Patience is a Virtue

(Note: Although the vast majority of dilemmas posted on this website are followed by an expert opinion, the one below embeds the moral points of the case without the need for further comment. We are thankful to the contributor for her astute analyses.)

My graduate thesis involved developing an assay to determine if light-activated metalloporphyrins could kill *Pseudomonas aeruginosa*. If the assay could validly and reliably show significant bacterial cell death, then the compounds we were evolving would present a possible alternative treatment for Pseudomonas infections, especially in burn patients. Developing the assay, then, was key to finding a reliable way to test a large number of candidate compounds and to identify the ones with the greatest lethality to the bacterium.

After developing and reworking various assays, I evolved a method for determining the killing efficiency of light-activated metalloporphyrins that could be performed in duplicate or triplicate in each trial. The first trial showed extensive bacterial cell death in all experimental groups, but the second repetition showed little or no cell death. Much to my delight, a third trial confirmed the results of our first trial.

At this point, I approached my advisor and requested permission to write my thesis with these results. He felt, however, that we needed to obtain the same results in two *consecutive* trials. Much to my surprise and dismay, a fourth and fifth trial showed no bacterial cell death. Consequently, we could not verify the original results, and I began an extensive troubleshooting process to determine if either the assay was defective or if the metalloporphyrins were ineffectual bacteriocidal agents.

Further trials, which were time-consuming and laborious, nevertheless resulted in more accurate data and, thankfully, prevented us from making embarrassingly inaccurate conclusions. It also eliminated the need to test a large number of other candidate compounds with an ineffective assay—which would have resulted in an even greater waste of time and materials than simply repeating our experiment a few extra times. Consequently, I not only took away from my thesis experience a better grasp of the scientific process, but an understanding of the ethical importance of patience, verification, and the reporting of reliable experimental data.