

# Ebola Virus Disease

December , 2014

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# Chain of Transmission

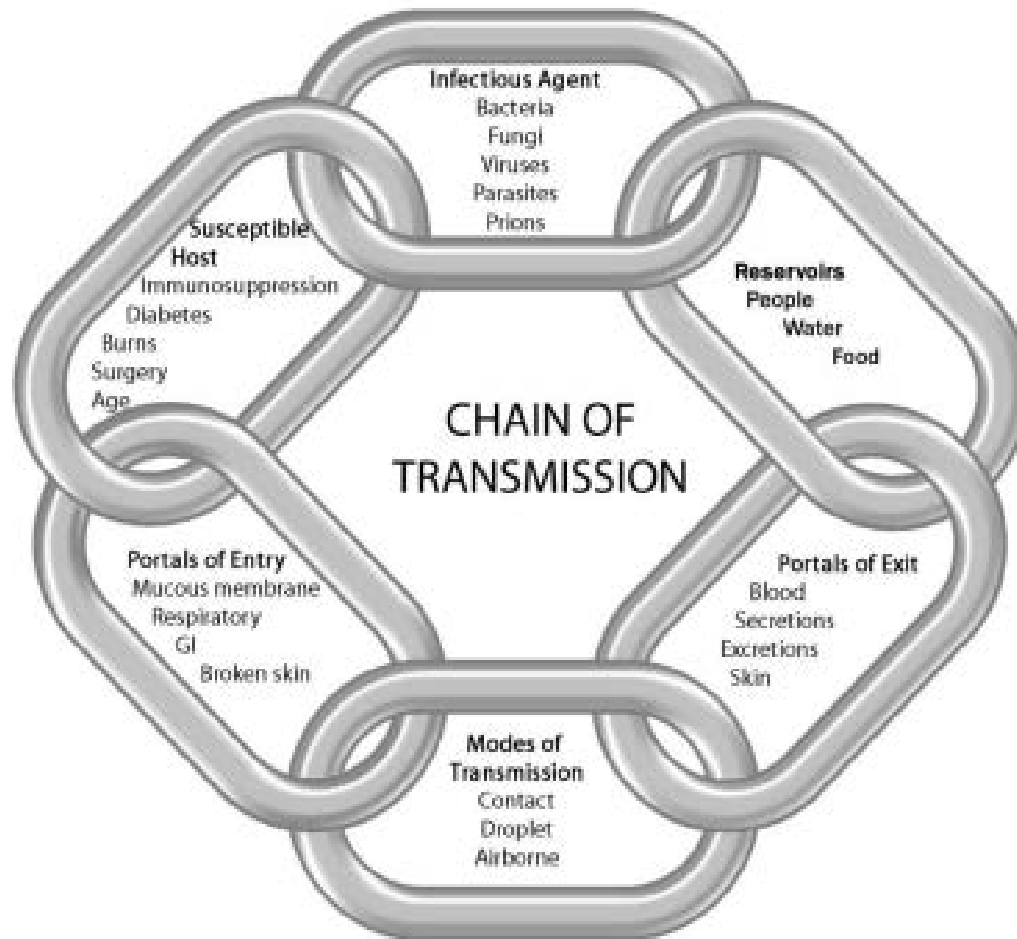
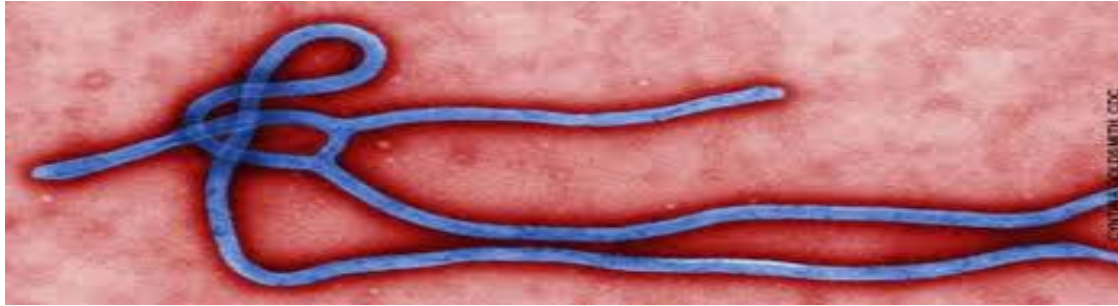


Figure 1: The Chain of Transmission

# Infectious Agents



- **Viruses:** ultramicroscopic, single /double strand (DNA/RNA) invades host cell nucleus and changes DNA sequence to reproduce. Must replicate inside living cell, live short periods of time outside of host- readily killed by most disinfectants. Do not always replicate exactly, ability to mutate

# Reservoir

- Any place where a micro-organism can survive and possibly multiply.

Three common sources:

Humans

Animals

Environment



# Portals of Exit

Manner in which the infectious agent leaves the reservoir

- Blood
- Secretions
- Excretions
- Skin



# Modes of transmission

## 1. Contact transmission

- Direct: STDs, HIV, HCV
- Indirect: environment
- **Droplet:** > 5 microns, meningitis, influenza



## 2. Airborne transmission : < 5 microns TB, measles, mumps, chicken pox

- Vector borne transmission: malaria, WNV, rabies, Lyme disease
- Common vehicle transmission: food, water  
E.coli, Salmonella, Norovirus

# Portals of Entry

Manner in which the infectious agent gains entry to a susceptible host

- Mucous membrane
- Respiratory
- GI, GU
- Broken Skin



# Susceptible Host

A person who is vulnerable to invasion of microorganisms.

Factors include:

- Age: very young and elderly
- Non-immune: not vaccinated/no hx of disease
- Chronic health problems : lung, cardiac.
- Immunocompromised : HIV, organ transplant, splenectomy, cancer/chemotherapy



# Breaking the Chain

Transmission may be interrupted when:

- the agent is eliminated or inactivated or cannot exit the reservoir
- portals of exit are contained through safe practices
- transmission between objects or people does not occur due to barriers and/or safe practices
- portals of entry are protected
- hosts are not susceptible

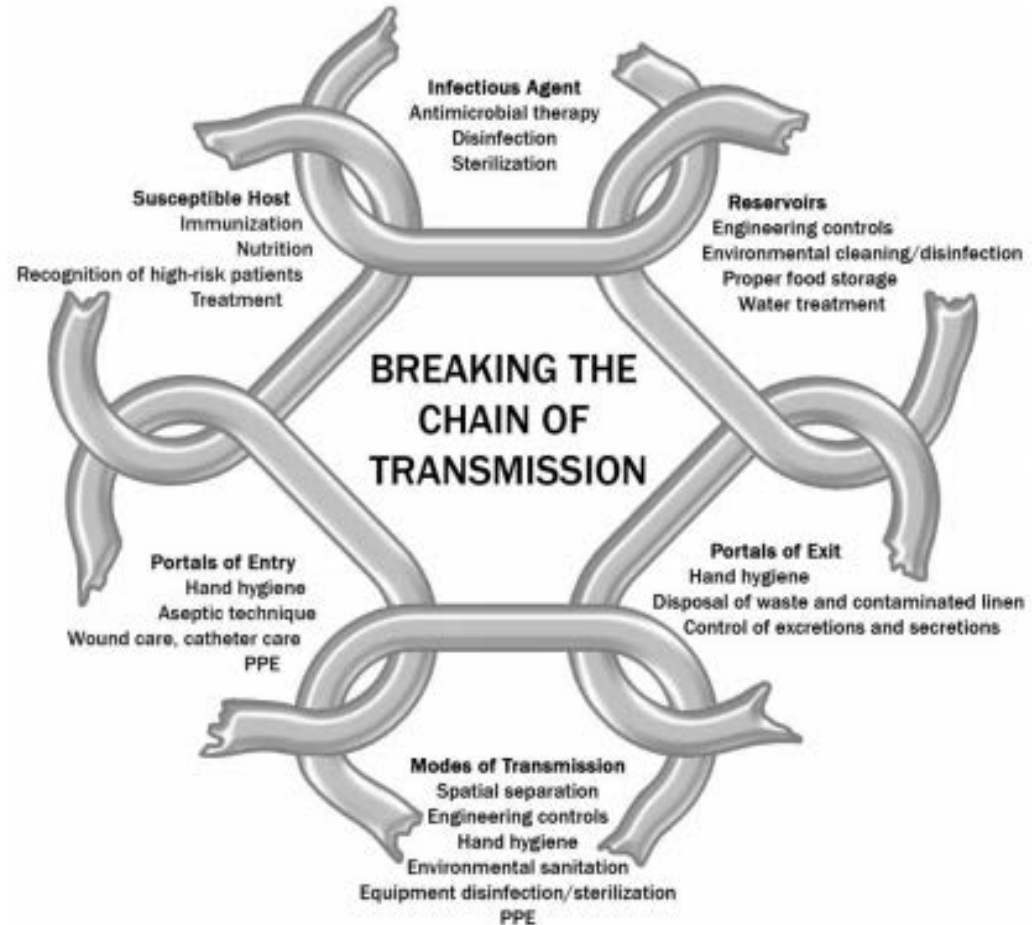


Figure 2: Breaking the Chain of Transmission

# Ebola Virus Disease (EVD)

Current outbreak started in West Africa – Feb. 2014

Current case fatality rate West Africa approx 60%

Case fatality –West Africa 72% hosp. 60%

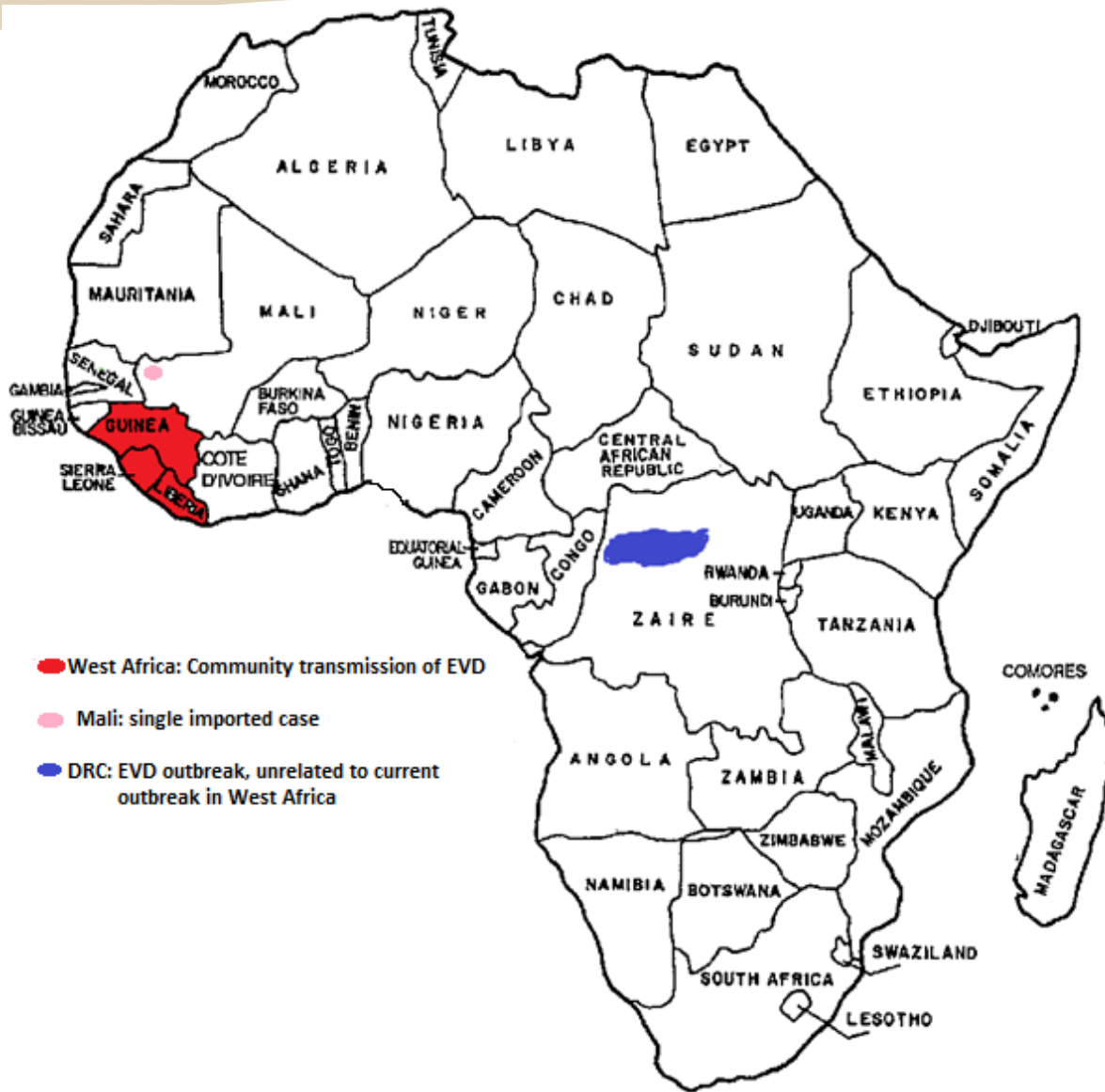


Risk is very low in Ontario - extensive planning, processes in place

WHO: Dec 3 **17,145** laboratory confirmed cases with **6,070** deaths

- Reservoir- animals (bats, primates)
- Transmission: animal to human, human to human via blood, secretions, excretions, possible aerosols NOT AIRBORNE
- Supportive treatment – currently two trial vaccines being tested
- Has been spread to health care workers who are suspected to not utilize proper infection control practices. (622 HCWs/346 deaths)





# Ebolavirus Ecology

## Enzootic Cycle

New evidence strongly implicates bats as the reservoir hosts for ebolaviruses, though the means of local enzootic maintenance and transmission of the virus within bat populations remain unknown.

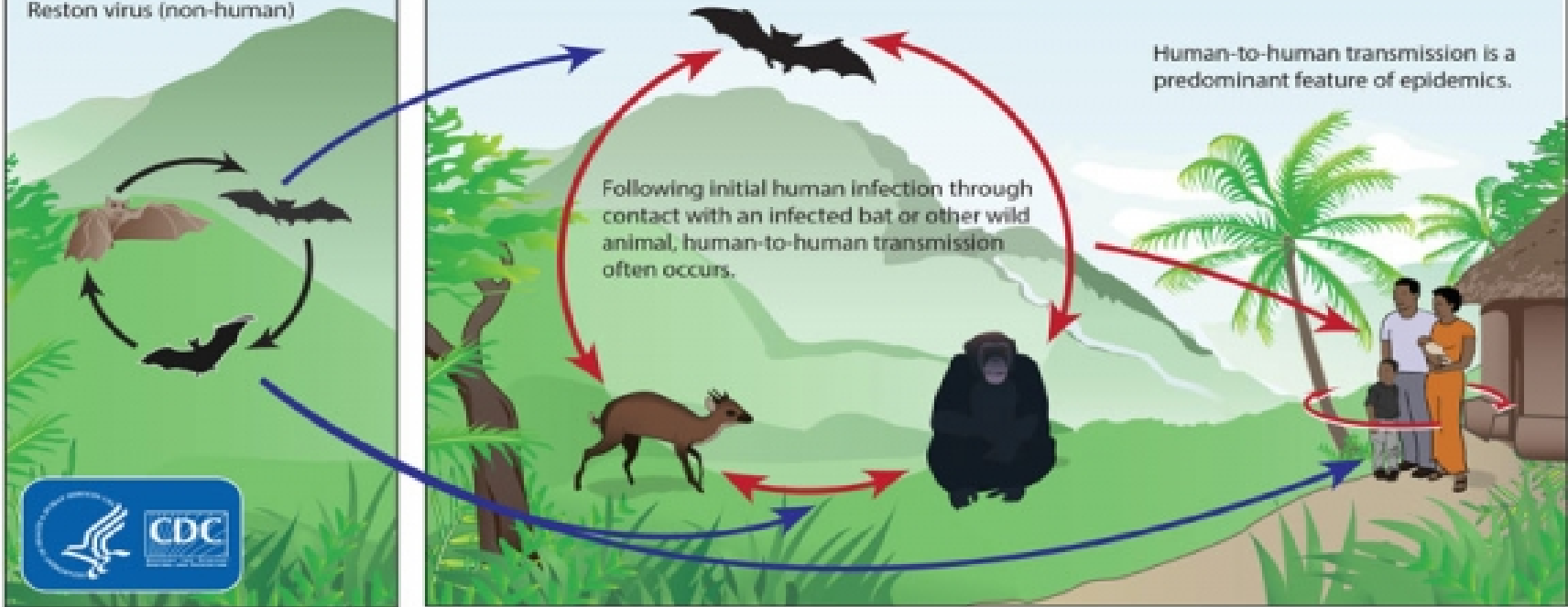
## Ebolaviruses:

- Ebola virus (formerly Zaire virus)
- Sudan virus
- Tai Forest virus
- Bundibugyo virus
- Reston virus (non-human)

## Epizootic Cycle

Epizootics caused by ebolaviruses appear sporadically, producing high mortality among non-human primates and duikers and may precede human outbreaks. Epidemics caused by ebolaviruses produce acute disease among

humans, with the exception of Reston virus which does not produce detectable disease in humans. Little is known about how the virus first passes to humans, triggering waves of human-to-human transmission, and an epidemic.

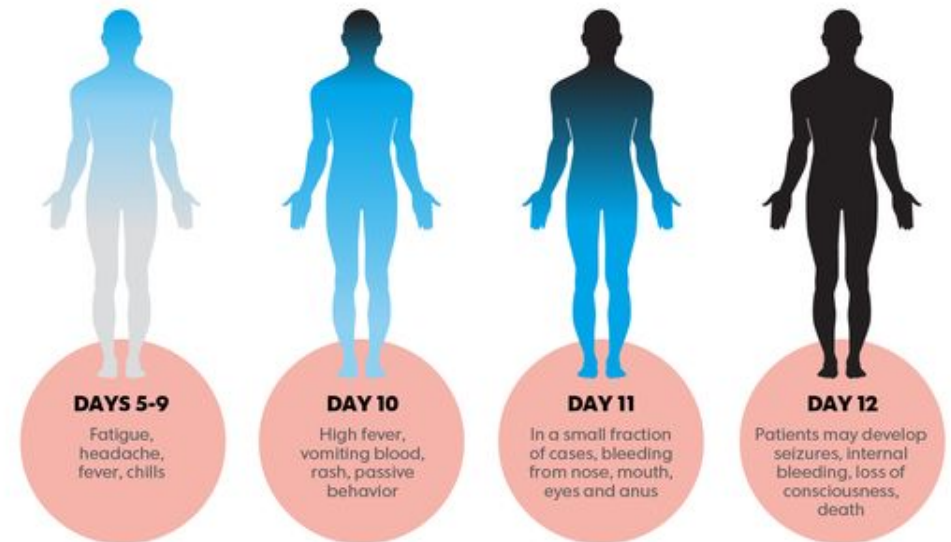


# Ebola Virus Disease



## EFFECTS OF EBOLA VIRUS ON HUMANS

Ebola can spread to others only after symptoms have begun. Symptoms can appear from two to 21 days after exposure. There is currently no vaccine for the Ebola virus. Progression of illness if left untreated:



SOURCE World Health Organization

USA TODAY



# Enhanced PPE

Goggles, safety glasses or  
face shield  
Mask or respirator

Gloves

Impermeable gown  
that reaches from the  
neck to at least  
mid-thigh



**Original C.D.C.  
guidelines**

Hood that  
covers the neck

Second layer of  
gloves

Suit will be  
standardized,  
but the changes  
were not  
specified

Fluid-resistant leg and  
shoe coverings

**Some of the things  
hospitals and the C.D.C. are  
adding to the original guidelines**

**Changes** announced by C.D.C.



Sources: Centers for Disease Control and Prevention; North Shore-LIJ; Nebraska Medical Center

# Differences in Health Care



# Transmission in West Africa

## Initial challenges

- Lack of supplies, medical expertise
- Lack of infection control best practices, education
- Lack of beds, treatment, isolation facilities
- Resistance from local population, strong tribal culture
- Deaths under-reported

## Current situation

- Increased international support, trained health care providers
- Increased bed capacity
- Trained burial teams, however still delays to bury all of the dead
- Difficult contact tracing
- Some areas outbreak declared over



# EVD Planning

## Provincial

- Public Health Ontario Lead Agency
- Chief Medical Officer of Health Issued Directives
- Designated Hospitals and Paramedic Services including Ornge fixed wing aircraft

## Local

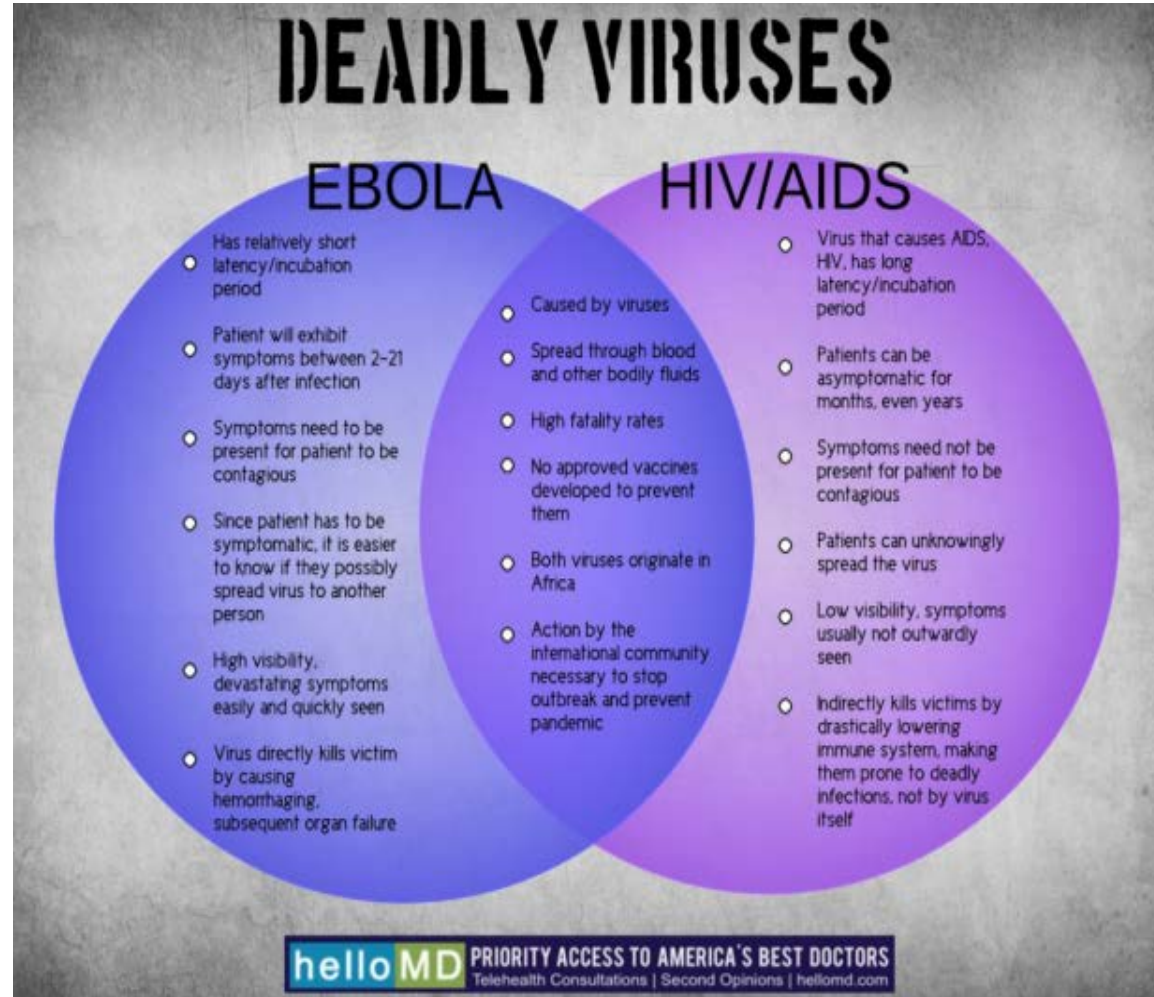
- Partnership with SDHU
- Designated Hospital & Paramedic Service
- Joint procedures in place “practice run”
- MOL review of Sudbury Paramedic Services procedures, employee communication & training



# Reality

## HIV Stats July 2014

- 35 million people living with HIV - more than 70% live in Sub-Saharan Africa including 91% of HIV+ children
- EVERY DAY 5,700 people contract HIV
- In 2013 ,1.5 Million people died from AIDS related causes



# Additional Resources

**Public Health Agency of Canada**

<http://www.phac-aspc.gc.ca/index-eng.php>

**Public Health Ontario**

<http://www.publichealthontario.ca/EN/Pages/default.aspx>

**Sudbury District Health Unit**

<http://www.sdhu.com/index.asp?lang=0>

**Provincial Infectious Disease Advisory Committee (PIDAC)**

<http://www.publichealthontario.ca/en/BrowseByTopic/InfectiousDiseases/PIDAC/Pages/PIDAC.aspx#.VHaaEjHF-pc>

**Ministry of Health and Long Term Care**

<http://www.health.gov.on.ca/en/public>

**Regional Infection Control Networks**

[http://www.publichealthontario.ca/en/About/Departments/Pages/Regional\\_Infection\\_Control\\_Networks.aspx#.VHaaUTHF-pc](http://www.publichealthontario.ca/en/About/Departments/Pages/Regional_Infection_Control_Networks.aspx#.VHaaUTHF-pc)

**Infection Prevention and Control Canada**

<http://www.ipac-canada.org>

**World Health Organization**

<http://www.who.int/en>



# Thank you!

## Questions

