

## A Review on Oral Biofilm Inflammation during the Pregnancy

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### Mini Review

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**Received:** 02 January, 2023, Manuscript No. jnhs-23-94677; **Editor Assigned:** 03 January, 2023, Pre QC No. P-94677; **Reviewed:** 18 January, 2023, QC No. Q-94677; **Revised:** 24 January, 2023, Manuscript No. R-94677; **Published:** 31 January, 2023, DOI: 10.4172/JNHS.2023.9.1.65

#### ABSTRACT

The oral cavity is home to several species of microorganisms, which form a complex ecosystem known as oral biofilm or dental plaque. These microorganisms interact with each other and with the host, contributing to the maintenance of oral health or the development of diseases such as dental caries and periodontitis. In addition to these local effects, the oral biofilm may have systemic consequences, as some of its components can enter the bloodstream and cause inflammatory responses in distant organs. During pregnancy, hormonal changes and alterations in the immune system may affect the composition and properties of the oral biofilm, leading to an increased risk of oral diseases and systemic complications. In this article, we will review the inflammatory response in the oral biofilm during pregnancy and its potential consequences for maternal and fetal health.

**Keywords:** Oral biofilm, *Streptococcus mutans*, periodontitis

### INTRODUCTION

Oral biofilm is a complex and dynamic microbial community that colonizes various surfaces of the oral cavity, such as teeth, tongue, cheeks, and gums. The biofilm is composed of a diverse range of microorganisms, including bacteria, fungi, viruses, and protozoa, that interact with each other and with the host to form a complex and dynamic ecosystem. The biofilm's properties and functions depend on the composition, abundance, and metabolic activity of its components.

The main bacteria found in oral biofilm are *Streptococcus mutans*, which is associated with dental caries, and *Porphyromonas gingivalis*, which is associated with periodontitis. These bacteria are often present in low numbers in healthy individuals but can overgrow and cause disease under certain conditions, such as hormonal changes during pregnancy<sup>[1-3]</sup>.

#### Oral biofilm and inflammatory response

The oral biofilm can trigger an inflammatory response in the host, leading to the recruitment of immune cells and the release of cytokines and other inflammatory mediators. This response is an essential defense mechanism that helps to control the growth and spread of microorganisms and repair tissue damage. However, when the inflammatory response is excessive or prolonged, it can cause tissue destruction and contribute to the development of chronic diseases.

The inflammatory response in the oral biofilm is mainly mediated by the innate immune system, which is the first line of defense against microbial pathogens. The innate immune system recognizes conserved structures of microorganisms, such as lipopolysaccharides (LPS) and peptidoglycan, through pattern recognition receptors (PRRs) expressed on the surface of immune cells. The activation of PRRs leads to the recruitment of immune cells, such as neutrophils, macrophages, and dendritic cells, and the release of cytokines, such as interleukin-1 $\beta$  (IL-1 $\beta$ ), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF- $\alpha$ ).

In addition to the innate immune system, the adaptive immune system can also be activated in response to the oral biofilm. The adaptive immune system recognizes specific antigens of microorganisms and generates memory responses that provide long-term protection against reinfection. However, the activation of the adaptive immune system in the oral cavity can also lead to tissue destruction and contribute to the development of periodontitis<sup>[4,5]</sup>.

### LITERATURE REVIEW

During pregnancy, hormonal changes and alterations in the immune system may affect the composition and properties of

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the oral biofilm, leading to an increased risk of oral diseases and systemic complications. The hormonal changes during pregnancy can increase the production of progesterone and estrogen, which can affect the growth and metabolism of oral bacteria. Progesterone can enhance the adherence and growth of certain bacteria, such as *Streptococcus mutans*, by increasing the expression of bacterial adhesins and the production of extracellular polysaccharides. Estrogen can also affect the growth and metabolism.

During pregnancy, changes in the oral biofilm and inflammatory response may affect the health of both the mother and the developing fetus. Hormonal changes and altered immune function can contribute to increased inflammation and changes in the composition of the oral biofilm. These changes may increase the risk of oral diseases, such as gingivitis and periodontitis. Additionally, research has suggested that inflammation in the oral cavity may be linked to systemic conditions such as preterm birth, preeclampsia, gestational diabetes, and low birth weight. The presence of periodontal disease, in particular, has been associated with an increased risk of adverse pregnancy outcomes. It is thought that the inflammation and bacterial byproducts from the oral biofilm can enter the bloodstream and affect other parts of the body, potentially triggering or exacerbating systemic conditions. However, the exact mechanisms by which this occurs are not fully understood. Overall, maintaining good oral health during pregnancy is important not only for the mother's oral health but also for the health of the developing fetus. This may involve regular dental checkups, proper oral hygiene practices, and potentially treatment for any existing oral diseases.

## DISCUSSION

### Periodontitis

Periodontitis is a type of gum disease that causes inflammation and infection of the tissues that support the teeth, including the gums, periodontal ligaments, and alveolar bone. It is a progressive disease that can lead to tooth loss if left untreated. The primary cause of periodontitis is the buildup of plaque, a sticky film of bacteria that forms on the teeth and gum line. Over time, this plaque hardens into tartar, which cannot be removed by brushing or flossing alone. Tartar buildup can lead to pockets between the teeth and gums, allowing bacteria to grow and cause further damage<sup>[6,7]</sup>.

Symptoms of periodontitis can include red, swollen, or bleeding gums; bad breath; receding gums; loose or shifting teeth; and changes in the way your teeth fit together when you bite down. Treatment for periodontitis typically involves professional deep cleaning of the affected areas, as well as possible use of antibiotics or surgical procedures in more severe cases. Prevention of periodontitis involves maintaining good oral hygiene habits, such as brushing and flossing regularly and scheduling regular dental check-ups and cleanings. Additionally, avoiding tobacco use, eating a healthy diet, and managing other health conditions such as diabetes can also help prevent the development of periodontitis.

### Preeclampsia

Preeclampsia is a serious pregnancy complication characterized by high blood pressure and damage to organs, often the liver and kidneys. It usually occurs after 20 weeks of pregnancy and can affect both the mother and the unborn baby. The exact cause of preeclampsia is not known, but it is believed to be related to problems with the placenta. Some of the symptoms of preeclampsia include high blood pressure, protein in the urine, severe headaches, blurred vision, chest pain, shortness of breath, and swelling of the hands, feet, and face. If left untreated, preeclampsia can lead to serious complications, such as seizures, stroke, or even death.

## CONCLUSION

The treatment for preeclampsia depends on the severity of the condition and how far along the pregnancy is. In some cases, medication may be prescribed to lower blood pressure or prevent seizures. In more severe cases, hospitalization and delivery of the baby may be necessary to prevent further complications. It's important for pregnant women to attend regular prenatal check-ups to monitor their blood pressure and detect any signs of preeclampsia early on. If you are pregnant and experiencing any symptoms of preeclampsia, it's important to contact your healthcare provider immediately.

## ACKNOWLEDGEMENT

None.

## CONFLICT OF INTEREST

Authors declare no conflict of interest.

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