



MICROBES IN MUD

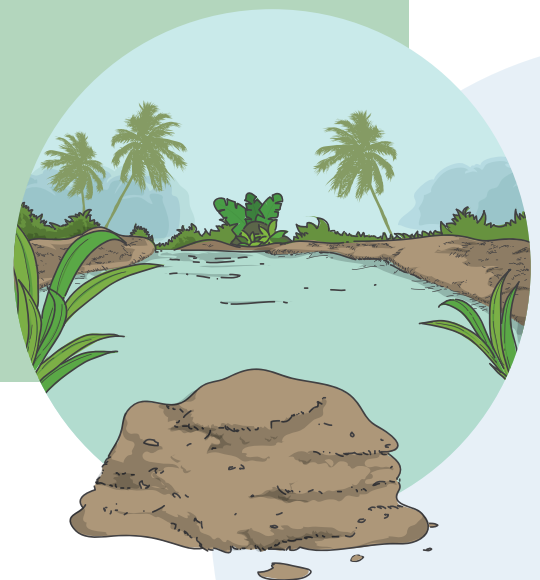


TEACHER PACK

The purpose of the Winogradsky column exercise is to teach children about the diversity of microorganisms all around us.

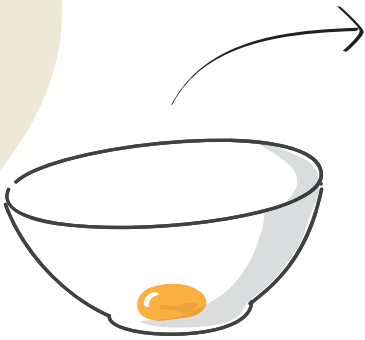
Here are the key concepts to teach during the exercise.

- That there is a whole world of microbes living in mud sediments and water.
- Some of these microbes can be cultured at home.
- The microbial communities in mud are diverse, there is not just one type of organism.
- Different microbes in the mud require different nutrients. If you supplement the Winogradsky column with carbon or sulphur, you can change the composition of the microbial community.
- Microbes out in nature contribute to the cycling of nutrients that are important for life on earth.

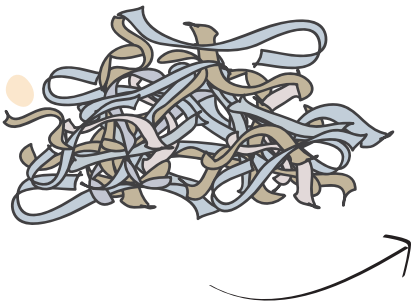


Experiment - What to expect

If you perform the experiments by changing different parameters you can expect to see differences in your Winogradsky column.



Eggs are a source of sulphur and will encourage the production of sulphides by sulphur reducing bacteria such as *Desulfovibrio*. Sulphides will mainly form at the bottom of the column where there is less oxygen.



By adding a carbon source in the form of newspaper, you are ensuring that there are enough nutrients in the system for microbes to grow. Without carbon there will be very little growth. However, you may still see growth in columns that don't contain newspaper as there can be natural sources of carbon from the mud.

When the Winogradsky column is exposed to light, you give photosynthetic microbes the chance to grow. This is impossible if the column is left in the dark. These organisms will probably have a green colour like tree leaves and will be more commonly found where light is hitting the column.

Oxygen is an important factor for microbes, some of them love it and some of them die when they are exposed to it. It is important to remember that there will always be more oxygen at the top of the Winogradsky column close to the opening and less (sometimes zero) oxygen at the bottom. The gradient of oxygen is partially because oxygen needs to diffuse from the top to the bottom, so there will always be less at the bottom. However, it is also partially due to the fact that microorganisms at the top of the column will use up oxygen to grow so there won't be enough to diffuse to the bottom.

Things to consider

No two Winogradsky columns are the same. It really depends on what microbes were in the sample when it was taken and how they develop over time. In some respects, it is hard to know exactly what to expect after 8 weeks of

monitoring the Winogradsky column. For this reason, the success of the exercise relies on the children being able to document their Winogradsky columns (i.e. by taking photos) and observe changes.



Some columns won't smell at all, others will produce sulphur and smell like rotting eggs. To be on the safe side, make sure that your Winogradsky column is kept in a place where the smell won't affect anyone. If there is a strong smell, don't be tempted to seal the Winogradsky column more tightly as this will result in a build up of gas which could eventually erupt.

Try not to move the Winogradsky columns once they are set up. They will ultimately form lots of unique layers due to the differences in concentrations of nutrients available to the microbial communities. If these are disrupted then the delicate layers and communities will break up.

Acknowledgements

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