Inhibiting Antimicrobial Resistance by Blocking Bacterial Necrosignal Transmission Using Kimchi LAB Metabolites

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In 2019, 2.8 million cases of antimicrobial-resistant infections have occurred, and 35,000 people have died as a result. Even the World Health Organization (WHO) recognizes bacterial resistance as one of the greatest threats to global health and food security. Previously, it was understood that bacteria that survive direct exposure to antibiotics acquire antibiotic resistance traits; however, according to a 2020 study by Bhattacharyya et al., a novel mechanism of resistance acquisition was introduced: dying bacteria transfer resistance-enhancing factor AcrA to living bacteria through a process called necrosignaling. Kimchi, a traditional Korean food, contains various lactic acid bacteria (LAB) depending on fermentation stage, or period, and it is well-known that LAB and its metabolites are effective in inhibiting the proliferation of harmful bacteria. Therefore, the purpose of this study was to prove whether the metabolites released by kimchi LAB of various fermentation stages could block the transfer of necrosignals, a newly discovered mechanism for generating resistant bacteria. Dying E. coli was applied on one side of LB agar plates, and kimchi metabolites were injected into their borders. Agar diffusion tests were performed with E. coli on the other side of the agar plates. It was found that E. coli evolved into resistant bacteria due to necrosignals, and kimchi LAB metabolites, especially of moderate fermentation, blocked the transmission of these signals. In addition, the activity of kimchi metabolites was maintained even after treatment under extreme environments. Thus, kimchi postbiotics could be used as a potential treatment to counter the outbreak of bacterial resistance.

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