

# Impact of Menopause on Gut Microbiome Diversity in Women

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## Description

Menopause marks a significant biological transition in women, typically occurring between the ages of 45 and 55 and is defined as the cessation of menstrual cycles for 12 consecutive months. This stage is accompanied by a range of physiological, hormonal and metabolic changes. Among the various bodily systems influenced by menopause, emerging research suggests that the gut microbiome the diverse community of microorganisms residing in the human gastrointestinal tract is extremely affected. The gut microbiome plays an important role in maintaining health by modulating immune function, digestion and even influencing the brain through the gut-brain axis. In recent years, studies have increasingly focused on understanding how menopause affects the diversity and composition of the gut microbiome in women. This article analyses the impact of menopause on gut microbiome diversity, the potential mechanisms behind these changes and the consequences for women's health.

The human gut microbiome consists of trillions of microbes, including bacteria, fungi, viruses and archaea. These microorganisms contribute to various physiological processes, including nutrient absorption, metabolism, immune response regulation and the synthesis of vitamins. A healthy and balanced gut microbiome typically shows high microbial diversity, which is need for maintaining metabolic stability, protecting against pathogens and supporting overall health. Disturbances in microbiome diversity, referred to as dysbiosis, have been linked to a variety of conditions, including obesity, diabetes, cardiovascular diseases and even mood disorders.

## Menopause and hormonal changes

Menopause is primarily characterized by a decline in ovarian function, which leads to decreased production of estrogen and progesterone. These hormonal changes have widespread effects on various bodily systems. Estrogen, in particular, is known to exert regulatory effects on the gut, influencing both the microbiome and the gastrointestinal tract itself. Estrogen receptors are found on cells within the gut and estrogen has been shown to affect gut motility, permeability and microbial composition.

In premenopausal women, estrogen and progesterone regulate the gut microbiome, promoting a balance between beneficial and potentially harmful microorganisms. However, as estrogen levels drop during menopause, this delicate balance may be disrupted, leading to changes in the composition and diversity of the microbiome.

Research on the impact of menopause on gut microbiome diversity is still evolving, but several studies have highlighted significant changes in microbial composition following the onset of menopause. One key finding is a reduction in microbial diversity in postmenopausal women compared to their premenopausal counterparts. This decrease in diversity has been linked to an increased risk of several metabolic and inflammatory conditions, such as obesity, type 2 diabetes and cardiovascular diseases.

Several studies have identified specific shifts in the microbiome following menopause. For instance, one study observed that postmenopausal women had a higher abundance of pro-inflammatory bacteria, such as Firmicutes and Proteobacteria, which are associated with metabolic disorders and chronic inflammation. In contrast, beneficial bacteria such as Bifidobacteria and Lactobacilli, which play protective roles in gut health, were found to be less abundant in postmenopausal women.

Another study demonstrated that the gut microbiome of postmenopausal women tended to show an increase in the abundance of bacteria involved in the metabolism of bile acids, which are need for fat digestion. Changes in bile acid metabolism have been implicated in the development of obesity and metabolic syndrome, conditions that are more prevalent in postmenopausal women.

## Hormone replacement therapy

Hormone Replacement Therapy (HRT) is commonly used to alleviate the symptoms of menopause, including hot flashes, mood changes and vaginal dryness. It has been suggested that HRT may also play a role in modulating the gut microbiome. Studies have found that women undergoing HRT tend to show a microbiome

composition closer to that of premenopausal women, with higher microbial diversity and a greater presence of beneficial bacteria such as Lactobacilli and Bifidobacteria.

However, the effect of HRT on the gut microbiome may depend on the type and duration of the therapy. For example, estrogen-only therapy has been associated with increased microbial diversity, whereas combined estrogen and progesterone therapy may not have the same effect. These findings suggest that estrogen plays an important role in regulating gut microbiome diversity and HRT could potentially mitigate some of the negative changes induced by menopause.

The changes in gut microbiome diversity and composition that occur during menopause may have important implications for postmenopausal health. One of the most notable health risks associated with menopause is an increased incidence of metabolic syndrome, which includes conditions such as obesity, hypertension and insulin resistance. Dysbiosis in the gut microbiome has been shown to contribute to the development of metabolic diseases by influencing energy metabolism, fat storage and insulin sensitivity. For example, an imbalance between Firmicutes and Bacteroidetes in the gut is often associated with obesity

and metabolic disorders and this imbalance has been observed in postmenopausal women.

Furthermore, postmenopausal women are at an increased risk for osteoporosis due to the decline in estrogen, which plays a key role in bone health. The gut microbiome is also thought to influence bone health through the production of Short-Chain Fatty Acids (SCFAs), which are metabolites produced by beneficial bacteria during fiber fermentation. SCFAs have been shown to enhance calcium absorption and bone mineralization, suggesting that a healthy gut microbiome may help protect against bone loss in postmenopausal women.

Another concern is the increased risk of cardiovascular disease in postmenopausal women, which is partly attributed to changes in lipid metabolism and inflammation. Dysbiosis in the gut microbiome has been linked to increased systemic inflammation and altered lipid profiles, both of which are risk factors for cardiovascular diseases. Research has shown that certain gut bacteria can influence cholesterol metabolism and the production of inflammatory cytokines, further underscoring the potential role of the microbiome in postmenopausal health.