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***Lactobacillus casei* strain Shirota Parabiotics: Unveiling Their Efficacy in Benzo[a]pyrene Degradation**

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Structured Abstract

Background: Polycyclic aromatic hydrocarbons (PAHs) are a class of widespread environmental pollutants known for their persistence and carcinogenic properties. Benzo[a]pyrene is a well-known PAH that poses significant health risks due to its persistence in the environment and potential to induce genetic mutations. It is commonly found in areas contaminated by industrial processes, vehicle emissions, and incomplete combustion of organic matter. Traditional methods for the remediation of PAHs, including chemical oxidation and incineration, often result in incomplete degradation or produce secondary pollutants, posing additional environmental challenges. This study explores the potential of *L. casei* strain Shirota parabiotics for degrading benzo[a]pyrene and aims to shed light on an innovative method to improving food safety and lowering the health concerns associated with consuming PAH-contaminated foods.

Methods: *L. casei* strain Shirota parabiotics were prepared through controlled laboratory procedures. The experimental setup involved exposing these parabiotics to benzo[a]pyrene under controlled conditions. Key parameters such as optical density (OD), pH, and benzo[a]pyrene concentration were monitored at intervals of 0, 2, 4, 6, and 24 hours. Gas Chromatography-Mass Spectrometry (GC-MS) was employed to accurately measure the residual concentration of benzo[a]pyrene. The experimental data were statistically analyzed using one-way ANOVA to ensure the reliability of the results.

Results: The concentration of benzo[a]pyrene showed a significant decrease over the 24-hour period, starting from an initial 2.044 µg/mL and reducing to 1.214 µg/mL, implying a degradation percentage of 40.63%. This reduction highlights the degradation capability of the *L. casei* strain Shirota parabiotics. Although there were variations in optical density and pH, these changes were secondary observations supporting the primary outcome of benzo[a]pyrene degradation.

Conclusion: In conclusion, the study demonstrates that *L. casei* strain Shirota parabiotics can effectively degrade benzo[a]pyrene, reducing its concentration significantly within 24 hours. The use of parabiotics offers a promising bioremediation strategy for environments contaminated with PAHs, presenting an eco-friendly alternative to conventional methods. Moreover, this development opens up possibilities for producing safer food products and reducing health issues associated with PAHs.

Keywords: *L. casei* strain Shirota, parabiotics, benzo[a]pyrene, PAH degradation, bioremediation

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