GCSE Biology B (Twenty First Century Science)

J257/03 Breadth in Biology (Higher)

Question Set 6

1 The female mosquito *Aedes aegypti* is responsible for the transmission of diseases such as Zika virus.

In May 2015, Zika virus was reported in Brazil and began to spread rapidly.

The mosquito feeds mainly on human blood. The virus is spread when a female *Aedes aegypti* mosquito bites an infected human and then bites an uninfected human.

(a) (i) Zika virus is a communicable disease.

Visitors to Brazil in 2016 were concerned that they could become infected with the virus. There is no vaccination for this virus.

Explain what a communicable disease is and suggest how a visitor to Brazil could reduce the risk of becoming infected with Zika. **[2]**

A communicable disease can be spread from organism to organism. The risk can be reduced by using insecticide.

(ii) The first ever human case of Zika was discovered in Nigeria in 1954. The timeline below shows how Zika spread.

1954		1977–78		2007		2013		2015
Nigeria	→	Pakistan, Malaysia, Indonesia	→	Micronesia	→	French Polynesia	→	Brazil

The Zika virus can also be transmitted by sexual intercourse.

People were concerned that hosting the Olympic games in Brazil in 2016 would increase the spread of the virus to other countries. **[2]**

Suggest how the virus could be spread to other countries **and** how this could be prevented.

An infected person having sex with an uninfected person from a different country. Can be prevented by using a **Condom.**

(b) (i) The mosquito responsible for the spread of Zika has become resistant to some of the insecticides used to kill it. **[3]**

Explain how a population of mosquitos could have become resistant to an insecticide. Mutation of DNA created resistant allele to insecticide which allowed resistant mosquitos to survive. This allele gets passed on to subsequent generations and becomes common.

(ii) One way scientists tried to solve the problem was to make genetically engineered mosquitoes that had a 'kill switch' gene. This gene caused the mosquitoes' offspring to die. **[3]**

Describe the steps a scientist would use when genetically engineering a mosquito to have the 'kill switch' gene.

First isolate the gene. Then copy the gene and insert into the GM mosquito cells using a vector / plasmid.

(iii) The 'kill switch' gene codes for the production of a protein called tTAV.

The tTAV protein blocks the transcription of other genes essential for mosquito survival.

When breeding the mosquitos in the laboratory a chemical called tetracycline is used. Tetracycline binds to the tTAV protein and deactivates it.

Suggest why scientists use tetracycline when breeding the genetically engineered mosquitos.

It only kills the offspring not the original breeding mosquito. **[1]**

(iv) Scientists thought using genetically engineered mosquitos was a better solution than using insecticide

.Do you agree?

Explain your reasons.

[3]

Yes, because insecticides can be toxic to other insects. Killing other insects would affect the food chain.

Total Marks for Question Set 6: 14