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The Effect of Competitive Swimming on Oral Health Status

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Abstract

Objectives/Aims: Competitive athletes are often considered to be susceptible to bodily injury. It is now being realized that competitive swimmers are also at risk, specifically in the unsuspected realm of the oral cavity. The purpose of our research is to examine the effect of competitive swimming on an athlete's oral health status.

Methods: Using sources via Pubmed and Google Scholar, the data used for the correlation of swimming pools and generalized dental trauma are as follows: competitive swimmers and non-competitive swimmers were examined for specific variables such as decayed, missing, or restoratively involved teeth, plaque and gingival index, and the presence of enamel erosion, calculus, and stain. The groups evaluated were divided in terms of activity level involving chlorinated swimming pools.

Results: Three specific oral health effects will be explored throughout our research. The first oral health effect that will be analyzed is the incidence of chlorine induced calculus buildup exhibited in competitive swimmers. Another health effect that will be examined is the process of dental staining that swimmers can experience when in consistent contact with the pool. Lastly, we will explore erosion of enamel that can occur from the lower pH values of pool water. Through various studies, it has been determined that professional swimmers are likely to exhibit a higher prevalence of generalized erosion of dental enamel, generalized dental stain, and chlorine-induced calculus as opposed to individuals who don't often swim within chlorinated water. This topic is of great importance as the chemical used to disinfect swimming pools causes evident physical and chemical dental trauma in not only professional swimmers, but also individuals who spend more than 6 hours per week in the pool performing vigorous physical exercise.

Conclusion: Oral health in competitive swimmers is a topic that affects many children and adults worldwide, indicating a large prevalence of dental trauma without obvious correlation to the swimming pool despite its significance.

Introduction

In recent years, information has begun to circulate both the dental realm and the world of sports considering the connection between competitive swimming and oral health status. It is now becoming increasingly apparent that two subjects, which were not previously seen to be so obviously connected, may in fact have a strong relationship. This report seeks to conduct a review of literature from the past five years to determine what effect, if any, prolonged contact with chlorinated swimming pools has on the oral health of competitive swimmers. The possible mechanisms and pathways that lead to any determined oral health effects will be examined and reviewed to discern the scope of the hazardous relationships and how they affect the competitive swimmers.

Results

- Individuals who spend at least two hours, five times per week in pools performing vigorous exercise qualify to be considered competitive swimmers (1)

Swimmer's Calculus:

- Chlorine, being an acidic solution due to water's formation of hydrochloric and hypochlorous acids, is able to easily deposit a harmful film-like residue on the enamel surface of swimmer's teeth (2)
- Following constant, long-lasting exposure to the acidic nature of chlorinated water, the teeth may begin to exhibit firmly attached yellow to dark brown deposits that are typically located on the anterior facial and lingual surfaces as the bacteria becomes mineralized (3)



Visual representation of calculus deposits in the oral cavity

Staining:

- Pool water varies from normal water structurally due to the additional antimicrobials, resulting in a liquid that contains a lower pH than saliva (4)
- This decrease in structural pH allows the water to form organic deposits on swimmer's teeth as a result of the quick breakdown of salivary proteins within the oral cavity (5)
- The extrinsic staining that occurs from chlorinated water typically resides on anterior teeth and is not able to be removed by traditional brushing (4)

Erosion:

- Chlorine gas is increasingly being used to chlorinate pools due to its inexpensive nature in comparison to more traditional chlorinating methods (2)
- Chlorine gas is more acidic than traditional chlorinating methods because hydrochloric and hypochlorous acids form as the chlorine interacts with the water, which can create a pH anywhere from two point seven to four point zero (3). For comparison, the pH of a pool should generally be between seven and seven point six (6)
- A group of researchers studying enamel erosion in competitive swimmers found that erosion was present in 39% of swimmers on a swim team (2) while another group of researchers studied fifty-six competitive swimmers and surveyed the presence of tooth sensitivity (7). They found that dental erosion occurred in an average of 48.2% of the competitive swimmers in which the severity varied proportionately to the amount of time the swimmers spent in the pools each week (7)

Discussion

pH Contents

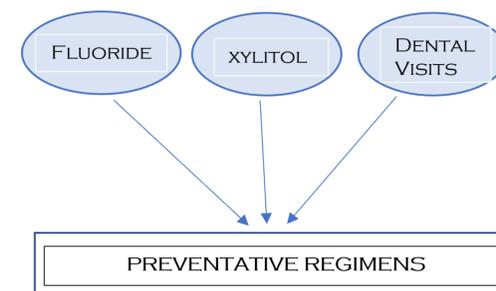
- The majority of the studies noted in this review of literature determined that the pH contents of the swimming pools were a factor in the negative oral health effects experienced by the competitive swimmers
- As the pH of the pool increases above eight, the ability of the chlorine to kill bacteria decreases significantly. As the pH of the pool decreases below seven, this becomes harmful as well due to the possibility of enamel erosion stemming from the acidic content within the water (5)

Fluoride Considerations

- A study in 2017 was conducted to measure the efficacy of fluoride products and tannic acid on teeth that were exposed to heavily chlorinated pools for thirty minutes a day (8)
- The study found that teeth which were treated with fluoridated milk, with or without tannic acid element, had increased protection from the erosive effects of chlorine, lowering their susceptibility to dental erosion versus the teeth that were only exposed to the pool water (8)
- Fluoride treatments are often used in practice in order to protect teeth in regard to caries prevention and enamel remineralization, and with a better understanding of the possible hazards that competitive swimmers face, their symptoms can be adequately addressed and treated

Preventive Home Care

- Chewing gum that contains xylitol may be beneficial to swimmers in reducing their overall caries risk as a result of dental erosions (5) In order to gain caries-prevention benefits, the individual must consume 5-6g of xylitol at least 3 times per day (5)
- In addition to the personalized home regimens to prevent swimming-induced dental trauma, the increase of professional oral health care will reduce the presence of stain, erosion, and calculus on the dentition and offer an extremely beneficial fluoride varnish that enhances remineralization of the teeth, reduces enamel solubility, and decreases the risk for carious lesions



Conclusion

- Competitive swimmers spend large amounts of time in chlorinated water, exposing their teeth to the chemicals, and facing hidden health hazards that can permanently affect their dentition and overall systemic health such as chlorine-induced calculus, extrinsic staining, and severe enamel erosion
- The effect of chlorinated pools on a swimmer's oral cavity are serious concerns, indicative by the term "swimmer's mouth", and should be addressed when setting standards for pool upkeep
- Chlorinated swimming pools should ideally be maintained in a way that is safe and doesn't negatively impact swimmer's oral health, with pH readings that are kept in a healthy range for the oral cavity such as seven to seven point six (8)

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