Science and Clinical Potpourri for Your Life and Your Practice

The Airborne Virus: Understanding Definitions Is a Good Start to Being Safe

There is debate about when and where facemasks and other modes of protection should be mandated. No matter where you live or what you believe, knowing what some of the terms mean goes a long way toward better processing the blizzard of information that buries us daily.

An *airborne* virus means that it remains in a pathogenic state (that is viable) as it is carried through the air. For example, the measles virus is dangerously airborne; the HIV virus is not.

To get a better handle on SARS-CoV-2, the bad actor that causes COVID-19, it gets a bit muddled as there are issues related to “aerosols” and “droplets” that must be considered. Droplets are generally referred to as aerosols if they are < 5 microns in diameter. Digging deep back to college biology, you may recall that our RBCs are about 6-8 microns in diameter, offering a bit of perspective. Aerosols then remain airborne and may linger in the air for a considerable period of time.

Droplets that are bigger and heavier tend to fall to the floor or onto a surface fairly rapidly, and most current advice (e.g., maintain a 6-foot distance!) is based on the view that a sneeze, cough or laugh ejects droplets with a potential large viral load. And “viral load” brings up yet another host of issues.

It is increasingly clear that an infected person can emit viral laden entities that may rapidly succumb to the physics of gravity, or remain somewhat defiant for varying periods of time. So, keep in mind that aerosols are droplets and droplets are aerosols; the differentiation is based on size.

Wear Your Climate Control?

First, I have no financial ties to this device! Sony just initiated sales of a highly portable (that is “pocket-sized”) air conditioning unit that they call the “Reon Pocket” to keep you cool in the heat and warm in the cold. It is literally an air conditioner that you wear.

The device is Bluetooth enabled, thinner than a deck of cards and is activated and controlled with a smartphone app, and it is reported to cool one’s body by 23°F, and raise body temperature by roughly 14°F. The thing is designed to fit into a uniquely designed undershirt with a pocket located at the base of the wearer’s neck.

So, for those of you concerned about climate change, or who just want to cool down a bit… this sleek little gadget might just be the thing. Then with winter coming in the not too distant future…

A 3D Printed House?

We are hearing a lot about 3D printers doing remarkable things. But a house? Czech Republic designers can now manage to produce a livable domain in just 48 hours that they predict will last for 100 years. In doing so they claim a reduction in carbon emissions by 20%.

Recently published work notes that the construction industry accounts for about 39% of world carbon emissions; putting this into perspective—the aviation industry contributes just 2% to the total.

Driven by environmental issues, the need for housing, and their entrepreneurial spirit, the two Czech designers started the Prvok project, with the intent of creating a 3D-printed, 43 square meter home that also floats.

The logistics of the product is such that it greatly reduces the time it takes to build a house, but also lowers the construction cost by half….a cost that will continue to fall as mass production ensues. And again, there is that dramatic decrease in carbon emissions.

And it really is a livable house, built with a robotic arm called Scoop, resulting in a living domain consisting of a bedroom, living room, bathroom, and kitchen. It’s designed so that whoever is living in it can do so year round, and it will be anchored on a floating pontoon, if you want to live on that lake that you had your eyes on!

A Setback in a Gene Therapy Trial

Two young boys have died after receiving gene therapy treatment for...
their x-linked myotubular myopathy, a very rare genetic disease affecting muscle. The treatments had a downstream effect on the liver that ultimately resulted in refractory sepsis.

The trial sponsor, Audentes Therapeutics, reported the cases although successes were achieved in other patients. While the boys who succumbed had preexisting liver problems there are success stories in younger patients who were managed with lower doses of the treatment and have done well, even being able to breathe without the need for a ventilator, which had been the case. The FDA has now put a hold on the trial and Audentes, which had stopped enrollment before the deaths, has postponed plans to seek FDA approval for the drug this year.

Fresh in the minds of all is a case from 1999 where a patient death associated with gene therapy occurred. Jesse Gelsinger had a rare metabolic disorder called ornithine transcarbamylase deficiency syndrome, or OTCD, in which ammonia builds up to lethal levels in the blood. After a particularly life-threatening crisis, a doctor told Jesse that a clinical trial for a potential OTCD treatment was in the works and he was very interested. Researchers at the University of Pennsylvania in Philadelphia were developing a fix for the OTC gene, which produces an enzyme that prevents ammonia buildup. Within a day he became disoriented and showed signs of jaundice. He had an intense inflammatory response and developed a dangerous blood-clotting disorder, followed by kidney, liver, and lung failure. Four days after receiving the shot Jesse died. The team of doctors and nurses caring for him were stunned by his rapid decline and death.

The news that an experimental treatment had killed a reasonably healthy volunteer rocked the field of gene therapy and the broader world of biological research. As promising as gene therapy has been for many biological ravages of humankind, there is still so very much to learn. The field rebounded considerably since Jesse’s death, and the FDA has approved two rare disease treatments. But recently, animal studies have suggested high doses of gene therapy can cause significant and fatal liver dysfunction.

And You Think Your Dog is How Old (in Human Years)?

We have all heard it before: every dog year counts for 7 human years. The myth has been around for a long time but what is the evidence for this 1:7 proportion? Researchers at the University of California San Diego School of Medicine have created a new formula that more accurately calculates your dog’s real age. The formula relies on the changing patterns of methyl groups in dog and human genomes.

The new, evidence-based accounting of age involves the rate and location of specific chemical tags as they age and tosses out the 1:7 rule of thumb out the proverbial window. The scientists say it does more than dispel a long-held myth, it may actually provide a useful tool for veterinarians, and for assessing anti-aging intervention options. The finding may also have application in studying the effects of so called “anti-aging” drugs where one would not have to wait out a lifetime in a controlled experiment to determine effectiveness. Rather perhaps you could measure your age-associated methylation patterns (the chemical signatures that the researchers use) before, during, and after the intervention to see if an intervention is doing anything.

The researchers selected dogs as their subjects because of how closely they live with us, making their environmental and chemical exposures very similar to ours. They also receive nearly the same level of healthcare. So, while they dispelled the 1:7 as myth, they hedged on coming up with a more-exacting, evidence-based metric. More research, they say is needed.