Evaluation of Curcumin Reincorporation in *Escherichia Coli*

T H N Lima[1], K C Blanco[1], A R Lima[1], F E G Guimarães[1], K J S Silva[2], and V S Bagnato[1,3]

[1]*Biophotonics Lab., CePOF, São Carlos Institute of Physics, São Carlos, Brazil*
[2]*Departamento de Hidráulica e Saneamento, Universidade de São Paulo, São Carlos, Brazil*
[3]*Texas A&M University, College Station TX, USA*
Contact Email: thalita.lima@usp.br

Antimicrobial resistance poses a critical threat to global health, with projections suggesting that by 2050, resistant bacterial infections could cause as many as 10 million deaths annually. *Escherichia coli* (*E. coli*), particularly third-generation strains, have become prominent in healthcare-associated and community settings, frequently associated with urinary tract and bloodstream infections. This underscores the urgent need for alternative therapeutic approaches. This study investigates the potential of photodynamic inactivation (PDI) as an innovative therapy against antimicrobial resistance. PDI employs a photosensitizer (PS) that absorbs light at a specific wavelength to generate reactive oxygen species (ROS) via energy and/or electron transfer mechanisms to molecular oxygen. This research particularly focuses on evaluating the thermal effects on the reincorporation process of curcumin in *E. coli* (ATCC® 25922) post-PDI treatment. Purified suspensions of *E. coli* were treated with curcumin and subsequently divided into groups for incubation at various temperatures. PDI was then conducted under blue light illumination (450 nm). The reincorporation of the PS was assessed using confocal fluorescence microscopy to understand the temperature's influence on this process. Preliminary findings indicate a discernible impact of temperature on the reincorporation dynamics of curcumin in *E. coli*. Although the results suggest that thermal conditions significantly influence PS uptake and efficacy, further detailed studies are required to elucidate these effects comprehensively. The study highlights the influence of temperature on the efficiency of PS reincorporation following PDI, suggesting a pathway to optimize curcumin uptake conditions for effective photoinactivation of *E. coli*. The implications of these findings are critical for developing PDI as a viable alternative to combat antimicrobial resistance in *E. coli* infections. Further research is essential to refine the technique and establish its practical application in clinical settings.