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Microbiology Research Paper

**Bacterial phylum:** *Proteobacteria*

**Bacterial Class:** *Delta Proteobacteria*

Myxobacteria were first isolated by Roland Thaxter in 1892. Myxobacterium belongs to phylum Proteobacteria, and class Delta Proteobacteria. Myxobacterica are strictly aerobic (Chemoorganoheterotrophs) and prokaryote whose unusually social behavior distinguishes them from other groups of prokaryotes. They are primarily a soil bacterium, but also found in treebark, in fresh water and in coastal water. In wild, myxobacteria engage in what is commonly known as “wolf packs” these bacteria glide along solid surfaces, such as agar. It is a Gram-Negative bacillus has multiplicity cell’s behavior. Myxobacteria recently has been studied more because of producing more abundant useful secondary metabolism, including antibacterial, antifungal, anticancer and thrombosis compounds. “Perhaps the most remarkable aspect of their social behavior during development, when tens of thousands of cells aggregate and form a colorful fruiting body” .(1) The myxobacteria are an interesting family of gliding bacteria that produce fruiting bodies in starvation conditions. Some of them grow by utilizing cellulose, but many of them feed by secreting antibiotics to kill other bacteria and then produce enzymes to lyses the cells of their prey.

“The fruiting myxobacteria exhibit the most complex behavioral patterns and life cycles of all known bacteria”. (2) The vegetative cells of all myxobacteria are aerobic, Gram-negative, extended rods with either rounded or tapered ends. They glide in water films across solid surfaces, secreting substance (polysaccharide) tracks in which many cells migrate to produce feathery extensions at the colony margin. At the beginning of nutrient running down the cells migrate back along the slime tracks, aggregating by chemotaxis, to form large concentrations of cells. These aggregates then develop into fruiting bodies which are raised above the agar surface and typically develop a bright yellow, red or brown pigmentation. As the vegetative cells migrate upwards into the fruiting body they undergo a progressive differentiation into rounded myxospores.

Myxobacteria are often referred to as either predators or hunters.  “Methods used to isolate myxobacteria from these environments include incubating tree bark (from the ground) under moist conditions and looking for the characteristic fruiting bodies or using sterilized rabbit dung pellets as bait”. (4)  Such pellets are full of dead bacteria which act as the nutrient source for the myxobacteria.

Myxobacteria are in constant communication with each other through a variety of means including fimbriae, long appendages made of protein with which the cells touch each other.  There are roughly 50 species of myxobacteria, out of all myxococcus Xanthus is researched widely which forms fruiting body. Myxococcus Xanthus hydrolyzes proteins and nucleic acids, to obtain essential amino acids and phosphate. When certain amino acids become scarce, and balanced growth is no longer possible, cells begin a series of coordinated movements leading to the production of a fruiting body.  This structure, composed entirely of cells that have piled on top of each other plus the slime they have produced, is brightly colored and visible to the naked eye, about 0.1 mm or slightly larger.  Many fruiting bodies are produced by one swarm.  Many cells within the swarm undergo a shape change from a long thin rod to a shorter, plumper myxospore.  These cells produce a cell coat which makes them somewhat resistant to heat and rather resistant to dehydration, but these myxospores do not have the incredible environmental tolerance that the typical bacterial endospore has.  When a fruiting body is transported to a new location,all the myxospores in the structure "germinate" and become "vegetative" cells again.  Thus, a new swarm is born; individual cells do not need to start a new swarm all by themselves.

Myxobacteria can divide and glide at the same time. “When the division septum form, one daughter cell inherits the active pilus engine from its mother and assembles an active slime engine at its newly formed pole. Likewise, the other daughter cell inherits the active slime engine and assembles a new pilus engine”. (3) From that each daughter cell keeps moving in the same direction as the parent, without missing a beat. Approximately every 7 minutes, the cells reverse their gliding direction. The leading pole that had been producing pili now extrudes slime, and vice versa. “It takes only a minute or so for the appropriate engines to be turned off and on”.(3)

The primary nutrient source of myxobacteria is protein or amino acids, because of which they grow well on general purpose culture media slowly. There has to be divalent cation otherwise autolysis occurs, so a source of magnesium is usually included in the medium. Myxobacteria live in groups called swarms, and each individual cell contributes a variety of hydrolytic enzymes which breakdown proteins, cell wall components, and nucleic acids. An individual cell does not produce enough enzymes to support itself, but the group as a whole is capable of breaking down polymers in the area. The low molecular weight molecules that result are taken up by myxobacteria for food.

In conclusion, there are about 50 species of Myxobacteria which belongs to phylum Proteobacteria. They are known as gliding bacteria. They are primarily a soil bacterium, but also found in tree bark, in fresh water and in coastal water. Among the proteobacteria, only the myxobacteria have the capacity to develop multi cellular fruiting bodies whose form is species specific. “M. Xanthus shares the ability to lyse and digest other bacteria with another δ–proteobacterium, Bdellovibrio bacteriovorus”. (4) The primary nutrient source of myxobacteria is protein or amino acids.

***Reference***

**(1)**

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**(2 )**

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**(3)**

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