

The role of reactive oxygen and nitrogen species in bacteria inactivation by PAW

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Reactive oxygen and nitrogen species (RONS) are suggested to play a key role when inactivating microorganisms by PAW. Thus, different authors have focused their works on identifying RONS and determining the most active ones. Although chromatography and spectrophotometry among others methods are used, tests and procedures are complex due to the small concentration of the RONS or overlapping at one wavelength (such as NO₃⁻ and peroxyxynitrites at 302 nm). For that reason, a substance known as scavenger is used. There are several types of scavengers and each one is supposed to trap one RONS such as OH• or NO₂⁻. Moreover, it is worth mentioning that the vast majority of the researchers add scavengers before PAW treatment which could influence the reactions that take part during PAW generation. However, in this work, we tried to capture the reactive specie once it is formed.

In this work, PAW was generated during 20 minutes with the bubble method. The plasma gas was air at 120 slm and the power was 500 W. Different scavengers were added to PAW and tested against *L. monocytogenes*. First of all, the minimum bactericidal concentration of each substance was analyzed in order to avoid an inactivation effect of the scavenger alone. Thereafter, PAW with and without several concentrations of scavengers were put in contact with *L. monocytogenes* during one hour. Results showed important roles of different RONS depending on the scavenger used. As an example, Fig. 1. shows the *L. monocytogenes* inactivation effect after adding superoxide dismutase (SOD) at different concentrations in PAW which gives an idea of the activity of O₂⁻.

On the other hand, some authors have recently said that making an artificial solution with the same concentrations of nitrites, nitrates and pH would achieve same bacteria inactivation than PAW. Both PAW and artificial solution were studied against *L. monocytogenes* after different contact times. Finally, under the conditions of this work it could be seen the higher effect of PAW when comparing with an artificial solution. Additionally, the authors are currently working on the identification of what parameter or characteristic of PAW is the main cause for the antimicrobial activity of PAW. Thereby, after preliminary results, ROS seem to be the ones with antimicrobial effect.

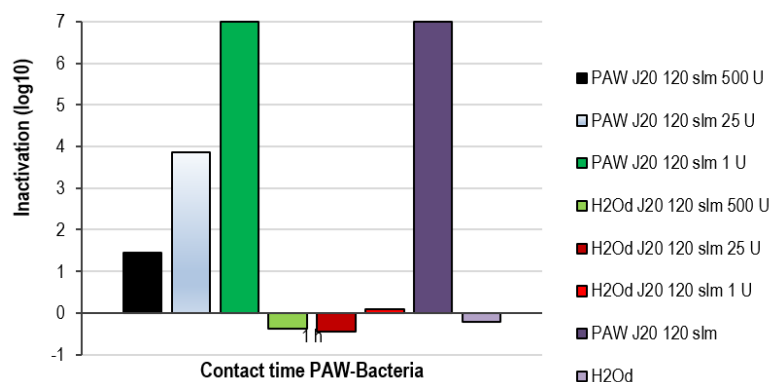


Fig. 1. *L. monocytogenes* inactivation after adding SOD to PAW.