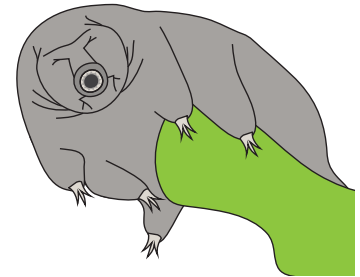


Culturing Tardigrades (Water Bears)

Background

Water bears, as known as moss piglets are members of a small phylum of invertebrates, *Tardigrada*, of about 900 species. They were first described by J.A.E. Goeze in 1773. They have short (0.05 mm to 1.2 mm) segmented bodies that are plump and bilaterally symmetrical with four pairs of legs each ending with four to eight claws. They are found everywhere! Water bears have been sighted on the tips of mountains all the way down to the depths of the ocean, from tropical rainforests to Antarctica. About 150 of the 900 species inhabit marine environments, while the remaining species belong to freshwater or semiaquatic terrestrial environments. Water is essential in the environment of the tardigrades as their bodies must be surrounded by moisture to allow gas exchange and prevent desiccation. Water bears can be commonly found on the film of water surrounding lichens or mosses and in sand dunes, soil, sediment or leaf litter. They are commonly found feeding on plant or animal cell fluids and even bacteria. They fall prey to amoebas, nematodes and even other tardigrades.

Tardigrades are often called extremophiles, which are organisms that thrive in extreme environments. This is not true of tardigrades. While they are able to survive in extreme environments, they are not adapted to live in such conditions. In fact, the chances of dying increase the longer they are exposed to extreme environmental conditions. That being said, some tardigrades have been known to survive in extreme environments with temperatures below $-200\text{ }^{\circ}\text{C}$ and above $151\text{ }^{\circ}\text{C}$, changes in salinity, a lack of oxygen and/or water, radiation 1000 times the lethal dosage in humans, and even pressure six times greater than the deepest parts of the ocean. They survive the environmental stress by undergoing *cryptobiosis*, a death-like state, in which metabolic activity come to a reversible standstill. Tardigrades are known to survive dry periods by curling up into a little ball, called *tun*. Entering *tun* requires metabolism and synthesis of a protective sugar called trehalose, which moves into the cells and replaces lost water. The metabolic state of the tardigrade will dwindle to less than 0.01% of the normal rate. Revival from *tun* can take hours or even days, depending on the length of time in the cryptobiotic state.



Culturing Media

Upon arrival of your tardigrade culture, loosen the lid and aerate with a pipet to replace oxygen that depleted during shipment. There is likely some debris at the bottom of the culture jar; this is most likely residue from life cycles of the tardigrades and can be left alone. Place the culture jar underneath a fluorescent light to keep algae, the tardigrades' food source, alive and multiplying. The culture jar should be kept in an area near room temperature, $18\text{--}21\text{ }^{\circ}\text{C}$. With minimal care, the culture will survive for days, possibly weeks. However, you will want to view your specimen within two to three days for best results.

Long-term culturing of tardigrades requires spring water (chlorine- and chloramine-free), culture dishes and freshwater green algae (*Chlamydomonas*, *Chlorella* or *Spirogyra*). Pour 100 mL of spring water and 50 mL of the green algae culture, which should be teeming with life and very green, into a culture dish. Inoculate with 50 tardigrades, or as many as you can capture. Check the culture every 2–3 days with a stereoscope to ensure your tardigrades are flourishing. Feed the tardigrades 50 mL of the algae culture every week. The tardigrade culture will need to be sub-cultured every three to four weeks to remove debris and clean the environment.

Tips

- Tardigrades are most active at $0\text{--}30\text{ }^{\circ}\text{C}$.
- An average life span is anywhere from 2 months to $2\frac{1}{2}$ years.
- Tardigrades molt 4–12 times throughout their lives.
- If the tardigrade population becomes too large in the culture dish, consider splitting in half. They will feed on each other if resources are limited.
- Keep under fluorescent light to ensure proper algae growth.

Disposal

Tardigrades may be disposed of according to Flinn Suggested Biological Waste Disposal Method Type IV. Please consult your current *Flinn Scientific Catalog/Reference Manual* for proper disposal methods.

Materials for *Culturing Tardigrades (Water Bears)* are available from Flinn Scientific, Inc.

Catalog No.	Description
LM1261	Tardigrades, Water Bears, Class of 30
LM1041	Chlamydomonas
LM1043	Chlorella
LM1051	Spirogyra
W0015	Spring Water, 3.78 L
AB1264	Culture Dish, 300 mL

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.