Title:	Microbial Electroactive Biofilms
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Abstract:	Microbial metabolism coupled with extracellular electron transfer (EET) plays a crucial role in redox cycling of major elements in natural environments. The EET capabilities of microorganisms are exploited in bioelectrochemical systems to drive transfer of electrons to and from electrodes for electricity generation, bioremediation, biosensing, and biocatalysis applications. The microorganisms that can use the electrodes to achieve their respiratory or metabolic processes via EET are commonly referred to as electrochemically active or electroactive microorganisms. Several microbes have evolved to perform EET via direct and indirect mechanisms. In the case of the direct electron transfer mechanism, physical contact between microorganisms and electrodes is necessary. The irreversible attachment of electroactive microorganisms to the electrode surface eventually leads to the growth and development of biofilms commonly referred to as “electroactive biofilms” (EAB). The formation and functioning of EAB are critical to the performance of different types of microbial electrochemical technologies such as microbial fuel cells and microbial electrolysis cells. This chapter first describes the electroactive microorganisms that have been reported to form biofilms on the anode and cathode surfaces. The electron transfer mechanisms between the EAB and electrode are then discussed. It is followed by a brief overview of the major tools and techniques that are used to study the formation and functioning of EAB as well as the electron transfer mechanisms at the biofilm–electrode interface. Finally, the main application areas and future research prospects of EAB are presented.
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