New technologies for dental care

In this first article of three, Dr Julian Holmes explores arguably the most important advance in caries management since the development of filling materials

Over the years, general dental practitioners have been, and continue to be, bombarded with information promoting the new and improved innovations that will assist them in enhancing their clinical and marketing skills.

It is now generally accepted that there are vast ranges of products available to improve patient communication and education by showing them the state of their oral health and highlighting problem areas. These devices help to sell dental care and treatment, allowing the practitioner to show X-rays almost instantly and store libraries of photographs of their patients. You can now buy anything from high technology imaging products down to the clever but simple dyes that make plaque and caries visible.

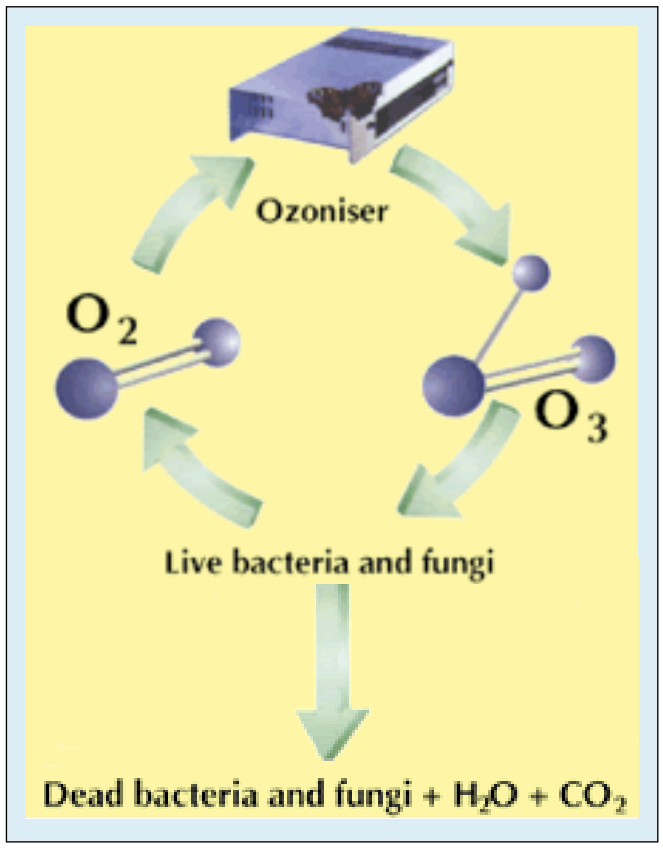
Mirror and probe and X-rays are inaccurate. To date, in many dental practices worldwide, caries detection and, therefore, the elimination of decay depends upon visual recognition with the aid of a mirror, probe and X-ray analysis. Studies have shown that these traditional systems can be inaccurate, with computerised analysis of digital radiographs, dyes and tests to look for the propensity of the individual to decay offering a little more accuracy.

Let's briefly review the theory of the development of a carious lesion as this is crucial to the understanding of the new technologies to be discussed. The 'niche environment theory' is now accepted to explain the process of initial colonisation through to the development of acidophilic micro-organisms in a specialised niche environment. As the bacteria collect, for instance in a fissure, they produce acid, which leads to the loss of mineral content in the enamel surface. This is known as demineralisation. This is offset to some extent by the balance between demineralisation of the enamel surface by these acids and remineralisation by the host's normal neutral oral environment. As the numbers of acidophilic bacteria increase, the niche becomes predominately acidic, attracting more acid-producing bacterial species and, over time, a cavity forms. The process of niche development may take many years. We already know from previous studies that decay can be reversed by improved oral care and the use of mineral mouthwashes and dentifrice.

Failure to find a cure for dental decay may be due to the change in the type and species of micro-organisms in caries development. The dental profession and pharmaceutical companies have searched in vain for a simple system to prevent and cure caries; varnishes and tablets have been developed with little success. One reason that they have not succeeded would seem to be the change over time in the type and species of the micro-organisms involved, from the process of colonisation to the establishment of the developing lesion. And while fluoride has undoubtedly reduced the incidence of decay, the prevalence of decay in my practice area has seen a noticeable increase, probably due to the amount of bottled mineral water being drunk.

Surely, therefore, the profession will welcome technology that makes caries detection simple and that will kill all the micro-organisms on and in a tooth surface, leaving it virtually sterile. This technology may allow the tooth surface to remineralise, encouraged by the patient's saliva, mouthwashes and dentifrice and, where the caries are already established, halt their growth and allow the area to 'heal' without amputation of tooth material to remove what we consider to be infected. All, of course, without the need for anaesthesia in already sensitive gum tissue.

If you want to learn more about this technology, help can be found at www.the-o-zone.cc where you can find out about ozone and how it is used in practice, as well as news about upcoming lectures and presentations on this technology. The lecture series is presented by Professor Edward Lynch, Dr Julian Holmes and members of the research team from Queens University. The presentations cover basic research, the quest for a simple effective system to eliminate decay, and how to use, market and cost it in practice



Ozone

The good news is that at last we have such a technology and, more to the point, it is available in the UK. KaVo released the caries-detecting DIAGNOdent some three years ago and now has just released HealOzone, which employs an ozone generating source. Ozone technology has been researched over a number of years in Belfast University under the watchful eye of Professor Edward Lynch. The published studies fulfil the profession's wildest dreams.

Ozone kills >99% of all bacteria, fungi and viruses. The new system is based on ozone (O_3) gas. Ozone forms part of the natural gas mix that surrounds the Earth at high altitude and protects the world's population from excessive ultra-violet radiation. That fresh, wonderful smell on the mountains when you ski or after thunderstorms is ozone.

The medical profession has used ozone for some 100 years with much research being carried out, especially in Russia and Cuba. In my quest for knowledge, a search of 'ozone medicine uses' on the internet brought up hundreds of references on the topic. All of the information studied showed that the elimination of all bacteria, viruses and fungi is possible through the application of ozone.

Ozone has also been used in commercial applications for over a century and is now used to purify public water supplies in cities worldwide. O_3 is also used to eliminate pollution in air supplies in hospitals and other buildings.

As ozone readily penetrates through decayed tissue, eliminating any bacteria, fungi and viral contamination, it would be expected that this 'clean' lesion would remineralise.

It must be stated that ozone is a substance that needs to be carefully controlled, as high concentrations at ground level have been known to cause respiratory distress.

The HealOzone from KaVo

Getting results

So what results have Professor Edward Lynch and his research team found to date?

In the primary root carious lesion studies, the research showed that just 10 seconds of treatment with ozone eliminated 99% of the micro-organisms; over 70% of the lesions studied reversed or improved, the remainder did not progress. More importantly, not a single lesion deteriorated. This study was compared against a control group where 80% progressed further. Recent results from the fissure caries study show even better results of caries reversal.

In my own practice, our studies have shown that at three and four month recall not a single lesion identified as a carious lesion has progressed; the majority of lesions show that remineralisation has occurred. Also, as the treatment is simple, does not involve any injections, drilling or discomfort, our patients love it. Faced with the options of an injection, amputation of part of your tooth, filling and its eventual replacement some time in the future, what would you go for? And when we do come across a lesion that has not responded to the ozone treatment, we can revert to the conventional filling systems.

Ozone technology potential

In the future, this technology may have other indications, including the decontamination of dental unit water lines that are especially vulnerable to bacterial contamination and colony growth due to the static layer of water at the inner tube surface or surface bacterial growth known as a biofilm.

Other uses may be for the treatment of periodontal disease and the pre-washing of surgical sites prior to, for example, implant placement.

A number of studies are currently being undertaken, including those by Dr Hubert Chang in London on the cleaning of root canals utilising ozone in endodontic treatment and my PhD study looking at its use as a possible tooth whitening system.

Further articles will look at its use in the dental practice in more detail. ■

Please note that the data from current research studies may not support the possible future uses of ozone in the dental management and treatment of patients