bronchiolar muscle, as to make all the difference between health and disease. The following table speaks for itself. The eight cases are not selected; they are old cases of whom I have heard *accidentally* while compiling this paper; most of them I had not seen for years. The reader will note that the nose demanded treatment in all but one, was beneficial in all, harmful in none, that the family history was positive in all but two, that the asthma was severe in most, and its duration over ten years in five.

Case No.		Date of Attendance		At Time of First Visit		Nose	Family History	Years Free from Asthma
		First	Last	Age	Duration of Asthma in Years			
I	1,080	1923	1927	14	11	+	+	5
II	149	1911	1912	14	10	+	+	20
III	996	1925	1927	45	1	+	+	3
IV	556	1918	1921	31	27	+	-	9
V	749	1925	1926	28	4	-	-	5
VI	1,480	1930	1930	43	36	+	+	2
VII	677	1918	1922	24	14	+	+	8
VIII	754	1922	1928	60	1	+	+	3

CASE NOTES

I. Single child, puny, irregular at school, in bed three months before first visit. Septum resected. Is now 20, and has never lost a day since treatment; has not wheezed for five years.

II. Single child, puny, mouth-breather, worse week-ends. Nasal and orthodontic treatment. Now a tall, athletic man, no mouth-breathing.

III. Six feet, 11 st., systolic pressure 100. Wheezed on least exertion. Can now do two rounds of golf. Has three children, none asthmatic.

IV. Inveterate asthma. Rejected for army on account of heart disease, which cannot now be detected. Teeth, nose, diet all badly needed attention.

V. Engineer in India; skin tested at Calcutta and found positive to fish, fowl, egg, milk, mutton, beef, tomato, cucumber. Called on furlough to say he has had no asthma for five years.

VI. Planter in Borneo; writes thence to say he has had no asthma for two years. Septum resected.

VII. In his fourteen years' asthma had a free interval of three years while leading open-air life in Australia; on return home was seldom free for next three years.

TREATMENT

This has been indicated above and given in detail elsewhere. I would only add that it may save trouble in the case of an asthmatic lady if before the rhinologist looks at her nose and the allergist tests her skin, they look at her shoe heels and at her feet. Free life in the open is not possible without good feet, nor is a cure of asthma without them, a right life, and a righteous nose.

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THE OCCURRENCE OF POLYCYTHAEMIA AND THE VALUE OF LIVER THERAPY IN ASTHMA

BY

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POLYCYTHAEMIA

In the course of an investigation on the effect of liver therapy in asthma it has been noted that polycythaemia is frequently found in cases of true spasmodic asthma. In thirty-eight cases of asthma, counts of over 6 million red cells were recorded in thirty-one cases (81.5 per cent.); not infrequently the red cell count was over 7 millions; in two cases it was over 8 millions, and in one of these the highest figure was 8,750,000 red cells per cubic millimetre. It has been noted also that the polycythaemia occurring in asthma was of an oscillating character, and that the total red cell count, when taken at different times, showed variations of 1 to 2½ millions. The haemoglobin percentage increase did not follow the rise in the total number of red cells at all closely, and usually the colour index was below 1.

Symptoms of polycythaemia were entirely absent, and although some cases had a "high colour," or cyanosis, this was not a constant feature, and cases with definite emphysema and marked cyanosis often presented a normal or low normal red cell count. Splenomegaly was observed once only in a case, which was, however, exceptional in many other respects. There was no reticulocytosis, and no immature red cells were observed. The condition appeared to be one of relative polycythaemia, which varied according to the state of the patient.

Relation to Emphysema

The presence of emphysema did not materially affect the red cell count, and polycythaemia was found as frequently without emphysema as with it. (See Table I.)

TABLE I

Emphysema	R.B.C. over 6 Millions	R.B.C. under 6 Millions
Present	11	4
Absent	10	2
Not mentioned ...	10	1

Polycythaemia was found both in recent cases and in cases of several years' standing; in approximately one-half of the cases the duration of the disease was under ten years, and in the other half over ten years. In one case a count of over 8 millions was recorded three weeks after the first attack the patient had ever had. The fact that a high red cell count may be found both in recent and in chronic cases suggests that emphysema is not an important factor in the determination of polycythaemia in asthma. Moreover, the condition of emphysema in asthma is often not true organic emphysema, but a state of inflation of the lung, which subsides with suitable expiratory exercises and with the abatement of the asthmatic attacks. Even in cases of true emphysema with bronchitis, polycythaemia is not so constantly found as is generally supposed.

Lemon¹ investigated twelve cases of varying grades of emphysema and chronic bronchitis with cyanosis in order to ascertain the possible variations in the blood volume resulting from deficient oxygenation of the pulmonary blood. The appearance of many of these patients suggested the existence of polycythaemia. He did not find

* With a grant from the Asthma Research Council.

any decisive changes in the total circulating cell volume and blood volume. Although the volume of the cells was not raised, the haemoglobin in the average cell was definitely increased. The erythrocytes varied from 4 to 6.86 millions, with a mean of 5.02 millions. In four cases the values were more than 5 millions, and in only two cases over 6 millions.

Incidence in Allergic Cases

An analysis of the incidence of polycythaemia among the different types of asthma showed that it was more frequently found in the allergic type—namely, in cases of manifest allergy, or in those in which allergy could definitely be suspected by a family or personal history of allergy. Polycythaemia was found at one time or another in each of six cases of definite allergy—that is, cases with a definite history of sensitivity and with positive dermal tests confirming the history. These included one case sensitive to wheat, one to pollen and cat hair, two to pollen, and two to feathers. The highest counts recorded in these cases were over 8 millions in one case, over 7 millions in three cases, and over 6 millions in two cases. In the group of cases without evidence of allergy—that is, with negative skin tests and without a personal or family history of allergy—polycythaemia was not so frequently found. This group, which I have labelled “not allergic,” includes cases in which no definite evidence of allergy could be ascertained, together with four cases of bronchitic asthma. Of the four cases of bronchitic asthma, two showed polycythaemia and two did not. (See Table II.)

TABLE II

Type	R.B.C. over 6 Millions	R.B.C. under 6 Millions
Allergic	22	2
Not allergic	9	5

The fact that polycythaemia occurs more frequently in the allergic type of asthma than in the non-allergic is also shown by the age incidence of cases showing high red cell counts. The ages of the patients of my series ranged from 15 to 67 years, and 85 per cent. of cases with polycythaemia were under 40 years of age. My series does not include children, but Bray,² in a series of blood counts carried out on 100 consecutive asthmatic children, observed that high red cell counts were of frequent occurrence. On repeating the blood counts at different times in the same case it was found that the total red cell counts varied considerably if taken shortly after an attack, or during a prolonged free interval. Usually a mean of two readings from separate pipettes was taken, and blood counts were all done by the same observer in order to ensure uniformity of results.

Seasonal and other Variations

High red cell counts were usually found immediately after an attack, and for varying periods up to one month after an attack, whereas during periods of freedom of over one month the total number of red cells tended to fall again to the normal figure. High red cell counts were also found in cases with constant wheeziness, or with frequent minor asthmatic attacks.

In Fig. 1 sixty-nine counts on thirty-eight cases of asthma have been plotted out according to the length of time between taking the blood count and the last attack of asthma. When two counts from the same patient have been recorded the highest and lowest figures are given. It will be seen that of forty-five counts taken within a month from the last attack, twenty-eight (or 62.2 per cent.) were over 6 millions, while of twenty-four counts taken during free intervals of one month or more

only six (or 25 per cent.) were over 6 millions. Often variations of 1 to 2½ millions were found to occur in accordance with the state of the patient. It was found that the red cell count rose as the result of a severe

FIG. 1.—The correlation between sixty-nine red cell counts in thirty-eight cases of asthma and the time elapsed between taking the blood count and the last attack of asthma.

attack, or of a succession of attacks, and that it fell again as the patient improved and the free intervals became longer. These variations in the red cell count were particularly striking in the seasonal types of asthma. Pollen-sensitive cases invariably gave high counts during the hay season, and in some cases a definite rise occurred from May to June and July, to fall again in the autumn. (See Fig. 2.)

On the other hand, it was noted that in the infected type of asthma with a good deal of bronchitis and with seasonal variations to cold and damp weather, a rise in the red cell count occurred in the winter instead. (See Table III.)

FIG. 2.—Graph showing seasonal variation of the red cell count in a pollen-sensitive patient (Case 13).

TABLE III

Case No.	Type	Remarks	Blood Count			Date
			Hb	R.B.C.	C.I.	
13	Pollen, cat hair; positive skin tests	Worse in summer	74	5.26	0.70	27/5/30
			95	7.21	0.68	25/6/30
			86	5.03	0.86	13/10/30
16	Pollen; positive skin test	Worse in summer	78	5.39	0.72	20/5/30
			94	6.48	0.78	24/7/30
			92	5.98	0.73	16/12/30
22	Pollen; positive skin test	Only in summer	88	6.40	0.69	8/7/30
			98	7.30	0.70	23/9/30
			90	4.98	1.00	8/3/32
23	Pollen; positive skin test	Worse in summer	99	6.70	0.70	8/7/30
			88	5.79	0.80	24/9/30
27	Feathers, pollen; positive skin tests	Worse in summer	80	7.73	0.58	30/7/30
			86	6.23	0.71	7/3/31
15	Bronchitic asthma (chronic bronchitis and emphysema)	Worse in winter	62	4.36	0.70	21/6/30
			62	4.63	0.67	1/7/30
			64	5.41	0.64	8/10/30
			72	5.05	0.72	3/12/30
			77	5.64	0.70	25/2/31

Suggested Interpretations

From these observations it appears that polycythaemia in asthma has a definite relation to the state of the patient, and that a fall in the red cell count may be regarded as a sign of therapeutic improvement. Usually a fall of a million in the red cell count signifies that the attacks

have become less severe, and that the intervals of freedom have lengthened to one month or longer. In this respect a red cell count is of greater help than a differential white cell count for eosinophilia. Although Spangler³ considers the eosinophilic index an important indication of the reactive power of the individual, Van Leeuwen and Niekerk⁴ found that eosinophilia gave no indication of the severity of the case or of therapeutic improvement.

It is difficult to express an opinion on the nature of the polycythaemia in asthma, but the fact that it occurs chiefly in the allergic type of asthma, and that it is definitely related to the asthmatic attacks, suggests that it may be due to the stimulative effect of anoxaemia or to concentration of blood from loss of fluid. The extreme variability of the polycythaemia and the slight or negligible increase in total cell volume and blood volume found by Lemon¹ in cases of chronic bronchitis and emphysema seem to oppose the former idea. It is more likely that the polycythaemia which occurs in asthma is a relative one, and that it is a condition in which the volume of the individual cell is decreased, and that consequently there is an increased number of cells for each cubic millimetre of blood without an increase in the total cell volume or blood volume. In favour of this theory are the observations made by Descamps (Joltrain),⁵ who found that the red blood corpuscles in the course of peptone shock are subjected to a diminution of volume corresponding to the loss of fluid from the transudation of plasma through the dilated capillaries.

LIVER THERAPY

Liver treatment has been carried out on fifty-three cases of asthma, of which twenty-three were males and thirty were females. This treatment was tried because it has been frequently assumed that the liver action in asthma is defective. Manwaring⁶ has shown that the liver is the site of the anaphylactic reaction in dogs, and that shock does not occur when the liver is thrown out of circulation.

Details of Investigation

Patients who underwent liver treatment were kept under observation for periods varying from a minimum of three months up to one and a half years. In the great majority of cases liver extract (Armour) was administered in the dose of one to one and a half ounces a day over periods of several months. In some cases the treatment was stopped for a few months and then resumed. Usually a minimum period of three months' liver treatment was necessary before the full beneficial effect was observed. In some cases half a pound of whole liver lightly cooked was taken by the patients instead of liver extract, or alternately with the liver extract, but it was found that whole liver was usually badly tolerated by asthmatic patients, and that it gave rise to gastric disturbances. In assessing the results of treatment patients have been considered improved when the attacks definitely diminished in frequency and severity. All patients who have undergone liver treatment have been circularized, and have been asked to reply to a questionnaire. In addition to liver treatment, most cases have received a routine treatment consisting of a diet, breathing exercises, and ephedrine. A certain number of cases have also received nasal treatment. If, however, a patient materially improved on general treatment, and there was some doubt as to the influence of liver treatment, the case was excluded from the present series. As liver treatment was being put to a test, it was carried out on a miscellaneous group of cases, and often on cases which had failed to respond to other therapeutic measures. In the series of cases treated with liver there have been no cures—that is, complete freedom for a minimum period of two years; the

longest period of complete freedom observed was ten months. Marked improvement, however, has been noted in several cases, and often attacks occurring at intervals of two to three weeks have been reduced to three a year. Of fifty-three cases treated with liver thirty-two cases (or 60.3 per cent.) were improved and twenty-one failed. The results obtained are shown in Table IV.

TABLE IV

Type of Case	Improved	Failed
Allergic	24	7
Not allergic	7	14
"T.N.T." case	1	—
	32 (60.3 %)	21 (39.7 %)

Illustrative Cases

The percentage of therapeutic successes is not high, but it might have been higher had a careful selection been made of the most suitable cases. Failures included nine cases of bronchitic asthma with definite lung damage, and two cases of asthma caused by recurrent polypi. Best results were observed in the allergic group of cases, and especially in those cases showing manifest allergy—that is, all cases with a history of sensitivity and with positive dermal tests confirming the history. The latter included sixteen cases, of which fourteen were improved and two failed to do so. The majority of these cases were sensitive to inhalants (pollen, feathers, and animal hair). In some individual cases the results obtained by liver therapy were very striking indeed.

Case 7.—Male, aged 67. Worked in the corn market for nine years and developed asthma during the last four years. Contact with flour invariably brought on an attack. Positive skin test (scratch) to wheat. When he first attended the clinic he was markedly wheezy and cyanosed, had attacks nearly every day, and had been at a standstill for the last two years. The asthma was not seasonal.

Treatment with one ounce of liver extract daily was started in April, 1930, and continued for six months; thereafter he has been taking from 2½ to 4 lb. of whole liver, lightly cooked, per week up to the present time (February, 1932). He has very definitely improved, and now has only occasional attacks of asthma, with intervals of freedom of several months.

Blood counts taken during the first ten months of treatment showed a steady fall in the number of red cells.

Before: Not taken.

After 2 months: Hb 84, R.B.C. 6.88, C.I. 0.60. 27/5/30.

After 3½ months: Hb 100, R.B.C. 6.15, C.I. 0.60. 10/7/30.

After 10 months: Hb 88, R.B.C. 5.46, C.I. 0.86. 7/1/31.

Case 22.—Female, aged 21. Asthma since the age of 9 years, following an attack of pneumonia. Definitely seasonal, and attacks occur only in the summer. Used to have attacks more or less continuously from June to September. Positive skin test (intradermal) to a grass mixture extract. Works as a carpet setter, and is exposed to dust.

Liver therapy (one ounce of liver extract daily) was started in June, 1930, and was continued until March, 1931. It was resumed in June, 1931, and continued up to the present time. During the first summer (1930) she was under treatment she had several attacks, but last summer (1931) she was very much better, and she only had four slight attacks. She is now working overtime. Two counts taken during the summer (1930) showed definite polycythaemia, while one taken recently showed a normal count. The fall in the red cell count in this case is probably due to seasonal variation. There was no fall in the red cell count during the first course of liver therapy.

Blood counts:

Before: Hb 88, R.B.C. 6.40, C.I. 0.69. 8/7/30.

After 2½ months: Hb 98, R.B.C. 7.30, C.I. 0.70. 23/9/30.

After 20 months: Hb 90, R.B.C. 4.98, C.I. 1.00. 8/3/32.

The following case is interesting in view of the unusual features, and because there was some evidence of liver dysfunction.

Case 5.—Female, aged 32. Worked in T.N.T. factory during the war from 1915 to 1918, and has never felt well since. Asthma started five years ago after her first pregnancy. On first attending the clinic the spleen was definitely palpable, and there was a definite icteric tinge of the skin. The van den Bergh test gave a positive indirect reaction. The attacks used to occur every fortnight all the year round. Liver treatment (one ounce of liver extract daily) was started in June, 1930, and continued up to the present time. Lately she has reduced the dose of liver extract to half an ounce daily. After six months of liver therapy the splenomegaly had disappeared and the van den Bergh test gave a negative reaction. She has been completely free from attacks for the last ten months.

Blood counts taken over varying periods showed a fall in the number of red cells.

Before: Hb 90, R.B.C. 7.00, C.I. 0.65. 20/6/30.
After 1 month: Hb 80, R.B.C. 6.44, C.I. 0.66. 20/7/30.
After 3½ months: Hb 74, R.B.C. 5.25, C.I. 0.74.
After 6 months: Hb 74, R.B.C. 6.62, C.I. 0.60. 7/1/31.
After 16 months: Hb 72, R.B.C. 4.98, C.I. 0.72. 24/11/31.

Effect of Liver on Red Cell Count

The response to liver treatment and the improvement of the patient was usually marked by a fall in the red cell count, which at times was considerable, and amounted to as much as 2½ millions. In some cases a diminution in the red cell count occurred fairly soon, and within about a month from starting liver treatment, while in other cases the fall took longer, or was broken by a temporary rise. Occasionally patients claimed to be feeling better although the red cell count showed a rise, but such a response was the exception, and occurred in only 25 per cent. of cases. Cases which did not improve on liver treatment either showed a definite rise of the red cell count or no change at all. This was particularly noticeable in three cases of bronchitic asthma. In Fig. 3 the variations in the red cell

FIG. 3.—Graph showing variations in the red cell count in the course of liver therapy. The type of variation is indicated by the direction of the arrows. The ciphers refer to the case numbers. Identified allergics: 7, 13, 16, 23, 27. Unidentified allergics: 1, 3, 4, 14, 17, 20, 42, 44. Not allergics: 8, 9, 12, 24, 26, 30, 43. Bronchitic asthma: 15, 52, 55. "T.N.T." case, 5. 6

count occurring in twenty-four cases treated with liver have been graphically recorded by means of arrows. The ciphers refer to the case numbers. Cases 13, 23, and 27 were seasonal types of asthma, and sensitive to pollen, and in these cases the fall in the red cell count may be

ascribed to the ordinary seasonal variations mentioned above.

Cases with an initial high red cell count responded better to liver therapy than those in which the count was constantly at a normal or low normal level; this may be explained by the fact that a large proportion of failures consisted of cases of non-allergic asthma and of bronchitic asthma in which polycythaemia was usually found to be absent. (See Table V.)

TABLE V

Red Cell Count	Improved	Failed
Over 6 millions ...	19	8
Under 6 millions ...	3	4
Not done... ..	10	9

Its Influence on White Count

No appreciable degree of eosinophilia was observed even after prolonged treatment with liver extract, while there were not sufficient cases taking whole liver for a conclusion to be drawn. Meulengracht and Holm⁷ have observed that the intake of liver extract did not give rise to eosinophilia, but that the ingestion of raw liver constantly showed a marked one. In some cases (see Table VI, Cases 20, 5) a slight rise in the eosinophils

TABLE VI

Case	Blood Count			White Cells	Eosinophils		Liver Treatment
	Hb	R.B.C.	C.I.		Per cent.	Total	
5	90	7.07	0.65	7,500	2.0	150	Before
	72	4.98	0.72	—	6.5	—	After 6 months (improved)
20	81	7.32	0.55	10,200	1.0	102	Before
	98	7.10	0.69	10,600	2.5	265	After 10 days
	86	5.36	0.86	7,450	8.0	596	After 6 weeks (improved)
15	62	4.36	0.70	6,400	6.0	384	Before
	62	4.63	0.67	9,100	1.5	136	After 2 weeks (failed)
18	90	5.49	0.83	7,700	5.0	385	Before
	82	6.22	0.68	6,300	3.5	220	After 2 weeks (failed)
11	52	6.55	0.71	8,200	3.5	287	After 6 weeks
12	86	4.68	0.95	4,900	2.0	98	After 11 weeks
17	93	7.76	0.63	8,350	3.5	292	After 20 weeks

was observed as the red cell count dropped and the attacks of asthma lessened, while in other cases (15, 18) not responding to liver therapy the eosinophils dropped as the red cell count rose. Gillespie⁸ has also noted that the eosinophils varied according to the state of the patient, and that during an attack there was a marked fall.

Unsuccessful Cases

Of the cases which failed to respond to liver therapy about 10 per cent. were actually made worse, either because it caused gastric disturbances, such as flatulence or nausea, or because it was definitely asthmagenic and brought on attacks. This occurred more frequently when taking whole liver than with liver extract. Matzger⁹ has reported a case of pernicious anaemia in which the administration of liver extract intensified attacks of bronchial asthma. Held and Goldbloom¹⁰ have also reported a case of pernicious anaemia showing allergic phenomena due to liver extract, but they expressed the opinion that, although allergy may have played a part, the amino-acids in the liver extract probably caused a rapid increase in the uric acid in the blood, which in turn caused the unusual phenomena. Adam¹¹ tried liver therapy in four cases of asthma, and found that in three cases liver made the asthma worse, while in the fourth it seemed to be beneficial.

GENERAL CONSIDERATIONS

It is not clear how liver therapy influences the asthmatic state. The fall of the red cell count observed in cases which responded favourably to liver therapy might suggest that the effect was due to lowering the number of red cells, thereby diminishing pulmonary congestion from the polycythaemia. Stephan¹² has noted a decrease of erythrocytes in a series of five cases of symptomatic polycythaemia in non-asthmatic subjects by the administration of liver substance. But it has already been mentioned that the reduction of polycythaemia noted in the present series of cases has been interpreted as a sign that the patient had improved, and not as a direct effect of liver therapy. Such variations and falls in the red cell count have been observed in seasonal cases of asthma quite independently of liver treatment, and also in a few cases which have improved with some other form of treatment. For instance, a marked fall in the red cell count occurred in one case of asthma after the treatment of an antrum infection. It is also unlikely that liver treatment may act by lowering the blood pressure, as the great majority of the cases responding to liver therapy had a normal or low normal blood pressure. Similarly, other effects of liver substance, such as diuresis and lowering of the blood sugar, do not offer any satisfactory explanation as to how they may influence asthma. Liver therapy may provide a substance which plays a part in the antigen-antibody reaction in man, and which is lacking in patients suffering from asthma. On the other hand, the beneficial effect may be due to a process of desensitization in virtue of the rapidly assimilable amino-acids present in the liver extract.

Skin sensitivity to an intradermal injection of a 1 in 1,000 solution of liver extract has been tested on ten normal control cases, on six cases of asthma with positive skin tests, and on four cases of asthma with negative skin reactions. A reaction, consisting of a wheal and erythema, occurred in all three groups of cases, but was most marked in the cases of the second group.

The same series of cases has been tested also against an intradermal injection of hepatex P.A.F. In the normal control cases blanching of the skin was observed, but no wheal formation occurred. In the asthmatic groups, however, and especially in cases with positive skin tests, a definite wheal with surrounding erythema appeared five to fifteen minutes after the injection, and lasted about an hour. In a case of asthma with positive dermal reactions to a pollen extract and to hepatex P.A.F., 0.1 c.cm. of the latter was repeatedly injected intradermally at two-hourly intervals into the same area of skin. It was found that after the fourth injection the skin had become desensitized and ceased to give a reaction. These observations suggest that the liver fraction active in pernicious anaemia may have antigenic properties.

SUMMARY

1. Polycythaemia frequently occurs in true spasmodic asthma, especially in the allergic type.

2. It is often found after a severe attack, or a series of attacks, and may last for varying periods. Usually after a free interval of a month the count tends to fall to a normal level again.

3. Seasonal variations in the red cell count have also been noted to occur, the count being highest in the summer in the pollen-sensitive cases and in the winter in the infective type of asthma.

4. A fall in the red cell count has been found to correspond with the lessening in the frequency and severity of the attacks, and may therefore be considered as an indication of therapeutic improvement.

5. Liver therapy has been tested in fifty-three cases of asthma, and has proved beneficial in 60.3 per cent. of

the cases. It has been found to be most effective in the allergic type of asthma and in those cases showing an initial high red cell count.

6. In the course of liver therapy a fall in the red cell count has been noted to occur in those cases which have improved on the treatment.

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THE MEAN TEMPERATURE IN NON-FEBRILE
HOSPITAL PATIENTS

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Although changes in body temperature in disease have been recognized for many centuries, it was not until the nineteenth century that the clinical thermometer came to be generally used in medical practice. The convenient modern instrument was first introduced to medicine by Sir Clifford Allbutt in 1867. Before this date the clinical thermometer was an unwieldy object, and was not adapted for ordinary practice. Since we are not concerned here with the temperature in febrile diseases, it may be of interest to refer to a few of the observations on body temperature in healthy individuals which were made by some of the pioneers in medical thermometry. The whole subject of medical thermometry was very ably expounded by Wunderlich in his classic treatise published in 1868. Prior to this, in 1845, John Davy¹ made a large number of observations on himself over a period of eight months, and found his mean temperature to be 98.4° F. taken in the mouth. Bärensprung² gives the figure 98.93° F. as the mean axillary temperature in healthy active individuals between the ages of 21 and 70. This reading has since been considered to be too high, and the error is thought to have been due to the employment of a defective thermometer. Other authorities have obtained varying results for the mean axillary temperature. Ringer and Stuart found 99.1°, Liebermeister 98.4°, Billet 98.06°, and Billroth 98.8°. More recently M. H. Whiting³ carried out investigations on the mean temperature in a large prison population. She found the mean temperature to be 98.37° for the whole population and 98.38° in those who were apparently in perfect health. It must be clearly understood that all these figures quoted represent the mean temperature in healthy *active* persons, and not in individuals confined to bed.

As a result, probably, of Davy's experiments the figure 98.4° has come to be regarded in English-speaking countries as the "normal" temperature in man. This fact is evidenced by the way in which clinical thermometers and temperature charts are marked, for it is common knowledge that these have engraved upon them a