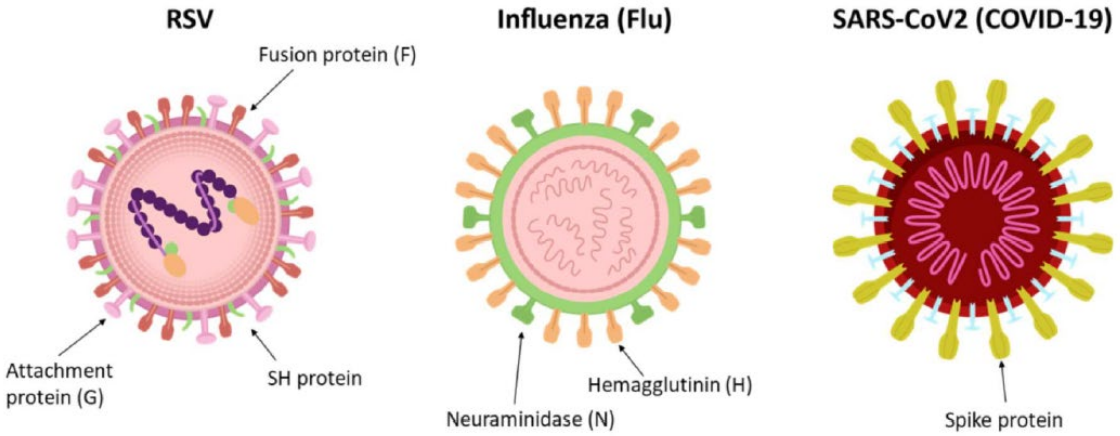

CAN WE SPARE THE PARTICULATES IN THE AIR WE SHARE?

Particle sizes from an allergist's perspective. An allergist/immunologist must understand particle sizes since allergens and viruses are microscopic particles. Most respiratory viruses are less than 0.25 microns. Ragweed pollen is much larger at 15-25 microns but release internal smaller allergic 0.5-to-4.5-micron particles once inside our airways. Grass pollen grains are about 20 microns in size. Moisture in the air on rainy days releases and "aerosolizes" the smaller internal allergic components of pollen grains. Dust mite allergens are a bit larger and heavier at about 50 microns. Allergic mold spores are about 1-100 microns in size. A red blood cell is about 7-8 microns for reference. A bacterium like e. coli is about 2 microns. You inhale on average about 10 mold spores and 10 pollen grains every breath. Asthma medications like inhaled steroids contain particles from 0.7 microns to 5 microns which reach the deep airways to exert its treatment effects.

The study of respirable aerosols divides aerosols into coarse droplets and fine aerosols. Coarse droplets contain particles greater than 5 microns, are heavier, and deposit into the nose, mouth, eyes, and upper airways. Fine aerosols contain particles less than 5 microns, are lighter, and travel deeper into the airways. Fine aerosols are "airborne" longer than coarse aerosols. You will not find ragweed or grass pollen in fine aerosols, but you will find the pollen's smaller internal "allergenic" particles in fine aerosols since the internal pollen particles are 0.5 to 4.5 microns in size.

An allergist also understands that respiratory syncytial virus kills approximately 500 children per year in the USA. It kills about 15,000 Americans annually. It is transmitted asymptomatically, and just about every American is exposed and infected with it by age 2-5. About 3-10% of the population is infected annually, but most infections are mild and many go undetected like any virus. Along with the much smaller rhinovirus, it is a major trigger of asthma flares and vaccines have been in development since the 1960s. There are some RSV therapeutics available since it is an RNA virus like influenza and SARS-COV2. RSV is 0.15 to 0.25 microns in diameter. Influenza is about 0.10 microns in diameter and SARS-COV2 is 0.10 microns in diameter. Generally, they are about the same size. These viruses are carried on larger respiratory droplets and fine respiratory aerosol particles of varying sizes as free-floating virus isn't as viable as virus attached to respiratory secretions. All 3 viruses above are found on surfaces and most scientists believe some percentage of transmission is from contact surfaces as RSV/influenza is found all over daycare and household surfaces. It is not known how many virions it takes to infect humans, as one respiratory droplet at 5 microns in size, can contain 100s to 1000s of infectious virions.

Trying to avoid these viruses has proven very difficult. Therefore, an H1N1 flu virus can kill millions in 1918 and continue to circulate and blossom again in the H1N1 2009 pandemic. Sometimes vaccines do well to control/reduce transmission as in measles and polio. Sometimes, not so much, like HIV, rhinovirus, RSV, influenza, and coronas. So, boosters are required to try and gain the upper hand on more difficult to control respiratory viruses.

Technically, wearing a surgical mask outdoors, for instance, should filter pollens/virus since surgical masks are supposed to filter particles greater than 3 microns. In 2021, there was a study with just 14 individuals showing reduced allergy symptoms while in an "allergen exposure chamber" for 2 hours. The subjects wore an N95 mask, a surgical mask, and no mask on 3 different visits while being exposed to grass pollens for 2 hours. They were not directed how to wear a mask to approximate the real-world. However, there is no wind inside the chamber to simulate the real-world. Behavior inside the chamber is also artificial from reality. The subjective symptoms were reduced with both types of masks compared to no mask and there was no difference in effect for the N95 or medical mask. The conclusion of this 14-person study was that wearing a medical or N95 mask can help alleviate allergies. Similarly, room HEPA filters show reduced allergen and viral particles in the air. The conclusion of these studies is that HEPA filters can help reduce allergies and viral infections. I do use a room HEPA filter where I sit in the evenings and where I sleep. However, it seems clear that room filters do not help allergy sufferers as much as the studies tout.

The problem in the "real world" is that avoiding all particles is impossible, as I said you breathe in pollen and mold spores just about every breath. N95 masks have NOT been shown to be better at protecting against infection or allergies compared to a surgical mask even though the N95 filters more particles. Double masking was recommended in 2020 after fitting a crash test dummy with 2 masks while an artificial aerosol device was placed in the back of its mouth. The double mask blocked more aerosols in this lab study. The aerosol was blocked for 30 minutes while the dummy doesn't move, talk, breathe, or touch its mask. This does not translate into the real-world protection, because we all talk, breathe, move, and touch our masks and air enters and escapes out the edges of the mask of a living human. This model doesn't simulate sitting in a crowded airport terminal for hours with other people bringing their "stow-a-away" viruses with them as humans always carry virus. Yes, we swim in rivers and waves of several infectious virus families when we get together. The experts have been quoted to say, "it makes sense that 2 masks are better than 1". That is a hunch only. Thankfully, our immune system usually generates memory once it encounters a virus that in most cases protects us from body damage upon re-exposure.

Blocking aerosols is beneficial when a contagious person is emitting pathogens into the breathing space of others. If one becomes ill with respiratory virus symptoms, one should mask in the presence of others. I would also open the windows and create air currents that waft infectious particles away from others while home sick. It shouldn't matter if it is rhinovirus, RSV, influenza, corona virus, human-metapneumo virus (hMPV), adenovirus, or enteroviruses. These can harm the susceptible. Masks and how they are used today have never been shown to reduce asymptomatic viral transmission. It has never been studied for that purpose. Masking in airplanes/airports does not stop international spread of variants as in the case of Delta and Omicron. It has been enforced very well, but is obviously ineffective.

Fauci wrote in Feb 2020: "Masks are really for infected people to prevent them from spreading infection to people who are not infected rather than protecting uninfected people from acquiring infection. "The typical mask you buy in the drug store is not really effective in keeping out virus, which is small enough to pass through material. It might, however, provide some slight benefit in keeping out gross droplets if someone coughs or sneezes on you."

The reality is that masks can partially block inhalation of infectious particles and partially block exhalation of infectious particles, but avoidance is impossible and people who mask outside their homes all day long or at work are no better protected from allergies or infectious disease. In fact, some studies have shown that harm befalls the wearer by concentrating allergens or infectious agents that were meant to be dispersed by our innate defenses including coughing and sneezing. A study in 2001 showed more infections in asthmatic patients who cover their face. There is no perfect solution, but the immune system was built on the uncertainty of particles that can harm. It can respond to new threats, but if shown some semblance of threats, the immune system's adaptive capacity can generate a more protective, reparative response. I am hopeful for improved vaccines against influenza, RSV, and corona viruses soon. In the meantime, I want my immune system to be prepared