

## *Integration into General Dental Practice. Successful treatment of Caries using the HealOzone. Part I*

*Edward Lynch*<sup>1</sup> *BDentSc, MA, FDSRCSed, PhD*

*Julian Holmes*<sup>2</sup> *BA SocSci BDS*

*Liviu Steier*<sup>3</sup> *BDS*

*Giovanni Megighian*<sup>4</sup> *BDS, MSc*

*Newton D. Johnson*<sup>5</sup> *BDS, MSc*

*Layla Abu-Naba'A*<sup>6</sup> *BDS, PhD*

*Aylin Baysan*<sup>7</sup> *BDS, MSc, PhD*

*Dipak Joshi*<sup>8</sup> *BDS, LDS*

*Martin Grootveld*<sup>9</sup> *PhD, BSc*

*Mousa Marashdeh*<sup>10</sup> *BDS, PhD*

*Hisham Al Shorman*<sup>11</sup> *BDS*

*Ola Abu-Salem*<sup>12</sup> *BDS*

### *Abstract*

This paper examines how the traditional concepts of dental care must change in the light of recent published evidenced based research into new methods for caries detection and treatment. The historical background to ozone is discussed and shows how this gas has a profound influence on the ecology of micro-organisms within active carious lesions.

The costs of traditional "amputation" therapy are compared to ozone treatment. The aim of Ozone treatment using the HealOzone system (KaVo) is to conserve tooth tissue to allow carious lesions to heal naturally by remineralisation and to regain structural strength of the tooth. The cost analysis is discussed in the wider implication of potential savings were this technology to be used throughout the world.

### *Successful use of Ozone to manage caries*

According to "The Niche Environment Theory", a "bacterial niche" is established within a carious lesion. Bacteria are far from the 'simple bugs' as they are often referred to. They have survived for millions of years, whereas humans have a minute time frame of existence in comparison. The dental profession should not be surprised to learn that bacteria set up complex interactions with other bugs, 'talk' to neighbouring colonies when times are good, and call for help from others when their host attempts to change their environment. Protein coatings, plaque and debris are known to protect these colonies by reducing the effect of pharmaceutical agents designed to eliminate these bacterial colonies.

The concept of dental caries has changed in the last decade. Investigations into the deepest molecular processes have disclosed the exquisite dynamic, cyclical, mechanisms of physiological demineralisation and remineralisation that takes place daily in oral hard tissues. The dental profession shares today a completely new vision of an old pathology. Decay starts as a metabolic imbalance, shifted towards acidity and demineralisation through numerous daily cycles of demineralisation and remineralisation. Dental plaque biofilm is the medium in which this process develops. In such an environment acidophilic and acidogenic bacteria develop this 'ecological niche'. It is important to accurately detect and diagnose caries<sup>1-9</sup>. At an early stage in the development of a carious lesion, when enamel and dentine are demineralised and dentine has not been denatured by proteolysis, these dynamics can be reversed, and remineralisation occurs. When the bacterial ecological niche is eliminated remineralisation occurs and predominates.

Progression of the carious lesion occurs when conditions are suitable for acidogenic microorganisms to release acid as a metabolic by-product. The acid produced may lead to a breakdown of mineralized tooth structure. At times, an equilibrium situation may occur when the rate of remineralisation equals the rate of de-mineralisation. Ozone has the effect, through its powerful oxidizing properties, of not only removing the protein protection and being bactericidal, but also oxidising the biomolecules that allow the niche to

survive and expand. This has a severely disruptive effect on the microbial population in the carious lesion and obliterates the cariogenic bacteria and their ecological niche, thereby swinging the equilibrium in favour of re-mineralisation. No more acid can be produced within the lesion when the acid-producing microflora are eliminated. For example, the acid pyruvic acid, one of the strongest naturally occurring acids manufactured by bacteria, and implicated in the maintenance of the resting Ph and progression of caries, is oxidised by ozone to acetate and carbon dioxide<sup>9</sup>. Acetate is less acidic than pyruvic acid, and this de-carboxylation reaction leads to mineral uptake due to the less acidic conditions in a carious lesion. The lesion will become populated with normal mouth commensals which do not produce significant acid, leading to a predominance of remineralisation, after ozone therapy. Ozone is safe when used in the Heal Ozone unit and has been shown clinically to be effective in the management of root caries lesions,<sup>10-15</sup>. These lesions often present in the elderly who may have associated medical problems, which complicate their dental management. Using ozone therapy, such lesions are easily treated. The portability of the HealOzone unit facilitates its use in the domiciliary setting and treatment is also simplified because the clinician does not need to carry a range of restorative materials on such visits. Dentists using the HealOzone unit for caries management, encourage their patients to regularly use a fluoride-containing mouthwash, that will enhance the efficacy of ozone by promoting remineralisation and to reduce the frequency of consumption of fermentable carbohydrates.

- 1 Prof. of Restorative Dentistry & Gerodontology school of Dentistry Royal Victoria Hospital Belfast Northern Ireland .
- 2 Adentec & UKSmiles Clinical Director Wokingham UK
- 3 Cologne Dental School, Specialist Practice Perio- Implantologist, Germany
- 4 Prof. in Milan Dental School, Specialist Practise in Verona, Italy
- 5 Specialist Practise in Walls , Queens University Belfast, Ireland
- 6 Department of Restorative Dentistry faculty of Dentistry Jordan University of Science & Technology Irbid, Jordan
- 7 University of Birmingham School of Dentistry , Birmingham, UK
- 8 Private Practitioner (Dipak Joshi Dental Clinic ) London, UK
- 9 Prof. Department of Applied Science London South bank University, UK
- 10 Glasgow dental Hospital, Glasgow, Scotland
- 11 Division of Restorative Dentistry School of Dentistry Royal Victoria Hospital Belfast, Northern Ireland
- 12 Queens University Belfast, Ireland