ions in presence of mercury vapor; (ii) impurities in commercial grade gelatin can replace chromate, although the radii are weaker in this case; (iii) migration of colloidal particles is not responsible for the formation of radii; (iv) a minimum of 2 to 3 μg of mercury per square centimeter of active gel surface is necessary. Further work on the subject is in progress.

References

1. H. Friedeberg, *Nature*, **152**, 305 (1943).
2. W. Ostwald, *Lehrbuch der Allgemeinen Chemie* (2nd ed., 1902) vol. 2, p. 778.
3. ———. *Kolloid Z.* **36**, 380 (1925).
4. A. C. Chatterji and N. R. Dhar, *Kolloid Z.* **40**, 97 (1926).

Received November 6, 1953.

A New Technique for Quantitative Paper Chromatography

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Paper chromatography has been adapted to quantitative analysis. At first only a rough approximation by means of matching colored spots, it has developed into a precise technique of photoelectric scanning (*1, 2*). But even these methods using a densitometer have errors at times as large as 5 to 17 percent (*2, 3*), because the exact technique of measuring the area of a spot that has been spread over on the filter paper is rather difficult. The author has devised a technique involving optical scanning that makes the measurement easier and the quantitative determination of the paper chromatogram more accurate.

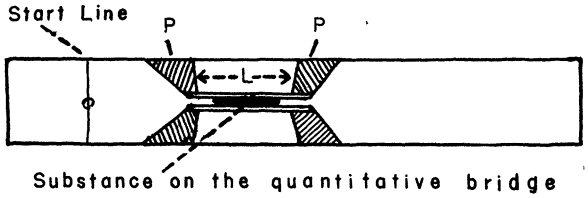

Fig. 1. Diagram showing technique employed.

Figure 1 shows this technique. Make a narrow passage (quantitative bridge) where the substance should be developed. The width of the passage should be 2 to 5 mm and the length about 30 to 100 mm, these dimensions being made commensurate with the quantity of substance. Cut off the side of the passage (bridge) with a sharp razor. Heated solid paraffin should be absorbed at P, so that the developer may ascend only through the bridge.

When a substance is developed into this bridge, the length of the colored zone is determined by the degree of the concentration of the substance, and this length can easily be determined by eye-measurement after some experience. Figure 2 shows this relationship between the concentration C of the substance and the length L of the colored zone. This relationship is

$$\log C = 1.26 \log L - 0.78, \qquad C = 0.167\, L^{1.26}.$$

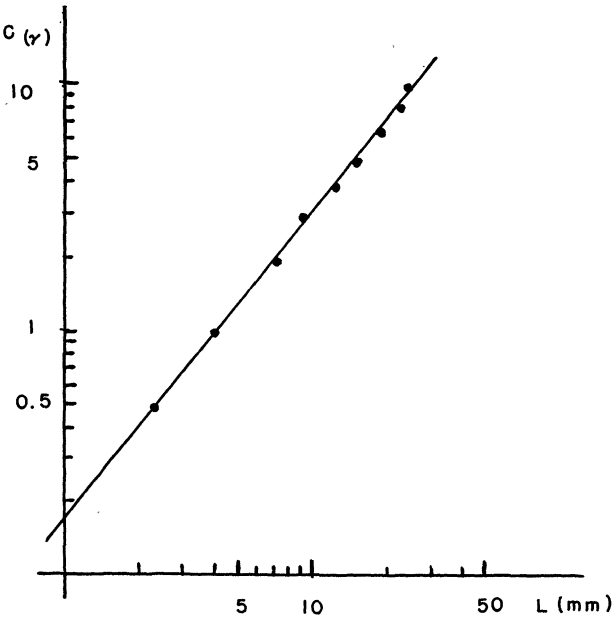

Fig. 2. Concentration of substance versus length of colored zone. Developer: butanol; athanol; 0.5N $NH_{aq.}$-6: 2: 3. Substance, auramine, 0.5 to 10 gamma. The bridge, of width 2 mm, was situated about 20 mm from the start line. Temperature, 28°C.

In measuring a mixture of two or more substances, one should first find separately the locus where each substance would develop itself and then make a bridge on the suitable locus.

Figure 3 shows the relationship between the length L of the colored zone and the width W of the quantitative bridge when we used 10 gamma auramine. The length is calculated by the following equation with error less than 1.8 percent:

$$\log L = 1.83 - 0.48 \log D, \qquad L = 67.5 \times D^{-0.48}.$$

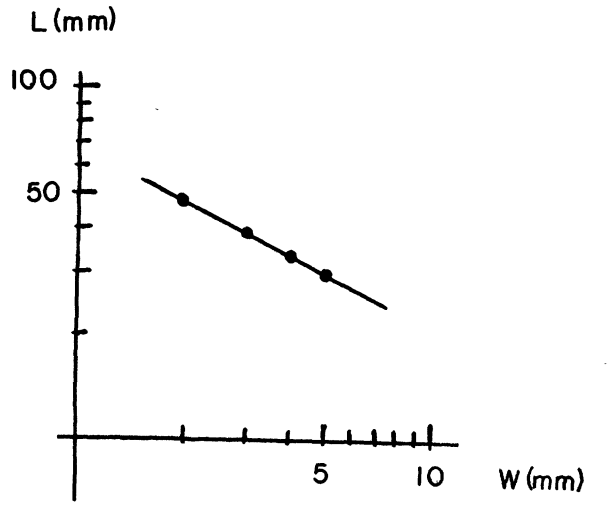

Fig. 3. Length of colored zone versus width of bridge for 10 gamma auramine.

If the substance being developed on the bridge is scanned with a thin light whose width is adjusted to that of the bridge, one can get more accurate quantitative results than by the prevailing method, in which one has some difficulty in measuring the irregular form of the colored zone on the filter paper accurately.

In this method, one should not use paraffin if it is soluble in the developer. In such case, the middle sections (*L*, Fig. 1) should be cut off and replaced by some other sort of reinforcement.

References

1. R. J. Block, *Anal. Chem.* **22**, 1327 (1950).
2. E. F. McFarren, K. Brand, and H. R. Rutkowski, *Anal. Chem.* **23**, 1146 (1951).
3. W. M. Welch Scientific Co., Densichron Densitometer for Quantitative Paper Chromatography.

Received March 15, 1954.

A Theory to Explain the Geographic Variations in the Prevalence of Histoplasmin Sensitivity[1]

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Geographic variation in the occurrence of histoplasmin sensitivity in human beings was first demonstrated soon after the discovery of a benign form of histoplasmosis (*1*). This variation, which is of great epidemiologic significance, has evoked considerable interest, and several theories (*2–5*) have been advanced to explain it. None have gained very wide acceptance, however. It is the purpose of this note to propose yet another theory to explain observed differences in the prevalence of histoplasmin sensitivity.

Histoplasma capsulatum, the specific etiologic agent of histoplasmosis, has been recovered from human beings, from a variety of animals, and from several inanimate sources. Current knowledge indicates that histoplasmosis is not contagious, and that neither human beings nor animals are sources or reservoirs of the disease. The causative fungus has been found most frequently in soil, and it is quite generally agreed among investigators that soil is probably the commonest and most important source of *H. capsulatum* in nature. If this is indeed so, it is logical to suggest that differences in characteristics of soil may account for geographic variations in the distribution of the fungus and, consequently, in the prevalence of histoplasmin sensitivity.

Quite by chance I saw a soil map of the United States and was struck by the similarity in distribution of red-yellow podzolic soils and the areas of highest prevalence of histoplasmin sensitivity. The correlation was not perfect by any means but appeared to be of a sufficiently high order to stimulate further study. Accordingly, the data of five reported American studies were pooled (*1, 6–9*) and summarized. The literature was combed for reports of histoplasmin sensitivity studies elsewhere in the world (*4, 10*), and these data were similarly analyzed. The results are shown in Table 1. Throughout the world there appears to be a significantly higher proportion of histoplasmin reactors in areas where red-yellow podzolic soils predominate. The probability that the observed differences could have occurred by chance is extremely remote.

TABLE 1. Prevalence of histoplasmin sensitivity in the United States and in the rest of the world, by soil group.

Soil group	United States			Rest of the world		
	Number tested	Number positive	Percentage positive	Number tested	Number positive	Percentage positive
Red-yellow podzolic	13,300	4633	34.8	14,712	2957	20.1
Other soils	12,853	2526	19.7	28,307	1305	4.6

The new theory to explain geographic variations in the prevalence of histoplasmin sensitivity is simply this: The characteristics of soil determine variations in the occurrence of *H. capsulatum* in nature. Of all soils, the red-yellow podzolic soils offer the best natural medium for the growth of *H. capsulatum*. Consequently, in areas where this soil predominates, the prevalence of histoplasmin sensitivity may be expected to be higher than in other areas.

A more detailed discussion of the theory and its supporting evidence will be published elsewhere (*11*).

[1] Part of a paper "Recent developments in the epidemiology of histoplasmosis" presented to Section on Public Health, Southern Medical Association Forty-sixth Annual Meeting, Miami, Fla., Nov. 11, 1952, with additional data.

References and Notes

1. A. Christie and J. C. Peterson, *J. Pediat.* **29**, 417 (1946).
2. M. L. Furcolow and J. Sitterley, *J. Kansas Med. Soc.* **52**, 584 (1951).
3. W. G. Beadenkopf and C. G. Loosli, *J. Am. Med. Assoc.* **146**, 621 (1951).
4. A. Mochi and P. Q. Edwards, *Bull. World Health Organization* **5**, 259 (1952).
5. H. A. Tucker and N. Kvisselgaard, *Bull. World Health Organization* **7**, 189 (1952).
6. W. G. Beadenkopf, *et al., Am. J. Hyg.* **57**, 328 (1953).
7. C. E. Palmer, *Public Health Repts.* **61**, 475 (1946).
8. C. E. Smith, *et al., Am. J. Public Health* **39**, 722 (1949).
9. C. G. Loosli, *et al., Am. J. Hyg.* **53**, 33 (1951).
10. Many reports too numerous to cite individually.
11. L. D. Zeidberg, *Am. J. Trop. Med. and Hyg.* In press.

Received January 7, 1954.