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Review Article

Biotherapeutics an Alternative Way of Treating Metabolic Disorders in Human.

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Abstract

The human population currently suffers from a variety of metabolic illnesses, with type 2 diabetes(T2DM) and cardiovascular disease being the two most prevalent (CVD) among them. These metabolic abnormalities affect both young and old persons, not just those who are elderly. Insufficient consumption of macronutrients, unhealthy lifestyle choices, and changes in the body's microbiota composition are typically the main causes of these illnesses. Changes in the microbiota's composition frequently cause obesity, metabolic endotoxemia, systemic inflammation, and dysfunctionality of beta cell. The microbiota composition within the body can be considerably improved by biotherapeutics like probiotics and prebiotics, preventing type 2 diabetes (T2DM) and cardiovascular illnesses (CVD). They can also drastically lower thecholesterol levels and enhance insulin levels in the body. Thus aids in reducing obesity. The present review deals with different types of metabolic disorders in human and how biotherapeutics can be used as an alternative way of treating them.

Keywords: Probiotics; Prebiotics; Cardiovascular Disease; Type 2 Diabetes; Obesity

Introduction

Type 2 diabetes (T2DM), obesity, and other metabolic disorders are relatively prevalent in the population and can affect persons of any age, gender, or ethnicity. These conditions are brought on by low levels of cholesterol and insufficient insulin in the body [32]. According to [22], between 46 to 65 percent of adults worldwide suffer from various forms of metabolic syndrome. In that case, biotherapeutics serve as a newly developed, cost-effective alternative strategy for treating metabolic illnesses. Probiotics are live microorganisms that, when taken as a supplement, improve health by reestablishing the balance of the gut flora. They are regarded as safe to consume [6]. In contrast, prebiotics like insulin and oligofructose/glucose help the body's probiotics function. These substances typically play a role in growth and development [8]. In order to effectively treat metabolic diseases, dietary solutions should be developed, such as creating natural food products with probiotics and prebiotics that modify MetS. Probiotics are therefore living microbes that, when taken, have positive effects on health. They are thought to be safe to consume. Probiotics are therefore typically dietary components with several health advantages as well as employed in various forms of metabolic disorders [11].

Metabolic syndromes and risk factors associated with it

Genetic factors, lifestyle choices, an improper diet, the environment, and other variables are the main causes of metabolic syndromes. According to [30], these factors cause the body's insulin to become dysfunctional, lipid toxicity, chronic inflammation, and adipose tissue saturation. These conditions include type 2 diabetes, hypertension, obesity, and other conditions [30]. Additionally, these characteristics increase the risk of cardiovascular disease in people [18].

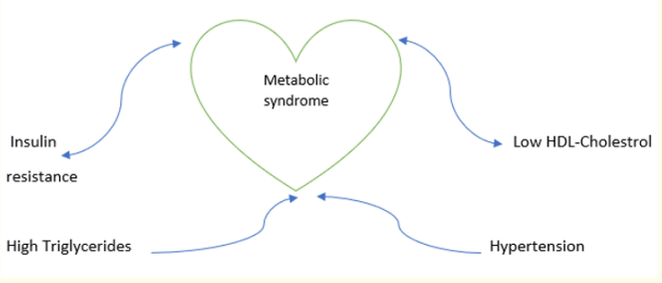

Figure 1: Risk factors associated with metabolic syndrome.

The different types of cardiovascular diseases and risk factors associated with them

- **Obesity**: According to Grundy and S.M. (2002) [13], obesity is brought on by the existence of excess adipose tissue and develops as a result of an imbalance between energy intake and energy expenditure. Genetic and environmental variables that result in chronic inflammation and high blood pressure, low levels of high-density lipoprotein, and hyperglycemia are further factors that contribute to the development of obesity [28]. Obesity affects a large number of people as a result of adipose tissue dysfunctionality and increased fat accumulation [12].
- **Diabetes**: In India, there are an increasing number of people who have diabetes. 72.9 million adults in India were predicted to have diabetes in 2017 by "The International Diabetes Federation." The cases of this disease is very high that is largely the result of lifestyle changes, hereditary factors, environmental variables, dietary habits, etc. T2D is a metabolic illness defined by insulin resistance and pancreatic beta cell malfunction, which results in elevated blood glucose levels, or hyperglycemia, and an unbalanced state of body homeostasis [21]. Type 2 diabetes is brought on by relative insulin shortage as a result of -cells' inability to produce enough insulin.
- **Hypertension**: The body's equilibrium is out of balance, causing hypertension, which is recognised as a metabolic illness. There are around 762 million persons in India over the age of 18, 234 million of whom have hypertension. In India, there are 25% more cases of it in urban areas than in rural areas. One of the main risk factors for hypertension is being overweight intake of excess salt in diet. The idea of "salt-induced obesity" exists. And in obese patients, increased sympathetic nervous system (SNS) activity in the kidney and brain causes high blood pressure [9]. Higher sympathetic nervous system (SNS) activity causes the body's blood pressure to rise [10]. Hypertension is exacerbated by increased SNS activity, particularly in the kidney. Renal SNS enhances renin and sodium reabsorption [2].

Probiotics	Prebiotics	Postbiotics	Paraprobiotics
Living microbial cells which stimulate health	Chemical agents have the ability to stimulate the probiotics.	Beneficial metabolites of probiotics.	Dead or inactivated probiotics.

Table 1: Microbial classification.

The different types of biotherapeutic measures and mechanism of action

- **Cholesterol lowering probiotics:** According to Kumar., *et al*. (2012), dietary supplements containing lactic acid bacteria or fermented dairy products may help lower cholesterol levels [20]. Probiotics, in particular Bifidobacterium spp. and Lactobacillus spp., are utilised to treat this issue [19]. Lactose fermentation is caused by living microorganisms known as probiotics [16]. *In vitro* research has revealed the methods by which probiotics reduce cholesterol levels. The proposed mechanisms include coprecipitation of cholesterol with deconjugated bile, cholesterol conversion to coprostanol, binding of cholesterol to probiotic cellular surface, deconjugation of bile via bile salt hydrolase activity, production of short-chain fatty acids from oligosaccharides and deconjugation of bile via bile salt hydrolase activity [15,26,31].
- **Probiotics used to control glucose metabolism:** Different probiotic strains are employed to regulate the body's glucose metabolism in type 2 diabetes patients [3]. One of the most prevalent metabolic diseases worldwide is type 2 diabetes. Additionally, it can cause severe heart malfunctions leading to heart attacks etc. Probiotics help reduce inflammation and stop the body from destroying b cells, which lowers blood sugar levels. Probiotics may also enhance glucose metabolism by blocking or delaying intestinal glucose absorption and by changing the function of the autonomic nervous system [1,7].
- **Probiotics used to control blood pressure:** Probiotics come in a variety of forms, and they can aid patients with hypertension by reducing their blood pressure [5,29]. The body's homeostasis and intestinal immunity are frequently preserved by the gut bacteria. Dysbiosis is the term used to describe an unbalanced gut flora. Recently, it was discovered that dysbiosis of the gut microbiota is linked to elevated blood pressure in both humans and animals. However, there is little clinical support for dysbiosis managing blood pressure [4,14,17].

The prebiotics as management component of treating metabolic disorders

Prebiotics are a potentially effective, cost-safe treatment for metabolic diseases. Prebiotics may help people with type 2 diabe-

tes lose weight, reduce pro-inflammatory state, improve glucose and insulin homeostasis, increase HDL, and lower TG or LDL levels. Prebiotics primarily help Lactobacillus flourish in the gut, which has numerous positive effects on health. Prebiotics are typically dietary fibres that regulate things like blood pressure, insulin levels, and body weight. Humans receive daily doses ranging from 5 to 20g. [25,27,33].

Conclusion

Numerous pieces of evidence indicate that the gut microbiota plays a crucial role in the onset of MS. From the secientific studies it was found that they also have the ability to control appetite of body serum lipids, plasma glucose, act as pro-inflammatory markers. Prebiotics and probiotics, which are used to change the microbiome, can help improve insulin resistance, reduce weight loss problem due to and lower intestinal inflammation. Biotherapeutics can act as cheaper,easily affordable means to cure the different types of metabolic disorders.To learn more about the potential uses of the human gut microbiome in treating different types of metabolic disorders and issues related to them, further clinical research is still required.

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Conflict of Interest

The authors declare that there are no conflict of interest.

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