ANNEX B: Characteristics of infectious disease

Infectious diseases are caused by pathogenic agents such as bacteria, viruses or parasites that can be transmitted from person to person, either directly or via a vector. The risks posed by, and actions required to contain, infectious disease outbreaks will depend on the particular characteristics of that disease, the causative agent and any vectors involved. In order to develop an effective response to a public health emergency a basic understanding of the nature of the disease, the causative agent (pathogen) and the susceptible population is important.

The key disease characteristics from a public health perspective are:

* The ***transmission route***, or how the agent is transferred from an infected host to a susceptible individual. This could be through direct person-person or person-animal contact, indirectly via contaminated inanimate objects (*fomites*) or animal vectors, or airborne transmission via liquid droplets in the air (*aerosols*).
* The time period that the infected individual is contagious, called the ***infectious period*** (or ***communicable period***). In many diseases the infectious period begins at or after the first onset of symptoms, however in diseases such as influenza, measles and hepatitis A the infectious period begins when the individual is still asymptomatic. In these cases it is difficult to identify and isolate all contagious individuals, as they may not be showing symptoms.
* The ***latency period*** is the amount of time between a person being exposed to an infectious pathogen and the beginning of the infectious period, the shorter this time the more quickly a disease will spread through a susceptible population.
* The ability of the causative agent to remain infectious (*viable*) in the environment, sometimes called the ***persistence***.
* The ***infectious dose*** is the quantity of pathogen that is required to cause an infection. This is partially a characteristic of the disease, and partially depends on the immune response of the individual. The infectious dose is measured in number of organisms. Whilst many diseases require only a small number of pathogenic organisms to cause infection (Ebola has an infectious dose of 1-10 organisms[[1]](#endnote-1)) some require significantly more (a cholera infection requires from 1,000 to 100,000,000 vibrio cholerae bacteria[[2]](#endnote-2)).
* The ***virulence*** of a pathogen, how able it is to invade and damage tissues of the host. The case fatality rate (CFR) is a proxy indicator of virulence, expressed as the percentage of persons diagnosed as having a specified disease who die as a result of that illness within a given period. CFR is obviously also dependent on the susceptibility of the population and the effectiveness of the public health response.

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| Disease | Causative agent | Transmission / Vector | Infectious period | Incubation period | Common symptoms | Global incidence (annual) | Case fatality rate | Notes |
| Ebola Virus Disease | Ebola Virus | Infected body fluids, contaminated objects, infected fruit bats or primates | From onset of symptoms | 2 - 21 days | Fever, headache, weakness / fatigue, diarrhoea / vomiting, bleeding | N/A | 50 - 90% |  |
| Cholera | Vibrio cholerae (bacteria) | Infected food or water (faecal-oral route) | 1 - 10 days after infection (even if asymptomatic) | 2hrs - 5 days | Acute watery diarrhoea | 2.8 million | 0 - 5% | Roughly 80% of cases are asymptomatic |
| Dengue fever | Dengue (virus) | Aedes aegypti Mosquitos | 4 - 5 days after first symptoms appear | 3 - 10 days | Fever, headache, pain behind eyes, vomiting, joint pain, rash | 50-100 million | 0.05 - 0.5% | Roughly 75% of cases are asymptomatic, 5% are severe cases which could be fatal |
| Swine flu | H1N1 Influenza (virus) | Airborne respiratory droplets | 1 day **before** onset of symptoms for 5 - 7 days | 1 - 4 days | Fever, lethargy, lack of appetite, coughing | N/A | 0.02% (2009 pandemic) |  |
| Poliomyelitis | Poliovirus (virus) | Infected food or water (faecal-oral route) | 7 - 10 days **before** the onset of symptoms | 7 - 10 days | Fever, nausea, aching muscles, lethargy, loss of appetite, stiff neck / back | 359 (2014) | <0.05% (children) | Roughly 76% of cases are asymptomatic |
| Hepatitis E | Hepatitis E Virus (HEV) | Infected food or water (faecal-oral route) | Unknown | 15 - 60 days | Fever, muscle / joint pain, nausea / vomiting, jaundice, dehydration | 20 million | 4% (20% during pregnancy) |  |
| Tuberculosis disease | Mycobacterium tuberculosis (bacteria) | Airborne respiratory droplets | During active disease | weeks - years | Coughing, chest pain, weakness, weight loss, fever, night sweats | 9.6 million | 23% (1997) | >1 in 3 people globally are infected with Mycobacterium tuberculosis, most infections are controlled by the immune system and remain latent |
| Malaria | Plasmodium (protozoan parasite) | Anopheles mosquito | N/A | 1 - 12 weeks | Headache, cough, fatigue, chills, muscle / joint pain | 300-500 million | <1% |  |
| Measles | Measles virus | Airborne respiratory droplets | From 4 days before until 4 days after rash onset | 7 – 21 days | Fever, conjunctivitis, runny nose, cough, spots, rash | 20 million | 0.6 – 7% | Measles can be more communicable during the incubation period than during the actual illness |

The details in the above table are for indication only.

1. Franz, D. R., Jahrling, P. B., Friedlander, A. M., McClain, D. J., Hoover, D. L., Bryne, W. R., Pavlin, J. A., Christopher, G. W., & Eitzen, E. M. (1997). Clinical recognition and management of patients exposed to biological warfare agents. Jama, 278(5), 399-411. [↑](#endnote-ref-1)
2. Schmid-Hempel, Paul, and Steven A Frank. “Pathogenesis, Virulence, and Infective Dose.” Ed. Marianne Manchester. PLoS Pathogens 3.10 (2007): e147. PMC. Web. 27 Jan. 2016. [↑](#endnote-ref-2)