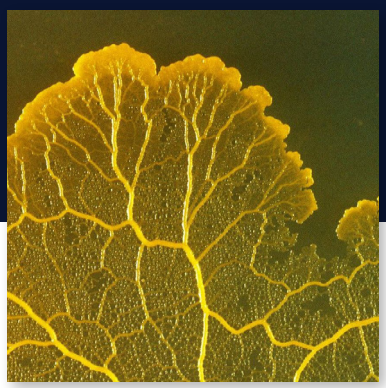
LIVING CARE GUIDES:
Physarum Polycephalum



Physarum and other slime moulds are found in nature growing on moist decaying vegetation or tree stumps. Under optimum conditions, this protoplasmic mass can spread for 0.1-0.2 square metres and represents the amoeboid stage of the life cycle.

The Kit you have received consists of:

1. Plasmodial culture of Physarum polycephalum, growing on a plain (non-nutrient) agar plate
2. Bottle of rolled oat flakes
3. Sterile plain agar plate (1.5% agar in water)

Protoplasmic streaming will be visible when culture is viewed under the microscope using low-power magnification (40x), by removing the lid from the culture and positioning the plate on the stage of the microscope. Close the diaphragm of the microscope to increase the contrast and focus on the bright yellow filaments.

Maintenance of Cultures

As soon as you receive your culture, place several of the plain uncooked rolled oat flakes on the plate, in contact with the brightest yellow areas of the culture. Typically 4-8 flakes are used on a new culture whilst 15-25 are required for a culture that is several days old. Once fed, replace the lid on the petri dish and leave it on a bench, out of direct sunlight, at room temperature. The Physarum plasmodium will colonise the oat flakes within 6-24 hours. A yellow, or colonized flake, can be used to make another culture, by sub-culturing onto a new plain agar plate. To sub-culture we recommend that you transfer 2-3 colonized flakes from the existing culture to a new plain agar plate, but allow your “stock” plate to grow for a few days before your first sub-culture. To make a sub-culture, take 2-3 yellow flakes and place each, yellow side down, onto the agar surface, then replace the Petri dish lid. Feed the “stock” culture with oat flakes but do not fed the new culture for 24 hours. Your new Physarum will fan out over the agar surface in 24 hours. Feed the new culture when the fan is more than 3 cm in diameter. Sub-culturing allows you to prepare as many Physarum cultures as you require, simply by increasing the number of oat flakes on the stock plate. One culture for every student in your class if you wish!

Physarum cultures need to be fed every day with oat flakes, even over the weekend. To maintain a culture over extended weeks/months you will need to sub-culture onto a new agar plate when the “stock” plate becomes full, or the agar base is showing signs of shrinking. This is done typically every 7-10 days. Cultures survive best at temperatures around 25°C but will survive at most room conditions. On fresh plates at this temperature, the speed of movement of the advancing edge of the culture can be 2-3 cm per hour.

The culture supplied to you in the Kit corresponds to Stage 1 in the accompanying life-cycle diagram. If sufficient food and moisture are supplied, the organism can be maintained in this plasmodial stage indefinitely. You may find it difficult to get Physarum to go through its complete life cycle in the laboratory but it can be done, so keep trying!

Characteristics:

1. Slime moulds live in cool, moist, shady places on rotting leaves, decaying trees, and come in a variety of colours.
2. Physarum display animal-like characteristics, engulfing food like an amoeba and then digesting it in food vacuoles. This is the plasmodial stage in which the slime mould is a mass of cytoplasm requiring high humidity and moisture.
3. If environmental conditions deteriorate, it can move into an (irreversible) spore forming reproductive stage.
4. However if the plasmodial stage is dried slowly as on filter paper, the slime mould can dry into a sclerotium (cyst form), which can be resuscitated with moisture to the plasmodial form in the future when required.

Possible experiments:

1. Example of protoplasmic streaming.
2. Different food sources (e.g. other carbohydrates).
3. Effects of positive and negative stimuli, e.g. light?, vegemite?, strong saline?, vinegar?, cheese?, milk?

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