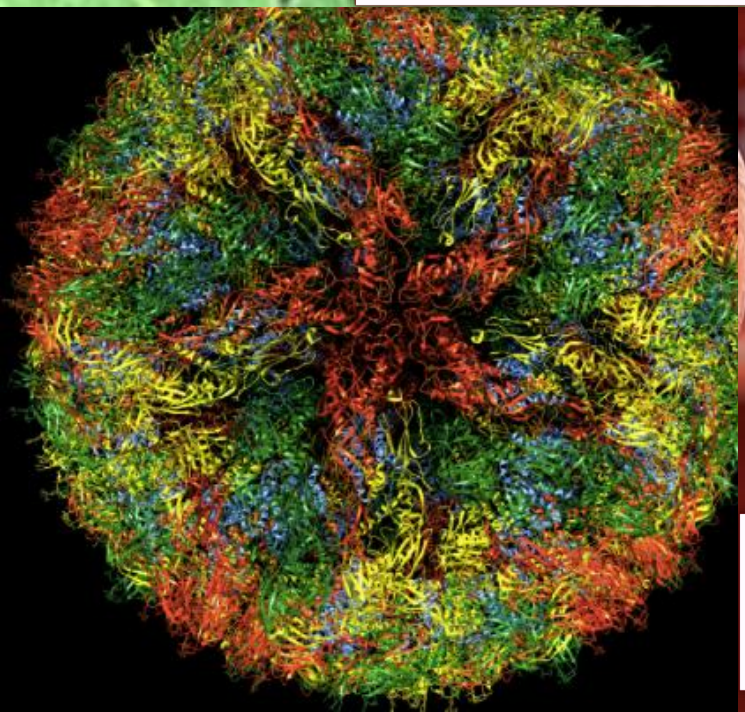
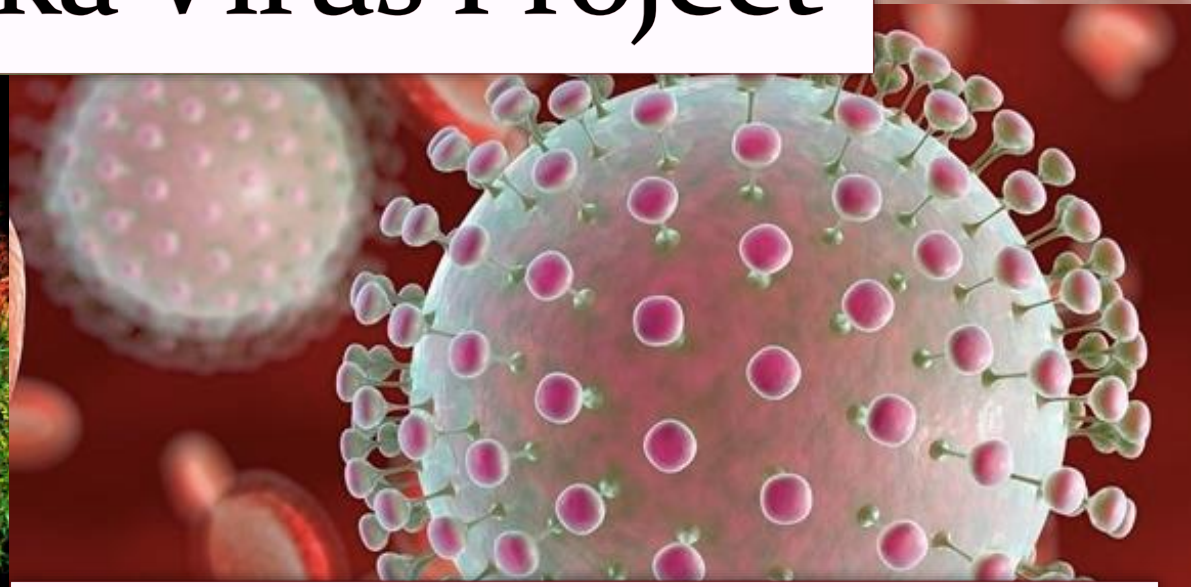
The Zika Virus Project





Juliana Minett

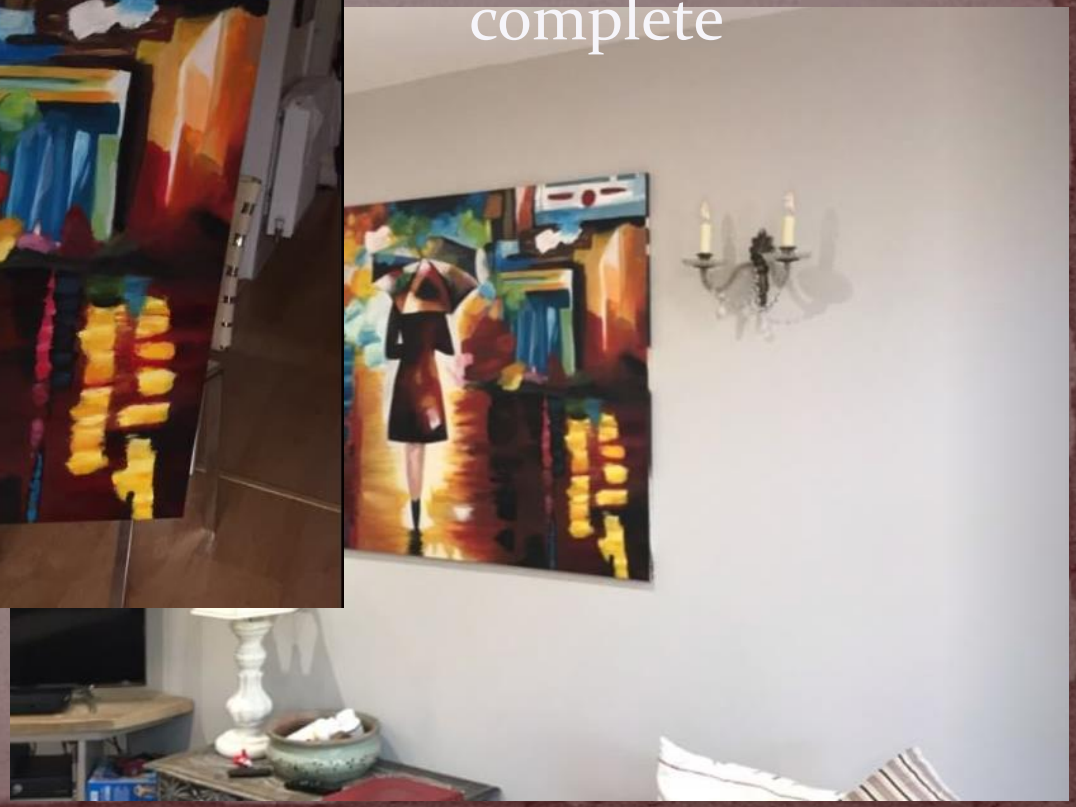
Year 9-10, Sawston Village College

- I was kindly supported by the Henry Morris Memorial Trust Fund
- I was awarded a grant of £300
- I raised an extra £600 that went towards my project

Fundraising £600

Art Commission Number 1

- I sold this for £300
- It took me 3 months to complete



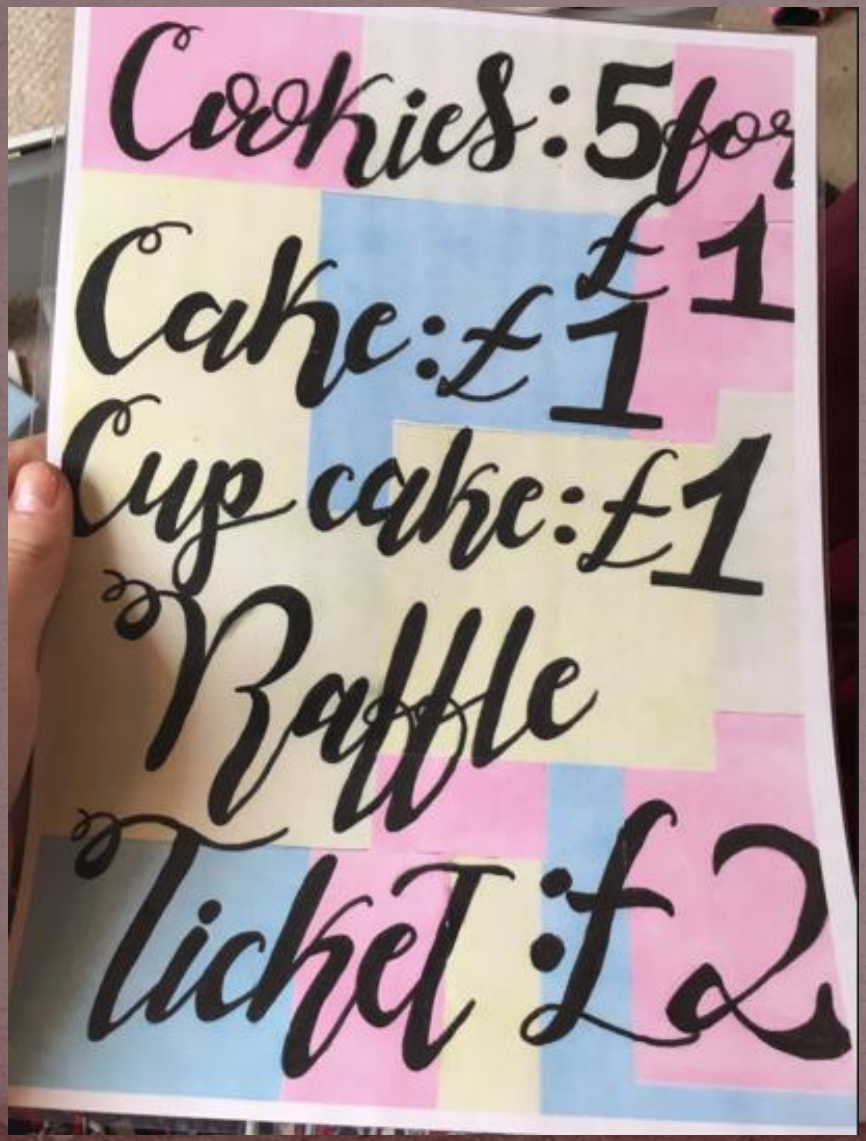
Art Commission Number 2

- I sold this one for £100
- It took me around five hours to complete – I did this all in one sitting!

Macaroons and Cake

- I sold these for £20
- It took me an entire day to bake each of these

School Cake Sale



- Made £50
- Took me a weekend to bake all the cakes
- I ended up not doing the raffle ticket sale, as there was no need for it

This is the Receipt (the total)

Who?	Date	Amount	Amount left to pay
School (HMMTF)	30-Mar	£300	849-300= £549
Granpa (Painting)	16-Apr	£50	549-50= £499
Mae (Macarons)	17-Apr	£10	499-10= £489
Mae(Cake)	26-Apr	£10	489-10= £479
Domi(Receipt)	01-May	£19	479-19= £450
Fede's Mum (painting)	11-May	£150	450-150= £300
Cake Sale	15-Jul	£50	300-50= £250
Fede's Mum (painting)	06-Sep	£150	250-150= £100
Deda Painting	05-Sep	£100	100-100= £0

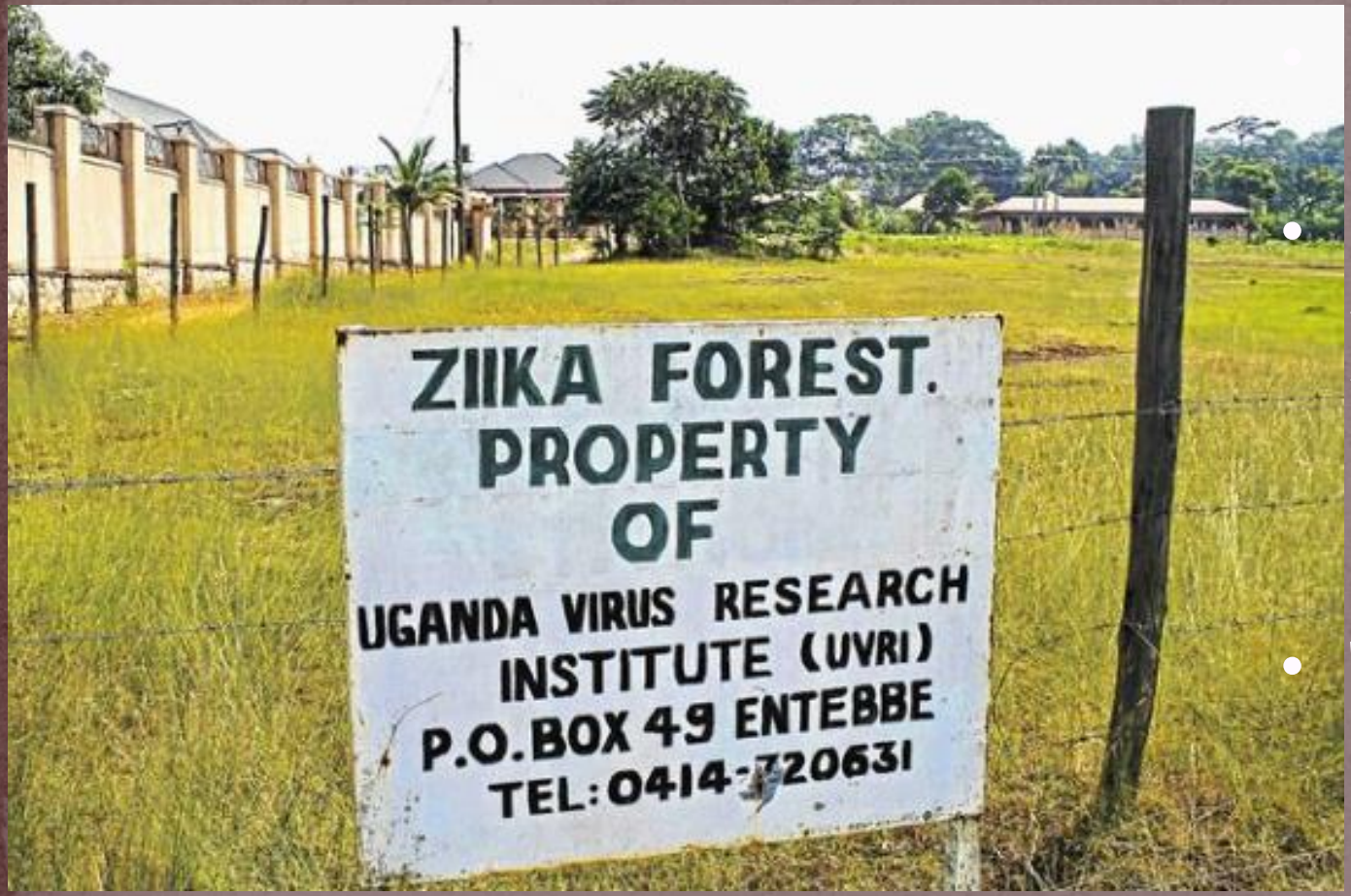
My Zika Research Trip to Brazil

Prof Dr Marcelo Nascimento Burattini

Department of Infectious disease, UNIFESP

I visited him on the 24/08/17

Where the Zika Virus Began…



- It began in Uganda.
- It went unnoticed because it only infected animals.
- There were only small and brief outbreaks.

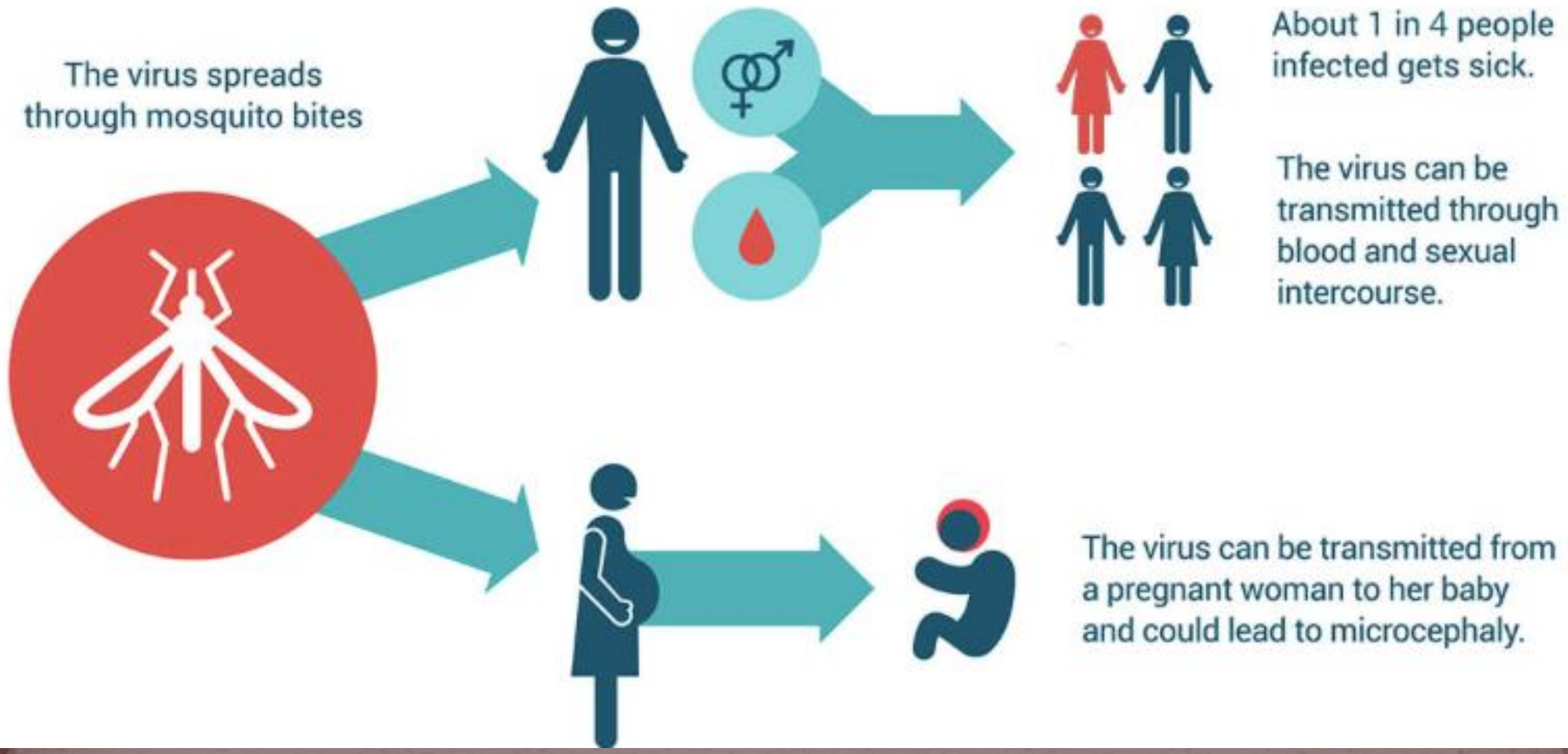
How It Spread…

Why there was little emphasis on the Virus before Brazil

- The virus is a **contributing** factor to microcephaly
- Microcephaly often occurs within the poor
- The reasons highlighted are common within the poor
- This means that one of these reasons plus Zika will lead to microcephaly

Microcephaly usually is the result of abnormal brain development, which can occur in the womb (congenital) or during infancy. Microcephaly may be genetic. Other causes may include:

- **Craniosynostosis.** The premature fusing of the joints (sutures) between the bony plates that form an infant's skull keeps the brain from growing. Treating craniosynostosis (kray-nee-o-sin-os-TOE-sis) usually means your infant needs surgery to separate the fused bones. If there are no underlying problems in the brain, this surgery allows the brain adequate space to grow and develop.
- **Chromosomal abnormalities.** Down syndrome and other conditions may result in microcephaly.
- **Decreased oxygen to the fetal brain (cerebral anoxia).** Certain complications of pregnancy or delivery can impair oxygen delivery to the fetal brain.
- **Infections of the fetus during pregnancy.** These include toxoplasmosis, cytomegalovirus, German measles (rubella) and chickenpox (varicella).
- **Exposure to drugs, alcohol or certain toxic chemicals in the womb.** Any of these put your baby at risk of brain abnormalities.
- **Severe malnutrition.** Not getting adequate nutrition during pregnancy can affect your baby's development.
- **Uncontrolled phenylketonuria (fen-ul-kee-toe-NU-ree-uh), also known as PKU, in the mother.** PKU is a birth defect that hampers the body's ability to break down the amino acid phenylalanine.


The virus spreads through mosquito bites
About 1 in 4 people infected gets sick.
The virus can be transmitted through blood and sexual intercourse.
The virus can be transmitted from a pregnant woman to her baby and could lead to microcephaly.

Prof Dr Marcelo Lima

Department of Biochemistry, UNIFESP

I visited him on 29/08/17

How does Zika enter the nervous system?

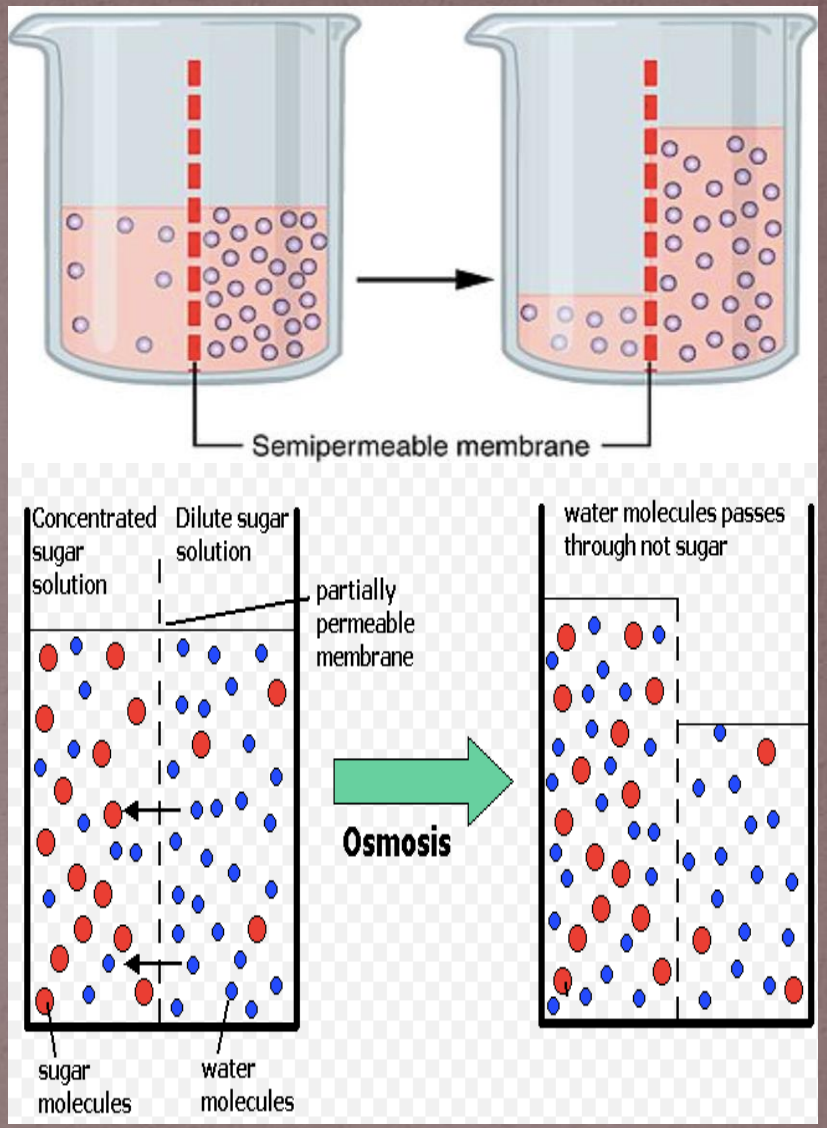
- It enters the blood-brain barrier
- Not many things can pass through
- The virus has receptors that can enter the brain cells via osmosis

Artwork: Juliana Minett

Osmosis

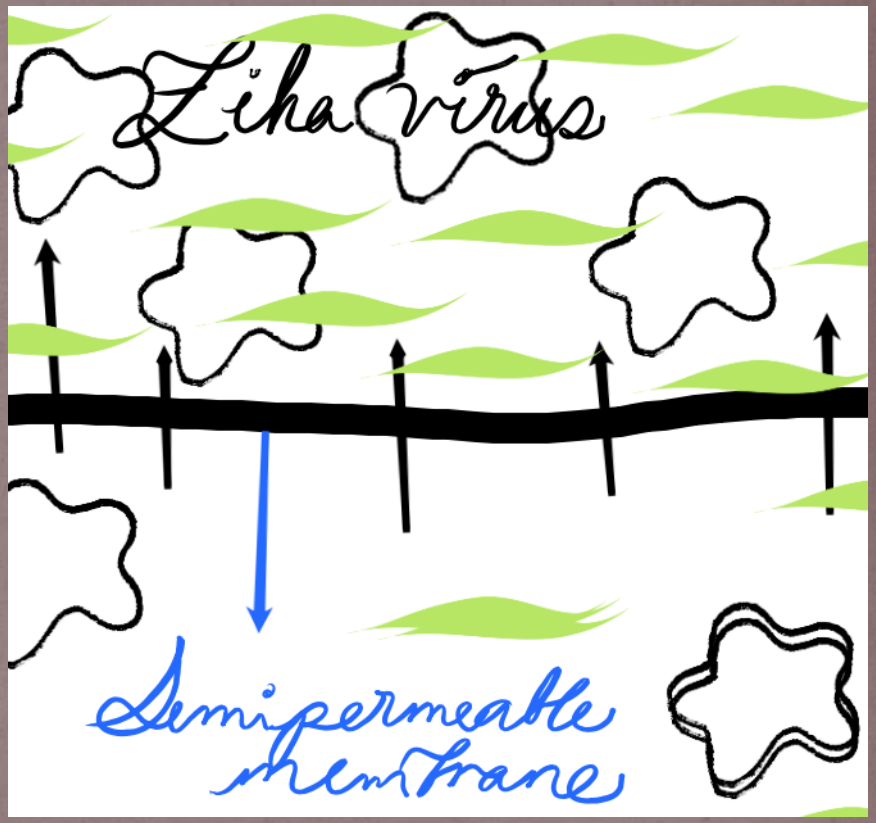
To understand Zika, osmosis needs to be understood too

- Particles go from a low to a high concentration
- They pass through a semi permeable membrane
- The membrane will only allow **some** particles to pass through



Why can Zika pass through?

- As the Zika virus is positively charged it can pass through the negative membrane
- Opposite charges attract each other



Artwork: Juliana Minett

Why other viruses cannot pass through

- **Extremely strong positive charges pass through**
- **Other viruses have positive charges in their genetic code**
- **But enough to pass through**

P	P	F	G	D	S
Y	I	V	I	G	V
G	E	K	K	I	T
H	H	W	H	R	S

This is the genetic code of the Zika virus

K, R, S have a positive charge. As you can see, there are many positive charges at one spot

This does not mean there is no hope

- The Japanese Encephalitis virus is similar to Zika
- They both affect the nervous system
- It causes brain swelling, so it can also pass through the blood-brain barrier
- There is a cure for the Japanese virus

Prof Dr Edward Araujo Junior

Department of Gynaecology and Obstetrics, UNIFESP

I visited him on 01/09/17

Pregnancy

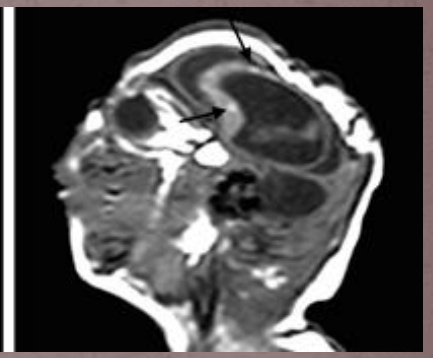
- The further along the pregnancy, the less likely the baby will develop microcephaly

- Microcephaly is a small head circumference

Foetus symptoms

- Severe microcephaly
- Eye deformity
- Twisted feet
- Brain calcification (shows it is diseased)
- Cracked skull
- Holes in skull, mainly at the top

Normal brain



Microcephaly due to Zika Virus

Baby Symptoms

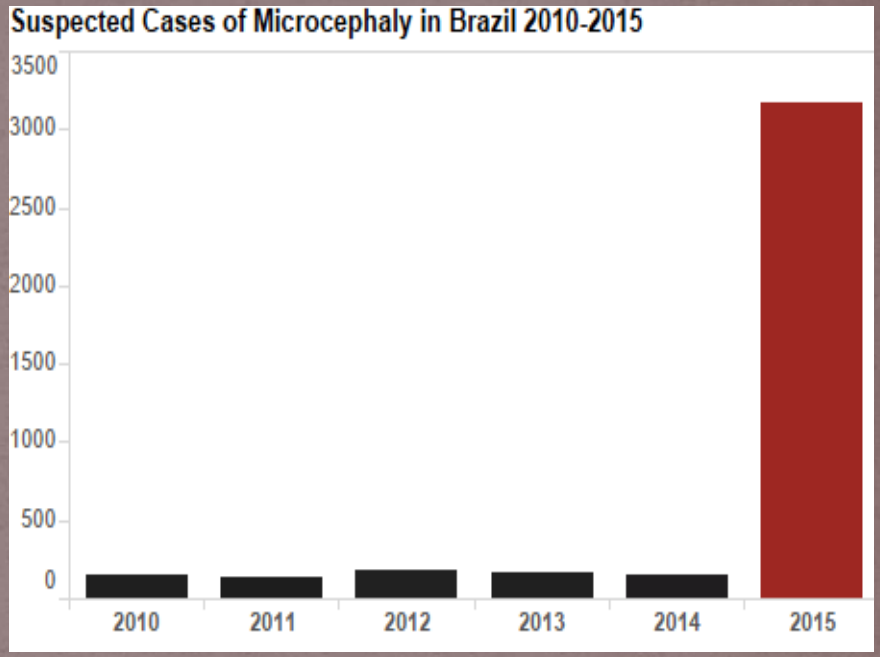
- Hyper flexibility
- Irritability
- Convulsion
- Prominent eyes
- Small cerebrum
- Small eyes
- White eyes

Adult Symptoms

- Only 20% of people show symptoms
- 90-100% of the time you'll get rashes
- 50-90% of the time you'll get conjunctivitis (redeyes)
- 60% of the time you'll get moderate itching
- The symptoms aren't severe

Facts and Statistics

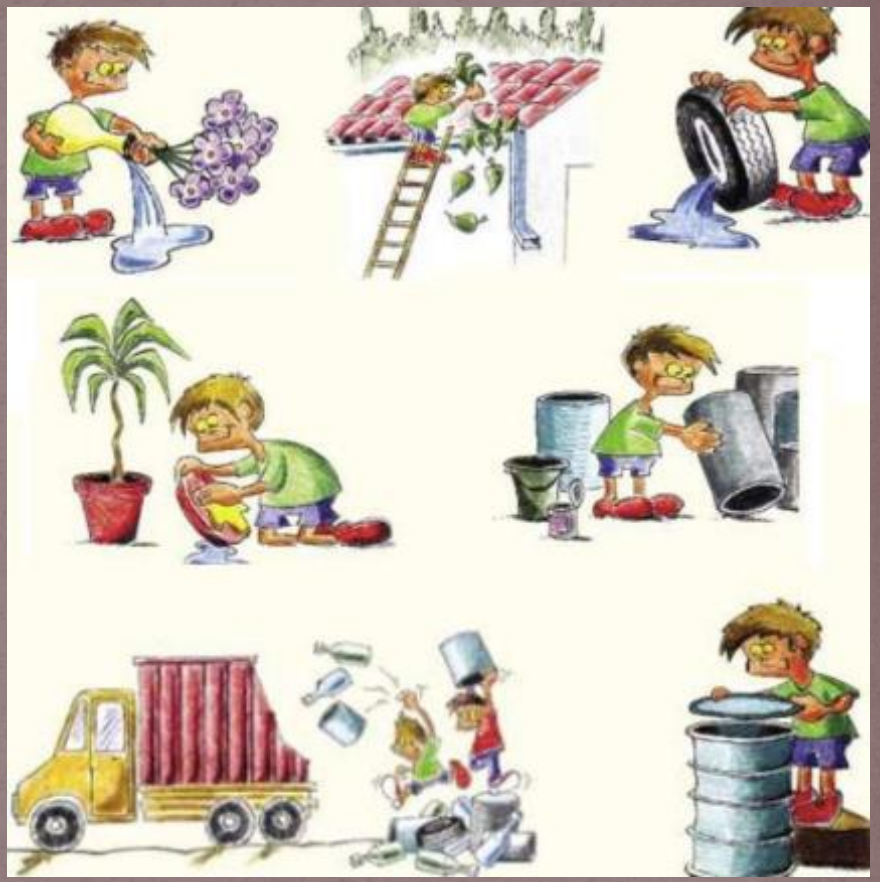
- Microcephaly cases went up by 2000% from 2010-2015
- 2015: 7400 notified microcephaly cases
- 1300 confirmed cases
- Many patients don't have timely access to healthcare



Source: Brazilian Ministry of Health

How to prevent it…

- Use mosquito nets to capture the mosquito
- Use a repellent (but can be harmful to kids)
- Empty still water so mosquito eggs cannot survive



Prof. Dr. Marcelo Masrhua

Department of Neuropaediatrics, UNIFESP

I visited him on 22/08/17

Case One

- 2y, girl
- She was born with normal head
- But her head did not develop normally
- She has microcephaly
- She does not have any friends
- Eats only liquefied food and sweets
- Cannot speak or understand language

Case One

- Family had to move home as there were no Neuropaediatricians in their area
- They felt that they did not receive enough support from the healthcare system

Case Two

- 4y, female
- She got microcephaly when 8 months old
- She goes to school, but does not socialize
- Sometimes, she stops breathing
- Breathing pause lasts for about 1 min and occasionally overlaps
- She has around 50 per day

Case Two

- Her family also had to move away to find a Neuropaediatrician
- They also did not receive enough support
- Her parents had to find new jobs
- She goes to physiotherapy twice a week
- The journey itself takes longer than the physiotherapy
-

Case Three

- 2y, girl
- The backstory is very sad and distressing
- The mother was 17 when her own father raped her. She became pregnant
- Abortions are controversial in Brazil, because of Catholicism
- Many view it as immoral and it is illegal there
- It is only legal in two circumstances: rape and risk of death to the mother
- Even though she was raped she did not get the abortion

Case Three

- The baby was born with microcephaly and lives in a hospital
- She does not go to school
- She cannot speak or understand language
- The child cannot focus on things such as toys, sounds and TV
- She physically cannot eat
- The baby can barely breathe, she is tubed: both to eat and to breathe

Case Three

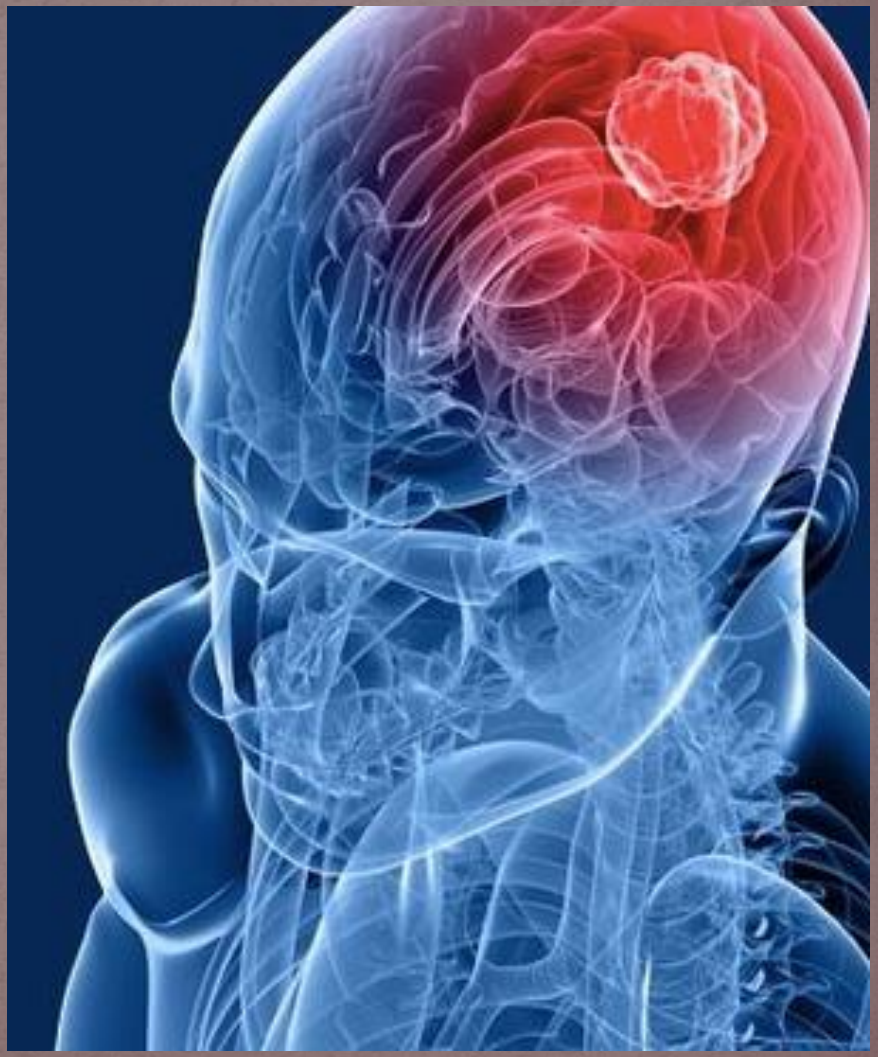
- The mother spends 14-20 h/day with her baby
- The mother has currently paused her university education
- Her aunt spends the remainder of the time with the baby
- They say that the healthcare system has been supportive

- Fortunately, the father was put in jail

Latest hopes and news for the Zika virus

How Zika could be used to kill brain tumours

- Since it can pass through the blood brain barrier, Cambridge scientists have hope that it might be used to cure cancer
- "We hope to show that the Zika virus can slow down brain tumour growth in tests in the lab…" - Dr Harry Bulstrode, a Cancer Research UK scientist at the University of Cambridge



Disclosure

The patients' pictures used in this presentation are representative of microcephaly. They are in the public domain and downloaded from the internet. They are not of the patients I interviewed.

Acknowledgement

- I am really grateful for the Henry Morris Memorial Trust Fund for giving me this amazing opportunity to develop my project.
- Special thanks to Drs Marcelo Masrhua, Marcelo Burattini, Marcelo Lima and Edward Araujo Jr, who generously gave me their time and enthusiasm.

What I have learnt with this project

- Insight in how to write a grant application
- How to organise a cost analysis and plan a budget
- To be proactive in developing my art skills to raise money
- To communicate with health professionals
- I developed my scientific skills
- I developed my humanistic communications with patients and families
- How social values effect life-changing decisions
- Insight in how to convey my findings and ideas in form of a report

I hope you enjoyed my presentation