Abstract
The human gastrointestinal (GI) tract is colonized by approximately 10^14 bacterial cells that belong to about 500 different species and co-exist with the host. The GI tract microenvironment is unique in the broad range of molecules that are present. This includes quorum sensing signals and metabolites produced by the resident microbiota, as well as hormones like norepinephrine and dopamine that are synthesized locally in the GI tract by the enteric nervous system. The close proximity of bacteria and the host cells, as well as the abundance of the signals they secrete, has lead to a signal-centric paradigm where the different GI tract signals are considered to be important mediators of homeostasis and disease, through intra-kingdom (i.e., recognition of bacterial signals by other bacteria) and/or inter-kingdom (i.e., recognition of host signals by bacteria and vice-versa) communication. Our central hypothesis is that inter-kingdom communication between bacteria and host cells, as well as intra-kingdom communication between different bacterial species, are key determinants of inflammation and pathogen colonization in the GI tract. We are investigating the role of these interactions in the sensing and migration of pathogens during infections, in the spatial organization and localization of pathogens in bacterial communities, and in interactions with host inflammatory signaling. In this talk, I will discuss some of our recent results on elucidating the role of inter-kingdom communication in bacterial chemotaxis and on maintaining the balance between inflammation and homeostasis in mucosal cells.

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Biosketch
Dr. Jayaraman received his PhD in Chemical Engineering from the University of California, Irvine in 1998. He worked on the scientific staff at Shriners Burns Hospital, Boston before joining Texas A and M in 2004. He is the recipient of numerous awards including the NSF CAREER award 2009.
Dr. Jayaraman’s research focuses on molecular systems biotechnology, specifically on using integrated experimental and modeling approaches for investigating problems in human health and medicine. Current research projects include systems biology of cytokine signaling in inflammatory diseases; Inter-kingdom signaling interactions between bacteria and human cells in GI tract infections; and development of microfluidic model systems for combinatorial drug screening and vascular tissue engineering.