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Research Article

Exploring the Interplay Between Nasal Microbiota and Polycystic Ovary Syndrome: A Potential Link

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Abstract

Polycystic Ovary Syndrome (PCOS) is a multifactorial disorder influenced by genetic, metabolic, and environmental factors. Recent findings highlight the potential role of microbial dysbiosis, particularly within the gut, in PCOS pathogenesis. Meanwhile, research on nasal colonization by Staphylococcus aureus reveals that certain bacterial strains persist in the nasal microbiota, especially inflammatory strains of S. aureus, could influence systemic inflammatory responses and thereby contribute to PCOS development. By synthesizing current literature on nasal microbiota and PCOS, we propose a novel link warranting further investigation.

Keywords: Polycystic Ovarian Syndrome; Staphylococcus aureus; Nasal Microbiota; Inflammation; Gut Dysbiosis

Introduction

Bacteria are one of the attractive microbes that change the planetary history and play an important role for their existence. Bacteria are known for spreading infectious diseases and play an important role in the health maintenance of many other ecosystems (Wess, 2023; Magnabosco., *et al.* 2024).

While Polycystic Ovary Syndrome (PCOS) affects approximately 5-10% of women of reproductive age, manifesting through hyperandrogenism, menstrual irregularities, obesity, insulin resistance, and infertility [1]. While its etiology remains multifactorial, increasing evidence supports the role of gut microbiota in modulating metabolic and endocrine pathways in PCOS. Separately, nasal microbiota, particularly *Staphylococcus aureus*, have been studied for their colonization behavior and their role in triggering inflammatory responses [2].

Chronic *S. aureus* nasal carriage can lead to persistent immune activation, which may have downstream metabolic consequences. This review aims to draw a conceptual bridge between these two fields-suggesting that nasal dysbiosis may play an overlooked role in PCOS progression through systemic inflammation.

Methodology

- **Sample Collection:** Nasal Cavity Samples were collected from teenage girls, of two different categories, one suffering from PCOS while the other group was normal. The age of the most of the girls ranged from 15-19 years.
- **Isolation of Bacteria:** The samples were placed on Mannitol Salt Agar and incubated at 37 degree centigrade overnight, The plates were examined after the incubation period to confirm whether the isolated bacterial strains were gram negative or gram positive (Michael., *et al.* 2023).
- **Isolation of Pure culture:** A medium was prepared to isolate pure colonies of *S. aureus*, and this medium is specific for the growth of *S. aureus* (Gautam, 2022). After the incubation, the media was poured into plates and allowed to cool. Once the media solidified, bacterial colonies were streaked and incubated for 48 hours at 37oC. After the incubation period, the analysis of plates was done to see if desired bacterial strains grow on the MSA media or not (Sawa., *et al.* 2020).

This synthesis is based on a literature review of two peer-reviewed articles:

- ***Staphylococcus aureus* nasal colonization in healthy individuals (FEMS Pathogens and Disease, 2014):** This study assessed the prevalence, strain diversity, and persistence of *S. aureus* colonization in nasal passages.
- **Polycystic Ovary Syndrome: Etiology and Management (J Clin Med, 2023):** A comprehensive review of PCOS etiology, including the influence of gut microbiota and systemic inflammation.

Both articles were analyzed for microbial-host interaction themes, with attention to inflammation, endocrine disruption, and metabolic dysfunction. Additional support was drawn from recent reviews on the human microbiome and systemic disease connections.

Results

- The *S. aureus* study found a significant prevalence of colonization in healthy individuals, with specific lineages dominating across samples. Certain strains are associated with persistent inflammation and increased susceptibility to systemic conditions.
- The PCOS review emphasized gut dysbiosis as a contributing factor in PCOS. Altered microbial metabolites, such as lipopolysaccharides (LPS), may increase systemic inflammation, insulin resistance, and hormonal imbalance.
- A novel hypothesis emerges from these findings: chronic nasal colonization by inflammatory microbes may augment systemic inflammation, serving as an upstream trigger or amplifier of PCOS-related metabolic dysfunction.

Comparative overview of nasal *S. aureus* colonization and PCOS-associated gut dysbiosis

Aspect	Nasal *S. aureus* Colonization	Gut Dysbiosis in PCOS
Prevalence	26.4% in healthy individuals in LMICs	Altered in PCOS patients, with reduced diversity
Associated factors	Age, corticosteroid use, immumosuppression	High-fat diet, sedentary lifestyle, hormonal imbalances
Health Implications	Increased risk of systemic infections, persistent inflammation	Insulin resistance, Obesity, Hormonal disturbances
Potential Interventions	Decolonization strategies, hygiene practices	Probiotics, dietary modifications, lifestyle changes

Table 1

Discussion

Though traditionally studied in isolation, nasal and gut microbiota may share systemic immunological pathways. If nasal carriage of *S. aureus* leads to persistent low-grade inflammation, it could mirror or synergize with gut-derived inflammation in contributing to PCOS pathology. This concept is consistent with current understanding that PCOS is not limited to a reproductive disorder but involves widespread metabolic disturbances. Further studies are required to analyze nasal microbiota composition in PCOS patients and assess whether decolonization or anti-inflammatory interventions yield clinical improvements [3,4].

Staphylococcus aureus colonies on blood agar

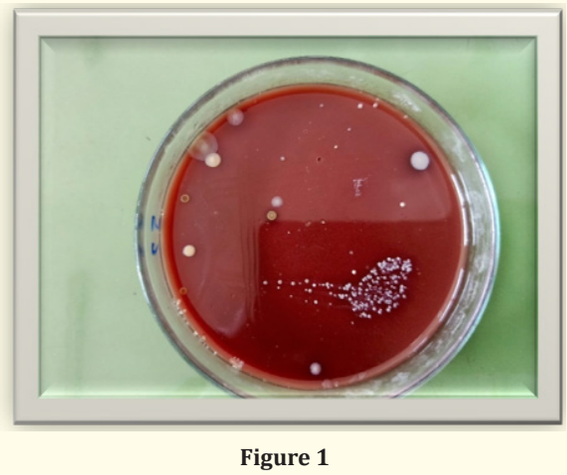

Figure 1

Conclusions

The proposed link between nasal microbiota and PCOS offers a fresh perspective on the complex web of host-microbiota interactions. Understanding these interactions may open avenues for novel diagnostics and interventions in PCOS management. Integration of microbiota profiles across different body sites is essential for a more holistic understanding of systemic disorders.

So in conclusion, there is no conflict of interest.

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