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Modes of Disease Transmission- Summary

Contact Transmission

- Can be direct, indirect, or by droplets
- Direct contact requires body contact between individuals
- Indirect contact occurs through fomites
- Droplet: occurs when a person coughs, sneezes, or speaks near others

Vehicle Transmission

- Nonliving carrier of an infectious agent from its reservoir to a susceptible host
- Water
- Air
- Food

Vector-Borne Transmission

- Vectors: Living organisms that transmit disease to humans
- Most vectors are arthropods: ticks, flies, fleas, lice & mosquitoes

Examples:

Direct contact- Rabies, staphylococcus infections

Indirect contact- Tetanus, common cold

Airborne- chicken pox, TB

Waterborne- Cholera

Foodborne- Hepatitis A, typhoid

Vector transmission- Malaria, yellow fever

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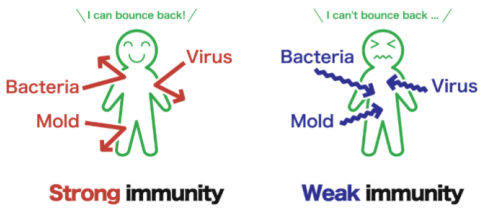
What causes symptoms of a disease?

Function of immune system: Protects the body from pathogens

If pathogen overcomes the defenses of your immune system, it damages the tissues and kills host cells



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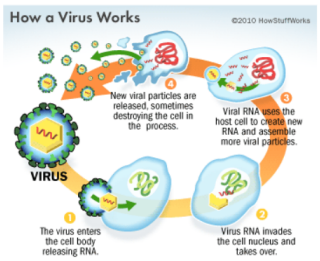
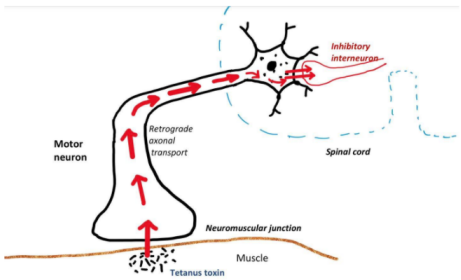
How do pathogens damage the host?



Viruses take over the host cell's genetic and metabolic machinery and cause death of cells

Toxins are poisonous substances produced by microorganisms. They may cause serious effects and sometimes death

Ex: Tetanus toxin



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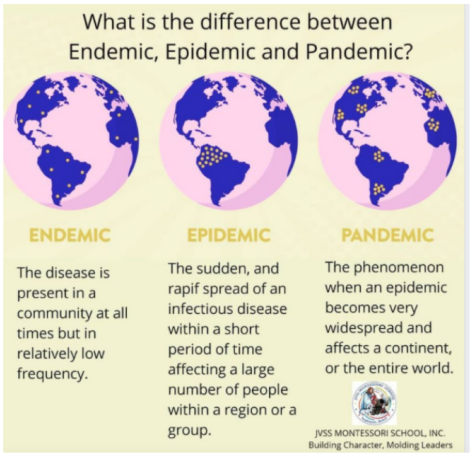
Patterns of disease



Ex: Malaria, cholera

Ex: Nipah, SARS etc

Ex: Covid-19 pandemic

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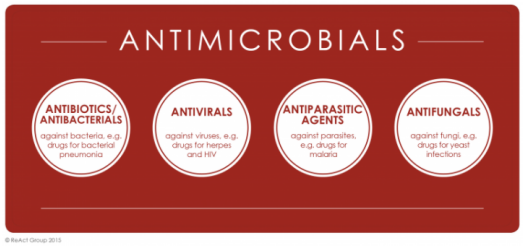
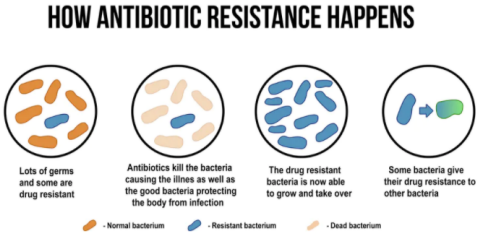
Treating diseases





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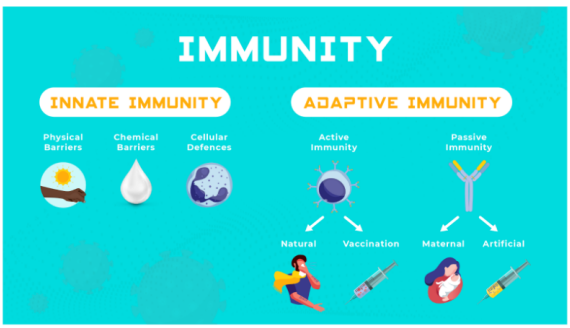
Defense against infectious diseases



Immunity is the capability of organisms to resist harmful microorganisms

Innate immunity- Innate immunity refers to nonspecific defense mechanisms that come into play immediately or within hours of an antigen's appearance in the body.

Adaptive/aquired immunity: Adaptive immunity refers to antigen-specific immune response.

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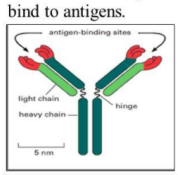
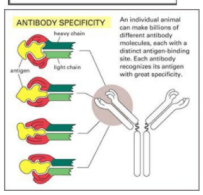
Antigen and antibody

ANTIBODY

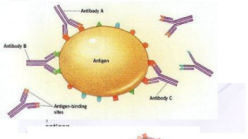
Proteins that recognize and bind to antigens.





ANTIGEN

- A protein on a foreign object that stimulates the immune system to produce antibodies.
- A virus, bacteria, toxin, ... that trigger the immune response.



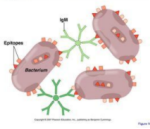
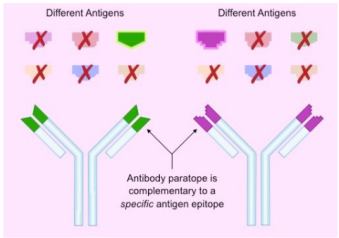


Figure 9.7



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INNATE IMMUNITY
Barriers

- Physical
  - skin
  - hair
  - mucous
- Chemical
  - Acid gastric secretion
  - Lysozyme (tears, saliva)
  - Low pH of Skin
  - Gastric & Duodenal enzymes
  - Antibodies & inhibitors
  - Inteferons
  - compliment proteins
  - Antimicrobial peptides

INNATE IMMUNE DEFENSES

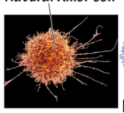
Cells

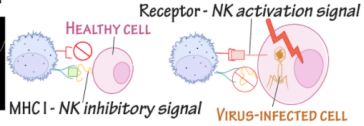
Leukocytes

- Phagocytose microbes
- Neutrophil
- Macrophage

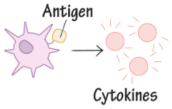
- Release inflammatory molecules
- Eosinophil
- Mast Cell

Natural Killer Cells





Dendritic Cells



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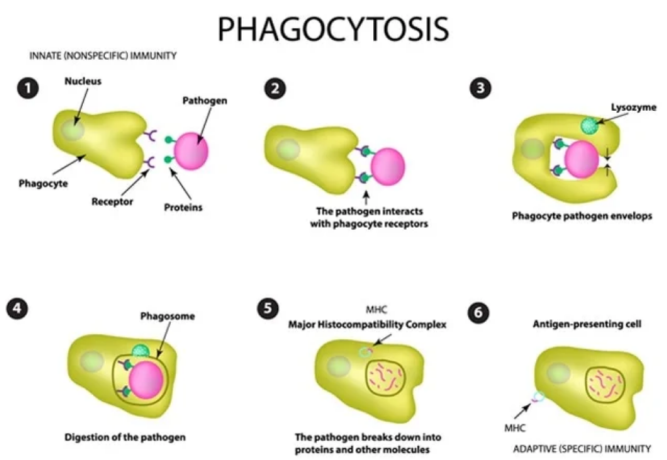
Phagocytosis



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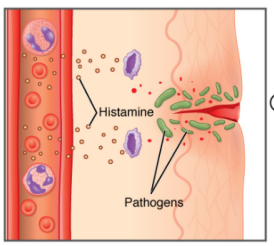
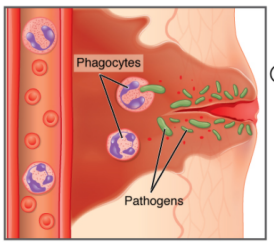
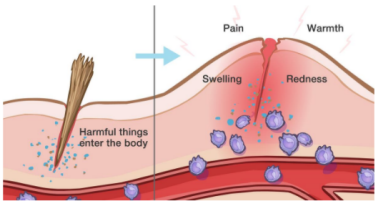
Inflammation



1 Mast cells detect injury to nearby cells and release histamine, initiating inflammatory response.



2 Histamine increases blood flow to the wound sites, bringing in phagocytes and other immune cells that neutralize pathogens. The blood influx causes the wound to swell, redden, and become warm and painful.



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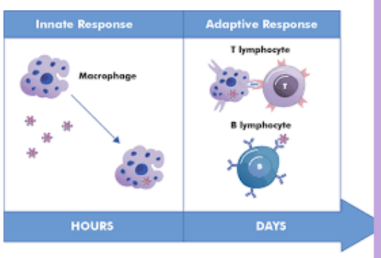
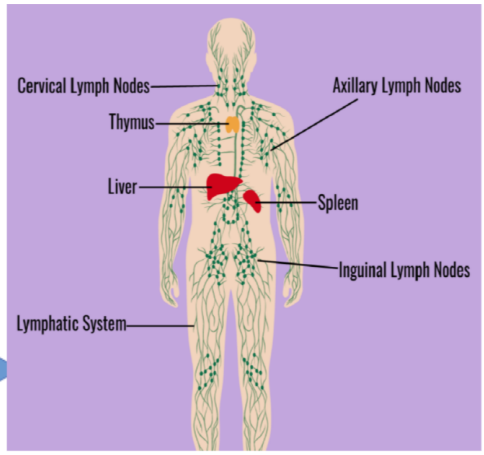
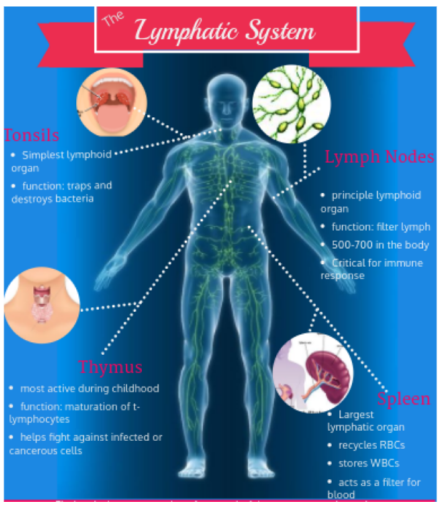
Acquired/adaptive immunity

Adaptive immunity is the immunity you develop over your lifetime



Lymphatic system

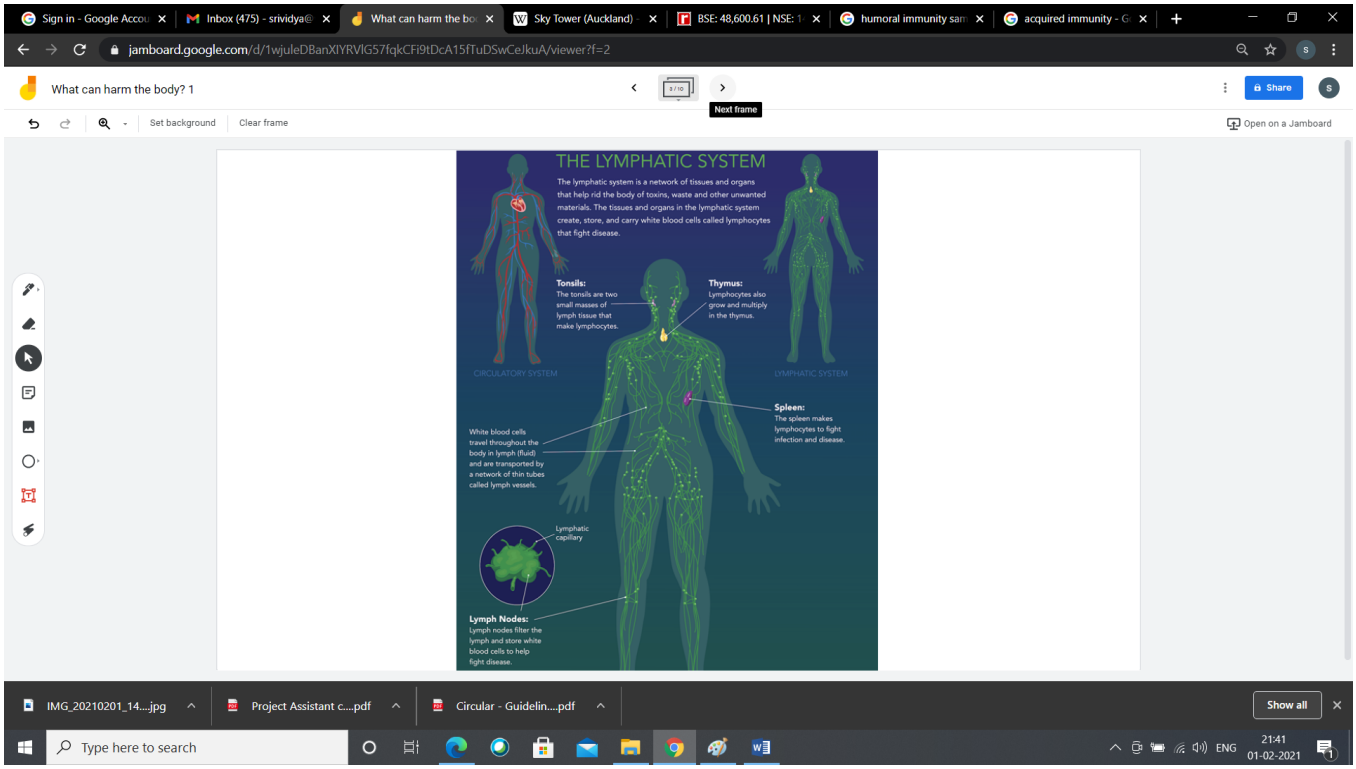




Functions:
Get rid of waste and toxins by the transportation of lymph fluid.

Lymph fluid contains WBCs that fight infections

Lymphocytes are white blood cells that are also one of the body's main types of immune cells.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THE LYMPHATIC SYSTEM
The lymphatic system is a network of tissues and organs that help rid the body of toxins, waste and other unwanted materials. The tissues and organs in the lymphatic system create, store, and carry white blood cells called lymphocytes that fight disease.
Tonsils:
The tonsils are two small masses of lymph tissue that make lymphocytes.
Thymus:
Lymphocytes also grow and multiply in the thymus.
CIRCULATORY SYSTEM
LYMPHATIC SYSTEM
Spleen:
The spleen makes lymphocytes to fight infection and disease.
White blood cells travel throughout the body in lymph (fluid) and are transported by a network of thin tubes called lymph vessels.
Lymphatic capillary
Lymph Nodes:
Lymph nodes filter the lymph and store white blood cells to help fight disease.
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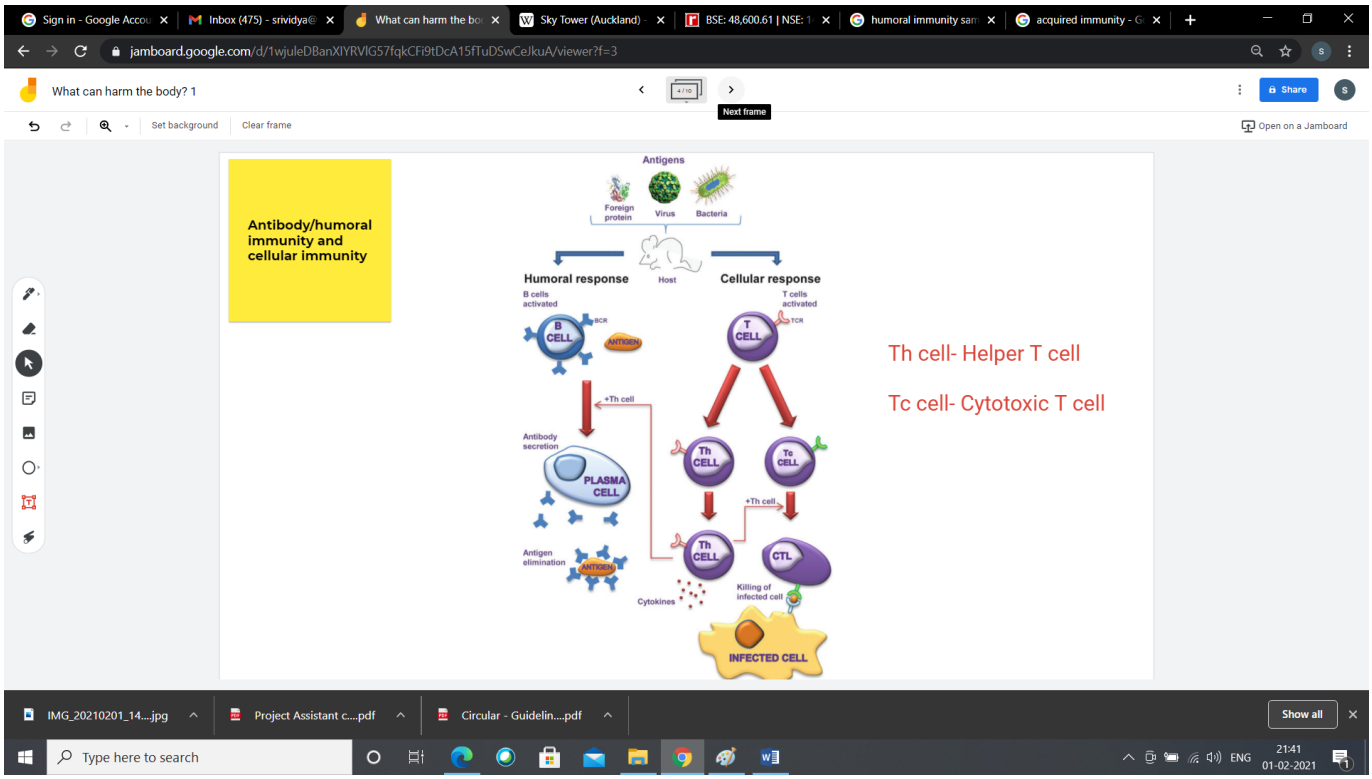
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Antibody/humoral immunity and cellular immunity
Antigens
Foreign protein
Virus
Bacteria
Humoral response
Host
Cellular response
B cells activated
T cells activated
B CELL
BCR
ANTIGEN
T CELL
TCR
+Th cell
Antibody secretion
PLASMA CELL
Th CELL
Tc CELL
+Th cell
Th CELL
CTL
Antigen elimination
ANTIGEN
Cytokines
Killing of infected cell
INFECTED CELL
Th cell- Helper T cell
Tc cell- Cytotoxic T cell
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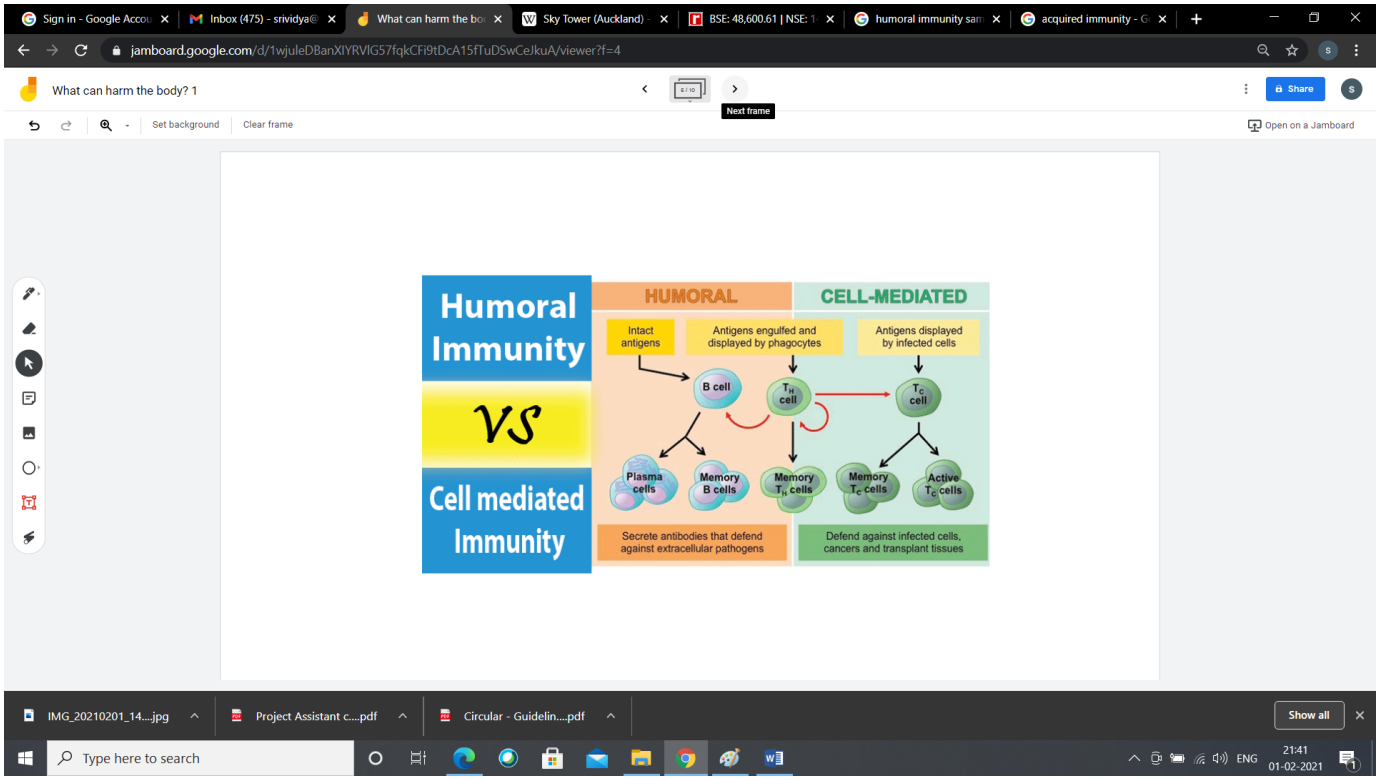
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Humoral Immunity
VS
Cell mediated Immunity
HUMORAL
CELL-MEDIATED
Intact antigens
Antigens engulfed and displayed by phagocytes
Antigens displayed by infected cells
B cell
T_H cell
T_C cell
Plasma cells
Memory B cells
Memory T_H cells
Memory T_C cells
Active T_C cells
Secrete antibodies that defend against extracellular pathogens
Defend against infected cells, cancers and transplant tissues
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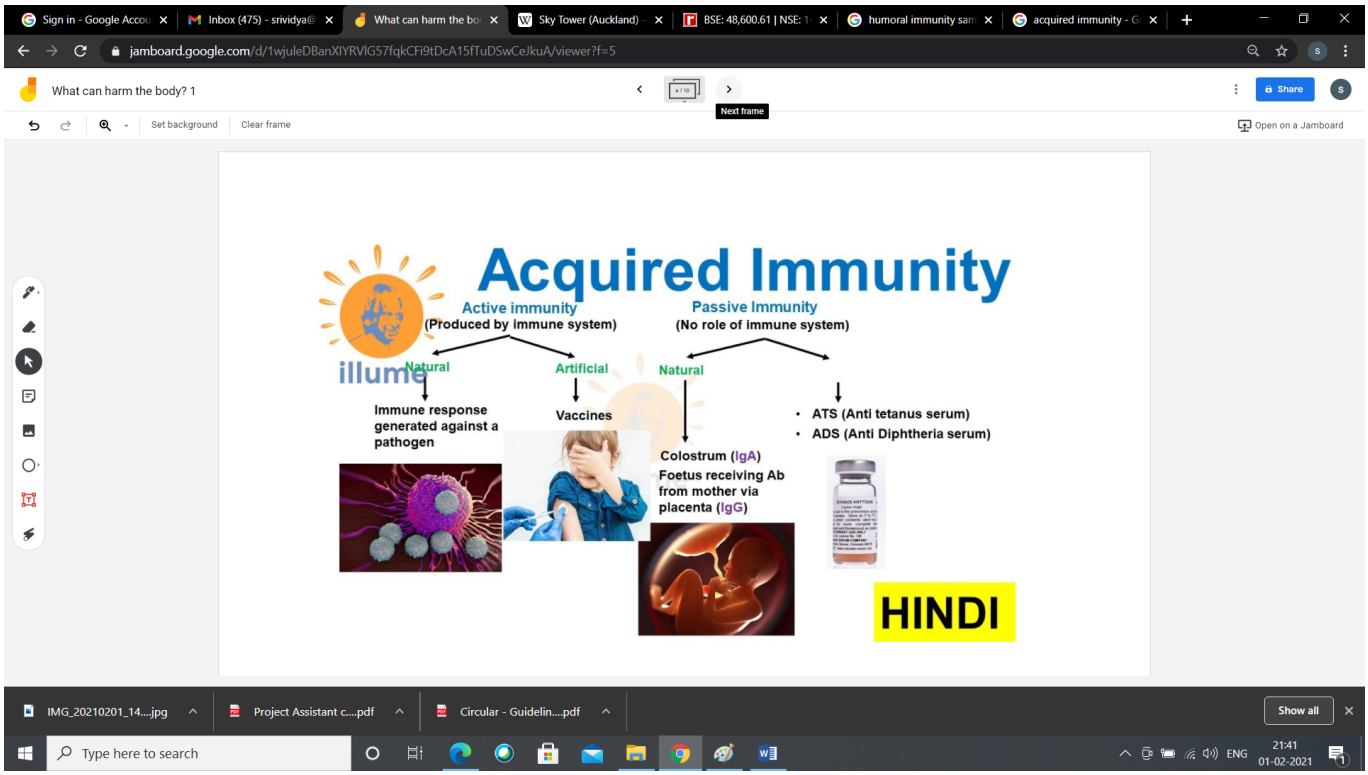
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Open on a Jamboard
Acquired Immunity
Active immunity
(Produced by immune system)
Passive Immunity
(No role of immune system)
Natural
Artificial
Natural
Immune response generated against a pathogen
Vaccines
Colostrum (IgA)
Foetus receiving Ab from mother via placenta (IgG)
ATS (Anti tetanus serum)
ADS (Anti Diphtheria serum)
HINDI
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Open on a Jamboard
Acquired Immunity
Immunity that develops during your lifetime
Active Immunity
Develops in response to an infection or vaccination
Passive Immunity
Develops after you receive antibodies from someone or somewhere else
Natural
Antibodies developed in response to an infection
Artificial
Antibodies developed in response to a vaccination
Natural
Antibodies received from mother, e.g., through breast milk
Artificial
Antibodies received from a medicine, e.g., from a gamma globulin injection or infusion
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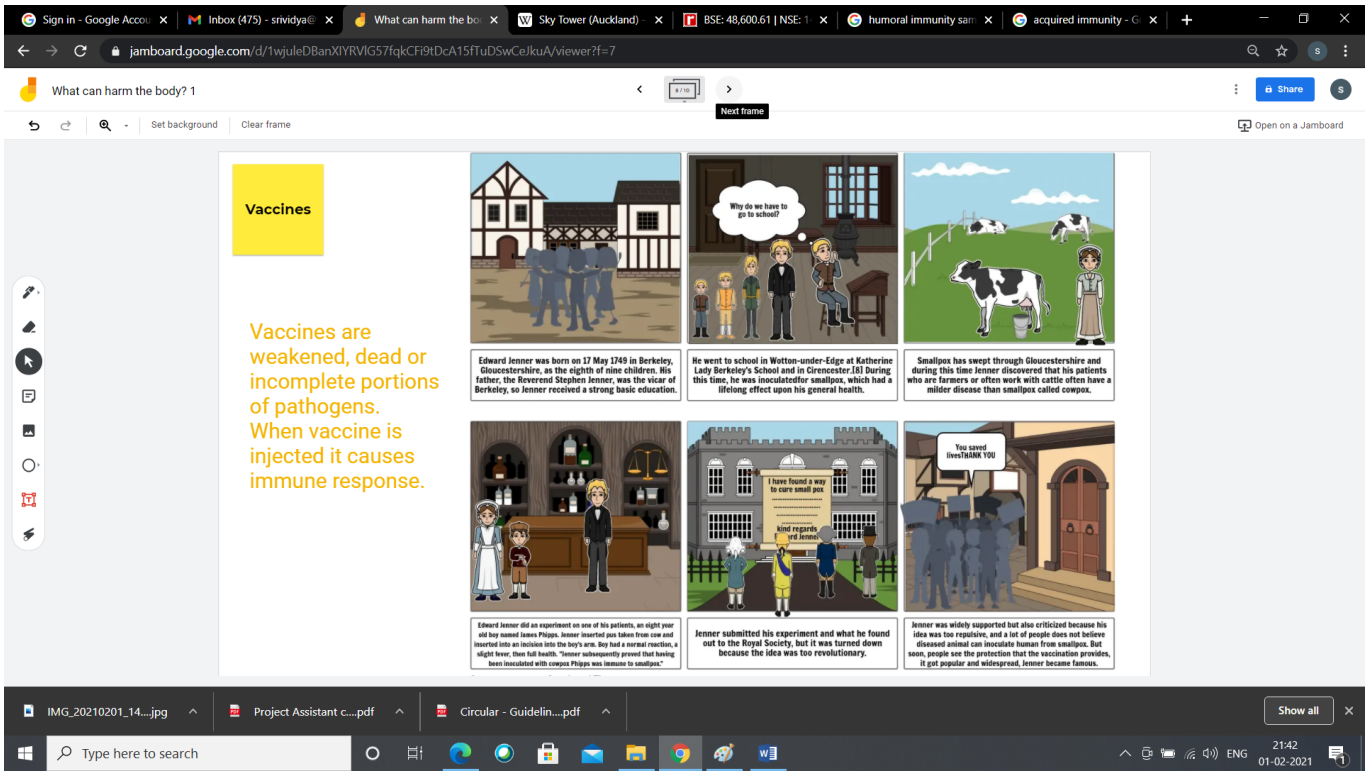
What can harm the body? 1
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Open on a Jamboard
Vaccines
Vaccines are weakened, dead or incomplete portions of pathogens. When vaccine is injected it causes immune response.
Why do we have to go to school?
I have found a way to cure small pox
You saved livesTHANK YOU
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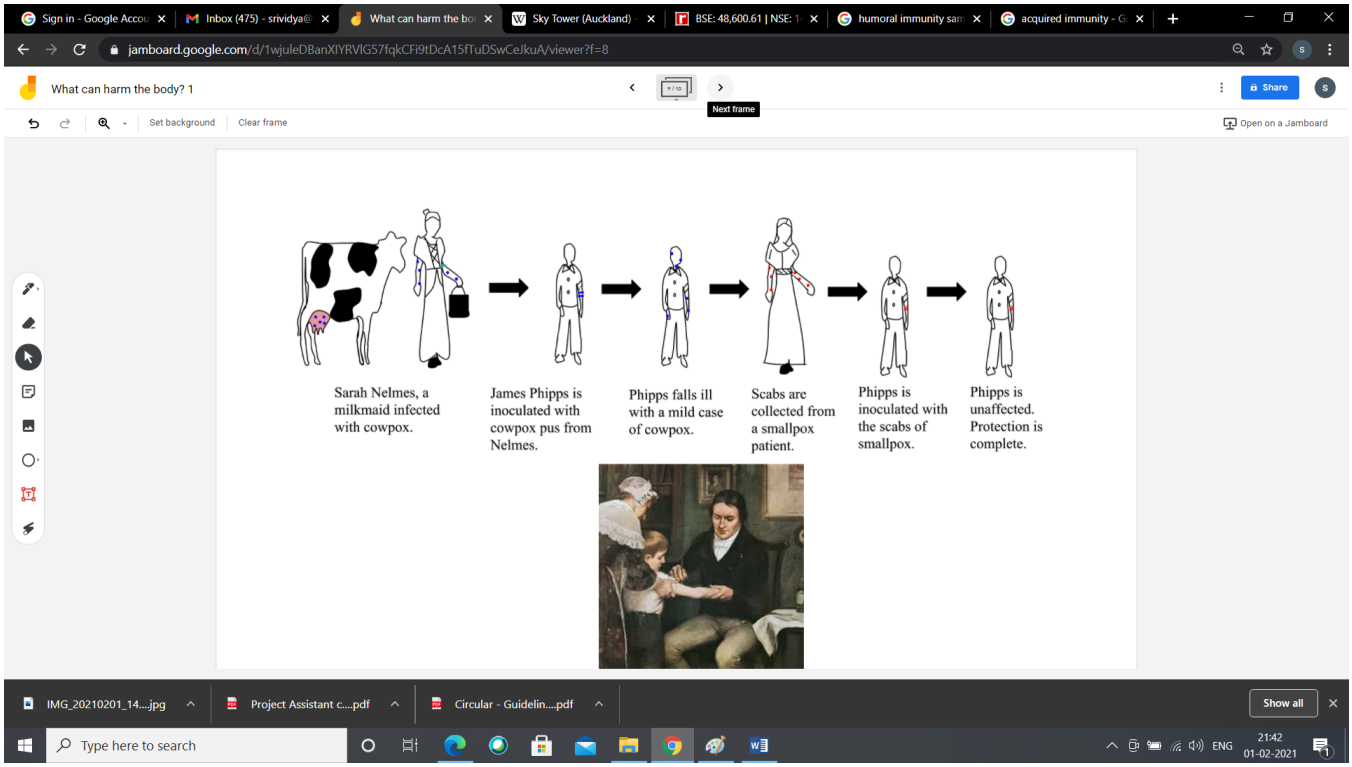
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Sarah Nelmes, a milkmaid infected with cowpox.
James Phipps is inoculated with cowpox pus from Nelmes.
Phipps falls ill with a mild case of cowpox.
Scabs are collected from a smallpox patient.
Phipps is inoculated with the scabs of smallpox.
Phipps is unaffected. Protection is complete.
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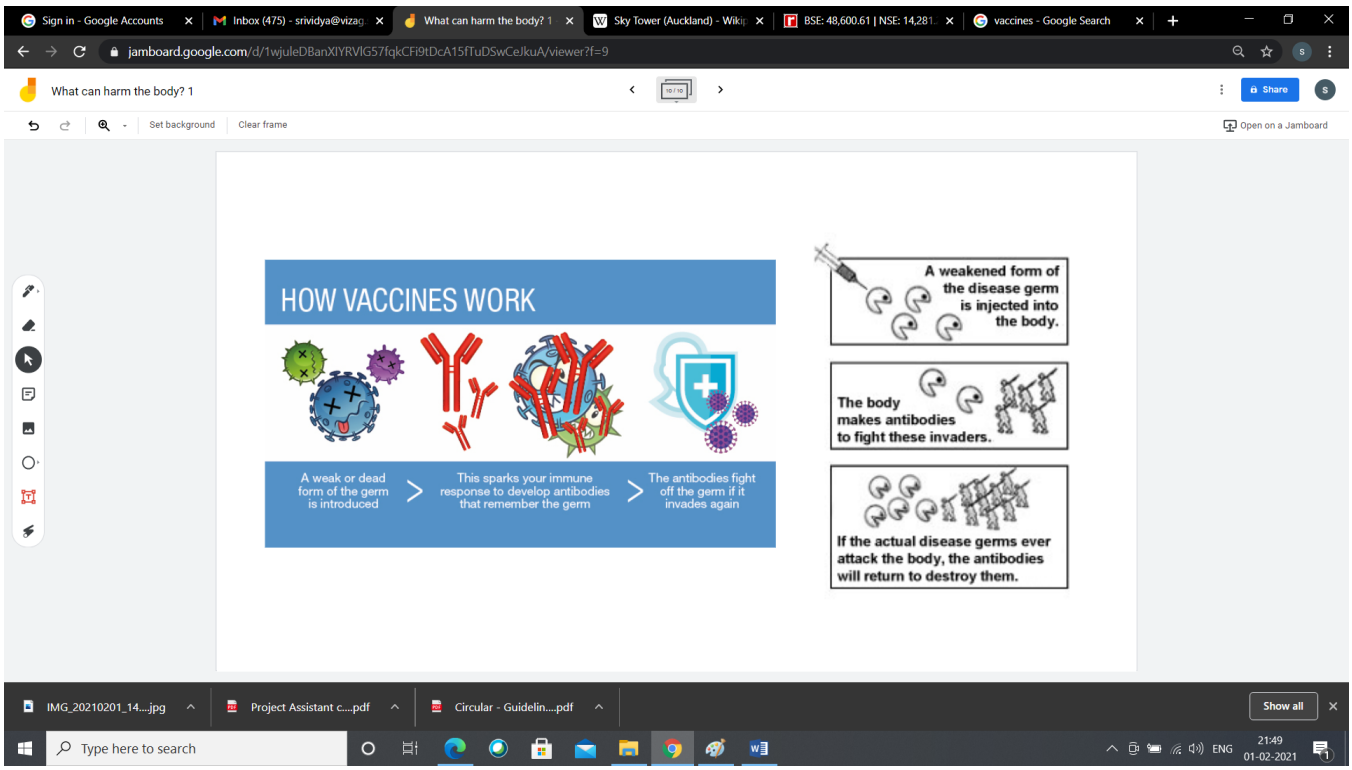
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HOW VACCINES WORK
A weak or dead form of the germ is introduced
This sparks your immune response to develop antibodies that remember the germ
The antibodies fight off the germ if it invades again
A weakened form of the disease germ is injected into the body.
The body makes antibodies to fight these invaders.
If the actual disease germs ever attack the body, the antibodies will return to destroy them.
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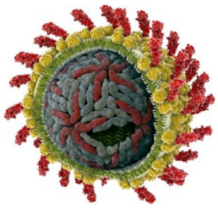
What is a virus?

What is a virus?

- A microscopic infectious agent
- Prolific and found in almost all life forms
- Can only replicate inside the living cells of organisms
- The study of viruses is called virology
- Viruses infect host cells to reproduce
- Viruses can learn to adapt to immune responses
- Viruses are much more difficult to treat than bacteria



Hepatitis C: Cut away molecular model

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What is the structure of a virus?

How does a virus attach to host cell?

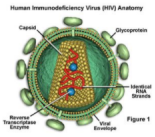
What Are Viruses Made Of?

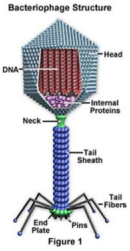
Nucleic Acid
- DNA or
- RNA
- But not both

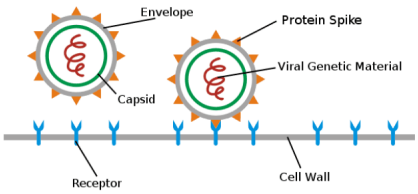
Capsid – a protein coat surrounding the nucleic acid.

Envelope- membrane like structure outside the capsid in some viruses

Examples:
- Influenza
- Chickenpox
- Herpes-simplex
- HIV







Some viruses infect more than one species

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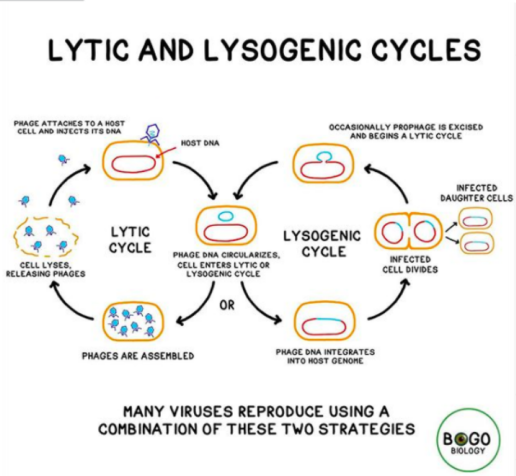
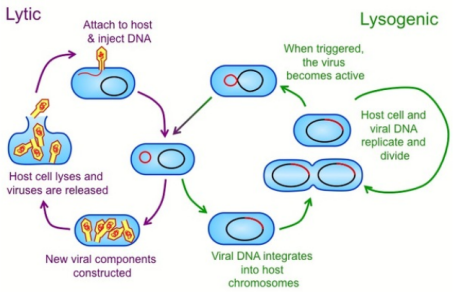
Lytic and Lysogenic cycles





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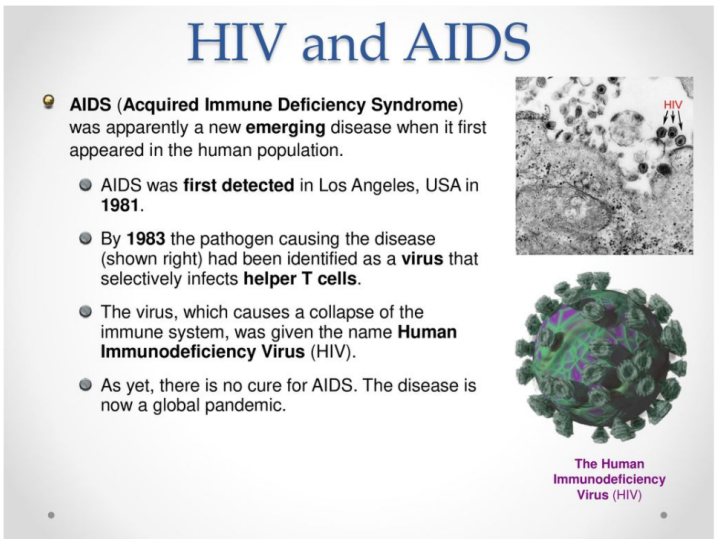
AIDS and the immune system

HIV is a retrovirus. It contains two copies of RNA genome



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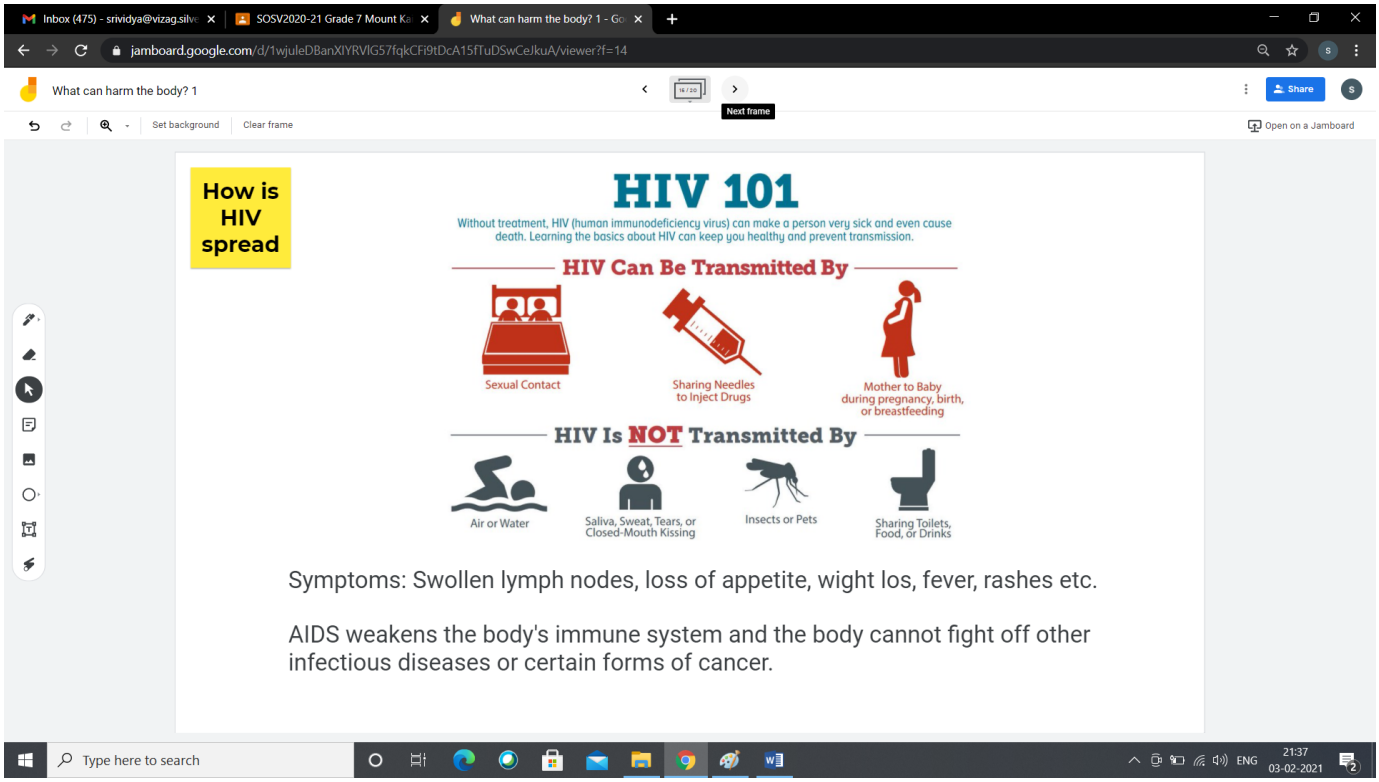
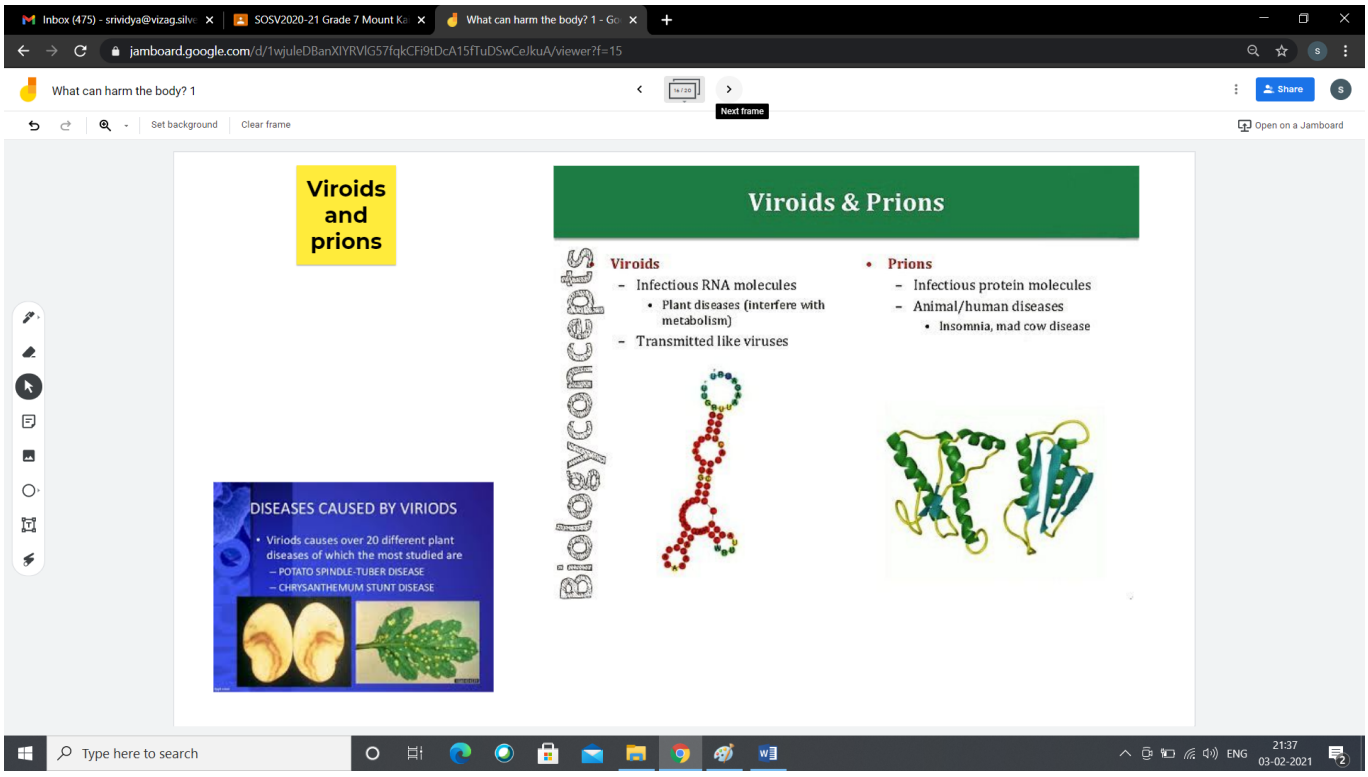

How is HIV spread
HIV 101
Without treatment, HIV (human immunodeficiency virus) can make a person very sick and even cause death. Learning the basics about HIV can keep you healthy and prevent transmission.
HIV Can Be Transmitted By
Sexual Contact
Sharing Needles to Inject Drugs
Mother to Baby during pregnancy, birth, or breastfeeding
HIV Is NOT Transmitted By
Air or Water
Saliva, Sweat, Tears, or Closed-Mouth Kissing
Insects or Pets
Sharing Toilets, Food, or Drinks
Symptoms: Swollen lymph nodes, loss of appetite, wight los, fever, rashes etc.
AIDS weakens the body's immune system and the body cannot fight off other infectious diseases or certain forms of cancer.


Viroids and prions
Viroids & Prions
Viroids
Infectious RNA molecules
Plant diseases (interfere with metabolism)
Transmitted like viruses
Prions
Infectious protein molecules
Animal/human diseases
Insomnia, mad cow disease
DISEASES CAUSED BY VIRIODS
Viriods causes over 20 different plant diseases of which the most studied are
POTATO SPINDLE-TUBER DISEASE
CHRYSANTHEMUM STUNT DISEASE

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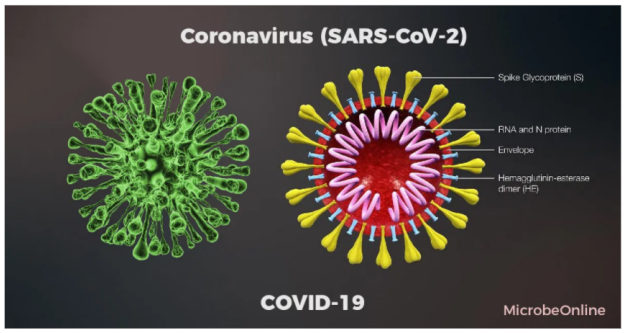
Coronavirus



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CORONAVIRUSES

large group of viruses

envelope

Genetic material

protein spikes

crown = "corona"

different types

number of human diseases

respiratory gastrointestinal

common cold

pneumonia

generally mild disease

some cause severe disease

SARS - COV China - 2003

MERS - COV Saudi Arabia - 2012

2019 N- COV China - 201 9

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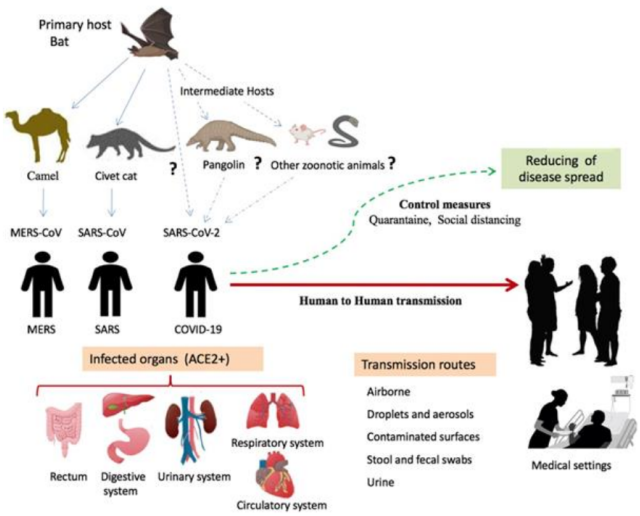
Origin and spread of SARS-CoV-2



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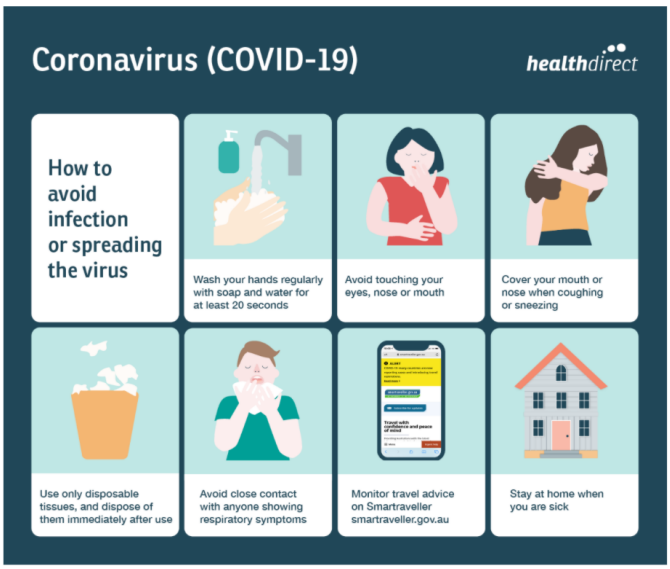
Prevention



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