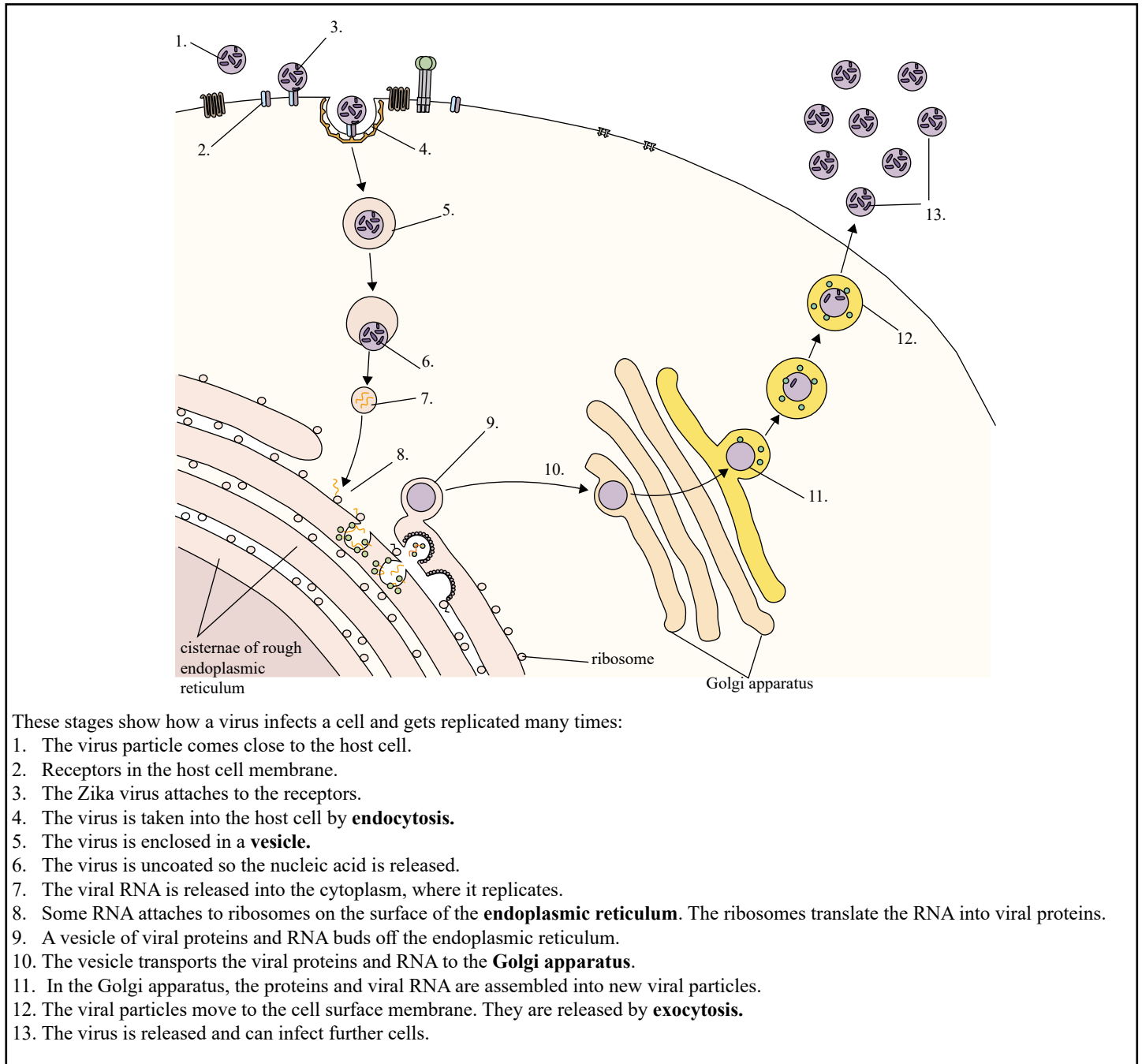






Fig. 4 Showing how the Zika virus is replicated within a host cell



### Zika and Microcephaly

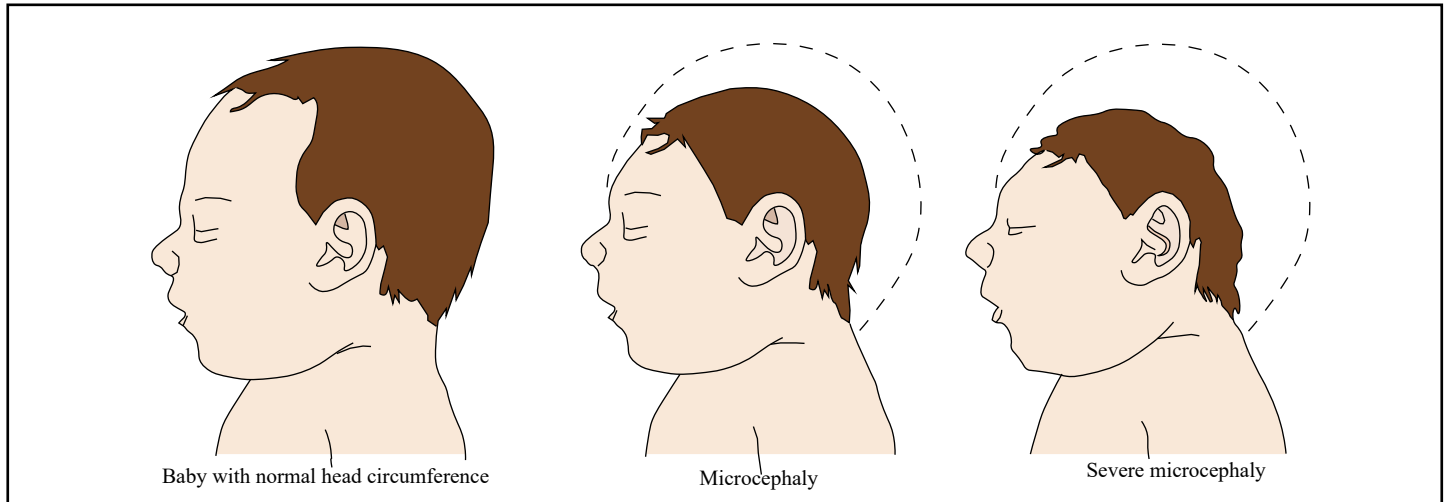
In August 2016, the World Health Organisation (WHO) declared the Zika virus a global public health emergency. The infection was linked to thousands of babies being born with undeveloped brains. This is called **microcephaly**. A state of emergency was declared in some areas where doctors described the disease as being a '**pandemic** in progress'. Some doctors even advised that women in affected countries should avoid getting pregnant.

Microcephaly is a condition where a baby is born with a very small head. Sometimes the baby's head stops growing after birth. Babies born with this condition suffer all sorts of developmental problems. They may have **convulsions** (fits) or have physical or learning difficulties. There is no cure or treatment for microcephaly.

There are many other causes of microcephaly. These include:

- Chromosomal abnormalities
- A lack of oxygen to the developing brain
- Exposure of the mother to certain toxins during pregnancy.

There is a growing consensus that the Zika virus is also a cause of microcephaly.

**Fig. 5 Showing the effect of microcephaly on the development of a baby's head**

The Zika virus very rarely leads to death. However, experts believe that Zika is linked to complications of pregnancy such as miscarriage, stillbirth, premature birth, and eye problems. Zika can be spread by sexual intercourse and passes through the placenta. However, scientists believe that the virus will not affect babies who are conceived after the virus has been cleared from the mother's blood

It is only recently that Zika virus has been associated with microcephaly. Having looked at the evidence, scientists in Brazil now believe that the outbreak of microcephaly and other birth defects are more likely to be due to the overuse of large amounts of banned **pesticides**. The poor sanitation, widespread deficiency of vitamins and minerals amongst certain populations in South America, and the exposure to pollution and toxic pesticides have been positively linked to birth defects.

### Control of Zika Virus

Unlike malaria and dengue fever, Zika virus rarely causes the death of a patient. However, all three are transmitted by mosquitoes. To control the spread of these diseases, mosquitoes need to be targeted.

There are several ways that mosquito bites can be prevented.

- Cover up bare skin in the evening when the female mosquitoes are active.
- Wear an insect repellent like lemon and eucalyptus.
- Sleep under a mosquito net.

Killing mosquitoes would prevent them acting as a vector. There are several ways in which mosquito numbers can be reduced:

- Spraying with insecticide.
  - This method was quite successful in many countries. However, when a disease seems to be under control, the programme of extermination is often stopped.
  - Many insecticides are extremely dangerous to human health and other wildlife.
  - Mosquitoes rapidly develop resistance to pesticides and these no longer kill the insects.
  - Many countries are unable to pay for extensive eradication programmes.
- Treating wetland areas.
  - Mosquitoes lay their eggs in water. Removing water also removes eggs and insect larvae. Clearing up sources of stagnant water from bird baths and swimming pools will help remove breeding sites.
  - Spraying with detergent. Detergent breaks the surface tension of water so eggs that are laid in rafts on the surface of water will sink. Larvae that rely on surface tension will also drown. Unfortunately, beneficial insects who lay their eggs in water are also harmed.

Other methods that have been trialled include:

- The mass release of male insects that have been **sterilised** by low doses of radiation. Sterile males mate with the females. The eggs that are laid cannot develop.
- **Biological control** uses male mosquitoes carrying a bacterium called *Wolbachia*. These bacteria are safe for humans and other mammals. Females mate with males that are infected with the bacteria and the eggs do not hatch.
- Fish which eat mosquito larvae have been introduced into the waters in fishing communities.

### Zika Vaccine

Zika virus is a disease that is not life threatening. It is usually mild and there is no specific treatment. A person who contracts the disease needs to drink plenty of fluids, treat any pain or fever with paracetamol, and get plenty of rest.

There is no vaccine available.

**Exam Questions**

1. Select the most suitable answer to the questions from the list of options:

A. The pathogen causing Zika fever is:

- a mosquito
- a DNA virus
- an RNA virus
- a bacterium

B. Zika fever was named after:

- a virus that causes the disease
- the Zika mountains in Brazil
- Zika, the scientist who first identified the disease
- the Zika forest in Uganda

C. Zika fever is treated:

- by vaccination
- using antibiotics
- injections of insulin
- paracetamol and bed rest.

D. The vector of the Zika fever is:

- Aedes* mosquito
- Plasmodium falciparum*
- Blood sucking mites
- Anopheles* mosquito

DI. Which disease has symptoms similar to Zika fever?

- Malaria
- Dengue
- Amoebic dysentery
- Sickle cell anaemia

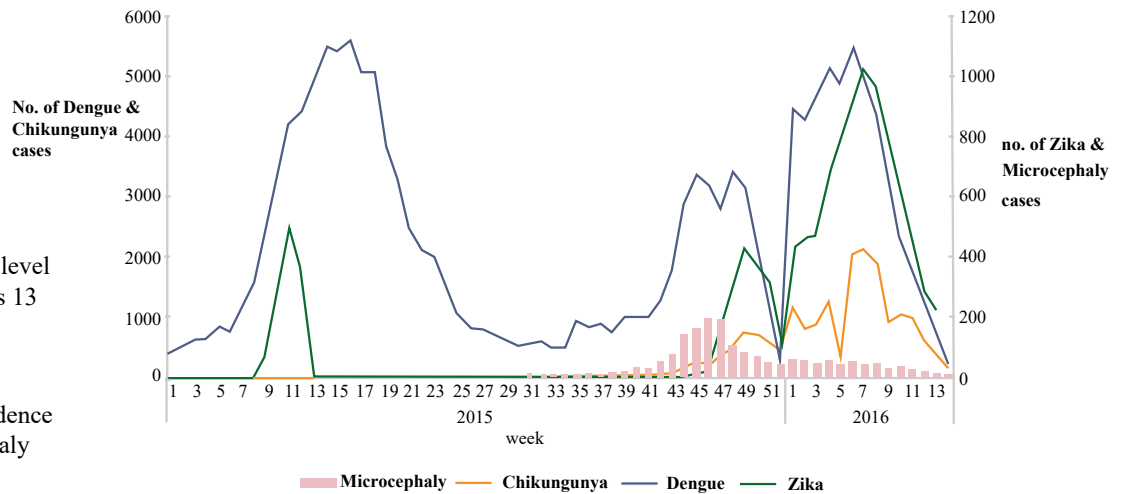
2. The graph below shows the number of cases of microcephaly and the viral diseases Zika fever, dengue fever and Chikungunya.

A. What common vector is responsible for the spread of Zika and Dengue fevers?

B. Describe the trend for the number of cases of Zika virus that is shown in the graph.

C. Suggest reasons for the low level of Zika virus between weeks 13 and 45 in 2015.

D. Describe and explain the correlation between the incidence of Zika virus and microcephaly show on the graph.

**Answers**

Question 1

A. iii. B. iv. C. iv. D. i. E. ii.

Question 2

A The mosquito.

B In 2015:

- The number of cases of Zika increased from 0 to 500 between week 7 and week 11.
- The number of cases then dropped to 0 until week 42 or 43
- Following this, there was a further increase in cases up to 420.
- The number of cases then halved in week 52.

In 2016:

- The number of cases increased up to 1100 in week 10.
- The numbers then declined to 20 by week 13.

C The number of cases of Zika is 0, This could be due to:

- A successful mosquito eradication programme.
- Draining stagnant water.
- Very dry conditions so that mosquitoes have no water in which to lay their eggs.

D Early in 2015:

- There is a spike in the number of Zika cases.
- During this time, there are no cases of microcephaly.

Later in 2016:

- There are a growing number of cases of microcephaly (up to a maximum of 200), which drop to 5 during week 13.
- The number of cases of Zika fever increases after the rise in the microcephaly cases.

The graph does not show a clear correlation between the increasing number of cases of Zika and the incidence of microcephaly. This could be because:

- The virus does not cause the disease.
- Environmental pollution levels were high.
- The area was sprayed with toxic pesticides.

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