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Microbiota and obesity: Is there a relationship in young adults? / Microbiota y obesidad: ¿Existe relación en adultos jóvenes?

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ABSTRACT

Introduction: the intestinal microbiota, composed of bacteria, fungi, viruses, and parasites, plays a fundamental role in human health by regulating key functions such as digestion, immunity, and vitamin production. In this thesis, we aimed to analyze the relationship between microbiota balance and the development of obesity, considering its pathophysiological mechanisms. To do so, we reviewed studies demonstrating how dysbiosis can induce chronic inflammation and contribute to metabolic disorders. Our findings confirmed that microbial composition influences body weight regulation and energy metabolism. It was observed that transplanting microbiota from obese individuals into animal models promoted weight gain, even under controlled dietary conditions, suggesting a direct impact of the microbiome on obesity development. Additionally, dietary factors—such as fat and fiber intake—were found to modulate bacterial composition and associated inflammatory processes. We also analyzed the gut-brain axis, finding evidence that bacterial metabolites influence the production of neurotransmitters related to mood and eating behavior. These results reinforce the importance of therapeutic strategies targeting microbiota modulation for the prevention and treatment of obesity.
Objective: the main objective of this study is to analyze the relationship between gut microbiota and obesity in young adults, highlighting how alterations in microbial composition may influence metabolism and body weight regulation.
Method: a systematic literature review will be conducted on the relationship between gut microbiota and obesity prevalence in young adults. Articles will be searched in PubMed, Cochrane, Elsevier, and SciELO databases, in Spanish and English, published within the last 10 years. Observational studies, clinical trials, and meta-analyses examining gut microbiota composition and its association with obesity development will be selected. Inclusion and exclusion criteria based on relevance, methodological quality, and study pertinence will be applied to ensure rigorous analysis.

Keywords: Gastrointestinal Microbiome; Obesity; Dysbiosis; Metabolic Diseases; Inflammation; Gut-Brain Axis.

RESUMEN

Introducción: el microbiota intestinal, compuesta por bacterias, hongos, virus y parásitos, desempeña un rol fundamental en la salud humana al regular funciones clave como la digestión, la inmunidad y la producción de vitaminas. En este trabajo nos propusimos analizar la relación entre el equilibrio de la microbiota y el desarrollo de la obesidad, considerando sus mecanismos fisiopatológicos. Para ello, revisamos estudios que evidencian cómo la disbiosis puede inducir inflamación crónica y contribuir a alteraciones metabólicas. Los hallazgos confirman que la composición microbiana influye en la regulación del peso corporal y el metabolismo energético. Se observó que el trasplante de microbiota de individuos obesos a modelos animales promovió

un aumento de peso, incluso bajo condiciones dietéticas controladas, lo que sugiere un impacto directo del microbioma en el desarrollo de la obesidad. Además, se identificó que factores dietéticos, como el consumo de grasas y fibras, modulan la composición bacteriana y los procesos inflamatorios asociados. También analizamos el eje intestino-cerebro, encontrando evidencia de que los metabolitos bacterianos influyen en la producción de neurotransmisores relacionados con el estado de ánimo y la conducta alimentaria. Estos resultados refuerzan la importancia de estrategias terapéuticas dirigidas a la modulación de microbiota en la prevención y tratamiento de la obesidad.

Objetivo: el objetivo principal de este estudio es analizar la relación entre el microbiota intestinal y la obesidad en adultos jóvenes, destacando como las alteraciones en la composición microbiana puede influir en el metabolismo y la regulación del peso corporal.

Método: se llevará a cabo una revisión analítica de la literatura sobre la relación entre la microbiota intestinal y la prevalencia de la obesidad en adultos jóvenes. Se buscarán artículos en las bases de datos PubMed, Cochrane, Elsevier y SciELO, en los idiomas español e inglés, publicados en los últimos 10 años. Se seleccionaron estudios observacionales, ensayos clínicos y meta análisis que analicen la composición del microbiota intestinal y su asociación con el desarrollo de la obesidad. Se emplearon criterios de inclusión y exclusión basados en la relevancia, calidad metodológica y pertinencia de los estudios para garantizar un análisis riguroso.

Palabras clave: Gastrointestinal Microbiome; Obesity; Dysbiosis; Metabolic Diseases; Inflammation; Gut- Brain Axis.

INTRODUCTION

Theoretical framework

The term microbiota refers to the community of living microorganisms present in a given ecological niche.[1] These microorganisms include bacteria, fungi, viruses, and parasites that coexist in the human gastrointestinal tract. In healthy individuals, the microbiota lives in a symbiotic relationship with the host, modulating their health by regulating immune function and protecting against pathogens.[2] The main functions of the gut microbiota are to prevent colonization by other pathogenic microorganisms, aid in food digestion, produce vitamins B and K that the human body cannot synthesize on its own, and, last but not least, stimulate the immune system.[3]

Intestinal dysbiosis is defined as an alteration in microbial composition compared to that of healthy individuals. It is characterized by a reduction in the diversity of beneficial bacteria and microorganisms, along with the proliferation of potentially harmful ones.[2] An unbalanced microbiota (dysbiosis) can also increase the production of pro-inflammatory metabolites and, in combination with a lack of physical exercise, contribute to the development of chronic diseases such as obesity. Chronic diseases, defined by the World Health Organization (WHO) as “health problems that require ongoing treatment over years or decades,” have a characteristic distribution associated with common risk factors, most of which are related to “bad habits” such as smoking, poor diet, sedentary lifestyle, and alcohol consumption.[4]

One of the primary chronic diseases is obesity Obesity is a chronic disease, and an imbalance in the gut microbiota can contribute to its development. Dietary fat can modulate the gut microbiota and help control obesity. Fat regulates the pro- and pre-inflammatory capacity of

the diet and increases the abundance of beneficial bacteria, promoting the production of short-chain fatty acids that favor a healthy microbiota. Likewise, dietary fat can reduce the numbers of some species and genera associated with excess body weight.

Relationship between gut microbiota and obesity in young adults

In recent decades, there has been a significant increase in the prevalence of chronic diseases such as colorectal cancer, heart disease, gastrointestinal disorders, and neuropsychiatric conditions, including autism, depression, and anxiety. This situation has raised questions about what constitutes a healthy diet, why eating can be an uncomfortable or painful experience, and what changes are necessary to restore health, particularly in relation to obesity and intestinal function.

The gut has traditionally been considered a purely digestive organ, but recent studies position it as a key center in the regulation of metabolism, immunity, and brain-gut communication.[5] From an evolutionary perspective, the gut acts as a "second brain," sending continuous signals to the central nervous system. This approach has revolutionized the modern understanding of health, highlighting the importance of the gut microbiota, an ecosystem of microorganisms composed of bacteria, fungi, viruses, and parasites, which is essential for the body's homeostasis.

The gut microbiota and its relationship to obesity

The gut microbiome plays a crucial role in regulating body weight. For example, experimental studies have shown that transplanting microbiota from an obese individual into an animal model results in significant weight gain, even under controlled dietary conditions.[6] This suggests that alterations in the microbiota, known as dysbiosis, are closely associated with obesity.

In obese individuals, imbalances have been identified in key bacteria such as Prevotella[7], which are associated with lower production of gut hormones responsible for satiety. This imbalance can hinder weight loss and perpetuate a cycle of overeating and chronic inflammation.

Factors that shape the gut microbiome

The gut microbiome is dynamic and changes throughout life in response to factors such as birth type, diet, physical exercise, stress, and life experiences. At birth, the initial colonization of the microbiome depends on the type of delivery: babies born vaginally acquire beneficial bacteria from their mother.[8] In contrast, those born by C-section have a different microbiota, which could predispose them to metabolic disorders in adulthood.[9]

Diet is one of the main determinants of microbial composition. A diet rich in fiber, fruits, and vegetables promotes microbial diversity and reduces the risk of intestinal inflammation. In contrast, diets rich in ultra-processed foods, sugars, and saturated fats are associated with lower bacterial diversity and increased risk of metabolic diseases, such as obesity.

The microbiota and brain-gut communication

The interaction between the gut and the brain is bidirectional and significantly impacts mood, appetite, and the stress response. Intestinal bacteria produce metabolites that influence the production of neurotransmitters such as serotonin, which is involved in mood control and eating behavior. Studies in animal models have shown that transplanting microbiota from individuals with depression can induce similar symptoms in mice, highlighting the role of microbiota in neuropsychiatric disorders.

Microbiota-based therapeutic interventions

Fecal microbiota transplantation (FMT) has become a promising tool for restoring microbial balance in patients with severe dysbiosis. Currently, FMT is FDA-approved for the treatment of recurrent Clostridium difficile infections and has a 90 % success rate.[11] Although this technique is still under development, preliminary research suggests its potential for addressing other conditions, such as obesity, inflammatory bowel disease, and certain neuropsychiatric disorders.[12]

Rationale

Obesity is a prevalent and growing condition in young adults, with significant consequences for physical and mental health, as well as for public health systems. Although conventional treatments have shown limitations, research on the gut microbiota offers new insights into the mechanisms underlying obesity.

The microbiota plays an essential role in regulating metabolism, controlling appetite, and inflammation.[13] Alterations in its composition, or dysbiosis, have been linked to increased susceptibility to obesity, especially in contexts of low-fiber diets rich in ultra-processed foods, which are common in this stage of life. Studying the relationship between gut microbiota and obesity in young adults is essential to developing innovative, personalized prevention and treatment strategies that promote better long-term health and well-being.

Given all of the above, the relationship between microbiota and obesity in young adults remains an expanding area of research, with questions about the exact mechanisms of dysbiosis and its impact on metabolism. To address this knowledge gap, we formulated the following research question under the PICO model:

- P (Population): young adults aged 18 to 60.
- I (Intervention/Exposure): intestinal dysbiosis and microbial composition in obesity (BMI > 30).
- C (Comparison): individuals with balanced microbiota versus individuals with obesity and dysbiosis.
- O (Outcome): metabolic changes, low-grade chronic inflammation, and body weight regulation.

Research question

"Is there an association between intestinal dysbiosis and the prevalence of obesity in young adults, and how does it influence metabolic regulation?"

Theoretical Background

The gut microbiota is a complex ecosystem of microorganisms that inhabit the gastrointestinal tract and play a key role in regulating metabolism, inflammation, and energy homeostasis. Its composition has been shown to influence predisposition to obesity, as specific bacterial populations are associated with increased energy extraction from food and systemic inflammatory processes that affect metabolic balance.

Recent studies suggest that an imbalance in the gut microbiota, known as dysbiosis, may contribute to the development of obesity by altering nutrient absorption, altering the production of bioactive metabolites, and modulating the gut-brain axis. In particular, an increase in the proportion of Firmicutes compared to Bacteroidetes has been linked to a higher body mass index and insulin resistance.In addition, the gut microbiota regulates hormones involved in

appetite and fat storage, such as ghrelin and leptin. Evidence suggests that modifications in microbial composition, whether through diet, prebiotics, probiotics, or fecal transplantation, may influence susceptibility to obesity and its potential treatment.

Literature Search Strategy

This analytical review will search for scientific articles examining the relationship between gut microbiota and obesity prevalence in young adults to identify microbiological patterns associated with this condition and their potential impact on metabolism. The PubMed, Elsevier, Cochrane, and SciELO platforms will be used, and the keywords "Gastrointestinal Microbiome," "Obesity," "Young Adult," "Dysbiosis," and "Metabolic Diseases" will be employed to search for articles, which will be analyzed to determine their eligibility for inclusion in this research protocol.

Objectives

General Objective

To analyze and describe the relationship between the balance of the gut microbiota and the development of chronic diseases, such as obesity, focusing on the pathophysiological mechanisms involved, including dysbiosis, low-grade chronic inflammation, and alterations in the intestinal barrier, to identify possible dietary and lifestyle strategies to prevent and control these diseases.

Specific Objectives

To analyze articles related to the microbiota and, within them, evaluate:

- The relationship between the gut microbiota and the prevalence of obesity in young adults, considering its metabolic and systemic implications.
- Evaluate the evidence on the composition of the microbiota in young adults with and without obesity.
- Analyze the impact of intestinal dysbiosis on energy metabolism and body weight regulation.
- Examine the influence of diet and other factors on the microbiota of people with obesity.
- The main factors influencing the composition and function of the gut microbiome include diet, lifestyle, and environmental factors.

METHOD

Study design

An analytical review of the literature will examine the relationship between intestinal microbiota and obesity prevalence in young adults.

Sources of information and search strategy

The search for scientific articles will be conducted in the PubMed, Cochrane Library, Elsevier, and SciELO databases. Controlled terms in MeSH format and keywords such as " " will be used, combined with Boolean operators (AND, OR).

"Gastrointestinal Microbiome," "Obesity," "Young Adult," "Dysbiosis," "Metabolic Diseases," combined with Boolean operators (AND, OR).

Inclusion criteria

Studies that meet the following criteria will be included:

- Published in the last 10 years (2019-2024).
- Written in English or Spanish.
- Original studies (clinical trials, cohort studies, case-control studies, systematic reviews, and meta-analyses).
- Research analyzing the composition of the gut microbiota in relation to obesity in young adults (18-35 years old).

Exclusion criteria

Narrative reviews, editorials, and letters to the editor will be excluded, as will studies not related to gut microbiota and its prevalence in obesity.

Selection and analysis of studies

The articles obtained will be evaluated in three phases:

1. Selection by title and abstract: Irrelevant studies will be discarded.
2. Reading of the full text: Relevance will be assessed against the study's objectives.
3. Data extraction and analysis: Relevant information will be collected on the composition of the microbiota, its influence on metabolism, and its relationship to obesity in young adults.

Synthesis of information

The results will be analyzed and compared to produce a critical synthesis of the relationship between gut microbiota and obesity.

RESULTS

Table 1. Results of article analysis

Article	Brief description
García GC et al.[14] Self-reported ongoing adherence to diet is associated with lower depression, fatigue, and disability in people with multiple sclerosis. Front Nutr. March 1, 2023;10:979380. doi:10.3389/fnut.2023.979380.	The study found significant differences in gut microbiota composition according to body mass index (BMI). Microbial diversity was lower in overweight or obese individuals, suggesting dysbiosis associated with excess weight. Although no direct associations were found between the *Firmicutes* and *Bacteroidetes* phyla and BMI, alterations in key metabolites were identified. Specifically, obese individuals had lower levels of short-chain fatty acids (SCFAs) and higher fecal concentrations of lipopolysaccharides (LPS), suggesting intestinal endotoxemia associated with the inflammatory state characteristic of obesity.
Sarmiento-Andrade Y et al.[15] Gut microbiota and obesity: new insights. Front Nutr. October 25, 2022;9:1018212. doi:10.3389/fnut.2022.1018212.	The review by Sarmiento Andrade showed that people with obesity have intestinal dysbiosis, characterized by a decrease in beneficial bacteria and lower production of short-chain fatty acids (SCFAs), which negatively impacts metabolic hormones such as GLP-1. This alteration is associated with chronic inflammation, increased intestinal permeability, and insulin resistance. Likewise, interventions with prebiotics, probiotics, and fecal transplants have shown positive effects on microbiota modulation and metabolic biomarkers, reinforcing their role in the development and maintenance of obesity.

Xu Z et al.[16] Gut microbiota in patients with obesity and metabolic disorders — a systematic review. Genes Nutr. January 29, 2022;17(1):2. doi:10.1186/s12263-021-00703-6	The systematic review by Xu, based on 60 studies, identified microbial patterns associated with obesity. A higher abundance of the phylum *Proteobacteria* was observed in obese individuals, while genera such as *Faecalibacterium*, *Akkermansia*, and *Alistipes* were associated with a metabolically healthy profile. The association between certain bacteria and obesity varied by geographic region, suggesting a significant environmental influence. In addition, the study questions the reliability of the *Firmicutes/Bacteroidetes* ratio and highlights the need for studies to determine whether microbial changes are a cause or consequence of obesity. The results provide potential therapeutic targets for microbiota-based interventions.
Lundholm A et al.[17] Short-chain fatty acids and gut microbiota in type 1 diabetes: a prospective study. Diabetes Care. 2022;45(5):1034-41. DOI: 10.2337/dc21-2205.	The study by Lundholm, conducted in young adults with type 1 diabetes, examined the relationships among gut microbiota, short-chain fatty acids (SCFAs), microbial diversity, and adiposity. An inverse association was observed between Eubacterium hallii abundance and BMI, suggesting a possible protective effect against excess weight. Similarly, elevated propionate levels were associated with poorer glycemic control, while three other SCFA-producing bacteria were negatively associated with body fat percentage and positively associated with lean mass. In contrast, Anaerostipes was associated with greater adiposity and an unfavorable glycemic profile. These findings highlight the complexity of the interactions between microbiota, fecal metabolites, body composition, and metabolic control, which are also key variables in the approach to obesity.
Leonario-Rodríguez M et al.[18] Gut microbiota and adipose tissue modulation in the pathogenesis of obesity. Arch Latinoam Nutr. 2022;72(2):100–108.	intestinal dysbiosis contributes to its pathogenesis. Key mechanisms were identified, including modulation of inflammation, intestinal permeability, and adipogenesis, mediated by metabolites such as short-chain fatty acids, claudins, macrophages, and oligosaccharides. Although the underlying mechanisms are not yet fully understood, the study highlights the importance of the GM in adipose tissue regulation and its role in obesity.
Jing Y et al.[19] Effect of fecal microbiota transplantation on neurological restoration in a spinal cord injury mouse model: involvement of brain-gut axis. Microbiome. 2021 Mar 7;9(1):59. doi:10.1186/s40168-021-01007-Y	In their review, Leonario-Rodríguez examined the relationship between gut microbiota (GM) and obesity, highlighting that obese individuals have lower gut microbiota diversity and an altered ratio of Firmicutes to Bacteroidetes. Genera such as Prevotella and Blautia are increased, while Bifidobacterium and Faecalibacterium are reduced. These changes favor greater energy extraction from the diet, with increased production of short-chain fatty acids (SCFAs), which influence metabolism, appetite, and inflammation. Studies with microbiota transplantation confirm the causal relationship between dysbiosis and weight gain. In addition, dysbiosis contributes to low-grade chronic inflammation, aggravating obesity. Modulation of the microbiota through prebiotics, probiotics, and fecal transplantation is emerging as a promising strategy for treating obesity.

Keubler LM et al.[20] Systematic review and meta-analysis of the effect of fecal microbiota transplantation on behavior in animals. Neurosci Biobehav Rev. July 11, 2023;153:105316. doi:10.1016/j.neubiorev.2023.105316.	Keubler conducted a systematic review and meta-analysis of animal models demonstrating that fecal microbiota transplantation induces consistent behavioral changes. These findings support the role of the gut microbiota in modulating the gut-brain axis, which may influence metabolic and inflammatory processes linked to obesity. The results suggest that intervening in the microbiota could have relevant therapeutic effects in young people with obesity.
Chinna Meyyappan A et al.[21]. Effect of fecal microbiota transplant on symptoms of psychiatric disorders: a systematic review. BMC Psychiatry. 2020;20(1):299. doi:10.1186/s12888-020-02654-5. PMID: 32539741	This study reviewed 21 studies on the impact of fecal microbiota transplantation (FMT) on psychiatric disorders. The results showed that FMT from healthy donors improved symptoms of anxiety and depression in humans and animals. At the same time, microbiota from patients with these disorders induced similar symptoms in recipient animals. The role of the gut-brain axis is highlighted, with the microbiota modulating neurotransmitters, inflammation, and metabolites. Although positive effects were observed, their duration was limited, and larger clinical trials are needed to confirm their efficacy and safety.
Biazzo M et al.[22]. Fecal Microbiota Transplantation as New Therapeutic Avenue for Human Diseases. J Clin Med. 2022;11(14):4119. doi:10.3390/jcm11144119	Fecal microbiota transplantation (FMT) is a promising therapeutic strategy for the management of obesity and metabolic syndrome. Scientific evidence shows that FMT from normal-weight donors can transiently improve insulin sensitivity and modulate energy metabolism. The efficacy of the intervention varies depending on the donor's microbial profile and the methodology used, with greater benefits observed in subjects with greater intestinal microbial diversity. However, despite the encouraging results, further studies are needed to establish its long-term effectiveness in treating obesity.

DISCUSSION

In recent decades, the gut microbiota has emerged as a determining factor in the pathophysiology of metabolic diseases, including obesity. This microbial ecosystem, composed of trillions of microorganisms that inhabit the gastrointestinal tract, performs essential functions in digestion, metabolism, immunomodulation, and energy homeostasis. In this context, multiple studies have explored the relationship between gut microbial composition and the development of obesity, particularly in young adults, a population in which early interventions could have a significant impact on the prevention of chronic diseases.

The studies analyzed in this paper agree that people with obesity exhibit alterations in the intestinal microbiota—known as dysbiosis—characterized by reduced microbial diversity and a decrease in bacteria considered beneficial, such as Faecalibacterium, Akkermansia, and Bifidobacterium. In turn, some studies report an increase in the Firmicutes/Bacteroidetes ratio, although this ratio has been controversial due to its variability across geographical, dietary, and methodological contexts. A consistent finding in the literature is the decrease in the production of short-chain fatty acids (SCFAs), such as butyrate, acetate, and propionate. These metabolites regulate intestinal hormones (GLP-1, PYY), lipid metabolism, insulin sensitivity, and inflammatory processes. The reduction of SCFAs in obese individuals could partly explain the energy imbalance and systemic inflammation observed in this condition.

Particularly relevant is the study by Lundholm et al.[17], which, focusing on young adults with type 1 diabetes, showed an inverse association between the abundance of Eubacterium hallii and body mass index (BMI), as well as a positive link between certain SCFA-producing bacteria and lean body mass. In contrast, Anaerostipes was associated with greater adiposity and a more impaired glycemic profile, highlighting the complexity of interactions among the microbiota, body composition, and metabolic control in young populations.

Another proposed mechanism is the role of lipopolysaccharides (LPS), which are components of the wall of gram-negative bacteria and, when increased in the intestinal lumen, can cross the epithelial barrier and induce metabolic endotoxemia. This condition is linked to low-grade chronic inflammation, common in obese individuals, and contributes to the development of insulin resistance and increased adipose tissue. Given this scenario, various interventions aimed at modulating the microbiota have shown promising results. The use of probiotics, prebiotics, and fecal microbiota transplantation (FMT) has been shown to improve microbial diversity, reduce inflammatory markers, and improve metabolic parameters. In particular, FMT from lean donors has shown temporary beneficial effects on insulin sensitivity and energy metabolism. However, the long-term efficacy of these strategies remains uncertain, and further research is needed to understand the factors that influence therapeutic response, such as baseline microbial diversity and donor profile.

In summary, the reviewed evidence supports the hypothesis that the gut microbiota plays an active—and possibly causal—role in the development of obesity in young adults. This bidirectional relationship opens new perspectives for personalized therapeutic interventions that integrate microbiome modulation into a comprehensive approach to obesity prevention and treatment.

CONCLUSIONS

The evidence reviewed in this thesis supports the conclusion that the gut microbiota plays a fundamental role in regulating metabolism and in the development of obesity in young adults. Throughout this work, it was observed that dysbiosis—that is, an imbalance in microbial composition—is associated with lower bacterial diversity, an alteration in the production of key metabolites such as short-chain fatty acids (SCFAs), and greater low-grade systemic inflammation, all of which are factors that contribute to weight gain and insulin resistance.

The relationship between microbiota and obesity is complex and multifactorial, influenced by dietary, genetic, environmental, and lifestyle variables. While some bacterial patterns, such as an increase in the Firmicutes/Bacteroidetes ratio, have been linked to obesity, their interpretation requires caution due to the heterogeneity of the studies. In contrast, the presence of beneficial bacteria such as Faecalibacterium and Akkermansia is consistently associated with a more metabolically healthy profile.

The studies reviewed also suggest that interventions such as prebiotics, probiotics, and fecal microbiota transplantation (FMT) could offer therapeutic benefits by favorably modulating the gut microbiota. However, their clinical application is still in its early stages, and more research is needed to establish safe and effective protocols.

We used to think of our gut as just the place where food ended up. However, with this study, we now realize that the gut is flexible and changes when we change the way we eat. The gut affects the entire body, including certain brain conditions. The interesting thing is that we cannot digest food on our own; we need microorganisms, which are a combination of bacteria,

fungi, viruses, and parasites that make up our microbiota.

People are very different, and we believe that the microbiota is the key. And it›s not difficult to have a healthy microbiome. Our gut bacteria need fiber, vegetables, and fruit every day. The more diverse your diet is, the richer your microbiome will be. This will allow you to better cope with allergies, diseases, and intolerances. The population has been doing the wrong things for many decades, and the obesity pandemic has only increased. The word «diet» is very confusing. Most people think it is something you do for a while to lose weight and then go back to their previous patterns of eating whatever they want. But a diet is about changing your lifestyle forever.

In conclusion, understanding the role of microbiota in obesity opens up new possibilities for the development of personalized preventive and therapeutic strategies. Promoting a balanced microbiota through healthy eating and sustainable lifestyle habits could be a key tool in the fight against obesity, especially among young adults, a strategic population for implementing early, lasting interventions.

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FINANCING

None.

CONFLICT OF INTEREST

None.

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