EMBRACING INNOVATION IN MICROBIOLOGY EDUCATION: INTEGRATING ONLINE INTERACTIVE SIMULATION AND F-2-F PRACTICAL INQUIRY WHEN TEACHING MADLI-TOF

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Diagnostic laboratories routinely use Matrix-Assisted Laser Desorption/Ionisation-Time Of Flight (MALDI-TOF) to identify bacteria present in patient samples (Patel, 2013). MALDI-TOF quickly and accurately identifies organisms, yet, it is uncommon for undergraduate students to use this equipment; being limited to theoretical application only. To address this, we combined F-2-F laboratory classes with a MALDI-TOF simulation to teach students how to process clinical samples from start to finish. On completing the F-2-F and online simulation, students should understand the microbiological steps required to process diverse clinical samples; understand which follow-up tests will confirm the identity of the organism; understand how to prepare a sample for MALDI-TOF; and correctly analyse and interpret MALDI-TOF data.

Third-year Infectious diseases students (n=37, mean age 22.2±4.9, mean GPA 5.46±0.84) at the University of South Australia participated in this study. In weeks 1 to 6 of semester, students learnt how to process clinical samples in a microbiology laboratory. In the mid-semester break, students used the simulation to process a patient sample (e.g. blood, sputum, or CSF). Students had to choose the correct culture medium, incubation conditions and interpret Gram stain results. Once isolated, single colonies were picked, processed and analysed using MALDI-TOF. The output was used to confirm the identity of the bacterial species. Written and video instructions were provided to teach students on use of the simulation. The MALDI-TOF data generated were interpreted while referring to laboratory data. On completion, students submitted a written laboratory report for assessment. Student feedback was obtained through a 5-point Likert-style questionnaire. Thematic analysis was performed on the free text written feedback.

Students “agreed” that the simulation reinforced the logic required to analyse a patient sample (taught in the F-2-F sessions). They “agreed” that using the simulation in conjunction with F-2-F practicals was beneficial to their learning and that the simulation enhanced their ability to combine laboratory data (e.g. biochemical testing) with MALDI-TOF data. Prior to the simulation student understanding of MALDI-TOF was 2.6±0.54 (out of 5), increasing significantly to 3.1±0.55 after completing the simulation (Students *t* test; $p < 0.0004$). The mean score for the written report was 16.2±3.1 SD (max of 20), with only 2 students failing to achieve a minimum passing score.

The combination of F-2-F laboratory and online MALDI-TOF effectively integrated all steps required to identify bacterial species in a clinical sample. While some aspects of navigating the simulation were identified as challenging for students, there were noted improvements in student understanding. We will continue to improve the flow of the simulation as well as the representation of culture plates for the different bacterial species.

REFERENCE

Patel R. (2013). Matrix-assisted laser desorption ionization-time of flight mass spectrometry in clinical microbiology. *Clinical infectious diseases: an official publication of the Infectious Diseases Society of America, 57*(4), 564–572. https://doi.org/10.1093/cid/cit247

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