

BILE ACID IS A HOST FACTOR THAT REGULATES THE COMPOSITION OF RAT CECAL MICROBIOTA

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We have long been investigating bile acid resistance in lactic acid bacteria and bifidobacteria and realized that bile acids display extremely strong antibacterial activity. This led us to think about the role of bile acids in controlling gut microbiota *in vivo*. Recently, the idea that gut microbiota influence host health has become popular, and it has been argued that an imbalanced bacterial population associated with a high-fat diet is a trigger for the development of metabolic diseases such as obesity, diabetes and hypercholesterolemia in animal models. However, little is known about host factors that induce changes in the bacterial population.

Here, we focused on bile acid as the candidate. Specifically, we investigated the effect of cholic acid (CA), a typical bile acid in humans, on gut microbiota composition and host physiology in a simplified rat model. We performed a feeding trial with diets supplemented with different concentrations of CA. Characterization of the cecal microbiota composition using molecular ecological methods revealed that administration of CA induced phylum-level alterations in gut microbiota composition wherein Firmicutes predominated at the expense of Bacteroidetes. CA feeding dramatically simplified the composition of the microbiota, with outgrowth of several bacteria in the classes Clostridia and Erysipelotrichi. The observed alterations were similar to those induced by high-fat diets. Externally administered CA was efficiently transformed into deoxycholic acid in cecum by a bacterial 7 α -dehydroxylation reaction. Serum adiponectin concentrations decreased significantly upon CA feeding. These results clearly demonstrate the hitherto unexplored role of bile acid as a host factor that controls the gut microbiota population *in vivo* and contribute to a better understanding of the relationship between metabolic diseases and gut microbiota composition.

keywords: Cholic acid, Deoxycholic acid, Antimicrobial activity, Adiponectin, Bile acid