Abstract

Fecal Microbiota Transplantation (FMT) is a method used to restore disrupted gut microbiota. Currently, it is approved only for the treatment of recurrent *Clostridioides difficile* infection, but its potential applications are being explored in experimental studies, including the treatment of metabolic diseases. This thesis investigates the potential use of gut microbiota from vegan donors as a supportive therapy for metabolic diseases associated with obesity, using a humanized mouse model. The main objective was to determine whether the transplantation of vegan microbiota and supplementation with the prebiotic fiber inulin could influence metabolic and immunological parameters, such as insulin resistance, liver steatosis, and changes in immune subpopulations. In this study, germ-free (GF) mice were inoculated with microbiota from vegan donors and subsequently exposed to the effects of either a standard or a Western-type diet (WD), with or without supplementation with plant-derived inulin fiber. All experiments were conducted in parallel on conventionally raised mice of the same strain. We evaluated the effects of diets and inulin supplementation on obesity-related metabolic and immunological parameters, specifically body weight, glucose metabolism, frequencies of T lymphocyte subpopulations, and gut microbiota composition.

Our results showed that the mere transplantation of microbiota from vegan donors did not protect experimental animals from the negative metabolic effects of the obesogenic WD. However, inulin supplementation in humanized mice led to improvements in some metabolic parameters, notably glucose homeostasis and normalization of liver triglyceride content. None of the interventions resulted in significant changes in T lymphocyte subpopulations in lymph nodes, Peyer's patches, or the spleen. A major finding of the study was the significant alteration in gut microbiota composition depending on diet and fiber supplementation, with these changes correlating with phenotypic outcomes observed at the physiological level.

The results of this study highlight the interaction between diet and gut microbiota. We demonstrated that the combination of microbiota transplantation from vegan donors and dietary modification could effectively prevent certain obesity-associated metabolic disorders. However, whether this strategy would also be effective in treating established metabolic diseases requires further investigation.

Keywords: gut microbiota, GALT, type 2 diabetes, humanized mice model, prebiotics