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Short Review Article

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Spring is here, now what? Know the Difference Between a Cold, Flu, Coronavirus and Allergy

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Introduction

Q. What do we learn when we ask a Professor of Molecular Biology, Professor of Immunology, Professor of Ear Nose and Throat Surgery with over 30 years of allergy experience, Professor of Pharmaceutical Sciences, and a Professor of Medical Education?

A. We learn the correct answers to some of the most current and confusing public health and medical questions relating to common allergies and infectious pathogens.

The Spring of 2020 is now upon us, but this season is very alarming for many. Recently, because our population is in a *frenzy* about the impact that the Novel coronavirus disease 2019 (COVID-19) may have, but it also coincides with the end of the northern hemispheres winter. That has many people still ill, suffering and passing on this year's latest influenza (the flu) or other winter infectious-related colds. In addition, a considerable number of seasonal allergy sufferers are beginning to experience their watery eyes, congestion and runny nose symptoms that they dread year after year, due to their over-reacting immune system and inflammatory response, i.e., their allergies.

So, what is the difference between a cold, the flu, the coronavirus, and an allergy? The common cold, also known as acute viral rhinopharyngitis and acute coryza, is a viral infection of the upper respiratory system. On the other hand, the flu results

from the infection by the influenza virus, classified as types A and B (most common), or C [1,2]. According to the Centers for Disease Control and Prevention (CDC), influenza in the United States this year alone has caused an estimated 34 million illnesses, 350,000 hospitalizations and 20,000 deaths this season. So, viral diseases are not new! The human population has been living with viral infections for some time. Then, why the extraordinary reaction to this new coronavirus? The novel coronavirus 19, is a new strain of coronaviruses (CoV) causing an upper respiratory infection similar to common colds; however, previously other corona viruses are implicated in respiratory complications including, Severe Acute Respiratory Syndrome (SARS-CoV), and Middle East Respiratory Syndrome (MERS-CoV). According to Dr. Anthony Fauci, director of the National Institutes of Allergy and Infectious Diseases (NIAID), "guarantee as we get into March and April flu cases are going to go down, you can predict pretty accurately what the range of the mortality and hospitalizations will be. The issue now with COVID-19 is there's a lot of unknowns". According to the CDC report, as of the time and date of this submission, March 15, 2020 the total COVID-19 cases in the United States were 2952, and the total deaths 57[3]. According to the CDC, the symptoms of the coronavirus include a fever of 101.4 or higher, cough, and shortness of breath. It is associated with an incubation exposure of 2 to 14 days. Usually, there's no evidence of runny nose or sore throat (**Table 1**). The influenza virus usually begins with a stuffy nose followed by a sore throat and then cough. These symptoms

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may last 2 to 3 weeks, but in some cases, it could be even longer. An allergic reaction such as allergic rhinitis, on the other hand, usually begins with a stuffy nose, runny nose, postnasal drip, itchiness of the nose or throat, followed by sneezing. It is rarely associated with a sore throat. It will last for longer than 2 to 3 weeks and may last for several months. It may also be associated with a cough due to the copious postnasal drip of mucus.

Symptoms							
Disease	Fever	Cough	Shortness of Breath	Runny Nose	Itchy	Sore Throat	Incubation Time
Flu	Yes	Yes	No	Yes	No	Yes	2-4 Days
COVID 19	Yes. 101.4 and above	Yes	Yes	No	No	No	2-14 Days
Allergy	No	Yes	No	Yes	Yes	No	Months

Table 1: These symptoms may last 2 to 3 weeks, but in some cases, it could be even longer.

Allergies are when your immune system reacts to a foreign substance called an allergen, and it might be the newly released pollen or something you inhale or inject or touch or even food items. The reaction causes coughing, sneezing, itchy eyes, runny nose and a scratchy throat. Seasonal allergies begin primarily in the spring, and since we are in the early stages of spring, we thought it would be interesting to give a little background on allergies. For example, spring allergies are caused by the release of pollen into the air primarily from trees that had begun to bloom. The most common of these include Birch, Bayberry, Elms, Oak, Maple, Pine, especially Australian, and even some Palm trees. When you go out to your car in the morning, you may see yellow dust all over it: that is tree pollen. Coincidentally, just a few weeks ago, in early March 2020, the Larkin Community Hospital Institutional Review Board (IRB) in Miami approved a first of its time novel study titled Patient Education: Do you know your Allergy IQ? This timely study aims to evaluate responder's allergy knowledge and beliefs relating to common allergen triggers and environmental control strategies, comparing doctors and other health professionals to laypeople to find out who knows more about their allergies.

Do you know your Allergy IQ? Test yourself with these sample questions:

Which symptom helps to tell the difference between an allergy, a cold, or a virus?

- a) Stuffy nose ☐
- b) Cough ☐
- c) Headache ☐
- d) Itchiness ☒

Over half of those that took the survey got the answer wrong.

A chemical called histamine is the usual culprit for the sensation of itchy nose, eyes, or skin found in allergy. Colds, Flu's, and viruses don't tend to make you feel itchy.

Which is the main allergen (a substance that triggers allergy) that hits many spring allergy sufferers?

- a) Tree ☒
- b) Ragweed ☐
- c) Mold ☐
- d) Dust mites ☐

If you suffer from seasonal allergies caused by tree pollen, you want to know this. Our data showed only 8% of quiz responders got this answer correct. In many areas of the United States, spring allergies begin in February and last until the early summer. Tree pollination begins early in the year followed by grass pollination later in the spring and summer and ragweed in the late summer and fall. In tropical climates, however, grass may pollinate throughout a good portion of the year. Mild winter temperatures can cause plants to pollinate early.

What is the best way to prevent seasonal allergy symptoms on a high-pollen day?

- a) Create a 'pet free' bedroom ☐
- b) Brush/wipe your pet before entering the home ☐
- c) Pretreat with your allergy medications before exposure ☒
- d) All of the above ☐

Our current sample data found that 84% answered this question incorrectly.

Speak with your doctor or pharmacist and start taking allergy medicine before the pollen season or high pollen count days to help you more than waiting to experience and react to your allergysymptoms

Here are the facts

- Allergy is currently the 6th leading chronic disease in the US [4].

- Allergy affects over 50M Americans [4].
- Allergies and Asthma cost the economy \$Billions each year [4].
- There is a published shortage of Board-certified Allergy specialists to treat the number of allergy sufferers [5].
- There are identified gaps in primary care provider (PCP) and non-allergy board-certified specialist training/ knowledge relating to evidence-based allergic disease management [6].
- Allergen triggers and understanding of environmental control strategies for allergic diseases can be confusing [7].
- Many allergy sufferers self-medicate using OTC medications without consulting their medical professional's advice [8].
- Evidence-based prevention strategies currently exist for better controlling and/or managing allergies [7].

Based on these facts, when you know you have an allergy and not a viral infection, what can you do? The immune response to an allergen (in most cases, otherwise benign substances such as pollen, animal dander, etc.) starts with sensitization (i.e. immune system “getting confused”) followed by the development of a specific immune response (production of an allergen-specific antibody) towards the usually benign substance. Allergic rhinitis (itchy, watery eyes, and sneezing) is also antibody-mediated, such as Immunoglobulin E, inflammatory response that affects up to 40% of the population worldwide [9]. Avoiding exposure to allergen is the first step. It should be part of an overall treatment strategy, followed by the use of either over the counter or prescription medications to address the symptoms. The most common oral medications, Zyrtec (cetirizine), Allegra (fexofenadine), Xyzal (levocetirizine), Claritin (loratadin), Benadryl (diphenhydramine), Dimetapp (Brompheniramine), Chlor-Trimeton (chlorpheniramine), and Tavist (clemastine) are found over the counter. These medications help to alleviate the symptoms but do not treat the cause of your allergy specific allergen reaction. As of now, only allergen-specific immunotherapy is known to cure the disease[10]. When medication treatment is no longer successful or avoidance is not possible, such as being allergic to family pets such as cats or dogs, immunotherapy is recommended. Today, immunotherapy is available in both the traditional injection method and, in some instances, with oral drops or tablets: this is the only mechanism that actually overcomes the allergy permanently.

Allergen Immunotherapy (Desensitization)

Desensitization is increasingly being prescribed therapeutically by many physicians to reduce allergen-specific sensitivity. Low doses of offending allergens are slowly introduced to the immune system by allergy shots or oral tablets or drops similar to other types of vaccines. Patients who tolerate the allergen immunotherapy have these doses progressively increased based on the patient's tolerance. Doses are delivered weekly in the case of injections or daily with oral treatment. These regimens

are becoming more standardized and generally agreed upon by national and international allergy and immunology societies. The end result is the same. The body has become immunized to the allergens that have caused you such discomfort.

How does it work?

When exposed to the natural allergen (pollen), the body releases chemicals that cause allergic reactions seen in allergic rhinitis. These chemicals are what make you often feel very itchy in the nose, eyes, or skin. That is why anti-histamines are recommended for allergic symptoms. The changes to the immune system as a result of immunotherapy are divided into immediate and late effects. Many researchers agree that around 6-8 weeks after commencing allergen immunotherapy treatment, a kind of *intelligent* white blood cell promotes the production of specific proteins that reduce pro-inflammatory chemicals. The production of these proteins, as a result, has a positive effect on the over-reactive immune system. The benefit from the body's production of this protein gradually increases over 2-3 years and, in some sufferers, alleviates the allergy permanently.

The future

Medical scientists continue to seek the exact scientific mechanisms to explain how allergen immunotherapy works. Nevertheless, suffering patients who are sensitive to environmental allergens such as tree pollen during springtime continue to show impressive results with available medications and allergen immunotherapy. The future will likely be treatment with nanoparticles of the offending antigen and will also include many food allergies.

Conclusion

COVID-19 indeed represents an important public health concern affecting the nation at this point. However, it is essential to point out that COVID-19 has coincided with seasonal diseases such as the flu and the upcoming spring with its increases in allergic cases. Recognizing the signs and symptoms of each of these conditions is an important step in minimizing the impact of both infectious and non-infectious disorders such as allergic disease in the general public.

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