# In Microbiome Stability and Functionality Emerging Roles of Modern Lifestyle Factors

Changes in the metabolomic output and composition of the gut bacterial community, known as the bacteriome, can modulate host health. The bacteriome is increasingly studied in cancer for diagnostic, therapeutic, and prognostic purposes, opening new horizons for cancer management.

Understanding the factors that lead to alterations in the bacteriome may therefore help improve the management of a wide range of medical conditions.

Multiple factors contribute to changes in the bacteriome, including lifestyle, dietary habits, inflammation, environment, and physical activity. These factors are also risk determinants for many acute and chronic diseases.

In this review, researchers discussed the roles of the circadian clock, exercise, stress, and sleep in maintaining the gut bacteriome and the consequences when this interplay is disrupted.

## Study

Sleep, like circadian rhythm regulation, plays a central role in physiological homeostasis, and its disruption can substantially affect health.

A prospective cohort study involving more than 400,000 participants found that individuals with healthy sleep patterns had a 17 percent lower risk of colorectal cancer. In contrast, sleep disorders, including irregular sleep patterns and insomnia, were associated with a 12 percent higher risk, independent of other lifestyle factors, although residual confounding cannot be excluded.

Sleep deprivation (SD) is characterized by insufficient or poor-quality sleep and is driven by factors similar to those that disrupt circadian rhythms.

Chronic SD impairs immune function by increasing pro-inflammatory cytokines and reducing anti-inflammatory cytokines. Individuals with SD show reduced natural killer cell activity, which may compromise immune surveillance against tumors and infections.

SD-related alterations in the gut microbiota have also been reported, primarily in experimental and observational studies, and have been linked to impairments in cognitive health and metabolic regulation.

## Research

Exercise induces favorable changes in the gut microbiota in animal models, including increased abundance of beneficial genera such as Akkermansia, which are associated with lower inflammation and improved gut barrier function.

Human studies indicate that structured endurance exercise improves metabolic health markers and cardiorespiratory fitness and can lead to beneficial shifts in gut microbiota composition.

The gut microbiome may also influence the metabolic benefits derived from exercise.

In one study, exercise-induced changes in the microbiome in men with prediabetes were associated with improvements in insulin sensitivity and glucose homeostasis. Responders exhibited increased microbial capacity for short-chain fatty acid biosynthesis and branched-chain amino acid catabolism.

In contrast, non-responders showed increased production of metabolically unfavorable compounds, including phenolic derivatives and sulfate-associated metabolites.

Fecal microbiota transplantation from responders reproduced exercise-related improvements in insulin resistance when transferred to obese mice.

## Conclusion

Modern lifestyle factors, including stress, circadian disruption, exercise patterns, and sleep deprivation, can modulate the composition and function of the gut microbiota, thereby influencing health and disease risk.

Circadian disruption also perturbs microbial rhythmicity, contributing to dysregulated immune responses and metabolic disturbances.

However, much of the mechanistic evidence supporting these associations is derived from animal models, while human studies are predominantly observational.

Current evidence on circadian disruption focuses mainly on bacterial communities, with limited data on other microbes such as archaea, fungi, and viruses.

Although specific bacterial taxa and metabolites have been associated with disease risk, the underlying molecular mechanisms remain poorly understood.

The relationships between non-intestinal microbiomes, such as oral and skin communities, and lifestyle factors, as well as physiological outcomes, remain unclear.

Large cohort studies further suggest that polypharmacy may exert a stronger influence on microbiome variation than lifestyle factors alone.

A more comprehensive understanding of how diverse microbes and their metabolites interact with lifestyle factors may support the development of novel strategies to mitigate adverse health effects associated with modern living.

## Source:

https://www.news-medical.net/news/20260127/How-modern-lifestyles-reprogram-the-gut-microbiome-and-shape-disease-risk.aspx