Infection Control in the Living and the Dead

Prof. Adriano Duse, University of the Witwatersrand, South Africa

A Webber Training Teleclass

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:

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

- Replication accompanied by suppression of TNF-α & rapid local & systemic dissemination:
  - MPS cells migrate to other tissues (while these viruses released into lymph or bloodstream
    - systemic dissemination, inflicting fixed tissue macrophages in liver, spleen & other
  - Viremia released from above cells infect nearby hepatocytes, adnexal 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-1α, etc.).

- Increased permeability of endothelium, leakage of macromolecules, expression of endothelial
  cell surface adhesion and procoagulant molecules, platelet aggregation, release of tissue factor,
  development of DIC, platelet dysfunction, & progressive hepatic failure.

- Massive vasoconstriction, hypoxia, cytokine effect, interstitial hemorrhage & tissue ischemia
  (from diffuse obstruction of capillary blood flow by masses of fibrin and microthrombi)

Differential Diagnosis: Huge

- Bacterial sepsis: meningococcal, staphylococcal, streptococcal, typhoid, gram-
  negative (from meningococcal to local), common (e.g. S. typhi in
  unusual e.g. Capnocytophaga), etc.

- Rickettsial infections: e.g. tick-bite fever

- Parasitic infections: e.g. malaria

- Viral infections: fulminating 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

<table>
<thead>
<tr>
<th>Region</th>
<th>Year</th>
<th>Cases</th>
<th>Deaths</th>
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<tbody>
<tr>
<td>MARBURG – 1967</td>
<td></td>
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<td>Germany &amp;</td>
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<td>YUGOSLAVIA</td>
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<td>Exposed to import</td>
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<td>African Green Monkeys</td>
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<tr>
<td>Cercopithecus aethiops captured in</td>
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<td>Uganda – 21 cases, 7 deaths</td>
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<tr>
<td>ZAMBIA/SOUTH AFRICA 1975 –</td>
<td>3</td>
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<td>1</td>
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<tr>
<td>3 cases, 1 death;</td>
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<tr>
<td>KENYA 1980 – 2 cases, 1 death, 1987 –</td>
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<td>1 case, dec.</td>
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<tr>
<td>DRC 1995-2000/1 – 141 cases &amp; 82</td>
<td>123</td>
<td>43</td>
<td>25</td>
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<tr>
<td>deaths; 123 deaths; CR 154 cases &amp; 25 deaths</td>
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<td>N ANGOLA (7 Oct 2004 – August 2005)</td>
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Properties and Nosocomial Transmission

- Nosocomial transmission well documented
- Survivore smear of a convalescent patient for up to 13.5 after disease onset,
  also located from anterior chamber of eye of convalescent patient with ulcers 86
  days after disease onset
- Virus survived on contaminated surfaces: several days, weeks
- Inactivated by gamma irradiation, UV light, heating @ 60°C for 30 mins, bleach,
  alcohols, phenolics, QACs, PPIs, propiophosphate, lipid solvents, detergents

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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痰’ drawn features, deep set eyes, expressionless face. Rash appears roughly on day 5.
Sy & Sl 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%

This photograph is courtesy of JOY LUSIENA NDJO & THE MEDICAL ANTHROPOLOGY TEAM

Strategy for Controlling Marburg Outbreak

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

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SOCIAL MOBILIZATION:

MARBURG FEVER COMMUNITY EDUCATION THROUGH SONG BY A POPULAR LOCAL GROUP OF ARTISTS WHO LOST THEIR FOURTH BAND MEMBER TO THIS ILLNESS:

SOCIAL MOBILIZATION: MEETING WITH FOCUS GROUPS TO INFORM AND TRAIN ON MARBURG VH-F

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ACTIVE SURVEILLANCE AND DETECTION OF SUSPECT CASES IN UIGE BY MOBILE TEAMS:

COLLECTION OF SAMPLES IN A DEAD BODY IN SONGO AND A PATIENT IN UIGE

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Obstacles to Epidemic Response
After having overcome it initially, again hostility and lack of trust from the communities.
Interference from too many parties, including the military.
Since Thursday 21st April, arrival of Moi Luanda team resulting in destabilisation/demoralisation of the team already deployed in the field.
Disorganisation of the established infection control at the Uige Provincial hospital.
Threat to the Uige Lab activities (which may damage the surveillance activities and the hospital activities).
Delay in launching the injection safety at home massive campaign due to conflicting views among social mobilization team.

THE CONSEQUENCES:

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THE 3 EPIDEMICS:

1. Marburg VHF (easy to deal with > 10)

2. Fruitless meetings, promises that did not materialize, delusions of termination of epidemic in 3 days – [5] 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 UHP - had to be URGENTLY addressed. Hospital was becoming a morgue NOT a HC!

2. Disengagement of HCWs that presented for work to UHP of great concern. Investigation to find out why something had not been received?

3. High-risk exposure to Marburg becoming increasingly more common: Elder, 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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What can you expect in 2008?

Multi-part teleclass series on long term care
Special series on CIC exam preparation
A world of ideas
Live broadcasts from 3 infection control conferences
Month-long series for the novice ICP
Teleclasses in at least 2 languages other than English
Featured faculty include experts from 4 continents

A debate On MDRO guidelines

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