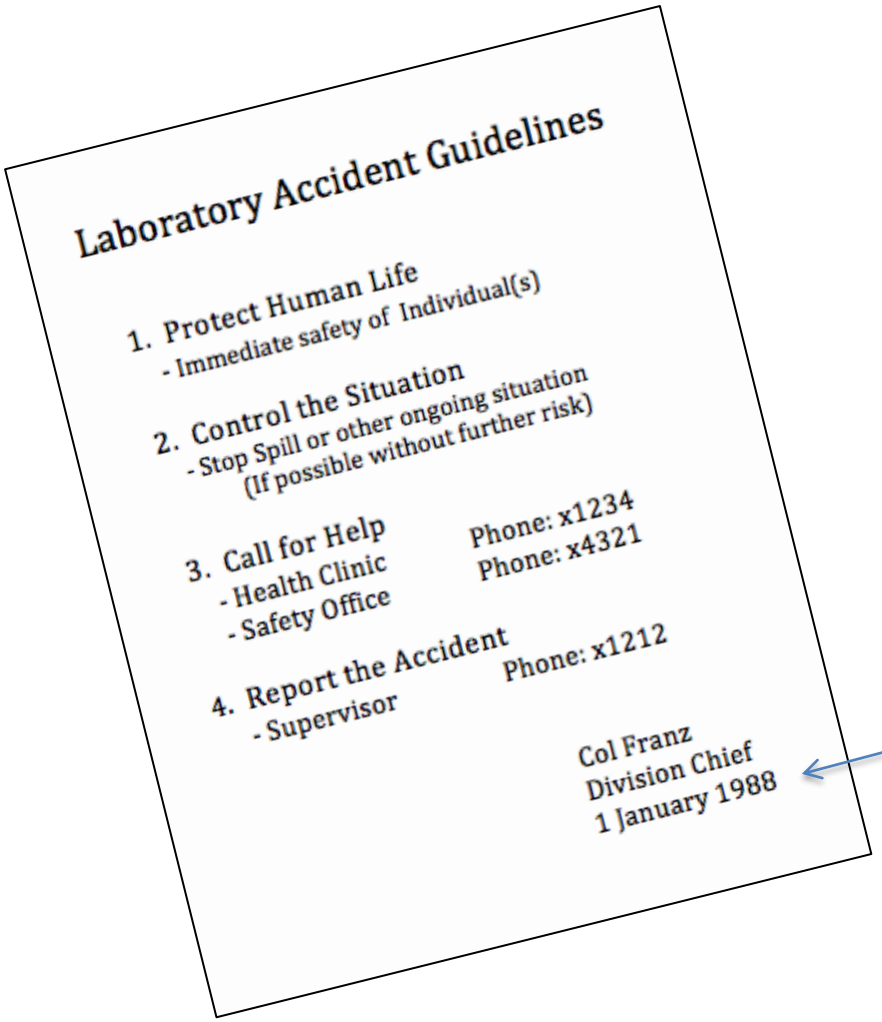
- **Laboratory management is responsible ultimately to implement the procedures and work practices**

- **Emphasize on risk assessment, training, SOPs, disinfection, waste management, immunization, post-exposure prophylaxis, & biosecurity**

Courtesy of:
Vijayasmitha Rayadurg, DVM, PhD, CBSP
Biosafety & Export Control Officer

A Simple Reminder…

…on the wall in every laboratory



Laboratory Accident Guidelines

1. **Protect Human Life**
   - Immediate safety of Individual(s)
2. **Control the Situation**
   - Stop Spill or other ongoing situation
     (If possible without further risk)
3. **Call for Help**
   - Health Clinic — Phone: x1234
   - Safety Office — Phone: x4321
4. **Report the Accident**
   - Supervisor — Phone: x1212

Col Franz
Division Chief
1 January 1988

25 years ago

Management of Lab accidents

- Adequate job specific training
- Proper immunization of laboratory employees
- Facility design and work flow that limits possible exposure
- Proper use of personal protective equipment
- Establishment of SOPs (standard procedures)
- Understanding our Limitations

Courtesy of:
Vijayasmitha Rayadurg, DVM, PhD, CBSP
Biosafety & Export Control Officer

The key to a safe workplace is employees who are knowledgeable of the routes of transmission of infectious agents in the laboratory setting and apply safety principles and work practices to reduce the risk

Courtesy of:
Vijayasmitha Rayadurg, DVM, PhD, CBSP
Biosafety & Export Control Officer

Finding the right balance and working together as a team

LAB PERSONNEL

WORK LOAD

LAB SUPERVISOR

We must always take care of our people

Consequences of LAI

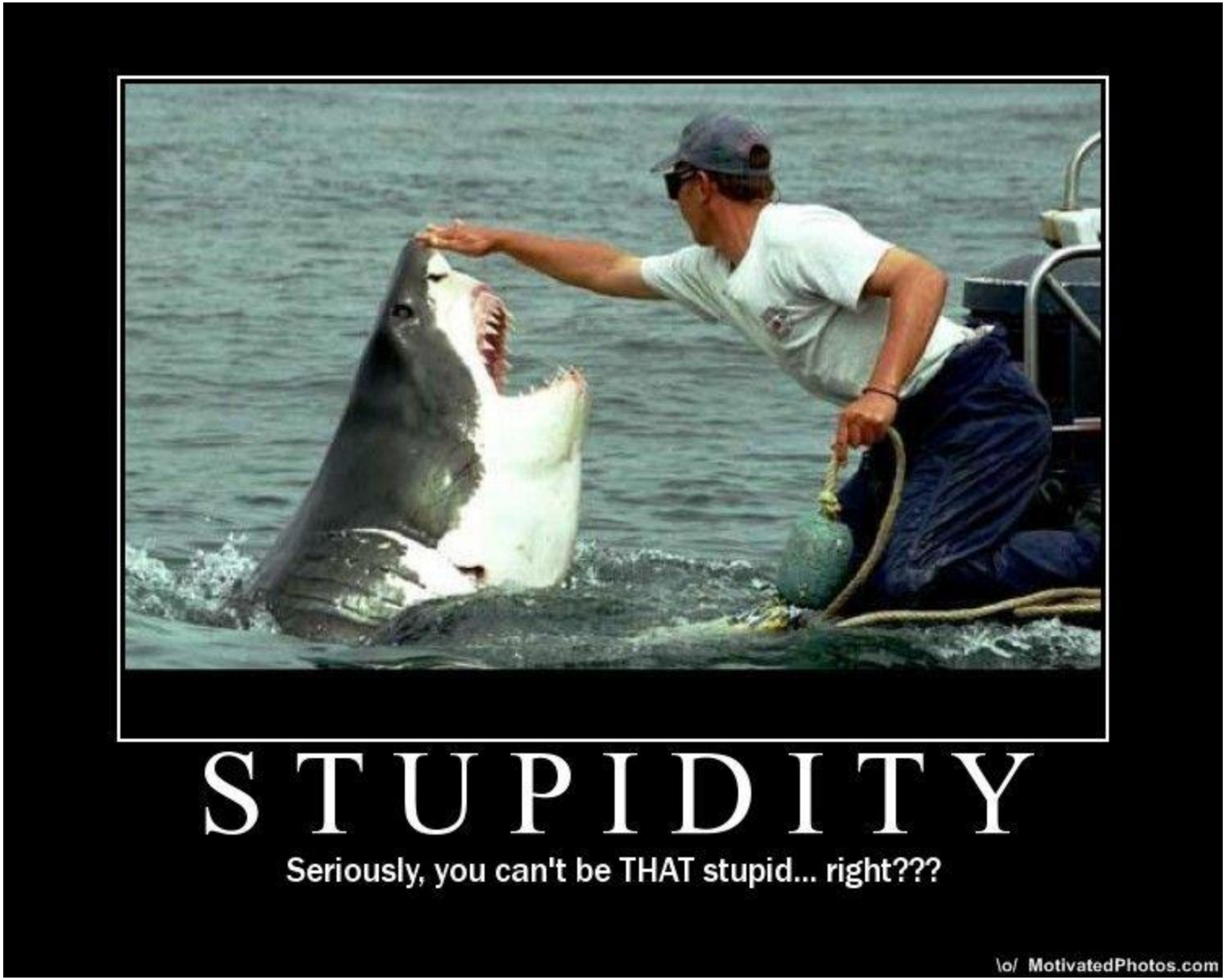
In addition to occupational exposures

spread of infections to the community,

loss of community trust

and loss of research funding!

Courtesy of:
Vijayasmitha Rayadurg, DVM, PhD, CBSP
Biosafety & Export Control Officer


STUPIDITY
Seriously, you can't be THAT stupid... right???
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