Abstract Submitted
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Bacteria interface interactions in *Ecology-on-a-Chip* by holographic microscopy and interferometry[1] JIAN SHENG, ANDREW WHITE, MARYAM JALALI, Texas AM Univ.- Corpus — To improve our remediation of oil spills into marine system, one must understand the fate of oil under complex physical, chemical and biological environments. It is found that various processes such as wind, wave, turbulence and currents break oil into suspensions of droplets, in which states consumption by microbial further degrade the oil. Our prior studies show that marine bacteria do not adopt biofilm life style at oil-water interface in comparison to those near a solid substrate. On the contrary, Extracellular Polymer Substance of oily microbial aggregates is easily formed around an oil droplet. This highlights complexities of cell oil interactions at a liquid-liquid interface. To investigate these mechanisms at oil water interface quantitative, we have developed a micro-bioassay consisting of continuous microfluidics with a substrate printed with oil droplet array, namely Ecology-on-a-Chip, and an integrated digital holographic microscopy (DHM) and interferometer (DHI). The oil-water interface can be maintained over days (>10 days), suitable for conducting long-term observations. 3D movements of bacteria are tracked by DHM, while the interface morphology are measured by DHI at 10nm. The system is applied to *Pseudomonas* sp. (PS62) near crude-water interface and *Escherichia coli* (AW405) at hexadecane-water interface subject to low surface tension. The 3D motility, attachment, detachment and dispersion of cells as well as motility induced interface change are discussed.

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