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LETTER

# LETTER TO THE EDITOR

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I commend *Fine Focus* for its article highlighting the importance of biosafety for microbiology undergraduate researchers (1). Biosafety in the microbiology laboratory should be of utmost concern to all involved in undergraduate microbiology education including student researchers, students enrolled in microbiology lab courses, faculty research mentors and teaching faculty. The article by Schwartz *et al.* included much valuable biosafety material, but I believe the article omitted two significant pieces of information. One was the laboratory-associated infections most relevant to undergraduate microbiology students and the other was the American Society for Microbiology (ASM) biosafety guidelines specifically developed for the undergraduate microbiology laboratory (2).

The article by Schwartz *et al.* emphasizes the importance of laboratory biosafety through its description of two laboratory accidents with unfortunate and deadly outcomes for the researchers involved who did not practice all aspects of proper biosafety (1). Although these cases are tragic, neither involved an undergraduate student in the laboratory. Unfortunately, infections and hospitalizations linked to microbiology teaching laboratories are all too common. The Centers for Disease Control and Prevention (CDC) has documented numerous cases of undergraduate students and their close contacts developing infections from exposures to organisms in the teaching laboratory. Between November 2013 and May 2014, a total of 41 cases of *Salmonella* Typhimurium infection with strains known to be used in laboratory settings were identified (<http://www.cdc.gov/salmonella/typhimurium-labs-06-14/index.html>). These cases came from thirteen different states and 86% of the affected individuals interviewed were enrolled in a biology or microbiology course. Thirty-six percent of

affected individuals were hospitalized. In 2011 another multi-state outbreak of *Salmonella* Typhimurium linked to clinical or teaching microbiology laboratories involved 109 cases and one death (<http://www.cdc.gov/salmonella/2011/lab-exposure-1-17-2012.html>).

In response to the 2011 *Salmonella* outbreak, ASM developed a set of biosafety laboratory guidelines that address the unique aspects of biosafety in the undergraduate microbiology laboratory (2). Unlike the universal and extensive BMBL guidelines (3), the ASM biosafety guidelines are valuable to students and faculty because they are explicit to the undergraduate microbiology laboratory experience. The guidelines address personal protection requirements, laboratory physical space requirements, stock culture requirements, standard laboratory practices, training practices, and document practices. Biosafety guidelines were developed for work at both biosafety level one (BSL-1) and biosafety level two (BSL-2). A risk assessment including the microbes to be used and the laboratory procedures to be performed should determine the appropriate biosafety level. Although Schwartz *et al.* state, “An undergraduate microbiology teaching laboratory may be considered a BSL-1 laboratory,” many undergraduate microbiology labs should be operating at BSL-2. If organisms such as *Staphylococcus aureus*, *Proteus vulgaris*, or *Salmonella enterica* are used or if students are subculturing unknown, environmental microbes, then the lab should be operating under BSL-2 conditions. An extensive appendix accompanies the ASM biosafety guidelines to clarify and expand on the guidelines. (<http://www.asm.org/index.php/microbelibrary/laboratory-safety-guidelines>).

Although these guidelines were published in 2013, it is likely that many faculty are

still unaware of them. The fact that an NIH researcher in the BioRisk Management Program failed to mention these guidelines in an article about biosafety for microbiology undergraduates demonstrates the unfortunate obscurity of the guidelines. While faculty want to keep their students safe in the lab, they may be ignorant of the best biosafety practices. The reasons why faculty are uninformed about the ASM biosafety guidelines are numerous. At many colleges and universities, faculty without expertise in microbiology are called upon to teach microbiology labs. Faculty who are not microbiologists occasionally do laboratory activities in their courses (Introductory Biology, Cell Biology, etc) that use microorganisms. Older faculty trained in an era with a cavalier attitude toward biosafety may not view biosafety as a significant concern. Even conscientious microbiology faculty whose students follow commonly accepted biosafety practices (washing hands, disinfecting benches, no food or drink, etc.) may not realize that students should only use institution-provided pens or pencils that are kept in the lab. When students use their own pens in the lab, they can become contaminated, allowing students to unwittingly take microbes out of the lab that could then infect them or others.

The article by Schwartz *et al.* focuses on undergraduate microbiology researchers (1). Although the ASM biosafety guidelines

were written for the microbiology teaching laboratory, the information is also applicable to the undergraduate research laboratory. Certainly undergraduates performing microbiology research should be just as concerned with biosafety as undergraduates enrolled in microbiology lab courses. Ideally such students have already been instructed in the best biosafety practices while enrolled in a microbiology lab course. If a student researcher is working with microbes and has not taken a microbiology course, the student should be sufficiently trained in biosafety before beginning the research project. Faculty advisors should be aware of the biosafety training their student researchers have received – especially if a student took a microbiology course at a different institution – and tailor the biosafety training for each student accordingly. As faculty we set the example for our students when we stress the importance and required diligence of consistently following best biosafety practices.

I wholeheartedly agree that good science is safe science! Students and faculty should work together to make sure the best biosafety practices are being followed at all times in all undergraduate laboratories. As readers interested in undergraduate microbiology education, I urge you to do your part to spread the word about the ASM biosafety guidelines and the importance of following the best biosafety practices.

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## REFERENCES

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