the child reaches adolescence; and if the ill effects can be prevented by avoiding the attacks for some years, much of the danger has gone. Other warm dry climates abroad are available, but economic as well as international difficulties preclude their help. In England the south and south-west coasts are valuable, but many inland districts are also reliable. From Birmingham many parents send their children to school in the Malvern district, and this relieves the majority. Open-air schools of the local authorities are also beneficial, particularly when they are found in sandy, sheltered, and warm situations.

In wartime especially, these measures are largely impracticable. Also, parents at any time are often loath to part with their children in their early years, and especially when they are delicate. For these cases breathing exercises have been found of extreme value. Their use has been increasing steadily in recent years, especially with the greater knowledge of the mechanism and physiology of the respiratory apparatus. Hurst (1927) has clearly described the main points, and the Asthma Research Council (1934) has also helped to popularize them. Livingstone and Gillespie (1935) have published some results which indicate their value.

The principal points required are to correct faulty posture and movement of the thoracic cage, to promote diaphragmatic movement, to increase respiratory excursion and resilience, and to improve expiration. Douthwaite (1930) has also indicated these points. There is no doubt that the disciplinary effect of these regular exercises is in itself of much benefit, and at the same time insistence on nose-breathing can obviate much of the reinfection and recrudescence of infection from the pharynx.

Teaching the exercises to the children may be done in a group, and I have a clinic at the General Hospital under the charge of Mrs. Brown, head of the massage department. This has the advantage of stimulating the team spirit and encouraging regularity, and of initiating new patients. The alternative is treatment individually, or perhaps in pairs. It is then easier to arrange times to avoid school hours, and with some of the more nervous or difficult children better control is obtained. It is essential that the exercises should be done regularly and daily, and regular supervision by the masseuse makes a great difference in keeping them correct and adequate. At my clinic the children attend twice weekly, and the mothers are also taught the exercises so as to make the children do them on the other days. It is essential to continue the treatment for months or years, and most failures or relapses are due to leaving them off too soon or to want of care in doing them regularly and persistently. The results are seen rapidly. The frequency of the acute attacks is reduced; the attacks are shorter; between the attacks the child is better, healthier in general, loses its cough, and becomes less susceptible to catarrhal infections. The condition seems to diminish naturally as the child grows up, but adequate treatment usually relieves it sooner, and so reduces invalidism and loss of schooling; also it obviates most of the permanent ill effects that may follow, such as chronic bronchitis, emphysema, and fibrosis of the lungs.

The general management of the child must also be watched and clothing and exercise be adjusted. Feeding is often difficult, but common-sense management is needed, especially as these patients can often be classed among the "nervous child" group (Cameron, 1929). As Cameron points out, the nervous child is particularly prone to catarrhal infections, whether from a lack of immunity due to chronic upper respiratory infection or from weak vasomotor defences. It is always necessary to remember the neuropathic tendency associated with most cases of asthma, recurring pulmonary infections, and the like. It is important, as Hurst has emphasized, that the child should not think he is an invalid.

Summary

The term "chronic pulmonary catarrh" describes a clinical syndrome common in children, causing recurrent respiratory "attacks," often suggesting asthma, but associated with inflammatory changes in the lungs. They cause much trouble to the parents and interfere with the child's development.

The symptoms, signs, and x-ray changes are described.

Treatment is most satisfactory by climatic measures, but, at the present time especially, breathing exercises are proving very valuable

and will relieve the majority of cases. It is essential that they should be controlled competently and be continued over a prolonged period.

REFERENCES

- Asthma Research Council (1934). *Physical Exercises for Asthma*, London.
 Bray, G. W. (1930). *Arch. Dis. Childh.*, **5**, 237.
 Cameron, H. C. (1926). *Post-grad. med. J.*, **1**, 87.
 — (1929). *The Nervous Child*, Oxf. Med. Publ., London.
 Douthwaite, A. H. (1930). *The Treatment of Asthma*, London.
 Hurst, A. F. (1927). *Guy's Hosp. Rep.*, **71**, 87.
 — (1943). *British Medical Journal*, **1**, 403.
 Leys, D. (1927). *Chronic Pulmonary Catarrh*, London (and personal communication).
 Livingstone, J. L., and Gillespie, M. (1935). *Lancet*, **2**, 705.
 Macpherson, A. M. C. (1943). *British Medical Journal*, **2**, 98.

SURVEY OF VITAMIN C LEVEL IN WARTIME IN PREGNANT WOMEN

BY

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The question of vitamin deficiency in wartime is one which is often under discussion. Vitamin C has perhaps excited the most interest because of the lack of fresh fruit and, to some extent, vegetables in present-day diet. Though the clinical symptoms of scurvy, which is the typical manifestation of vitamin C deficiency, may be absent, it is becoming recognized more and more that subclinical deficiency may be present to give rise to other less definite symptoms. The normal requirements of the body in order to prevent scurvy are usually stated to be 25 mg. of vitamin C a day, though Codville *et al.* (1938) believe the real needs of the body to be 100 mg. daily. Glazebrook and Thomson (1942), in their investigation on boys with tonsillitis, found that a supplementary dose of vitamin C to the normal diet reduced the duration of the disease. None of these boys, moreover, developed rheumatism or pneumonia, as did a small percentage of controls not receiving the supplementary dose. It would appear, therefore, that a higher dose than 25 mg. daily would prove beneficial to the maintenance of good health.

During wartime there have been various reports on the degree of saturation with vitamin C. Harris (1942), using the saturation tests described by Harris *et al.* (1935), investigated children in residential homes, elementary-school children, and university students. By comparison with results obtained under pre-war conditions he found that the average saturation curves for April, 1941, were lower than those for 1939. He also found a seasonal variation, the results being low after winter and better after summer. Francis and Wormald (1942) also investigated students. Their results after 9 months of war were not much different from those of a similar group 12 months earlier. After 21 months of war, however, a greater degree of unsaturation was found. More recently, Kohn, Milligan, and Wilkinson (1943) gave a preliminary communication on levels of vitamin A and C nutrition in school-children. They found that 72% of the control group were unsaturated, but that in the group which had received supplementary vitamins all were found to be saturated after three months' tests.

Present Investigation

It was considered that it might be of interest to examine a group of pregnant women with reference to their degree of saturation with vitamin C under wartime conditions. These women, though receiving certain extra rations—e.g., milk, and in some cases blackcurrant juice—have probably a greater drain on their resources owing to pregnancy. By collaboration with the doctor of an ante-natal clinic it was possible to choose the patients according to their degree of intelligence and power to co-operate. In all, 40 women were tested at monthly intervals on their visit to the clinic. They received a special form in which to record their diet for the week previous to the test, with special reference to fruit and vegetables. It was obviously impossible to control their diet or to take samples for vitamin C

content, but, in any case, the results on present-day ordinary meals were what was required. Five non-pregnant women were tested each month as controls. The saturation test employed was that described by Pemberton (1940). This test does not reach the same peak as that described by Harris *et al.* (1935). Pemberton, however, obtained comparative results on two groups of boys—one group on a basic diet and the other on a supplemented diet. He was able to show a marked difference between the two groups. Harris's method is definitely better as it covers a slightly longer period, since the last specimen is not passed till 3 or 4 p.m. Owing to transport difficulties it was impossible to arrange for the women to bring back specimens later in the day, hence the decision to use the shorter method. The first specimen of urine was passed at 9 to 9.15 a.m. (Specimen A); a test dose of vitamin C of 70 mg. per stone of body weight was then taken. Urine was again passed at 11.15 a.m., but was discarded; and again at 1 to 1.15 p.m. (Specimen B). This latter one represents the specimen after the test dose. Only a cup of water, as recommended by Pemberton, was allowed to be drunk after the test dose. The urine was collected in special bottles containing a known volume of glacial acetic acid. Vitamin C was estimated in Specimens A and B by the method of Harris and Ray (1935), the dye being standardized each time. The number of monthly investigations varied with the different cases, as some were evacuated before confinement; but an average of five were done on each woman, making over 200 in all. The whole range of the experiment extended from May, 1942, to Feb., 1943, when, owing to unavoidable circumstances, it was impossible to complete the full year.

The results are given in four tables and a graph. Table I depicts the average amount of ascorbic acid excreted by the five controls both before and after the test dose. It also

shows the range for each period. Table II is similar to Table I, but relates to the 40 pregnant women. These results are plotted as a graph. Table III gives the average percentage excretion of ascorbic acid per patient for the first 28 weeks of pregnancy and for the remaining period.

TABLE II.—Average Amount of Ascorbic Acid excreted by 40 Pregnant Women

Tests	Dates	Specimen A: Range before Test Dose (mg. per 100 c.cm.)	Specimen B: Range after Test Dose (mg. per 100 c.cm.)	Average before Test Dose	Average after Test Dose
10	6/5/42– 2/6/42	0 –0.7	0.3– 53.0	0.34	9.44
16	3/6/42– 30/6/42	0 –1.2	0 – 82.3	0.30	26.9
22	1/7/42– 28/7/42	0 –1.04	0.2–123.1	0.27	39.9
21	29/7/42– 25/8/42	0 –1.3	0 –222.2	0.36	36.0
21	26/8/42– 22/9/42	0 –2.1	0.5–214.0	0.81	67.0
14	23/9/42–20/10/42	0 –4.0	2 –204.6	0.85	55.2
18	21/10/42–17/11/42	0 –3.8	15 –345.6	1.30	86.5
14	18/11/42–15/12/42	0 –1.3	1.2– 86.3	0.57	18.0
13	16/12/42– 12/1/43	0.3–2.1	0.5–118.0	0.86	20.0
12	13/1/43– 9/2/43	0.1–4.7	0.3– 23.6	1.01	6.9

Average after test dose per whole period and whole group = 39.7 mg.

TABLE III

Average excretion after test dose during first 28 weeks	.. 36.4 mg.
Average excretion after test dose from 29th week	.. 32.3 mg.

TABLE IV

Case	Average Excretion of Ascorbic Acid after Test Dose	Symptoms	Remarks	Infant
1	27.6	Spongy gums	Worse during parturition	Weaned at 3 months because of infantile eczema. Doing well now
2	49.5	" "	—	Did well
3	52.1	" "	—	" "
4	43.0	" "	—	" "
5	2.3	" "	Twins (one died)	Other did well
6	21.5	" "	—	Did well
7	36.9	Anaemia	B. coli pyelitis in puerperium; cleared up	" "
8	25.0	" "	—	" "
9	20.6	" "	—	" "
10	6.2	" "	—	" "
11	6.1	" "	—	" "
12	21.5	" "	—	Haematemesis 14th day. Transfused; did well
13	18.7	" "	—	Did well
14	72.0	Slight anaemia	Corneal ulceration at 3 months	" "
15	64.0	Spongy gums and anaemia	Manual removal of placenta	" "
16	19.9	" "	—	" "
17	8.5	" "	Threatened miscarriage 18th week; settled down	" "

Health of Subjects

With regard to the controls, their health with one exception was good throughout save for the usual colds. There was no evidence of anaemia or bleeding gums. The one exception may be worth mentioning as she lived with another of the controls, and therefore had practically the same diet. From May, 1942, to October their results rose together; but from November to January one of them fell considerably below the other, although still receiving the same diet, and in January she developed influenza followed by bronchitis, and was off work for five weeks. The clinical history of the pregnant women was fully investigated by the clinic doctor. Of the 40 women examined, 3 suffered from both spongy gums and anaemia, 6 others from spongy gums alone, and 8 from anaemia alone. Apart from these symptoms, only the complications associated with pregnancy developed, such as toxæmia and pyelitis, and even these in only a small proportion. This incidence of anaemia—27.5%—is considered by the clinic doctor to be definitely more marked than in pre-war days. With regard to the number of cases of spongy gums, both the clinic doctor and the ante-natal dentist to whom the patients

Graph showing comparison between results in controls and those in pregnant women. (a) = Average excretion per test, control group. (b) = Average excretion per test, pregnant women.

TABLE I.—Average Amount of Ascorbic Acid excreted by Controls

Tests	Dates	Specimen A: Range before Test Dose (mg. per 100 c.cm.)	Specimen B: Range after Test Dose (mg. per 100 c.cm.)	Average before Test Dose	Average after Test Dose
5	6/5/42– 2/6/42	1 –0.8	0.8– 3.6	0.48	1.76
5	3/6/42– 30/6/42	0 –0.3	0.7– 20.8	0.10	6.56
5	1/7/42– 28/7/42	0.2–0.3	21.1– 91.8	0.22	61.0
5	29/7/42– 25/8/42	0 –6.2	77.3–266.7	1.48	133.3
5	26/8/42– 22/9/42	0 –0.5	6.1–135.0	0.22	51.8
5	23/9/42–20/10/42	0 –1.0	16.7– 91.5	0.32	47.2
5	21/10/42–17/11/42	0.3–1.5	18.1–157.0	0.88	69.9
5	18/11/42–15/12/42	0.4–0.8	1.8–115.0	0.58	33.1
5	16/12/42– 12/1/43	0.3–1.5	1.4– 89.1	0.96	22.2
3	13/1/43– 9/2/43	0 –0.3	0.4– 23.9	0.10	8.3

Average after test dose per whole period and whole group = 43.512 mg.

were sent are of the opinion that the incidence is definitely increased as compared with pre-war days.

The average results on the above 17 pregnant women showing symptoms are recorded in Table IV.

Discussion of Results

Three main points are shown up by the results. In the first place there is a wide variation in the degree of saturation as judged by the amount of ascorbic acid excreted after the test dose. To economize in space, tables showing each individual excretion are not given, but the variation in the control group lies between 0.4 and 266.7 mg., and in the pregnancy cases between 0 and 345.6 mg. Pemberton (1940) also found variations in his children—namely, 0.5 to 2.6 in those on a basic diet and 13.1 to 74.0 in those on a supplemented diet. One would expect wider variations in our cases, as there was no definite basic diet. Variations occurred from month to month, but where there was a marked rise this appeared to depend on the diet and, incidentally, the season of the year. This leads to the second point—namely, the seasonal variation in both groups. This is well illustrated in the graph. No precise figure for the exact level for saturation following the test dose has been found because, as Harris *et al.* (1935) state, "the test dose does not set out to measure an 'all or nothing' effect—rather, it measures a degree of response or saturation." The average amount excreted per test was worked out for the whole period of the experiment. That for the controls was 43.5 mg., as against 39.7 mg. for the experimental group. Neither of these figures represents a high degree of saturation, and thus it can be assumed that anything below is definitely on the low side. Taking this as our basis, we find in the graph that the real rise towards saturation begins near the end of June for the controls, and near the beginning of August for the pregnancy cases. This rise remains above the average level till November for both groups. The third point of significance is the height of the peak in the two groups. The controls show a much higher peak of 133 mg., as opposed to 86 mg. for the pregnant women.

Most of the investigations on vitamin C in pregnancy have been carried out by workers abroad. The majority show that there is a deficiency in this condition, though Imaz and Gascon (1941) state that, while some change occurred as pregnancy progressed, the limits were found to correspond to normal cases. They conclude that, given an adequate diet, there is no deficiency of vitamin C during pregnancy. Neuweiler in 1935, using the saturation test, found the following range: 8–125 mg. for non-pregnant women, 2–54 mg. during pregnancy, and 2–28 mg. during lactation. He concludes that the utilization of vitamin C is greater in pregnant than in non-pregnant women, and still greater during lactation. Gaehtgens and Werner (1937) found a deficiency which was rather more marked in multiparae than in primiparae. Investigating the serum ascorbic acid, Elmy and Christensen (1938) found it was diminished during pregnancy. They also concluded from their investigations that the winter diet from October to April was insufficient as the source of vitamin C—a fact which has been confirmed by our findings. De Rezende (1939–40) and Portnoy and Wilkinson (1938), using Rotter's test, found that the tissues of pregnant women were deficient in vitamin C and that this deficiency increased as pregnancy progressed. We have worked out the average excretion per person for the first 28 weeks of pregnancy and the remaining period (Table IV). There is only a small difference between the two, but it suggests a slightly lower saturation in the latter part. The finding that the excretion is lower in pregnant women than in controls thus confirms previous observations. That the latter show an earlier rise is also probably due to this fact, since any diminution during pregnancy would tend to lower not only the peak but the time at which the peak is reached. The explanation for this decrease in saturation was well defined by Teel *et al.* (1938), who, finding that the vitamin in the cord plasma was greater than that in maternal blood, deduced that the foetus acts parasitically on the mother.

Our results appear to indicate that, though at the present time the degree of saturation of both groups is low, there are certain periods during the summer months when it rises and the diet would seem to be more adequate. The increased

incidence of anaemia as suggested by the clinic doctor may not be due to lack of vitamin C only but to other factors. With regard to the spongy gums, it would appear from clinical evidence that more cases are occurring than in pre-war days. The results of our experiments, however, show no definite indication that they are associated with lack of vitamin C. This may play a minor part, but no conclusion can be arrived at from the small number of clinical cases reported by the ante-natal doctor.

Summary

A group of 40 pregnant women were examined in respect of their degree of saturation with vitamin C under wartime conditions.

Results showed that there is a wide variation in the degree of saturation, and that it is on the low side.

There is a marked seasonal variation, the patients becoming definitely more saturated from June to October.

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REFERENCES

- Codville, E., Simonnet, H., and Mornand, J. (1938). *Presse méd.*, **46**, 1745.
De Rezende, J. F. (1939–40). *Gynec. et Obstét.*, **40**, 322.
Elmy, A., and Christensen, P. B. (1938). *Ugeskr. Laeg.*, **100**, 1047.
Francis, G. E. C., and Wormald, A. (1942). *Lancet*, **1**, 647.
Gaehtgens, G., and Werner, E. (1937). *Klin. Wschr.*, **16**, 843.
Glazebrook, A. J., and Thomson, S. (1942). *J. Hyg., Camb.*, **42**, 1.
Harris, L. J. (1942). *Lancet*, **1**, 642.
— Abbasy, M. A., Ray, S. N., and Marrack, J. R. (1935). *Ibid.*, **2**, 1399.
— and Ray, S. N. (1935). *Ibid.*, **1**, 71.
Imaz, F. A. U., and Gascon, A. (1941). *Sem. méd.*, **B. Aires**, **2**, 355.
Kohn, G., Milligan, E. H. M., and Wilkinson, J. F. (1943). *British Medical Journal*, **2**, 477.
Neuweiler, W. (1935). *Klin. Wschr.*, **14**, 1793.
Pemberton, J. (1940). *British Medical Journal*, **2**, 217.
Portnoy, B., and Wilkinson, J. F. (1938). *Ibid.*, **1**, 328.
Teel, H. M., Burke, B. S., and Draper, R. (1938). *Amer. J. Dis. Child.*, **58**, 1034.

SUDDEN DEATH IN LABOUR

BY

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The following is an account of sudden death occurring during normal labour in an apparently healthy young primipara, in whom a congenitally small aorta and a persistent thymus gland were found to be present post mortem.

Case History

Mrs. A. B., aged 22; primipara; well-developed muscular woman. No history of any illness. Had attended ante-natal clinic regularly and appeared to be a normal case. On June 2, 1943, at 9.30 p.m., pains started, and at 11.45 p.m. she was admitted to hospital. Term. R.O.A. Blood pressure 136/90. No albumin in urine. General condition good. Strong pains every 15 minutes. Foetal heart normal.

June 3, 1943.—1.30 a.m.: Three fingers dilated; membranes intact. 2 a.m.: Half an ounce of routine sedative mixture given; general condition good; foetal heart normal. 3 a.m.: Membranes ruptured; fully dilated. 3.5 a.m.: Patient became unconscious, cyanosed; breathing stertorous, limbs flaccid; strong pains every one or two minutes. 3.20 a.m.: Pulse rapid and weak; not so deeply unconscious; reflexes present; arms rigid; legs flaccid; diffuse macular rash on trunk and limbs. 3.25 a.m.: Child born—stillborn. 3.40 a.m.: Placenta expelled; normal loss; ergometrine 1 c.cm.; condition of patient poor but uterus well contracted; warmth; intravenous plasma; oxygen. 4 a.m.: Patient recovered slightly; semi-conscious, muttering, and restless. 4.30 a.m.: Patient deeply unconscious again; pulse weak and thready; condition very poor. 5 a.m.: Condition becoming hopeless; acutely restless; pupils dilated and fixed. 5.45 a.m.: Death.

Post-mortem Report.—Heart normal size. Right side relatively empty; this was opened *in situ* and found to contain about six air bubbles, but the blood was not frothy and no bubbles were in the pulmonary artery. Multiple subendocardial haemorrhages in the left ventricle. Valves normal. The aorta was notably small in diameter, measuring only 34 mm. in circumference. Other blood vessels normal. The thymus persisted. Upper air passages clear. The pleura and lungs were perfectly normal, with no trace of pulmonary oedema. The thyroid was slightly enlarged and showed some nodules. Lymph glands not appreciably enlarged. There was ascites of 2 to 3 pints; the fluid was straw-coloured and slightly blood-stained; the peritoneum was otherwise normal. The stomach and