Morphology of Skin Disease

Found in Common Fruits & Vegetables

Sophia Chen
ARTDES 401 FA 20

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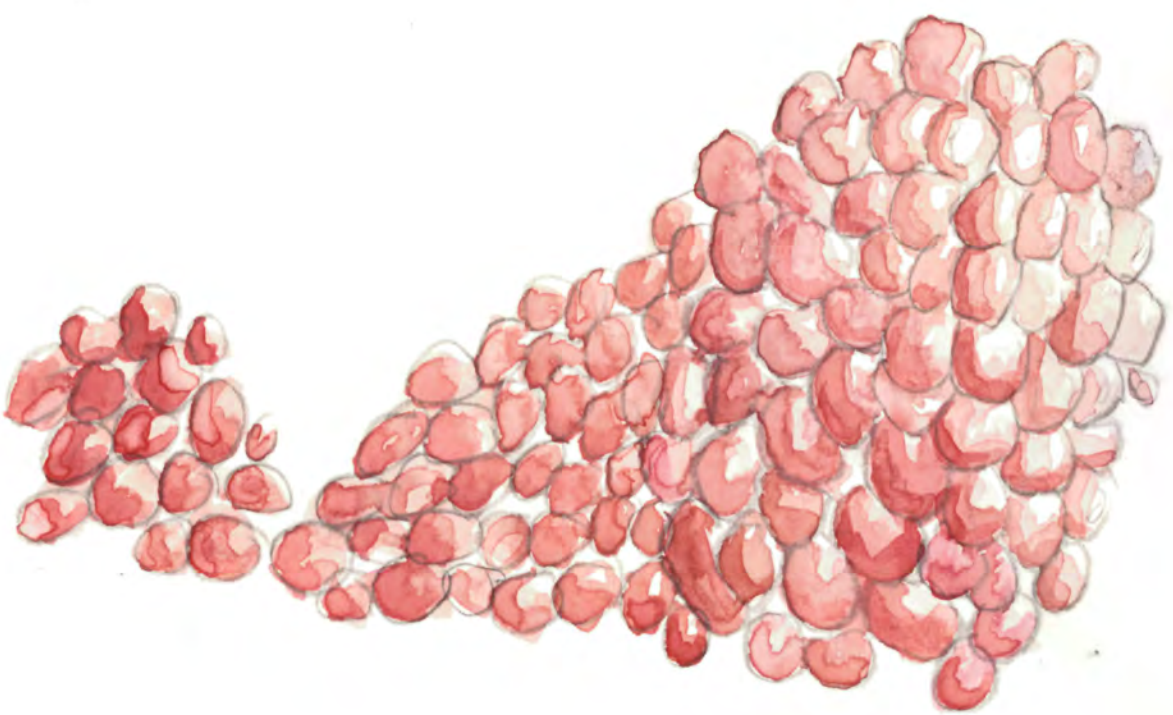
Blisters

An area of skin covered by a raised, fluid-filled bubble.

Common Cause: Shingles

Can have other causes such as burns, trauma, and certain autoimmune diseases. Shingles is caused by the Varicella Zoster virus, the same virus that causes chickenpox.

The sacs are filled with serum, the liquid in blood which separates from blood cells and clotting factors.



Shingles (Herpes Zoster)

The blisters caused by shingles often present in clusters that form a stripe that wrap around the torso. Other symptoms include fatigue and itching.

Pomegranate (Punica Granatum)

Pomegranate is a fruit that has edible seeds inside named arils which are filled with juice and have a reddish, translucent apperance, similar to blisters cuased by shingles.

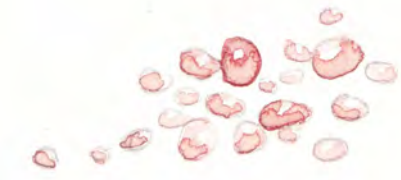
Onset of Symptoms for Shingles

Stage one

There are four stages to the development of shingles, it usually starts with itching and tingling pain for the first few days. Some people may also experience headache and fever.

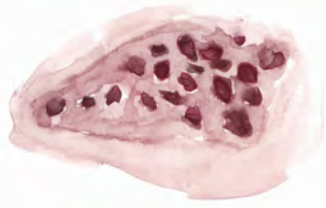
Stage Two

After the tingling pain, a flat red rash develops on the skin.



Stage Three

A few days later, the rash will develop into fluid-filled painful blisters.



Stage Four

Around one week later, the blisters pop, the content drains, and they scab over.

Development of Pomegranate Fruit

Pomegranate flower bud

Blooming season is from April to June.

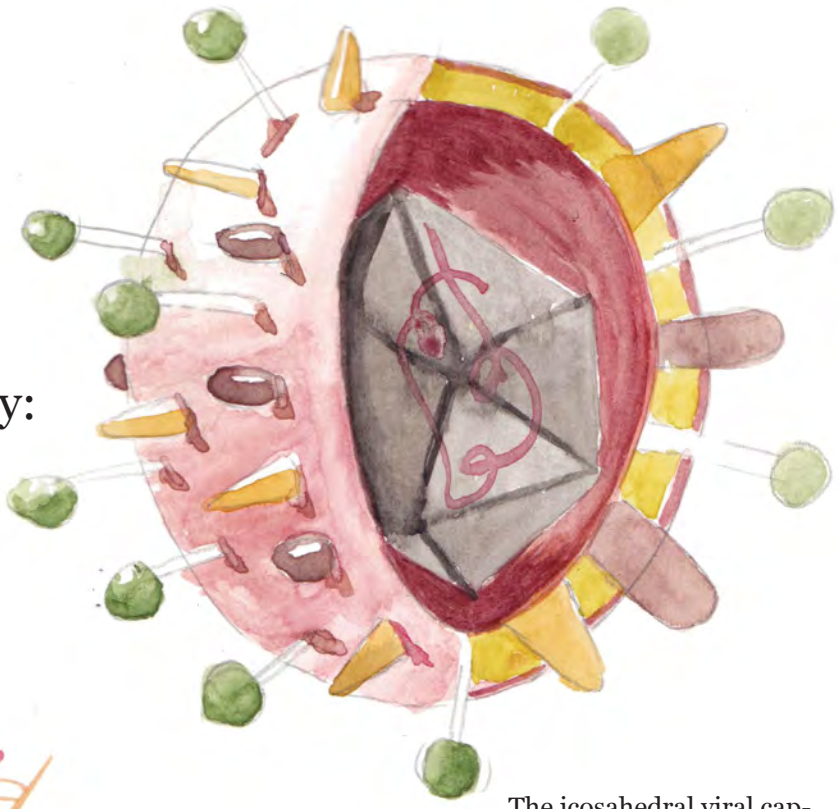
After the flower is fertilized, the original utereus portion turns into a fruit which will mature in a few months.

Harvested from October to January

Varicella-Zoster Virus

Herpesviridae

Morphology:
Enveloped



The icosahedral viral capsid sits inside of a spherical envelope studded with glycoprotein spikes.

Genome:
dsDNA

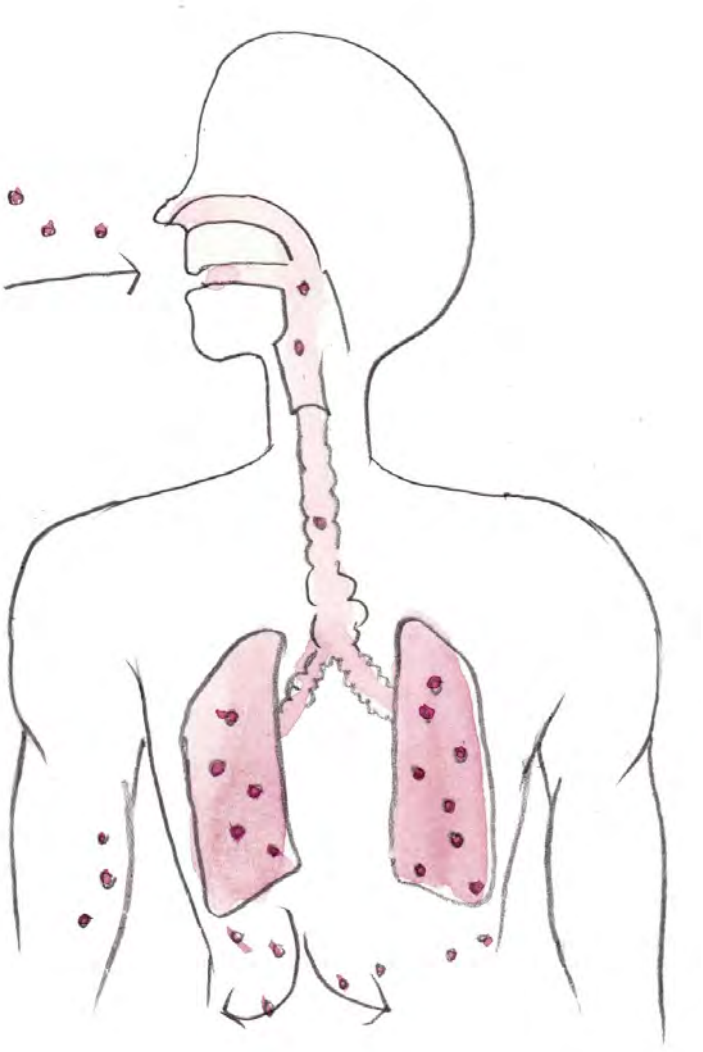
One common feature to all viruses in the Herpes family is latency. A chronic latent infection means that your body will never get rid of the virus even if you're clear of all the symptoms. Althought the virus may not be actively replicating, its DNA is able to remain in the host cell as an Episome and the infection will remain dormant for life. When it is opportunistic, the virus will reactivate and the host will exhibit symptoms once again.

Replication & Pathogenesis

Varicella Zoster Virus can be spread through direct contact or inhalation of repiratory droplets. Note that Shingles is not contracted through getting infected with VZV the first time, instead, you can only develop Shingles if you've had chickenpox in the past. It's possible to get chickenpox from someone with Shingles.

Droplets containing the Varicella Zoster Virus is inhaled and traveling down the repiratory tract.

VZV is an enveloped virus that enters the cell through direct fusion. A similar virus that will be covered is the Measles Morbillivirus. In the pathogenesis of Measles there will be a more detailed illustration of how the virus particles invade on a cellular level.



VZV spreading to the rest of the body.

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Fuller, Oveta. Fall 2020, Mircobiol 405 Virology Unit.
"Watch me," April 2020, https://www.youtube.com/watch?v=Ny4Zix89stw, *Fruiting Stages of Pomegranate*.
Mayo Clinic Staff, https://www.mayoclinic.org/diseases-conditions/shingles/symptoms-causes/syc-20353054, *Shingles*, Mayo Clinic
https://varicellazostervirusroth.weebly.com/morphology.html, *Morphology of VZV*

Pustule

A pimple or abcess contained with pus, a thick yellow substance.

Common Cause: Staph

Pus is the result of the body's immune cells fighting off a foregin antigen, which could be viral, bacterial or fungal and it is composed of both alive and dead pathogens as well as white blood cells. One common pus forming infection is caused by bacterial antigen Staphylococcus Aureus.

Staph Aureus causes large, painful pus filled abcesses that are called furuncles or carbuncles. Those infected often present with a fever. The bacteria can lead to other conditions that are potentially life threatening such as septicemia and toxic shock syndrome.

S. Aureus Infection

Pus-filled abcess. These are often caused by an infection of the follicle spreading to surrounding tissue. Staph can be treated with antibiotics.

Banana (Musa)

The consistency of smashed banana is the most similar to that of pus.

Development of Staph infected Pus

A cut in skin is opportunistic for Staph infected folliclitis, resulting in furuncles or carbuncles.

Staph is an "opportunisitc" member of the normal flora

Unlike viruses which can only survive and reproduce intracelluarly, bacteria are prokaryotic cells which do not depend on a "host cell." Humans carry around trillions of bacteria as our normal microbiome, and Staphylococcus Areus is one that up to 30% of the population carry. We can carry S. Aureus in our nasal cavities without it causing any damage. However, it is an "opportunistic" bacteria in ways that it make us sick if it finds a chance. For example, broken skin due to shaving can be a great opportunity for Staph to enter the body and cause diseases.

A pus filled abscess developing from a cut in the skin.

Pus draining from an abscess.

Development of Banana Fruit

Banana stalks grow in the late summer, each stalk only bear fruit once.

Banana flower bud

Banana flower

Fruits are harvested in April, while still green

Staphylococcus Aureus

Gram Positive, Catalase positive, Beta-hemolytic bacteria

Morphology:
Spherical bacteria
arranged in clusters

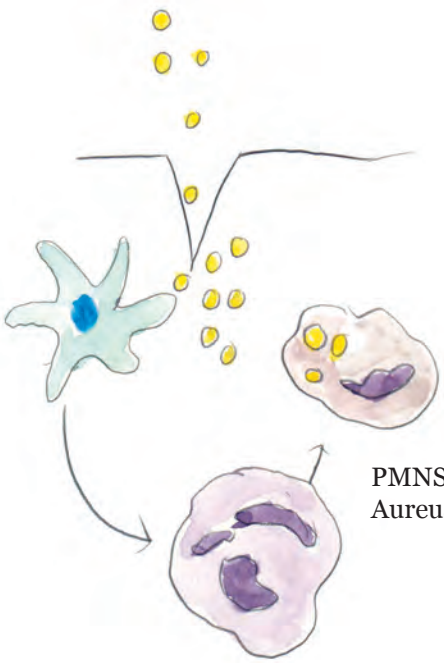
"Staphyl" comes from Ancient Greek and stands for "a bunch of grapes," "coccus" refers to bacteria that are ball shaped. "Aureus" are the gold coins used in Ancient Rome, and as you see, S. Aureus appears golden under a microscope.

There are three strands of Staph bacteria, with S. Epidermidis and S. Saprophyticus being the other two. S. Aureus is the most virulent of the three. It could lead to a clusters of conditions such as endocarditis, osteomyelitis, pneumonias, food poisoning, toxic shock syndrome and scalded skin syndrome.

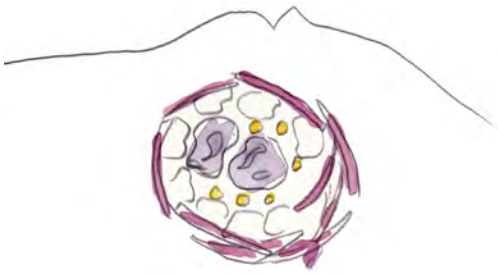
S. Aureus Abscess Formation

After S. Aureus enters a wound in the skin, local APC (antigen presenting cells) will signal to PMN(white blood cells of the innate immune system consisting of neutrophils, eosinophils and basilphils) to come fight the antigen by phagocytosis. Pus forms as a result of an accumulation of dead PMNs and bacteria.

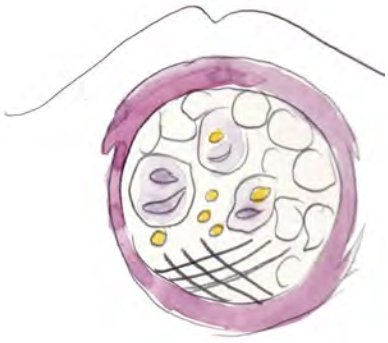
Staphylococcus Aureus bacteria entering an open wound.



PMNS phagocytosing S. Aureus



Fibrous capsule begins to form



Mature Abcess contained in fibrous capsule with pus formed by viable and dead PMN, and bacteria

References:
Hanna, Philip. Fall 2020, Mircobiol 405 Bacteriology Unit.
https://www.bananalink.org.uk/all-about-bananas/. *All About Banana*. Banana Link

Maculopapular Rash

Maculopapular rash is composed of both flat and raised skin lesions. The term “macule” refers to flat discolored lesions and “papule” refers to small bumps on the skin.

Common Cause: Measles

Maculopapular rashes can be caused by a variety of conditions, such as Measles, Rubella, allergies and scarlett fever. To accurately identify the disease would require the presentation of other symptoms. Measles usually presents with repiratory symptoms as well as the skin rash.

Measles virus is part of the paramyxovirus family, along with its close cousin Mumps and Rubella. The MMR vaccine is effective against all three infections.

Measles Rash

The Maculopapular rash caused by Measles can extend to the entire body. They will start out flat and some may develop into small bumps.

Apple (Malus domestica)

The small spots on apple skins resembles a Measles rash. They are called lenticels and they are tiny holes that allow for breathing.

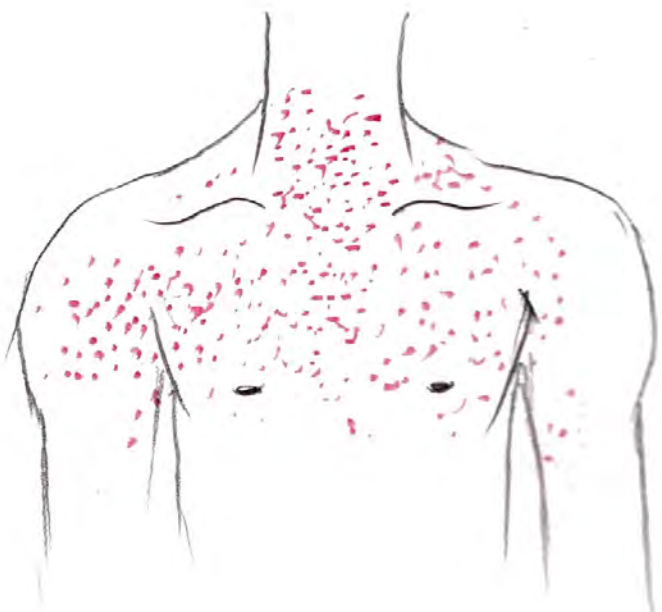
Onset of Symptoms for Measles

First Symptoms

Measles symtpoms typically appear after 7-14 days of contrating the virus. The infect person first exhibits repsiratory symptoms such as runny nose and a cough, as well as watery and itchy eyes.

Rash Begins

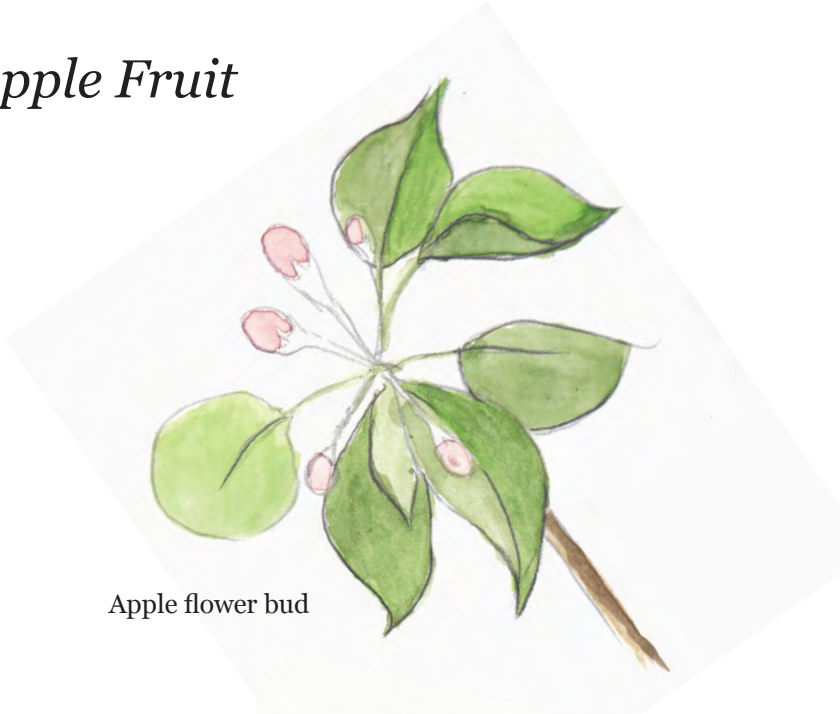
About 3-5 days after symptoms occur, Measles rash begins. It occurs first on the face, at the hairline then spreads lower.



Rash Expands

Measles rash spreads down to the rest of the body after first appearing on the face. The infected person may spike a fever of up to 104 degrees Farenheit.

Development of Apple Fruit



Apple flower bud

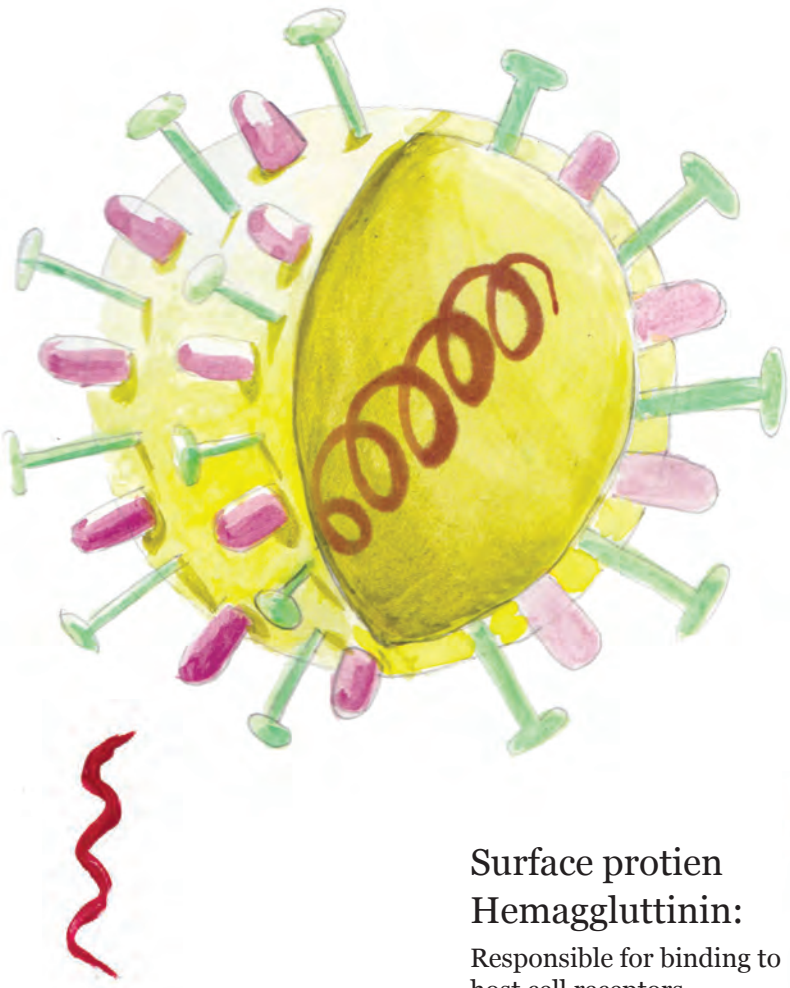
Blooming Season is May

Young apple fruit

Apple can be harvest in late summer, fall or winter depending on the specific type

Measles Morbilivirus

Paramyxoviridae



Morphology:
Enveloped

Fusion Protein:

Responsible for fusion between host cell and virus membranes

Surface protien Hemagglutinin:

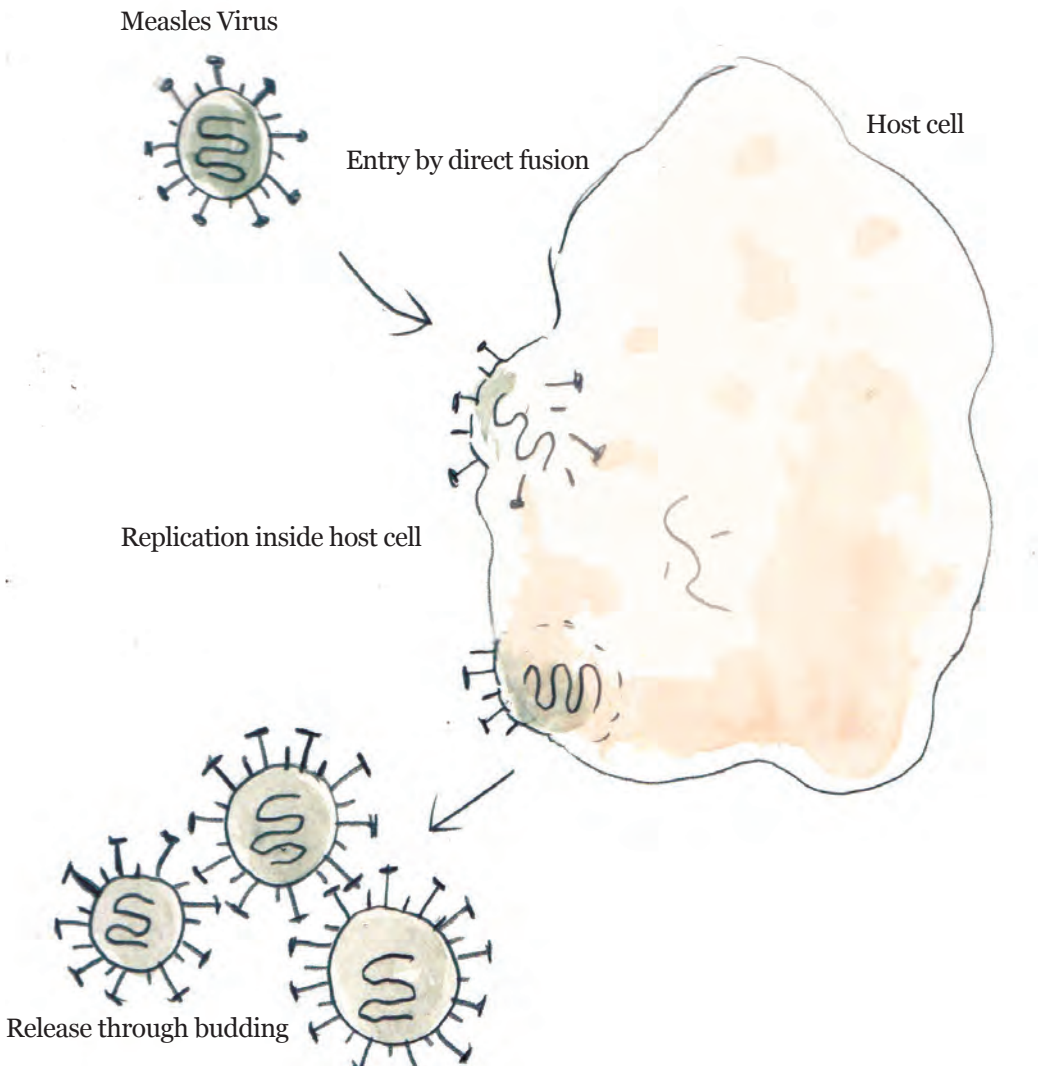
Responsible for binding to host cell receptors

Genome:
-ssRNA

Measles virus is part of the Paramyxovirus family. “Para” means beyond and “myxo” means mucuous. They are a group of RNA viruses which cause repiratory illnesses. Some others included in the family are Respiratory Syncicial Virus, Mumps and Rubella. Measles, also known as Rubeola, is often confused with Rubella, also named German Measles.

Replication & Pathogenesis

Because Measles Morbilivirus is an enveloped virus, it has spikes on it out envelope that will facilitate fusion into the host cell. The hemagglutinin bind to cell receptors, the fusion protein penetrates the membrane, while the content of the virus is released into the cell. New virus particles which are assembled in the host cell are released through budding.



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Fuller, Oveta. Fall 2020, Mircobiol 405 Virology Unit.
November 5, 2020. https://www.cdc.gov/measles/symptoms/signs-symptoms.html. *Signs and Symptoms*. CDC.

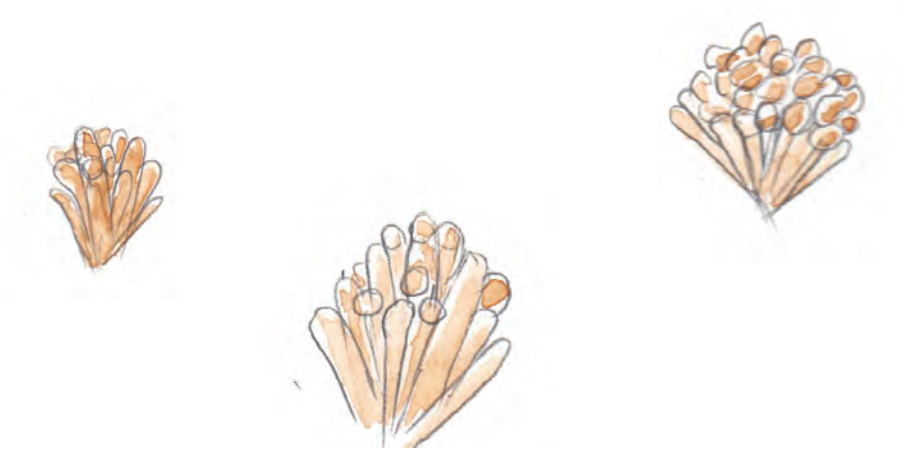
Filiform Warts

The word filiform means “thread-like.” These thin warts grow in clusters, often on human faces, hands and feet.

Common Cause: HPV

Filiform warts are a signature symptom of the Human papillomavirus infection. There are over 100 strands of HPV, and while most strands are benign and go away on their own, there are a few that could lead to cervical cancer. Symptoms are dependent on the specific strand of HPV. Warts are not necessarily present in every case of the infection.

While commonly known as a sexual transmitted infection, warts that appear elsewhere on the body could be caused by skin contact such as shaking hands.



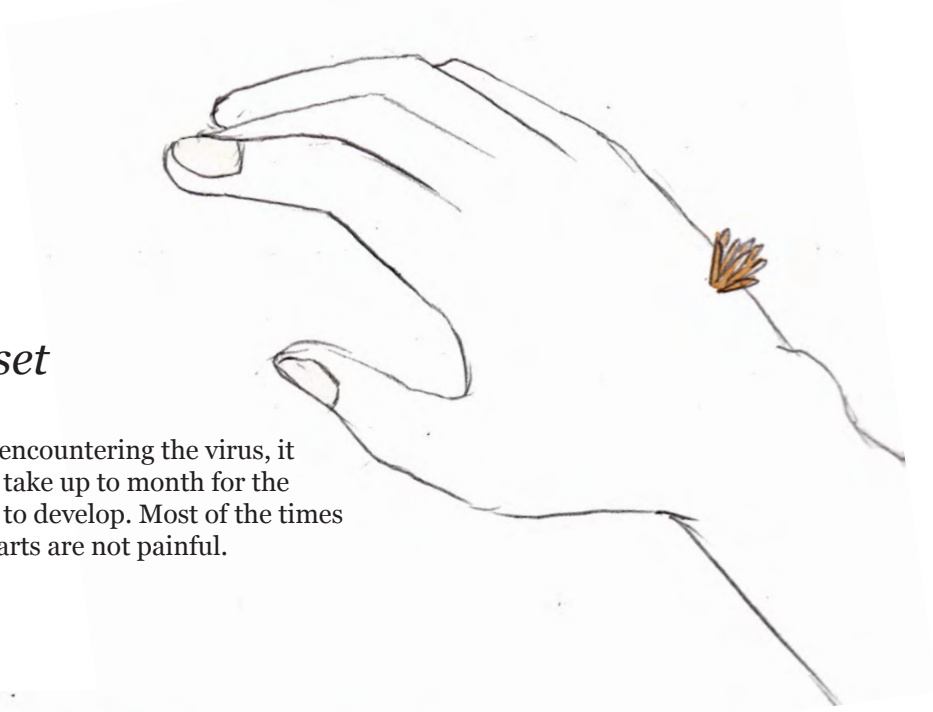
An image consisting of both filiform warts on hands and gential warts. Note that this person is infected with two different HPV strains at the same time, as hand-to-genital spreads and vice versa do not occur. Penile warts often grow on the tip of the penis, which is covered by a thin and moist layer of mucous membrane instead of skin. Filiform warts most commonly grow on the face, as well as hands and feet.

Florets of broccoli (Brassica oleracea) best represent the small clusters or warts.

Development of Filiform Warts

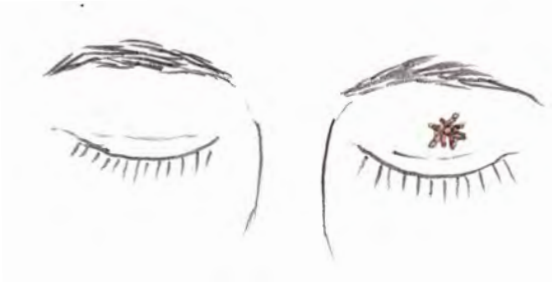
Transmission

HPV, the type that causes skin warts, is transmitted to direct skin contact with an infected person. Handshakes can lead to infection.



Onset

After encountering the virus, it could take up to month for the warts to develop. Most of the times the warts are not painful.



Although filiforms that develop on your hand cannot spread to the gentials, they could develop on your face.

Development of Broccoli

Human Papillomavirus

Papillomaviridae

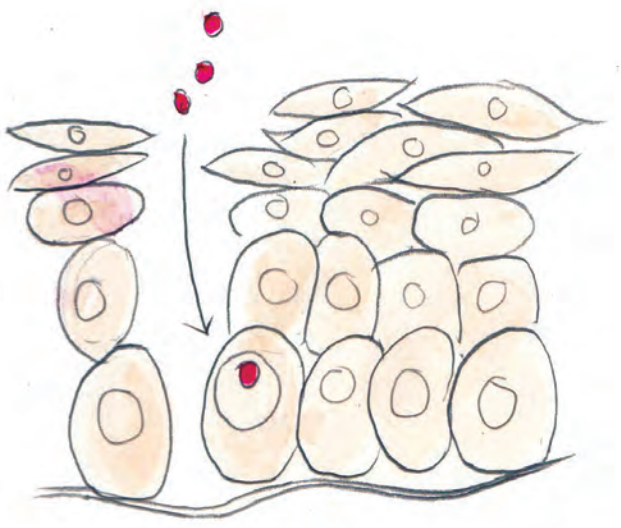
Morphology:
Naked Icosahedral

Genome:
dsDNA

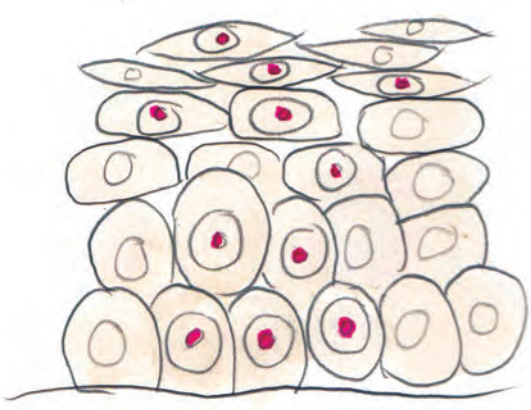
The Human Papillomavirus is part of the Papillomavirus family. “Papilla” comes from Latin meaning “nipple” and “oma” means tumor, so papilloma stands for “nipple like tumor,” which refers the abnormal growth this virus causes. HPV is a naked icosahedral virus, meaning that it does not have an envelope, and as we can see, this virus does not have spike proteins like the enveloped viruses. As a result, naked viruses enter the host cell through phagocytosis rather than direct fusion. Human Papillomavirus has double stranded DNA as its genome.

Replication & Pathogenesis

Most strands of HPV are benign and do not cause a persistent infection. With proper treatment, the virus can be cleared in 1-2 years. However, there are more harmful strands that could transform healthy cells into tumor cells. Vaccines are available for the Human Papillomavirus.



Human Papillomavirus invading epithelia cells.



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