

I've always wondered: why is the flu virus so much worse than the common cold virus?

Written by David Griffin, Advanced Trainee, Infectious Diseases and General Medicine, The Peter Doherty Institute for Infection and Immunity



Flu seems to be more deadly than colds, here's why. from www.shutterstock.com.au

This is an article from I've Always Wondered, a new series where readers send in questions they'd like an expert to answer. Send your question to alwayswondered@theconversation.edu.au

I've always wondered why the influenza virus is more potent and dangerous than the common cold virus. They're both viruses, but what makes the influenza worse that it causes more deaths? - Junting Yeung

Thanks for the question Junting, and we have certainly [seen a pretty bad year for flu in Australia](#). More than [160,000 people](#) have been confirmed to have the flu this year, ranging from mild to severe, and some even [causing death](#). So why is it the flu can cause death but we don't generally hear of colds doing the same?

What is the cold virus?

In contrast to flu, which is caused by variants of a [family of genetically related influenza viruses](#), the "common cold" is caused by [more than 200 different viruses](#), many of which are unrelated.

Read more: [H1N1, H5N1, H7N9? What on earth does it all mean?](#)

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Not all common cold viruses are created equally, and the course of a “cold” depends to a degree on which cold virus a person is afflicted by. These viruses share a tendency to infect and replicate most effectively in the cooler environment of the [upper airway](#), including the [ears, nose, throat and sinuses](#)

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Rhinovirus is the most common virus responsible, and tends to cause an infection of the upper airway, lasting a few days and improves on its own. Typically, rhinovirus binds to a receptor on the surface of cells in the nose and sinuses. This allows the virus to enter cells, start to replicate, and causes infected cells to produce molecules that lead to inflammation. These inflammatory molecules are [thought to be responsible](#) for the symptoms associated with the common cold; runny or blocked nose, sore throat and cough.

Infection is sometimes further complicated by [inflammation in the sinuses](#) and [middle ear infection](#)

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Sometimes, infection can have no symptoms at all.

But infection can be more severe in patients with an [impaired immune system](#), including those with cancer, on medications to suppress the immune response, or those undergoing a bone marrow transplant. Plus, the common cold [may exacerbate or contribute to](#) the development of chronic airway diseases, like asthma.



Cold viruses tend to be self-limiting, meaning they go away by themselves. from
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What is the flu?

The [illness you get when you catch influenza \(the flu\)](#) varies widely, and depends on the person infected (the host), the virus, and secondary bacterial infections that may follow infection with the virus. The flu virus can infect both the

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[upper and lower respiratory tract](#)

, which in part explains its ability to cause severe disease.

Other medical conditions, age and a weakened immune system also play a big part in how much the flu virus will affect the host. Plus, a person's genetic makeup may predispose them to a more severe [inflammatory response](#), known as a "cytokine storm". Inflammation is a [normal response](#)

that allows our body to fight infection and heal damaged tissue. Paradoxically, too much inflammation

[makes the illness from flu worse](#)

by causing more swelling and tissue destruction.

For the flu virus to bind to and infect cells in our respiratory tract it uses a molecule called "[hem agglutinin](#)

".

[Bird and swine flu strains](#)

, which cause

[pandemics](#)

in

[humans](#)

may have a haemagglutinin molecule on their surface that preferentially binds to receptors in the lower respiratory tract, including the tiny air sacs (alveoli). These alveoli are responsible for

[transferring oxygen into](#)

and taking carbon dioxide out of the blood stream.

Read more: [Have you noticed Australia's flu seasons seem to be getting worse? Here's why](#)



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The flu affects your upper and lower respiratory tract, and can cause subsequent bacterial infections, making it potentially dangerous. [Demet/Flickr](#) , [CC BY](#)

Infection and inflammation in the [alveoli](#) , can significantly impact the ability of the lungs to give the body enough oxygen. Also, the haemagglutinin molecule rapidly changes [during and between flu seasons](#)

. Since haemagglutinin is an important target our immune system uses to protect against flu, this change means that infection or immunisation in one flu season doesn't usually prevent future infection. Our immune system only learns to fight off that specific strain, and not the one with the new mutations. This is why it's [important to get immunised for flu every year](#)

.

The final aspect making flu so severe is that it makes you more likely to get bacterial infections, by weakening some of the natural defences of the respiratory tract. This includes damage to the surface of the airway, exposing molecules that bacteria can adhere to, and damaging the “ [mucociliary elevator](#)

”- tiny hair-like structures in the airway that catch and expel bacteria and mucus from the respiratory tract. These bacterial infections lead to further damage to lung tissue, more inflammatory cells, and can cause severe problems in your respiratory system. It is thought that most of the 100 million deaths that occurred during the [Spanish flu pandemic of 1918](#)

were due, at least in part, to [secondary bacterial infection](#)

.

So why are there more flu deaths?

Both the common cold and flu can cause similar respiratory illnesses, and exacerbate underlying medical conditions. Important in both cold and flu is how the person's immune system is functioning, and the part of the airway infected.

In patients with flu, infection of both the upper and lower respiratory tract, the resulting local and systemic inflammatory response evoked by the virus, and the secondary consequences of infection are important determinants of how sick we get.

And these are in turn dependent on a combination of viral, bacterial and patient factors, including how effectively the virus infects, replicates and triggers the immune response, and the

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ensuing tissue inflammation and damage. Together, these can mean a person with the flu can have a spectrum of illness, from no symptoms at all to being potentially fatal.

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David Griffin does not work for, consult, own shares in or receive funding from any company or organisation that would benefit from this article, and has disclosed no relevant affiliations beyond the academic appointment above.

Authors: David Griffin, Advanced Trainee, Infectious Diseases and General Medicine, The Peter Doherty Institute for Infection and Immunity

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