THE EDITOR'S DESK

Science and Clinical Potpourri for Your Life and Your Practice

Are “Water Bears” Living on the Moon?

Tardigrades or water bears, as they're often affectionately called, are some of the most amazingly resilient animals that we know of. Many biologists consider them the most extreme critter on the planet—able to withstand intense heat, cold, pressure, radiation, even the vacuum of space.

Well, thanks to the Beresheet Israeli lunar probe that crashed on the moon carrying a load of the little critters as part of a planned experiment, it is entirely possible that there is a colony of survivors now on the landscape. Well, sort of.

Tardigrades are known to tolerate virtually any environment (with evidence of their survival after a 3-decades-long deep freeze). So, theoretically they could have survived the crash and the challenge of a lunar exposure. Although survival is possible, reproduction is not so likely in the inhospitable, anoxic, and waterless environment of the moon. Some of them were sealed in epoxy with 100 million human, plant, and microorganism cells as part of a “library” that was being delivered to the lunar surface. Others were placed on the sticky side of a 1 cm square piece of special tape that was sealed inside a set of discs. As such while they may have survived the crash, they cannot reproduce on the moon there.

Keep in mind that though the moon was formed over 4 billion years ago, we’ve left microbes there before. The majority of Apollo missions stayed on the Moon for about a day, with those on the surface needing to excrete human waste at some point. In fact, in total, our intrepid lunar explorers left nearly 100 bags of it. Future visitors will find the lunar landscape dotted with bags of urine, feces, and the contents of nauseated stomachs, replete with human microbes whose current status can only be speculated on.

5G Cellphone Signals Could Interfere With Weather Forecasts and Monitoring Smoke From Wildfires to Model Nuclear Winter

To the list of human enterprises that have adverse consequences for mother Earth (think offshore oil drilling, our love of combustible engines, depleting the ozone layer, deforestation of the Amazon, etc.) we might now consider the coming of 5G cellphones.

In recent months, telecommunications companies in the United States have purchased a new part of the spectrum for use in 5G cellphone networks. Meteorologists and earth scientists are concerned that these extremely strong signals have the ability to extinguish out weaker signals from water vapor—which are in a nearby band and important for weather prediction.

Is this academia gone wild or is there fundamental science to support this? Let’s await further research and practical observation to see.

Can Dosing With Broccoli Restore Tumor Suppressor Activity?

A recent report from the Journal of the American Medical Association (2019;322:805-6) describes a compound derived from cruciferous vegetables such as broccoli, brussels sprouts, and kale as having the capability to suppress tumor growth in laboratory animals. The research also detailed the molecular pathway through which the compound mitigates tumorigenesis.

This work was born from an effort to identify regulators of certain tumor suppressors. These tumor suppressors are often dysregulated in human cancer cells through the loss of a particular gene.

The researchers found a new important player that drives a pathway critical to the development of cancer, an enzyme that can be inhibited with a natural compound found in broccoli and other cruciferous vegetables. It turns out that this pathway emerges not only as a regulator for tumor growth control but also as a kind of Achilles heel that can be targeted with therapeutic options.

However, before developing a treatment strategy based on this approach, researchers will need to further investigate how specific enzyme activity coordinates with

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other regulatory factors that affect cancer cells. Nevertheless, the research is yet another scientific advance describing the genesis, and potential treatment interventions, involved in cancer.

It Seems We Should Know But We Don’t: How Many Species Are on Planet Earth?

The most recent studies suggest/estimate that there are some 8.7 million species, with a total of 1.3 million species having so far been identified but many (read: many!) more actually living on the planet.

Interestingly, despite what we might have recalled from our high school and college biology courses, current estimates range from a whopping one trillion species on the planet to the much lower 5.3 million. This rather compelling difference, actually starts with disagreement among biologists on what the term species actually means. It is somewhat akin to the argument that astronomers had in deciding if Pluto is a planet or not (Pluto, as we all know, is no longer considered the ninth planet in our solar system.)

A conventional definition says two organisms belong to the same species if they can interbreed and produce fertile offspring. But this has been challenged, as the concept can’t be used to define asexual organisms and also ignores that many living things we consider separate species can interbreed.

At the same time, researchers have so far been unable to count all life forms on the planet. A large number live in places that can’t be accessed by humans, so what scientists do is look for patterns in biodiversity and try to estimate the total number of species.

In a somewhat macabre field experiment a US entomologist (I will shield his name here to avoid a provocative response by those of you who are bug lovers) did one of the first studies, back in 1980, spraying pesticides into the canopy of trees, with 1,200 species of dead beetles falling to the ground. The researcher concluded that there are 30 million species on Earth, using some extrapolation equations that not all similar researchers embraced.

The figure has been repeatedly challenged, with more estimates arriving at figures under 10 million. In 2011, scientists used a technique based on patterns in the number of species at each level of biological classification to arrive at a much lower prediction of about 8.5 million species.

Despite the large disagreement on the number, what’s clear is that there’s a long way to go until completing the catalog of species, with the risk of not discovering all of them before they face extinction.

Scientists have so far named and cataloged 1.3 million species. How many more species there are left to discover is a question that has hovered like a cloud over the heads of experts for centuries.

Researchers constantly find new species, at a rate of roughly 18,000 per year. For example, in Los Angeles experts found 30 new species of a kind of fly living in urban parks, while in the United States more than 1,400 new species of bacteria living in the belly buttons of university students were found.

Exotic species also present difficulties for biodiversity. When a species is introduced in an area where it’s not native, it competes for space and resources with native ones. This can harm local species and even displace them, having an invasive behavior. The number of many species has been reduced because of this.

Climate change also plays a role because it can greatly impact the habitats and conditions in which species live, forcing them to move to new locations that are in line with their climate patterns. The World Wildlife Foundation notes that most species will have to move 1,000 meters per year to keep within their climate zone.

Hunting and exploitation of animals can also be a factor in reducing the number of species, a practice that remains in many countries. The same occurs with the trade of exotic species and collecting or capturing animals with supposedly curative properties, leading to the decline of many species. What is agreed upon by all is that there is still a lot of exploring and identification that remains to be done.