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More on an Alternative Swab Recovery Procedure

The May 2011 Cleaning Memo was on an alternative procedure for determining swab recovery percentages. I had several comments and questions on that alternative, so I considered it best to provide an additional perspective on that procedure. I will not repeat the details of the procedure here. Go back and review the May Cleaning Memo for those details. However, in essence what that procedure involves is swabbing the same surface area twice, with a different swab each time. If you assume that recovery in each case is more or less the same (within experimental error), then the percent recovery can be calculated for the two data values, even though you don't know in advance how much was actually on the surface before swabbing was done.

One consideration is that it might be possible to actually swab the same surface three times, measuring the residue for each swab separately. With that data, it may be possible to calculate the percent recovery in two independent ways. One way is to determine the recovery using the data from swab #1 and swab #2. Then the recovery can also be calculated by using the data from swab #2 and swab #3. If the assumptions are correct about swab recovery being essentially the same over the range sampled, then the results from the swab#1/ swab#2 calculation should be essentially the same as the results from the swab#2/swab#3 calculation, at least within reasonable expectations. For example, if the swab#1/swab#2 calculation gave a result of 66% recovery and the swab#2/swab#3 calculation gave a result of 74% recovery, I would consider my assumption confirmed (but would use the lower value for my recovery percentage used to correct data).

Here is a (made-up) example of how this might work. From the May Cleaning Memo, the equation (Equation V) for determining recovery percentage is:

$$P = (R - S)/R$$

Where: R is the amount (µg) per swab for the first swab
S is the amount (µg) per swab for the second swab
P is the recovery expressed as a decimal

Let's say I'm doing a protocol and don't have a pre-established recovery percentage. I swab a fixed area with the first swab, and the result of 35 µg. I then swab the same area with a second swab, and the result is 10 µg. I then swab the same area with a third swab and the result is 2 µg. Using the formula above, the recovery percentage is 71% for the swab#1/swab#2 calculation, and 80% for the swab#2/swab#3 calculation. I would consider these essentially the same, and use 71% as my official swab recovery percentage. (Note that I might actually do swabbing on three separate areas for three replicate values for each calculation.)

A second consideration involves the limit of quantitation (LOQ) and the limit of detection (LOD) of the analytical method. Let's take the same data as above for the swab#1/swab#2 calculation, except that the LOQ of the method is 15 µg. In this case, what I can do is make a worst case calculation using a value of 15 µg for the swab#2 result. That results in a recovery percentage of only 57% (a lower percentage than what I obtained when I could actually get a measureable value for the second swab).

As mentioned in the May Cleaning Memo, the danger of this technique, however, arises when the value for the first swab is below the LOQ or LOD of the analytical method. In that case, I don't know if the reason for the low values is good cleaning (resulting in low residue values) or a low recovery percentage. Therefore, there is

a risk with use of this alternative recovery percentage determination. However, it suggests that I would want to try to drive the LOQ/LOD values of the analytical method as low as possible in order to make sure that I had a quantified result for the first swab, and particularly a quantified result that was at least double the LOQ (in order to demonstrate a recovery of at least 50%).

Finally, note that with this method if the first swab has a value above the residue limit for swabbing, it doesn't matter what the recovery percentage is. The sample fails the acceptance criterion. You can calculate the recovery percentage to determine how much above the limit you might be at, but the sample fails.

The purpose of the Cleaning Memo is not to advocate for the use of this method, but to present additional considerations in its possible use.