

Abstract Submitted
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Microfluidic study of environmental control of genetic competence in *Streptococcus mutans*¹ MINJUN SON, SEYEDEHDELARAM GHOREISHILANGROUDI, Department of Physics, University of Florida, SANG-JOON AHN, ROBERT BURNE, Department of Oral Biology, University of Florida, STEPHEN HAGEN, Department of Physics, University of Florida — The bacterial pathogen *Streptococcus mutans* has the ability to enter a transient state of genetic competence in which it can integrate exogenous DNA. It regulates the competent state in response to several environmental inputs that include two quorum sensing peptides (CSP and XIP) as well as pH and other variables. However the interplay of these variables in regulating the competent state is poorly understood. We are using microfluidics to isolate and control environmental inputs and examine how the competence regulatory circuit responds at the single cell level. Our studies reveal that the pH of the growth environment plays a critical role in determining how cells respond to the quorum sensing signals: The response to both peptides is sharply tuned to a narrow window of near-neutral pH. Within this optimal pH range, a population responds unimodally to a XIP stimulus, and bimodally to CSP; outside this range the response to both signals is suppressed. Because a growing *S. mutans* culture acidifies its medium, our findings suggest that the passage of the pH through the sensitivity window transiently activates the competence circuit. In this way a sharply tuned environmental response gives *S. mutans* fine control over the duration of its competent state.

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