

Infection Control in the Living and the Dead

Prof. Adriano Duse, University of the Witwatersrand, South Africa
A Webber Training Telecass

Out of Africa: Infection Control in the Living and the Dead. Marburg Fever Outbreak, Angola, 2005

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WHAT IS MARBURG FEVER ?

Infectious disease, often associated with fever and/or hemorrhage, caused by a rare Filovirus: species Marburg

Endemic to certain parts of the African continent

Reservoir/s speculated (bats/other) but essentially unknown

Treatment: supportive

No commercially available vaccine - unfeasible to manufacture

Transmission routes of Marburg VHF:

Transmission
Most human infections due to direct or indirect contact with skin, mucous membranes, body fluids of infected patients (blood, saliva, vomitus, urine, stool, semen, ?sweat)

Amplification
Hospital: health care workers, in-patients, care givers
Community: household contacts whilst caring for the sick; funerals

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Pathogenesis:

Initial infection of macrophages, dendritic cells & other cells of mononuclear phagocytic system (MPS), probably in regional lymph nodes.

Replication accompanied by suppression of $INF-\alpha/\beta$ > rapid local & systemic dissemination.

Some MPS cells migrate to other tissues while free virions released into lymph or bloodstream > systemic dissemination, infecting fixed tissue macrophages in liver, spleen & other tissues throughout body.

Virions released from above cells infect nearby hepatocytes, adrenal cortical cells, fibroblasts, endothelial cells in adjacent blood vessels.

Infected macrophages become activated > release large quantities of cytokines and chemokines (TNF- α , MCP-1, MIP-1^a etc.).

Increased permeability of endothelium, leakage of macromolecules; expression of endothelial cell surface adhesion and procoagulant molecules + tissue destruction > exposure of underlying collagen & release of tissue factor > development of DIC; platelet dysfunction & progressive hepatic failure.

Massive cytolysis, fluid shifts, cytokine effect, interstitial haemorrhage & tissue ischemia (from diffuse obstruction of capillary blood flow by masses of virions and microthrombi) > contribute to fatality.

Differential Diagnosis: Huge

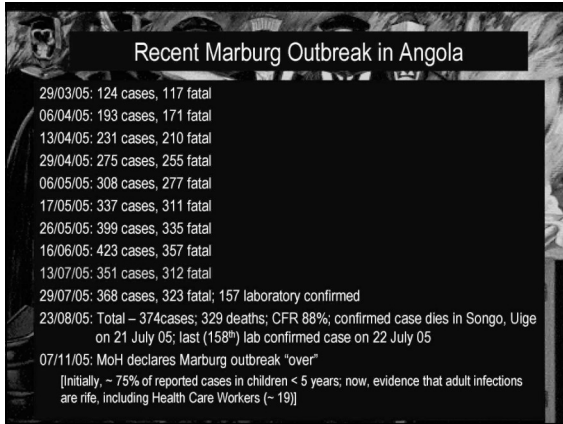
- Bacterial septicaemia: streptococcal, staphylococcal, typhoid, gram-negatives (from meningococci to bacilli – common e.g. *S typhi* to unusual e.g. *Capnocytophaga*), etc.
- Rickettsial infections: e.g. tick-bite fever
- Parasitic infections: e.g. malaria
- Viral infections: fulminant hepatitis A & B, systemic herpes virus infections, hemorrhagic Varicella zoster, hemorrhagic measles, etc.
- Non-infective causes: neoplasia, drug sensitivities, anticoagulants, snake-bite, glue sniffing, traditional medicines, agricultural & industrial chemicals

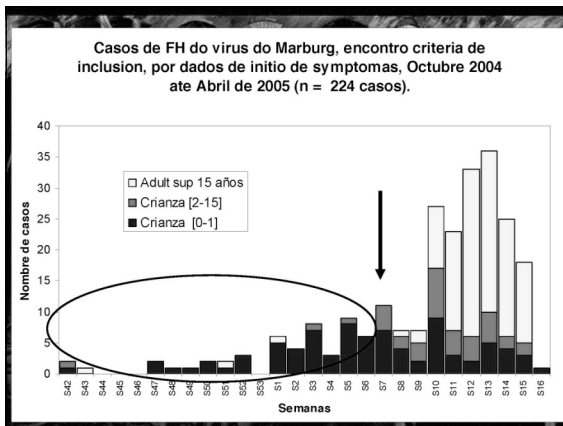
Agent: Marburg virus	Properties and Nosocomial Transmission
<p>MARBURG – 1967 Germany & Yugoslavia exposed to imported African Green Monkeys (<i>Cercopithecus aethiops</i> captured in Uganda) – 31 cases, 7 deaths</p> <p>ZIMBABWE/SOUTH AFRICA 1975 – 3 cases, 1 death;</p> <p>KENYA 1980 - 2 cases/1 death, 1987 – 1 case, died;</p> <p>DRC 1998-2000/1 – 141 cases & 82 deaths / 123 deaths OR 154 cases & 23 deaths</p> <p>N ANGOLA (? Oct 2004 – August 2005)</p>	<ul style="list-style-type: none"> •Nosocomial transmission well documented •Survives in semen of a convalescent patient for up to 83 d after disease onset; also isolated from anterior chamber of eye of convalescent patient with uveitis 80 days after disease onset •Viral survival on contaminated surfaces: several days - weeks •Inactivated by gamma irradiation; UV light; heating @ 60 C for 30 min; bleach; aldehydes; phenolics; QACs; β-propiolactone; lipid solvents, detergents

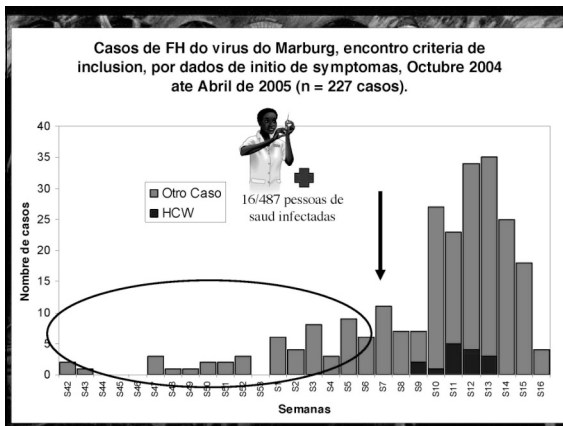
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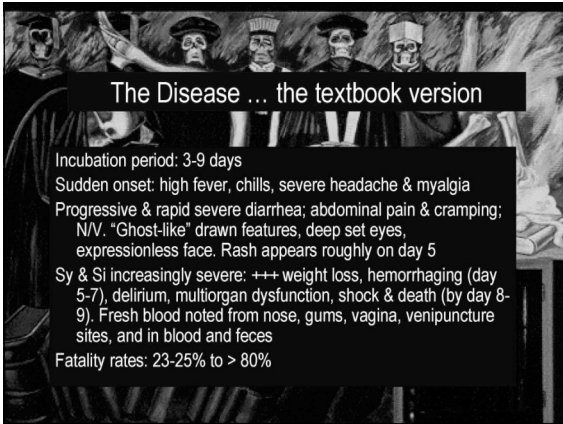






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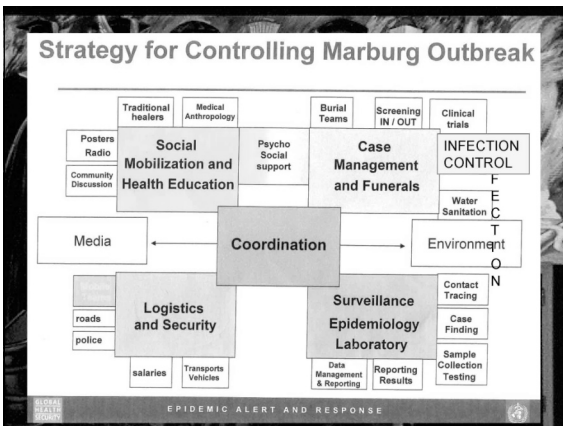
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The Disease ... the textbook version

Incubation period: 3-9 days
 Sudden onset: high fever, chills, severe headache & myalgia
 Progressive & rapid severe diarrhea; abdominal pain & cramping;
 N/V. "Ghost-like" drawn features, deep set eyes, expressionless face. Rash appears roughly on day 5
 Sy & Si increasingly severe: +++ weight loss, hemorrhaging (day 5-7), delirium, multiorgan dysfunction, shock & death (by day 8-9). Fresh blood noted from nose, gums, vagina, venipuncture sites, and in blood and feces
 Fatality rates: 23-25% to > 80%

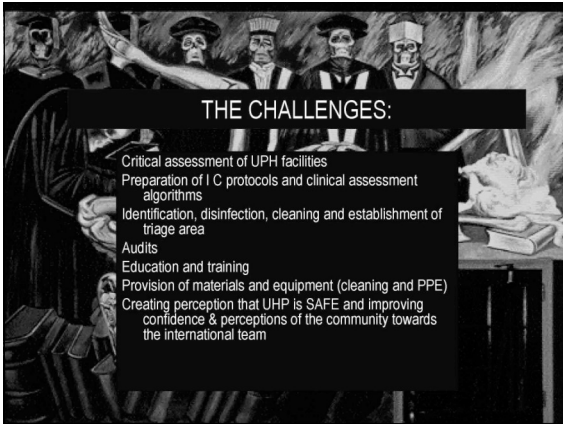




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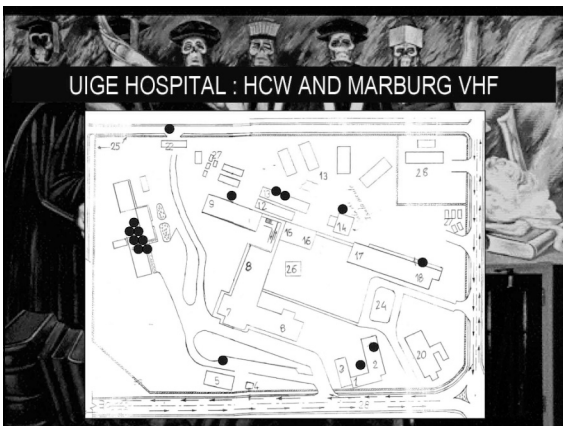
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THE CHALLENGES:

- Critical assessment of UPH facilities
- Preparation of I C protocols and clinical assessment algorithms
- Identification, disinfection, cleaning and establishment of triage area
- Audits
- Education and training
- Provision of materials and equipment (cleaning and PPE)
- Creating perception that UHP is SAFE and improving confidence & perceptions of the community towards the International team





UIGE HOSPITAL : HCW AND MARBURG VHF

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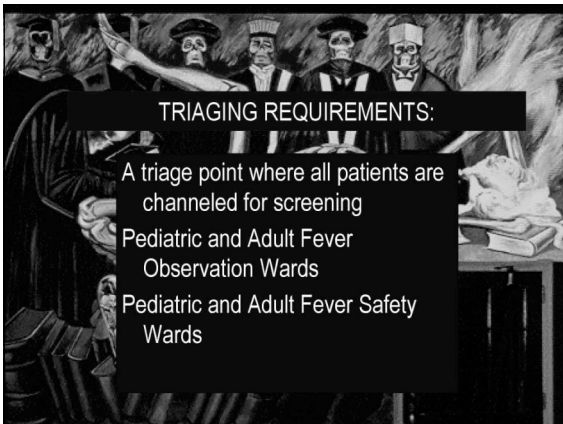
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**ADDRESSING THE CHALLENGES:
PRAGMATISM VERSUS THE "GOLD
STANDARD"**

What is most appropriate
given:

- The background epidemic
- The hospital conditions
- Staff and patient safety
- Termination of the outbreak ?



TRIAGING REQUIREMENTS:

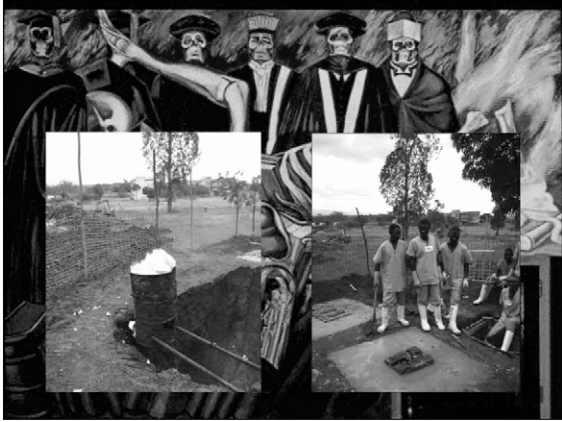
A triage point where all patients are
channeled for screening

- Pediatric and Adult Fever
Observation Wards
- Pediatric and Adult Fever Safety
Wards

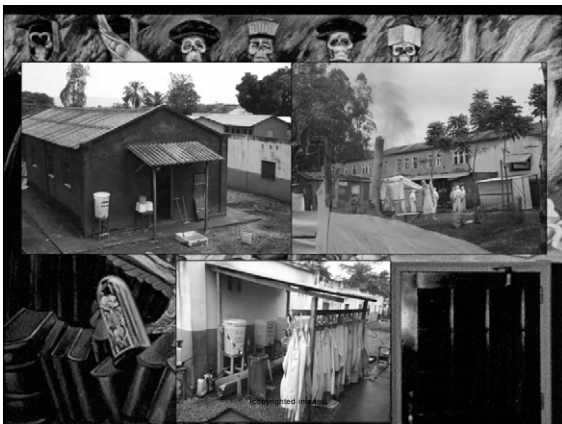


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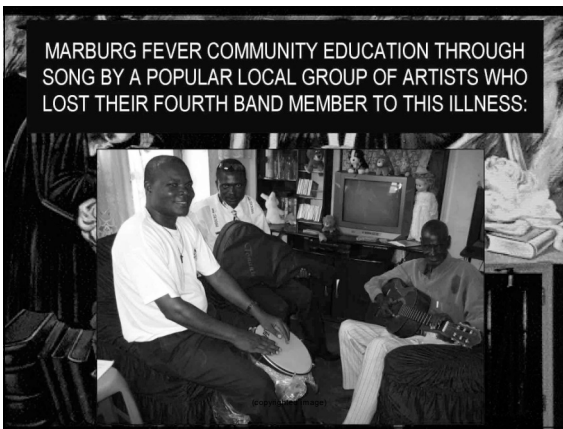


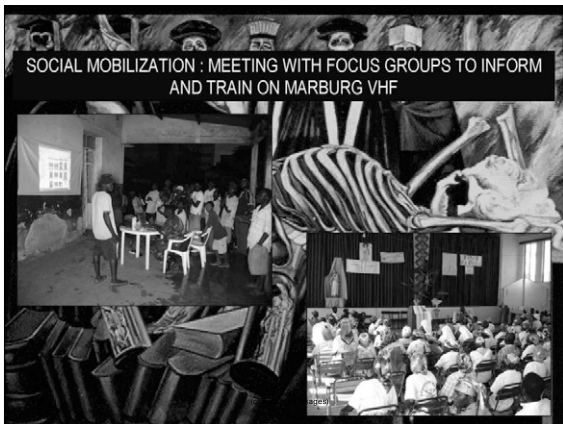


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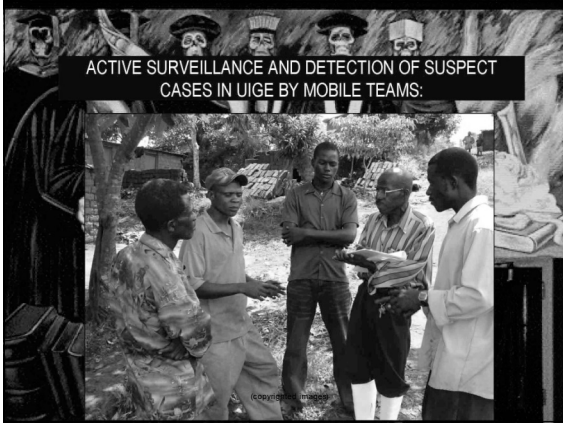


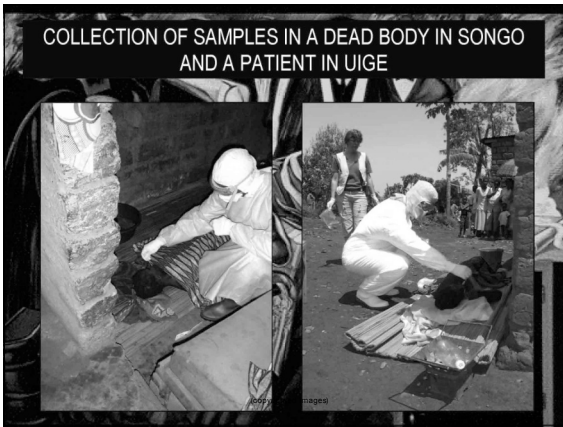




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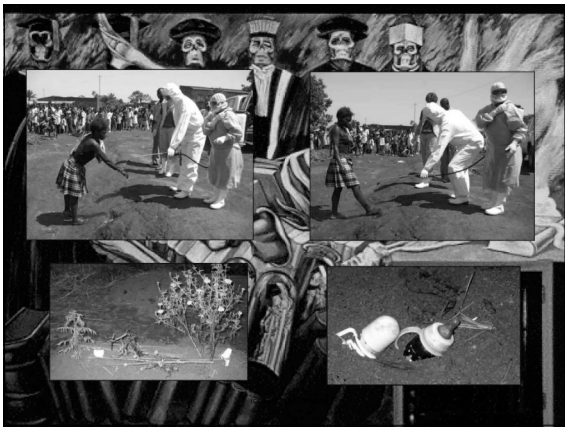






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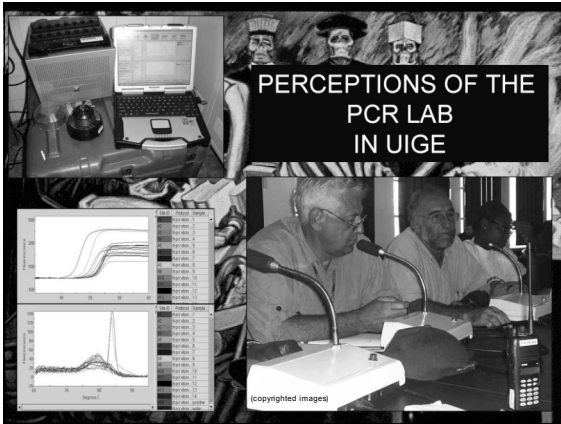


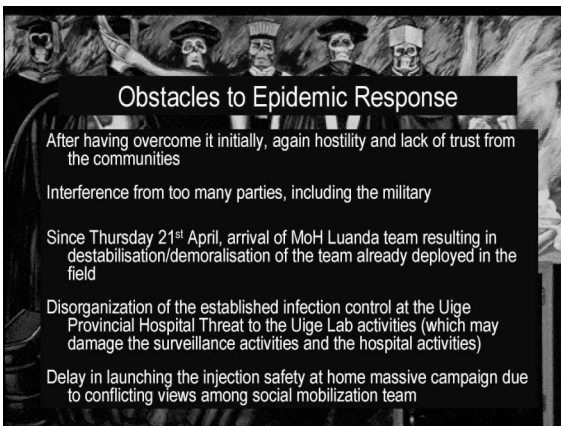


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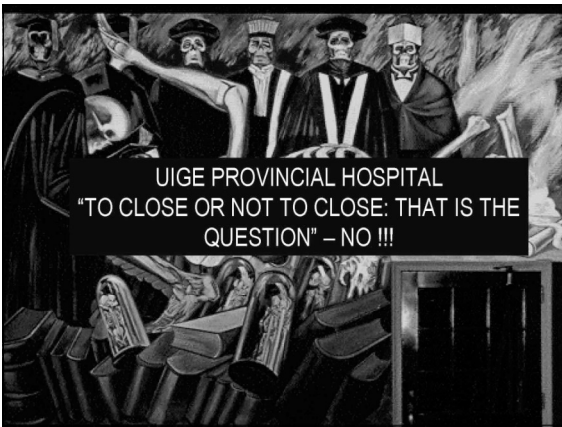




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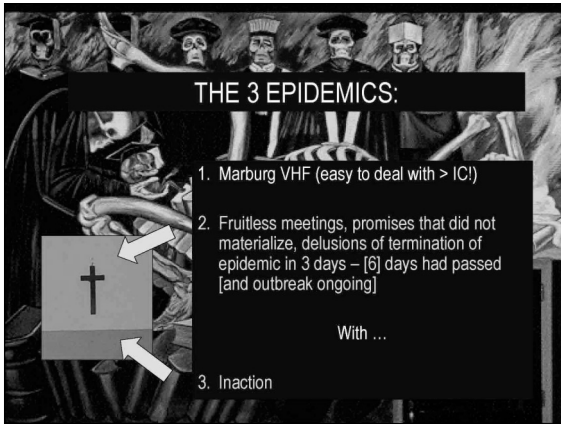




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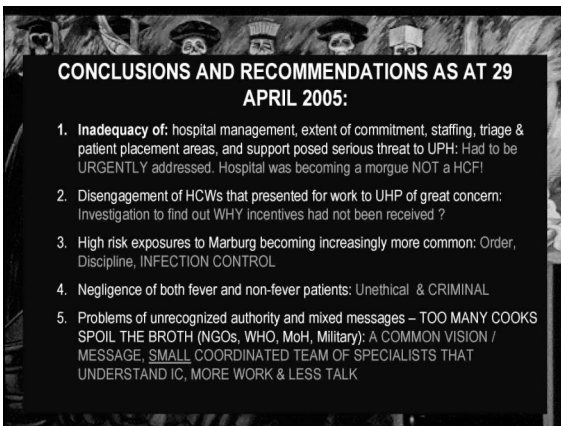


THE 3 EPIDEMICS:

1. Marburg VHF (easy to deal with > IC!)
2. Fruitless meetings, promises that did not materialize, delusions of termination of epidemic in 3 days – [6] days had passed [and outbreak ongoing]

With ...

3. Inaction



CONCLUSIONS AND RECOMMENDATIONS AS AT 29 APRIL 2005:

1. **Inadequacy of:** hospital management, extent of commitment, staffing, triage & patient placement areas, and support posed serious threat to UPH: Had to be URGENTLY addressed. Hospital was becoming a morgue NOT a HCF!
2. Disengagement of HCWs that presented for work to UHP of great concern: Investigation to find out WHY incentives had not been received ?
3. High risk exposures to Marburg becoming increasingly more common: Order, Discipline, INFECTION CONTROL
4. Negligence of both fever and non-fever patients: Unethical & CRIMINAL
5. Problems of unrecognized authority and mixed messages – TOO MANY COOKS SPOIL THE BROTH (NGOs, WHO, MoH, Military): A COMMON VISION / MESSAGE, SMALL COORDINATED TEAM OF SPECIALISTS THAT UNDERSTAND IC, MORE WORK & LESS TALK



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