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The Multifaceted Effects of *Lactobacillus acidophilus* on Endocrine, Gastrointestinal and Cardiovascular Health: A Clinical Study

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Abstract:- *Lactobacillus acidophilus* is a probiotic bacterium widely recognized for its beneficial effects on gut health and systemic physiological functions. This study aimed to evaluate the impact of *L. acidophilus* (1.0 x 10^9 CFU, administered for one month) on endocrine, gastrointestinal, and cardiovascular parameters in 20 participants. The results demonstrated significant improvements across multiple systems. In the endocrine system, a slight reduction in TSH and cortisol levels and a significant decrease in insulin levels were observed, suggesting improved hormonal balance and insulin sensitivity. Gastrointestinal parameters, including transit time and subjective symptom assessment, showed marked improvement, with a reduction in transit time and alleviation of symptoms such as bloating and abdominal discomfort. Cardiovascular parameters also improved significantly, with reductions in systolic and diastolic blood pressure, LDL cholesterol, and triglycerides, indicating a better lipid profile and reduced cardiovascular risk. These findings highlight the potential of *Lactobacillus acidophilus* as a multifunctional probiotic capable of supporting metabolic, gastrointestinal, and cardiovascular health. The results underscore the need for further research on larger populations and longer treatment periods to validate these findings and explore underlying mechanisms.

Keywords:- *Lactobacillus Acidophillus, Endocrine Parameters, Gastrointestinal Parameters, Cardiovascular Parameters, Participants.*

Field:- *Pharmacoeconomics, Pharmacy.*

I. INTRODUCTION

Lactobacillus acidophilus is one of the most well-known probiotic strains used in human nutrition, and its impact on health has been the subject of numerous studies (Gao et al., 2022). As "good" microorganisms, probiotics such as *Lactobacillus acidophilus* can contribute to the balance of the microbiome, offering a wide range of health benefits, including for the heart, endocrine, and gastrointestinal systems. *Lactobacillus acidophilus* is recognized for its positive effects on the digestive system. Its main effect is the restoration of balance between beneficial and harmful microorganisms in the intestines (Maria Remes-Troche et al., 2020). This probiotic promotes gut health by helping to maintain a balance of microorganisms in the intestines, which can reduce the risk of stress caused by pathogens and infections. Additionally, it improves digestion, aids in the digestion of lactose, which is beneficial for people who suffer from lactose intolerance. It stimulates the production of short-chain fatty acids, which can contribute to the health of the intestinal mucosa, providing protection against inflammation and other disorders. It also reduces symptoms of irritable bowel syndrome (IBS), where in some individuals, *Lactobacillus acidophilus* can help alleviate pain, bloating, and other IBS symptoms (Yang et al., 2020).. Certainly, *Lactobacillus acidophilus* also affects the endocrine system, where it plays a role in insulin regulation. Some studies suggest that *Lactobacillus* may help improve insulin sensitivity, which is important for the prevention of type 2 diabetes. It also supports hormonal balance, as probiotics can influence the production of hormones such as estrogen and progesterone, which may have a positive impact on reproductive health, as well as overall hormonal balance. *Lactobacillus acidophilus* also has an effect on the heart and cardiovascular system (Huang et al., 2021). One of its effects includes reducing cholesterol levels. Many studies suggest that probiotics can help lower levels of LDL ("bad") cholesterol and total cholesterol, thereby reducing the risk of heart disease. *Lactobacillus acidophilus* also has anti-inflammatory properties, which can reduce inflammation in the body, a key factor in the development of atherosclerosis and other cardiovascular problems. It may also improve blood pressure, with some research indicating that probiotics can help lower blood pressure in individuals with hypertension (Paul et al., 2021). *Lactobacillus acidophilus* offers many beneficial effects on health, especially when it comes to maintaining the balance of the microbiome. Its impact on the gastrointestinal, endocrine, and cardiovascular systems shows promise in improving overall health, reducing symptoms of various disorders, and preventing diseases.

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II. MATERIAL AND METHODS

A study was conducted to investigate the effects of *Lactobacillus acidophilus* on endocrine, gastrointestinal, and cardiovascular parameters in 20 healthy adult individuals, 18-50 years over a 4-week period. Participants were supplemented with *Lactobacillus acidophilus* at a dose 1.0 x 10^9 CFU daily throughout the study. Measurements included endocrine parameters (hormone levels such as TSH, T3, T4, insulin, cortisol, leptin), gastrointestinal parameters (microbiota analysis, intestinal transit time, subjective assessment of digestive symptoms), and cardiovascular parameters (blood pressure, heart rate, lipid profile). Blood and stool samples were collected at baseline and at the end of the study. Statistical analysis involved a t-test to compare pre- and post-intervention data, with p-values less than 0.05 considered statistically significant. Participants voluntarily consented to the study by signing an informed consent form, and the research was conducted in accordance with ethical guidelines, ensuring the anonymity of data and respecting participants' privacy.

III. RESULTS

In *Table 1*. the results for endocrine parameters before and after treatment with *Lactobacillus acidophilus* 1.0 x 10^9 CFU (one month) are presented. The analyzed endocrine parameters were: TSH, T3, T4, Insulin, and Cortisol. TSH before treatment was 2.1 mIU/L (± 0.3), while after *L. acidophilus* administration it decreased to 1.9 mIU/L (± 0.2), with statistical significance confirmed (p = 0.05). T3 before treatment was 110 pg/mL (± 12), and after treatment, it increased to 115 pg/mL (± 10), but statistical significance was not confirmed (p = 0.05). T4 was around 1.2 µg/dL (± 0.1) before treatment, and after treatment, it was 1.3 µg/dL (± 0.1), with statistical significance confirmed (p = 0.04). Insulin and cortisol before treatment were 12 µU/mL (± 3) and 18 µg/dL (± 2), respectively, and after treatment with *L. acidophilus*, they decreased to 10 µU/mL (± 2) and 16 µg/dL (± 3), with statistical significance confirmed for both parameters (p = 0.02; p = 0.05).

Table 1. Endocrine Parameters before and after *Lactobacillus acidophilus*1.0 x 10^9 CFU Treatment SD- Standard Deviation

Endocrine Parameters	**Before Treatment with *Lactobacillus acidophilus* 1.0 x 10^9 CFU (Mean ± SD)**	**After Treatment with *Lactobacillus acidophilus* 1.0 x 10^9 CFU (Mean ± SD)**	**P-Value (p<0.05)**
TSH (mIU/L)	2.1 ± 0.3	1.9 ± 0.2	0.03
T3 (pg/mL)	110 ±12	115±10	0.07
T4 (µg/dL)	1.2 ± 0.1	1.3 ± 0.1	0.04
Insulin (µU/dL)	12 ± 3	10 ± 2	0-02
Cortisol (µg/dL)	18 ± 4	16 ± 3	0.05

Table 2. gastrointestinal parameters before and after *Lactobacillus acidophilus* treatment (1.0 x 10^9 CFU, one month) in 20 participants. The gastrointestinal parameters included: transit time and subjective symptom assessment. The transit time before treatment was 23 hours (± 3), and after treatment with *L. acidophilus*, it decreased to 18 hours (± 2), with statistical significance confirmed (p = 0.01). The subjective symptom rating before treatment was 6.2 (± 1.5), which also decreased to 4.3 (± 1.3) after treatment with *L. acidophilus*, with statistical significance confirmed for this trend as well (p = 0.02)."

Table 2. Gastrointestinal Parameters before and after Treatment with *Lactobacillus acidophillus* 1.0 x 10^9 CFU

Gastrointestinal Parameters	**Before Treatment with *Lactobacillus acidophilus* 1.0 x 10^9 CFU (Mean ± SD**	**After Treatment with *Lactobacillus acidophilus1*.0 x 10^9 CFU (Mean ± SD)**	**P-Value (p=0.05)**
Transit time (h)	23 ± 3	18 ± 2	0.01
Subjective symptom rating	6.2 ± 1.5	4.3 ± 1.3	0.02

SD-standard deviation

Table 3. cardiovascular parameters in 20 participants before and after *Lactobacillus acidophilus* treatment (1.0 x 10^9 CFU, one month). The cardiovascular parameters included: systolic blood pressure, diastolic blood pressure, HDL, LDL, and triglycerides. Before treatment, systolic BP was around 132 mmHg (± 7), while diastolic BP was 88 mmHg (± 5). After treatment with *L. acidophilus*, systolic BP decreased to 127 mmHg (± 6), and diastolic BP decreased to 83 mmHg (± 4), with statistical significance confirmed (p = 0.04; p = 0.03). Furthermore, before treatment, HDL was 48 mg/dL (± 5), and LDL was 123 mg/dL (± 12). However, after the treatment with *L. acidophilus*, HDL decreased to 42 mg/dL (± 6), and LDL decreased to 115 mg/dL (± 10), with statistical significance confirmed for both parameters (p = 0.01; p = 0.03). Lastly, triglycerides before treatment were around 160 mg/dL (± 20), and after treatment with *L. acidophilus*, they decreased to 150 mg/dL (± 18), with statistical significance confirmed (p = 0.05)."

Table 3. Cardiovascular Parameters before and after Treatment with *Lactobacillus acidophillus1*.0 x 10^9 CFU

Cardiovascular Parameters	Before Treatment with *Lactobacillus acidophilus* 1.0 x 10^9 CFU (Mean ± SD)	After Treatment with *Lactobacillus acidophilus* 1.0 x 10^9 CFU (Mean ± SD)	P-Value (p=0.05)
Systolic BP (mmHg)	132 ± 7	127 ± 6	0.04
Diastolic BP (mmHg)	88 ± 5	83 ± 4	0.03
HDL (mg/dL)	48 ± 5	42 ± 6	0.01
LDL (mg/dL)	123 ± 12	115 ± 10	0.03
Triglycerides (mg/dL)	160 ± 20	150 ± 18	0.05

SD-standard deviation; BP- blood pressure

IV. CONCLUSION

The results of the study indicate a significant impact of *Lactobacillus acidophilus* administration on multiple physiological systems in participants. In the endocrine system, slight changes in average TSH, T3, and T4 values were observed, along with a significant reduction in insulin levels, suggesting improved insulin sensitivity, and a decrease in cortisol levels, which may indicate reduced stress and better hormonal balance. In the gastrointestinal tract, there was a reduction in the average transit time of food through the digestive system and a subjective decrease in gastrointestinal symptoms such as bloating and pain, indicating improved digestive health. Cardiovascular parameters also showed significant improvement, with reductions in systolic and diastolic blood pressure, LDL cholesterol, and triglycerides, alongside a slight decrease in HDL cholesterol. These changes collectively suggest an improved lipid profile and cardiovascular health, highlighting the broader benefits of probiotics in maintaining homeostasis and preventing metabolic disorders.

V. DISCUSION

The results of this study are consistent with a growing body of evidence highlighting the diverse health benefits of *Lactobacillus acidophilus* on metabolic, gastrointestinal, and cardiovascular systems.In the endocrine system, the slight reduction in TSH and cortisol levels, alongside decreased insulin levels, suggests potential regulatory effects of *L. acidophilus* on hormonal balance and glucose metabolism. Wang et al. (2021) demonstrated that probiotics improve insulin sensitivity by modulating gut microbiota, supporting the observed decrease in insulin levels in this study. Similarly, Aizawa et al. (2019) found that probiotics could reduce cortisol levels, likely through interactions along the gut-brain axis, which could explain the stress-reducing effects seen here. The mild increase in T4 levels observed in this study aligns with evidence suggesting that probiotics may support thyroid function through improved nutrient absorption, although more studies are needed to confirm this mechanism.In the gastrointestinal system, the reduction in average transit time and subjective gastrointestinal symptoms supports findings from Martoni et al. (2020), who highlighted the role of probiotics in enhancing gut motility and alleviating symptoms such as bloating and abdominal discomfort. These effects may stem from probiotics' ability to balance gut microbiota, reduce inflammation, and promote the production of short-chain fatty acids, which contribute to improved gut function.The improvements in cardiovascular parameters are particularly notable, as they align with findings from multiple studies. Liu et al. (2020) reported significant reductions in blood pressure following probiotic administration, consistent with the observed decreases in systolic and diastolic blood pressure in this study. The reductions in LDL cholesterol and triglycerides, alongside a slight decline in HDL cholesterol, mirror the results of Mo et al. (2019), who found that probiotics improved lipid profiles by modulating cholesterol absorption and bile acid metabolism. This suggests that *L. acidophilus* may play a role in lowering cardiovascular risk through both direct and indirect mechanisms involving lipid metabolism and vascular health.Overall, these results underscore the potential of *Lactobacillus acidophilus* as a multifaceted therapeutic agent with positive effects on hormonal balance, digestive health, and cardiovascular function. However, given the relatively small sample size and short intervention period in this study, further research involving larger populations, longer treatment durations, and mechanistic studies is warranted to confirm these findings and explore the underlying pathways. This broader perspective highlights the potential of probiotics as a safe, natural, and holistic approach to managing a range of metabolic and systemic health conditions.

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