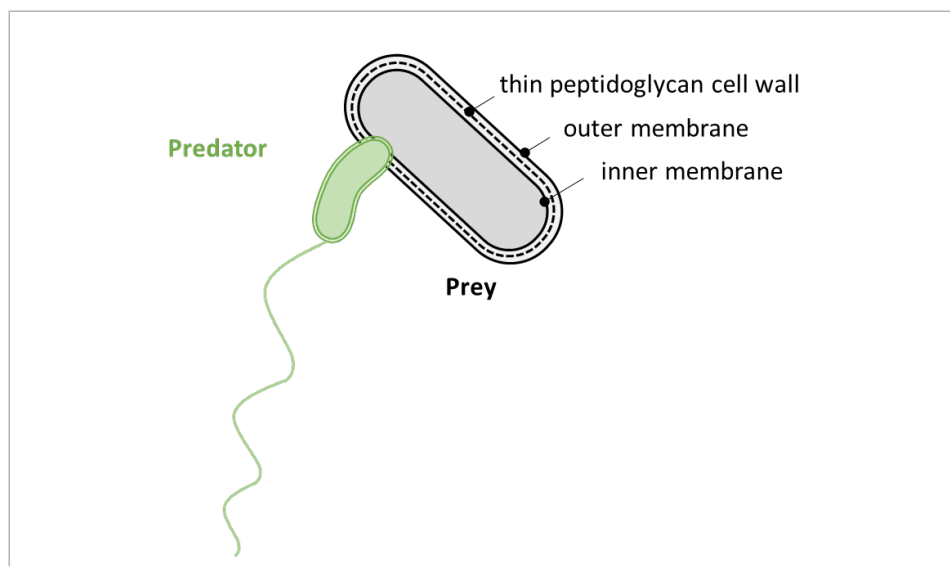


MicroPredator: Dello (*Bdellovibrio bacteriovorus*)

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Dello invading a prey bacterium. The predator is smaller than the prey.

Claim to fame: a bacterial predator of other bacteria that invades and eats them from within.

Some microorganisms are able to infect humans, plants or other animals, and cause fatal diseases in sensitive individuals. Such microorganisms are described as pathogens. But certain microbes can kill other microbes, including pathogenic ones. These predators may be useful to kill human pathogens that cause deadly infections!

Dello: the clever MicroPredator. Dello were isolated accidentally during a search for new viruses of bacteria by Heinz Stolp in 1962. He found small, fast-moving bacteria that attach to and lyse other bacteria, and named them *Bdellovibrio bacteriovorus*, from 'bdella' Greek = leech, and 'vibrio' Latin = curved, because "The parasite seems to cling to the cell surface like a leech attaches to the skin", and because their shape is often vibrio-like, and "*bacteriovorus*" means "eater of bacteria". Dello and its family members (other bacteria that much resemble it, collectively called *Bdellovibrio* and like organisms, BALOs) are very common on Earth, where they inhabit soil, the roots of plants, and the aquatic environment, such as the ocean, estuaries, rivers, sediments, sewage, fishponds and so on. They also colonize complex microbial communities growing on surfaces known as biofilms, and have even been found in some animals.

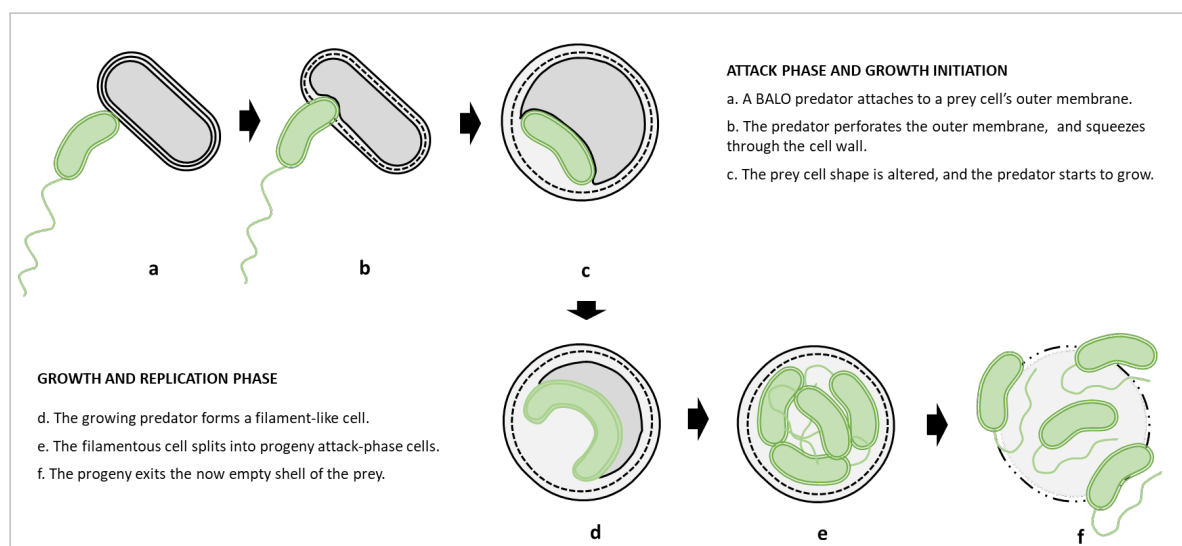
In predation, one organism (the predator) consumes another (the prey). BALOs are obligate predators, so they must have a prey to eat in order to grow and to replicate. They can use many types of bacteria, including pathogens of plants, humans and other animals, and other microbial predators.

Thanks to these abilities, they have great potential to benefit medicine, agriculture and biotechnology. However, they do not prey on all kinds of bacteria, but rather prefer so-called Gram-negative bacteria, whose cell envelope consists of an outer membrane, below which a thin

A child-centric microbiology education framework

peptidoglycan layer is found, and a cytoplasmic membrane that encloses the cytosol, where most of the cellular activities take place. The peptidoglycan is rather rigid and gives the bacterium its shape. BALOs are also Gram-negative. Many disease-causing, pathogenic bacteria are Gram-negative, and can be preyed upon by BALOs.

BALOs are fast swimmers, and this ability helps them catch prey. The first stage in predation is called the “attack phase”. Once an attack-phase cell encounters a prey, it firmly attaches to the outer membrane, makes a tiny pore, and squeezes into the prey cell near the cytoplasmic membrane (a, b). To do so, it modifies the prey’s peptidoglycan while protecting its own. This modification changes the shape of the prey cell (c). Then, the predator starts the growth and replication phase (d), during which it greatly elongates and replicates its DNA, utilising prey’s cellular contents as nutrients (d). When Dello has used up almost all the nutrients of the prey cell, its long, filament-like cell divides into progeny cells (e). The prey cell then disintegrates allowing the progeny cells to exit, leaving an empty envelope of what was once a bacterial cell, and begin searching for new prey (f).



The life cycle of Dello.

Dello in the in the food web. Predators are very important partners in the food web and help maintain the stability of the ecosystem. When a cheetah captures a steenbok in the savanna or a wolf pack devours a deer in a forest, they keep the number of herbivores in check and help sustain ecosystems. Do BALOs do a similar thing in the microbial world, which we cannot see with our naked eyes? We can't provide a definite answer like we may with cheetahs and wolves, but research so far indicates that this may be the case. We know that they can influence population levels of certain bacteria in the environments they inhabit, and may thus help control the balance of microbial communities.

Dello is a mighty predator!

The importance of Dello for us.

Today, antibiotics used in human and veterinary medicine are becoming increasingly less effective because pathogens develop resistance against them, and in agriculture, we too often have no effective ways to protect crops from bacterial diseases. BALOs, by being able to prey on pathogenic bacteria, may help us fight diseases in plants as well as in humans and in other animals. For example, they can fight lung and eye infections, and reduce dental plaque. They are able to prevent *Salmonella*-induced gut diseases in chickens, and they can protect cultured shell fish and finfish against shrimp and fish diseases in aquaculture. They can also defend crops, preventing bacterial blight in rice paddies, and protecting potatoes from soft rot. They also help us keep water systems safe by preying on many bacteria in wastewater treatment plants. In doing so, BALOs may help us maintain our health, and that of our animals and our food crops, in a more environment-friendly way. But, this still requires a lot of research, from the laboratory bench and the microscope to the clinic and the field!