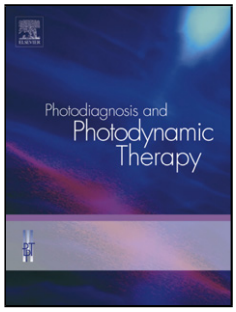


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# *Effect of photodynamic therapy on surface decontamination in clinical orthodontic instruments*

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## Highlights

- Characterize and test the "Photodynamic Inactivation Device" (PID) (Patent Deposit MU-BR20.2017.002297-3);
- Antimicrobial inactivation and disinfection action of solid surfaces using PID;
- Action of microbial inactivation against gram-positive and gram-negative bacteria.
- Propose a low cost and atoxic alternative for disinfection;
- PDI of biomedical appliances as non-critical instruments and food industry.

***Abstract***

The objective was to develop, characterize and test a box containing light emission diode (LED), Patent Deposit MU-BR20.2017.002297-3, which was named "Photodynamic Inactivation Device" (PID) and verify if it's suitable in microbial reduction or disinfection action of solid surfaces using PID. The equipment was made in a container of polypropylene with a lid of the same material and, for a better use of irradiation the internal part was covered with a layer of reflective aluminum. In addition, sixty boards of red LED 660nm wavelength, containing three radiators each, for which the distribution of irradiation and spectral irradiance in all of the six internal faces were calculated in this device. That way, a low cost alternative was tested over three types of microorganisms present on the human microbiota: two strains Gram-positive (Gram +), *Staphylococcus aureus* and *Streptococcus mutans* and one strain Gram-negative (Gram -), *Escherichia coli*, inoculated in orthodontic instruments previously autoclaved. To assess the Photodynamic Inactivation (PDI) over these bacteria, instruments were contaminated by bacterial suspensions ($3x10^8$ CFU/mL) and ulterior treatment with a solution of 100µmol/L of MB for 20 minutes, and irradiated for another 20 minutes (energy density of 0,26J/cm²). Microbial reduction was assessed by number counting of Colony Forming Units (CFU). At the end, microbial reduction of the surface of orthodontic metal instruments was compared with the positive group of each group. Results showed that PID caused a significant reduction ($p<0.05$) of the microbial charge stuck in the orthodontic instruments. Thus, the photo prototype of the drawing is appropriate for phototherapy studies, granting it´s advantageous to the low level light therapy as well as for the antimicrobial photodynamic therapy. The perspective is that PID may potentialize the dissemination of phototherapy studies for determining its proper use in healthy sciences. And, thus, propose a low cost and atoxic alternative for disinfection of biomedical appliances as non-critical instruments, allowing also for use in the food industry.