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Filaments in curved flow: Rapid formation of *Staphylococcus aureus* biofilm streamers MIN YOUNG KIM, KNUT DRESCHER, ON SHUN PAK, BONNIE L. BASSLER, HOWARD A. STONE, Princeton University — Biofilms are surface-associated conglomerates of bacteria that are highly resistant to antibiotics. These bacterial communities can cause chronic infections in humans by colonizing, for example, medical implants, heart valves, or lungs. *Staphylococcus aureus,* a notorious human pathogen, causes some of the most common biofilm-related infections. Despite the clinical importance of *S. aureus* biofilms, it remains mostly unknown how physical effects, in particular flow, and surface structure influence biofilm dynamics. Here we use model microfluidic systems to investigate how environmental factors, such as surface geometry, surface chemistry, and fluid flow affect biofilm development in *S. aureus.* We discovered that *S. aureus* rapidly forms flow-induced, filamentous biofilm streamers, and furthermore if surfaces are coated with human blood plasma, streamers appear within minutes and clog the channels more rapidly than if the channels are uncoated. To understand how biofilm streamer filaments reorient in curved flow to bridge the distances between corners, we developed a mathematical model based on resistive force theory and slender filaments. Understanding physical aspects of biofilm formation in *S. aureus* may lead to new approaches for interrupting biofilm formation of this pathogen.

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