



F M T



AmbiJet

MAKE PATIENTS SMILE AGAIN





Challenges Periimplantitis

Unavoidable
infection and inflammation



The implant loses
its stability



Harmful
treatment attempts



Highly invasive
and ineffective

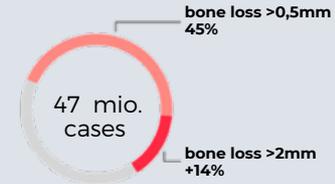


Dentists are seeking
a new solution



No effective
standard therapy

- No implant is safe from periimplantitis
- There is no effective standard therapy



[1]

Peri-implantitis is an inflammation of the gum and bone around a dental implant, which can lead to the loss of the implant.

Peri-implantitis is a significant and growing problem in dentistry.

An industry-independent study on peri-implantitis [1] showed that 60% of all patients had peri-implantitis after 9 years, resulting in bone loss of approximately 30% of the original bone supporting the implant.

More than 150 million implants are already inserted worldwide, with **20 million more every year**.

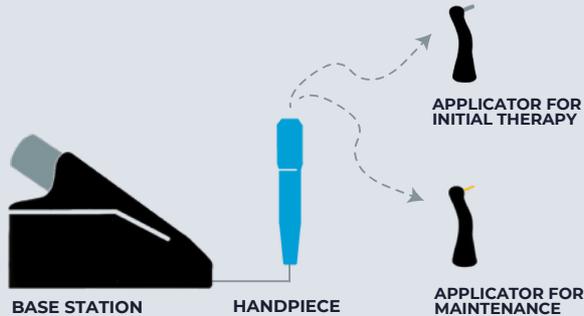
This results in an enormous need for treatment, which has **added up over the last decades**.

A generally accepted peri-implantitis therapy is currently not available.

[1] Derks et al., 2016 / 2 DMS V, Fünfte Deutsche Mundgesundheitsstudie, 2016 / 3 IQWiG, Systematische Behandlung von Parodontopathien, 2017 / 4 Sjögren U. et al., 1990; Ng et al. 2007

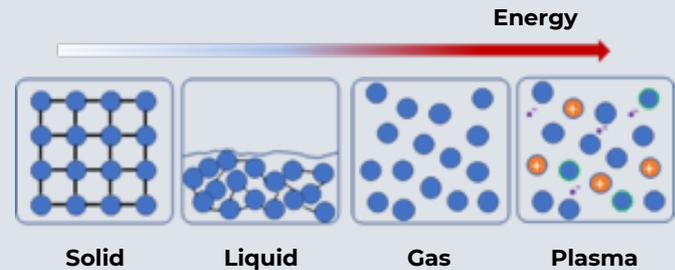
AmbiJet

The applicators are single-use and suitable for most clinical situations and all types of metallic implants. The handpiece is designed like contra-angle dental instruments. The base station is controlled with a foot switch.



- **AmbiJet kills bacteria and disintegrates biofilms.**
- **AmbiJet works on already inserted implants in-situ.**
- **Microsystems-based technology.**
- **Special applicators for initial (surgical) and for maintenance (conservative) therapy.**

As energy is supplied to matter, it transforms from solid to liquid, then to gas. Going one step further gas transforms to the fourth state of matter: plasma. It is basically an energetic gas, in which many different elemental particles coexist. Those interact with microorganisms in specific ways. They can kill bacteria and viruses, and activate the immune system, without building resistance. [2]



[2] Bergmann M, Ledernetz L, Altenburger M, Kaufmann A, Gross T, Engesser F, Buerkin E. "AmbiJet Treatment for Periimplantitis," 2022 IEEE International Conference on Plasma Science (ICOPS), 2022, pp. 1-1, doi: 10.1109/ICOPS45751.2022.9813022.

Plasma

Solution



Bacteria

The *in-vitro* efficacy of plasma disinfection was demonstrated for the first time on Petri dishes containing different bacterial species relevant in dentistry.

Samples:

- Monospecies-infected bacterial lawn.

Analysis:

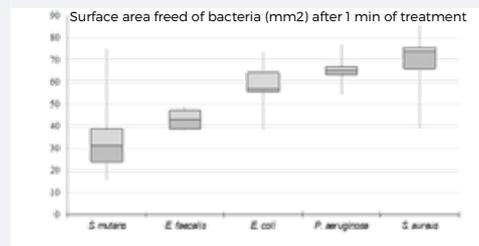
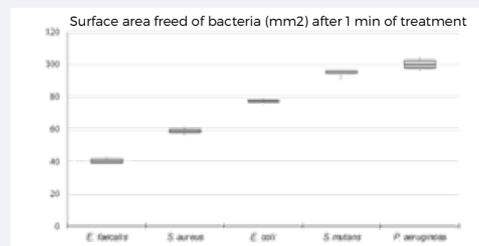
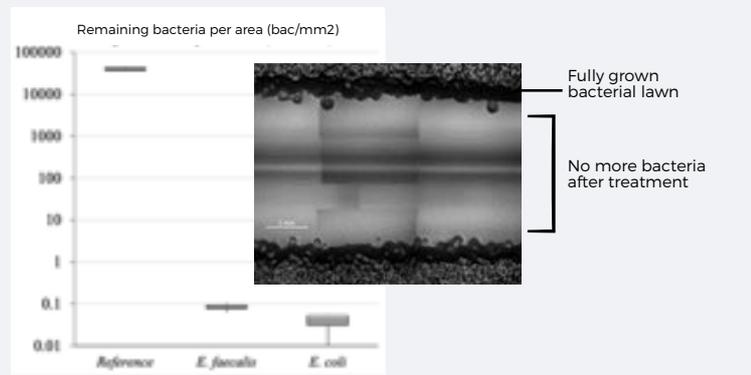
- Petri dishes treated locally with AmbiJet to assess disinfection. Stroke-shaped treatments were performed with different durations (1 to 7 min).

Results:

- AmbiJet is effective against **gram-negative** and **gram-positive** bacteria. It even shows excellent efficacy against *E. faecalis*, considered a problem germ in dentistry. [3-5]



The applicator is moved at a distance of 1 mm from the surface with a velocity of 1 mm/sec.



[3] Ledernez L, Engesser F, Altenburger M, Urban G, Bergmann M. "Effect of Transient Spark Disinfection on Various Endodontics Relevant Bacteria". Plasma Med. 2019;9(2):121-128. doi:10.1615/plasmed.2019032357
 [4] Ledernez L, Bruch R, Altenburger M, Bergmann M, Urban G. Transient Spark for Bacterial Cleaning of Dental Microcavities. Plasma Med. 2019;9(1):39-48. doi:10.1615/PlasmaMed.2018027475
 [5] Bhardwaj, Sonia Bhonchal. "Role of Enterococci faecalis in failure of Endodontic treatment". Int. J. Curr. Microbiol. App. Sci., vol. 2, no. 8, 2013.

in-vitro Biofilm

The efficacy of AmbiJet was demonstrated on titanium samples with *E. faecalis* biofilms demonstrating its ability to treat dental implants. The efficacy was quantified in terms of **disinfection and tissue regeneration**.

Samples:

Sterile medical grade titanium discs and implant grade samples processed by the implant manufacturer.

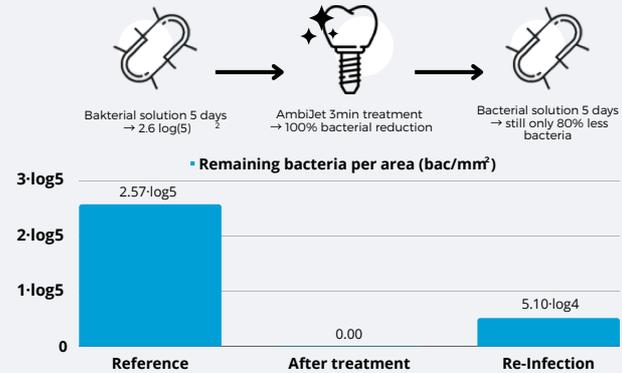
Analysis:

- The titanium samples are stored in a bacterial solution for 5 days to form a biofilm. The surface is then treated with AmbiJet; CFUs are counted. Then the samples are placed back in a bacterial solution to evaluate their post-treatment growth. Again, CFUs are counted.
- Cells were stained using conventional IIF to assess cell adhesion, proliferation, morphology and cytotoxicity.

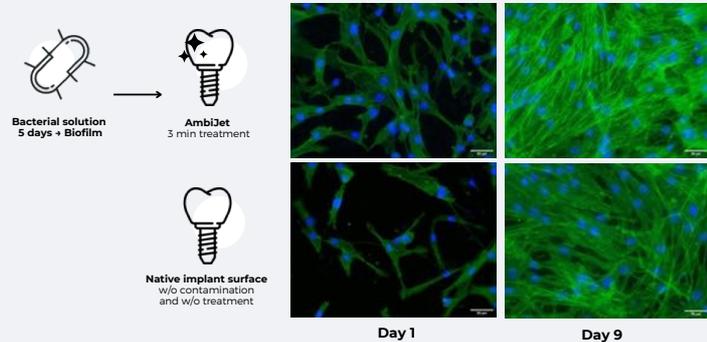
Results:

- CFU values show a clear and 100% bacterial reduction immediately after treatment. Even after 5 days of incubation, the treated surface still contains 80% less bacteria demonstrating the antiadhesive characteristics of the treated areas.
- The pictures show immunostaining of the hCF cytoskeleton and nuclei after treatment of the titanium samples. Note the differences in cell adhesion and morphology after only one day of incubation. No toxic effects were detected in any sample at any time. The bacteria were completely inactivated to allow for subsequent cell adhesion. [6]

Disinfection



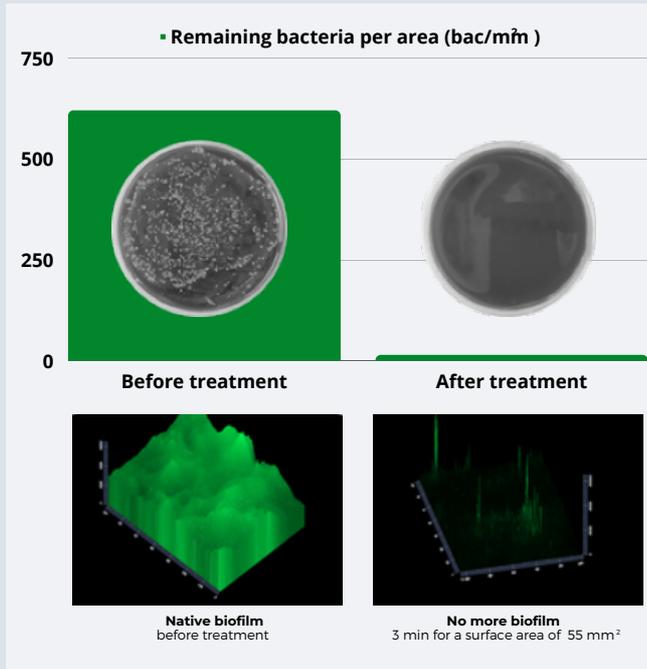
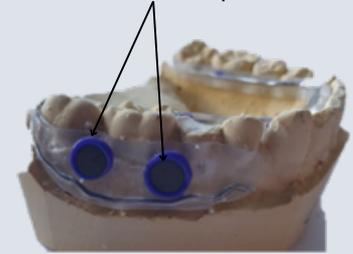
Tissue regeneration



- **The disinfection is total. Re-infection is slowed down.**
- **The treated samples show a faster adhesion and proliferation than fresh implant material.**

in-vivo Biofilm

Titanium samples



The efficacy of AmbiJet is demonstrated on native biofilms. For this purpose, titanium samples are worn by volunteers for several days.

Samples:

- Intraoral splint
- Sterile medical grade titanium discs
- Implant quality samples
- Worn by volunteers for 24 and 96 hours

Treatment:

- One minute per disc area (5 mm diameter).
- Total: 3 minutes for a total area of 55 mm

Analysis:

- Live/dead staining
- Classical microbiology

Results:

- CFU value is 0.14 per mm², which is negligible compared to CFU from native surface. [7]

2

The AmbiJet treatment disintegrates the entire biofilm on the titanium discs.

[7] Altenburger M, Bergmann M, Ledernez L, Gross T, Kaufmann A. AmbiJet disinfects human biofilm on implant surfaces: a clinical study. In submission process

AmbiJet vs. Scaler & Perioflow

AmbiJet is compared to other techniques commonly used in peri-implantitis treatment attempts.

Techniques:

- Scaler
- Powder water-jet (EMS Perioflow with Erytrol)
- AmbiJet

Samples:

- Sterile medical grade titanium samples

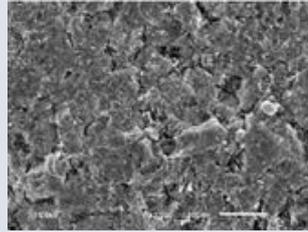
Analysis:

- SEM analysis
- Classical microbiology

Results:

- Classical microbiology shows massive contamination on the reference, scaler and powder water-jet samples. On the AmbiJet samples, the treated area is free of bacteria.

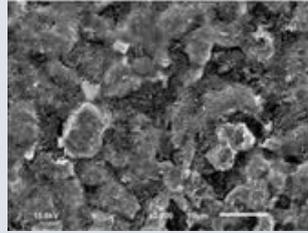
A comparative analysis shows that the AmbiJet treatment gives far better results than conventional techniques.



Native Biofilm



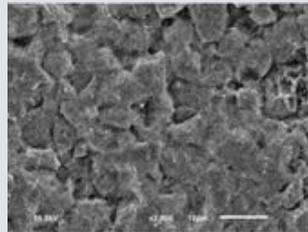
Massive biofilm



Scaler



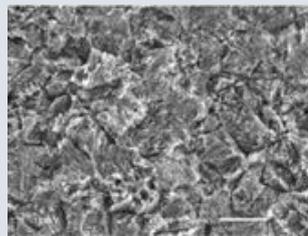
Massive biofilm remains



Perioflow



Strong biofilm remains



AmbiJet



No more biofilm





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