Balbina J Plotkin, Organic Chem Curr Res 2014, 3:3
http://dx.doi.org/10.4172/2161-0401.S1.005

OMICS Group Conferences
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International Summit on
Past and Present Research Systems of Green Chemistry
August 25-27, 2014 Hilton Philadelphia Airport, USA

Use of chemical signals to control biofilm formation and depletion

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Biofilm formation by microorganisms is the principle mechanism of biofouling, whether on surgical implants or industrial pipes. An ecological tactic to discourage biofilm formation is at the leading edge of the approach towards prevention of medical device-associated infections and inhibition of industrial biofouling. Plants and competing bacteria in the environment naturally prevent biofilm formation through production of quorum-signaling compound mimics or antagonists. Quorum-signaling systemsare typically comprised of auto inducing compounds that trigger phenotypic shifts in a bacterial population after the requisite population density has been achieved. These quorum-signaling compounds are typically produced autologously by the homogenous bacterial population. However, in nature these signaling compounds are hijacked by environmental competitors or organisms, e.g., certain plants, that seek to prevent their own biofouling. These quorum-signaling compounds consist of chemicals that range from peptides for Gram positive bacteria to homoserine lactones for Gram negative organisms. New inhibitors and inducers of quorum-signaling systems associated with biofilm formation are being identified. Identification of new quorum-signaling compounds and production of novel quorum-signal inhibitors could be effective in impeding biofilm formation. Thus, these compounds have the potential to prolong in an ecologically compatible manner the utility of medical devices, industrial piping components and antibiotics.

Biography

Balbina J Plotkin is a tenured full Professor with appointments in both the Colleges of Medicine and Dentistry at Midwestern University in Downers Grove, IL. She received her PhD in Microbiology and Veterinary Bacteriology and had Postdoctoral training in Photobiology and Photochemistry. Her primary program of research is phenotypic regulation of microbial behavior in response to diverse chemical and physical signals. Her group published the first description of host steroid and protein hormones acting as an inter-kingdom quorum signal and their effects on regulation of planktonic and biofilm population phenotypic behaviors.

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