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ANALYSIS OF THE RELEVANCE OF MICROFLORA STABILIZATION AND MEASURES TO IMPROVE IT

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ABSTRACT

There is growing recognition of the connection between human health and gut bacteria. It is now commonly known that a healthy gut flora plays a major role in the host's general health. The normal human gut microbiota comprises of two major phyla, namely Bacteroidetes and Firmicutes. Even though an infant's gut microbiota seems random, by the time they are three years old, it begins to resemble the adult flora. However, throughout a person's life, there are differences in the microbial dispersal from the esophagus to the rectum in both space and time. Scientists can now examine these microorganisms, their roles, and the interactions between microbes and their hosts in both health and sickness in great detail because to advancements in genome sequencing tools and bioinformatics. A healthy gut microbiota has a specialized role in immunomodulation, pathogen defense, xenobiotic and drug metabolism, host nutrition metabolism, and gut mucosal barrier structural integrity. The typical gut microbiota is shaped by a number of variables. These consist of (1) the birth method (caesarean or vaginal); (2) the food in infancy (breast milk or formula feeds); (3) the usage of antibiotics or antibiotic-like compounds that come from the

environment or the gut commensal community. The long-term disruption of the typical, healthy gut microbiota and the horizontal transfer of resistance genes are two significant issues with antibiotic use that may lead to a reservoir of organisms with a multidrug-resistant gene pool.

Introduction. The term "microbiota" describes the whole population of microorganisms that live in a specific area. This population includes not only bacteria but also fungus, viruses, archaea, and protozoa. The scientific community has recently shown a great deal of interest in the gut microbiota. Although the evidence supporting this association is not strong, the gut microbiota has been linked to a wide range of human diseases, including metabolic disorders like obesity and diabetes, neurodevelopmental disorders, and luminal diseases like inflammatory bowel disease (IBD) and irritable bowel syndrome (IBS). It has long been hypothesized that the gut microbiota plays a vital functional role in preserving gut health and overall human well-being. These theories are now being supported by an increasing amount of data from research on germ-free mice and humans. High-quality data from the European Metagenomics of the Human Intestinal Tract (MetaHIT), the US Human Microbiome Project (HMP), and other research have now shown the positive effects of normal gut flora on health, even at the genetic level [1-6]. For instance, research has now discovered a number of gut microbial genes, including the HMO-related gene cluster 1 that controls the digestion of human milk oligosaccharides. From an immunological point of view, the host immune system identifies and eradicates germs as pathogens. The vast majority of gut bacteria, on the other hand, coexist symbiotically with enterocytes and are not harmful. Two significant indicators of advancement in gut microbiology and immunology have emerged in recent years. First, it has been shown that the internal host environment is the primary modulator of the gut bacteria. Second, the immune response is significantly impacted by the makeup and byproducts of gut microbes. As a result, controlling gut microbes has emerged as a novel strategy for preserving health and enhancing immunity, which has received a lot of attention. The importance of gut microbes on the immune system is becoming more and more clear. For instance, intestinal microbes' production of short-chain fatty acids (SCFAs) can improve the function of the epithelial barrier and penetrate other organs, influencing antigen-presenting cells and lowering inflammation in associated disorders. Furthermore, research has demonstrated that intestinal microbiota can influence immune function beyond the colon. Mice deficient in GPR43, a single G protein-coupled receptor, for instance, exhibit a significantly changed inflammatory response. To avoid illnesses and preserve human health, more research on the relationship between gut microbes and immunity is needed [7-11]. The gut commensals primarily support intestinal barrier function, medication metabolism, food metabolism, and the avoidance of harmful microbial invasion. In the process of defending against invasive pathogenic bacteria, the immune system has co-evolved to coexist harmoniously with the beneficial microbiota. Probiotics are generally thought to be dietary components that can affect the

human gut microbiota and regulate the intestinal flora's composition and structure. It is important to note that intestinal flora has a significant impact on the immune system. In the human body, intestinal flora can supply nutrition, fend off infections, and preserve the integrity of the mucosal barrier. It's interesting to note that new studies have discovered a connection between sleep and skin type that involves the immune system. Furthermore, the immune system has an impact on the central nervous system (CNS). As a result, immunology has a direct impact on people's lives, and probiotics have emerged as a useful tool for regulating intestinal bacteria. This manuscript's goal is to discuss the most recent data about the roles of the normal gut microbiota and the mechanistic understanding of how these beneficial effects are carried out. The information in this review is a combination of experimental and observational research on people, germ-free mice, and humanized mice. This review does not cover the significance of gut microbiota in disease states. The impact of probiotics on human immunity and gut microbiota, as well as the connection between immunity and life quality, are covered in this review. Additionally, the methods for boosting immunity using probiotics are addressed [12-17].

The main purpose of this brief review is to analyze the stability of microflora based on the relevance and improvement of measures based on the results of prestigious scientific research

Current gut microbiota study methods. Individual feces samples must be taken in order to isolate DNA from the stool in order to examine the gut flora. It is difficult to isolate, identify, and count the great majority of gastrointestinal bacteria using traditional culture-based methods. Because the majority of the microorganisms in the gut are anaerobic, scientists were only able to isolate 10% to 25% of the microbiota using culture-based approaches in the past. Later, when anaerobic culturing techniques advanced, dominating genera like *Clostridium, Bifidobacterium* and *Bacteroides* were discovered [1,4,5]. The primary disadvantage of employing these methods is the challenge of examining the culture properties of different colonies on a petri dish. Second, it takes a lot of time. Now that high throughput gene sequencing technology is available, there are two main phases to the research of the gut microbiota: bioinformatics analysis and 16S rRNA-based bacterial gene sequencing. Another quickly developing area of study on the gut microbiota is metabolomics, which assesses tiny chemicals linked to the interaction between bacterial and host metabolism and has consequences for both health and illness. The strongest evidence that can show the strongest correlation between healthy and pathological states is now provided by composite data from the gut microbiota and the metabolome [3,7,8].

The Gut Microbiome's Contribution to Local Adipose Tissue Inflammation and Obesity. One prevalent metabolic condition is obesity. The causes of obesity are numerous. Apart from genetic, dietary, and lifestyle variables, some research has indicated that gut flora abnormalities may also be a contributing factor to obesity. Furthermore, compared to healthy, lean people, obese patients are more likely to have local inflammation in their adipose tissue, which can eventually develop into systemic inflammation. By boosting immunity and reducing obesity, intestinal flora can stop local inflammation of adipose tissue. The aforementioned illustrates how the immune system

and intestinal flora interact, with the former playing a significant impact in the latter. Furthermore, it is commonly known that the gut microbiome can affect how obesity develops [1-5]. Researchers used genetic sequencing to identify distinct strains in fecal samples from several obese patients, which were then compared to lean volunteers. The proportion of Firmicutes and Bacteroidetes may be correlated with the occurrence of obesity, as they discovered that obese people had much more Firmicutes and fewer *Bacteroidetes* (figure 1). The researchers gave adult GF mice normal cecal microbiota in another groundbreaking experiment. Adult GF mice retained a 60% rise in body fat and insulin resistance two weeks later, even though their food intake had decreased. This demonstrates the important role gut flora plays in avoiding obesity. In conclusion, gut flora significantly reduces adipose tissue's local inflammation [6-11].

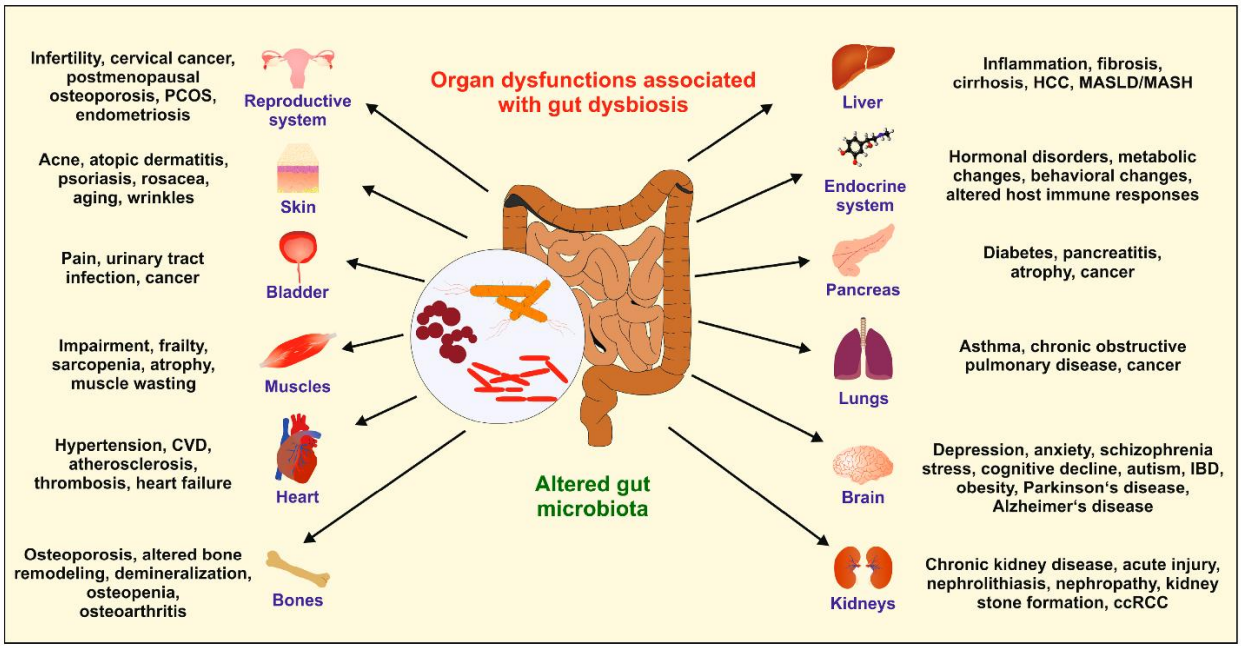

Figure 1. shows how dysbiosis can lead to organ dysfunction [22].

The Interaction of Skin and Intestinal Flora and the Application of Probiotics to Enhance Skin Quality. Numerous studies have shown that the skin and the gut are connected in both directions, and that the skin can reveal the nature of some gastrointestinal conditions. Researchers are currently examining how local microbes affect the immunological competence of distant organs as a result of ongoing studies on the connection between gut microorganisms and host health. The effects of gut bacteria on the heart, lungs, skin, and other organs have received the greatest attention among them[13-16]. Thus, scientists discovered a strong correlation between the gut microbiota and common skin conditions such atopic dermatitis (AD), psoriasis, and acne. Furthermore, probiotics have gained increasing interest as a treatment for various illnesses in addition to some conventional approaches. Consider the connection between AD and the gut microbiota. Around the world, AD is a prevalent chronic inflammatory skin condition. These days, anti-inflammatory and emollient medications are the cornerstones of AD treatment, offsetting the drawbacks of impaired immunological tolerance and barrier dysfunction. Probiotics have been shown in recent years to improve immunity, which may help prevent and treat AD. For instance, a Norwegian study

discovered that giving probiotic milk to expectant mothers and newborns both before and after birth can significantly lower the incidence rate of AD. According to a different study, AD patients had lower levels of Bifidobacterium in their digestive tracts than the healthy control group, and there was a negative correlation between the severity of the condition and the amount of Bifidobacterium in the intestinal tract. The study also revealed that gut flora changes might occur before AD develops. Therefore, we can conclude that abnormalities in the gut flora may contribute to the development of AD [17-21].

Synbiotic, Prebiotic, and Probiotic Treatments. The World Health Organization defines probiotics as live bacteria that can bring benefits to human health when provided in suitable levels. Numerous species have been demonstrated to impart immunomodulatory and gut barrier functions, including *Streptococcus thermophilus, Lactobacillus casei, Lactobacillus planatarum, Lactobacillus bulgaricus, Lactobacillus acidophilus, Bifidobacterium longum, Bifidobacterium infantis* and *E. coli* strain Nissle 1917, to mention a few. These and several more have been used commercially in the management of human ailments e.g., IBD and antibiotic related diarrhea [7,8,9]. The basic idea behind employing these organisms in the therapeutic arsenal is to replicate the physiological processes that the "good" bacteria use to promote health. The action of the probiotics may be enhanced by the addition of a prebiotic. A synbiotic is a combination of a probiotic and a prebiotic. Prebiotics are food items that contain non-digestible oligosaccharides, such as galactooligosaccharides and inulin. These fibers are selectively fermented by the gut bacteria, which produces SCFAs, which have positive health effects (see above). Since this review focuses primarily on a normal gut flora, a thorough discussion of probiotics and prebiotics is outside its purview. Despite the fact that dietary fiber and a healthy gut microbiota are proven to improve health, we think that before deploying synbiotics as commercial health promoters, their utility for maintaining health needs to be thoroughly investigated [11,12,17].

Discussion. Beneficial active bacteria known as probiotics colonize the human intestines and alter the flora's makeup in specific host areas. Probiotic use to control gut flora and boost host immunity has drawn a lot of attention lately. According to recent research, probiotics have a major impact on the makeup of the gut microbiota, which can improve the host's immune system, prevent harmful bacteria from colonizing the intestine, and assist the host in developing a protective layer of intestinal mucosa. Because human immunity and gut microbiota are closely related, using probiotics to regulate the gut microbiome has proven to be a very successful strategy for boosting human immunity. The impact of probiotics on human immunity and gut microbiota, as well as the connection between immunity, probiotics, gut microbiota, and life quality, were covered in this review [1,2,3]. We also underlined how probiotics can improve people's lives and boost human immunity by regulating gut microbiota. With thousands of microbial species living there, the human gut microbiome is a complex ecology. It differs from person to person and is influenced by environmental factors including antibiotics and food as well as host genotype. As crucial ecological traits of the gut microbiota and its significance for human health, stability and resilience are the main topics of this review. Resilience appears to be largely dependent on microbial diversity,

metabolic flexibility, functional redundancy, and interactions between microbes and hosts. Disturbances like antibiotic medication can upset the balance of the gut ecology, leading to substantial reductions in microbial diversity and functional richness as well as effects on metabolic health [18,19,20,21]. Unbalanced states or even unhealthy stable states may result, which may contribute to or cause diseases. In order to prevent or reverse ill conditions brought on by disruptions, methods for modifying the gut microbiome have been devised. These include transplanting the microbiota in the feces, taking probiotics or non-digestible carbohydrates as supplements, and making more significant dietary changes. Due to the distinct features of each person's microbiome, a growing body of research has demonstrated interindividual diversity in the degree and direction of response to food and disturbances. Enhancing the gut microbial ecosystem's resilience before disturbances or reestablishing its balance thereafter would be highly advantageous from a clinical, translational standpoint. A customized or subgroup-based understanding of each patient's genetics, nutrition, gut microbiota, and other potentially relevant environmental factors is probably necessary for this therapy strategy to be successful [1,4, 13,17].

Conclusions. Significant medical advancements in recent years have led to the development of new medications and improved approaches to treating both communicable and non-communicable diseases. Nonetheless, a number of elements that have a substantial impact on the efficacy of the treatment procedures require particular consideration. One of these elements is the gut microbiota, whose makeup and activity significantly indicate the state of the body. Studying the new connections between the intestinal microbiota and pharmacotherapy is made possible by the understanding of the role the intestinal microbiome plays in drug metabolism. This has already been seen as a shift in clinical practice and medicine. We have shown that the impact of specific medications and phytochemicals on the composition and functionality of the gut microbiota.

Probiotics are a type of helpful microbe that can improve immunity and control the makeup of intestinal flora. By preserving the epithelial barrier, preventing pathogens from sticking to the intestinal surface, and regulating and appropriately maturing the immune system, probiotics can enhance host protection. Additionally, probiotics can treat specific disorders by altering intestinal flora, which enhances host immunity. These days, it is established that intestinal flora, immunity, and probiotics are closely related. Future research will clarify the exact method by which probiotics enhance immunity and control the composition of gut flora. They will also be a useful tool for enhancing people's quality of life.

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