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AIR QUALITY AND PORTABLE AIR PURIFIERS

I teach a home repair and maintenance class for the Emeritus Program at Santa Monica College. Students and friends in areas that have experienced heavy smoke pollution this year have asked me about air quality and air purifiers so I have compiled some information and appended some helpful articles.

There are four considerations:

The long term damage to our health caused by smoke and other pollutants

The frequently unhealthy quality of indoor air

The size of airborne particulate matter, including viruses, and why this is important

The efficacy of air purifiers in filtering airborne particulate matter, including viruses

AIR QUALITY

Wildfire smoke

Stanford researchers state that:

People who are over 65 years of age have a higher chance of heart attacks and strokes even after two to three days of bad air quality due to wildfire smoke.

Indoor air quality

Indoor air is frequently more polluted than the surrounding exterior air
Construction materials, new furniture or carpeting, chemical-based cleaning supplies, even cooking may release dangerous particulate matter

Indoor air quality monitors

There are a number of devices on the market that monitor indoor air quality

The size of dangerous airborne particles

There are three different sizes of dangerous airborne particles

The following measurements are about particle size, not the number of particles in the air

PM stands for *particulate matter*:

PM 10 particles equal to or less than 10 micrometers (microns) in diameter, these do not have a special designation

PM 2.5 particles equal to or less than 2.5 micrometers (microns) in diameter, these are called *fine particles*

PM 0.1 particles equal to or less than 0.1 micrometer (micron) in diameter, these are called *ultra fine particles* or sometimes *nanoparticles*

Ultra fine particles (PM 0.1) are the most dangerous to health

They lodge deeply in the lungs and easily penetrate the circulatory system

They end up in all organ systems in the body

Compared to fine particles, they cause more pulmonary inflammation and stay longer in the lungs

Problems caused by exposure to ultra fine particles

Ultra fine particles cause coughing and worsen asthma, predispose people to cardiovascular disease and hypertension, and are linked to diabetes

New research is linking these particles to Alzheimer's disease and brain cancer

Most viruses scale as ultra fine particles

Viruses are usually much smaller than bacteria

Sources of ultra fine particles

Some of the sources include forest fires, ocean splashes, viruses, combustion processes, vehicular and power plant emissions, tobacco smoke and cooking

The airnow.gov website

This easy to use website lets you plug in your zip code or the name of your city to get current information on air quality

The government Air Quality Index (AQI) monitors PM 10 and PM 2.5

It does not monitor PM 0.1, the ultra fine particles

Note that a *moderate* air quality rating does not mean *good*

PORTABLE AIR PURIFIERS

Very few commercially available portable air purifiers filter out the most dangerous particles: the ultra fine or nanoparticles (PM 0.1)

I have two high efficiency portable air purifiers

The Swiss-made IQAir Health Pro Plus and an IQAir GC Multigas unit
I purchased both units and I have no other connection to this company

Specifications compared to other leading portable air purifiers keep these units in the industry forefront with a filtration capability of 0.003 micron which is ten times smaller than a virus (source: iqair.com)

TIP: When buying replacement filters containing charcoal, do not buy extra filters before you need them

Filters containing charcoal as part of the filtration media have a limited shelf life
This suggestion also applies to other filtration devices that use a charcoal media such as ice makers and water purifiers

TIP: When using an air purifier or HVAC system in an intensely polluted environment, check the filters frequently

During the Southern California Woolsey Fire, the optional, coarse pre-filters which I had installed on my air purifiers were coated with an oily, tar-like substance after several smokey days and required immediate replacement

My door and windows were shut, and these pollutants still penetrated my apartment

TIP: If you select a unit that offers an optional, coarse pre-filter, install that extra filter

While these pre-filters are designed to catch pet hair and other normal, coarse debris, in a very polluted environment, the coarse pre-filter may extend the life of your other filtration components by removing some of the material in the air before it clogs your more expensive filtration media

NOTES

airnow.gov

Damage from wildfires' toxic air lingers long after the smoke clears
<https://www.latimes.com/environment/story/2020-09-18/wildfires-toxic-air-leaves-damage-long-after-the-smoke-clears>

Stanford researchers discuss wildfires' health impacts
https://news.stanford.edu/2020/08/26/wildfires-health-impacts/?mkt_tok=eyJpIjoiWVdNNVpURTJNREUzT0dVMYlsluQiOiJvY3FYK21KdUIIUUpNVW5GeEiUUbU0wTW5QVEduWUQRs2dUdkJFYm80eVBOeU84MjFiM3FEM3pMQWhzMjZtajEyY1pFS1d6c2MwNlwwXC9oVVdhNDFNSjICS0ExUTN6dEJsTUU1SmNVMjdHQIBZUTVuTHQ5d0xRODIPVUQxR21uUFNnIn0%3D

Introduction to Indoor Air Quality

<https://www.epa.gov/indoor-air-quality-iaq/introduction-indoor-air-quality>

The Hidden Air Pollution in Our Homes

<https://www.newyorker.com/magazine/2019/04/08/the-hidden-air-pollution-in-our-homes>

Air pollution ultrafine particles: toxicity beyond the lung

<https://pubmed.ncbi.nlm.nih.gov/21222367/>

The health effects of ultrafine particles

<https://www.nature.com/articles/s12276-020-0403-3>

Air pollution particles in young brains linked to Alzheimer's damage

<https://www.theguardian.com/environment/2020/oct/06/air-pollution-particles-in-young-brains-linked-to-alzheimers-damage>

Air pollution nanoparticles linked to brain cancer for first time

<https://www.theguardian.com/environment/2019/nov/13/air-pollution-particles-linked-to-brain-cancer-in-new-research>

California's wildfire smoke could be more harmful than vehicle emissions, study says

<https://www.theguardian.com/us-news/2021/mar/06/california-wildfire-smoke-harmful-pollution-study>

iqair.com