

ACCESSING THE OVERLOOKED POTENTIAL AND DIVERSITY OF MICROORGANISMS

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Abstract

The number of microorganisms inhabiting the Earth is estimated to be about 10³¹ cells, whose total weight is larger than that of all the other organisms. Extremely wide variety of microorganisms are living in different environments including not only seawater, soil, and air, but also stratosphere, hydrothermal deposits, salt lakes, and even in the organs or tissues of other organisms. Since they have adapted to such many different ecosystems, microorganisms can be regarded as huge genetic resources. However, our knowledge about microorganisms is still very limited. For example, it is estimated that cultured (isolated) microorganisms consist only 0.1-1% of the total microorganisms present in soil. As seen in the novel finding of a unique antibiotic, Avermectin, for which Dr. Ohmura Satoshi was awarded Nobel Prize in 2015, screening of microorganisms for novel functions is fundamentally important. However, as we managed to grow only limited number of microorganisms so far, we may have overlooked many microorganisms with important and valuable functions. How can we get full access to such overlooked resources? Except for microorganisms that are completely dependent on very specific environments (like obligate endosymbionts in insects), there must be a way to obtain them, somehow, in our hands. In this plenary talk, I will introduce a novel discovery of microorganisms that require lanthanide metals for their growth on methanol and methane. Such reduced C₁-compounds can be used as exclusive growth substrates (carbon source) by microorganisms called methylotrophs. It is now more evident that the C₁-compounds are important factors mediating the interaction between plants and methylotrophs. However, so far, screening of methylotrophs has been conducted in the absence of these important metals. The recent discovery of the unexpected importance of the metals in microbe's metabolism, is not only novel, but also gives us an important lesson, that essential factors for microbial growth have been overlooked so far and it is limiting our knowledge of microbial diversity in natural ecosystems.

Key words: Methanol, lanthanides, plant-microbe interaction, methylotroph