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Establishing a Lung Model for Evaluation of Engineered Lung Microbiome Therapies

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ABSTRACT

Benzene, a toxin and carcinogen found in air polluted by cigarette smoke, car exhaust, and industrial processes, is associated with the development of leukemia and lymphoma. Other than avoiding exposure, there is no current method to deter the effects of benzene. One potential strategy to prevent these effects is to engineer the bacteria of the human lung microbiome to degrade benzene. To evaluate this novel approach, we must verify that the bacteria remain viable within the lung microenvironment. To do so, lungs were harvested from rats and swabbed to determine the contents of the original lung microbiome. Then green fluorescent protein (GFP)-transformed *E. coli* were introduced to the lungs and the lungs were ventilated for five minutes before being swabbed again. The lungs were sliced with a vibratome and cultured for three days. They were analyzed under a microscope and swabbed daily to determine how the bacteria disperse upon delivery and detect changes within the lung microbiome. If results show that introduction of a new bacterial species does not significantly change the lung microbiome over time, the project can move forward to test the engineered bacteria's viability in the lung environment and effectiveness in rescuing lung cells from benzene's toxicity.

KEYWORDS

Biotechnology, engineering, genetics, benzene, cancer, lungs, therapy, modeling