

# Intra-Laboratory Consistency: An Argument for Biosafety Principles in Academia

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As a Primary Investigator and educator I've heard my fair share of times the same story heard by all PIs, "I just can't replicate the data". Time and again this statement is uttered by someone whose project (and possibly academic career) is riding on data attained by a previous student. In the typical academic lab, the protocol for how these data in question were obtained is written in a notebook and either incomplete or poorly described. One potential reason for this may be that the steps in the protocol are taken for granted by the experimental designer and that these skills may not be in the bench-level repertoire of next laboratorian. Importantly, there are ways to alleviate this, all too common, occurrence by adopting a more thorough appreciation for the lessons taught through a biological safety program.

Biological Safety programs stress a number of behaviors and traits including; 1) risk assessment, 2) training, and 3) developing & following standard operating procedures (SOPs) and approved protocols. Because of these behaviors, there is very little inconsistency in the data generated in a BSL-3 laboratory despite different laboratorians performing the work. The traits mentioned above, while ingrained in those of us who've worked in BSL-3 and/or BSL-4 facilities, are less common in lower safety-level laboratories, particularly in academic settings. Adoption of SOP and training principles found in BSL-3 and BSL-4 laboratories into a BSL-1 and BSL-2 setting could significantly aid in the intra-laboratory data acquisition methods leading to enhanced intra-laboratory consistency. For example, Goeres et al. developed internal SOPs for a biofilm growth method and device [1]. While adaptation of this, or any, SOP may not be done in the name of Biosafety, the effect is the same, increased safety through standardization.

Most academic that into the BSL-1 or 2 categories are bound by the NIH Guidelines for Research Involving Recombinant and Synthetic Nucleic Acid Molecules (the Guidelines) [2]. As such, many of these laboratories and their PIs are versed in submitting protocols for review by their Institutional Biosafety Committees (IBCs) and

granting agencies. The next logical progression is for the PI to develop laboratory-wide SOPs based on their submitted and approved protocols followed by training students to perform these protocols properly. Importantly, as students become adept at method development, they can be given the opportunity to generate new SOPs for their laboratory. These students can also pass on the proper, safe techniques to the next generation entering their labs. Students that chose to pursue a career outside of academia where SOPs are the norm will have gained valuable experience while those who go on to academic careers, may choose to carry this "culture of safety" to their own lab having seen its value first-hand.

To be clear, I'm not advocating BSL-3 style safety precautions be deployed to all laboratories, rather, I'm suggesting that the best practices developed in these laboratories can be utilized to increase intra-laboratory data acquisition and consistency, thus decreasing cost and risk to a PI's program. Arguments such as the one I've put forward here have been proposed by others for different situations. For example, Abad has skillfully articulated how Biological Safety and Good Laboratory Practices (GLP) are intertwined [3]. While some PIs may scoff at the idea of Biological Safety and developing SOPs for an academic setting, it's possible to logically argue that these very ideas will aid their research. It is incumbent on the individual Biological Safety Officer (BSO) to encourage a culture of Biological Safety within their institution and each individual lab. One piece of the BSOs argument for the implementation of a safety program within each laboratory should be data acquisition consistency.

## References

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