

Public Health

VITAMIN C IN SCHOOL-CHILDREN

W. W. PAYNE, M B LOND, M R C P

BIOCHEMIST TO THE HOSPITAL FOR SICK CHILDREN, GREAT ORMOND STREET, AND TO THE EMERGENCY MEDICAL SERVICE

AFTER the study of vitamin-C saturation in a group of hospital children in the winter of 1940-41 (Payne and Topley¹) it was decided to make a further study in normal school-children.

Two methods of investigation were used. The first was to make saturation tests on a series of school-children. The technique adopted was to take 10 boys between 10 and 13 years and starting on a Monday, give a dose of 50 mg. of ascorbic acid per stone of body-weight daily, until satisfactory saturation had been demonstrated by the presence of at least 7 mg. of ascorbic acid per 100 c.cm. of urine passed in the period between 3 and 5 hours after the dose. A fresh group of boys was taken each week starting in December and the investigation was continued until the end of the spring term.

In the second method two school forms were chosen—one of boys and one of girls, aged between 11 and 12 on an average. About 40 children were in each form. In this school each age-group was already graded into A, B, C and D standards according to scholastic merit and behaviour. A-standard children were the best in intelligence and behaviour; B-standard children were thought to be capable of attaining A standard but were falling short of it for some reason; those of C standard were ordinary average children, and those of D standard were dunces. B-standard forms were chosen as being the most likely to show improved performance or behaviour. To half the children of each form 50 mg. of ascorbic acid was given daily; to the other half dummy tablets were given. Which half was having the active tablets was known only to the headmaster and headmistress.

At the beginning and at the end all the children were given a thorough examination by Dr. C. E. Field and Dr. A. W. Franklin. The progress of the groups was compared by the respective headmaster and headmistress at the end of the spring term with regard to alteration in behaviour, alteration in position in class and number of days absent through illness. It was unfortunately not possible to apply the saturation test to these groups of children.

RESULTS

Saturation tests.—Table I shows the number of days taken to saturate the boys in the months of December to March. Using Harris's criterion of saturation² within 3 days as being satisfactory, it will be seen that, taking the whole period, 86% of the boys were having enough ascorbic acid.

TABLE I—NORMAL SCHOOL-CHILDREN

1941-42	Cases	Cases saturated on days				Not saturated (duration of test in parentheses)	% saturated in 3 days
		1	2	3	4		
December ..	17	4	12	1	0	100	
January ..	27	10	7	4	3 { 2 (4 days) 1 (3 days)	78	
February ..	40	15	15	7	3	92	
March ..	28	3	11	7	4 3 (4 days)	75	
Dec.-March	112	32	45	19	10	86.5	

A control group of children in hospital was tested, to compare with the results of the previous year's test. It will be seen that the results are much worse than in the healthy groups and slightly worse in 1941-42 than in 1940-41 (table II); the same sort of thing has been found among other groups of children in different parts of the country by Harris (1942). The tests were made at the same time of the year in all cases.

Feeding tests.—The reports of both headmaster and

headmistress agreed; no difference in behaviour could be detected by the form teachers.

Place in class—

Girls—no change.

Boys—average position { Vitamin group — 1
Control + 2

Absence through illness—

in both boys and girls the percentage was identical in each group.

Parents' comments—

Vitamin-fed group, 2 reported improvement; no adverse effects reported.

Control group, no improvement reported but 2 reported vomiting and attributed it to the tablets.

Medical examination—

Dr. Franklin reported that he found no difference between the two groups of boys at either the beginning or at the end of the test.

Dr. Field reported no difference in the two groups of girls at the beginning. At the end of the test the only difference observed was a slight injection of the mucous membrane of the anterior aspect of the lower tooth sockets in some cases in the control group. She was rather doubtful of its significance.

Urinæ examined before and after showed no alteration in the minor abnormalities found (albumin or sugar) and no red cells were present at any time.

TABLE II—CHILDREN FROM THE WARDS OF A CHILDREN'S HOSPITAL

—	Cases	Saturated in 3 days	Saturated in 6 days	Not saturated	% saturated in 3 days
1940-41	18	7	4	7	39
1941-42	30	7	12	11	23

DISCUSSION

These results may on the whole be regarded with satisfaction as indicating a reasonably good standard of vitamin-C nutrition considering the difficulties of war-time. The school was situated in the outskirts of a semi-industrial town and served a well-developed housing estate. The usual school meal was supplied (it was one of the schools mentioned by Booth and his colleagues³); the school had no garden.

Supplementary feeding with ascorbic acid produced no detectable improvement in the children. This may be taken as supporting evidence that the Harris saturation-technique gives results in conformity with nutritional needs.

SUMMARY

Saturation tests have been performed on school-children during the winter months and showed a fair degree of saturation. A group of children was fed 50 mg. ascorbic acid daily and their behaviour and physical health were compared with those of a control group. No material difference in these respects could be detected at the end of four months.

I wish to thank Mr. Tovey, the headmaster, and Miss Clifford, the headmistress, for their help; the Hertfordshire county council education committee for permission to do the work; and Dr. Field and Dr. Franklin who so kindly examined the children. Miss B. Kettle was responsible for most of the urinary ascorbic acid estimations. The ascorbic acid was supplied by Roche Products Ltd.

From the School Reports

SCABIES

Dr. Meredith Davies of Devon calls attention in his school report for 1941 to overcrowding in schools in reception areas. In Devon, the native children numbered 38,000 and official evacuees 26,000. This overloading may have something to do with the increase in skin diseases—compared with 1940, scabies increased 2½ times and impetigo and other skin conditions doubled, while the difference in incidence between native and evacuated children, so well-marked at first, was reduced. The increase of scabies in school-children in 1941 was serious

1. Payne, W. W. and Topley, E. *Lancet*, 1941, ii, 596.

2. Harris, L. J. *Ibid.*, 1940, ii, 259.

3. Booth, R. G., James, G. V., Marrack, J. R., Payne, W. W. and Wokes, F. *Ibid.*, 1942, ii, 569.

and widespread. In *Colchester*, the numbers in the three years 1939-41 were 17, 27, 131. In *Stockport*, there were 153 cases in 1940 and 346 in 1941. In *Leicester* the numbers recorded annually since 1934 were 54, 67, 143, 215, 371, 445, 738, 2637. Dr. E. K. Macdonald calls attention to the fact that in Leicester, as in all other parts of the country, the rise in scabies started in 1936; so the pandemic cannot be accounted to anything connected with the war, though war-time conditions undoubtedly favour its spread. In *Northampton*, where there were about 10,000 children on the registers, of whom about 4000 were evacuees, 752 cases of scabies, 310 in the evacuees, were treated at the clinics against 192 in 1940. In *Kettering* among about 42,000 school-children there were 481 cases of scabies. As elsewhere, the incidence was higher among evacuees than among native children, but the difference is rapidly diminishing. In *Exeter*, the known incidence of scabies, which in 1940 was 288 cases in 167 families, increased to 950 cases in 468 families in 1941. Generally in our school-children there was an increase in impetigo and a lowering of the standard of freedom from head lice in 1941, but nothing to be compared with the increase of scabies: The rise in scabies is not limited to the reception areas, nor is it greater in them than in evacuation areas, and, though reliable figures for other sections of the population are not available, it appears to be no greater in school-children than in other people.

TUBERCLE

There will be special interest in the returns of tuberculosis in school-children in the next few years, especially of early pulmonary tuberculosis, for with improved X-ray facilities detection of the disease before the onset of definite symptoms should be possible and three important points at present doubtful can be finally cleared. The first is whether adolescent phthisis starts before puberty; the second, whether the condition of chronic indifferent ill health, formerly called pre tuberculosis, has anything to do with tuberculosis; the third, whether hilum tuberculosis—direct extension of lesion from the bronchial glands to the lungs—is a reality. Dr. Ash of *Derbyshire* gives a table of cases of non-pulmonary tuberculosis in persons under 25 years of age since 1937 arranged in the six age-groups. In the two age-groups below 5, the incidence shows no trend in either direction, but in the other four groups the incidence, after dropping to a low level in 1940, rose sharply in 1941. In 1940, 81 cases of non-pulmonary tuberculosis were detected in children aged 5-25; in 1941, the number was 139. In *Carlisle*, 70 children of school age were referred to the tuberculosis officer—11 notified cases, 30 suspects and 29 contacts. Three were found to have pulmonary tuberculosis, 12 other forms and 55 showed no evidence of tuberculosis. In addition, 5 evacuees were notified, 2 pulmonary and 3 other. In *Southampton* 6 cases of pulmonary and 11 of other tuberculosis in school-children were notified. In *Croydon* among school-children the pulmonary tuberculosis mortality was 6.5 and the incidence 19.5 per 100,000. The non-pulmonary rates were 51.9 mortality and 136.4 incidence. Dr. Holden says that the non-pulmonary rates show a considerable increase "but this may be more artificial than real owing to the fluctuation in numbers due to evacuation." In *Leicester* 2 definite and 51 suspected cases of pulmonary tuberculosis were found in school-children in 1941.

From the Annual Reports

Preliminary reports show 1942 to have been a very healthy year, nearly equal to 1938 and with none of the fears of prolonged war so far realised. The birth-rate was the highest since 1933, but was still less than three-quarters of that required to keep the population at the present level. The death-rate was the lowest but one so far recorded; presumably this does not take into account members of the Services who died abroad. The heavy death-roll of old people from the severe winter of 1940 would automatically lower the death-rate for two or three years by eliminating those most ready to die, if circumstances remained the same; but the low mortality from infectious diseases which helped to keep down the general death-rate of 1942 is altogether favourable. The year was extraordinarily free from epidemics. The trend of tuberculosis was downwards, but this does not

remove our anxiety though it somewhat allays it. Syphilis is the blackest spot, but syphilis is a curable disease and if we can maintain facilities for treatment and the people respond to the present appeals the rapid increase in primary infections should not lead to future grave syphilitic manifestations. Some of the favourable mortality statistics of 1942 can be accounted to improvement in therapeutics, chiefly to the sulphonamides. The suspension of severe air-raids removed the danger of typhoid. Even after the severe bombing of 1940-41, which caused much anastomosis between the water-supply and the sewerage system, there was very little typhoid. This rather suggests that carriers of typhoid are not numerous; but experience of water-borne typhoid is that extensive pollution is less dangerous than slight fouling which does not interfere with potability and can be discovered only by analysis. However, the absence of typhoid outbreaks in towns after severe bombing tells us that even the most desperate dangers can be frustrated if we are ready to deal with them at once.

So far, the severest disease of the war period has been whooping-cough. This may be only because the disease has been made notifiable and attention has been drawn to it. A good case has been made out for preventive inoculation, the validity of which now seems to be established. Since whooping-cough is worst in the first years of life, prevention must be practised in early infancy. The results to be expected are not comparable with those from diphtheria immunisation, but roughly it will reduce the attack-rate to about a third and fatality to about a quarter. There was a well-marked increase in recognised infective hepatitis, or catarrhal jaundice. This disease has always been more common than records show, for until recently the health departments took no interest in it, though the school medical service often came across local outbreaks. Outbreaks of infective hepatitis have been somewhat frequent in the Services. The fall in epidemic prevalence of cerebrospinal fever was slower and less steep than many of us hoped, but the epidemic in the last war was also very tardy in collapsing and the disease never returned to the low prevalence ruling before 1913. During the present year the incidence has been declining more rapidly, whereas in 1942 it increased in the late winter. The results of treatment remain constant with a fatality of 20% of notifications. We should not rest contented with this. Some physicians still withhold sulphonamide treatment from cases which are apparently moribund when first seen, but there are many recorded instances of dramatic recovery in persons not expected to live more than an hour or so. Perhaps the most remarkable health phenomenon of 1942 was the rarity of food-poisoning and diseases spread by food. There was no malnutrition of clinical significance attributable to shortage of food elements.

Infectious Disease in England and Wales

WEEK ENDED JUNE 12

Notifications.—The following cases of infectious disease were notified during the week: smallpox, 0; scarlet fever, 1966; whooping-cough, 2063; diphtheria, 607; paratyphoid, 6; typhoid, 5; measles (excluding rubella), 6724; pneumonia (primary or influenzal), 637; puerperal pyrexia, 143; cerebrospinal fever, 50; poliomyelitis, 5; polio-encephalitis, 2; encephalitis lethargica, 3; dysentery, 127; ophthalmia neonatorum, 97. No case of cholera, plague or typhus fever was notified during the week.

The number of civilian and service sick in the Infectious Hospitals of the London County Council on June 9 was 1828. During the previous week the following cases were admitted: scarlet fever, 187; diphtheria, 46; measles, 76; whooping-cough, 40.

Deaths.—In 126 great towns there were no deaths from enteric fever, 1 (1) from scarlet fever 3 (1) from measles, 14 (1) from whooping-cough, 7 (3) from diphtheria, 51 (9) from diarrhoea and enteritis under two years, and 16 (0) from influenza. The figures in parentheses are those for London itself.

Manchester and Birmingham each reported 5 deaths from whooping-cough. Liverpool and Manchester both had 5 fatal cases of diarrhoea.

The number of stillbirths notified during the week was 219 (corresponding to a rate of 31 per thousand total births), including 21 in London.