LETTERS TO THE EDITOR

COMPARATIVE EVALUATION OF THE PAPER CHROMATOGRAPHIC AND HPLC METHODS FOR THE DETERMINATION OF URINARY HIPPURIC ACID

Since Elkins¹⁾ established the concept of excretory and biological threshold limits, biological monitoring has assumed an increasingly important role in strategies for the evaluation of exposure intensity, in accordance with the development of more specific and convenient methods for the determination of index chemicals in biological specimens. Such development, however, has made it necessary to establish a conversion algorithm from results obtained by one method to those obtained by another so that accumulating information can be evaluated on the latest scale. In preceding work²⁾, a conversion formula was established to compare results obtained by either colorimetry, gas liquid chromatography (GLC) or high performance liquid chromatography (HPLC) for the determination of urinary hippuric acid, an important measure of toluene exposure³⁾. To supplement that report, paper chromatography, a somewhat old yet valuable method of analysis, was studied in comparison with HPLC to enable conversion to be made between the results obtained by any one of the four leading methods.

The subjects studied were 19 workers (8 males and 11 females) in a handwork craft plant where the adhesives in use contained toluene and *n*-hexane at 20–30% and 25–35%, respectively. The toluene exposure in terms of 8-hour time-weighted averages ranged from 3 ppm to 70 ppm as measured by carbon field dosimetry⁴⁾. Urine samples, passed on and off work and totalling 128 (i.e., mostly 7 samples per person), were subjected to analysis for hippuric acid both by paper chromatography after Ogata *et al.*⁵⁾ and by HPLC after Ogata *et al.*⁶⁾ The values obtained by paper chromatography (*x*) are plotted on the horizontal axis in Fig. 1 against those by HPLC (*y*) on the vertical axis. The calculated regression line was:

$$y=1.195x+0.022 \quad (r=0.896; n=128)$$

where the units of *x* and *y* are both mg hippuric acid/ml urine. The very small intercept on the *y* axis and the high correlation coefficient enable approximation to 1.2 times *x* as *y* and *y* divided by 1.2 as *x*. Accordingly, the values obtained by either of these two leading methods can be readily converted to those which should be obtained by the other.

The present results in combination with the preceding observations²⁾ indicate that, after calculation following a given conversion formula, the urinary hippuric acid levels as measured by any of the two old methods of colorimetry and paper chromatography can

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Fig. 1. Comparison of results between paper chromatography and HPLC. Open and solid circles are for males and females, respectively. The line is the calculated regression line expressed by

$$y = 1.195x + 0.022 \quad (r = 0.896, n = 128)$$

where x is hippuric acid (mg/mL) as measured by the paper chromatographic method and y is hippuric acid (mg/mL) as measured by the HPLC method.

be compared with results obtained by the latest methods of GLC and HPLC. It should also be noted that the specificity of paper chromatographic analysis for urinary hippuric acid is comparable to those of GLC and HPLC as indicated by the high correlation coefficient of 0.896 (Fig. 1), and higher than that of colorimetry²⁾.

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