Science Lessons for Kids

Understand coronaviruses by understanding influenza

Coronavirus disease (COVID-19) and the Respiratory System

Research compiled by Mini Macks Lab | 3/28/2020 | charitymack.com

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What is influenza?

What is influenza?

- All influenzas are respiratory illnesses. Sometimes called “flu”
- The “flu”, when you have a stomach “bug” and puke a lot, is not the same type.
- However, all flus are viruses
- Most people build an immunity to virus flus. But 2019's coronavirus (COVID-19) has never been seen in humans before and the human body has not built an immunity to it.
- Viruses aren’t bacteria. Bacterias can cause infection in the body. The body, either way, has to learn how to build against the intruder. Viruses are more like Technics instead of bacteria LEGO blocks. The structure is different, but the body can figure out a way to deconstruct it.

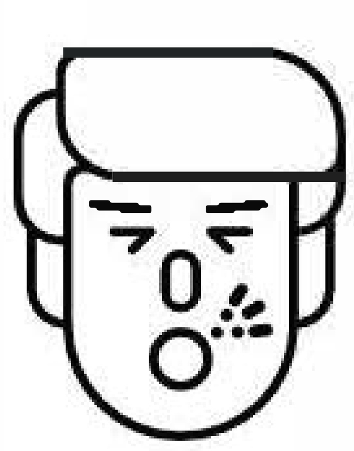
What is immunity?

What is immunity?

Immunity is your body learning how a foreign invader (germs, bacteria, virus...) work so it can create antibodies (soldiers) to fight. If your body has never had to fight that kind of invader before it won't know how to fight it. Over time, the body can learn and build an immunity to the invader. If it can’t, sometimes medicine is available to help the body fight. Sometimes there is no cure.

Watch: [How Does Your Immune System Work?](#) (5 min)

How does COVID-19 virus get in?

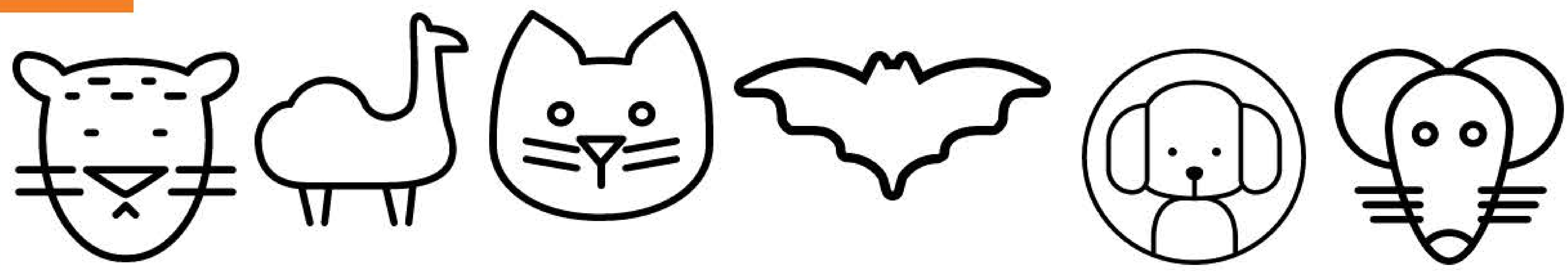


Through water droplets from other humans who have the virus in them. You can’t get it by yourself. But you can get it from someone getting their cough or sneeze on you called “**respiratory droplets**”. It is possible those respiratory droplets, when on surfaces, can be touched and infect the person who touched them.

Quick Facts

Quick Facts of COVID-19

- COVID-19 has never been seen before in humans
- It is a respiratory virus
- First discovered in Wuhan, Hubei Province, China
- Pets, as far as we know, do not get COVID-19. Pets can get other types of coronaviruses, but not this one.



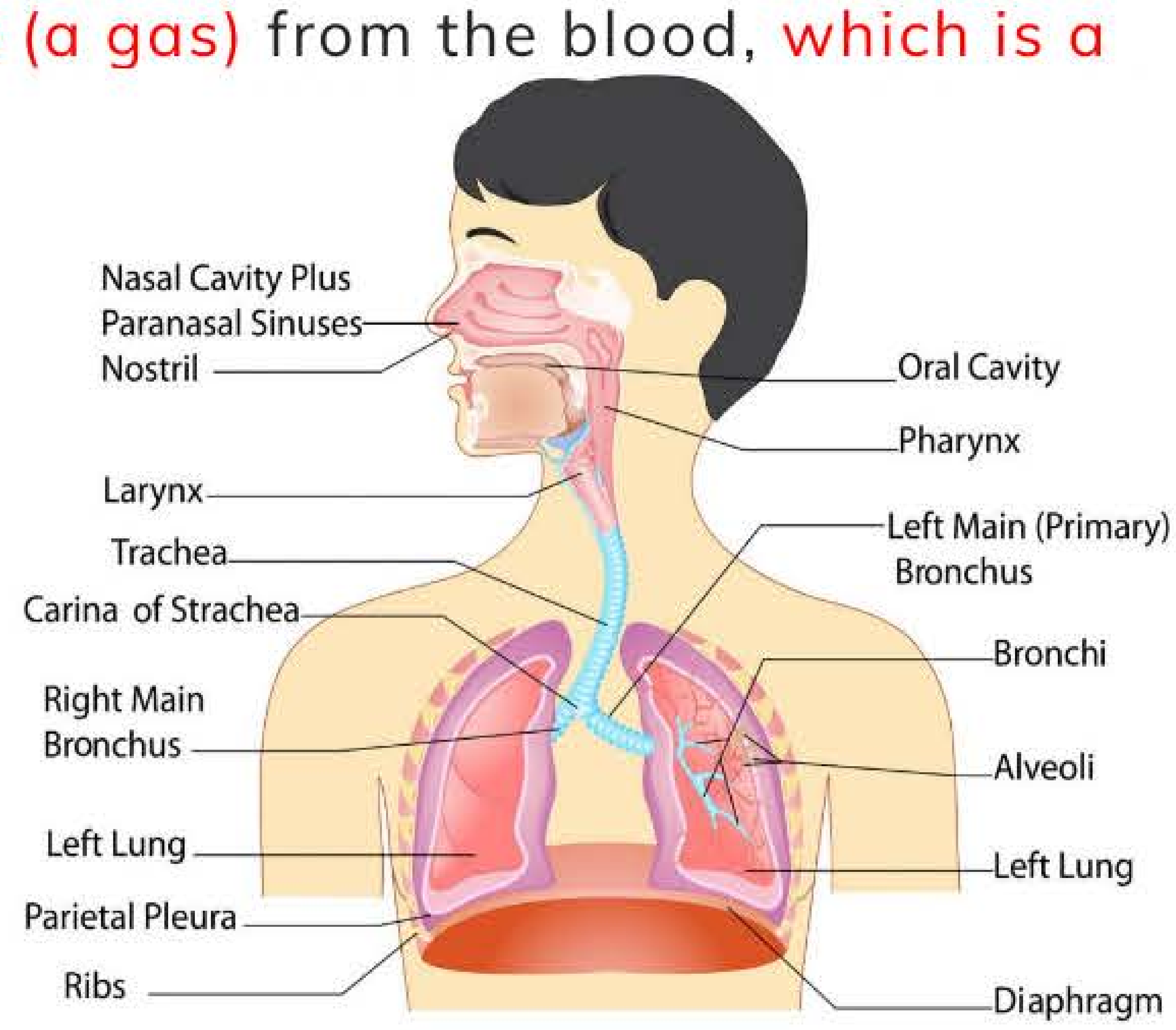
What is the respiratory system?

H_2O

CO_2

The **respiratory system** is organs that take in oxygen (a gas) for the blood (a liquid) that powers us. The respiratory system also takes out carbon dioxide (a gas) from the blood, which is a poisonous gas.

Without the lungs, the gases (oxygen and carbon dioxide) couldn't get in and out of the blood. The primary organs of the **respiratory system** are the lungs, which carry out this exchange of gases as we breathe.



How do the gases get into the blood (liquid) safely?

Alveoli

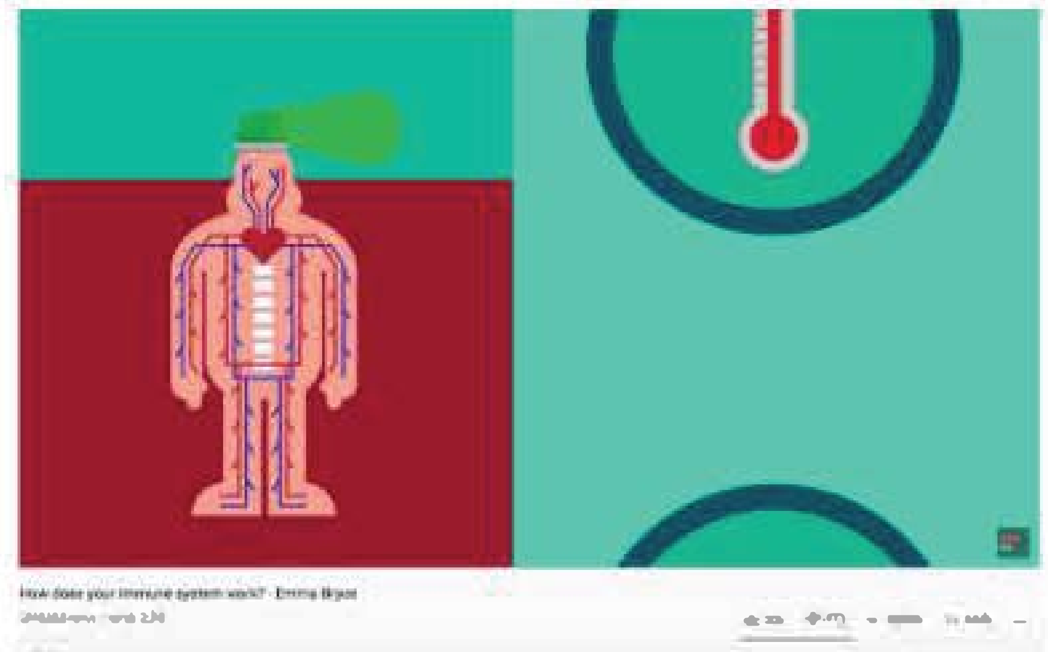
The alveoli, small air sacs (like balloons), are in your lungs. **Think of revolving doors.** Alveoli convert the gases through their doors, allowing oxygen gas through the capillary and into the bloodstream.

They also take the carbon dioxide from the deoxygenated blood, convert it back to gas, and have you breath it out.

Oxygen's surprisingly complex journey through your body - Enda Butler

Watch Now

1. [How Does Your Immune System Work?](), **5 min**, Emma Bryce
2. [Oxygen's surprisingly complex journey through your body](), **5 min**, Enda Butler
3. [Lungs 101](), **3 min**, National Geographic
4. [How does COVID-19 spread?](), **1 min**, CDC



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COVID-19

COVID-19 Virus Symptoms

- Fever
- Cough
- Fatigue
- Shortness of breath

2018
2019
2020
2021
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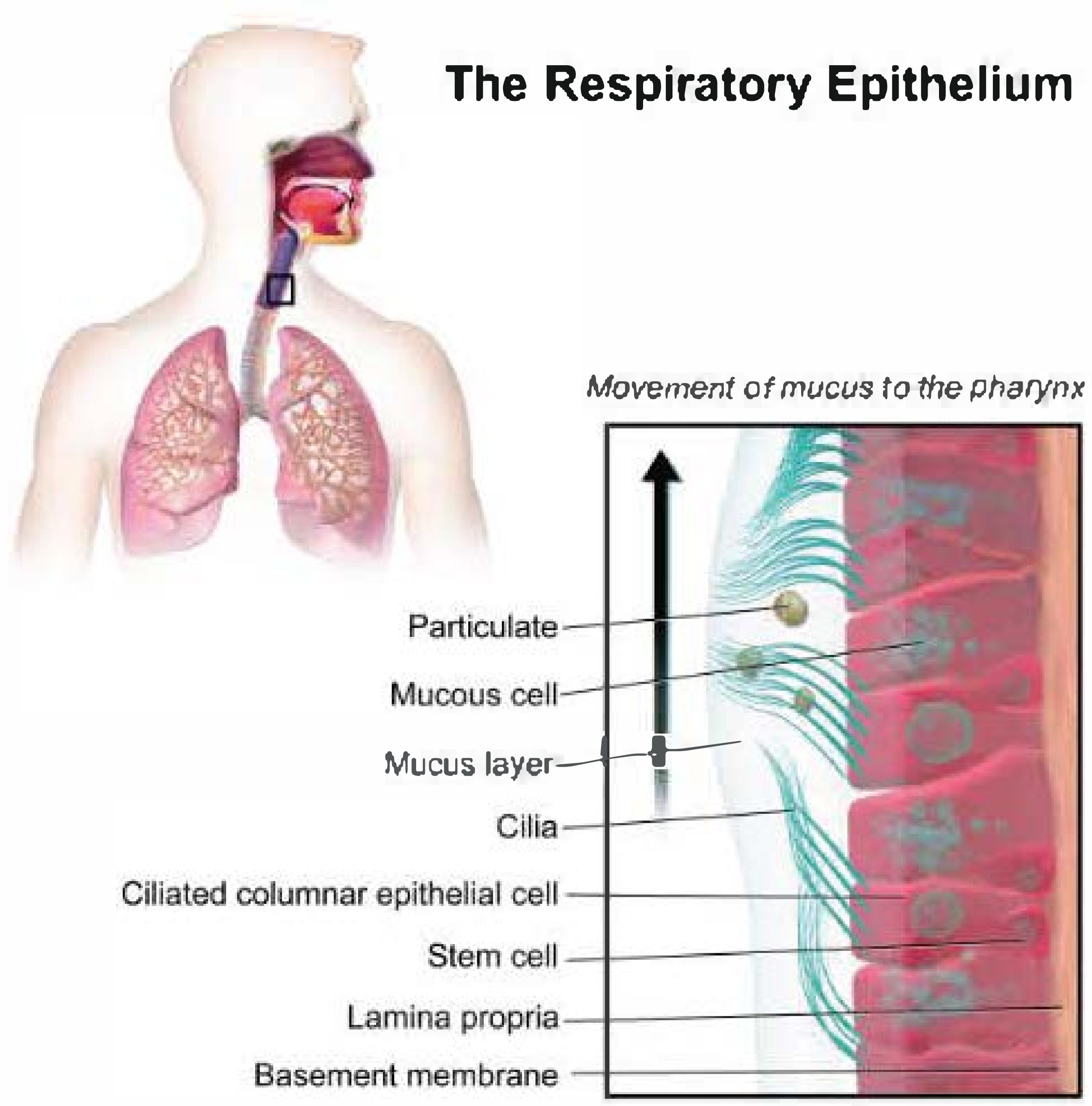
Phases of Corona Viruses

Phase 1

Phase 1: Viral replication.
Virus attacks the respiratory system and the army gets bigger. The lungs try fighting back (trying to build immunity with antibodies. This causes inflammation).



Phase 2

Phase 2: Immune hyper-reactivity.
Too much inflammation and infection (death of cilia cells) causes lung damage.

Phase 3

Phase 3: Pulmonary destruction respiratory failure.
Death or permanent lung damage - holes in the lungs; a "**honeycomb like appearance**"

Science of COVID-19

The Science of COVID-19

- “In the early days of an infection, the coronavirus rapidly invades human lung cells. Those lung cells come in two classes: ones that make **mucus** and ones with **hair-like batons** called cilia.”(1)
- “Mucus, though gross when outside the body, helps protect lung tissue from pathogens and make sure your breathing organ doesn’t dry out. The cilia cells beat around the mucus, clearing out debris like pollen or viruses.”(1)
- SARS and COVID-19 are proving to **infect and kill cilia cells**, which then leave the patient’s airways susceptible to debris and fluids, which can lead to pneumonia. (1)
- **Immune cells** come in to attack the issue and this causes inflammation and sometimes compromising good tissues - thus further compromising and damaging respiratory health. This leads to more junk in the lugs - hard to breathe!
- The **honeycomb holes** are probably from the immune cells overworking and causing scars and hardening the tissues of the lungs. This hardening, although in an effort to strengthen the lungs, makes it difficult to breathe. Many patients need ventilators (breathing machines) to help them. Others are able to rest and breathe on their own, although weakly. (1)

What happens when the lungs break down?

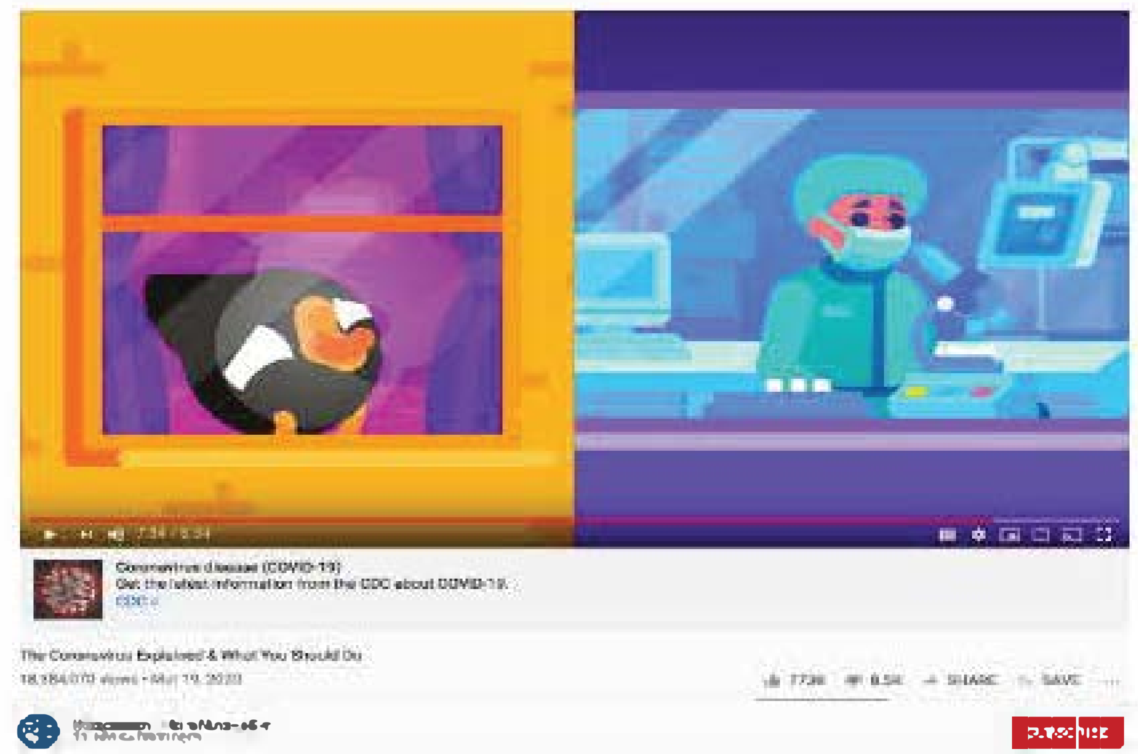
Inflammation, the lungs swelling, also makes the **membranes between** the air sacs (alveoli) and blood vessels (capillaries) to let **liquids and gases pass through the wrong way**.

Remember our revolving door? The alveoli? We need the alveoli, our revolving door, and blood vessels to be able to exchange oxygen and carbon dioxide to keep the blood healthy. If the alveoli and blood vessels are struggling to work, the exchange can’t happen. **The lungs try to pass gases and liquids through other areas of the lungs - think Hulk through the wall, instead of the revolving door**.

This can fill the lungs with fluid as a result. The blood doesn’t get oxygenated, because the gases didn’t enter the bloodstream through the revolving doors and systems start shutting down.

Watch Now

1. How Mucus Keeps Us Healthy , **4 min**, Katharina Ribbeck
2. The Coronavirus Explained and What You Should Do, **8 min**, Kurzgesagt
3. What are the Cilia?, **20 sec**, Daniel Izzo



1. McKeever, Amy. Here's What Coronavirus does to the body. National Geographic. 18 Feb. 2020. Accessed 27 March, 2020.
2. Coronavirus Disease 2019 (COVID-19). Center for Disease Control and Prevention. Accessed 27 March, 2020. https://www.cdc.gov/coronavirus/2019-ncov/index.html
3. Respiratory system, Google Images; Revolving-Door, salinoxglass.com
4. How Mucus Keeps Us Healthy, **4 min**, Katharina Ribbeck. 5 Nov 2015. Accessed 27 Mar 2020.
5. The Coronavirus Explained and What You Should Do, **8 min**, Kurzgesagt. Kurzgesag.19 Mar 2020. Accessed 27 Mar 2020.
6. What are the Cilia?, **20 sec**, Daniel Izzo. 5 Jan 2009. Accessed 27 Mar 2020.
7. Hulk, via Google Images, registered trademark of Marvel Comics; Cilia, Wikimedia