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THE EFFECT OF ROOM TEMPERATURE ON ERYTHROCYTE SEDIMENTATION RATE AND ITS CORRECTION

BY

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It is not generally realized that erythrocyte sedimentation rates may double with variations in room temperature normally found in wards and laboratories in Great Britain and other temperate climates. A patient attending a chest clinic in April and July with an actually unchanged erythrocyte sedimentation rate may show a marked increase in rate purely due to increased room tempera lure. From July to October the reverse would occur. In the follow-up of tuberculosis this is of great importance.

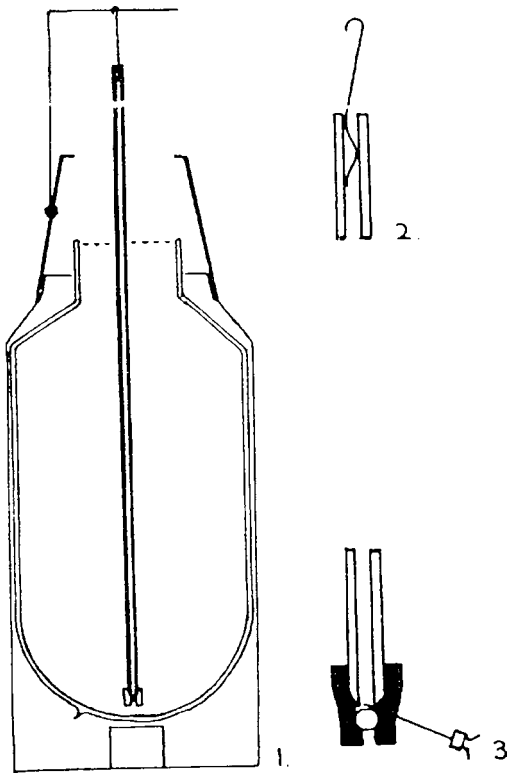

FIG. 1-1 Selection of "thermos" flask showing tube suspended in water. 2. Method of hanging tubes. 3. Method of sealing lower end of tube showing position of needle for filling.

Many workers have noted that sedimentation rates vary with room temperature. The early workers believed that the changes in room temperatures normally found did not affect the rate to a significant degree. Weingarten (1945) using Westergren's method performed the test on each patient at 44°F. and 99° F. In many of the tubes at 44°F he observed red blood cell clumping causing sedimentation at faster rate then in the tubes at 99°F., where clumping was not seen. By using an abnormally low temperature (44° F.) he was not able to show any relation between room temperature and sedimentation rates.

Rogers (1946) showed that temperatures below 15°C. (59°F.) should never be used, as the results are not trustworthy. Wartman (1946) prepared a correction graph for variations in room temperature using the method of Wintrobe and Landsberg. From personal experiments using Westergren's technique, it was found that variations in room temperature affected sedimentation rates in

Table
ERYTHOCYTE SEDIMENTION A RATE IN PATIENTS

Patient No.	Temperature				
	55° F	65° F	75° F	85° F	95° F
	12.8°C	18.3°C	23.9°C	29.4°C	35° C
1	3	4	5	7	9
2	6	8	10	13	17
3	7	9	11	14	20
4	7	9	12	17	24
5	9	10	13	17	21
6	18	18	21	25	32
7	16	19	23	29	35
8	28	32	38	46	58
9	29	34	40	49	59
10	35	40	48	57	69
11	40	44	53	63	72
12	40	46	54	65	76
13	63	60	71	89	102
14	87	75	80	86	103
15	87	94	101	114	130

ROOM TEMPERATURE AND ERYTHR OCYTE SEDIMENTATION RATE

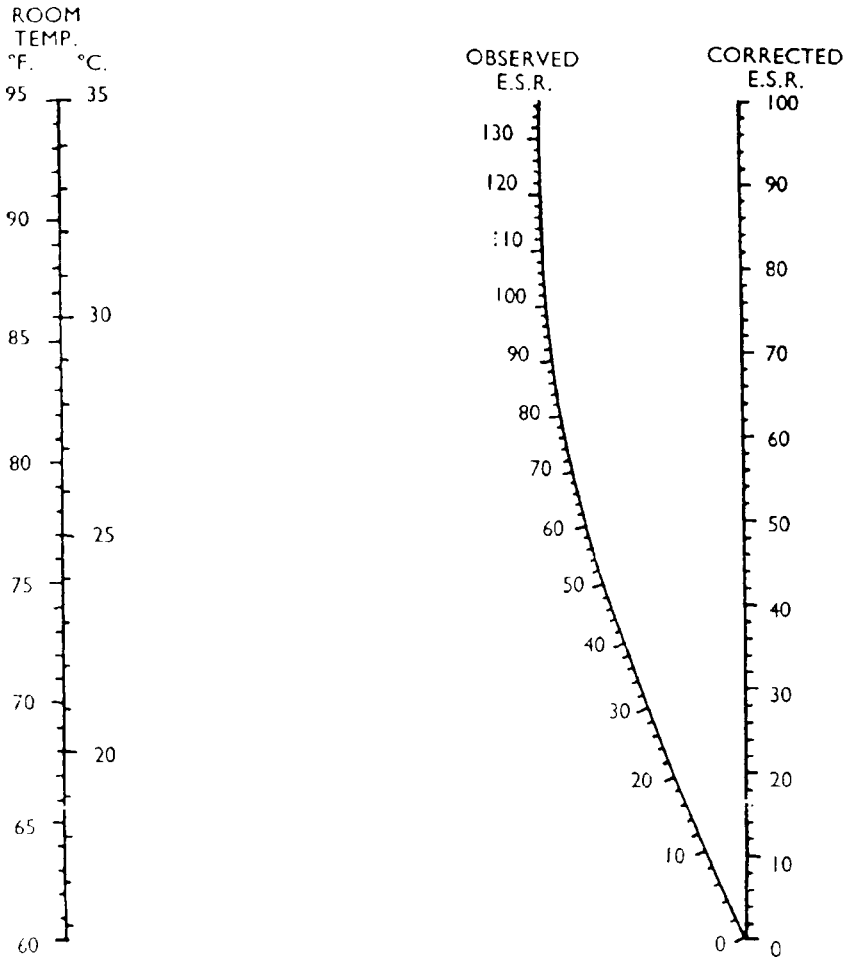

Fig 2 Nomogram for the correction of erythrocyte sedimentation rates by Westergren's method for variations in room temperature.

Westergren tubes to a greater extent and over a greater range then those shown by Wartman to occur in Wintrobe tubes. This is due to the difference in height of the columns of blood the two tubes, the influence of packing being less marked in the taller column.

Experimental

Dry. sterile 10 ml. syringes and 22 S.W.G. needles were used, and all blood was taken by the author from male and female patients under treatment for pulmonary tuberculosis. First 1.5 ml. 3.8% sodium citrate was drawn into the syringe and 6 ml. of venous blood was withdrawn from the patient. These were mixed in the syringe and then introduced into five Westergren tubes. The lower ends of the tubes were sealed by 1 in. lengths of rubber tubing and plastic beads. The blood was introduced through the rubber by the needle as shown in Fig. 1. The tubes were hung by a clip from a wire loop gallows fixed to the cap of "thermos" flasks filled with water at 55° F., 65°F., 75°F., 85°F. and 95°F. This ensured that the tubes were vertical and that the whole column of blood was below the surface of the water. An initial series was preformed to show that sedimentation rates by this us method were comparable to those in the Standard rack in air at equivalent temperatures.

Results

One hundred and forty-eight estimations were performed on 33 patients. Fifteen series of results are given as examples. The table shows the sedimentation rates in one hour found at the temperatures shown.

Numbers 13 and 14 show the increased rates at 55°F. due to clumping.

A nomogram compiled from the experimental results is given Fig. 2.

The nomogram is used by finding the room temperature on the first scale and placing a straight edge, e.g., a ruler, through this point and

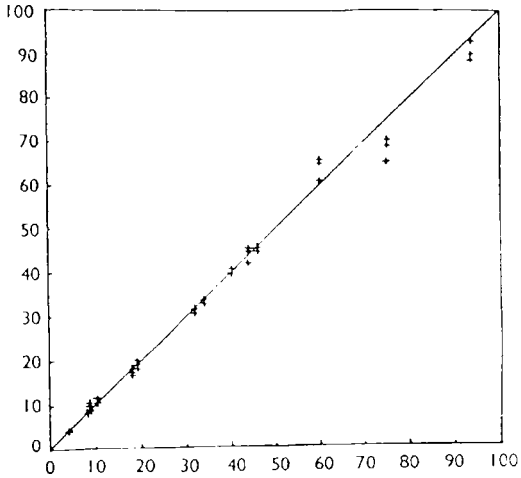

FIG. 3.- Erythrocyte sedimentation rates corrected to 65° F. (vertical scale) plotted against E.S.R.1 observed at 65°F. (horizontal scale).

through the point corresponding to the observed sedimentation rate on the centre scale. The sedimentation rate corrected to 65°F. will correspond to the point on the third scale cut by the straight edge.

To check the accuracy of the nomogram all the observed sedimentation rates at 75° F., 85° F., and 95° F. were projected on to the nomogram and corrected to 65° F. The corrected sedimentation rates were then plotted against the observed sedimentation rates at 65° F, in the scatter graph in Fig. 3.

Summary

The erythrocyte sedimentation rate performed by the method of Westergren is affected to an important degree by normal variations in room temperature. The rates are affected to a greater extent and over a greater range than are those performed by Wintrobe's method.

The correction graph for Wintrobe's method by Wartman does not apply to the Westergren technique.

A nomogram for correction for Westergren s method is given.

I wish to thank Dr, I.J. Grant for permission to perform this work on this patients.

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