

Sedimentation of Erythrocytes:

An Inquiry into its applicability

as a test in various

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Sedimentation of Erythrocytes: an enquiry into its applicability as a test in various conditions of disease.

The rate of sedimentation of red blood cells in citrated blood appears to have been investigated previously by Fahraeus. He showed that the sedimentation was due to the action of haemagglutinins, and that when the red blood cells were agglutinated, they dropped down. To the property indicated by the differences in the rate of sinking down of the red blood cells, he applied the term "suspension stability of blood". According to this term a slow rate of sinking indicated a high degree of stability on the part of the red blood cells. He showed that a reduction in the suspension stability was brought about by an increase in the fibrinogen or globulin protein fractions. His technique was simple. He punctured a vein and allowed the blood to flow into a small tube containing 2 c.c. of 2% sodium citrate solution. The required amount of blood having been run in, the citrate solution and the blood were thoroughly mixed together, and then the tube was placed upright. According to the depth of clear fluid which appeared on the top at the end of one hour, so was the rate of sedimentation of the red cells estimated. From the investigations which he carried out Fahraeus found that the sedimentation rate was increased in all kinds of infection, most distinct when accompanied by high fever; in many cases of malignant tumour and certain varieties of psychoses"

These observations directed other enquiries to the subject, with various modifications of the technique employed. Thus Linzemeier² employed 0.2 c.c. of a 5% solution of sodium citrate. He punctured a vein and drew up blood to the ~~approximate~~ ^{APPROXIMATE} mark on the tube, When the blood was thoroughly citrated, the time was noted for the upper level of the red cells to fall to the various gradations marked on the tube. The results obtained by him corroborated in the main the findings of Fahraeus.

Attention was next directed to the Sedimentation Rate as a possible test in the detection of tuberculous lesions, and as a help in arriving at a prognosis in such affections. Westergren modified considerably the technique that had been employed by Fahraeus, and investigated the sedimentation rate of the erythrocytes in tuberculous patients. He employed a 3.8% solution of sodium citrate to which blood from a vein was added, and then the citrated blood was put in a small test tube where thorough mixing was ensured. The actual sedimentation test was carried out in a glass pipette, and readings were taken, at the end of one and two hours, of the measurement of the column of clear fluid above the upper border of the sedimented corpuscles. As a result of his observations carried out on over three hundred tuberculosis patients, he arrived at the following conclusions:-

- 1) Where the clear fluid column is 3 mm, it is to be regarded as a normal finding in a healthy person.
- 2) Where the column is from 4 to 6 mm, the case should be regarded with doubt and suspicion as to good health.

What he regarded as the pathological results he divided into two main groups:-

- 1) A clear fluid column of 7 to 12 mm, is probably pathological ^{in a} (any allowable element of doubt as to this conclusion being very small indeed, in his opinion)
- 2) A very definite pathological group where the clear fluid measures over 12 mm.

Two American observers, Zeckwer and Goodell, devised a simplified method of determining the sedimentation rate of erythrocytes. For the sedimentation tube they made use of an ordinary glass centrifuge tube of 15 c.c. capacity and graduated in tenths of a c.c. A 3% solution of sodium citrate was employed, 2 c.c. of this solution being placed in the tube. Blood from a vein was then allowed to flow into the tube until it reached the 10 c.c. mark. To ensure citration of the blood, the tube was then inverted several times, and thereafter placed vertically in a rack. Zeckwer and Goodell's method of reading off the result differed from the others mentioned above in that they determined the height of the column of the erythrocytes, and not, as previous observers had done, the clear fluid above the column of red cells. From this it could be deduced that ~~were~~^{was} the height of the column of erythrocytes at the end of one hour was e.g. only half that usually obtained, in such cases the sedimentation rate could be regarded as being very markedly ~~altered~~^{ALTERED}.

From their observations Zeckwer and Goodell divided their cases into four main categories, differentiation into these categories being determined by the degree of sedimentation in each particular case -

- 1) First group comprised those cases where the column of erythrocytes varied between 2 and 4.5 c.c.
- 2) Second group embraced those where the reading was from 4.5 to 5.5.
- 3) Third group, where the erythrocytes occupied 5.5 to 8 c.c.
- 4) Fourth group, where the red blood cells occupied 8-9 c.c.

From their investigations they embodied the main results of their enquiries into the following form, all the readings of the height of the column of erythrocytes being taken at the end of one hour.

In normal patients, they found that on an average, the erythrocytes occupied 7.1 c.c. whereas at the other extreme, so far as readings were concerned, malignant tumour cases occupied 4.2 c.c. Between these two extremes, they found average results for various disease conditions, eg. the average reading for tubercle was 4.4, while acute inflammatory lesions gave on an average a reading of 4.3. They found that in pregnancy the erythrocytes occupied, on an average, 5.8 c.c.

In the investigations ~~of~~^{for} account of which is subjoined, the method of Zeckwer and Goodell was employed, as being the most simple one and the one which could most readily be carried out in general medical practice. The specimen of blood was readily obtainable from a vein at the flexure of the elbow, and a small portable rack was devised to hold the centrifuge tube in a stable vertical position.

The enquiries were conducted with a view to finding whether the results obtained of the sedimentation rate could be interpreted to aid one in the diagnosis or prognosis of any particular disease or group of diseases, and the findings are set forth below.

It was not possible to study a large number of patients afflicted with any one particular disease but from the nature of the results I felt justified in arriving at certain broad conclusions.

(1) Normal Healthy Adults:-

The rate of sedimentation of the ~~erythrocytes~~^{ERYTHROCYTES} in the case of ten subjects was determined. These subjects appeared to be organically

sound and to present no definite evidence of any active disease. Their ages ranged from eighteen to fifty years.

Case 1.	Sedimentation Figure (<u>S.F.</u>)	7.5	c.c. red cells	at one hour.
Case 2.	S.F.	8.4	c.c. red cells	at one hour.
Case 3.	S.F.	7.6	c.c.	" " "
Case 4.	S.F.	7.4	c.c.	" " "
Case 5.	S.F.	6.8	c.c.	" " "
Case 6.	S.F.	7.0	c.c.	" " "
Case 7.	S.F.	7.3	c.c.	" " "
Case 8.	S.F.	7.2	c.c.	" " "
Case 9.	S.F.	7.0	c.c.	" " "
Case 10.	S.F.	7.0	c.c.	" " "

These give an average S.F. of 7.3. So far as was possible uniformity in the time of day at which the specimens of blood were taken was observed.

Cases 1, 3, 5, 7, and 9 had their S.F. again determined after one week's interval and the results obtained were those that had previously been reached.

(2) Tuberculosis:-

The test was employed in patients the subject of tuberculosis, and also in patients whose signs and symptoms, although suspicious of tuberculous lesions, were not conclusive of that disease.

Case 1. Male, aet 29: disease involving upper lobe of left lung, and apex of right lung: scanty sputum (7.B+): afternoon temperature, 98.8-99.4 F.

Sedimentation figure was found to be 4.8 c.c. red cells at the end of one hour. Toxaemic features did not appear pronounced with this patient: a fairly good prognosis was given. Patient was seen three months later on return from sanatorium where he had gained 10 lbs: sputum was now 7.8 - afternoon temperature did not rise above 98.4 and the degree of activity of lung lesion now appeared much less than before. S.F. was found to be 6.2. Patient was again examined at the expiry of a further period of three months, his weight was well maintained, and clinically there was no manifest activity in the pulmonary lesion. S.F. was again determined, and was now found to be 7.2 red cells at one hour.

Finding. In this patient, the stability reaction of the erythrocytes appeared to increase pari passu with the improvement in his general and in his pulmonary condition. Six weeks after the S.F. was determined for the third time, the patient began to complain of undue fatigue, and had slight loss of weight. Examination of the lungs did not reveal any definite activity, but on the S.F. again being determined it was found to be 5.9 c.c. at one hour. From a consideration of the symptoms plus the S.F. it was thought likely that some activity was probably present again. A further period of rest was enjoined upon the patient, and two months later the patient again presented himself, feeling and looking better than previously. S.F. was again investigated, and was now 7.2 c.c. and one felt warranted in concluding that the activity had passed off.

Other cases of tubercle in which sedimentation rates were investigated may be mentioned more briefly:-

Case 2. Female aet 56. Chronic fibroid lesion of lungs, of many years standing. When first seen patient was recovering from an attack of what she called "bronchitis". Extensive pulmonary disease was found present involving the upper half of both lungs, with little mucoid spit (7.B +) The degree of activity did not appear great, and the general condition was fair. S.F. was found to be 5.4 c.c. ~~PATIENT~~ was seen three months later when no definite activity was clinically ascertainable: S.F. found to be 6.6 c.c. Bearing in mind the lesson of case 1, a further period of appropriate treatment was ordered, and after a period of two months the S.F. was found to be 7 c.c. red cells at one hour.

Case 111 Male aet 24 - lesion confined to upper lobe of right lung, little sputum (7.B +) very little evidence of toxæmia. S.F. was found to be 5.8 c.c. red cells. Three months later this had become 6.8 c.c. and three months later still 7.4 c.c. Examination of patient at time when S.F. was 7.4. revealed as the only abnormality an impaired percussion note over the upper lobe of the right lung.

Case 115. Boy aet 12, with enlarged tuberculous glands on both sides of neck, with discharging sinuses on right side. General condition was poor, S.F. was found to be 6.2. c.c. at one hour. After treatment by open-air methods, with the systematic exposure of the neck to direct sunlight, had been carried out for two months, the glandular and general condition had much improved. There was still a small sinus in the neck with little discharge. S.F. was now 6.7 c.c. After a further period of two months S.F. was found to be 7 c.c. At that time the sinus was quite healed, the glands had become much smaller, and the boy from being small and undersized had become well nourished and fresh complexioned.

Case V. Case of lupus affecting both ^{ANTERIOR NARES} ~~nores~~ and upper lip, in girl aet 16. Lesion had been present since age of ¹¹ ~~sixteen~~ years, and appeared to have flared up again into activity a short time before she was seen by me. S.F. was found to be 5.9 c.c. there being a fresh growing margin at one side of lupoid patch at that time. Two months later the activity appeared to have been checked to some extent and S.F. was found to be 6.6 c.c. Increase in stability reaction was maintained and when S.F. was again determined after a further lapse of three months it was found to be 7.0 c.c.

Three cases may be mentioned in which the determination of the S.F. was employed as a possible adjunct to other means of investigation.

Case 1. Man aet 25; indefinite ~~malaise~~ slight loss of weight: temperature within normal limits. Physical examination of chest was inconclusive. S.F. was found to be 5.2 c.c. at one hour. The ~~opinion was expressed that there might be some tuberculous mischief~~ at work in the lungs, and the patient was told to regard himself as suffering from pulmonary tubercle. Three weeks later a little ~~spitum~~ ^{sputum} appeared and was found to contain a few tubercle bacilli. The percussion note at the right apex was now found to be impaired, and a few moist rales were elicited on cough at sterno-clavicular angle. Here it was felt that the S.F. had been of use in directing ones suspicions to tuberculosis, as the probable underlying cause of symptomatology.

Casell. Girl aet 18. Here I was called upon to deal with a girl who had enjoyed good health until an attack of influenza two months previously. Influenza had been followed by a cough, and this had persisted until the time of her being seen by me. The girl's Mother suspected pulmonary tubercle, and had consulted another doctor who had had the lungs X-rayed, with, according to her, negative results. On keeping the girl under observation for a few days it was found that there was no elevation of her temperature and no abnormal diurnal range of temperature: the pulse was readily quickened, and took some time to return to a normal figure. Physical examination of the lungs did not reveal any pulmonary tubercle. The S.F. was found to be 8.2 c.c.

The girl's mother was told that there seemed to be no question of the existence of a tuberculous focus in the lungs. Rest and change of air were ordered for the patient. When she was seen two months later, the findings in the chest were still quite negative, and the general condition was much improved. S.F. was again determined and was found to be 8.4 c.c.

Case 111. This was a female patient aet 21, whose Mother reported that the girl had palpitation, was tremulous, and was losing weight. She suspected pulmonary tubercle, as the girl's Father had died from that disease. No signs conclusive of P.T. were elicited in chest. The case appeared to be one, an early one, of Graves' disease. S.F. was found to be 7.0 c.c. and the patient was told that no tuberculous lesion was present.

Findings: From the above cases, it was concluded that the S.F. gave some additional information in cases of pulmonary and other forms of tubercle. It appeared to form a good check on the progress made, and on the state of the patient at any one time. According as it varied, so one could judge whether the progress was being maintained. In trying to judge the progress of a disease like tuberculosis, it is essential that one should have as much evidence as possible, before one tries to give a definite opinion, and the S.F. appeared to be an additional help in this direction. Where the S.F. was within normal limits, no active tuberculous lesion was found present.

In the elucidation of cases of a somewhat obscure symptomatology, the S.F. findings also proved useful. In such cases they did not appear to offer evidence positive in itself, but from the normal figure given in two of the cases mentioned, it was made easier to discount the possibility of ~~tuberculous~~ TUBERCULOSIS being the underlying lesion. In one case, acceleration in the S.F. proved a very useful clue in bringing the possibility of tuberculosis before one, and, as it so happened, treatment for the condition was able to be undertaken at an earlier date than might otherwise have been the case.

111. Influenza.

In thirty cases on influenza, the S.F. was determined. These cases conformed to a main type, with a sudden onset ~~as AND~~ characterised, generally, by severe headaches and backaches, pronounced general weakness, and temperature varying from 99.20 to 104°. The specimen of blood was obtained on the first day of illness in sixteen of the cases while the other fourteen it was obtained on the second day of illness.

Results obtained were as follows:-

a) Cases in which S.F. was determined on first day:-

Four were 4 c.c.

Three were 4.3 c.c.

One was 4.4 c.c.

Two were 4.8 c.c.

One was 4.9 c.c.

Two were 5.0 c.c.

Three were 5.3 c.c.

Average reading 4.6 c.c.

b) Cases in which S.F. was determined on second day of illness.

Three were 4.0 c.c.

Four were 4.2 c.c.

Two were 4.3 c.c.

Two were 4.5 c.c.

Three were 4.7 c.c.

Average reading 4.5

The cases of influenza varied somewhat in severity. It was found that the cases with the highest initial temperature and the greatest degree of prostration were those in which the suspension stability of the erythrocytes was the most upset. Three of the cases which showed a S.F. of 4 c.c. on the first day, ~~four~~, were critically ill, remaining so for some days. At the other end of the scale it was found that those with a S.F. of 5 or upwards got off relatively lightly, and soon arrived at a period of convalescence.

Specimens of blood were also examined on the fourth day of illness, with a view to determining the S.F., and the results obtained were as follows:-

Four were 4.2 c.c.

Five were 4.4 c.c.

Six were 4.6 c.c.

Four were 4.7 c.c.

Three were 4.9 c.c.

Four were 5.2 c.c.

Two were 5.4 c.c.

Two were 5.9 c.c.

An average reading of 4.8. The four whose readings were 4.2 were still very ill indeed, while those with a reading of 5 or more were comparatively well.

A determination of the S.F. on the seventh day was productive of the following results:-

Three were 4.2 c.c.

Three were 4.9 c.c.

Four were 5.8 c.c.

Three were 6.4 c.c.

Seven were 7.1 c.c.

Four were 7.5 c.c.

Three were 7.9 c.c.

Three were 8.4 c.c.

Average reading of 6.6 c.c.

Of the six patients with S.F. below five, the three ^{WHOSE} were S.F. ~~was~~ 4.2 had all developed influenza pneumonia and were very ill. Those with a reading of 4.9 had diffuse bronchitis of an acute capillary type, and for one or two days appeared to be verging on broncho-pneumonia.

Findings. The results obtained in this series indicated that the S.F. was greatly modified in cases of influenza, more especially those in whom the illness was of the greatest severity. Sedimentation was most accelerated in those with the most ^{toxemia} ~~toxemia~~. One did not find that the readings of the S.F. in this group of cases afforded more information than could be elicited by the employment of the more ordinary means ^{at} ~~ones~~ disposal. Certainly in the cases acutely ill it corroborated the existence of a very acute type of the disease, but, as has been explained, this information ^{HAD} ~~has~~ already been gained by other means.

IV Acute Lobar Pneumonia. Investigation in this group of cases was entered upon to find if the S.F. was altered in ^{such} ~~such~~ profound systemic disturbance. Six cases in all were investigated.

Case 1. Man aet 28, left lower lobe consolidated.

Third day of illness S.F. 4.9 c.c.

Seventh " S.F. 4.3 c.c.

Ninth " (day ~~AFTER~~ crisis) S.F. 5.4 c.c.

Twelfth day of illness S.F. 6.3 c.c.

Case 2. Man, aet 25. Right lower lobe consolidated.

Third day of illness S.F. 5.4 c.c.

Seventh " S.F. 4.5 c.c.

Tenth " (day ~~AFTER~~ crisis) S.F. 6.1 c.c.

Twelfth day of illness S.F. 7.3 c.c.

Case 3. Man aet 17, Right lower lobe consolidated.

Third day of illness S.F. 5.8 c.c.

Seventh " S.F. 4.4.c.c.

Tenth " (day ~~AFTER~~ crisis) S.F. 5.9 c.c.

Twelfth day of illness S.F. 7.1 c.c.

Case 4. Man, aet 46, middle and lower lobes of right lung involved.

Third day of illness S.F. 4.1 c.c.

Seventh " S.F. 3.6 c.c.

Eleventh " (day ~~AFTER~~ crisis) S.F. 4.7 c.c.

Fourteenth day illness S.F. 6.0 c.c.

Case 5. Boy aet 17, left lower lobe consolidated.

Third day of illness S.F. 5.4 c.c.

Seventh " S.F. 5.2 c.c.

Ninth " (day ~~ARTERIAL~~ crisis) S.F. 6.9 c.c.

Twelfth day of illness S.F. 7.5 c.c.

Case 6. Man, aet 33, right lower lobe involved.

Third day of illness S.F. 4.9 c.c.

Seventh " S.F. 4.6 c.c.

Tenth " (day ~~ARTERIAL~~ crisis) S.F. 6.8 c.c.

Twelfth day of illness S.F. 6.9 c.c.

Findings.

In this group of cases, marked alteration in the S.F. appeared to confirm the presence of marked tox^aemia, and it was found that where the tox^aemia was most pronounced the stability reaction was upset to a greater extent than in other cases. ~~For~~ case 4 was a patient profoundly toxic whose life was despaired of; on the seventh day of his illness, the S.F. was very low indeed, being down to 3.6c.c. However he weathered the crisis. Even on the fourteenth day however his S. F. was still low, being 6.0 c.c. at one hour.

It will be noted that the S.F. tended to come back towards normal on the day after the crisis.

In this series then, where the tox^aemia was most pronounced in such cases was the S.F. lowest.

Case 5. V Acute Follicular Tonsillitis:-

The S.F. of four cases was determined. All the cases presented marked inflammatory enlargement of both tonsils with crypts distended with caseous material. In all cases the systemic disturbance was marked.

Case 1. Boy aet.16.

Second day of illness S.F. 4.6 c.c.

Sixth day of illness S.F. 6.3 c.c.

(tonsils less swollen, tox^aemia slight now)

Case 2. Boy aet 19.

Second day of illness S.F. 4.9 c.c.

Fifth day of illness S.F. 6.9 c.c.

(tonsils much smaller, tox^aemia slight now)

Case 3. Man aet 22,

Second day of illness S.F. 4.0 c.c.

(tonsils are very large, tox^aemia pronounced)

Fifth day of illness

(toxemia lessening slowly,
tonsils still large)

S.F. 4.6 c.c.

Case 4. Man aet 18,

Second day of illness S.F. 5.2 c.c.

Fifth " " S.F. 6.8 c.c.

(throat clearing very
rapidly)Findings.

In this group of cases, the S.F. appeared to be most altered in cases where the tox^aemia was greatest in degree (see case 3) and the alteration in it lingered on longest in this case.

In case 4 where the degree of tox^aemia was not so great, the S.F. quickly adjusted itself and was 6.8 c.c. on the fifth day.

VI ~~Case 6.~~ Pregnancy.

Eight cases in all were investigated with a view to finding whether any variation in the S.F. occurred in this condition.

	<u>End of third month.</u>	<u>End of fifth month.</u>	<u>End of ninth month.</u>
Case 1.	6.4 c.c.	5.6 c.c.	5.0 c.c.
Case 2.	6.2 c.c.	5.6 c.c.	5.2 c.c.
Case 3.	6.0 c.c.	5.8 c.c.	5.6 c.c.
Case 4.	5.9 c.c.	5.7 c.c.	5.7 c.c.
Case 5.	5.7 c.c.	5.8 c.c.	5.4 c.c.
Case 6.	6.0 c.c.	5.8 c.c.	5.0 c.c.
Case 7.	7.0 c.c.	6.4 c.c.	6.1 c.c.
Case 8	7.0 c.c.	6.6 c.c.	6.4 c.c.

These cases gave an average reading as follows:-

End of third month S.F. 6.4 c.c.

End of fifth month S.F. 5.9 c.c.

End of ninth month S.F. 5.5 c.c.

Findings.

In this series of cases, it was noted that the S.F. altered according to the duration of the pregnancy; Altering from an average finding of 6.4 c.c. at the end of the third month, to an average finding of 5.9 at the end of the fifth month, and a finding of 5.5 at the end of the ninth month. Presumably, close on term, enzyme action is marked, and the marked alteration in the S.F. may be an expression of this.

General disturbance of fair degree T.100
S.F. 4.5 c.c.

(Diagnosis in each case was confirmed by operative findings)

Findings.

In these cases, it was seen that where the inflammation remained fairly well localised there was not so great a modification in the S.F. as in the other cases. In the first three cases (which could be classified as local inflammatory lesions) the S.F. had **AVERAGED** reached 6.4 c.c. In the other two where the inflammation was no longer confined to the appendix it averaged 4.2. In these two cases the marked alteration in the S.F. was interpreted as meaning that the inflammation was no longer localised and that there was some general poisoning throughout the body.

LX. "Common Cold" Four cases were investigated with the following results:-

Case 1. Second day of illness T.99.4° S.F. 5.9 c.c.

Fourth " T.99° S.F. 6.3 c.c.

Case 2. Second day of illness T.99.4° S.F. 6.3 c.c.

Fourth " T.98.9° S.F. 6.7 c.c.

Case 3. Second day of illness T.99° S.F. 6.1 c.c.

Fourth " T.98.4° S.F. 6.5 c.c.

Case 4. Second day of illness T.99.6° S.F. 6.0 c.c.

Fourth " T.98.2° S.F. 6.9 c.c.

Findings.

TOXAEMIC

Toxaemia features in these cases were certainly greater on the second day than on the fourth, and the alteration in the S.F. appeared to express to some extent the degree of **toxaemia** associated with the cold.
TOXAEMIA

X. Cellulitis. Two cases were investigated from the point of view of the S.F. findings:-

Case 1. Patient with marked cellulitis affecting whole of right arm (lesion developed after accidental cutting of edge of thumb with bank note)

Fourth day of illness (profound general disturbance)
S.F. 3.7 c.c.

Sixth " (arm ^(INCISED) increased two days before)
S.F. 4.7 c.c.

Tenth day of illness (condition improving steadily)
S.F. 6.3 c.c.

Case 2. Patient abraided his knuckles while at work and neglected THE condition. Cellulitis of upper arm developed.

Third day of illness S.F. 4.9 c.c.

Fifth " (general disturbance more marked) S.F. 4.0 c.c.

Eighth " (condition improving T. normal) S.F. 6.0 c.c.

Findings.

In these cases the extent to which the S.F. was modified appeared to be some measure of the profundity of the general disturbance. Thus, in case 1 the reading of 3.7 c.c. was obtained when the systemic disturbance was most pronounced and similarly in case 2 when the general disturbance was at its highest, the alteration in the S.F. was at its greatest.

Conclusions:- The determination of the sedimentation rate of erythrocytes in citrated blood has been carried out in various diseases met with in the routine of general medical practice, and also in health and in pregnancy. Eighty cases in all have been investigated.

From the findings obtained, the drawing of several main conclusions would appear to be justified:-

- 1) In health, the S.F. varies within limits, the figures obtained in this series ranging from 6.8 to 8.4.
- 2) In some diseased conditions, the S.F. is altered. This alteration does not appear to be specific in degree for any one particular disease, and, indeed, the same alteration is not necessarily met with at every stage of the same illness.
- 3) Some latitude in the interpretation of the results obtained must be used, the test not appearing to be one of great exactitude.
- 4) From the results, a reading of six and under for the S.F. appeared to be indicative of the presence of some pathological condition.
- 5) The S.F. undergoes modifications in such a variety of conditions and illnesses that it does not appear to be of value, in the diagnosis of any one particular disease.
- 6) S.F. is altered in pregnancy, this alteration being more marked, the more one advances from the earlier months of pregnancy towards term.
- 7) S.F. is affected in tuberculosis, especially in pulmonary lesions with associated ~~toxaemia~~^{toxaemia}. So long as any activity is present in the focus, so long would the S.F. appear liable to alteration. The determination of the S.F. appears of some value in early doubtful cases of tubercle, either to confirm one in one's suspicions as to the presence of such lesions or else, if the S.F. is within normal limits, this finding may be utilised as confirmation that the disease is not present in an active form.
- 8) S.F. is altered in inflammatory lesions, to a less extent where the lesion remains localised, to a greater extent, where the mischief becomes widespread. The degree to which it is modified in such conditions is some measure of the profundity of the general disturbance.
- 9) S.F. undergoes changes where a cancerous growth is present, the effect of the alteration varying according to the type of cancer present, and the degree of interference with the general wellbeing associated with its presence.

The conclusions reached by Chapman and Dodds, (loc. cit.) would appear to be justified — "that the sedimentation test has therefore many limitations, but it appears to have some value as an aid to diagnosis and prognosis if used intelligently in conjunction with other clinical and laboratory investigations."

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