

STANDARD DEVIATIONS: A Bug's Life

Greetings,

Survival. It's a pretty big deal.

The ability to fend off death is extremely rare. Well, let's face it, so far it's been impossible.

But some organisms are sneaking up on it. And they may have been sneaking around for a long time.

Bdelloid rotifers are freshwater microscopic organisms that may be the toughest little guys around. These asexual worms have been revived from desiccated slumber after 24,000 years in Siberian permafrost.

Bdelloids are one of a handful of teensy creatures, including tardigrades, which are known to survive incredibly inhospitable conditions.

Bdelloid rotifers are all around us — on moist strands of moss, in rain puddles and bird baths, and across freshwater bodies spanning arctic and tropical regions and everything in between. They have been studied by scientists since the invention of microscopes. In 1702, Antony van Leeuwenhoek described them as “little round animalcules,” after spotting the creatures in gutter water.



{There are three main regions of the body of bdelloids: head, trunk and foot.}



They feed on bacteria and algae, swimming and inch-worming around happily when conditions permit.

They are under some heavy scrutiny for their reproductive behavior. Even though they have gonads, they have lost the ability to respond to sexual differentiation. No males are seen and females reproduce only by [parthenogenesis](#).

Bdelloids survive by rapid desiccation (anhydrobiosis) similar to the tardigrade. They synthesize a matrix of chemicals that protect their essential genetic material and the integrity of a skeleton while somehow removing almost all water from their body.

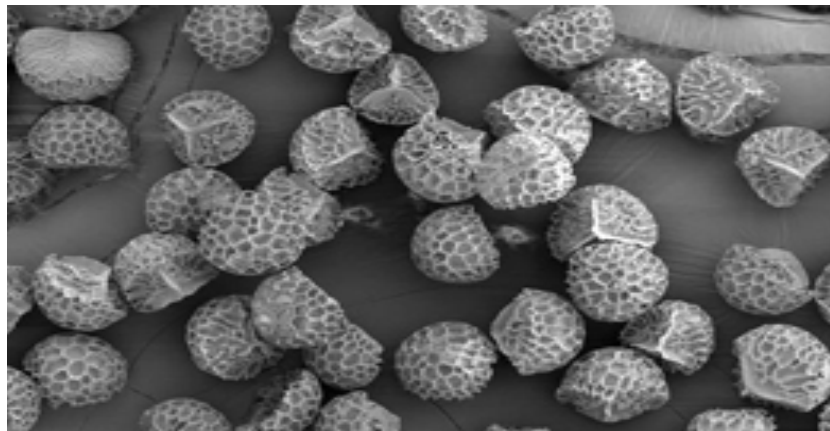
They can remain in this dormant state a long time. Drilling in permafrost discovered bdelloid rotifers that were carbon dated back 24,000 years. When conditions favor hydration, they rehydrate and become fully active, and capable of reproduction, in just hours.

The complex anatomy of the tiny rotifer makes it one of the planet's most resilient animals. In its cryptobiotic state the rotifer can withstand extreme acidity, starvation, low oxygen, radiation, and years of dehydration.

This kind of survival is handy for an organism. Being able to close up shop and wait out dangers in the environment is something we can all be jealous of after our experience with the recent pandemic.

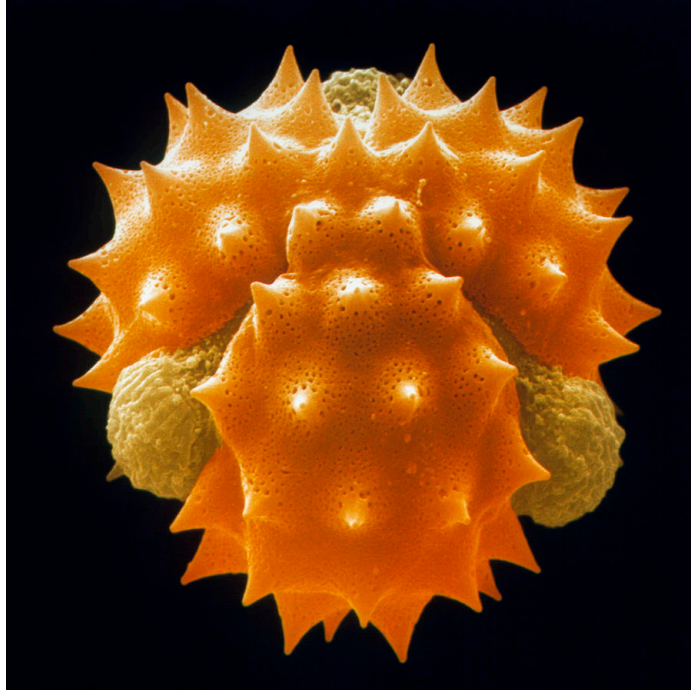
While this biology seems incredible in animals equipped with brains, guts, muscles and reproductive systems like rotifers and tardigrades, we see the process in other branches of the tree of life.

Plants and fungi reproduce through a sporulation that offers gametes and progeny survival advantage. Seeds, spores, and pollens are mechanisms of survival that protect the offspring.



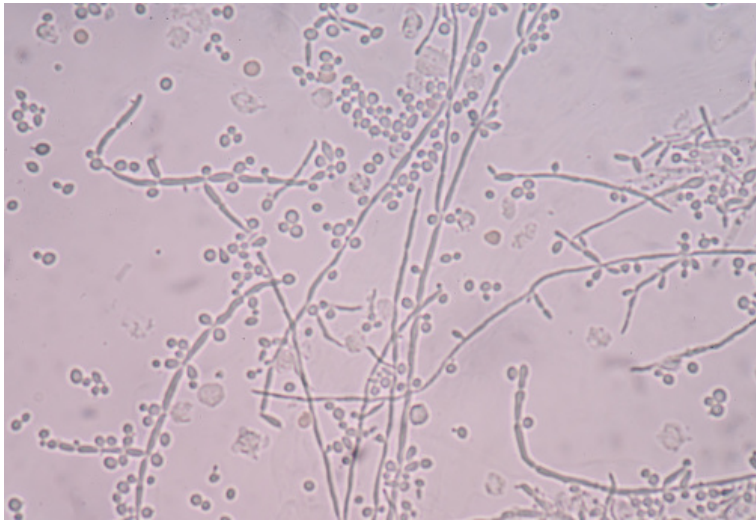
{Slime mold spore.}





{Chamomile pollen spore.}

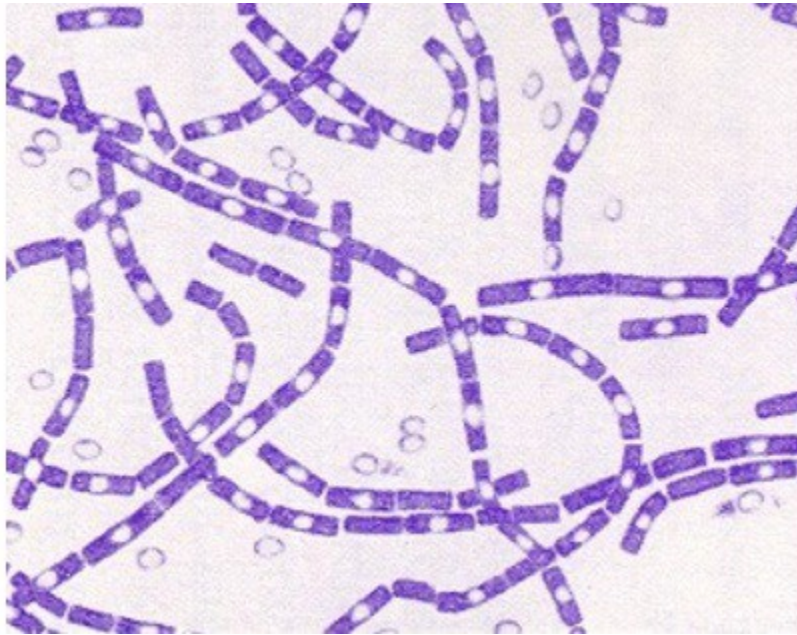
In our work we encounter these survivors in human disease. Bacterial and fungal spores are characteristics of pathogens that make our bodies their home. Some of them are ubiquitous and some are rare. Some of them pose minor threats to health....



{Budding yeast in urine is a classic site on the clinical bench.}



.... And some are deadly.



{Anthrax with spores.}

A curiosity of the bdelloid rotifer evolution is the large amount of [horizontal gene transfer](#) with bacteria, plants and fungi that has been found. The thinking is that borrowing genes has led to the adaptive sexual and stress-induced behaviors unique to these leeches. Somehow all this cobbling-together of genetic know-how has enabled the bdelloid rotifer to, seemingly, escape death.

Have a great week and be safe,

Bryan

