Case Example

Alexa is a graduate student in Professor Wells’s lab. The research involves testing the drug Wegrotuximab, a novel potential inhibitor of epidermal growth factor signaling (EGF). EGF signaling appears to contribute to tumor growth in several cancers by increasing cell division and survival.

There is preliminary evidence this inhibitor will result in slower cell proliferation, thus making it a candidate as an anti-cancer drug.

Alexa wants to make sure that she has everything in order so that she does not waste any trials; she cannot afford to make any mistakes because Wegrotuximab is not only very expensive but also is difficult to obtain; it might take several weeks before more will be available. Alex carries out experiments with two plates of cultured human cells growing in parallel in a solution that is used to keep such cells alive. One plate of cells included the drug Wegrotuximab (“drug treated”), and the other plate (“control”) has the same conditions but with no drug.

She counts the number of cells in each plate after 24 hours. Alex repeats this experiment three times. After the 24-hour treatment, the drug treated plates show a reduction in the number of the cells compared to the control. A t-test to see if the magnitude of cell proliferation was significantly different between the drug-treated and control wells showed a p-value = 0.1. Professor Wells had stated that in order for experimental results to be publishable, a t-test must show a minimum p-value of 0.05. The lab has only enough Wegrotuximab to test the number of cells in two more plates.

Alex mentions the results and her dilemma to her colleague Matt. Matt tells her that this is a common problem but that there is an easy solution. He suggests that Alexa add to the data that she has already collected by doing the experiments with the remaining drug, in order to see if the p-value drops below 0.1. Alexa reminds Matt that she doesn’t have enough compound to repeat her three experiments. Matt clarifies that he is not suggesting she repeat the entire set of experiments, but rather that she add to her existing data. Alexa doesn’t recall coming across this method in her data management class, and wonders if this approach is on the “up and up”!

Matt tells her that this is totally fine because it is not as if she is making up data or falsifying it; she is just working with the constraints that she is under and making the most judicious use of the limited resources to get the best results. This makes sense to Alexa and it seems smart to do only as many experiments as necessary.

If she grows two more plates of cells and treats them with Wegrotuximab, and also grows two more plates of cells as controls without the drug and the results prove to be similar to the previous experiments, she might have enough data to bring the p-value down to 0.05.

If the p-value drops below 0.05, Alexa thinks that she will have the results she needs to present to Professor Wells. If she doesn’t see a reduction in the p-value, she can continue to do more experiments to add to her data. Given the results to date and the evidence from previous studies in the lab, Alexa thinks that it is just a matter of time before she will get the p-value that will satisfy Professor Wells.

Case Example Questions

* What are your thoughts on the approach of “checking as you go and stopping when you get the desired result” in research? Do you agree with this approach? Why or why not?
* Should Alexa have set up her experiment differently from the outset? If so, how?
* What would you advise Alexa to do now?

Cornell University (Winter 2017 RCR Symposium Case Studies)