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A Route to Marine Oil Snow: Bacteria Produce Extracellular Polymeric Streamers on Oil Micro-Droplets with Significant Impacts on Drag[1] ANDREW WHITE, MARYAM JALALI, MICHAEL MIRANDA, MATTHEW AMARO, JIAN SHENG, Texas A&M University-Corpus Christi — After the Deepwater Horizon oil spill in 2010 a substantial fraction of oil settled to the seafloor. This contradicts popular belief that dispersed oil merely undergoes bioconsumption and dissolution following a spill; results suggest these only account for up to 50% of the droplets volume. A possible mechanism for sedimentation is Marine Oil Snow (MOS): mucus-rich aggregates of plankton, extracellular polymeric substances (EPS), oil and other debris. However, MOS formation, particularly in real marine environments, are poorly understood. For instance, our previous results suggested plankton encounter rates on a rising oil drop would be too low and microbial residence times too short to form substantial aggregates. In this work we use a microfluidic bioassay (Ecology-on-a-Chip) to simulate a crude oil drop rising in a bacteria suspension by pinning the drop in a microchannel with a continuously flowing bacteria culture. Microbial EPS streamers form on an oil-water interface within 30 min. High speed microscopy provides snapshots of the evolving flow including increased drag due to streamers and recovery when streamers detach. The streamer induced drag and consequential reduction in rising velocity establish a missing link for MOS as a key pathway for the fate of spilled oil.

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