Diet, obesity, and gut microbes: determinants of metabolic outcomes in non-human primates

Tiffany M. Newman
Carol A. Shively
Thomas C. Register
Susan E. Appt
Hariom Yadav
Rita R. Colwell
Brian Fanelli
Manoj Dadlani
Karlis Graubics
Uyen Thao Nguyen
Sivapriya Ramamoorthy
Beth Uberseder
Kenysha Y. J. Clear
Adam S. Wilson
Kimberly D. Reeves
Mark C. Chappell
Janet A. Tooze
Katherine L. Cook

Video Byte

Keywords: metagenomic sequencing, metabolomics, Western and Mediterranean diet, body fat composition, Prevotella copri, Eubacterium siraeum, urinary carnitine metabolites, uremic toxins, obesity, adiposity, Western diet, Mediterranean diet, gut bacteria, gut bacterial diversity, microbiome, microbiota, metabolic dysfunction, intestine, nonhuman primate, shotgun metagenomics, cynomolgus macaque, crab-eating macaque, Microbiome

Posted Date: October 16th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-979239/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License
Abstract

The composition of the gut microbiome is affected by diet as well as obesity, which can itself be diet-related, but the comparative influences of these factors are unclear. To explore the complex interactions among diet, obesity, and gut microbes, researchers examined female monkeys fed either a Western or Mediterranean diet. Metagenomic sequencing of fecal samples revealed that diet was the main contributor to gut bacterial diversity. Compared with the Western diet group, the Mediterranean diet group had greater overall diversity and different abundance of 54 bacterial species. Within each diet group, leaner and heavier monkeys also had subtly different microbiomes. Interestingly, the Western diet-fed group had more Prevotella copri and had high-P. copri and low-P. copri subgroups. High-P. copri monkeys had lower diversity than low-P. copri monkeys and different proportions of some microbes. Untargeted metabolomics of urine and plasma also suggested that the high-P. copri monkeys exhibited early kidney dysfunction. Although additional studies with male subjects and baseline fecal samples are needed, this study suggests that diet is the main driver of gut microbiome diversity but interacts with body weight to affect some taxa and that P. copri may mediate metabolic dysfunction in Western diet-fed monkeys.