Ebola Characteristics and Comparisons to Other Infectious Diseases

The current outbreak of Ebola virus in West Africa has been declared a public health emergency of international concern by the World Health Organization (WHO) and is the most severe such outbreak of Ebola to date. Almost eight in ten cases ever reported have been reported in the past few months alone, and there is increasing attention to and concern about its further escalation.

Ebola virus has a unique set of characteristics that determines how and why it spreads, and how deadly it can be. To better understand Ebola, we compare it to twelve other infectious diseases that continue to represent public health challenges today. These include diseases that have been around for thousands of years (the so-called “ancient diseases”) as well as others that are much more recent (the so-called “emerging diseases”). They include viruses as well as bacteria and parasites, and vary in terms of how easily they are spread, how deadly they are, and whether there are vaccines, treatments, or cures to address them.

Five Key Take-Aways:

How is it Transmitted?

How an infectious disease is transmitted – whether through direct contact with bodily fluids, through air, or other means, as well as whether human-to-human transmission is possible – is important for understanding how to prevent and track the disease. Ebola is transmitted only through direct contact with bodily fluids, as are HIV and Hepatitis C. Other diseases, such as measles and SARS, are transmitted through airborne means. Human-to-human transmission occurs for all of the diseases included in this profile except for malaria, which is transmitted by mosquitoes to humans.
**Is Asymptomatic Transmission Possible?**

Some diseases can be transmitted only when symptoms are present while others can be transmitted even when a person does not yet have symptoms, known as being *asymptomatic*. Ebola can only be transmitted when symptoms are present, in contrast to diseases such as HIV, influenza, and malaria which have asymptomatic transmission.

**How Long is the Incubation Period?**

The incubation period of a disease is the time between initial infection and when symptoms first appear. Ebola’s incubation period of 2 to 21 days is fairly short compared to other infectious diseases such as HIV, which can have an incubation period of 10 years or even longer. It is also shorter than the incubation period for Tuberculosis and Hepatitis C. However, some other infectious diseases, such as SARS and influenza, have, on average, shorter incubation periods than Ebola.
**Are There Vaccines, Treatments, or Cures?**

Currently, there is no vaccine to prevent Ebola, no treatment for the disease (other than treatments for its symptoms and some experimental treatments), and no cure. Other diseases have treatments but no vaccine and no cure (such as HIV), while still others have vaccines, but cannot be treated or cured (such as measles).

<table>
<thead>
<tr>
<th></th>
<th>VACCINE</th>
<th>TREATMENT</th>
<th>CURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ebola</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Measles</td>
<td></td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Pertussis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV</td>
<td>NO</td>
<td></td>
<td>NO</td>
</tr>
<tr>
<td>Influenza – Seasonal</td>
<td></td>
<td></td>
<td>NO</td>
</tr>
</tbody>
</table>

**How Deadly is it?**

Ebola is one of the most deadly infectious diseases, causing death in approximately 50-90 percent of those who become infected (its estimated case-fatality rate). This is much higher than almost every other infectious disease included. Case fatality rates for other diseases are much lower, including those for influenza (less than 1%) and SARS (13-43%).
<table>
<thead>
<tr>
<th></th>
<th>Ebola</th>
<th>Hepatitis C</th>
<th>HIV</th>
<th>Influenza - H1N1 Pandemic</th>
<th>Influenza - Seasonal</th>
<th>Lassa Fever</th>
<th>Malaria</th>
<th>Marburg</th>
<th>Measles</th>
<th>Pertussis</th>
<th>Polio</th>
<th>SARS</th>
<th>Tuberculosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Causative Agent</strong></td>
<td>Virus</td>
<td>Virus</td>
<td>Virus</td>
<td>Virus</td>
<td>Virus</td>
<td>Parasite</td>
<td>Virus</td>
<td>Virus</td>
<td>Virus</td>
<td>Bacteria</td>
<td>Virus</td>
<td>Virus</td>
<td>Bacteria</td>
</tr>
<tr>
<td><strong>Primary Mode(s) of Transmission</strong></td>
<td>Direct contact*</td>
<td>Direct contact†</td>
<td>Airborne</td>
<td>Airborne</td>
<td>Direct contact*, ingestion or inhalation</td>
<td>Vector-borne (mosquito)</td>
<td>Direct contact*</td>
<td>Airborne</td>
<td>Airborne</td>
<td>Fecal-oral</td>
<td>Airborne</td>
<td>Airborne</td>
<td></td>
</tr>
<tr>
<td><strong>Asymptomatic Transmission</strong></td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Unlikely</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Unlikely</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><strong>Incubation Period</strong></td>
<td>2-21 days</td>
<td>2 weeks-6 months</td>
<td>10 years</td>
<td>2-6 days</td>
<td>1-4 days</td>
<td>7-10 days</td>
<td>7-30 days</td>
<td>5-10 days</td>
<td>7-21 days</td>
<td>4-21 days</td>
<td>3-35 days</td>
<td>1-14 days</td>
<td>weeks to years</td>
</tr>
<tr>
<td><strong>Transmission Potential (average # new cases generated by each case)</strong></td>
<td>1.5-2.0</td>
<td>2-4</td>
<td>3-6</td>
<td>1.3-1.7</td>
<td>1.2-1.4</td>
<td>n.d.</td>
<td>n/a</td>
<td>1.6</td>
<td>12-40</td>
<td>16-18</td>
<td>6-7</td>
<td>3.6</td>
<td>1-40</td>
</tr>
<tr>
<td><strong>Case Fatality Rate (estimate, range)</strong></td>
<td>50-90%</td>
<td>Unknown</td>
<td>80-90%**</td>
<td>0.01% - 0.3%</td>
<td>&lt;0.1%</td>
<td>50%</td>
<td>&lt;20%</td>
<td>23-90%</td>
<td>1-30%</td>
<td>&lt;4%</td>
<td>Children: 3-5%; Adults: 15-30%</td>
<td>13%&lt;60 yrs</td>
<td>43%&gt;60 yrs</td>
</tr>
<tr>
<td><strong>Available Vaccine to Prevent Infection</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Available Treatment</strong></td>
<td>No^</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Can It Be Cured?</strong></td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><strong>Immunity After infection?</strong></td>
<td>Likely</td>
<td>No</td>
<td>No (can be infected with &gt;1 strain)</td>
<td>Partial</td>
<td>Partial</td>
<td>Unknown, potential</td>
<td>No (possibility for re-infection)</td>
<td>Unknown, potential</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Unknown</td>
<td>No (possibility for relapse)</td>
</tr>
<tr>
<td><strong>Annual Cases Worldwide Per Year (latest year estimate)</strong></td>
<td>8,997‡</td>
<td>n.d.</td>
<td>2.1 million</td>
<td>24% of global population (2009-2010)</td>
<td>3-5 million</td>
<td>100,000-300,000</td>
<td>207 million</td>
<td>Few; largest outbreak (Angola, 2004-2005) yielded 252 cases</td>
<td>226,722</td>
<td>16 million</td>
<td>406 (in 2013)</td>
<td>8,096 (in 2003)</td>
<td>8.6 million</td>
</tr>
<tr>
<td><strong>Annual Deaths Worldwide Per Year (latest year estimate)</strong></td>
<td>4,493‡</td>
<td>350,000-500,000</td>
<td>1.5 million</td>
<td>284,000 (2009-2010)</td>
<td>250,000-500,000</td>
<td>5,000</td>
<td>627,000</td>
<td>Few; largest outbreak (Angola, 2004-2005) yielded 227 deaths</td>
<td>122,000</td>
<td>195,000</td>
<td>None reported</td>
<td>774 (in 2003)</td>
<td>1.3 million</td>
</tr>
</tbody>
</table>

NOTES: n.d. = no data
n/a = not applicable due to no human-to-human transmission, only vector-borne transmission
* Direct Contact refers to the primary route of infection being through bodily fluids such as blood and feces; also includes mother-to-child transmission
† Primary routes of transmission for HIV are sexual contact, blood-borne, and mother-to-child transmission
^ Experimental treatments have been used to treat Ebola patients
‡ Current West Africa Epidemic, data as of October 12, 2014
** Not fatal with early treatment
**EBOLA AND OTHER DISEASES REFERENCES**

**Ebola:**

**Hepatitis C:**
CDC, Hepatitis C Information for Health Professionals: FAQs, July 2014. www.cdc.gov/hepatitis/hcv/hcvfaq.htm

**HIV:**

**Influenza- Seasonal:**
CDC, Seasonal Influenza (Flu): Key Facts about Influenza (Flu) & Flu Vaccine, September 2014. www.cdc.gov/flu/flukeys.htm
CDC, Seasonal Influenza (Flu): How Flu Spreads, September 2013. www.cdc.gov/flu/about/disease/spread.htm
CDC, H1N1 Flu: Antivirals, www.cdc.gov/H1N1flu/antivirals/

**Influenza- H1N1 Pandemic:**
CDC, H1N1 Flu: Antivirals, www.cdc.gov/H1N1flu/antivirals/

**Marburg:**

**Measles:**
CDC, MMWR: Global Control and Regional Elimination of Measles, 2000–2012, February 2014. www.cdc.gov/mmwr/preview/mmwrhtml/mmr6305a5.htm

**Pertussis:**
WHO, Health topics: Pertussis. www.who.int/topics/pertussis/en
CDC, Pertussis: Epidemiology and Prevention of Vaccine-Preventable Diseases, September 2013. www.cdc.gov/vaccines/pubs/pinkbook/pert.html

**Lassa Fever:**
CDC, MMWR: Global Control and Regional Elimination of Measles, 2000–2012, February 2014. www.cdc.gov/mmwr/preview/mmwrhtml/mmr6305a5.htm

**Malaria:**
CDC, Malaria: Disease, February 2010. www.cdc.gov/malaria/about/disease.html

**Malaria:**
CDC, Malaria: Disease, February 2010. www.cdc.gov/malaria/about/disease.html
**Pertussis (continued):**


**Polio:**


**SARS:**


WHO, Immunization, Vaccines and Biologicals: Severe Acute Respiratory Syndrome (SARS), December 2013. www.who.int/immunization/topics/sars/en/


**Tuberculosis:**


The intrinsic transmission dynamics of tuberculosis epidemics. Nature Medicine 1, 815-821 doi:10.1038/mm0895-815


CDC, Tuberculosis: Vaccine and Immunizations, August 2012. www.cdc.gov/TB/topic/vaccines/default.htm