Wound healing requires a variety of cells to increase their metabolic activity, resulting in a high oxygen demand. Oxygen at the wound site has been shown to promote wound healing by stimulating several processes, including:

- Neovascularization
- Collagen production
- Phagocytosis (engulfing of microorganisms, cells, or debris by macrophages or neutrophils)
- Neutrophil-mediated oxidative microbial killing
- Degradation of necrotic wound tissue

Lack of sufficient oxygen (hypoxia) has been associated with pain in the wound area, with the prevalence of hypoxia being more pronounced in patients who are smokers and diabetics. These populations demonstrate slower wound healing and increased risk of wound healing complications compared to healthy patients.

Bluem mechanism of action

Bluem is using a mechanism to deliver active oxygen (H₂O₂) in a controlled manner directly to the treatment site. In contact with saline Sodium perborate is converted into sodium borate and H₂O₂. In low concentrations of 0.003%-0.015%, hydrogen peroxide has a disinfectant action, and occurs, together with the antibacterial ROS (reactive oxygen species) during the respiratory burst of neutrophiles in normal wound fluid and has a chemotactic effect on leucocytes. The concentrations of hydrogen peroxide in the products used are not comparable to the high concentrations (1.5 – 3%) of hydrogen peroxide used in medicine as a disinfectant. It is known that the production of free radicals then causes damage to the wound. Research has shown that the continuous presence of a low concentration of hydrogen peroxide kills pathogenic bacteria much more effectively than a one-off high concentration and that fibroblasts are not damaged by this.

Bluem oxygen technology

Protection for natural teeth and implants. Accelerating wound healing, implant integration and bone regeneration in a safe, effective and non-invasive approach.

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

Wound healing

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Accelerated tissue remodeling: Sodium Perborate\textsuperscript{21} & Honey\textsuperscript{22}

Application of Bluem (oral gel) to injured tissues accelerates wound healing. Tissue oxygenation at peri-implantitis sites was significantly decreased ($p < 0.05$) when compared with that at healthy sites\textsuperscript{20}.

\textsuperscript{20} On site noninvasive assessment of peri-implant inflammation by optical spectroscopy. J Periodontal Res. 2011 Jun;46(3):382-8
\textsuperscript{21} Nascent oxygen from sodium perborate in oral disinfection and hygiene Odontoimatr Rev Iberoam Med Boca. 1950;7(83):617-50.
\textsuperscript{22} Honey: An immunomodulator in wound healing Wound Rep Reg (2014) 22 187–192

**Plaque control: Sodium Perborate\textsuperscript{23,24} Honey\textsuperscript{25} and Xylitol\textsuperscript{27,28}**

Oxygen molecules ($O_2$) can penetrate much deeper into the biofilm to kill the anaerobic bacteria than the Chlorhexidine ($C_{22}H_{30}Cl_{2}N_{10}$) molecule

Oxygen molecule ($O_2$) can penetrate much deeper into the perimucosal seal around the implant.

\textsuperscript{23} Effect of an oxygenating agent on oral bacteria in vitro and on dental plaque composition in healthy young adults Frontiers in Cellular and Infection Microbiology July 2014, Volume 4
\textsuperscript{24} The effect of chemotherapeuticagents on titanium-adherent biofilms. Clin. OralImplants Res. 22, 1227–1234
\textsuperscript{26} A Comparative Evaluation of the Antibacterial Efficacy of Honey In Vitro and Antiplaque Efficacy Preliminary Results J Periodontal • September 2012

Bone growth accelerator: Lactoferrin\textsuperscript{29,30}

Lactoferrin potently stimulates the proliferation and differentiation of primary osteoblasts

\textsuperscript{30} Lactoferrin promotes bone growth Biometals. 2004 Jun;17(3):331-5.

Fluoride-free:

All Bluem products are Fluoride-free. Fluoride impairs the corrosion\textsuperscript{31,32,33,34} resistance of the titanium implants. Due to the corrosion microscopic particles of titanium can be found in the surrounding tissue, which may have a negative impact on the devices, as this can potentially be pro-inflammatory.

\textsuperscript{32} Effect of Fluoride Concentration and pH on Corrosion Behavior of Titanium for Dental Use. J DENT RES 1999 78: 1568
\textsuperscript{33} The role of fluoride on the process of titanium corrosion in oral cavity. Biometals (2012) 25:859–862
\textsuperscript{34} Biomedical Implants: Corrosion and its Prevention - A Review Recent Patents on Corrosion Science, 2010, 2, 40-54

Relative Dentin Abrasion (RDA < 30)

Bluem toothpaste has a neutral pH value and contains no scouring ingredients. No damage can therefore be caused to the surfaces of teeth or implants.


**Treatment indications:**

Acute wound healing after implant placement, Gingivitis\textsuperscript{37}, Periodontitis\textsuperscript{36}, Peri-implant mucositis, Peri-implantitis\textsuperscript{36}, Pericoronitis, Oral Ulcers.

\textsuperscript{36} Adjunctive topical Reactive Oxygen Species (ROS) in periodontitis and peri-implantitis – a pilot study
\textsuperscript{37} Application of toothpaste and mouthwash “BLUEM” in complex hygienic oral care for patients with coronary heart disease Stomatologia (Mosk). 2014;93(3):18-20

Different concentrations of slow oxygen release

- Bluem toothpaste 75ml $\pm$ 20 mg/l $O_2$
- Bluem mouthwash 500ml $\pm$ 20 mg/l $O_2$
- Bluem oral spray 15 ml $\pm$ 20 mg/l $O_2$
- Bluem oral gel 15 ml $> 100$ mg/l $O_2$

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