

# Influence of Probiotics on Gut Microbiota and Their Systemic Antioxidant Capacity: A Narrative Review

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## INTRODUCTION & AIM

### Background

Probiotics, live microorganisms known for their gut health benefits, are increasingly recognized for their potential to enhance antioxidant capacity, reducing oxidative stress and inflammation. This is particularly important in inflammaging, digestive problems, cardiometabolic conditions, and neurodegenerative diseases, where oxidative stress and gut dysbiosis are common.

Compared to direct antioxidant supplementation, probiotics may offer more comprehensive benefits by simultaneously modulating gut microbiota and promoting endogenous antioxidant defenses.

### Objective

This narrative review explores how **probiotics** influence antioxidant capacity and **gut microbiota**, emphasizing their potential advantages over traditional antioxidant supplements.

## METHOD

A **narrative search** of the existing literature on probiotic effects on gut microbiota, antioxidant biomarkers, and related health outcomes was conducted.

After searching **PubMed** and **Google Scholar**, 8 reviews were included in this research [1–8].

## PROBIOTICS

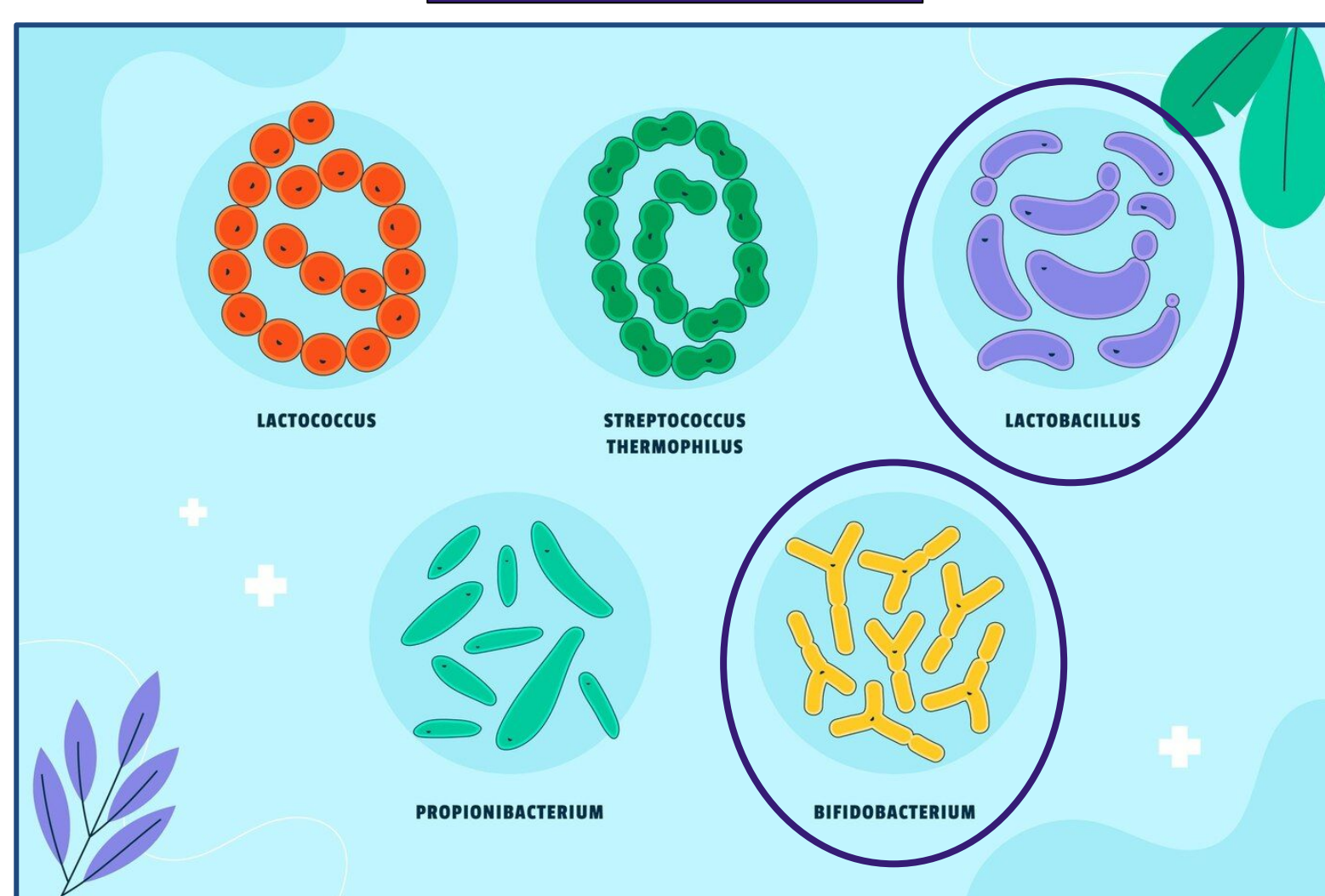


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## RESULTS & DISCUSSION

**Probiotic supplementation consistently increased endogenous antioxidant enzymes**, including catalase (CAT), glutathione peroxidase (GSH-Px), superoxide dismutase (SOD), and total antioxidant capacity (T-AOC). It also decreased oxidative stress markers such as malondialdehyde (MDA) and hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>).

**Unlike direct antioxidants, probiotics act through multiple pathways:** modulating gut microbiota, enhancing the gut barrier, and stimulating the immune system. These effects were particularly notable in patients with disease-related oxidative stress.

While all probiotics contribute to antioxidant capacity and gut health, **Lactobacillus rhamnosus**, **Lactobacillus casei**, and **Bifidobacterium longum** stand out for their pronounced effects on reducing oxidative stress and improving gut-related conditions. Their targeted actions make them ideal candidates for managing chronic diseases associated with inflammation and oxidative damage.

## CONCLUSION

**Probiotics provide significant antioxidant benefits while restoring gut microbiota balance.** This integrative approach makes probiotics potentially more effective than traditional antioxidants, particularly for patients with diseases characterized by oxidative stress and inflammation.

- Direct **scavenging of free radicals** and chelation of metal ions
- **Stimulation of antioxidant enzyme production**
- **Regulation of host redox balance, improvement in inflammation**, and reduction of reactive oxygen species (ROS) generation
- **Positive modulation of gut microbiota composition** and its beneficial byproducts

These effects have been demonstrated in laboratory studies and observed in relation to oxidative stress in **patients with metabolic, inflammatory, and potentially neurodegenerative disorders** [5–6].

Additionally, probiotics have shown a synergistic interaction with standard antioxidants, including ascorbic acid, green tea, and grape extracts: this synergy enhances both the survival and the health-promoting effects of probiotics [2].

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