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A fluorescent protective shield, the new superpower of tardigrades

Inquisitive tardigrades can survive extreme temperatures, dehydration, radiation, and even the vacuum of space. Now a new discovery reveals that thanks to a fluorescent pigment, a newly discovered strain of tardigrade can also resist lethal doses of UV radiation.

Paramacrobiotus BLR

Photo: Harikumar R. Suma & Sandeep M.Eswarappa / Biology Letters

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October 19, 2020 8:08 AM Updated October 19, 2020, 12:18 PM

The discovery occurred by pure chance when researchers from the Indian Institute of Sciences were conducting a series of experiments in which these tardigrades, also known as water bears, were once again exposed to various extreme conditions to be studied. .

One of the tests carried out by the team of **Sandeep M. Eswarappa, lead** author of the study recently published in the journal **Biology Letters** of the **Royal Society** under the title *Naturally occurring fluorescence protects the eutardigrade Paramacrobiotus sp. from ultraviolet radiation* , was subjecting these creatures, described on countless occasions as indestructible, to the action of a germicidal ultraviolet ray lamp like those used to sterilize or eliminate pathogens from certain surfaces and even purify the air in certain public spaces.

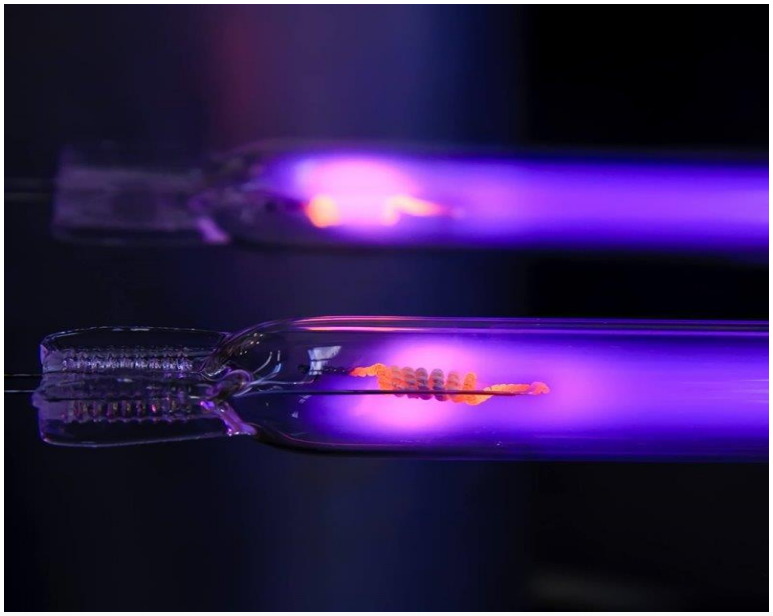
Tardigrades, also known as water bears because of their appearance and the way they move, are tiny invertebrates.

As expected, an applied dose of 1 kilojoule per square meter of ultraviolet light killed the bacteria and intestinal worms in the sample studied after just 5 minutes of exposure. The same dose of UV radiation, this time applied over a 5-minute period, was also lethal to tardigrades of the species *Hypsibius exelaris,* most of which died 24 after the experiment.

However, the surprise occurred when **Eswarappa and his team** came **across a kind of tardigrade of which all the analyzed specimens had managed to survive.** What's more, when the researchers increased the dose up to four times, they found that approximately 60% of the sample of this new reddish-brown species of water bear managed to stay alive for more than 30 days. It was thus that **the researchers discovered that they were facing a new strain of the genus *Paramacrobiotus*** , which had been collected from the moss on the walls of the University of Bangalore.

Fluorescent pigments, probably located under the skin of tardigrades, transformed ultraviolet light into harmless blue light

To find out how this new strain, called *Paramacrobiotus BLR* , had managed to survive UV radiation, the scientists examined it under the light of an inverted fluorescence microscope. **To their surprise, under ultraviolet light these reddish-brown tardigrades turned an intense fluorescent blue**. Fluorescent pigments, likely located under the tardigrades' skin, transformed the ultraviolet light into harmless blue light, the team reports.



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To further explore the function of the pigments found in Paramacrobiotus BLR, the scientists took a sample and applied them to the other species studied, *Hypsibius exelaris.* And while the specimens studied died a few days later, the scientists showed that the pigments extracted from Paramacrobiotus BLR also provided at least some degree of protection to H. Exelaris.

"There was no difference in the survival of these two tardigrade species when they were not treated with UV radiation" states Eswarappa. "But surprisingly, the fluorescent extract of *Paramacrobiotus sp.* Could protect the tardigrade *Hypsibius exelaris,* more sensitive to UV rays" continues the author, "which in a new turn of events also observed with his team that the pigment not only It safeguarded tardigrades, who have earned the title of the most resistant organisms on our planet, but also did the same with a nematode of the species *Caenorhabditis elegans* , which it protected to some degree from germicidal UV radiation.

"There are other species that show tolerance to UV rays, but this new species is the only one that uses fluorescence as a mechanism to resist lethal doses of UV radiation " declares the author, who also in an additional experiment, showed how the *Paramicrobiotus BLR* strain it survived in an anhydro-biotic state -living in the absence of water- by eliminating its environment. The subsequent slow rehydration "revived" tardigrades to an active state with an efficiency of 90%, demonstrating that these tardigrades also possess tolerance to desiccation in addition to UV rays.