



Letter to the editor

Clinical challenges of antimicrobial photodynamic therapy for bovine mastitis



Sir,

Antimicrobial photodynamic therapy (aPDT) is emerging as a new promising tool to treat local infections in Veterinary Medicine [1]. In 2016, our group was the pioneer to investigate its use to inactivate pathogens related to bovine mastitis [2]. In this regard, in a recent report published in this journal, Moreira et al. [3] explored the use of toluidine blue (TBO)-mediated aPDT to treat subclinical bovine mastitis.

Remarkably, bovine mastitis still remains as the most economically relevant disease for dairy industry worldwide, resulting in substantial economic losses for milk producers due to extensive antibiotic use and product losses. In this sense, antibiotic misuse or overuse to treat bovine mastitis is worrisome because it can simultaneously lead to antibiotic residues in dairy products and increase multidrug-resistant foodborne pathogens. Unfavorably, there is still no consensus on the ideal approach for bovine mastitis treatment; therefore, aPDT represents a viable option to reduce the use of antibiotics in dairy farms. The preliminary results of Moreira et al. [3] are exciting and deserve discussion on some points. In this letter, we intend to highlight other relevant aspects to be addressed in order to consolidate the use of aPDT for management of bovine mastitis.

The concentration of the photosensitizer (PS) diluted in the milk plays a pivotal role. In the study by Moreira et al. [3], the authors designed a clinical assay using a 2.5% TBO solution, which promoted a significant reduction of bacterial load. It is noteworthy that clinical mastitis represents a more complex challenge for aPDT than subclinical mastitis since the alterations in the milk composition could influence the PS absorption properties. Additionally, we believe that intermolecular interactions between PS and milk components should be considered to optimize clinical protocols because it could induce aggregation of phenothiazine dyes and leads to lower photodynamic inactivation efficiency [4,5].

Another important point is in respect to the light diffusion within mammary parenchyma. Appropriated light delivery systems need to reach deeper mammary tissue since pathogens normally colonize the entire mammary gland [6]. Therefore, the use of diffuser fibers should be considered to deliver homogeneous light intensities inside the gland parenchyma. Hence, investigations regarding different light delivery systems could optimize clinical protocols and facilitate the establishment of aPDT into the dairy industry. Finally, we encourage the development of innovative strategies to improve selective PS delivery to pathogens using targeted molecular and nanoparticle systems.

In summary, we hope that this letter motivates further studies to develop safe and effective protocols for bovine mastitis and promote aPDT applications in Veterinary Medicine.

References

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