Salivary Parameters of Competitive Swimmers at Gas-Chlorinated Swimming-Pools

Dear Editor-in-Chief

Earlier reports have demonstrated that prolonged exposure to a gas-chlorinated swimming-pool was associated with enamel erosion, particularly in competitive swimmers (Centerwall et al., 1986). A few additional reports have confirmed these findings (Buzkowska-Radlińska et al., 2012; Gabai et al., 1988; Geursten, 2000). Although the regulation may vary according to each state jurisdiction (as is the case for the US), a frequently recommended chlorine level for a typical swimming pool is between 1.0 to 1.5 mg L⁻¹. When using cyanic acid (stabilizer) minimum and maximum values are set to respectively 2.0 and 5.0 mg L⁻¹. The expected pH range for swimming pools is between 7.2 and 8.0. However, if a gas-chlorinated pool becomes inadequately buffered, the pH may decrease rapidly to tooth decalcifying levels as low as 3.

While swimmers may not be sensitive to the low pH, it may lead to tooth demineralization. The dental literature suggests that pool water with a low pH can cause very rapid and extensive dental erosion (Centerwall et al. 1986; Dawes and Boroditsky, 2008; Geursten, 2000). Thus, habitual swimming may be considered a contributory factor when diagnosing dental erosion in competitive swimmers.

The purpose of this study was therefore to determine the salivary parameters of competitive swimmers at a gas-chlorinated swimming-pool, before and after a 2-hour swimming practice. We hypothesized that intensive exercising may alter significantly the salivary flow rate and balance of calcium (Ca), phosphorus (P) and fluoride (F) salivary levels for competitive swimmers while in training at gas-chlorinated swimming-pools.

Competitive swimmers from the University of Michigan Swimming Team 18-23 years old (males only) participated in the study. Consent was obtained from all participants approved by an institutional review board (University of Michigan, School of Dentistry IRB). Participants were asked to fill a semi-structured questionnaire concerning aspects of their diet, medicine intake, self-confrontation, the development of severe dental erosion in inadequately maintained gas-chlorinated swimming-pools. Our study suggests that even in properly maintained

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Figure 1. Salivary parameters of competitive swimmers measured before and after a swimming session. Mean ± SD (n = 22). Statistical differences between groups by paired-t-test are designated with an asterisk (*).

gas-chlorinated swimming-pools (i.e. average pH 7.5, calcium chloride = 1.5 mg·L⁻¹), parameters (decrease in saliva output and increase in Ca an F salivary levels) contributing to enamel dissolution of competitive swimmers who swim on a regular basis may be affected. This study per se does not establish a direct causal relationship between competitive swimming and dental erosion, but it suggests that additional longitudinal studies merit evaluation on this topic.

We did not measure dental erosion of the swimmers, but the athletes are well aware of the risk for erosion when swimming in gas-chlorinated pools. In fact, many of the athletes in this study reported being aware of their "yellow teeth" (loss of enamel) due to swimming. Consistent with these anecdotal self-reports, the literature describes the detection of unusual yellowish brown staining on tooth surfaces of competitive swimmers (Escartin et al., 2000; Rose and Carey, 1995). These adverse events can be minimized if athletes who engage in competitive swimming at an early age are educated about the potential risk for developing staining and dental erosion. This would entail the supervised use of fluorides (i.e. mouthrinses, gels, varnishes) in order to prevent loss of the tooth mineral content while swimming in gas-chlorinated swimming-pools and regular attendance for periodic dental check-ups.

The possible consequences of enamel dissolution due to frequent swimming are therefore of considerable diagnostic and therapeutic significance for competitive swimmers and regular swimmers of the general public. This fact also underscores the significance of regular pH monitoring of the water of gas-chlorinated swimming-pools.

Walter A. Bretz 1 and Marcela R. Carrilho 2
1 Department of Cariology & Comprehensive Care, New York University College of Dentistry, New York, NY, USA; 2 School of Dentistry, Schulich School of Medicine & Dentistry, Western University, London, Ontario, Canada and Bandeirante University of São Paulo, Biomaterials Dental Group, São Paulo, Brazil.

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References


Walter A. Bretz, DDS, PhD
Associate Professor, New York University College of Dentistry, 345 E. 24th Street, New York, NY 10010, USA
E-mail: walter.bretz@nyu.edu