



The Education Gap in Clinical Microbiology

¹Ryan D. Cordner, ¹Celeste Dunn, ¹Mary F. Davis

¹Department of Microbiology and Molecular Biology, Brigham Young University, Provo, UT, USA, 84602.

ABSTRACT

The objective of this study is to establish the differences that exist between clinical microbiology coursework in university based MLS and MLT programs, and the actual testing that takes place in clinical laboratories. The gap that exists between the university and hospital settings is often a concern for educators and for hospital staff who train students. A survey was sent to all of the MLS/MLT programs in the state of Utah. Another survey was sent to the hospitals in Utah. The survey results revealed several differences between university programs and clinical laboratories, including the fact that 100% of the MLS/MLT programs use biochemical tubes and CAMP plates, while only 5% of hospital respondents reported the use of any biochemical tubes and 9% the use of CAMP plates. Despite these differences, only 55% of hospital respondents considered the clinical microbiology coursework insufficient to prepare students to work the microbiology bench, with most citing the need for longer exposure on a hospital bench for proficiency, suggesting that clinical microbiology coursework still provides an important scientific foundation for students. Increased focus on current methodologies and exposure to true clinical specimens may help to better prepare students for work in the clinical laboratory.

INTRODUCTION

The major purpose of medical laboratory science programs is to prepare students to enter the workforce as medical laboratory scientists and medical laboratory technicians. For clinical microbiology, this includes didactic coursework and practical hands on training in pathogen identification. Due to limited resources and a need to prepare students for the board of certification exam, many university based programs teach outdated techniques in their clinical microbiology courses. This often includes the use of biochemical tubes, rapid benchtop tests, and CAMP plates. Currently, many hospitals are using molecular based techniques to diagnose pathogens, including PCR and mass spectrometry. In this study we sought to address two major questions. First, how do the techniques taught for pathogen identification in university based programs compare with the techniques currently used in hospital laboratories, and second, do the techniques taught by university based programs adequately prepare students to work in clinical microbiology laboratories?

METHODS and RESULTS

Two surveys were created using Qualtrics survey software. One survey was sent out to hospitals, and another to MLS programs in the state of Utah. The hospital survey inquired about the microbiology work done at the hospital, the types tests performed, and the opinion of the hospital staff on the preparedness of recent MLS graduates to work the clinical microbiology bench. The MLS program survey inquired about the methodologies taught, and the reagents used for pathogen identification in clinical microbiology coursework. The survey also asked about the difficulties facing educators in clinical microbiology.

Media	MLS Programs	Hospitals
SBA	X	X
Chocolate	X	X
MAC	X	X
TSB	X	X
TCBS	X	
Anaerobic Media	X	X
BEA	X	X
XLD	X	
CIN	X	
CNA		X
Campylobacter		X
TSA	X	
CHROMagar		X
SS	X	X
HE	X	X
Thio Broth		X
Selenite Broth		X

Table 1 – Media Comparison. Comparison of the types of media used in MLS programs and hospital laboratories. A good variety of medias are used in both MLS programs and hospitals, with a large amount of overlap between the two.

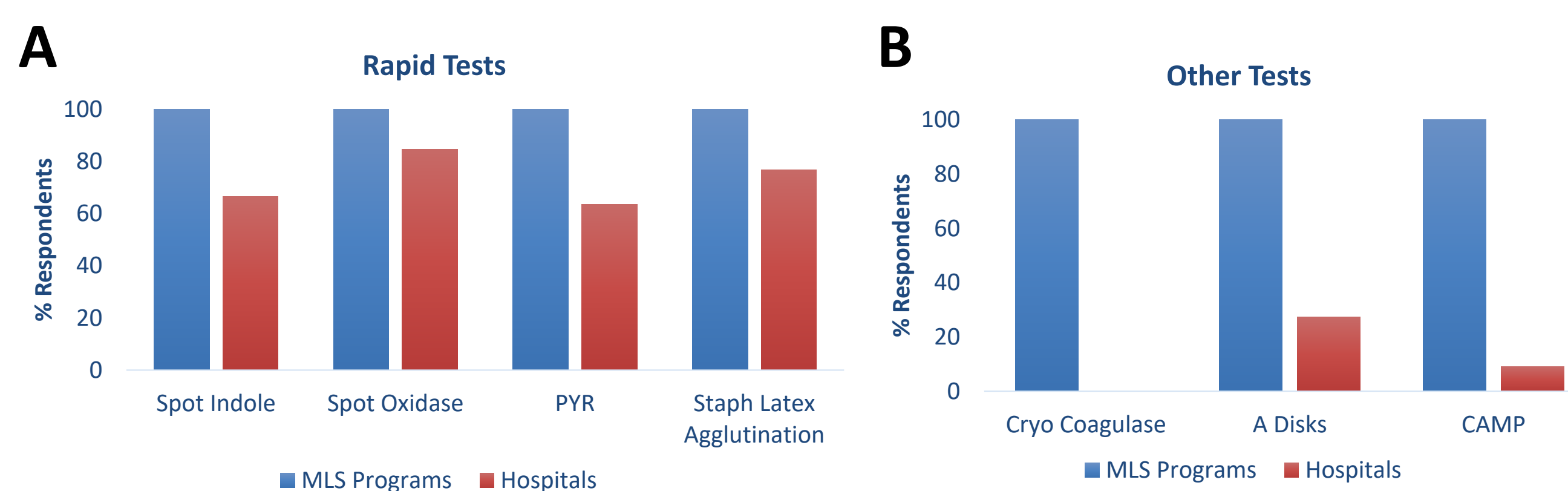


Figure 1 – Rapid Tests and Other Tests. A. The results of the survey show that most hospitals, and all surveyed MLS programs use rapid benchtop tests. B. Other more time consuming diagnostic tests have been mostly abandoned by hospital laboratories, but are still widely used in MLS programs.

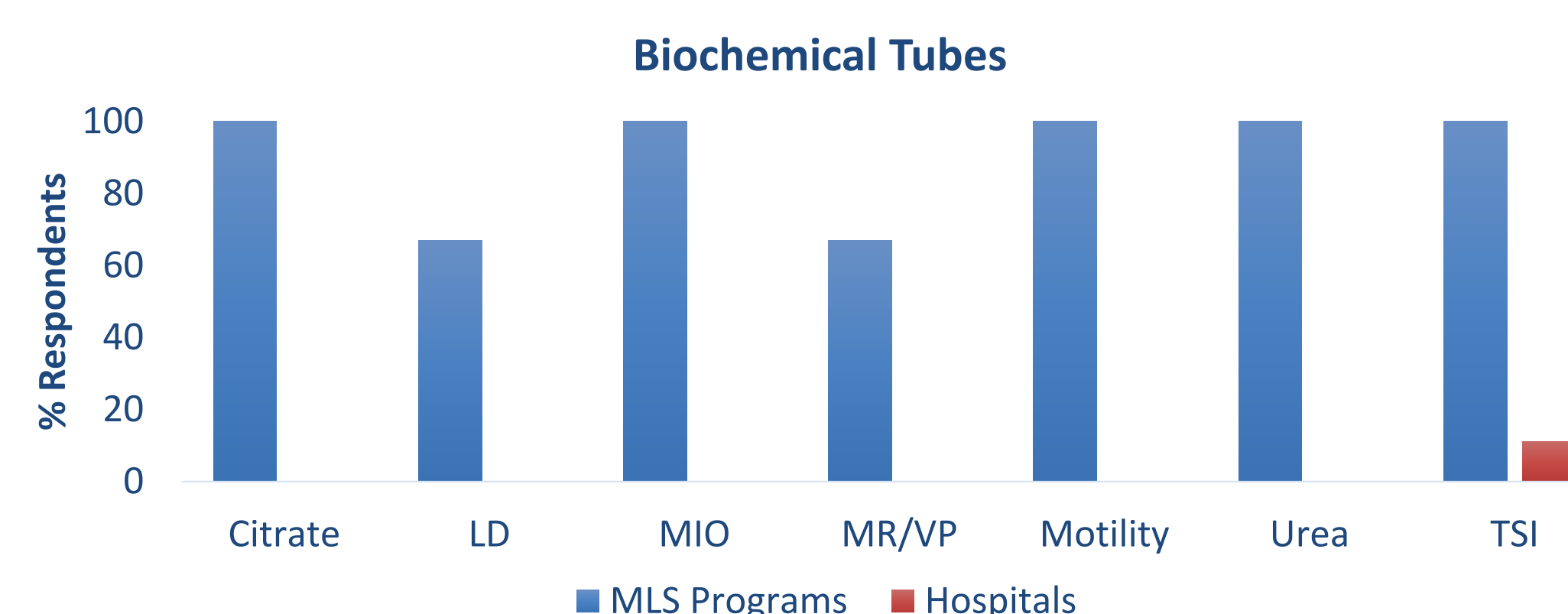


Figure 2 – Biochemical Tube Comparison. Comparison of the types of biochemical tubes used in MLS programs and hospital laboratories shows that MLS programs rely heavily on biochemical tubes, while they are almost entirely absent from hospital laboratories. This is most likely due to the fact that many hospitals use instruments that perform the same reactions.

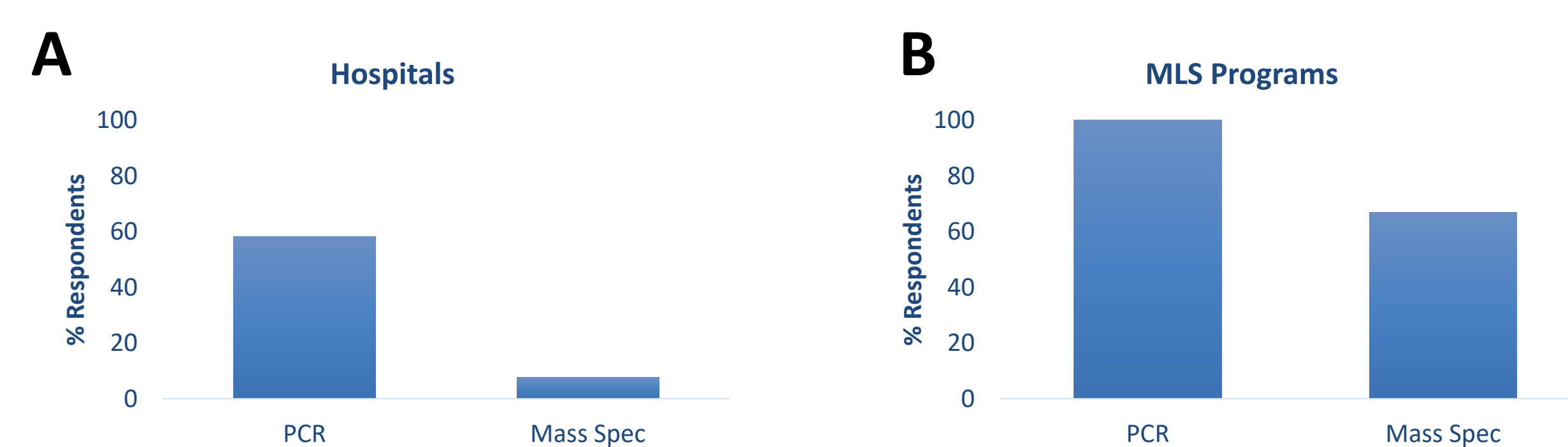


Figure 3 – Molecular Testing Comparison. A. Over half of the surveyed hospitals use PCR technology, and one of the hospitals uses mass spectrometry. B. 100% of the surveyed MLS programs indicated that they teach their students about PCR technology, and over half of the programs teach their students about the use of mass spectrometry for pathogen identification.

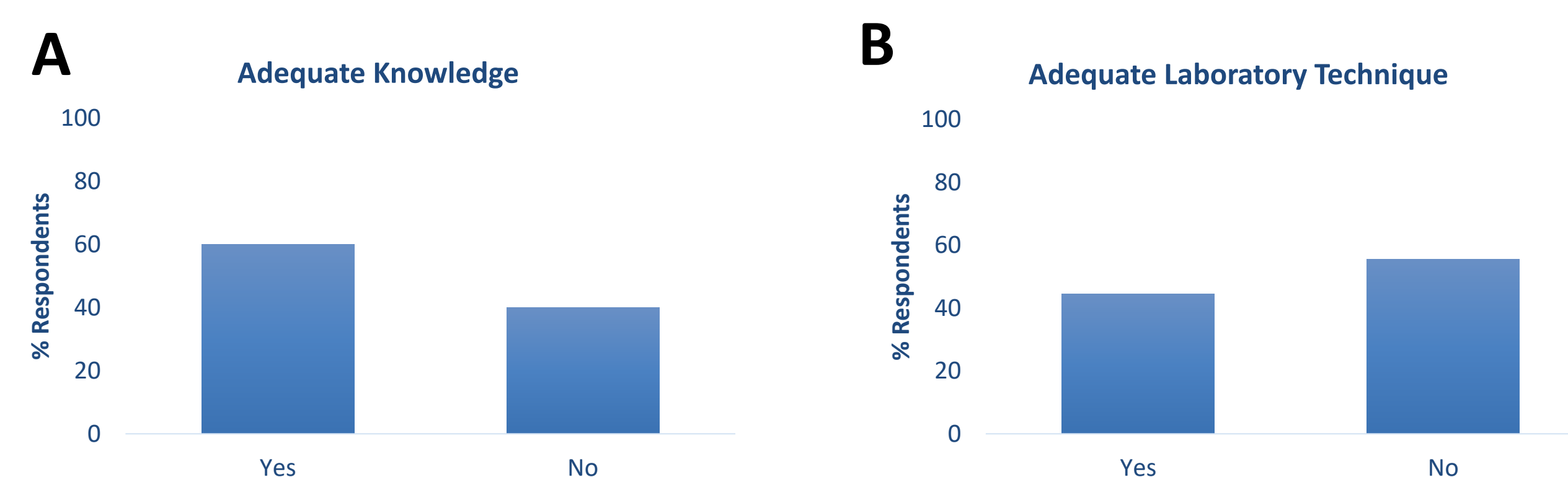


Figure 4 – Knowledge and Practice. A. Survey respondents from hospitals were asked if recent graduates of MLS programs had a sufficient scientific foundation to understand the process of pathogen workup and identification. The majority responded that they did think that the current scientific knowledge provided in MLS program courses was sufficient, but some respondents suggested that a focus on more current techniques would be helpful. B. When asked if recent graduates of MLS programs had sufficient laboratory technique to work the clinical micro bench, the majority of hospital respondents responded negatively. Many cited the need for prolonged training at the bench to be fully proficient.

CONCLUSIONS

Our study confirmed that the current laboratory techniques taught in university based MLS programs do not directly correlate with what is actually performed in clinical microbiology laboratories. Many of the tests currently taught by MLS programs have either been automated, or are being replaced by molecular biology techniques that give rapid, accurate answers. Despite the large gap that exists between what is taught in a student lab and what is actually done in a hospital lab, it appears that the scientific foundation provided by the coursework is still very valuable. However, MLS programs could also benefit from an increased focus on the current and emerging molecular diagnostics, which will give their students a better preparation for working in a hospital lab.