

Supplementary Information

Photodynamic Inactivation of *Staphylococcus aureus* in Plasma Using Photogem: Optimization and Mechanistic Insights

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Irradiation device

The successful implementation of photodynamic inactivation (PDI) hinges on understanding the dynamic interplay between light energy, photosensitizer concentration, oxygen availability, and medium composition. Figure 6 provides a visual representation of the experimental setup, showcasing the illumination of bacterial suspensions in a 24-well plate using the Biotable® LED device.

This image highlights the uniformity of light exposure across samples, ensuring consistent activation of Photogem® at 630 nm and enabling precise control over irradiation parameters. The standardized setup depicted in Figure 6 is critical for reproducibility and underscores the importance of maintaining consistent experimental conditions to achieve reliable results in PDI studies.



Fig. S1. A picture of a 24-well plate undergoing illumination

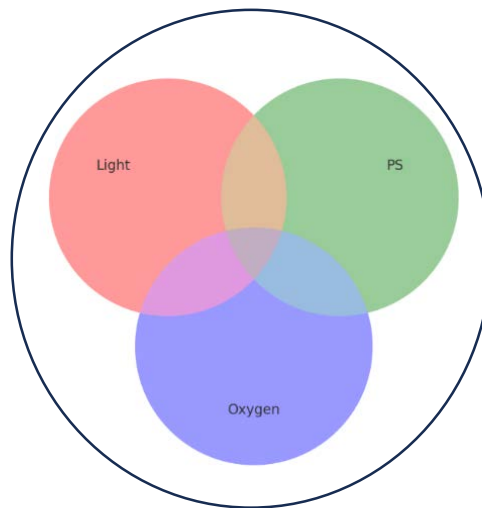


Fig. S2. Interplay of key components in the PDI Space.

Figure S2, on the other hand, illustrates the conceptual framework underlying PDI efficacy by depicting the interplay between light energy, photosensitizer (PS) concentration, oxygen availability, and medium composition. This diagram emphasizes how these factors synergistically influence ROS generation and bacterial reduction. For instance, while PBS allows unrestricted ROS generation due to its simplicity, plasma's complex molecular environment introduces challenges such as ROS scavenging by proteins and delayed oxygen diffusion. The figure encapsulates the foundational principles guiding PDI optimization, providing a visual summary of how these variables interact to shape treatment outcomes.

Together, these figures serve complementary purposes: Figure 6 demonstrates the practical execution of experiments, while Figure 7 contextualizes the theoretical framework driving PDI efficacy. Their inclusion enriches the supplementary section by bridging experimental design with mechanistic insights, offering readers a holistic understanding of how PDI parameters were optimized to achieve significant bacterial reductions while preserving plasma integrity.