Understanding host-microbe interactions using metabolic modeling

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Video Byte

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Abstract

The gut microbiota – the community of microorganisms living in the gut – plays a critical role in health and disease. In healthy individuals, the microbiota and the host are in symbiosis, but disruption of this careful balance can result in severe disease, including inflammatory bowel disease, diabetes, and psychiatric and behavioral disorders. To better understand the relationship between host and microbe, researchers focus on gut microbiota communication via metabolites. However, because microbes' metabolic output depends on their often-complex environment, it is difficult to fully elucidate the dynamic interactions within the microbiota. These limitations have led to the development of a complementary approach to better understand the relationship between host and microbe. Computational modeling allows researchers to visualize bacterial interactions in the form of a metabolic network. A technique called flux balance analysis helps to simulate the gut environment in silico and modeling a set of bacterial species in a shared metabolic environment can enable the study of the effect of dietary changes or probiotic treatment. Together, experimental and computational biologists can combine their knowledge to completely uncover the network of host-microbe interactions in the complex gut environment.