is regarded as the solvent, which corresponds with the experimental procedure. Dilute solutions with nitromethane as solute follow this law to the extent that Raoult's law is followed as stated above. As to chloroform as solute, data were not obtained at low enough concentrations to determine if the ratio between concentration in the oil phase and pressure in the vapor phase would be constant in dilute solution.

Solubility of nitromethane in olive oil and in water. The solubility determinations were made by the synthetic method, using total quantities of about 5 grams in sealed glass tubes. Temperatures at which turbidities appeared or disappeared could be determined over a range of about 0.5°. The data obtained are recorded in Table 2.

New Rectal Culture Tube[1]

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The importance of examining material obtained directly from the intestinal wall in the diagnosis of infectious diarrheas has been stressed in recent years by students of the subject. The sigmoidoscopic mucosal crypt aspirator has been described elsewhere (*1*). It is essentially a heavy-walled capillary tube 40 cm. in length, with the distal 2.5 cm. bent 15 degrees for better approximation of the tip to the intestinal mucosa. At the point of bending, the capillary canal is blown into a small elliptical-dilatation of sufficient size to hold two or three drops of aspirated material. This instrument requires the use of a sigmoidoscope, and it is applied to the mucosa by direct vision.

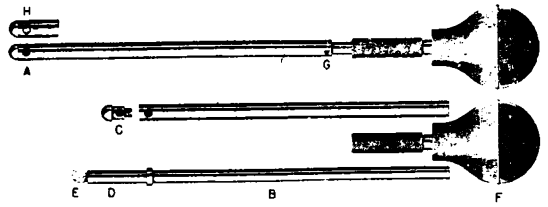

FIG. 1

The new rectal culture tube (Fig. 1) may be used without the aid of the proctoscope or sigmoidoscope. It consists of a metal outer tube 18 cm. in length with a round opening 0.5 cm. in diameter (A) near its distal end. An inner tube (B) screws into a detachable receptacle (C) with smooth tip 1.4 cm. in length and containing a shallow trough. When fitted together, the trough coincides with opening A in the outer tube and may be opened or closed by a quarter turn at D, which represents the proximal end of the inner tube, containing a cotton filter (E), to which a small aspirating rubber bulb (F) is attached.

In actual use, the sterile, assembled, rectal culture tube (without rubber bulb), contained in a stoppered sterile test tube, is removed and lubricated at its distal end (A) by dipping it into sterile glycerine. The rubber bulb is attached to the proximal end. The metal tube, with receptacle at A closed, is then inserted into the rectum for a distance of approximately 10 cm. The inner tube is given a quarter turn, indicated by an arrow at G and a small stop at H. This opens the receptacle at A, which is then applied to the rectal mucosa. The exudate is aspirated into the receptacle, which is promptly closed by a quarter turn in the reverse direction, and the instrument is removed from the bowel. The material may be cultured and wet smear studies made at once by opening the receptacle and blowing out the aspirated material on suitable culture media and slides; or the closed instrument can be dropped into the original test tube and transported to the laboratory. Sterilization and cleaning of the three simple components of the instrument are effected quickly, efficiently, and economically.

[1] The author wishes to acknowledge the assistance given him by Clay-Adams Company, 44 East 23rd Street, New York City, in the designing of this tube.

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Comparison of Hematocrit Methods[1]

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In connection with a study on relative corpuscle and serum (plasma) volumes in blood, selection of a reliable hematocrit method has become a matter of primary concern. While the physical factors which affect the final volume of centrifugally packed corpuscles are well known (*4*, *5*, *6*), this information is frequently ignored in practice, with the result that many different forms of apparatus have been proposed and are in common use for routine work. In these experiments, three such methods were compared, first, as to their reliability in detecting known dilutions of blood, and second, as to differences among the absolute measurements obtained.

The comparisons were made on each of 10 samples of defibrinated beef blood, and on 3 dilutions of each sample with its own serum. The dilutions contained 90, 80, and 50 per cent of whole blood, respectively.

The types of hematocrit tubes employed and the details of centrifugation were as follows:

Method 1. Straight-walled glass tubes of the Daland (*1*) type, 50 mm. long with 1-mm. bore, were rotated in a standard Daland head at 12,000 r.p.m. and 4.7-cm. effective radius (centrifugal force, approximately 7,500 × G) until constant sediment volumes were obtained. This usually required less than 10 minutes of actual spinning and in every instance caused translucence of the sediment column (*3*).

Method 2. Straight-walled glass tubes of the Wintrobe (*7*) type, 11.5 cm. long with 3-mm. bore, sealed at one end, were rotated in an International centrifuge at 3,000 r.p.m. and 14-cm. effective radius (centrifugal force, approximately 1,400 × G) for one hour.

Method 3. Ordinary, tapered, graduated, 15-ml. centrifuge tubes, containing 10 ml. of blood, were rotated at the same time and under the same conditions as described for Method 2, following closely the recommendations of Haden (*2*).

All tests were in duplicate, the pairs being centrifuged simultaneously. Paired observations differed by 1.0 volume per cent or less in 95 per cent of the tests.

[1] Presented before the 31st Annual Meeting of the Federation of American Societies for Experimental Biology, Chicago, Illinois, May 18–22, 1947.

Typical results are presented in Table 1. Table 2 summarizes the data, giving the major statistical constants for relative volumes of red cells, errors in prediction of dilution, and deviations from the results ot an arbitrary reference standard.

TABLE 1

Sample No.	Whole blood in mixture (%)	Relative volumes of red cells (Vol. %)		
		Method 1	Method 2	Method]3
4	100.0	40.5	41.1	41.3
	90.0	35.5	36.8	37.5
	80.0	32.0	32.4	34.1
	50.0	20.0	19.8	20.4
5	100.0	44.5	47.0	48.3
	90.0	40.5	42.0	43.0
	80.0	36.0	36.6	37.2
	50.0	22.5	22.9	22.6
6	100.0	46.0	46.2	47.8
	90.0	41.0	41.9	42.3
	80.0	36.5	36.8	39.0
	50.0	23.0	23.3	24.3

With regard to the actual hematocrit values obtained, the methods yielded slightly different but statistically indistinguishable means and variance for the entire series and at each dilution level (Table 2, A).

TABLE 2

Method No.	Obs.	Mean	S.E.	Max.	Min.	Alg. mean	Distribution of errors		
							Under 1%	Under 3%	Under 5%
A. Relative volumes of red cells									
	No.	Vol. %	Vol. %	Vol. %	Vol. %				
1	44	35.5	1.3	52.0	18.5				
2	38	35.7	1.6	53.5	18.3				
3	38	36.6	1.6	54.1	19.0				
B. Errors in prediction of dilution									
	No.	%	%	%	%	%	% of obs.	% of obs.	% of obs.
1	33	0.95	0.12	2.78	0.00	−0.29	51.5	100.0	100.0
2	28	2.05	0.29	5.50	0.00	−1.89	42.9	75.0	96.4
3	28	1.95	0.28	6.40	0.00	−1.34	32.1	78.5	96.4
C. Deviations from results by Method 1*									
2	38	2.20	0.26	7.30	0.33	+1.51	13.2	73.7	92.1
3	38	3.53	0.31	8.54	0.00	+3.53	10.5	39.5	81.5

* Method 1 was arbitrarily taken as a standard to illustrate the magnitude of differences among the methods.

With respect to quantitative detection of blood dilution, the various methods yielded the errors summarized in Table 2, B. The mean error for Method 1 was significantly lower than those for the remaining methods. Further, all errors for Method 1 were less than 3.0 per cent of the expected value, an accuracy attained in about three-fourths of the tests for Methods 2 and 3. The algebraic mean for all methods was negative in sign, indicating a preponderance of relatively low readings for the diluted samples. This feature was much less prominent for Method 1 than for the other methods. Methods 2 and 3 were about equivalent in reliability, while Method 1 was definitely superior from the standpoint of revealing degree of blood dilution.

Table 2, C, contains an analysis of individual deviations among the methods, based on Method 1 as an arbitrary reference standard. The difference between the means was significant, and the variance indicated definite disparity between the two methods, although the total range was about the same for both. With regard to distribution of these deviations, Method 2 was superior to Method 3, especially as to errors less than 5.0 per cent. The algebraic mean for both methods was positive in sign, indicating a tendency for both of these procedures to yield high results in comparison with Method 1. Results for Method 3 exceeded those for Method 1 in 95 per cent of the observations. Readings for Method 3 exceeded those for Method 2 in about three-fourths of individual comparisons, while the latter were greater than the values for Method 1 in roughly the same proportion. Degree of dilution did not significantly affect the relative differences between the values for Method 1 and those for the other methods.

The three hematocrit methods studied, involving widely different varieties of tubes and different conditions of rotation, produced results which, on the average, were not seriously divergent. At the same time, differences among the methods appeared in the comparisons of results on individual samples and in the accuracy with which known dilutions of blood were revealed by hematocrit observations. Method 1 was the most satisfactory from both points of view, yielding, in general, the lower hematocrit values and measuring degree of dilution with an average error of less than 1.0 per cent. The further advantages of speed and minimal blood requirement were obvious. Method 2 was generally more satisfactory than Method 3. Although it was no more accurate in revealing dilution, it gave results more nearly approximating the values for Method 1, and the distribution of its errors and deviations was more favorable. The amount of blood required was not excessive, and no special equipment, aside from the tubes, was necessary. Method 3 was considered the least reliable. Its accuracy in detection of dilution, while comparing favorably with Method 2, was distinctly inferior to Method 1. Furthermore, results obtained by Method 3 were consistently higher than those of other methods—a significant point in view of the general criticism of centrifugal methods, namely, that cell volumes so determined are always high because of the presence of fluid in the sediment.

The study indicated that, for problems demanding a high degree of accuracy, commonly employed hematocrit techniques are not equivalent, and that average comparative results are not necessarily trustworthy criteria of the general reliability of such methods.

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