With its new photodynamic agent perio green®, elexxion AG (based in Radolfzell, Germany) brings some colour to the realm of laser-supported periodontitis and periimplantitis therapy. In this interview, Dr Gordon John, scientific staff member of the Poliklinik für Zahnärztliche Chirurgie, University Hospital Düsseldorf, Germany, informs about this innovative agent.

Dr John, new technologies and materials usually aren’t overnight inventions. How much time passed between the first idea until perio green®’s introduction to the market, and what is this new product based on?

In principle, the path from the initial idea to the final market approval of a product is long and tiring. Of course, new products must be tested with regard to their effects and, more importantly, unwanted counter effects as well as interactions with other medical products or medications. This is an essential part of patient protection. In the case of perio green®, ten years have passed from our initial idea until its application in periodontitis therapy, five years of which can be attributed to the certification process.

How does the photodynamic germ reduction with indocyanine green work? Is there any possible discomfort for the patient? Is the treatment performed under local or general anaesthesia?

The operating principle of photodynamic germ reduction or photodynamic therapy is based on placing a colouring agent in the periodontal pockets, which is activated by a light source and thus enrolls its bactericidal effects. After its placement, indocyanine green (perio green®) penetrates the base of the pockets as well as small retention niches because of its very low viscosity, selectively colouring the bacterial cell walls. Endogenous cell components are not coloured. Perio green® is activated at a wavelength of 810 nm and a power of only 300 mW. Its main effect is based on a very high energy absorption of the light of the respective wavelength, which is expressed on local, short heat peaks. These result in the destruction of the bacterial cell walls, thus developing its bactericidal effect. Heat peaks are quite short and locally restricted. Therefore, neither are they noticed by the patients nor do they influence the surrounding healthy tissues. The term "photothermal therapy" would however be more accurate with regard to perio green®, as its effect relies on the impact of the photosensitizer in the form of released oxygen radicals.

A general anaesthesia is not required for germ reduction with perio green®. In most cases, even local anaesthesia is not necessary. In some cases, patients regard the insertion of the application or laser tip an unpleasant sensation. Here, local anaesthesia can be applied.

Periogreen® allows a highly effective and pain-free adjuvant periodontitis and periimplantitis therapy. Are
there any risks for hard and soft tissues or any side effects?
Side effects for the dental hard tissues or surrounding soft tissues as well as any risks for restorations or implants are unlikely because of the low laser power.

For example, indocyanine green is applied intravasally in ophthalmology, visceral surgery or cardiology. Intravasal application results in a very low half-life period of indocyanine green of three to four minutes, a low toxicity and a safe introral and topical application. As perio green® is not resorbed by the intestinal mucosa, there are no serious risks for the patient even if it is swallowed during the procedure.

Systemic side effects have not been reported to date, and only a low number of allergic reactions have been described. However, indocyanine green does contain iodine and should thus be regarded cautiously in cases of iodine allergies.

Perio green® is distributed in the form of pills. How is it applied and could any colour residues of the photosensitizer remain on the root and implant surfaces?

It is correct that perio green® is distributed in the form of pills. This is necessary, since perio green®, in its operational, dissolved form, maintains its activity for only two hours. The photosensitizer is prepared chairside, individually for each patient. This process couldn’t be simpler: all necessary materials are delivered in aseptic packages. After one pill is placed in a mixing vessel, 2 ml of sterile water are added. After one minute, the solution is homogenous. The solution is then drawn into an aspiration cannula (red label), which is then exchanged with a thinner application syringe (green label). This is used to apply perio green® in the periodontal or periimplant pockets. After two minutes, the remaining colouring agent is rinsed off. In none of the previously treated cases, colouring residues were reported at the dental hard and soft tissues or implant structures. Afterwards, perio green® is activated via laser (810 nm wavelength, 300 mW) for one minute. The final treatment step is the rinsing of the pockets.

Does the photodynamic agent also remove mineralised plaque or does this require further measures?
Perio green® does not remove mineralised plaque. However, it is also not intended to do so. The mineralised biofilm should be removed mechanically, for example by special curettes. There can be up to 60 per cent of residual biofilm after the decontamination of rough implant surfaces, for example after treatment with plastic curettes. In this diluted, reduced biofilm, photodynamic/photothermal therapy can reach its full potential more easily, killing the remaining pathogenic germs.

Which amount of time does therapy with perio green® take and how often does it have to be repeated during recall? And another question: Is it mandatory that perio green® is applied by a dentist or can it also be applied by a trained assistant?

A full-mouth application should take about one hour. If there are a high number of implants to be decontaminated, you should consider more time due to the rising difficulties in probing when compared to periodontal pockets. There are no general rules that can be applied to the repetition of the therapy. Patients should be recalled about two to three weeks after therapy for another clinical examination. Based on the results, any further steps should be decided upon individually. High putrid or refractory periimplantitides among our patients were treated with perio green®. After two or three applications, they entered a stable, stagnating situation. With regard to treatment delegation, there is still a grey area which has yet to be defined. That means: a non-invasive application can be transferred to dental assistants. However, the dentist is responsible for his personnel to be adequately educated and trained in the correct use of the equipment. The dentist must state the treatment indication and give instructions to start the therapy. The patient has to be informed about the delegation, and the dentist must supervise the procedure. Furthermore, the dentist is liable for any treatment consequences.

New elexxion laser systems come with the software necessary for the application of perio green®. Can older devices also be modified?
Older elexxion laser systems can be modified without any problems. All it takes is the new software to be loaded on the devices. This can be done during the standard safety check-up. In addition, elexxion offers another interesting service: if perio green® is ordered on a regular basis, we provide you with our laser system pico lite for free.

What are your experiences with perio green® and can you recommend this treatment without any reservations?
The application of perio green® is fairly easy, secure and effective. Of course you have to be aware of its restrictions. For example, you cannot expect a regenerative effect from the therapy. However, especially an effective decontamination of tooth or implant surfaces before surgical-regenerative therapies can help to prepare the defect situation. Furthermore, the application of perio green® can result in even difficult situations becoming static; thus prolonging implant preservation, for example if the patient does not approve of any surgical procedure. Photothermal therapy with perio green® can reduce the widespread application of antibiotics in dentistry, along with its side-effects, significantly.

Thank you for this interesting conversation.