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Martian habitats in the classroom: testing *Artemia*

Activity 1 answer sheet

How 'Martian' is this experiment?

The experiment is Martian in the sense that it asks students to test whether a small organism can become active in different simulated habitats. However, it does not reproduce many real Martian challenges, such as extreme cold, low pressure, high radiation, toxic perchlorates, lack of liquid water at the surface and reduced gravity.

How do experimental variables affect the results?

Salinity is the independent variable, while hatching success is the dependent variable. Temperature, number of cysts, light levels and water volume are controlled variables; keeping them constant helps ensure that salinity is the main factor influencing the results.

Which 'Martian habitat' worked best?

The best 'Martian habitat' is the salinity condition with the highest hatching success after 24 h and 48 h. Students should compare the number or percentage of hatched *Artemia nauplii* in each beaker and identify which salinity produced the most successful hatching.

Did *Artemia* hatch in freshwater?

Usually, *Artemia* hatching is poor or absent in freshwater, because these organisms are adapted to saline environments. This suggests that water alone is not enough: the chemical conditions of the habitat must also match the organism's biological requirements.

Compare the number of hatched *Artemia nauplii* after 24 h and 48 h. How can any difference between the two counts be explained?

Variation in hatching time can be advantageous because it spreads the risk. For example, if temperature rises, oxygen levels fall, or salinity suddenly increases through evaporation, *nauplii* that hatch early may die, while cysts that remain dormant and hatch later may survive until conditions improve.

How could the experiment be improved to increase the reliability of the results?

The reliability of the results could be improved by using more cysts, repeating each salinity condition several times, keeping temperature and light constant, counting carefully and calculating average hatching percentages for each salinity.

What would *Artemia* need, beyond hatching, to successfully colonise a habitat?

Hatching is only the first step. To successfully colonise a habitat, *Artemia* would need suitable and stable conditions, including food, oxygen, appropriate salinity and temperature, enough space, waste control, and the ability to grow, reproduce and maintain a population over several generations.

Why use cysts rather than adult *Artemia*?

We use cysts rather than adult *Artemia* because cysts are easier to obtain, store and transport. They are also dormant and resistant, with low metabolic activity, which helps them survive unfavourable conditions and makes them a useful model for discussing how life stages might endure storage, transport and a long journey to Mars.

Should we take life to other planets?

This raises both scientific and ethical questions. Introducing Earth organisms beyond our planet could support research and future life-support systems, but it also risks contaminating other worlds and making it harder to detect possible native life. For this reason, planetary protection and careful ethical debates are essential.