

THE BERNARD M. BARUCH COLLEGE

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HERBERT ARKIN
Professor Emeritus

April 20, 1981

Mr. Allan Topol
Covington & Burling
888 Sixteenth Street, N. W.
Washington, D. C., 20006

Dear Mr. Topol,

I have analyzed the two sets of data which you sent me. The first set of data for 47 brands included not only TPM (dry), nicotine and carbon monoxide measurements as determined by the new type of smoking machine, but measurements for the same brands using the same sample obtained by the prior method. The second set of data provided TPM(dry), nicotine and carbon monoxide (CO) measurements for an additional 140 brands using the new machine only.

The Two Measurement Methods

For the 47 brands for which measurements of TPM(dry) and nicotine by both the new machine and the prior method, the TPM and nicotine values were in close agreement by the two methods.

For these 47 brands, all but one showed a difference between the values obtained by the two methods for TPM(dry) not exceeding 0.6 mgm. for a given brand average. The one exception showed a disparity of 1.0 mgm. but that was for a high TPM brand and only constituted only 4.5% of the value. The coefficient of correlation for the two sets of TPM(dry) values was .9991.

For the nicotine measurements for the 47 brands there was an equally close set of values by both methods and with one exception the brand averages differed by less than .04 mgm. The one exception was for the same brand as previously mentioned and amounted to 0.06mgm or only 3.3% of the estimate.

These data indicate that the new machine, as operated by TITL, can produce replicatable and consistent measurements for TPM(dry) and nicotine. It should be emphasized that the presently available data do not assure that an equal reliability and consistency will be obtained when operated in another laboratory such as that of the FTC.

Carbon Monoxide (CO) Measurements

Data were supplied which included carbon monoxide (CO) measurements for 187 brands as obtained on the new machine of the type used by the FTC laboratory but operated by TITL.

It is interesting to note that the CO measurement values were about the same order of magnitude as the TPM (dry) values for the same brands. The average (arithmetic mean) for the carbon monoxide values was 12.31 while for TPM it was 12.55 for the 187 brands.

The carbon monoxide measurements for the brand averages ranged from 0.6 mgm to a high of 24 mgm for the brand averages. The brand to brand variability of the CO measurements was appreciably less for these values than for TPM(dry). The standard deviation of the brand averages for the CO measurements was 4.78 mgm as compared with 6.47 mgm for TPM(dry).

A more important form of variability, however, is the within brand variability since this determines the sampling error of the average brand value. For the 140 brands for which standard deviation values were supplied, the average within brand variability was appreciably higher for the CO measurements than for TPM(dry) values. The average within brand standard deviation for the CO measurements was 3.35 mgm as compared with 2.94 mgm for the TPM measurements.

On the basis of these data, the conclusion may be drawn the sample size for CO measurements would have to be increased at least 30% to achieve the sample precision (sampling error) as that previously obtained for TPM(dry).

Not only were the values of the CO measurements of the same general magnitude as the TPM (dry) values, but for those brands with TPM average values of less than 16 mgms, there was a very close association between the CO and TPM values for each brand. The coefficient of correlation for the association between the CO values and the TPM values for the same brands was .9766 for brands with a TPM average of less than 16 mgm.

This association is so close that for these brands, a reasonable approximation of the CO value for a brand with a known TPM(dry) can be obtained by merely adding 0.8 to the TPM (dry) value. * This method of approximation when applied to the 145 brands with TPM averages of less than 16 mgm produced estimates which for 80% of the brands were within 1.0 mgm and for 90% within 2 mgm.

* A more precise estimate can be obtained from:

$$CO = .79 + .997 \text{ TPM}$$

However, an unusual feature of this association was that it was not true of brands with TPM(dry) averages in excess of 16 mgm.. The coefficient of correlation for the association between the CO and TPM(dry) values for those brands was only .1712.

It was found that in many cases the corresponding CO values for high tar brands was unexpectedly low. In a number of instances the CO measurements for a given brand with a high TPM value was lower than that for other brands with much lower TPM averages.

General

The supplied data enables the conclusion that [the new machine as operated by TITL produces reliable results which are consistent with prior methods for TPM and nicotine measurements.] These data will make possible a comparison of CO measurements with those contained in the forthcoming FTC report. ✓

However, in order to audit the accuracy of the FTC results, it will be necessary to have available more than the computer summary presently provided for the TITL data. The input information including run results and deletions will be needed.

Sincerely,



Herbert Arkin