“Ex Africa Semper Aliquid Nova”

Index case:
- 46y old anaesthetic assistant, private clinic in Johannesburg
- 2/11/96: ill with fever
- 5/11/96: severe headache
- 6/11 to 13/11: admitted, leukopenia, thrombocytopenia, deranged LFTs, deteriorating renal function - dialysis (13/11)
- 14/11: presumptive laboratory diagnosis of Ebola virus; definitively confirmed 15/11
- 16/11 to 22/11: T/F to JH ICU, critical condition, haemorrhaging, secondary nosocomial bacterial and fungal infections, large intracranial haemorrhage (22/11)
- 24/11/96: demised

Primary case/source:
- Very ill 40 y old doctor transported by air from Libreville, Gabon; admitted to private clinic on 27/10/1996
- 29/10/1996: Index case (anaesthetic assistant) exposed to large amount of his blood during CVC insertion and subsequent cleaning-up process
- Unusual presentation - misdiagnosed as suffering from a polymyositis-overlap syndrome - given hydrocortisone - prompt improvement - discharged 11/11/1996
- 16/11/1996 traced to a convalescence home. Ebola titres >1/512 confirmed he was primary case

Nosocomial implications: critical retrospective review of South African VHF infection control practices
Objectives Of Presentation Are To:

- Review some blood-borne pathogens endemic to the African continent that are transmissible by contaminated medical paraphernalia
- Illustrate the manufacture, import and export dynamics of these microbes: “Out of Africa”
- Describe, using case scenarios typical, unconventional, bizarre, and sinister modes of transmission of these organisms
- Discuss possible preventive strategies to control the transmission of blood-borne pathogens

OUT OF AFRICA: ENDEMIC BLOODBORNE MICROBES

VIRUSES:

- VHF Agents
- HIV
- Hepatitis B, C
- And Others...

Out Of Africa: Viruses

<table>
<thead>
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<th>Agent</th>
<th>Properties And Nosocomial Transmission</th>
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<tr>
<td>LASSA VIRUS</td>
<td>E Easily inactivated for safe lab tests (heat 56 C/30 mins; B-propiolinolate; formalin; UV radiation) Disinfection 0.5% phenolic; 10% hypochlorite; peracetic acid Sharps injuries; ill advised surgery; blood exposure; contaminated equipment</td>
<td>Infection control (isolation; PPE: gloves, gowns, masks; dispose single-use items (esp. needles, syringes, gloves) and sharps safely; sterilize equipment adequately; Ribavirin (Vaccine)</td>
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Out Of Africa: Viruses

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<td>MARBURG VIRUS</td>
<td>Shown to survive in semen of a convalescent patient for up to 83 days after disease onset; also isolated from anterior of eye of a convalescent patient with uveitis 80 days after disease onset Nosocomial transmission as for Ebola virus</td>
<td>Infection control isolation; PPE: gloves, gowns, masks; avoid re-use of inadequately sterilized equipment; sharps &amp; waste disposal</td>
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<td>EBO’s isolated from semen of convalescent 61 days after disease onset Finding of abundant viral antigens &amp; particles in the skin of EHF: ? possible aetiological role for contact transmission Contact with blood and high risk body fluids predominant mode of spread; ? touch, droplet, airborne particle, fomite Percutaneous exposure through unsterilized needles; laboratory accidents; person-to-person by direct physical contact or contact with blood, stool, vomitus Viral survival in used syringes in excess of 7 days at tropical ambient temperatures (35 C)</td>
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Lassa Fever: The High Price Of Poor Medical Practice

  - Among 34 cases: 20 patients, 6 nurses, 2 surgeons, 1 physician, son of a patient (65% mortality)
  - Most cases exposed in hospitals (attack rate in one hospital 55%)
  - Both hospitals inadequately equipped & staffed, with poor medical practice: parenteral drug rounds with sharing of syringes fuelled the epidemic; Staff infected during emergency surgery and during health care delivery

Hosted by Paul Webber  paul@webbertraining.com  www.webbertraining.com
Out of Africa: Viruses

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<td>CCHF VIRUS (Bunyavirus)</td>
<td>Virus labile: does not survive in dried blood, at high temperatures (cooking meat), pH&lt;6, matured meat</td>
<td>Infection control isolation; PPE: gloves, gowns, masks; avoid re-use of inadequately sterilized equipment; sharps &amp; waste disposal</td>
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<td>1930s: Soviet Union 1968: Stanleyville Belgian Congo - (virus isolated) Widespread: E Europe, Asia, Middle east, China, all of Africa</td>
<td>Although survival &lt;3d, 1 PM CCHF v survival of H7N</td>
<td>Ribavirin</td>
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VHF Isolation Precautions

- Isolation of patient
- PPE
- Reinforcement of standard and contact precautions
- Safe disinfection of spills, equipment & supplies (enhanced with use of hypochlorite solutions)
- Disposal of sharps and contaminated waste by incineration/ burial
- Safe handling and burial of corpses
- Education to families & communities re: prevention of VHF and care of patients

HIV: The South African Scenario

- HIV seroprevalence high!
  - HSRC 2002: 11.4% of country's population of 2 years/older (~ 5.2 million) are living with HIV/AIDS. 12.8% females, 9.5% males. Highest prevalence in 25-29y age group (28%), followed by the 30-34y age group (24%). 15.6% of people are HIV positive among the 15-49y age group
  - 40-70% of admitted hospital patients are HIV-infected
- Available guidelines for management of occupational exposures to blood-borne pathogens may not be applicable
- Strategies to minimize sharps injuries must go beyond universal (standard) precautions
- HIV seroprevalence high!
  - Delay autopsy for ≥24h to markedly decrease infectivity

PEP Is Not Necessarily A Solution

- 21 documented failures
- 16 used ZDV monotherapy
- 2 used DDI and ZDV
- 3 used at least 3 drugs
- Compliance is a challenge
- Drug resistance is emerging

HIV: The South African Scenario

- Occupational exposure of interns to blood in an area of high HIV seroprevalence SAMJ 2001;91:57-61
  - 96 interns in their one-year internship surveyed (anonymous questionnaire)
  - 69%: one/more percutaneous injuries/yr; 33% aware of HIV+ blood exposure
  - 45%: mucocutaneous exposures to HIV+ blood
  - Only 64% (28/44) percutaneous injuries from HIV reported
  - 40-70% of admitted hospital patients are HIV-infected
- Available guidelines for management of occupational exposures to blood-borne pathogens may not be applicable
- Strategies to minimize sharps injuries must go beyond universal (standard) precautions

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The Challenge Of Compliance

- 4 weeks is optimal
- Counselling regarding side effects
- Using regimens which are least toxic
- Avoid unnecessary PEP
- Make drugs accessible to HCWs
- Education regarding seroconversion

What’s New – AIDS 2002

- Profile of occupational HIV exposures in urban hospital in Mumbai, India (Singh et al.):
  - 31 cases
  - Injuries mainly in residents and surgeons
  - 100% efficacy with PEP
- Absenteeism adds significant cost to HIV needlestick prophylaxis (Akagi et al.):
  - PEP associated with significant morbidity
  - Time loss costs are significant

What’s New- AIDS 2002

- 6-year longitudinal follow-up of 50 HCW exposed to needle stick injury of symptomatic HIV infected patients in India (Thakur et al.)
  - No seroconversions
  - Only 9 used PEP
- Occupational exposure to HIV in paediatricians - a previously undescribed high risk group (Marais et al.)
  - Incidence of injury = 69% amongst all doctors
  - Post-call or after-hours (74%)
  - HIV exposure in 26%
  - All received PEP – no seroconversions

What’s new – AIDS 2002

- Proposed PEP guidelines for Europe
  - Need for consensus
  - Some countries recommend 3 drugs regardless of risk assessment
- Surveillance of PEP in France (Lot et al.)
  - 1995-2001, 2898 HCWs sought advice
  - 31% needed PEP
  - No seroconversions
  - Only 41% follow up

Hepatitis B

- Well-recognised occupational risk
- Related to nature of contact and HBeAg status of source
  - HBeAg +
    - Clinical hepatitis 22-31%
    - Serological evidence of infection 37-62%
  - HBeAg -
    - Clinical hepatitis 1-6%
    - Serological evidence of infection 23-37%

Hepatitis B - A “Long Term Survivor”

- Percutaneous transmission is highly
- There is still a large pool of hepatitis B in South Africa
- Survival of virus in dried blood on environmental surfaces for at least one week!
- HBV transmission from surfaces documented in haemodialysis units
Organisms Other Than Viruses.....

- Many other infections can potentially be acquired by contact with blood or blood stained fluids

- In Africa:
  - Mycobacterial infections are very important!
  - Cutaneous tuberculosis well-described!

HIV and mycobacterial infections:

- 3rd of world population infected; 3 million deaths/y; 85% in developing countries; (Mt in RSA: 495/100,000 pop; 200,000 new cases/year); HIV-: 5-10% TB risk per lifetime, but if HIV+ 5-10% risk per year; in some parts of SA up to 60% of TB cases co-infected with HIV

- 100 hospitalised HIV+ black South Africans with CD4 counts < 100/cu mm
  - BACTEC (Becton Dickinson) blood culture technique
  - Point prevalence of MAC = 10% (cf. other African studies that report that infection is uncommon)
  - Point prevalence of Mtb = 54%

  => NB implications for occupational exposures to NSIs from mycobacteraemic patients

Sharps Injuries And Primary Cutaneous TB


- Tuberculosis of the thumb following a needlestick injury CID 1998;26:210-211

- In South Africa high HIV and TB co-infection rates

- Mycobacteraemia (caused by MTB and MOTTs) is very common

Drug-sensitive Cutaneous TB


OUT OF AFRICA: ENDEMIC BLOODBORNE MICROBES

PARASITES:

- Nosocomial Malaria

- And Others... (trypanosomes, leishmania, toxoplasma, etc.)

Nosocomial Malaria

- Nosocomial infection in South Africa:

- Nosocomial malaria described in other countries
Nosocomial Malaria

- UK:
  - Malaria by accidental inoculation Lancet 1970; Oct 31:936
  - Needlestick malaria Lancet 1995; 346, Nov 18:1361
  - And many more...
- West Germany:
  - Malaria transmission from patient to nurse Lancet 1982, Nov 27:1212
- Poland:
  - Falciparum malaria probably acquired from infected skin-cut Lancet 1987, July 25:220
  - Libya: Hospital-acquired malaria transmitted by contaminated gloves JHI 2001; 47:156-158
- Saudi Arabia:
  - Plasmodium falciparum malaria transmitted in hospital through heparin locks Lancet 1997; 349:23-25

OUT OF AFRICA – ISSUES

- Contamination Of Injections And Equipment / Infusions / Transfusions / Medications
- Waste Disposal:
  - Recycling of single-use items
  - Vehicle for theft
- Creative Exposures: Body Art
- Ritual Circumcision

Unsafe Injections And Equipment

- Unsafe injections in the developing world & transmission of bloodborne pathogens Bull World Health Organ 1999; 77:769-800
  - Each person receives on average 1.5 injections/year
  - Majority of these judged unnecessary
  - 50% of injections unsafe in 14/19 countries representing developing world
  - Link between unsafe injections and transmission of hepatitis B and C, HIV, VHF, malaria
  - Unsafe injections account for a significant proportion of all new hepatitis B and C infections
- Nosocomial outbreak of multiple bloodborne viral infections JID 2001; 184:369-372

Contamination Of Injectables

- Aspiration of blood (retrograde contamination) into syringe when needle removed – 2X10^-5 mL blood NEJM 1894; 310:1335-1337 ~ 200-2000X greater than amount to transmit hep B to chimpanzees JID 1975: 132:451-458
- Anaesthetic (propofol and multidose vials), transfusion-, medication (multidose vials)- & many other injectable/infusion-associated infections have been described

Hosted by Paul Webber paul@webbertraining.com www.webbertraining.com
Bugs, Blood and Barrier Breaches
Professor Adriano Duse, Johannesburg, South Africa
A Webber Training Teleclass

Blood, Sharps And The Storage And Disposal Of Waste:

CH Baragwanath Hospital: View Over Maternity East

CHB Hospital ICU

Waste Disposal: Means of Transport

Waste Disposal: Wrong Procedures

Searching For Biohazardous Waste

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www.webbertraining.com
Circumcision-related Sepsis:
- Outbreak of *S. pyogenes* infections following ritual circumcisions
- Same razor blade used for multiple procedures
- Solution: agreement with Trad. Healer that sterile, single-use blades would be provided
- Outcome: no further cases

Body Art
Prevention of infective complications lies in the ambit of infection control philosophy

“Body Art” Or “Self Mutilation”?
- Body piercing
- Tattooing
- Tongue splitting, genital wedge cuts
- Scarification (branding and cutting)
- Other?

Infectious Complications Of Body Art
- Pyogenic infections: e.g. *S. aureus*, *S. pyogenes*, *P. aeruginosa*
- Non-pyogenic infections: e.g. syphilis, leprosy, TB*, tetanus, rubella, viral hepatitis B/C/D, HIV* see Cutaneous inoculation tuberculosis secondary to “Jailhouse Tattooing” Arch Dermatol 1985;121:648-650
- Cutaneous diseases that localise in tattoos: e.g. herpes simplex and zoster

OUT OF AFRICA – SINISTER
- Blood Theft
- Hijacker’s Weapon For “Stick-Ups”
- The Traditional Healer’s Market (“MUTI”)
OUT OF AFRICA

CONCLUSIONS...

• Ease of international travel has resulted in high levels of migrancy: blood-borne pathogens (B-BPs), no matter how exotic, can appear in any HCF at any time

• An understanding of the physical properties and survival of B-BPs is essential to avoid making assumptions of their hazard potential

• The profile of occupationally transmitted B-BPs is broader and the risks may be different than those described in the developed world

• The high HIV-seroprevalence in South Africa mandates urgent review and validation of NSI and splash-injury protocols

• Intern and medical student exposure to blood is extremely common but markedly under-reported

• Following Universal (Standard) Precautions may only result in prevention of one-fifth of injuries

• Additionally, contaminated blood, re-use of (single-use) disposable medical devices, ritual practices, illicit use of blood-contaminated items and, possibly, body art all contribute to the transmission of blood-borne viruses

• Intervention priorities include: education, introduction of safer techniques, products and equipment; skills training; methods of reporting blood exposures and a national database

• Finally, appropriate disposal of waste, investigating socio-cultural practices and offering acceptable alternatives, and investigating ways to minimize the potential for criminal events are of crucial importance

Shakespeare: A Sharp Sage

“To be or not to be: that is the question:
Whether ’tis nobler in the mind to suffer
the slings and arrows of outrageous fortune,
Or to take arms against a sea of troubles,
And by opposing end them?”

Hamlet, Act III, Scene I
Thank you!