

Effects of a 217 km ultramarathon on the composition of the gut microbiota of a runner with a low-fiber diet

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Moderate physical activity can positively change the gut microbiota (GM). It is known that ultramarathon, an extreme physical exercise, causes disturbances of physiological homeostasis and GM in runners. Diet is the most important modulator of GM. A high-fiber diet is associated with the proliferation of bacteria that produce short-chain fatty acids, which could be beneficial for human health. The aim of this study was to investigate the change in GM composition of a runner on a low-fiber diet after a world ultramarathon. The study was conducted during the 2021 edition of the Brazil 135 Ultramarathon (BR135), a single-stage mountain ultramarathon over a distance of 217 km. A food frequency questionnaire and a stool sample were collected 7 days before the race (T0). Two further stool samples were collected 15 minutes after the race (T1) and 7 days after the race (T2). The GM was analyzed by metagenomic shotgun sequencing to assess the microbial composition across the different time points. A male ultramarathon runner with a BMI of 27.87 kg/m², 44 years old, on a low-fiber diet (7 g/day) and ranked 101st in BR135, was studied. α -diversity remained stable after the race, followed by a decrease at T2. The Bacillota/Bacteroidota ratio increased after the race. No Bacteroidota detected 7 days after the race. The proliferation of Pseudomonadota and Verrucomycetota was observed at T1. The presence of Veillonellaceae was not detected. At the genus level, *Blautia* did not change post-race, but showed a clear increase in T2. At the species level, higher proportions of *Eubacterium rectale* and *Ruminococcus bromii* were observed at the beginning, which decreased slightly after the race, followed by a notable decrease at T2. In contrast, *Blautia wexlerae* and *Fusicatenibacter saccharivorans* remained stable after the race, followed by a strong increase 7 days after BR135. The decrease in α -diversity combined with the increased Bacillota/Bacteroidota ratio could indicate a disruption of GM homeostasis. The increase in the proportion of Pseudomonadota could be related to a high protein intake, which may explain the decrease in fiber-fermenting bacteria. Taxa of this phylum can synthesize metabolites harmful to human health, such as TMAO. The absence of Veillonellaceae contrasts with previous findings of increased numbers of *Veillonella* species in ultramarathon runner. They are thought to have an ergogenic effect on endurance by converting lactate into short-chain fatty acids. In addition, a reduction in *Eubacterium rectale* and *Ruminococcus bromii*, an important fiber-fermenting species, possibly due to low fiber intake, which may affect gut health by reducing butyrate production. The marked increase in *Blautia* spp. at T2, suggesting a delayed response of this species to the physiological stress of the ultramarathon or to nutritional factors during the recovery phase. In conclusion, the combination of extreme physical exertion during BR135 and a low-fiber diet may have negatively impacted the runner's GM, suggesting a possible detrimental effect on gut health after an ultramarathon.

References

- COUTINHO-WOLINO, Karen Salve et al. Can diet modulate trimethylamine N-oxide (TMAO) production? What do we know so far?. European journal of nutrition, p. 1-18, 2021.
- NILSEN, Morten et al. Butyrate levels in the transition from an infant-to an adult-like gut microbiota correlate with bacterial networks associated with *Eubacterium rectale* and *Ruminococcus gnavus*. Genes, v. 11, n. 11, p. 1245, 2020.
- SHIN, Na-Ri; WHON, Tae Woong; BAE, Jin-Woo. Proteobacteria: microbial signature of dysbiosis in gut microbiota. Trends in biotechnology, v. 33, n. 9, p. 496-503, 2015.
- GROSICKI, Gregory J.; DURK, Ryan P.; BAGLEY, James R. Rapid gut microbiome changes in a world-class ultramarathon runner. Physiological reports, v. 7, n. 24, p. e14313, 2019.

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