Each particular type of pill counting equipment has sources for counting errors. For the purposes of this analysis we shall break pill counters down into 3 basic types: 1. the counting tray (manual counting), 2. the pill counting scale (count by weight), and 3. the mechanical-optical counter (count by optical detection).

The **counting tray**, where a tongue depressor, or equal, is used to sweep pills (that have been poured out in quantity on to a flat counting surface) in small groups (5 at a time is popular) into a script groove on one side of the tray, the operator keeping count in their head, until the desired quantity for the script is counted into the script groove, then the excess pills are swept into a return groove on the opposite side of the tray. The pills in the script groove are poured into the customers vial, and the excess pills are returned to the supply bottle. Sounds easy enough, but try doing several hundred in one day against the usual hubbub of a pharmacy.

The error sources here are all human. The counting errors are largely the result of human fatigue, and the probability of an error increases with the size of the count and the number of scripts done in the day. Studies have been done and error rates of 0.4% seem to be typical (4 counting errors per 1000 scripts).

The desire to reduce the workload on the pharmacist, along with reducing the pill counting error rate, led to the National Committee on Weights and Measures (NCWM) making it legal **to count drugs by weight**
in the pharmacy provided that only scales certified by the National Type Evaluation Program (NTEP) were used for this purpose.

These **scales** are precision devices and the major source of counting errors in this technique is in establishing a valid Average Piece Weight (APW) for the pills to be counted. Some of the questions that impact APW accuracy are the size of the sample used to establish the APW (30 pills is better than 10), the sample count must be correct, and the APW should be updated periodically to keep weight data current. The counting errors are usually very small (+/-1pill) and just as likely to be high as low. Counting errors are rare if the APW database is kept current.

The **optical counter** will make mistakes if its optical detector gets dirty (and the large number of uncoated generics that powder makes sure that they will get dirty, this also causes cross

contamination), it may have problems with liquid gel caps that are translucent, it may miss a pill if it travels thru the optical path overlapped on another pill, it may count a broken pill as two pills. The counting errors due to dirty optics and overlapped pills cause extra pills in the vial. The counting problems due to translucent pills can be in either direction. Keeping the pill path and the optics clean will eliminate the majority of the errors made in these systems (and the cross contamination).