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Characterization of Simplified Microbial Communities that can Inhibit Clostridioides difficile Infection

Human fecal microbial transplantations (FMT) restore the homeostasis within the gut environment that resists Clostridioides difficile and are an effective treatment option in recurrent C. difficile infections (CDI). However, safety concerns of FMTs arise due to indications that acute and chronic disease can be transferred and long-term effects on human health remain unknown, in addition, they have yet to be regulated by the Food and Drug Administration (FDA). Due to C. difficile being classified as an urgent threat by the Center for Disease Control and Prevention (CDC), there is an immediate need for an alternative treatment option that is safe and doesn't pose short or long-term adverse outcomes to human health. In this study we identify and characterize multiple defined and simple microbial communities originating from the human intestine that are aimed to prevent CDI and disease recurrence. Four independent simplified human fecal microbial communities consisting of 15-30 members that reduce C. difficile invasion were generated. In a mouse model, those communities were able to significantly reduce the severity of initial CDI and limit susceptibility to disease relapse. To get a better understanding of key organisms that are required to resist the invasion to the pathogen, the communities will be deep sequenced. Individual strains have been isolated from the communities and further studies are aimed to characterize each individual isolate and reconstitute the communities one strain at a time.