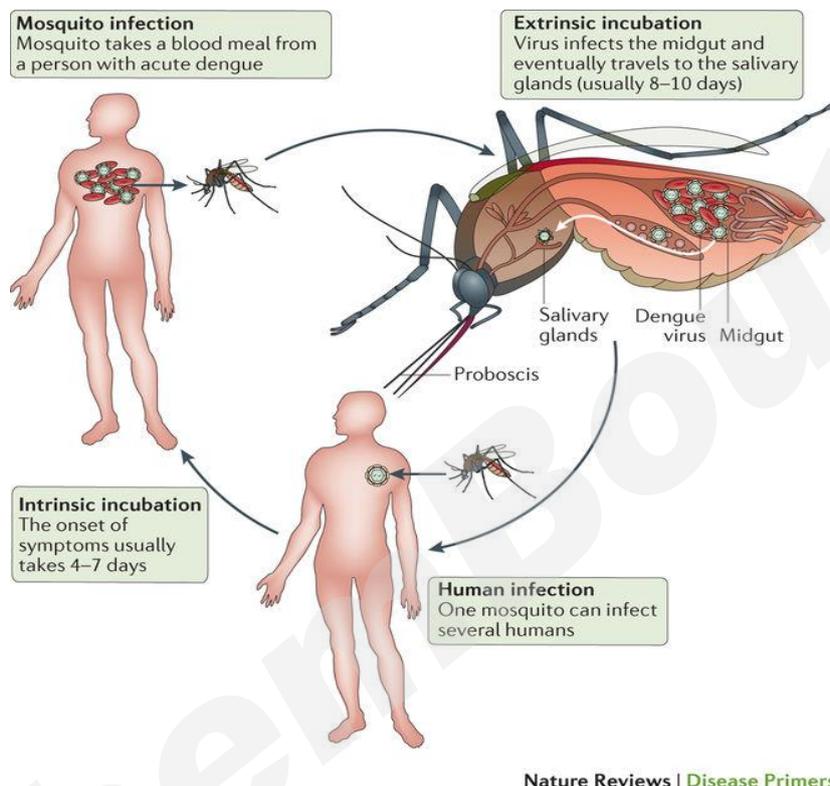


*“Dengue virus is a mosquito-borne viral disease.”*

World Health Organisation (WHO): Dengue virus is transmitted by female mosquitoes mainly of the species of *Aedes aegypti*. This mosquito also transmits yellow fever and Zika infection. Dengue virus causes dengue fever.



### What is dengue fever?

Symptoms of dengue fever include severe joint and muscle pain, swollen lymph nodes, headache, fever, exhaustion and rash. For typical dengue fever, the treatment is directed toward relief of the symptoms.

Severe dengue (also known as **Dengue Haemorrhagic Fever**) was first recognised in the 1950s during dengue epidemics in the Philippines and Thailand. It has become a leading cause of **hospitalization and death** among children and adults.

## Glossary

**Species:** A group of individuals that are able to interbreed in nature

**Incubation:** the time between being exposed to infection and showing first symptoms

**Haemorrhagic:** severe illness, sometimes associated with bleeding, that may be caused by a number of viruses.

**Serotypes:** a distinguishable strain of microorganism

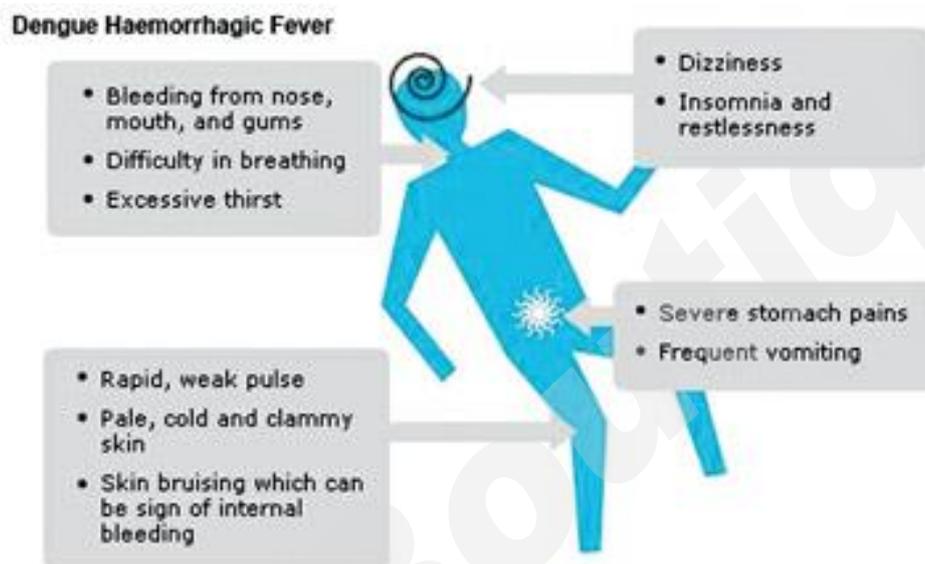
**Vaccines:** contains an agent that resembles a disease-causing microorganism and is injected into human body to stimulate immune response and provides active acquired immunity

**Internal bleeding:** loss of blood that occurs from the vascular system into a body cavity or space.

**Tetravalent:** contain all the four serotypes of dengue virus

## What is Dengue Haemorrhagic Fever?

Four different dengue viruses are known to cause haemorrhagic fever. The early symptoms of dengue haemorrhagic fever are similar to those of dengue fever. But after several days, the infected person becomes irritable, restless, and sweaty. Bleeding appears as tiny spots of blood on the skin and larger patches of blood under the skin. Minor injuries can cause bleeding. These symptoms are followed by a shock-like state.



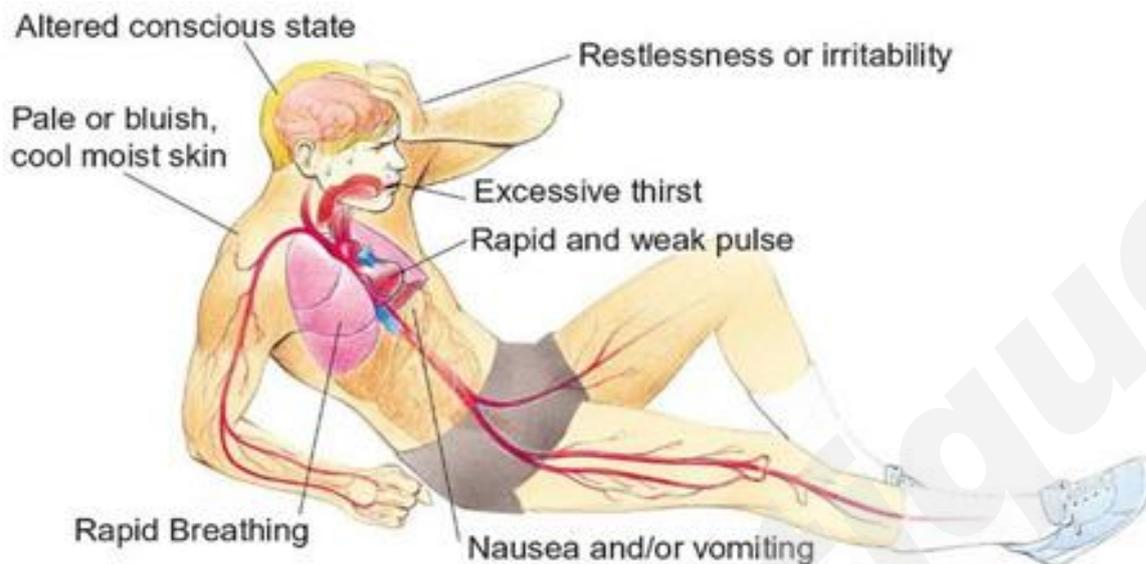
## What is shock-like state?

Shock is a life-threatening medical condition and is a medical emergency. Patients in shock-like state are suffering from a serious condition in which the body is not able to get enough blood to all the parts of the body. Shock can lead to other complications such as lack of oxygen in the body tissues, heart attack or organ damage.

There are **four types** of shock:

- Cardiogenic shock: heart weakens, stop pumping, or pumps irregularly
- Haemorrhagic shock: loss of blood internally or externally
- Neurogenic shock: dilation of arteries caused by damage to the brain or spine
- Anaphylactic shock: severe allergic reaction

Dengue patients are suffered with **haemorrhagic shock**.



**There are no specific dengue therapeutics. What are the challenges to vaccine development?**

Infection by one of the four serotypes of dengue virus has been shown to confer lasting protection against homotypic re-infection, but only transient protection against a secondary heterotypic infection. Moreover, secondary heterotypic infection is associated with an increased risk of severe disease.

**What is homotypic infection?**

Patients are infected by **one of the four serotypes** of dengue virus.

**What is secondary heterotypic infection?**

Patients are infected with one of the four serotypes of dengue virus **BEFORE** and are infected for the **SECOND TIME**. This time, the patients are infected with another serotype of dengue virus.

An **ideal dengue vaccine** should produce life-long protective immune response in the form of neutralising antibodies that are **equally effective against all the four serotypes of dengue virus (DENV 1 to 4)**. Currently, empirical adjustment of the doses of each of the four dengue virus serotypes still remains as a challenge in development of a tetravalent live attenuated dengue virus vaccine. More researches are required to establish an ideal dengue vaccine.

### If you found this article interesting, you are interested in **Virology and Immunology!**

You will study the immune system and how it controls infection. You will also learn about autoimmune diseases that can occur if the immune system attacks the body's own tissues rather than an infectious agent. In addition, you will review the main viral diseases of humankind in terms of their natural history, biology, molecular biology, immunology, pathogenesis and epidemiology. These include HIV, hepatitis B and C, papilloma, influenza and measles, among others. You will learn about cutting-edge issues in virology and immunology, including emerging viruses such as the Ebola and Zika viruses.

### What are the entry requirements for Genetics degrees?

Minimum of ABB/ABC/BBB in A-Level:

- Chemistry
- Biology
- Physics
- Mathematics

### What are the course structure and assessment methods?

Lectures, seminar, independent studies and study in industry is available by transfer after securing a placement during the second year.

### What careers are possible with a Virology and Immunology Degree?

Graduates from Virology and Immunology can go into a range of careers:

**Academic:** Teaching, work in scientific research and development (may require significant postgraduate study, usually a PhD)

**Industrial:** Research and development scientist (infectious disease scientist, researcher at immunobiology centre or vaccine research pharmaceutical companies.)

**Top Ten Universities (2017) that specialise in Virology and Immunology:**

1. Harvard University
2. University of California – San Francisco
3. Johns Hopkins University
4. Washington University in St. Louis
5. Yale University
6. Rockefeller University
7. University of Oxford
8. Massachusetts Institute of Technology
9. University of Pennsylvania
10. University of Washington



*tailor-made education*  
**boutique**  
**consultancy**

**Prepared by,**

**1<sup>st</sup> March 2018**

**Dr Catherine Tan**

**PhD in Pharmacology & Toxicology, UPM Malaysia**

**Registered Chemist of Royal Chemistry Society, United Kingdom**

**Principal Consultant in Chemistry Boutique Consultancy**

**Email: [drtan@chemistryboutique.com](mailto:drtan@chemistryboutique.com)**