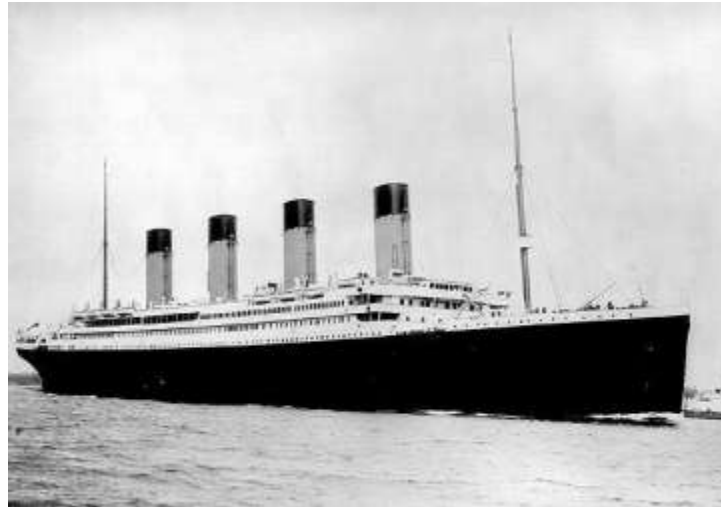


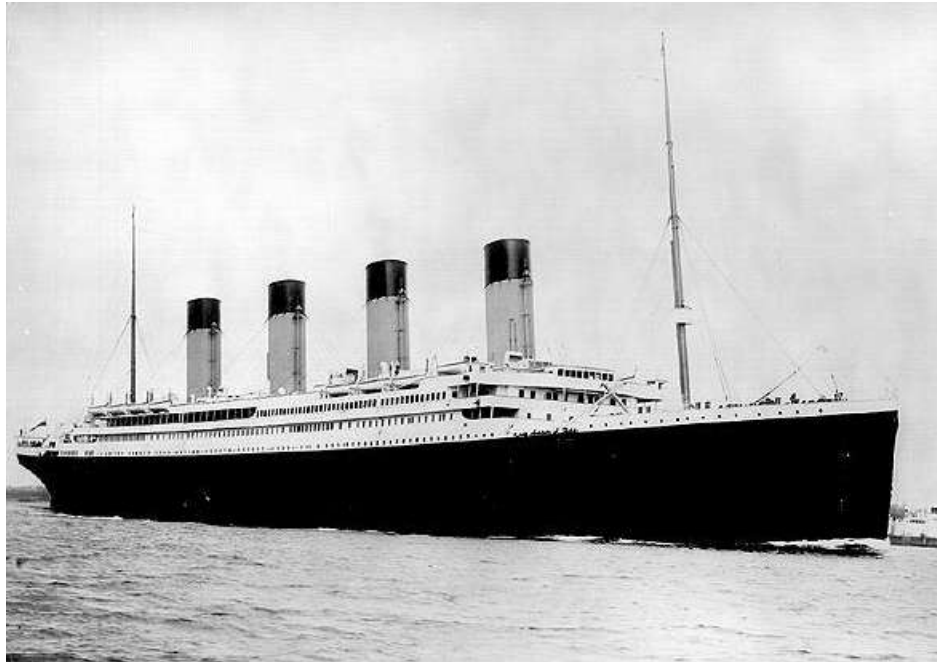
Why Biosafety?

What could possibly go wrong?



Steven J. Phillips, PhD
Baylor Research Institute
Dallas, TX

Before



Wrong1 16MAY11

After



Learning objective

- **Only a small number of LAI's involve a specific incident!**
- Non-specific associations
 - Working with a microbial agent
 - Being in or around a laboratory
- Clinical:research labs = 50:50 LAI split
- Universal precautions DO work

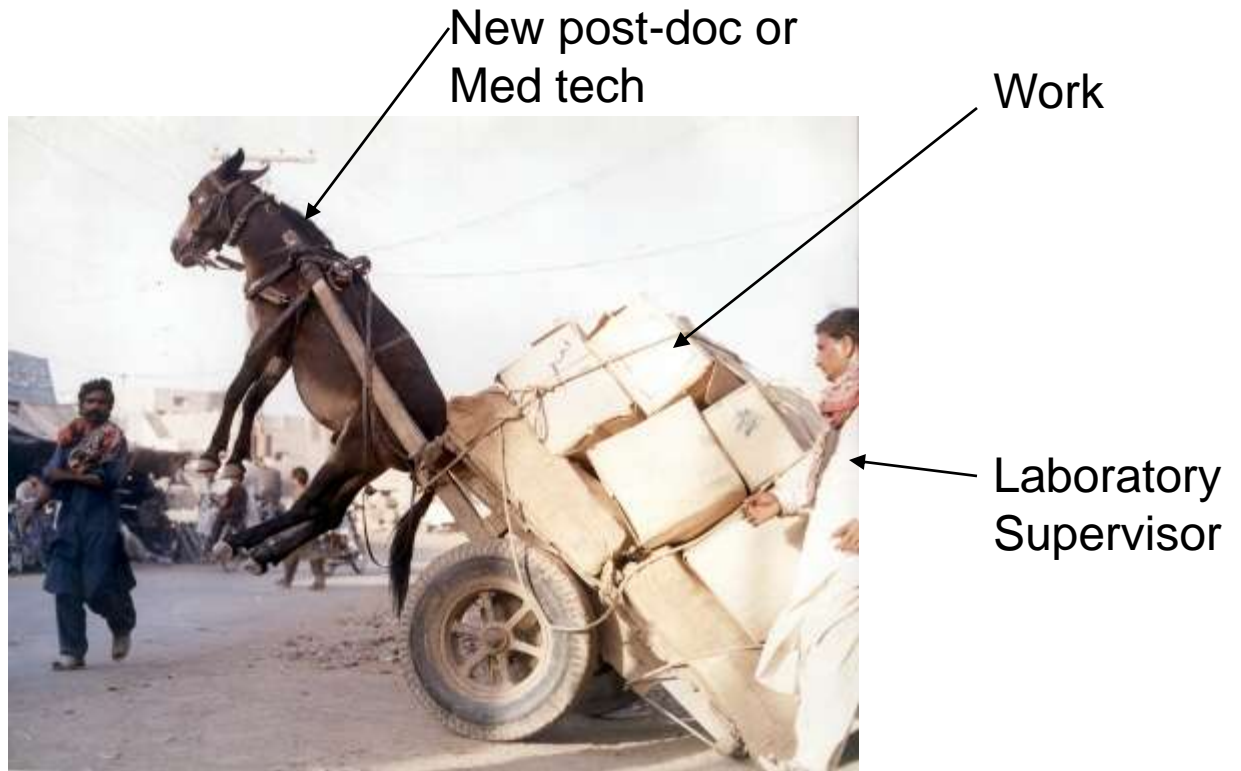
Laboratory Acquired Infections (LAIs) 1930-1978

- Four studies by Pike and Sulkin (cited in BMBL, section I)
- Identified 4079 LAIs
- 168 deaths (4%)
- Authors noted that 4079 is a lower limit.
- Not all infections were reported.

Pike and Sulkin Top 10

* indicates BRI or BUMC organisms

1. *Brucella spp.**
2. *Coxiella burnetii*
3. Hepatitis B virus*
4. *Salmonella typhi*
5. *Francisella tularensis*
6. *Mycobacterium tuberculosis**
7. *Blastomyces dermatidis*
8. Venezuelan equine encephalitis virus
9. *Chlamydia psittaci*
10. *Coccidioides immitis** (endemic to Texas)



Harding and Byers, 1978-1998

- 1267 overt infections with 22 deaths (2%)
- Five fetal deaths aborted as consequence of maternal LAI
- Top 10 accounted for 1074/1267 (85%) of infections
- An additional 663 sub-clinical infections.

Harding and Byers Top 10

1. *M. tuberculosis**
2. *C. burnetii*
3. Hantavirus
4. Arbovirus
5. Hepatitis B virus*
(HBV)
6. *Brucella sp.**
7. *Salmonella sp*
8. *Shigella sp.*
9. Hepatitis C virus*
10. *Cryptosporidium sp.**
(endemic in Texas)

Harding and Byers

- **Only a small number of the LAI's involved a specific incident!**
- Non-specific associations
 - Working with a microbial agent
 - Being in or around a laboratory
 - Being around infected animals
- Clinical labs = 45% of total LAI's
- Research labs = 51%

Planning



Beaver RIP

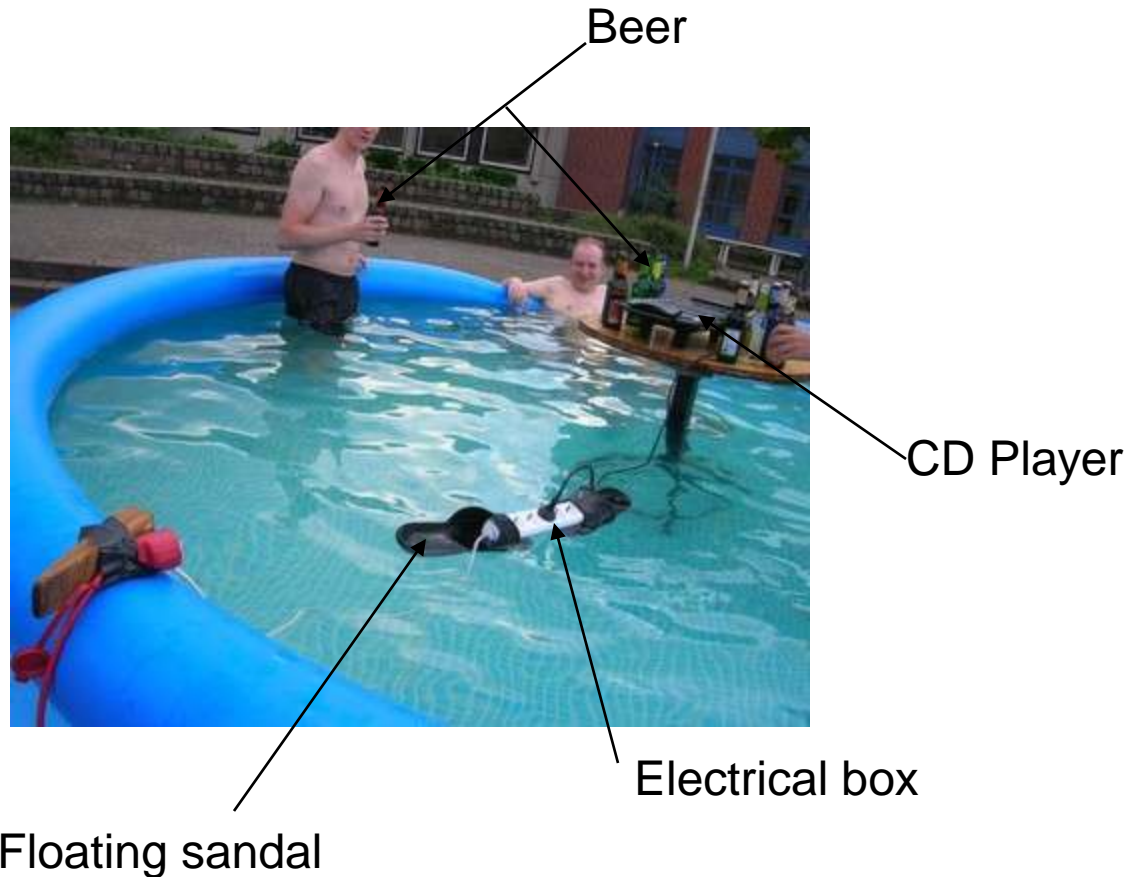
Comparison of more recent LAI's

- Number is decreasing
- Decrease attributed to improvements in
 - Containment equipment
 - Engineering controls
 - Greater emphasis on safety training

One example of occupational (clinical micro. lab) exposure

- *Brucella melitensis* (aerosol transmissible)
- One worker inadvertently sub-cultured *B. melitensis* on open bench (not in BSC)
- Result: 8 LAI's among 26 co-workers
- Attack rate = 31%

What could possibly go wrong?



What could possibly go wrong?



Cigarette

Gasoline pump

Question:

What could happen besides someone getting sick?

Answer:

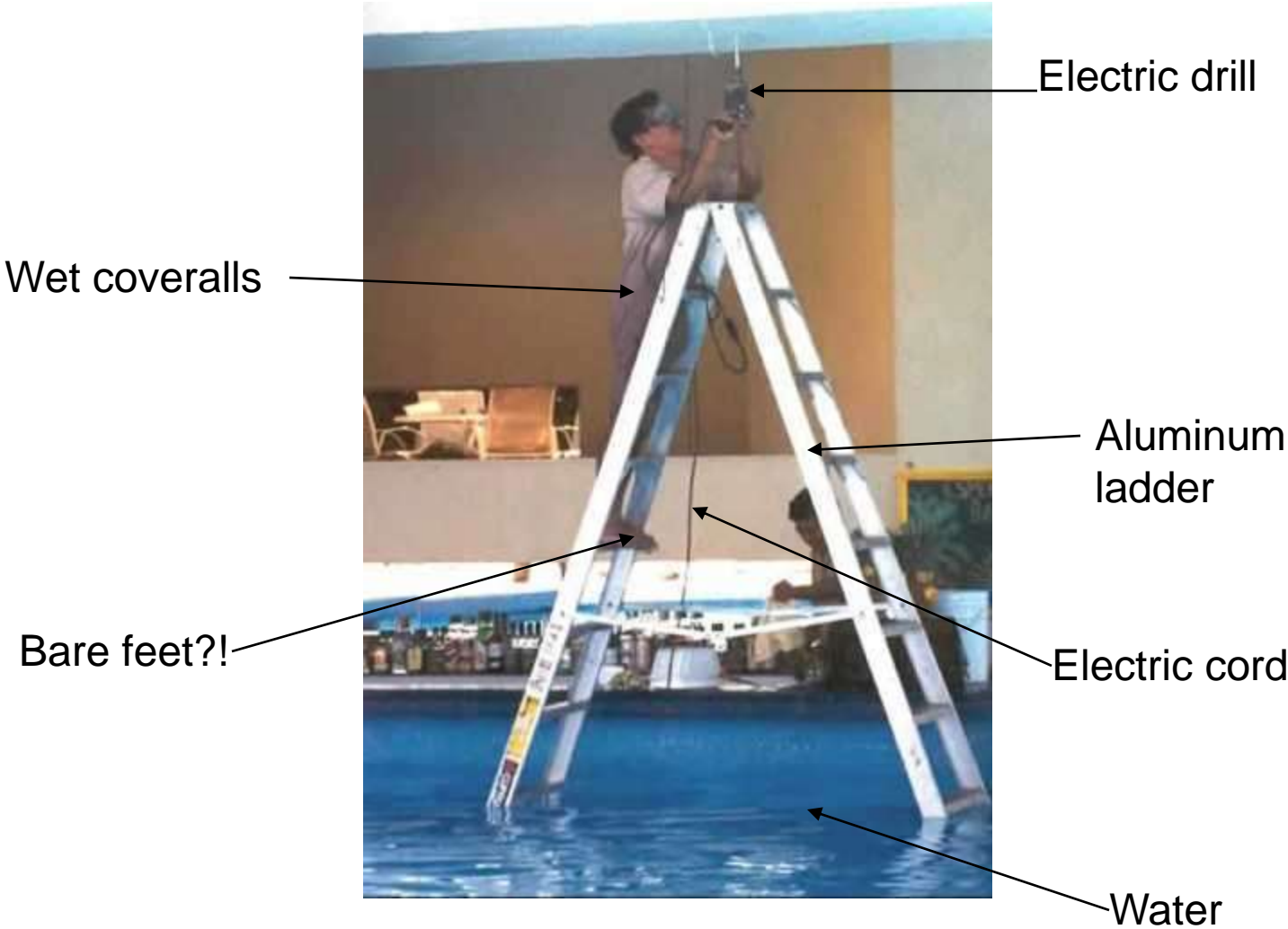
You could lose all your federal
funding!

CDC suspends A&M research on infectious diseases

- ... after the university's failure to report two 2006 cases of human exposure to biological agents.
- The letter warns that the university could permanently lose the authority to work with select agents if researchers don't follow federal guidelines.
- DMN 1JUL07
- BIIR plans to work with Select Agents

CDC Halts A&M research

- At Texas A&M, a scientist **was infected** with *Brucella* after carelessly cleaning a supposedly "foolproof" aerosol chamber in February, 2006.



JB, our Institute's Director

- JB has seen this chamber.
- JB visited A&M shortly after the event.
- JB told me then he **DOES NOT** want this happening at BIIR
- This is one reason I tell all workers, “Lab coats and gloves....”
- BIIR has several million dollars in Federal funding every year.
- Would **YOU** like to be the guy who tells your boss, “Gee, I’m sorry, but I lost ALL of your Federal funding for you.”

Brucella

- JP Gorvel works with *Brucella*.
- He will be working here at BIIR
- Later that year (April, 2006), three A&M researchers were infected with Q fever (rickettsial disease).

Two (2) CDC follow-ups with A&M

- 20+ person CDC/NIH-SWAT team visited Texas A&M
- 20 pages of deficiencies and recommendations.
- Published on the Internet (see References)
- Many deficiencies involved “not following the basic rules” including: gloves, lab coat, handwashing, respiratory protection, etc.
- A&M was fined, humiliated, reputation damaged, etc.
- All of this was 100% avoidable

Ask yourself ...

- Would **YOU** like to be the guy who tells your boss and colleagues, “Gee, I’m sorry, but I lost ALL of your Federal funding for you.”
- Hint: This would be a BAD career move.

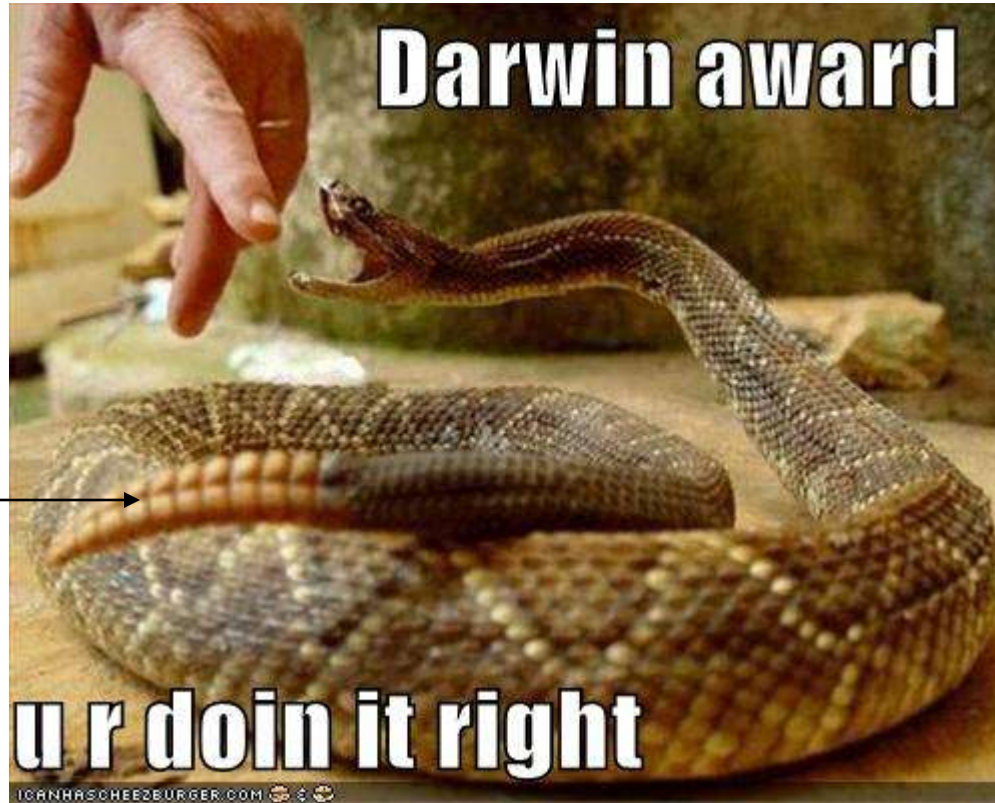


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Example 2 (Reference 6)

- Elizabeth Griffin, 22, died 10DEC97 after being infected with herpes B by a monkey at the Yerkes field station in Lawrenceville.
- She was splashed in the eye with bodily fluids,
- She did not seek treatment immediately because she didn't regard it as serious.
- Six weeks later, she was dead.
- Two weeks before Christmas.
- How would you like to bury your daughter 2 weeks before Christmas?

- **Three of our researchers regularly receive samples of trapped, wild, macaque (rhesus) monkey blood and blood products**



Rattle snake
(poisonous)

Come on, Dr. Phillips!

- I work with blood and blood products from a commercial blood bank.
- They check all that stuff
- What could possibly go wrong?

Here is what our commercial blood bank checks our buffy coats for ...

- A, B, O, and Rh
- Cholesterol
- Hepatitis B Core antigen
- Hepatitis B Surface Antigen
- Hepatitis C virus
- Human Immunodeficiency virus Type 1 & 2
- Human T lymphotropic virus Type 1 & 2
- Indirect antiglobulin test
- Nucleic acid amplification test for HIV 1&2
- Serologic test for syphilis
- West Nile Virus
- Cytomegalovirus (about 10% of units are tested for this = no customer specification)

Here is what they DON'T check
for ...

What they DON'T check for

Infectious Diseases Designated as Notifiable at the National Level during 2008*

Anthrax

Domestic arboviral diseases, neuroinvasive and nonneuroinvasive

California serogroup virus

Eastern equine encephalitis virus

Powassan virus

St. Louis encephalitis virus

West Nile virus

Western equine encephalitis virus

Botulism foodborne, infant, and other (wound and unspecified)

Brucellosis

Chancroid

Chlamydia trachomatis infections

Cholera

And hundreds more including Plague

Plague?!

- 3 cases in USA, 2008

You get the idea ...

- ... and all the rest of Bergey's manual, protozoans, viruses, fungi, *Mycoplasma*, prions, etc.



Fork lift # 2

Fork lift # 1



Bomb

How about a real life example?

- You mean besides the four people at A&M and their funding loss?
- And the Christmas time death of Elizabeth Griffin?
- And the five thousand plus LAIs already reported?
- OK. Let's try something close to home

MMWR 9JUL04

- Investigation of rabies infections in organ donor and transplant recipients – Alabama, Arkansas, Oklahoma, and Texas, 2004
- On 1JUL04, CDC reported laboratory confirmation of rabies as the cause of encephalitis in an organ donor and **three (3)** organ recipients at BAYLOR UNIVERSITY MEDICAL CENTER in Dallas, TX
- Has anyone in the audience heard of BUMC?

Here's a picture



MMWR 9JUL04 (cont'd)

- Hospital and public health officials in AL, AR, OK, and TX initiated public health investigations to identify donor and recipient contacts, assess exposure risks, and provide rabies post-exposure prophylaxis (PEP)
- 9JUL04, PEP had been initiated in approximately 174 (19%) of 916 (!) persons who had been assessed for exposures to the organ recipients or the donor.

Transporting 916 medical records



MMWR 9JUL04 (cont'd)

- As a result of the Public Health investigation, it was determined that the donor reported being bitten by a bat.



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Whew! Glad THAT'S over!

- Not quite ...



DARWIN AWARDS

I've got the feeling we aren't giving out enough
of them!!

\o/ MotivatedPhotos.com

Wrong1 16MAY11

MMWR 9JUL04 (cont'd)

- On 7JUL04 (+ 6 DAYS), CDC was notified of an ADDITIONAL patient at BUMC who had received a liver transplant.
- Review of surgical procedures at BUMC determined that a segment of iliac artery recovered from the [rabies infected] donor had been stored at the facility for use in future liver transplants.
- This patient also died.

Here is what Transplant
(BMT) checks for:

Marrow Donors: Routine tests

[Source: J. Saenz, BUMC NMDP Registry 11JUN10 pers. Comm.]

Confirmatory typing:

- Hepatitis b surface antigen
- Hepatitis b core antibody
- Hepatitis C antibody
- HIV 1 HCV Nat
- HIV 1/2 Antibody
- HTLV 1/11 Antibody
- CMV antibody
- RPR
- ABO & RH

At workup we add

- Chagas

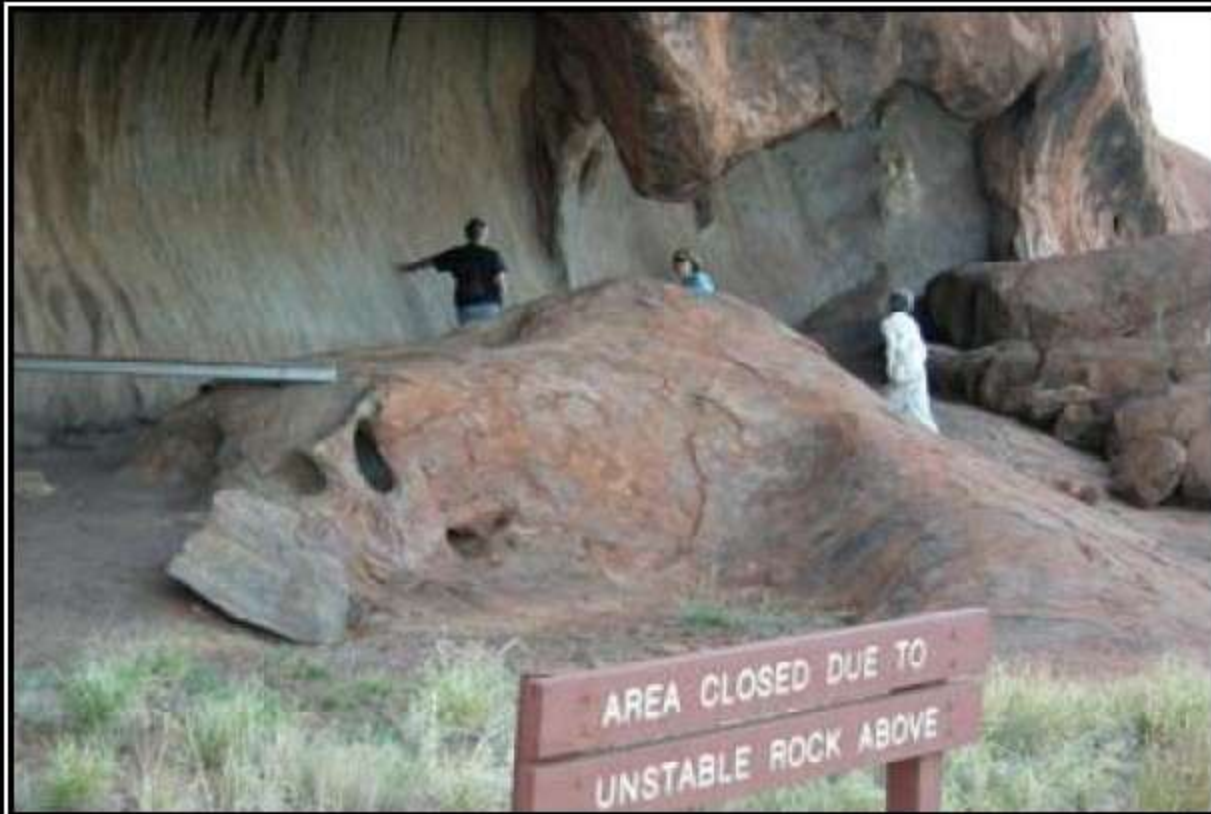
At day of collection we add

- WNV NAT

If it is overseas patient we add

- EBV

You already know what the
DON'T test for



DARWIN AWARDS

There's never a shortage of candidates

lo/ MotivatedPhotos.com

Wrong1 16MAY11



Well, that's all very interesting,
but...

- I'm only pipetting buffer
- This is just saline
- I'm the only one who works here
- There's nothing on this bench
- etc



STUPIDITY

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

lo/ MotivatedPhotos.com

Wrong1 16MAY11

Recall: Harding and Byers

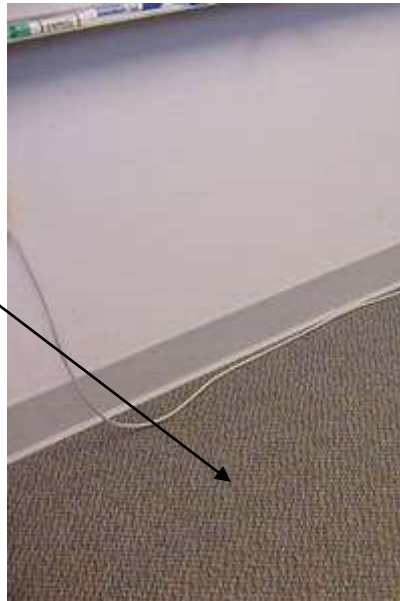
- **Only a small number of the LAI's involved a specific incident**
- **Non-specific associations**
 - **Being in or around a laboratory working with the agent**

You may be careful, but what about that co-worker of yours?



This area looks clean, right?

Clean?



Add Luminol to visualize blood



“Gee officer, my wife went uh shopping yesterday and she just didn’t come back. I’m so worried about her....”



The point is ...

- You don't know what the guy yesterday spilled on the bench and left there.
- Or had on his gloves, lab coat, sample vessel, etc.



Wrong1 16MAY11

A happier ending

- 2005
- College of American Pathologists (CAP) sent out unknowns for proficiency testing to clinical microbiology labs.
- One of the unknowns was a non-pathogenic influenza virus.
- Oops! Not quite!
- **MONTHS LATER** it was found that H0T influenza was sent out

Asian flu

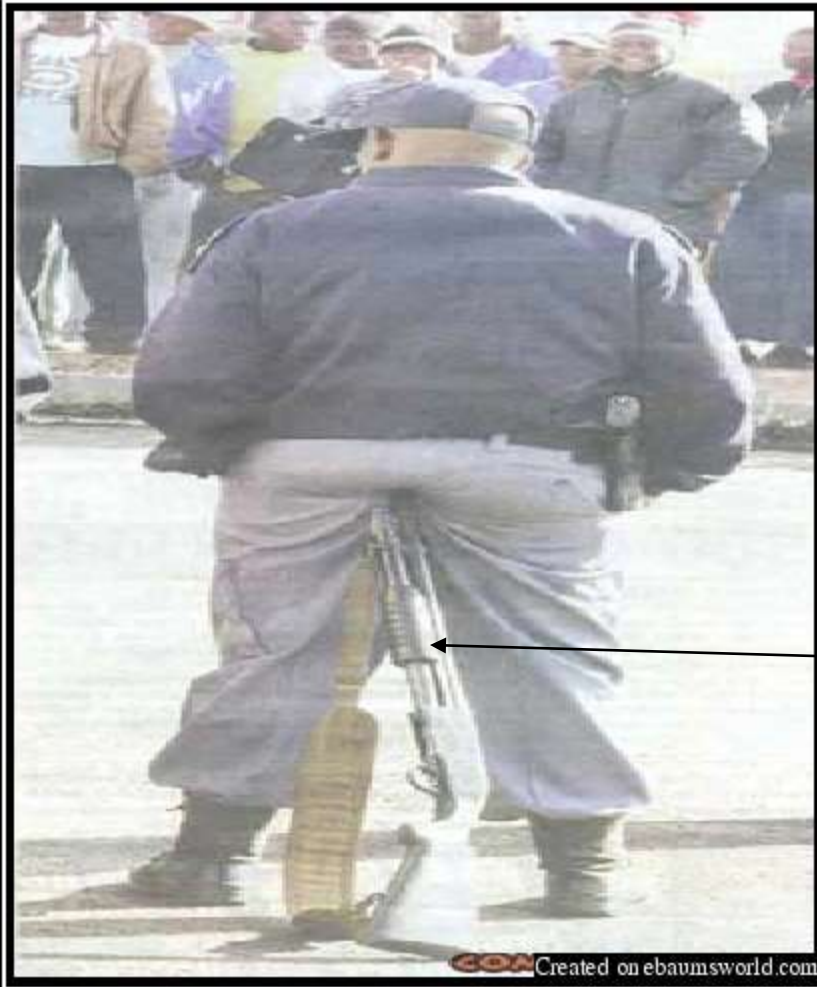
- 1957 Pandemic Strain was sent out
- 1957 A/Singapore/57 H2N2 caused pandemic of “Asian flu”
- It killed 1 to 4 million people in 1957-1958.

Result of CAP error

- No one got sick.
- No one died.
- Over 5000 labs in 18 countries received the incorrect unknown.

Take home lesson

- “Standard Precautions” do work.
- Give them a chance.
- What could possibly go wrong?
- Answer:
 - Anything at any time.
 - You just never know.
 - Wear your lab coat and gloves while working in the lab
 - **Tell your co-worker to wear his lab coat and gloves.**
 - Or tell your boss why you are too busy and important to do that.



Shotgun

Darwin Award

Best of '08

References

1. Biosafety in Microbiological and Biomedical Laboratories, 5th ed. 2007. CDC, Atlanta.
2. OSHA BBP standard. 29 CFR 1910.1030
3. MMWR. Various issues as cited above.
4. 30APR07. 1st CDC visit to A&M <http://www.sunshine-project.org/TAMU/CDCTAMUReport.pdf>
5. 31AUG07. 2nd CDC visit to A&M <http://www.sunshine-project.org/TAMU/CDCTAMUReport.pdf>
6. Centers for Disease Control and Prevention. Fatal Cercopithecine herpesvirus 1 (B virus) infection following a mucocutaneous exposure and interim recommendations for worker protection. MMWR Morb Mortal Wkly Rep.1998;47:1073-6,1083.

Additional stuff

- Fomites. Cloth. Blankets. Smallpox. Revolutionary war.
- Fomites. Computers CDC Norovirus
- Fomites = still controversial.

Lives - 1



DARWIN AWARD

I has it.