OPEN ACCESS Freely available online

Journal of Physical Chemistry & Biophysics

Editorial

A Short Note on Magnetotactic Bacteria

Peterlik Fujita*

Department of Chemistry, University of Sheffield, Sheffield, UK

DESCRIPTION

Magnetotactic Bacteria (MTB) is a polyphyletic group of bacteria that orient themselves along the magnetic field lines of the Earth's magnetic field. Magnetotactic bacteria are diverse, mobile, and disseminated prokaryotes that bio mineralize a unique organelle called a magnetosome. Magnetosomes consists of a nanoscale crystal of the magnetic iron mineral that is surrounded by the lipid bilayer membrane. In the cells of almost all MTBs, magnetosomes are organized as a well-ordered chain. The magnetosome chain causes the cell to behave like a moving miniature compass needle with which cell lines up, nothing parallel to the magnetic field lines. MTBs are found in almost all types of aquatic environments, where they can make up a significant part of the bacterial biomass. The genes responsible for the bio mineralization of the magnetosome are organized as clusters in the MTB genomes, in some as genomic islands of magnetosomes. The roles of various magnetosome genes and associated proteins in magnetosome synthesis and magnetosome chain construction have now been clarified.

The biological phenomenon of microorganisms that tend to move in response to the magnetic properties of the environment is known as magnetotaxis. The origin of the magnetotaxis appears to be monophyletic that is, it evolves in a common ancestor of all MTBs, although the horizontal gene transfers from magnetosomes also appears to play a role in its distribution. These types of bacteria have been the subject of many experiments. They were even aboard the space shuttle to study its magnetotactic properties in the absence of gravity, but no definitive conclusion was reached. Magnetosomes are made up of magnetic mineral crystals, either magnetite (Fe_3O_4) or the greigite (Fe_3S_4) surrounded by the bilayer membrane composed mainly of phospholipids called the magnetosome membrane, which contains a series of proteins found in the cytoplasmic and Outer Membranes (OM) and they are exclusive to MTB.

Although the magnetosome magnetite and greigite crystals may have a different morphologies, mature crystals of both minerals are generally within the size range of a single magnetic domain, around 35 to 120 nm, in which they have the highest possible magnetic moment. Magnetosomes are generally arranged as a chain within the cell, which maximizes the cell's magnetic dipole moment, and the cell is passively aligned along magnetic field lines when swimming. Magnetotaxis is believed to work in conjunction with chemotaxis to help MTB locate and maintain an optimal position in vertical chemical concentration gradients common in stationary aquatic habitats by reducing a three-dimensional search problem to a single dimension. Magnetotactic bacteria thrive in chemically stratified sediments or water columns, where they are predominantly found at the Oxyc Anoxic Interface (OAI), the anoxic regions of the habitat, or both.

Although recent advances in many areas of MTB research have provided more information on the biodiversity, evolution of MTB as well as elucidation of many specific gene functions of the magnetosome. The magnetotactic bacterial cells are used to determine the southern magnetic poles in meteorites and rocks containing fine-grained magnetic minerals and to separate cells by phagocytosis after introduction of magnetotactic bacterial cells into granulocytes and monocytes. Magnetotactic bacterial magnetite crystals have been used in magnetic domain analysis studies and in many commercial applications including, immobilization of enzymes, the formation of magnetic antibodies and the quantification of immunoglobulin G.

Correspondence to: Peterlik Fujita, Department of Chemistry, University of Sheffield, Sheffield, UK, E-mail: pfujita@gmail.com

Received: October 07, 2021; **Accepted**: October 21, 2021; **Published**: October 28, 2021

Citation: Fujita P (2021) A Short Note on Magnetotactic Bacteria. J Phys Chem Biophys. 11:e304.