

RC1

General comment

The paper focuses on an analysis of performances of nebulizers to produce airborne bacteria in laboratory experiments. The topic is interesting and it has useful application in bio-aerosol laboratory studies. The paper is well readable and suitable for the Journal. However, there are some aspects not very convincing or at least not very clear (see my specific comments). Therefore, I would suggest to consider the paper for publication after a major revision step.

We thank the Reviewer for the valuable comments, we reply point by point directly in the text (blue lines):

Specific comments

One aspect that is not very clear to me is that the paper is focused on the analysis of performance of nebulizers evaluated in terms of viable bacteria. I can understand the setup with the impinge that seems the one used to really evaluate the efficiencies. However, it should be explained what is the role of chamber experiments in the context of efficiencies of nebulizers. Have these experiments be used somewhat to calculate efficiencies? A discussion on this aspect is needed.

The Reviewer is right. Actually, the chamber experiments came after the set of tests with the nebulizers and aimed to assess the reproducibility of the whole procedure, having fixed a working condition (possibly the best one) for each nebulizer. Therefore, they did not add any information on the efficiency of the nebulizers.

We added the follow statements:

Line 164-165: *"The comparison here focuses on the reproducibility of the operating conditions of the nebulizers when coupled to atmospheric simulation chambers."*

Line 202-203: *"The goal of this set of experiments was to assess of the reproducibility of the whole procedure by fixing a working condition for each nebulizer."*

Figure 3 shows efficiencies larger than one, even if by definition should be limited to one. It does not seem to be a problem of uncertainty in the counting because several points are larger than one even including the error bars. What is the explanation? An interpretation of this values should be provided in the manuscript.

We modified the Figures 3, 4 and 5 captions to make clear that the efficiency is given as a percentage values.

Figures 6, 7, and 8 show that when more viable bacteria are injected in the chamber, more viable bacteria are collected after deposition on petri dishes in similar conditions. This seems quite straightforward; I believe that a discussion explaining how the slopes are related to the efficiencies of nebulizers should be included. The differences in the slopes are due to the efficiencies of nebulizers or the injected bacteria in the x-axis have been corrected for the different efficiencies? Are they compatible with the efficiency found with the impinge setup?

As for the first comment, the text is not clear enough. Actually, the relationship between number of bacteria nebulized and number of viable bacteria collected on the petri dishes passes through the deposition losses on the walls of the chamber and through the viability reduction inside the chamber environment. The aim of these bunches of experiments was to find a quantitative and reproducible link between these quantities. The nebulization efficiency (and

its stability) is a crucial part of the game, which however remains more complex. In the three figures, the slope decreases from the BLAM, to the Collison and finally to the SLAG as the nebulization efficiency does. We decided to not correct the injected bacteria by the nebulization efficiency (but we could correct, of course) to have a value on the x-axis directly and simply determined by the bacteria concentration in the initial solution and the volume/time of injection. We consider this “operative” approach easier for the control of the whole procedure.

We have added at line 221 the following text:

“Actually, the relationship between number of bacteria nebulized and number of viable bacteria collected on the petri dishes passes through the deposition losses on the walls of the chamber and through the viability reduction inside the chamber environment. The aim of these bunches of experiments was to find a quantitative and reproducible link between all these quantities. In Fig. 6-8, the slope decreases from the BLAM, to the Collison and finally to the SLAG as the nebulization efficiency does (see Fig. 3-5). The concentration of injected bacteria has not been corrected by the nebulization efficiency, this way values on the x-axis are directly and simply determined by the bacteria concentration in the initial solution and the volume/time of injection.”

The title should probably include the word performances, like bio-aerosol nebulizers performances” or something similar.

We agree with the Reviewer and we propose to modify the title as follow:

“Comparative characterization of the performance of bio-aerosol nebulizers in connection to atmospheric simulation chambers”.

Line 9. Better atmospheric sciences.

Done.

Lines 65-66. This sentence is not clear. It should be added that counting errors are assumed to be equal to the square root of counting in agreement with a Poisson statistics. Or something similar.

The errors issue is discussed at the line 197. We modified the lines 66-68 as follow:

“The average of the CFU counting is used to estimate the uncertainty range of the bacterial concentration in the solutions following the Poisson statistics (i.e., the square root of the number of colonies counted in the Petri dishes).”