

Novel bioemulsifier produced by a *Paenibacillus* sp. strain and its applicability in Microbial Enhanced Oil Recovery

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Microbial Enhanced Oil Recovery (MEOR) is potentially useful to increment oil recovery from reservoirs beyond primary and secondary recovery operations using microorganisms and their metabolites. *In situ* stimulation of microorganisms that produce surface active compounds reduces the capillary forces that retain the oil inside the reservoir, thus promoting its flow and increasing oil production. *Paenibacillus* sp. #510, isolated from crude oil samples obtained from a Brazilian oil field, produced a bioemulsifier in a mineral medium containing sucrose as the carbon source under aerobic and anaerobic conditions, and its production was induced (up to 7.9 g/l) by the addition of paraffin or crude oil to the culture medium. It formed stable emulsions with several hydrocarbons and its emulsifying ability was not affected by exposure to high salinities (up to 300 g/l), high temperatures (100°C-121°C) or a wide range of pH values (2-13). This is the first description of bioemulsifier production by a *Paenibacillus* strain. A preliminary chemical characterization by Fourier Transform Infrared Spectroscopy (FT-IR), proton and carbon nuclear magnetic resonance (^1H NMR and ^{13}C CP-MAS NMR) and size exclusion chromatography indicated that this new bioemulsifier is a low-molecular weight oligosaccharide-lipid complex. Mobilization of heavy crude oil by this isolate was evaluated using a core-flooding equipment working at the oil reservoir pressure (32.4 bar) and temperature (40°C). Growing *in situ* *Paenibacillus* sp. #510 for 14 days at the oil reservoir conditions using a mineral medium resulted in the mobilization of 6% of the entrapped heavy oil, confirming that this isolate can contribute to enhance oil recovery from mature reservoirs. These results will be further validated in a pilot field assay.