Lot-to-Lot Kit Comparison Q&A

Why do I need lot-to-lot comparison?

For longitudinal studies, the major concern is the stability of the analyte of interest. If the analyte is stable under appropriate storage conditions (usually -80°C), tests can be conveniently carried out in a single batch after all the samples are collected. However, the stability of the analyte after prolonged periods of storage is often unknown. To avoid sample degradation, samples will often be tested annually or more frequently depending on the stability of the analyte(s). This means kits of different lot numbers (manufactured at different times) will need to be used over time as immunoassay kits usually expire in 4-10 months. To ensure that the test results at different times are comparable, a lot-to-lot kit comparison will be needed to verify whether the data from the new kits will correlate with that from the old one, and what the correlation factor is if there is a correlation.

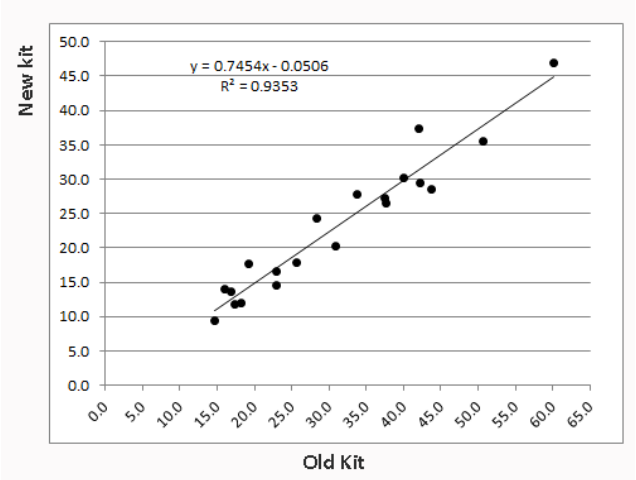

Figure 1. Analysis of lot-to-lot kit comparison data. In this hypothetical case, the test values with the new kit are ~75% of those from the old kit.

How do you perform lot-to-lot comparison?

Lot-to-lot kit comparison involves testing positive samples using the old and new kits side-by-side (on the same day). That is, lot-to-lot comparison should be completed before the old kits expire. This may be difficult to do because sometimes kits expire in 2-4 months. However, it is important to know that a side-by-side lot comparison is the most accurate because it avoids potential variations from the samples themselves. For example, suppose we test some samples at certain time point and then test them again one year from the initial testing using a different lot of kit, and we find the values differ by 15%. We wouldn't know whether the difference is caused by the variation of the kits or changes in the samples during storage. Additionally, if the samples require any pre-treatment before testing, lot comparisons must be performed side-by-side to avoid potential variations derived from the pre-treatment. If there is no pre-treatment involved, and it is proven that the analyte level would not change during a prescribed time in storage, we could consider lot comparisons after the old kits have expired. However, a fresh (unused) aliquot of samples must be used.

At least 37-40 positive samples are needed, and samples should cover a wide range of positive values (the low positives as well as the high positives). Testing results from the old and new kits are plotted using GraphPad Prism or Microsoft Excel, and a linear curve fit (trendline) as well as bias-analysis is obtained. Figure 1 shows a typical lot comparison data analysis. A R^2 of 0.85-1.00 will be considered acceptable. The slope of the fitting line is the correlation factor, with an acceptable range (i.e. one not requiring correction) of 0.85-1.15. An ideal correlation factor is 1.00.

What will happen if lot comparison fails?

If the new kit does not correlate well with the old kit in a side-by-side comparison (i.e. $R^2 < 0.85$), we will inform the kit manufacturer to see if they are aware of any issues. A reputable company would review our data against their own QC data, run tests and communicate potential complaints from other clients. We may be able to obtain a different lot to do another comparison if we still have samples available.

What we have learned about lot-to-lot comparisons

Lot-to-lot kit comparisons are standard practice in clinical labs in order to ensure test results comparability and reproducibility over the years. It is important to understand that keeping lot-to-lot consistency is a major quality control (QC) effort and companies differ in their QC guidelines. Thus for large longitudinal studies, it is important to choose the assay kit from the right company. Over the years we have experienced kit discontinuation due to low business volume or company buyout. We have also experienced inconsistent lots from a reputable company that produces IVD kits. Therefore, lot inconsistency is a real issue that can be avoided with careful planning and testing.