

course, the degree of pigmentation of the skin. If the skin is too dark, it is obviously not possible to carry out the test.

TABLE III
Showing time of intradermal test

Subject	Age	Time	
		mins.	secs.
1	21	4	35
2	21	5	22
3	21	4	0
4	21	7	40
5	21	4	47
6	21	2	45
7	21	5	50
8	21	3	35
9	22	3	50
10	22	3	0
11	23	5	5
12	22	5	40
13	21	9	30
14	20	5	0
15	21	3	0
16	27	5	35
17	28	3	15
18	27	5	10
19	27	6	0
20	27	6	15
21	24	3	0
22	23	5	0
23	23	5	0
24	25	3	0
25	28	2	30
26	26	2	20
27	26	3	5
28	25	5	15
29	26	3	10
30	28	5	0
31	30	4	0
32	25	3	50
33	26	5	0
34	23	2	30
35	27	4	0
36	22	8	15
37	27	6	20
38	22	5	10
39	24	8	40
40	25	7	0
41	21	7	30

[Note.—The mean of 41 estimations in normal Bengalis is 4 minutes 53 seconds \pm 1 minute 48 seconds. The normal range may be looked upon as from 8 minutes 28 seconds to 1 minute 16 seconds.—EDITOR, I. M. G.]

Summary

(1) The accuracy of the intradermal test for the assessment of the level of vitamin-C nutrition was tested with guinea-pigs under controlled conditions. It was observed that if the guinea-pigs are placed on a scorbutic diet the time of decolorization increased approximately at the same rate as the body weights diminished, the two curves, in fact, following each other fairly closely. When normal diet or ascorbic acid was given to these scorbutic guinea-pigs, the decolorization time gradually diminished and the body weight rose at fairly equal rates. If the ascorbic acid supplement was withdrawn, the weight

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AN EXPERIMENT IN COOLIE LINE SANITATION : EFFECTS ON HEALTH

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Introduction.—In a previous communication (1938) I described the construction of a set of latrines for a coolie line and gave reasons for the adoption of a particular design. It has not yet been possible to estimate the effect of these latrines on hookworm incidence owing to the absence of a preliminary stool survey of the line in question (see previous report). I am, however, in a position to report on their effect on general health and happiness and on dysentery incidence and, also, on their construction.

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curves and decolorization time curves again followed each other approximately.

(2) In another set of experiments in which three separate groups of guinea-pigs were fed on a scorbutic diet, supplemented by 2 mgm., 1 mgm. and 0.5 mgm. ascorbic acid, respectively, the average decolorization time (observed during the last seven days of experiment) with the group receiving 2 mg. ascorbic acid was considerably less than that observed with the group receiving 1 mg. ascorbic acid. The average time of decolorization with the group receiving 0.5 mgm. ascorbic acid was also less than in the group receiving 1 mgm. of the vitamin, but the difference was not considerable. It would seem, therefore, that when the dose of vitamin C begins to be low, the vitamin disappears from the skin relatively more slowly.

(3) The excretion of 'true total' ascorbic acid in the urine and the decolorization time in the skin test with nine healthy male human subjects before and after ingestion of 700 mg. ascorbic acid were observed. In nearly all cases there was a sharp rise in the ascorbic acid excretion. The decolorization time was also, however, sharply reduced except in one case. These results are discussed.

(4) The intradermal test has been applied to 41 Bengali young men, mainly students, and their vitamin-C status appears to fall within normal limits.

Our sincere thanks are due to the Calcutta University Students' Welfare Committee for a personal grant to one of us (S. B.) and to Dr. A. N. Chatterjee, secretary of the Committee, for his valuable help. We wish also to thank the Indian Research Fund Association for financing our researches on ascorbic acid.

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Effect on health and happiness.—The improvement in the morale of the coolie living in the Balimara line has been remarkable. They have always, from the very beginning, taken advantage of their latrines and have kept them clean themselves. The line is now a model of cleanliness and tidiness and one is struck by the complete absence of odour. The assistant medical officer of the estate reports a drop in the sickness figures for Balimara as compared with the remainder of the estate and the manager reports an increased wages bill owing to reduction of absenteeism. Many of the occupants of other lines have applied to be transferred there and, when told that there was no room, have agitated for similar latrines in their own lines. The management fully intend to carry out this work early in 1939.

Hookworm incidence in the line.—As mentioned above and previously reported (*loc. cit.*) it was impossible to carry out a preliminary stool survey of this line but stools were collected from a random sample of fifty-six persons from the other lines and examined. All the inhabitants of the Balimara line were given a mass treatment with oil of chenopodium (m. xxx) in March 1938. A stool survey was also carried out on the total population, one hundred and twelve persons, of an isolated line on another estate. This is acting as a control line as it possesses no sanitary amenities. Immediately after the survey (in March 1938) all the inhabitants of that line also received a mass treatment with oil of chenopodium (m. xxx). In November 1938 a second survey of the control line and a survey of the Balimara line were carried out using the same technique as before. These surveys were immediately followed by a second mass treatment using tetrachlorethylene (one drachm for adults and proportionate doses for children). The results of the surveys are given in tables I, II, III and IV. Table IV in fact probably gives a fairly accurate picture of the position in March 1938 since Hare and Dutta (1939) have shown that the absolute-cure-rate for a single treatment with oil of chenopodium (m. xxx) is only five per cent, using the mode of administration normally employed in this district.

TABLE I

Stool survey of 112 persons, being the total population of the control line, carried out in March 1938

Infection	Number infected	Percentage incidence
All helminths	103	91.9
Hookworm	97	86.6
Ascaris	54	48.2
Trichuris	61	54.4

TABLE II

Stool survey of 113 persons, being the total population of the control line, carried out in November 1938

Infection	Number infected	Percentage incidence
All helminths	107	94.7
Hookworm	94	83.2
Ascaris	77	68.1
Trichuris	59	52.2

TABLE III

Stool survey of 56 persons, being a random sample of coolies living on Dirial Tea Estate excluding the Balimara line, carried out in April 1938

Infection	Number infected	Percentage incidence
All helminths	49	87.5
Hookworm	40	71.4
Ascaris	33	58.9
Trichuris	29	51.8

TABLE IV

Stool survey of 126 persons, being the total population of the Balimara line, carried out in November 1938

Infection	Number infected	Percentage incidence
All helminths	121	96.0
Hookworm	103	81.7
Ascaris	95	75.4
Trichuris	88	69.8

The latrines also appear to have had some effect on the incidence of 'water-sores' which are most probably the result of irritation of the skin caused by penetration of hookworm larvae. The Balimara line, as is shown in table V, had previously a high incidence of water-sores as compared with the remainder of the estate. This incidence dropped during the worst months of 1938 to a figure slightly below that for the

TABLE V

Water-sore cases in Dirial Tea Estate

Line	Period of observation	Number of cases	Percentage incidence
Balimara	July	21	17.5
	August		
	September	1937	
Other lines	Do.	102	10.3
Balimara	July		
	August		
	September	1938	
Other lines	Do.	11	8.0
		91	9.4

remainder of the estate. That a larger drop has not been shown is not surprising in view of the established longevity of the hookworm larva.

Effect on dysentery

It was a reasonable expectation that the provision of sanitation would have some effect on the incidence of dysentery, already improved by the provision of a pure water supply. Tube-wells were sunk in other lines of the estate in May 1936 but not in Balimara until May 1937. The effect was to reduce the dysentery incidence of that line to that of the remainder of the estate. The latrine system was installed in Balimara line during February 1938. The actual effect of the latrines, though not dramatic, has been satisfactory as is shown in table VI.

TABLE VI
Dysentery on Dirial Tea Estate

Line	Period of observation	Number of cases	Percentage incidence
Balimara	June 1936 to May 1937.	9	6.9
Other lines	Do.	38	3.7
Balimara	June 1937 to February 1938.	3	2.3
Other lines	Do.	27	2.6
Balimara	March 1938 to November 1938.	5	3.5
Other lines	Do.	43	4.4

Though dysentery assumed epidemic proportion in the remainder of the estate during the summer of 1938 and gave rise to great anxiety, it never spread to the Balimara line. Of the cases reported above three arose sporadically and the other two occurred when there was no other dysentery in the remainder of the estate and there is reason to believe that they were due to consumption of infected food from the *bazar*. If these cases are ignored, the incidence in the Balimara line is reduced to 2.1 per cent. It would appear therefore that the problem of dysentery in tea estates can be adequately dealt with by the provision of a pure water supply and effective sanitation.

Construction

There has been no sign of caving-in of any of the bored-holes although no lining of any description has been used and the housings have stood up to the very inclement weather of the 1938 rains excellently. The use of a 'topping' of two courses of *pucca* bricks and the coating of the Kapax bricks with tar and crude oil have proved absolutely effective in preventing collapse of the walls due to damage by heavy rain.

Acknowledgment.—I wish to acknowledge my indebtedness to Dr. H. C. Das, assistant medical officer, Dirial Tea Estate, for his patient work in searching through his sickness records for the material embodied in tables V and VI.

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THE SOURCE OF STREPTOCOCCAL INFECTION IN PUERPERAL FEVER

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and

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PUERPERAL FEVER, so far as it has been possible to demonstrate, may be due to one or more of the following micro-organisms, *viz.*, Streptococcus, Staphylococcus, *B. coli*, *B. welchii*. Puerperal fever due to streptococcus is the commonest. Even in well-equipped hospitals where the greatest possible aseptic precaution is taken, puerperal sepsis cannot be avoided. This induced scientific workers to search for the source of infection and streptococcus being the commonest cause of puerperal infection, investigation on the source of this micro-organism was taken up with much care and interest.

There can be two possible sources of streptococcal infection, (1) Autogenous, *i.e.*, the patient herself can harbour a haemolytic streptococcus in her throat which becomes virulent at the puerperium when the defensive power of the body is low, and (2) Exogenous, *i.e.*, infection may occur from contact with medical attendants, nurses or visitors.

It was shown by Dr. Dora Colebrook that in 38.1 per cent of streptococcal puerperal infection the strains of *Streptococcus haemolyticus*, isolated from the throats of the patients, serologically corresponded exactly to those isolated from the blood or vaginal discharge, in other words the infection was autogenous. Our investigation was directed to determining the sources of infection in this country. From obvious difficulties in collecting materials from visitors to the maternity cases we could not ascertain directly as to how far contacts were responsible for the source of infection by *Streptococcus haemolyticus*.

Method of investigation.—Materials for investigation were collected from Baldeodas Maternity Home, Medical College Hospital and Calcutta Medical School Hospital.

As soon as a maternity case was admitted into the hospital one swab from the throat was taken and the streptococcus, if any, was isolated. Haemolytic and non-haemolytic strains were grouped separately. Subsequently, if any case developed puerperal fever, one or sometimes two on different occasions, vaginal swabs were taken to find out if there was any streptococcus (either haemolytic or non-haemolytic) present.

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