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The Role of Different Diets in Shaping the Gut Microbiome

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Abstract

Introduction and Objective

The gut microbiota plays a crucial role in metabolism, immunity, and digestion, with diet being a key factor shaping its composition. Disruptions in microbiota balance contribute to chronic diseases like obesity and insulin resistance. This study examines the impact of various dietary patterns—Mediterranean, ketogenic, high-protein, gluten-free, and low FODMAP diets—on gut microbiota, highlighting their mechanisms, benefits, and risks to metabolic health.

Review Methods

A literature review of peer-reviewed studies on diet-microbiota interactions was conducted, focusing on microbiota composition, function, and metabolic effects.

Abbreviated Description of the State of Knowledge

The Mediterranean diet enhances beneficial bacteria, increases short-chain fatty acid (SCFA) production, and reduces inflammation, improving gut barrier integrity. The ketogenic diet alters microbiota by decreasing carbohydrate-fermenting bacteria, with both positive and

negative metabolic outcomes. The low FODMAP diet alleviates irritable bowel syndrome symptoms but may reduce beneficial bacteria like Bifidobacterium. A high-protein diet increases bacteria involved in amino acid metabolism, yielding mixed effects on metabolic health. The gluten-free diet, while essential for celiac patients, may reduce microbiota diversity and lead to nutrient deficiencies. Each diet uniquely influences gut microbiota, underscoring the need for tailored dietary strategies to support metabolic and overall health.

Summary

Diet significantly impacts gut microbiota composition and function, affecting metabolic and immune health. Maintaining microbiota balance is crucial for homeostasis, as dysbiosis can contribute to disease. Understanding diet-microbiome interactions is essential for developing evidence-based nutritional strategies to optimize health.

The Impact of the Ketogenic Diet on the Gut Microbiome

The ketogenic diet (KD), characterized by very low carbohydrate content, high fat content, and moderate protein intake, is gaining popularity among individuals seeking effective treatments for various conditions, such as drug-resistant epilepsy or autism spectrum disorders (ASD). The beneficial effects of the ketogenic diet on metabolic, neurological, and psychological health have been the subject of many studies. However, it is increasingly recognized that this diet also influences the composition of the gut microbiota, which can have far-reaching health consequences. This paper discusses the changes in the gut microbiome resulting from the ketogenic diet and their potential health effects. [1] [2] [3] [4] [19] [20] [21]

Changes in the Gut Microbiome Composition Due to the Ketogenic Diet

The ketogenic diet, due to its low carbohydrate content and high fat content, significantly impacts the composition of the gut microbiota. Initial studies indicate a reduction in the number of carbohydrate-fermenting bacteria, such as those from the *Bacteroides* genus, which are essential in the fermentation of fiber and other carbohydrates. A decrease in these bacteria leads to a reduced production of short-chain fatty acids (SCFAs), which are the main energy source for intestinal cells and have anti-inflammatory properties. SCFAs, such as acetic acid, butyric acid, and propionic acid, are crucial for maintaining gut health and microbiota balance. The reduced production of SCFAs may, over the long term, lead to compromised gut health, including an increased risk of dysbiosis—an imbalance of the gut microbiota.

Changes in the gut microbiome composition due to the ketogenic diet also include an increase in the number of bacteria that prefer fat metabolism. One example is *Alistipes*, which supports fat metabolism and may protect against inflammation in the intestines. The increase in bacteria such as *Bilophila wadsworthia* may be beneficial in the context of animal fat metabolism but is also associated with a risk of pro-inflammatory reactions that may lead to the development of inflammatory bowel diseases, such as Crohn's disease or ulcerative colitis. Bacteria from the *Firmicutes* genus may also play a key role in fat metabolism. Changes in their abundance, linked to the transition to a ketogenic diet, can lead to increased production of ketones, which in turn affects microbiota balance and gut health. It should be noted that a high-fat diet may also promote the growth of sulfur-producing bacteria, such as *Desulfovibrio*, which are associated with inflammatory bowel diseases. An excess of these bacteria in the body can lead to unpleasant symptoms such as bloating, constipation, or diarrhea. [1] [2] [3] [4] [19] [20] [21]

The Varied Impact of the Ketogenic Diet on the Microbiome in the Context of Different Diseases

The ketogenic diet also shows diverse health effects depending on the health condition of the individual following the diet. An example of this is its use in the treatment of drug-resistant epilepsy in children. Studies on this application have shown the diet's effectiveness in reducing seizure frequency, although the exact mechanism of action remains unclear. In children following the ketogenic diet, changes in the gut microbiota have been observed, which may contribute to improvements in neurological symptoms, such as reduced seizures. There is also a hypothesis that ketone bodies, such as β-hydroxybutyrate, have neuroprotective effects and may influence improvements in social abilities in children with autism spectrum disorder (ASD). The reduction in carbohydrate-fermenting bacteria, coupled with an increase in fat-metabolizing bacteria, may contribute to improved brain function through inflammatory regulation.

Similarly, in other conditions such as autism and multiple sclerosis, the ketogenic diet influences the gut microbiome in a way that may contribute to symptom improvement. In children with ASD, the ketogenic diet has shown promising results in improving behaviors, particularly in reducing behavioral symptoms. The increase in ketone bodies, such as β-hydroxybutyrate, may positively affect inflammatory regulation and improve the balance of the gut microbiota. This mechanism may also involve modulation of the gut microbiome, increasing the number of bacteria producing SCFAs, which have anti-inflammatory effects and positively impact brain health. [1] [2] [3] [4] [19] [20] [21]

Long-Term Effects of the Ketogenic Diet on the Gut Microbiome

Although the ketogenic diet may lead to short-term benefits, such as reducing inflammation and improving fat metabolism, its long-term impact on gut health is more complex. A decrease in the diversity of the gut microbiota, which is one of the effects of following the ketogenic diet, may lead to dysbiosis, thus increasing the risk of developing inflammatory bowel diseases, such as Crohn's disease or ulcerative colitis. A reduction in the number of SCFA-producing bacteria, as well as an increase in the number of pro-inflammatory bacteria, such as *Desulfovibrio*, *Escherichia coli*, and *Bilophila wadsworthia*, may lead to chronic intestinal inflammation and an increased risk of colorectal cancer.
Some studies suggest that the ketogenic diet may lead to an increase in the number of bacteria, such as *Desulfovibrio* and *Escherichia coli*, which are associated with inflammatory bowel diseases. An excess of these bacteria in the microbiome can negatively affect gut health, leading to unpleasant symptoms, such as bloating, constipation, or diarrhea. On the other hand, the ketogenic diet may promote the growth of bacteria, such as *Alistipes*, which support fat metabolism, potentially improving the balance of the gut microbiota. [1] [2] [3] [4] [19] [20] [21]

Summary

The ketogenic diet has a significant impact on the composition of the gut microbiota, which can bring both health benefits and pose risks of long-term health problems. In the short term, this diet can lead to reduced inflammation, improved fat metabolism, and positive health effects in the context of treating epilepsy, ASD, or other neurological disorders. The decrease in carbohydrate-fermenting bacteria, such as *Bacteroides*, and the increase in bacteria favoring fat metabolism, such as *Alistipes* and *Bilophila*, can have both positive and negative consequences for gut health. However, long-term adherence to the ketogenic diet may lead to a reduction in microbiota diversity, potentially resulting in dysbiosis and inflammatory bowel diseases. Therefore, individuals following the ketogenic diet should monitor their gut health and, if necessary, support their microbiome with appropriate dietary supplements to minimize potential health risks.

Impact of a Gluten-Free Diet on the Gut Microbiome

A gluten-free diet (GFD) affects the gut microbiome, inducing moderate changes in its composition that do not lead to significant alterations in alpha diversity. Alpha diversity, which refers to the number and diversity of bacterial species present in a given microbiome, remains stable under a gluten-free diet. However, changes are observed in the abundance of specific bacterial groups. For example, a reduction in the numbers of families such as *Veillonellaceae* and bacteria like *Ruminococcus bromii* and *Roseburia faecis* has been noted. This decrease suggests that a gluten-free diet may lead to a reduction in bacteria associated with inflammatory processes and fiber fermentation. Such changes could have a positive impact on gut health by decreasing the risk of developing inflammatory conditions, particularly important in the context of inflammatory bowel diseases (IBD), such as Crohn's disease or ulcerative colitis.
On the other hand, an increase in the number of bacteria from families like *Victivallaceae*, *Clostridiaceae*, and *Coriobacteriaceae* suggests that the gluten-free diet may promote bacteria with potentially beneficial effects on gut health. These bacteria are involved in the metabolism of fatty acids, such as butyrate, an important energy source for epithelial cells of the gut and a key player in regulating the inflammatory response. Butyrate and other short-chain fatty acids (SCFAs) can support gut health by reducing inflammation and improving the gut barrier. Therefore, a gluten-free diet may have a potentially beneficial impact on the microbiome, particularly by promoting the growth of SCFA-producing bacteria, which may improve gut function and reduce the risk of inflammatory bowel diseases. [5] [6] [7] [8] [23] [22] [34] [35] [36] [37]

Metabolic Impact

In terms of metabolic activity, a gluten-free diet affects metabolic pathways associated with the metabolism of butyrates, fatty acids, and tryptophan. Although this diet leads to an increase in the activity of these metabolic pathways, no significant changes in butyrate levels in feces have been observed in studies. This result suggests that changes in microbiome composition induced by a gluten-free diet do not always translate into noticeable changes in fecal metabolites, indicating the complexity of the interactions between diet and the microbiome. It is possible that bacterial metabolic activity changes subtly without affecting the final levels of metabolites released into the feces, suggesting that changes in the microbiome may be more complex than initially assumed.

Despite these changes in microbiome composition and activity, the study did not find significant alterations in inflammatory biomarkers, such as calprotectin, β-defensin-2, or chromogranin A, nor in metabolic biomarkers, suggesting that a gluten-free diet does not induce significant inflammatory or metabolic processes in healthy individuals. This may indicate that, while the gluten-free diet brings about some changes in microbiome composition, it does not lead to significant changes in the body's inflammatory state in healthy individuals. The lack of significant changes in inflammatory and metabolic biomarkers suggests that the gluten-free diet has a subtler impact on the microbiome in healthy people, which may manifest in different contexts, for example, in individuals with inflammatory bowel diseases where the microbiome is already altered.

In the analysis of beta diversity, which measures differences in microbiome composition between individuals, it was observed that changes in the microbiome were strongly dependent on the individual characteristics of the study participants. Such variation points to significant variability in the microbiome between individuals, suggesting that a gluten-free diet does not lead to uniform changes in the microbiome but that the effect depends on the participants' individual predispositions. A gluten-free diet may have a lesser impact on microbiome diversity than other more radical dietary changes, such as transitioning to a high-protein or vegetarian diet. Nevertheless, changes in microbiome composition related to a gluten-free diet may have potential health benefits, particularly for individuals with gut disorders. [5] [6] [7] [8] [23] [22] [34] [35] [36] [37]

Conclusions

While the gluten-free diet (GFD) does induce some changes in microbiome composition, it does not have as profound an impact on the microbiome as more radical dietary changes. For instance, diets that involve the complete elimination of specific food groups (such as vegetarian, high-protein, or ketogenic diets) lead to more pronounced modifications of the microbiome. Therefore, the gluten-free diet may have a smaller impact on the microbiome than more drastic dietary changes, although it should not be underestimated, especially in the context of individuals with gluten-related disorders.

The findings from this study suggest that a gluten-free diet may offer health benefits, particularly in the context of inflammatory bowel diseases (IBD), due to the reduction in pro-inflammatory bacteria such as *Veillonellaceae*. These changes may indicate the role of the gluten-free diet in the therapy of individuals with specific gut disorders, especially those with irritable bowel syndrome (IBS) or inflammatory bowel diseases. However, the lack of significant changes in inflammatory and metabolic biomarkers in healthy individuals suggests that a gluten-free diet may not offer substantial benefits for the general population, and its therapeutic potential might be more pronounced in patients with IBD or other gluten-related disorders.

Despite noticeable changes in microbiome composition, the gluten-free diet did not induce dramatic effects as seen with more radical dietary changes. It is important to note that the study focused on healthy individuals, limiting the ability to generalize the results to patients with celiac disease or other gluten-related disorders.

Impact of the Mediterranean Diet on the Gut Microbiome

The Mediterranean diet (MD) is widely regarded as one of the healthiest dietary approaches, offering numerous health benefits, including its impact on the gut microbiome. Components of the MD, such as fiber, omega-3 fatty acids, polyphenols, and unsaturated fats, contribute to beneficial changes in the microbiome, positively influencing metabolic, immune, and mental health. Compared to Western diets, the Mediterranean diet promotes greater diversity of gut bacteria, which is considered an indicator of health. These changes are associated with improved gut barrier function, reduced inflammation, and overall better health.

One of the key mechanisms through which the Mediterranean diet affects the microbiome is its ability to increase the production of short-chain fatty acids (SCFAs), such as butyrate. SCFAs are beneficial for gut health because they have anti-inflammatory effects, support gut barrier function, and may improve insulin sensitivity. Bacteria responsible for SCFA production, such as *Faecalibacterium prausnitzii* and *Clostridium leptum*, are more prevalent in individuals following the Mediterranean diet. An increase in the abundance of these bacteria is linked to improved metabolic health and a reduced risk of diseases such as atherosclerosis and colorectal cancer.[9] [10] [11] [26] [39] [40] [41] [42]

Role of Fiber, Polyphenols, and Fatty Acids

Dietary fiber intake, characteristic of the Mediterranean diet, plays a crucial role in modulating the gut microbiome. Fiber, present in large quantities in vegetables, fruits, and whole grains, acts as a prebiotic, supporting the growth of bacteria such as *Bifidobacterium* and *Bacteroides*. These bacteria are beneficial to health, improving glucose metabolism, reducing the risk of cardiovascular diseases, and enhancing insulin sensitivity. Additionally, fiber helps maintain a healthy gut barrier, preventing harmful substances from entering the bloodstream, thereby reducing the risk of inflammation and chronic diseases.

Polyphenols, present in olive oil, red wine, and other plant-based products, are another component of the Mediterranean diet that supports gut health. They have anti-inflammatory and antioxidant effects, altering the microbiome composition in a way that is beneficial for health. Polyphenols may also reduce the presence of harmful bacteria, such as *Helicobacter pylori*, which can be significant in the prevention of stomach diseases like ulcers. [9] [10] [11] [26] [39] [40] [41] [42]

Omega-3 Fatty Acids in the Mediterranean Diet and Their Impact on the Gut Microbiome

Omega-3 fatty acids, found in fish, nuts, and seeds, are another important component of the Mediterranean diet. These fatty acids act by reducing inflammation and improving gut barrier function. Omega-3 fatty acids are also associated with a lower abundance of pro-inflammatory bacteria, such as *Firmicutes* and *Blautia*, which influences improved gut health and reduces the risk of chronic diseases. Their anti-inflammatory properties are crucial for maintaining overall health, including preventing metabolic disorders. [9] [10] [11] [26] [39] [40] [41] [42]

Conclusions on the Mediterranean Diet's Impact on the Gut Microbiome

Compared to the Western diet, which is rich in saturated fats and refined sugars, the Mediterranean diet promotes greater diversity in the microbiome, which is a key indicator of health. The Western diet, being low in fiber and high in saturated fats, leads to reduced microbiome diversity and the proliferation of pro-inflammatory bacteria, which contributes to the development of obesity, insulin resistance, and other metabolic diseases.

It is important to note that while many studies confirm the beneficial effects of the Mediterranean diet on the microbiome, not all results are unequivocal. Several studies suggest that changes in microbiome composition require long-term adherence to this diet, and the effects may be difficult to observe in short-term interventions.

In conclusion, the Mediterranean diet significantly influences the gut microbiome by promoting greater diversity and encouraging the presence of bacteria that produce beneficial short-chain fatty acids. These actions have the potential to prevent and treat various chronic diseases, including cardiovascular, metabolic, and cancer-related conditions. However, further research, especially interventional studies, is needed to fully understand the mechanisms of this impact and to better define how the Mediterranean diet can be utilized in the therapy and prevention of diseases related to gut dysbiosis.

Impact of the Low FODMAP Diet on the Gut Microbiome

The Low FODMAP Diet (LFD) has become widely recognized as a treatment for irritable bowel syndrome (IBS) and has been studied for its effects on other gastrointestinal disorders. FODMAPs are a group of short-chain carbohydrates that are poorly absorbed in the small intestine and are fermented by gut bacteria, leading to the production of gases and fluids. This fermentation process can exacerbate IBS symptoms such as bloating, abdominal pain, excess gas, and irregular bowel movements. The Low FODMAP Diet involves the elimination of these components for a specified period, followed by a gradual reintroduction based on the individual’s tolerance.

Numerous studies have shown that this diet provides relief from IBS symptoms, but long-term adherence may be associated with certain risks, such as a reduction in prebiotics like fructooligosaccharides (FOS) and galactooligosaccharides (GOS), which are important for the health of the gut microbiome. Changes in the microbiome can lead to a decrease in the production of short-chain fatty acids (SCFAs), which serve protective roles for the gut. Research has found that the Low FODMAP Diet may result in a reduction in beneficial bacteria, such as *Bifidobacteria*, which are crucial for gut health, and a decline in the presence of *Akkermansia muciniphila*, a bacterium considered beneficial for the integrity of the gut barrier. Additionally, the decrease in *Faecalibacterium prausnitzii*, a butyrate-producing bacterium, could have negative effects on gut health since butyrate plays a vital role in maintaining healthy epithelial cells and supporting the gut's mucosal barrier. [12] [13] [14] [15] [24] [25] [27] [28] [29] [30] [31] [32] [40]

Low FODMAP Diet: Limitations and Recommendations for Use

The Low FODMAP Diet (LFD) has its limitations, and it should be followed for a specific duration, typically between two and six weeks, after which FODMAPs need to be gradually reintroduced to avoid nutritional deficiencies and restore gut microbiome balance. Continuous monitoring and collaboration with a dietitian are crucial for identifying which FODMAP components can be tolerated by the patient and ensuring that the diet remains nutritionally adequate. [12] [13] [14] [15] [24] [25] [27] [28] [29] [30] [31] [32] [40]

Impact of the Low FODMAP Diet in Various Gastrointestinal Disorders

Studies on the impact of the Low FODMAP Diet on patients with ulcerative colitis (UC) and Crohn's disease (CD) show that the diet does not significantly affect inflammatory biomarkers, such as fecal calprotectin levels. However, for patients with Crohn's disease, the Low FODMAP Diet influenced the phenotype of T-cells, reducing the number of naïve CD4+ and CD8+ T-cells and effector/memory CD8+ T-cells expressing $\alpha4\beta7+$. No significant differences in the proportions of $\alpha4\beta7+$ expressing T-cells were observed in patients with ulcerative colitis between the two diets. In terms of the gut microbiome, the Low FODMAP Diet led to a reduction in short-chain fatty acids (SCFAs), especially butyrate, acetate, and valerate, particularly in the UC group. For Crohn's disease patients, the diet resulted in a decrease in isobutyrate levels.

Despite these microbiome changes, the Low FODMAP Diet did not have a significant impact on clinical symptoms such as pain, heartburn, bloating, or diarrhea. However, there was a reduction in bloating severity in patients following this diet compared to those on a standard diet. Nutrient intake changes related to the Low FODMAP Diet included reduced energy, protein, fat, sugar, and minerals such as calcium, phosphorus, and sodium, which could lead to deficiencies if not properly balanced. [12] [13] [14] [15] [24] [25] [27] [28] [29] [30] [31] [32] [40]

Conclusions on the Low FODMAP Diet

In summary, the Low FODMAP Diet is an effective treatment for irritable bowel syndrome (IBS) and may also support the management of inflammatory bowel diseases such as ulcerative colitis and Crohn's disease. Despite positive effects on the gut microbiome and symptom relief, its use requires strict monitoring to avoid the negative effects associated with reduced intake of prebiotics and other essential nutrients. The key to the effectiveness of this diet is an individualized approach, including adjusting it according to the patient's tolerance of specific FODMAPs and ensuring the diet remains nutritionally balanced to prevent deficiencies.

High-Protein Diet's Impact on the Gut Microbiome and Metabolic Health

A high-protein diet (HPD) significantly influences the composition and functionality of the gut microbiome, which may be crucial for metabolic health and the risk of developing inflammatory bowel diseases. Studies suggest that HPD alters the diversity and abundance of certain bacterial groups, which in turn has various health consequences. [16] [17] [18] [21] [43]

Functional Changes in the Microbiome and Mechanisms of Action

In studies comparing microbiome differences between experimental groups, HPD was shown to increase the abundance of the *Helicobacter* genus, particularly associated with amino acid and tryptophan metabolism, while decreasing bacteria from the *Lachnospiraceae* family, which were more abundant in the control group. The negative correlation between these groups suggests antagonistic microbial relationships that may affect the overall balance of the microbiome. [16] [17] [18] [21] [43]

Benefits and Drawbacks of a High-Protein Diet

The microbial changes induced by HPD have been linked to the pathogenesis of Crohn's disease (CD). Increased presence of *Escherichia coli*, which is more abundant in the HPD group, is closely associated with CD. Conversely, bacteria such as *Anaerostipes hadrus*, *Roseburia intestinalis*, and *Parabacteroides distasonis* play protective roles by supporting gut barrier integrity and bile acid metabolism. Maintaining a balance between pro- and anti-inflammatory microorganisms seems crucial for gut health.

Regarding obesity, HPD increases microbiome diversity, particularly among individuals of diverse ethnic backgrounds. Increased abundance of bacteria like *Akkermansia* spp. and *Bifidobacterium* spp. may help reduce insulin resistance and inflammation. Both HPD and the normal protein diet (NPD) reduced the abundance of *Prevotella_9*, which could contribute to improved metabolic health. Interestingly, there was a decrease in *Prevotella_2* in the HPD group, which could be linked to a reduced risk of cardiovascular diseases. The mechanism of HPD involves the increased supply of protein to further segments of the gastrointestinal tract, which promotes fermentation by microorganisms. These findings suggest that initial microbiome composition may determine the response to the diet, highlighting the need for further research. [1] [16] [17] [18] [21] [43] [33]

Advantages and Risks of High-Protein Diets

A high-protein diet has multifaceted effects on the gut microbiome, which could explain its potential health benefits. However, there is also the risk of promoting the growth of pathogenic microorganisms like *Helicobacter*. To fully understand these effects, further studies incorporating metagenomics and metabolomics, as well as considering different protein sources, are essential. Gaining a better understanding of the relationship between diet, the microbiome, and health could provide new strategies for preventing and treating inflammatory and metabolic diseases. [1] [16] [17] [18] [21] [43] [38]

Conclusions

Analysis of various diets reveals how dietary patterns influence the composition of the gut microbiota, which can lead to either beneficial or detrimental health effects. Numerous diets, despite their different mechanisms of action, may support metabolic, inflammatory, and systemic health.

The Mediterranean diet, rich in fiber, omega-3 fatty acids, polyphenols, and olive oil, has a strong positive impact on gut health. It enhances microbiota diversity, supports the growth of beneficial bacteria producing short-chain fatty acids, which have anti-inflammatory effects and assist in glucose metabolism. Following this diet reduces the risk of chronic diseases, such as atherosclerosis and colorectal cancer, and improves insulin sensitivity.

The Low FODMAP diet, primarily used for the treatment of irritable bowel syndrome (IBS), alleviates symptoms such as abdominal pain and bloating. However, prolonged adherence to this diet may lead to a decrease in beneficial bacteria and the production of short-chain fatty acids, which can disrupt the balance of the microbiome and cause nutritional deficiencies. Therefore, it should be followed short-term, and after symptom resolution, FODMAP-rich foods should be gradually reintroduced.

A high-protein diet (HPD), popular for improving metabolic health, impacts the gut microbiome by promoting the growth of bacteria such as Akkermansia and Bifidobacterium. However, it may also promote the growth of pathogenic microorganisms such as Helicobacter, potentially leading to inflammatory bowel diseases. Long-term consumption of large amounts of protein can also disrupt microbiota balance, so this diet should be followed under appropriate supervision.

A gluten-free diet, mainly recommended for individuals with gluten intolerance, influences the gut microbiome by increasing the number of beneficial bacteria such as Lactobacillus and Bifidobacterium. However, its use may result in reduced microbiota diversity and deficiencies in fiber and other nutrients. Individuals on a gluten-free diet should pay special attention to supplementation and careful selection of products.

The ketogenic diet, based on low carbohydrate intake, also affects the gut microbiota composition, increasing the number of bacteria that break down fats. Short-term effects may offer health benefits, such as weight loss and improved insulin sensitivity, but prolonged use can decrease microbiota diversity and promote inflammatory conditions.

In summary, diet has a significant impact on the gut microbiome, which is crucial for metabolic health and the prevention of chronic diseases. The Mediterranean, Low FODMAP, high-protein, gluten-free, and ketogenic diets, despite having different mechanisms of action, can support health; however, their implementation requires proper supervision and individual adjustment to the body's needs. Further research on how diet affects the microbiome and gut health is necessary to develop effective therapeutic strategies for treating and preventing diseases related to gut dysbiosis.

Table 1 :Changes in the abundance of specific bacterial species depending on the diet

Diet type	**Bacteria**	**Changes in Abundance / Observations**
Mediterranean Diet	Bifidobacterium, Akkermansia muciniphila	increased
	Firmicutes (overall)	increased
	Lachnospiraceae	increased
	Faecalibacterium prausnitzii	increased
Low FODMAP Diet	Bifidobacterium	decreased
	Akkermansia muciniphila	decreased
	Lactobacillus	decreased
High-Protein Diet	Akkermansia spp., Bifidobacterium spp.	increased
	Helicobacter	increased
	Lachnospiraceae	decreased
	Prevotella_9	decreased

Gluten-Free Diet	Lactobacillus	increased
	Bifidobacterium	increased
	Firmicutes	decerased
Ketogenic Diet	Firmicutes	increased
	Bacteroidetes	decreased
	Lactobacillus	decreased

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