

## INTRODUCTION

- Dental caries is a prevalent, chronic, and infectious oral disease that continues to plague both adults and children.<sup>1</sup>
- Worldwide, approximately 2.3 billion people have experienced caries in their permanent teeth, and 530 million children are diagnosed with caries in their primary teeth.<sup>2</sup>
- Caries disproportionately affects people who have lower socioeconomic status (SES) as well as minorities.<sup>3</sup>
- Caries can negatively affect individuals throughout their lifetime and can lead to diminished quality of life. <sup>1</sup> Untreated caries may result in life-threatening infections.<sup>4</sup>
- Caries is a multifactorial disease based on the interaction of the host, the substrate and the bacteria.
- The interaction may shift to a favorable balance of protective factors which leads to remineralization of the tooth; or it may shift in favor of pathological factors which may lead to demineralization of the tooth.<sup>4</sup>
- The dental professional can play a role in the first line of defense in the caries process by educating patients on available options both for home use as well as in office use.

## MINIMALLY INVASIVE DENTISTRY & PATIENT PREFERENCES

- Minimally invasive dentistry was founded on the concept to treat caries conservatively and preserve tooth structure.<sup>5</sup>
- Minimally invasive dentistry supports the reversal of incipient lesions through remineralization efforts as well as the prevention of caries entirely.<sup>5</sup>
- This can be achieved through the use of various products and procedures.
- Moreover, patients have an opinion about ingredients in their oral care products.
- Some patients desire a more holistic approach to dentistry and prefer to avoid fluoride.
- Clinicians need to provide alternative oral care products to those patients seeking fluoride free substitutes.

## FLUORIDE

- Fluoride is a mineral found in natural sources of water such as groundwater and oceans.<sup>6</sup>
- Fluoride protects the teeth by binding to the tooth structure, replacing the hydroxide anion (oxygen and hydrogen) with fluorohydroxyapatite, thereby making it less susceptible to acid attacks.<sup>7</sup>
- Fluoride is considered the Gold Standard: The Centers for Disease Control and Prevention (CDC) has listed water fluoridation as one of the top ten great public health interventions of the 20<sup>th</sup> century.<sup>6</sup>
- Fluoride can be administered topically, at higher concentrations through in office professional applications or at home prescription-strength products, or at lower concentrations, through over-the-counter products.
- The benefits of certain types of fluoride are not just limited to caries prevention. Fluoride varnish and stannous fluoride can both aid with dentinal hypersensitivity by providing a smear layer. In addition, stannous fluoride has antimicrobial properties.<sup>8</sup>
- Silver diamine fluoride (SDF) prevents demineralization and promotes remineralization of both enamel and dentin. Furthermore, SDF can arrest caries and contains both desensitizing and antimicrobial properties.<sup>9</sup>

## CHLORHEXIDINE & XYLITOL

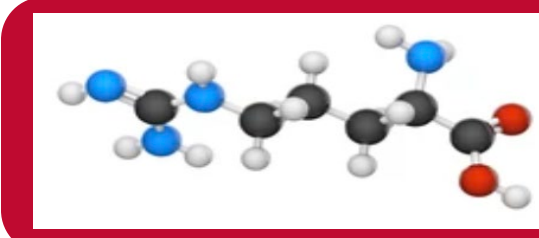
- Chlorhexidine** is a broad-spectrum antimicrobial agent and is used orally for biofilm control.<sup>10</sup>
- Research indicates chlorhexidine suppresses the proliferation of *Streptococcus mutans*.<sup>10</sup>
- Studies have demonstrated that rinsing with 0.12% chlorhexidine gluconate in conjunction with a daily high dose of fluoride toothpaste reduces both coronal and root caries than when fluoride is used alone.<sup>11</sup>
- Xylitol** is a plant-based, five carbon sugar polyol that has been approved by the Food and Drug Administration (FDA) as an artificial sweetener.<sup>12</sup>
- In addition, xylitol has been shown to exhibit anticaries properties.<sup>13</sup>
- Xylitol inhibits the transfer of glucose to bacteria, specifically *S. Mutans* that effectively disrupts their energy production process and results in bacterial cell death.<sup>13</sup>

## DENTAL SEALANTS

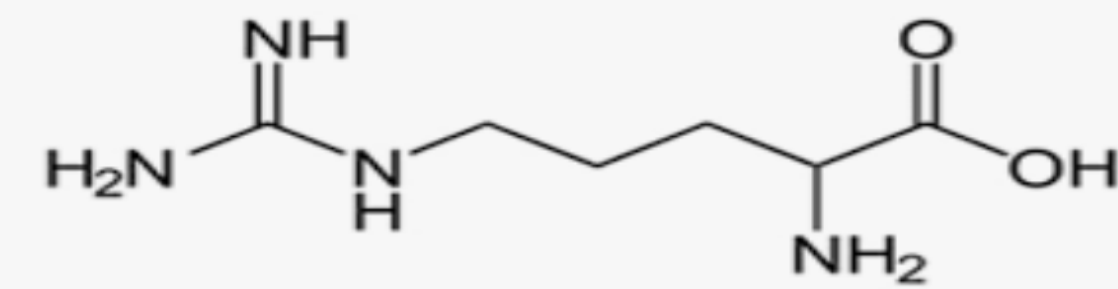
- Dental sealants prevent caries by providing a thin plastic protective coating between the tooth surfaces and the acid challenges of the oral environment.<sup>14, 15</sup>
- The two main types of dental sealants are resin-based and glass ionomer and each have distinct properties, such as caries' preventive effect, fluoride release, and retention rate.<sup>14</sup>
- Resin sealants can be distinguished by their method of polymerization (autopolymerized or photopolymerized), filler content (filled or unfilled), and color (clear, tinted, or opaque).<sup>14</sup>
- Though they have been recognized as a caries-inhibiting procedure for decades, they remain underutilized.<sup>14</sup>

## CALCIUM PHOSPHATE TECHNOLOGIES

- Amorphous calcium phosphate (ACP) is an essential mineral that provides an artificial source of hydroxyapatite.<sup>16</sup>
- It is unstable on its own and must be combined with fluoride or other stabilizing agent to provide remineralization properties.<sup>16,17</sup>
- Calcium sodium phosphosilicate (CSP) is a bioactive glass that uses calcium and phosphate ions to form hydroxyapatite. Although indicated for dental hypersensitivity, CSP exhibits remineralizing properties.<sup>16, 18</sup>
- Casein Phosphopeptide-Amorphous (CPP) - ACP is a remineralization technology that combines calcium and phosphate ions in a soluble agent that binds to saliva, biofilm, soft tissues, enamel, and dentin.<sup>19</sup>
- Casein peptides are combined with amorphous calcium phosphate to form stabilized solution to support remineralization and inhibit demineralization by increasing the level of calcium and phosphate residing in the oral cavity.<sup>19,20</sup>
- Tri-calcium phosphate (TCP) helps promote remineralization by creating a barrier to allow for calcium and phosphate to be delivered to the tooth surface.<sup>16, 21, 22</sup>



## WHAT IS ARGININE?



- Arginine is an amino acid (2-amino-5-guanidinovaleric acid) that helps the body make proteins.<sup>23</sup>
- Kleinberg and colleagues first discovered arginine in 1979.<sup>24</sup>
- It is produced naturally in the body and is a component of healthy saliva.<sup>23</sup>
- Arginine can also be obtained through dietary supplements or a diet of protein-rich foods such as red meat, poultry, fish, lentils, nuts, soybeans, and dairy products.<sup>23-25</sup>
- Arginine has been long studied as a safe and natural dietary supplement and most recently has found its place in dentistry.<sup>25</sup>

## THE ANTICARIES BENEFIT OF ARGININE

- Arginine is metabolized by several arginolytic bacteria such as *Streptococcus sanguinis*, *Streptococcus parasanguinis*, and *Streptococcus gordonii* via the arginine deiminase pathway (ADS) to produce ammonia as a byproduct.<sup>26</sup>
- Ammonia helps to increase the pH in the oral cavity to seven, thereby shifting the oral balance to one that favors health.<sup>26</sup>
- When the pH is maintained at an alkaline level, acidogenic bacteria perish, thereby altering the microbiota in the oral cavity.<sup>27,28</sup>
- Arginine has been shown to reduce caries, reverse incipient lesions, prevent secondary lesions and treat hypersensitivity.<sup>29,30</sup>

## NON-RESTORATIVE ANTICARIES APPROACHES

Professional Application	Home Use
Fluoride Varnish	Over-the-counter and prescription fluoride
Silver Diamine Fluoride	Xylitol
Dental Sealants	N/A
Calcium phosphate technologies	Calcium phosphate technologies
Chlorhexidine	Chlorhexidine*
Arginine	Arginine

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