

The Effect of Electrical Discharge Plasma on Inactivation of Escherichia Coli MG 1655 in Pure Culture

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Abstract : Electrical discharge plasma is a new non-thermal processing technique which is used for the inactivation of contaminating and hazardous microbes in liquids. Plasma is a source of different antimicrobial species including UV photons, charged particles, and reactive species such as superoxide, hydroxyl radicals, nitric oxide and ozone. Escherichia coli was studied as foodborne pathogen. The aim of this work was to examine inactivation effects of electrical discharge plasma treatment on the Escherichia coli MG 1655 in pure culture. Two types of plasma configuration and polarity were used. First configuration was with titanium wire as high voltage needle and another with medical stainless steel needle used to form bubbles in treated volume and titanium wire as high voltage needle. Model solution samples were inoculated with Escherichia coli MG 1655 and treated by electrical discharge plasma at treatment time of 5 and 10 min, and frequency of 60, 90 and 120 Hz. With the first configuration after 5 minutes of treatment at frequency of 120 Hz the inactivation rate was 1.3 log₁₀ reduction and after 10 minutes of treatment the inactivation rate was 3.0 log₁₀ reduction. At the frequency of 90 Hz after 10 minutes inactivation rate was 1.3 log₁₀ reduction. With the second configuration after 5 minutes of treatment at frequency of 120 Hz the inactivation rate was 1.2 log₁₀ reduction and after 10 minutes of treatment the inactivation rate was also 3.0 log₁₀ reduction. In this work it was also examined the formation of biofilm, nucleotide and protein leakage at 260/280 nm, before and after treatment and recuperation of treated samples. Further optimization of method is needed to understand mechanism of inactivation.

Keywords : electrical discharge plasma, escherichia coli MG 1655, inactivation, point-to-plate electrode configuration

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