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Influence of Food Microbes on Horizontal Transfer of β-Lactam Resistance Genes between Salmonella Strains in the Mouse Gut

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Abstract : Consumption of food contaminated by antibiotic-resistant (AR) bacteria may lead to the transmission of AR genes in the gut microbiota and cause AR bacterial infection, a significant public health concern. However, information is limited on if and how background microbes from the food matrix (food microbes) may influence resistance transmission. Thus, we assessed the colonization of a β-lactam resistant Salmonella Heidelberg strain (donor) and a β-lactam susceptible S. Typhimurium strain (recipient) and the transfer of the resistance genes in the mouse gut in the presence or absence of food microbes that were derived from washing freshly-harvested carrots. Mice were pre-treated with streptomycin and then inoculated with both donor and recipient bacteria or recipient only. Fecal shedding of the donor, recipient, and transconjugant bacteria was enumerated using selective culture techniques. Transfer of AR genes was confirmed by whole genome sequencing. Gut microbial composition was determined by 16s rRNA amplicon sequencing. Significantly lower numbers of donors and recipients were shed from mice that were inoculated with food microbes compared to those without food microbe inoculation. S. Typhimurium transconjugants were only recovered from mice without inoculation of food microbes. A significantly higher survival rate was in mice with vs. without inoculation of food microbes. The results suggest that the food microbes may compete with both the donor and recipient Salmonella, limit their growth and reduce transmission of the β-lactam resistance gene in the mouse gut.

Keywords : antibiotic resistance, gene transfer, gut microbiota, Salmonella infection
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