BioMEDIA ASSOCIATES LLC HIDDEN BIODIVERSITY Series Locomotion of Microorganisms

Study Guide Written and Photographed by Rubén Duro Pérez Supplement to Video Program

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One of the characteristics that allows to us to differentiate animals from plants is their ability to move. In general, in our macroscopic world, the world we see with the naked eye, animals can move and plants cannot. However, in the microscopic world things are very different. In this microcosm virtually all microorganisms can move.

We are used to see how animals move. We know they can swim, crawl, run or fly, and that each of these strategies requires specialized and perfectly adapted locomotion structures.

The **fins** that fishes use to swim are the oldest locomotive structures we can find among vertebrates or chordates.



Its evolution led to the **legs** of the other vertebrates. Legs adapted for traveling on firm ground, either crawling, running or jumping.

And a further evolution turned legs into **wings** fitted to move in the air, to fly.



Some questions:

How many modes of locomotion do you know from chordates?

Why do you think animals need to move? In what characteristic the

wings of a bird are similar to our arms?

In the microscopic world we do not find the same locomotive structures that we can find into the chordates group. There are no fins or legs or wings. However, the tiny organisms also move, they can also go from one place to another in search of a better environment, a greater amount of food or simply a place with a better light.

How do they do?

In the microscopic world we can find three basic strategies of locomotion: amoeboid movement, movement by flagella and movement by cilia.

Amoeboid movement



The amoeboid movement is the simplest of those we can see in the microscopic world. To carry out any special structure is needed since it is based on the elastic deformation of cell wall due to the currents which are created inside the cells.

This type of movement is used both by amoebas (hence its name) and by other organisms. Even some algae, such those of the genus *Euglena*, use in some cases this type of movement even though they have other more advanced systems to move.



Some questions:

Why amoeboid movement is considered the simplest of all? What feature should

have a microorganism to perform this kind of movement? Quote some

microorganisms using amoeboid movement.

Some microorganisms have developed special structures to move called flagella. Flagella look like delicate and long hairs that appear in certain parts of the cell wall and usually having an undulating movement. Their fragility makes them suitable to move only in the liquid medium, usually in water, however, it allows the organism to reach a higher speed than that provided by the amoeboid movement. The possession of flagella has given rise to the name of the group of protozoa called flagellates.



The number of flagella may vary from one microorganism to another. Usually there are only one or two flagella, as in the case of the alga *Haematococcus*.

However, there are species of microorganisms, such those of the genus *Trichonympha*, a symbiont living in the gut of termites, which have a lot of very long flagella.



The movement of flagella is controlled by the microorganism itself, so it can always decide in which direction and how fast to move.

Some questions:

What advantages provide flagella to the microorganisms?

Why do you think that flagella serve only to swim?

A slightly more efficient system of locomotion is the movement by means of cilia. Cilia are like very short flagella, and have a very similar structure to those. However, the cilia appear in much greater quantities than the flagella. The possession of cilia has given rise to the name of a very special group of protozoa, the ciliates.



The cilia can move at high speed, and in many cases they do so by a synchronous movement regulated by the microorganism itself. And the abundance of cilia on the surface of cells provides the microorganisms an enormous maneuverability and great speed.

Cilia are not exclusive to the group of protozoa ciliates. Other organisms such as rotifers, also possess cilia in some parts of their bodies that are used both for moving and to extract their food from water.



Some questions:

Why do you think that the movement by means of cilia allows greater maneuverability to the microorganisms?

In what type of ecosystem do you think can live organisms moving by cilia? Why?



Horse (Equus caballus)



Newt (Euproctus asper)



Spoonbill (*Platalea leucorodia*)and Whimbrel (*Numenius phaeopus*)



Ciliate (Chilodonella sp.)





Red deer (Cervus elaphus)



Common mullet (Mugil cephalus)



Ciliate (Colpidium sp.)



Amoeba (Amoeba sp.)



Diatoms Flagellate (Peranema sp.)



Microalga (Haematococcus sp.)



Ciliate (Paramecium sp.)