

# FotoO<sub>2</sub>San



**Light activated disinfection**

## A quantum leap

*How often do you discover a new groundbreaking form of treatment within dentistry?*

*In order that an innovation is regarded as a real quantum leap within an available clinical treatment option, it must fulfill several additional requirements:*

- *The treatment must be effective, so the action is expected every time.*
- *The treatment must be safe, so it is risk free for the patient and practitioner, and ideally without side effects.*
- *There must be a high patient compliance, so that patients have a positive experience of the treatment.*
- *There must be high practitioner compliance, i.e. the treatment must not be too complicated, technical or extremely time consuming.*
- *The cost of the treatment must be reasonable so it is not more expensive than the patient can afford, while the practitioner still benefits financially.*

*When all the requirements are fulfilled, one can talk about a real quantum leap in clinical treatment.*

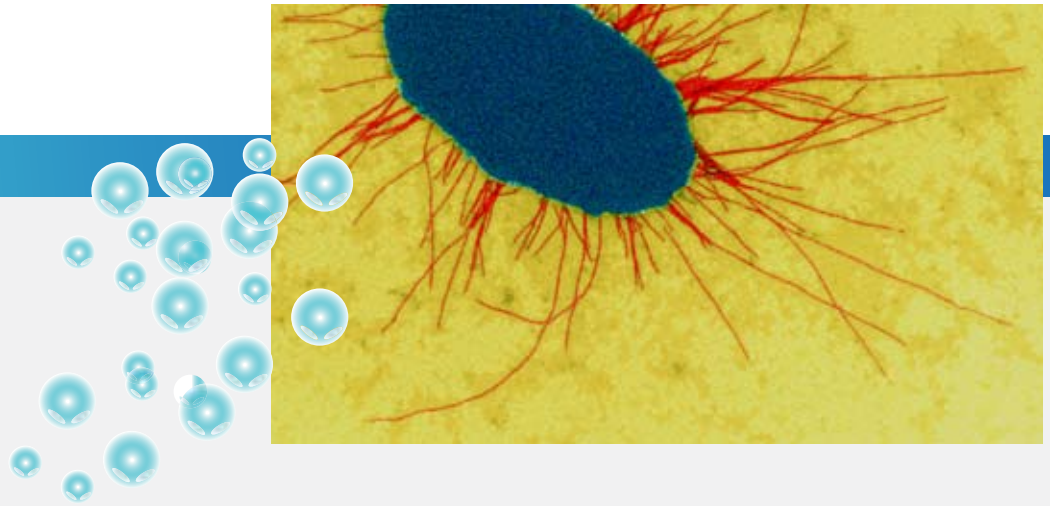
*The FotoSan concept fulfills all these requirements. As a benefit to the patients, we look ahead to when FotoSan is offered as a standard treatment to all patients, where treatment is indicated.*

*Yours faithfully  
CMS Dental*

*Lisbeth Rose M.D.*

*Jimmie Kert M.D.*





## The principle

A photosensitizer binds itself to the surface of the micro organisms.



The photosensitizer absorbs light in a specific spectrum, and receives energy.



The energy received affects the  $O_2$  present, which is split into either  $O^-$  or  $O^\bullet$ , which is commonly called ROS (= Reactive Oxygen Specimen).



ROS reacts strongly and instantaneously destroys microbial cell walls and other structures only in the micro organisms.



The FotoSan logo describes the principle graphically:

$O_2$  molecules receive energy from the activated photosensitizer, and becomes either  $O^-$  (negatively charged ions) or  $O^\bullet$  (radicals).

The FotoSan product is a highly effective red LED light, which is used together with the FotoSan Agent photosensitizer.

The concept is internationally called PACT (Photodynamic Antimicrobial Chemo Therapy), LAD (Light Activated Disinfection) or PAD (Photo Activated Disinfection).

# Foto<sub>2</sub>San

Light activated disinfection



The treatment  
works  
instantaneously



## Treatment in dentistry

### Endodontic treatment

The root canal is instrumented and flushed.  
The canal is filled with photosensitizer. Each canal is illuminated for 30 seconds with the endodontic tip attached. The root canal is dried and filled as usual.

### Periodontic treatment

Scaling and root planning is performed.  
The photosensitizer is applied into pockets. Deep pockets are illuminated for 10 seconds with a long tip in the pocket and then from the outside for 10 seconds with a blunt tip pushed firmly against the mucus membrane.

### Periimplantitis

Is treated in the same way as periodontitis.

### Gingivitis and pericoronitis

The photosensitizer is applied in the gingival pocket and is treated for 10 seconds with a blunt tip pushed firmly against the mucus membrane.





### Treating caries

Especially for decontaminating profound caries. After excavating the majority of the carious dentine, the photosensitizer is applied and is illuminated for 10 seconds. It is then sealed with a temporary filling.

The LAD principle is not only effective against bacteria, but also other micro organisms like viruses, fungus and protozoa. The applied photosensitizers have far less affinity to mammal cells; and thus no negative side effects in the treatment have been noted.

As a result, light activated disinfection (LAD) has a number of advantages in relation to both traditional antibiotic treatment and chemical disinfectants.

The photosensitizer is available in several viscosities: low, medium and high viscosity respectively. All solutions have the same concentration of active ingredients.

**Also  
effective on  
viruses, fungus  
and protozoa**

**Kills  
bacteria at the  
speed of light**

### Treatment indications

- Endodontics
- Periodontitis
- Periimplantitis
- Pericoronitis
- Gingivitis
- Caries

### The advantages of the FotoSan treatment

- Works instantaneously
- Effective on all micro organisms
- No resistance developed
- No side effects
- Quick and easy to apply
- Simple concept
- Low-cost treatment

### Limitations of the FotoSan treatment

- Photosensitizer must be in contact with target micro organisms
- The light must have a physical access to activate the photosensitizer

## The concept is scientifically well documented

FotoSan is continually used for clinical research in leading university departments. Keep up with the latest results on our website.

The principle behind LAD, so-called photodynamic therapy (PDT), has been known for over 100 years. The concept behind the FotoSan product has been thoroughly tested throughout the last 10 years, partly with lasers and partly with LED light. LAD is particularly interesting because the concept can be used for treatment of as many different micro organisms as there are cases. Several scientific experiments have been carried out with plaque biofilms in vitro (refer to the table below).

Oral bacteria which are wrapped in a biofilm that is an extracellular

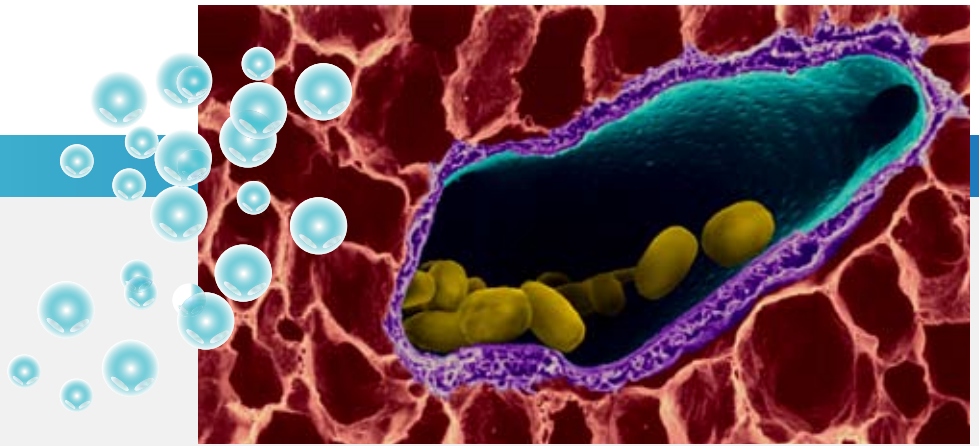
matrix of polymers (EMP) of microbial and host organism origin, is protected against antibiotics, immune reactions and other external influences to some degree. It is therefore particularly important that the reaction with singlet oxygen also breaks down the polysaccharides in this EMP, and thus makes the micro organisms more sensitive to further destruction.

Oral indications for LAD treatment have been met with particular interest, as the application of the photosensitizer is relatively easy. The most crucial thing has been to find a powerful non-laser light source that is not technically difficult or expensive. The FotoSan light fulfills this need completely.

### LAD studies on plaque biofilm in vitro

Study (year of publication)	Photosensitizer	nm light/LED/laser	Micro organisms
Dobson and Wilson (1992)	TBO, MB, AIS2Pc, HP-HCL	633 laser	Streptococcus sanguinis Porphyromonas gingivalis Fusobacterium nucleatum Actino. actinomycetemcomitans
Wilson et al (1996)	AIS2Pc	660 LED	Streptococcus sanguinis
Haas et al (1997)	TBO	905 LED	Actino. actinomycetemcomitans Porphyromonas gingivalis Prevotella intermedia
Wood et al (1999)	ZnPc	White light	Mixed strains
O'Neill et al (2002)	TBO	633 laser	Mixed strains
Seal et al (2002)	TBO	633 laser	Streptococcus intermedius
Soukos et al ((2003)	pL-Ce6	Red light	Actinomyces naeslundii
Lee et al (2004)	ALA	630 LED	Pseudomonas aeruginosa
Zanin et al (2005)	TBO	633 laser/639 LED	Streptococcus mutans
Metcalf et al (2006)	Erythrosin	White light	Streptococcus mutans
Hope and Wilson (2006)	SnCe6	488 laser, 543 laser	Streptococcus pyogenes
Wood et al (2006)	Erythrosin, MB, Photofrin	White light	Streptococcus mutans
Williams et al (2006)	TBO	633 LED	Streptococcus intermedius
Zanin et al (2006)	TBO	639 LED	Streptococcus mutans, sanguinis, sobrinus
Soukos et al (2006)	MB	665 LED	Enterococcus faecalis
Donnelly et al (2007)	TBO	635 Paterson lamp	Candida albicans
Garcez et al (2007)	PEI-Ce6	660 LED	Proteus mirabilis Pseudomonas aeruginosa
Schlafer et al (2008)	TBO	630 LED (FotoSan)	Streptococcus intermedius





## Light activated disinfection (LAD) in dentistry – in vivo studies

Dortbudak (2001) showed a significant reduction in the number of *Actinomyces actinomycetemcomitans*, *Porphyromonas gingivalis* and *Prevotella intermedia* after treatment with PAD (TBO+690nm LED) on 15 patients with periimplantitis.

Haas (2000) also showed on 17 patients with periimplantitis that PAD was able to reduce the inflammation.

Kömerik et al (2003) showed in a rat model, where the rats were inoculated (on each side of the maxillary molars) a dissolution of *Porphyromonas gingivalis*, and was subsequently treated with 630 nm laser light resulting in:

1. No surviving bacteria in the group treated.
2. On histological examination no negative effects were found with PAD.
3. After 90 days there was significantly less bone resorption in the group with TBO+laser compared with the control group (no treatment or TBO and laser respectively).

Sigusch et al (2005) showed, in a model with beagles where these were infected with *Porphyromonas gingivalis* and *Fusobacterium nucleatum* subgingivally around all teeth that the PAD treatment resulted in significantly less reddening and tendency to bleeding.

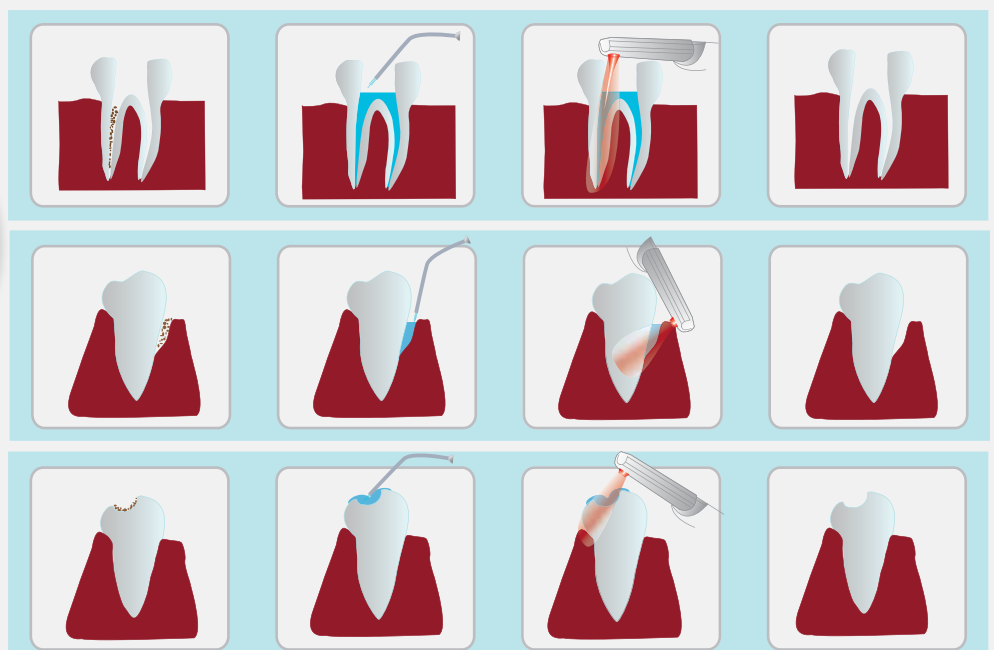
Shibli et al (2003) showed in a model with a ligature induced periimplantitis in dogs that PAD reduced the number of bacteria of *Prevotella* strains, *Fusobacterium* strains and *Streptococcus betahaemolyticus*.

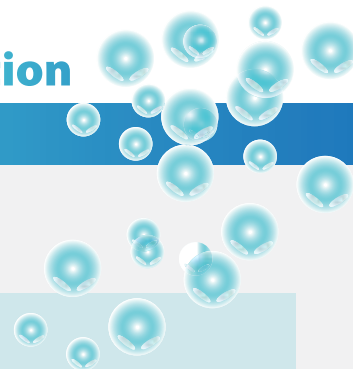
Furthermore, Shibli (2006) showed in dogs with periimplantitis, that PAD together with guided bone regeneration (GBR) gave better results than GBR alone.

Teichert et al (2002) showed in a model with immuno-suppressed mice that PAD could totally eradicate *Candida albicans* from pseudomembranous candida lesions on the back of the tongue.

Bonsor (2006) showed in an examination of 14 patients and 32 root canals in clinical practice that 20 root canals were initially infected.

**Effective  
and without  
side effects**





## CMS Dental profile

### Mission

We develop, produce and distribute specialised high quality products for dentists who value innovative solutions; equipment and materials, which make the work at the clinic easier and gives the patient a better prognosis, shorter treatment time and reduced pain.

### Vision

Our aim is to offer the most innovative high quality products at reasonable prices so that dentists and their patients throughout the world can benefit from the latest advances.

### Development

CMS Dental was established in 1984 by two doctors Jimmie Kert and Lisbeth Rose. From the beginning their interest has been focused on new treatment methods and the development of new products to benefit both patients and dentists.

### Specialised and flexible production of high quality

We have chosen to manufacture our own products in Denmark by companies who are specialised in specific processes.

This provides several advantages for our customers as we are in close contact with the production stage and therefore can easily introduce improvements and quickly serve our customers' needs. Flexibility is the key word for finding good solutions.

CMS Dental exports its products throughout the world.

### New advances to benefit for patients and dentists

## FotoSan – technical specifications

### Power supply

Input power: 100–240VAC, 50/60Hz  
Output power: 9VDC, 1.3A/1.7A

### Battery

Nominal voltage: 3.2 V  
Nominal current: 800 mA  
Battery type: LiFePO<sub>4</sub>  
Charging time: Approx. 3 hours  
Working life: Approx. 500 sec.

### Diode

Nominal wattage: 15 Watt  
Output intensity: 2000 mW/cm<sup>2</sup>  
Wavelength: 625–635 nm

### Time settings

Large button: 30 sec. light with vibration  
Small button: 10 sec. light with vibration