

TITLE: Real lab day, a scientific hands-on activity to enhance education in microbiology: focusing on *Salmonella*, *Escherichia coli* and *Pseudomonas*

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ABSTRACT: Increasingly, educational methods require adaptation to the student's demands. Creative approaches should be considered, moving away from the classic classroom teaching style. A considerable change lies in the student's empowerment as an active subject in their knowledge construction. One way to achieve this goal in higher education is the student involvement in procedures of scientific production, linking teaching and research. Considering this scenario, we develop an approach called “Real lab day” that leads students to a scientific hands-on activity to enhance education in microbiology. During the Real lab day, students first encounter research projects in the microbiology field where they performed experiments in different laboratories. For example, one group of students evaluated the pathogenicity difference between *Salmonella* and *E. coli*, and another evaluated the presence of *Pseudomonas* in the University gardens. Regarding *Salmonella* and *E. coli*, we focus on the ability of both bacteria to induce epithelial cells death. Students stained cells with viability dyes to observe live and dead cells by flow cytometry and fluorescence microscopy. For the *Pseudomonas* Group, students should answer the question: “Do *Pseudomonas* isolated from a clinical environment are more resistant to antibiotics than environmental strains?”. Therefore, they designed the experiment to assess the antibiotic susceptibility from environmental strains and *Pseudomonas aeruginosa* PA14 strain (clinical isolate). In addition to learning how to manipulate equipment and design experiments, students learned how to create a scientific poster. The “Real lab day” develops students’ basic and advanced intellectual skills, such as reflection, originality, and deeper knowledge of the research field. Consequently, teachers expect students to demonstrate additional reflexivity, stimulus to debate and exchange opinions, deep understanding, criticality and creativity, construction of arguments, and ability to analyze and write experimental data.

Keywords: Microbiology, blended learning. *Salmonella*, *Escherichia coli*, *Pseudomonas*