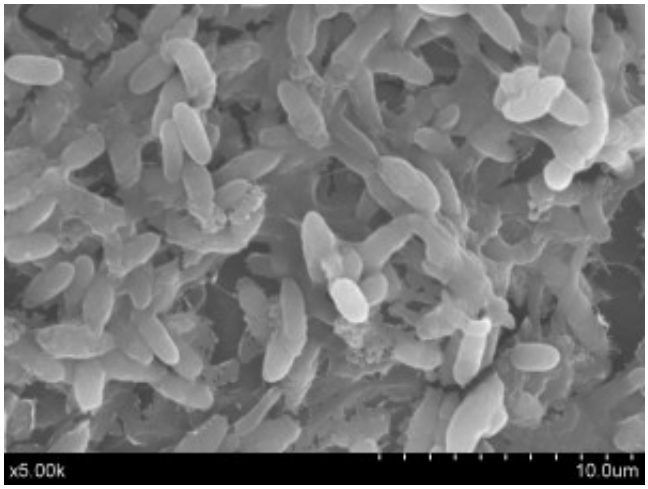
Electricity generation from microbial fuel cells

In an important step towards the development of “wastewater power plant” and “bacterial batteries”, a new study published in the journal of “Bioresource Technology” developed a facile strategy to improve the power output of microbial fuel cells (MFC)-a device which can produce electricity from wastewater.

Just as conventional fue



l cells use rare metals to catalyze the conversion of chemical energy to electric energy? MFC can use bacteria as the catalysts. The bacteria can “eat” the organic matters in the wastewater, and decompose them to release the chemical energy (electrons) and store inside the cells. Some electric bacteria can produce electricity by shuttling electrons across the membrane and passing them to the electrode. Therefore, the membrane permeability of cells determined the efficiency of electron shuttling process as well as the power output.

To improve the membrane permeability of the bacteria, researchers from Jiangsu University (China) developed a new approach—enhanced biosurfactant production from the electric bacteria by genetic modification. It is known that biosurfactant is efficient to improve the membrane permeability and increase the transport across the membrane. The researchers overexpressed *rhlA* gene—the key gene responsible for rhamnolipids (a biosurfactant) production, which directly resulted in overproduction of rhamnolipids production from the electric bacteria—*Pseudomonas aeruginosa*. As expected, the membrane permeability of this bacterium increased and the electron transport across the membrane was largely enhanced. As a result, the power output of the MFC catalyzed by this genetically engineered bacterium was enhanced about 2.5 times compared to the MFC with the parent strain.

The improvement of electron shuttling across the bacterial cell membrane could enable scientists to develop high efficient bacterial batteries for energy harvesting from wastewater (wastewater power plant) or for self-powered environmental monitoring in remote areas, for example. More

impressively, it may also enhance the efficiency of its reverse process—uptaking electricity from the electrode by bacteria, which is a new promising/green approach to produce value-added chemicals by bacteria.

Publication

Endogenously enhanced biosurfactant production promotes electricity generation from microbial fuel cells.
Zheng T, Xu YS, Yong XY, Li B, Yin D, Cheng QW, Yuan HR, Yong YC
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