

# **EBOLA AS A THREAT TO CARIBBEAN HEALTH AND DEVELOPMENT**

**Dr Anton Cumberbatch and HEU, Centre for Health Economics  
Research Team**

**Presented at the 9<sup>th</sup> Caribbean Conference on National Health  
Financing Initiatives**

**Tobago, November 4—6, 2014**

# RECENT PUBLIC HEALTH THREATS

Years	Disease/ Condition	Notes
1999--2007	Severe Acute Respiratory Syndrome (SARS)	Worldwide
2003--2008	Avian/Bird Flu (H5N1)	Worldwide
2009--2011	Swine Flu (H1N1)	Worldwide. About 1000 cases in Caribbean with CFR of 2%
2012--present	Cholera	Haiti
2011--present	Middle East Respiratory Syndrome (MERS)	Middle East
2013--present	Chikungunya (CHIK-V)	Latin America and Caribbean
2014--	Ebola (EVD)	West Africa and US

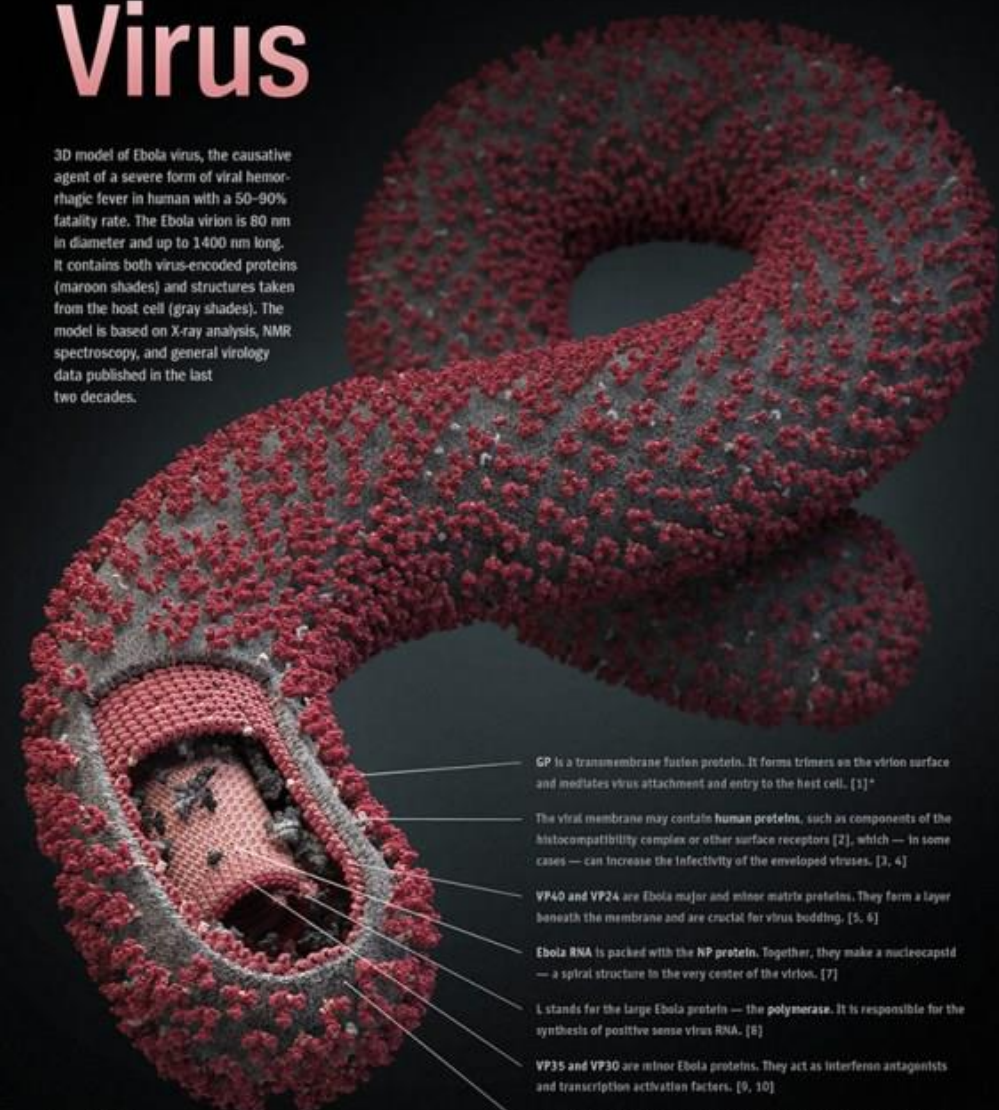
# What is Ebola

- Ebola virus is the cause of a viral haemorrhagic fever.
- The virus originated in the Central African rainforest and is thought to have spread to humans by handling or butchering of infected animals such as monkeys, gorillas, chimpanzees, forest antelope, porcupines or bats.
- It is extremely virulent and has a case fatality rate of 50-90%

## The Ebola Virus

VIRAL PARK  
Project of Visual Science

3D model of Ebola virus, the causative agent of a severe form of viral hemorrhagic fever in human with a 50-90% fatality rate. The Ebola virion is 80 nm in diameter and up to 1400 nm long. It contains both virus-encoded proteins (maroon shades) and structures taken from the host cell (gray shades). The model is based on X-ray analysis, NMR spectroscopy, and general virology data published in the last two decades.



- GP is a transmembrane fusion protein. It forms trimers on the virion surface and mediates virus attachment and entry to the host cell. [1]\*
- The viral membrane may contain human proteins, such as components of the histocompatibility complex or other surface receptors [2], which — in some cases — can increase the infectivity of the enveloped viruses. [3, 4]
- VP40 and VP24 are Ebola major and minor matrix proteins. They form a layer beneath the membrane and are crucial for virus budding. [5, 6]
- Ebola RNA is packed with the NP protein. Together, they make a nucleocapsid — a spiral structure in the very center of the virion. [7]
- L stands for the large Ebola protein — the polymerase. It is responsible for the synthesis of positive sense virus RNA. [8]
- VP30 and VP30 are minor Ebola proteins. They act as interferon antagonists and transcription activation factors. [9, 10]
- The budding viral particle is wrapped in the lipid membrane taken from the human cell. [11]

10 nm

This model contains accurate models of 11 types of Ebola and human proteins, 18900 nucleotides of genomic RNA and more than 2.5 million lipid molecules.

\*For more information and references visit [www.visualsciencecompany.com/ebola](http://www.visualsciencecompany.com/ebola)

# How is Ebola Spread?

- **Direct contact through broken skin or mucous membranes with the blood, or other bodily fluids or secretions (stool, urine, saliva, semen) of infected people.**
- **Sex ..transmitted in semen up to 7—12 weeks after recovery .**
- **Environment..contact of broken skin/mucous membranes of a healthy person with environments contaminated with an patient's infectious fluids eg.soiled clothing, bed linen, used needles**
- **Dead Bodies..the virus CAN be spread by contact with dead bodies**

# Clinical Presentation of EVD

## EVD clinical course

- No specific treatment available
- New drug therapies being evaluated
- Hyper-immune sera: no evidence
- WHO ethical review of experimental treatment, week 11 August 2014

- General supportive therapy
  - Fluid replacement
  - Analgesic

- No licensed vaccine available - several tested

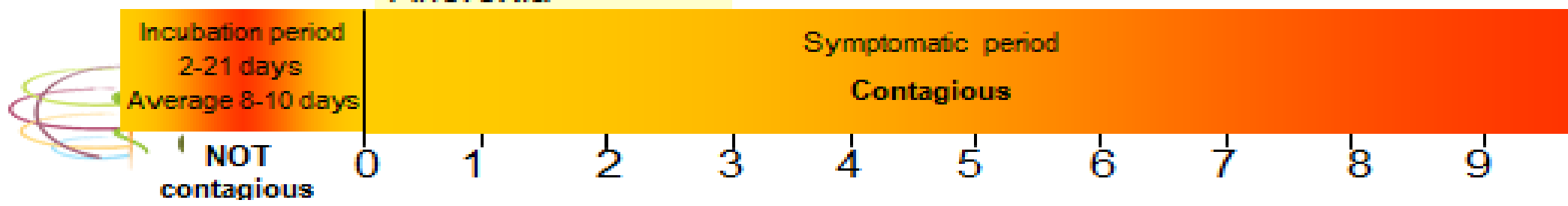
Death  
Coma  
Delirium  
Somnolence  
Hiccoughs  
Haemorrhage

CFR 50-90%

Diarrhoea  
Nausea/vomiting  
Dysphagia  
Chest and abdominal pain  
Conjunctival injection  
Rash

Fever  
Severe headache  
Myalgia  
Extreme fatigue  
Anorexia

- Low white blood cell
- Low platelet counts
- Elevated liver enzymes





# Patient zero?

Baize et al. *New England Journal of Medicine*, 10.1056; April 16, 2014

Patient Zero in the [Ebola](#) outbreak, researchers suspect, was a 2-year-old boy who died on Dec. 6, just a few days after falling ill in a village in Guéckédou, in southeastern [Guinea](#). Bordering [Sierra Leone](#) and [Liberia](#), Guéckédou is at the intersection of three nations, where the disease found an easy entry point to the region.

A week later, it killed the boy's mother, then his 3-year-old sister, then his grandmother. All had fever, vomiting and diarrhea, but no one knew what had sickened them.

Two mourners at the grandmother's funeral took the virus home to their village. A health worker carried it to still another, where he died, as did his doctor. They both infected relatives from other towns. By the time Ebola was recognized, in March, dozens of people had died in eight Guinean communities, and suspected cases were popping up in Liberia and Sierra Leone — three of the world's poorest countries



# CARPHA-CARICOM's Response to Ebola

## **Risk Assessment**

- Current risk to CARPHA member states is low. But preparedness must be augmented to face possibility of cases of Ebola entering the region.

## **Establishment of Incident Management Team**

- To coordinate response to the current situation and providing technical cooperation and advice to Member States on preparedness

## **Posting of Relevant Public Health Info on Website**

- Website information for travellers as well as health professionals, and Frequently Asked Questions have been addressed. ([www.carpha.org](http://www.carpha.org))

## **Communication with Member States**

- Regional Risk Assessment briefings with CMOs via virtual conferencing and with Epidemiologists, Lab Directors and IHR focal Points.
- Convene Heads of Gov't Meeting to give political commitment; mobilise high-level action

# LIKELY HEALTH IMPACT

- **Morbidity---severe physical/psychological symptoms so hospitalisation or house-bound**
- **Mortality—Case Fatality Rate of 50-90% (average of 70%)**
- **Reproduction rate of 1.7 affecting mostly caregivers, close family members, health workers**
- **Enhanced Vaccine Activity but still months away**
  
- **Diverts attention from other diseases-conditions**
- **Rise of alternative therapies (nano silver; herbs; drink salt water, vitamins, essential oils)**
- **Challenges strength of health system**



# DEVELOPMENT IMPACT (1)--SOCIAL

- **FIRST LEVEL:-**

- **Morbidity—house-bound**
- **Morbidity—CFR of 50—90%**

- **SECOND LEVEL**

- **Fear and Panic**
- **Distrust of health authorities**
- **Information battle--National Authority vs Media/Social Media**
- **Conspiracy Theories abound**
- **Disruption of social interaction— isolation, socialising, grieving/burial,**
- **Travel and trade ban**
- **Human rights vs quarantine concerns**
- **Poverty as a critical factor—poor individuals, communities worse affected**

# DEVELOPMENT IMPACT (2)-FINANCIAL

- **Need for /Diversion of Funds for Ebola –related Expenses**

- **Capital Costs—**

- **quarantine space;**
- **bio-containment unit;**
- **equipment (fever testing instruments,**

- **Recurrent Cost—**

- **training;**
- **surveillance;**
- **screening and testing;**
- **contact tracing; enforcement;**
- **supplies for case response;**
- **waste disposal;**
- **compensation to health workers**

**> Focus on prevention vs vaccines and treatment**

# DEVELOPMENT IMPACT (3)--ECONOMIC

- **WB estimate –cost of US\$32.6 bn by end of 2015 for West Africa or 2.5 times combined national incomes of Liberia; Guinea; Sierra Leone (Oct 8 2010)**
- **Travel Ban—tourism..role of interdependence and globalisation**
- **Trade ban—raw materials**
- **Collapse of Production in key sectors**
- **Loss of Productivity**
- **Shut down country in 3 to 6 months**
- **Small islands—bigger impact**
- **Caribbean contamination—only as strong as weakest link (country)**
- **High Cost of re-establishing ‘its safe to come here’**
- **New shock in face of slow growth; fiscal deficit; debt problems; high cost of borrowing; high poverty**