TECHNICAL ARTICLE

Back-to-Basics #5: Tailing

So far in this Back to Basics series, all the peaks we've looked at are symmetric. The ideal peak in an HPLC chromatogram is Gaussian in shape, with an equal amount of distortion on the front and back edge of the peak. However, in the real world, this is rarely the case – most peaks tail. Because excessive peak tailing is an indication that something is wrong, it is a good idea to include a measure of peak tailing as part of the system suitability measurements.

Peak tailing is most commonly measured in one of the two ways shown in Figure 1. In the pharmaceutical industry, the tailing factor, TF, is used. This may also be referred to as the *USP* tailing factor or the *EP* tailing factor, for the *United States Pharmacopoeia* or *European Pharmacopoeia* , two of the regulatory bodies generating guidelines for pharmaceutical HPLC methods. The tailing factor is determined by drawing a perpendicular line from the peak centre to the baseline of the peak. Then the peak width and the front half-width are measured for the peak at 5% of the height of the peak. The tailing factor is simply the entire peak width divided by twice the front half-width (Figure 1, left side). For a perfectly Gaussian peak, the front half-width will be exactly half the entire peak width, so the tailing factor will be 1.0.

The non-pharmaceutical world tends to use the asymmetry factor instead of the tailing factor to measure peak tailing. The asymmetry factor is based on the front and back half-widths of the peak, but these are measured at 10% of the peak height. The asymmetry factor is determined by dividing the back half-width by the front half-width (Figure 1, right side). As with the tailing factor, a Gaussian peak will have equal half-widths, so the value of the asymmetry factor for a Gaussian peak will be 1.0.

One might wonder why there are two different ways to measure peak tailing, and I really don't have a clue. In fact, there are other less popular methods, too, such as the tau-sigma technique. You can see from the data of Table 1 that there isn't much difference between the values of As and TF at values less than approximately 2, but the numbers diverge as they get larger. Which one is better to use? I don't think it makes much difference, so it is best to employ the technique used most commonly in your industry or dictated by your company's policies.

The important practice is to calculate the peak tailing consistently, and on a regular basis, such as in your system suitability test. As we'll see in the next article, peak tailing (As or TF) of less than ≈2 usually is acceptable. An increase in tailing can be an indication of column failure, poor mobile phase preparation, or some other chemical change in the system.

This technical article was produced in collaboration with John Dolan, best known as one of the world's foremost HPLC troubleshooting authorities.

Figure 1

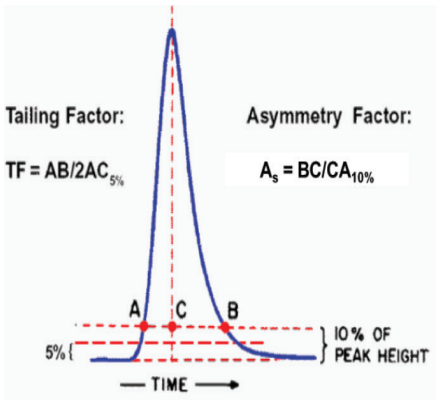

Table 1

A_s (at 10%)	TF (at 5%)
1.0	1.0
1.3	1.2
1.6	1.4
1.9	1.6
2.2	1.8
2.5	2.0