regard to the patients with skin manifestations of the disease, the lesions have disappeared more slowly than those in the mouth and throat. All showed improvement, but only in a few could the result be considered brilliant. In two of these cases the primary lesion was still present. One of these had a primary lesion at the anus, another on the vulva. In both of these instances the primary lesions, which was ulcerated and showed evidence of secondary infection, became clean and granulating within three days, although these initial lesions had made little progress in healing under the usual forms of treatment. In one the eruption faded very perceptibly in three days and had disappeared in two weeks. In the other patient, who presented a marked papular and macular eruption, only a few macules remained at the end of six days. A patient in which there was a profuse maculo-papular eruption all over the body, which had been present but one week, showed marked improvement in three days, and but a few faint papules remained at the end of ten days. Another patient in which there was a disappearing papular and macular eruption with a few pustules which had been present for two months resulted in a complete disappearance of the pustules, and only a trace of the macular eruption remained at the end of two weeks following the use of the drug. With another patient who had a large papule in the palm of the hand and a few scattered papules on the remainder of the body, the treatment resulted in the disappearance of all the lesions except the one in the hand at the end of ten days, and this disappeared in three weeks. A patient with a profuse papular and pustular eruption of two weeks' duration, associated with a large bubo, showed absence of the pustular six days after the drug. The papular persisted after the pustular had disappeared, but these became absent in sixteen days, at which time the bubo had disappeared except for slight induration.

In considering these cases as a group the results obtained in regard to the lesions must be considered most satisfactory, and some brilliant.

In regard to the influence of the drug on the sero-reaction in the early cases.—Of the fifteen cases which comprise this group, all showed a Wassermann +++, and all but six a Noguchi +++ reaction, before receiving the drug. In these six cases, the Noguchi reaction was not made. At a period between four and six weeks after the administration of the drug the sero-reaction was negative in seven and positive in eight. None of the cases becoming negative in this period have become positive after eight months. Of the eight cases remaining positive at an interval of between four and six weeks, four remained unchanged in the degree of the reaction, four showed the reaction decreased in severity. A sero-reaction at an interval between six and ten weeks following the drug showed in these eight cases that four had become negative, three remained positive, two of these less in degree, and in one no test was made. Of the four cases negative, the reaction remained

negative three months later in two, four months in one and no test has been made in the fourth case. Of the three cases positive and the one not tested at this time (an interval of between six and ten weeks) showed the sero-reaction to have become negative between the tenth and fourteenth week in two (one, the case in which no test was made in the interval between six and ten weeks), and two remained positive. These two patients received repeated doses: one eleven weeks after the first dose and the other twelve weeks after the first dose. Both of these cases gave negative sero-reactions four weeks after the second dose.

A summary of these cases shows that seven became negative between the fourth and sixth week, that eleven were negative at a period between the sixth and tenth week, that thirteen were negative between the tenth and fourteenth week, and that two were positive at the end of the tenth week. These two, receiving a second dose, became negative within four weeks following the second dose.

(To be continued.)

BOSTON'S HOSPITAL SCHOOL FOR TUBERCULOUS CHILDREN.*

BY EDWIN A. LOCKE, M.D., AND TIMOTHY J. MURPHY, M.D., BOSTON.

ONE of the most important developments of the tuberculosis campaign in recent years has been the demonstration of the prevalence of pulmonary tuberculosis among children at the school age, and of the direct relationship of infection to conditions of general debility in the child. Every well-organized program of anti-tuberculosis work should give prominence to efforts especially directed against the disease at this age period. Unquestionably the most important measure adopted to meet the needs in this field is the outdoor school.

So generally are these principles accepted, that it would be superfluous to discuss them in this paper. We start with the assumption that all will admit the necessity of the maintenance of such institutions for the care of tuberculous children at least in every large community.

The Hospital School conducted in Boston during the past two years is one of the most important of the experiments in this new field of tuberculosis work yet made, and it is hoped that a discussion of our experience in this undertaking may prove of interest.

HISTORY.

In July, 1908, the Boston Association for the Relief and Control of Tuberculosis opened, on Parker Hill, a day camp for tuberculous children. While primarily for those actually tuberculous, a certain number of debilitated children who were exposed to the disease at home were also admitted. The children were kept in the open air for the entire day, and were always under a definite program,

* Read before the meeting of the National Association for the Study and Prevention of Tuberculosis, Denver, June 20, 1911.

including the care of gardens, housework, play, rest, talks on health, and nature studies. The success of the undertaking during the first two months led the Association to seek the co-operation of the Boston School Board in changing the day camp to an outdoor school. This co-operation on the part of the School Board was readily given, and the School was opened in September of 1908. The onset of cold weather, together with the increase in numbers, necessitated a change to larger and more permanent quarters, and through the generosity of the Park Commissioners the school was installed in the Refectory Building in Franklin Park. The roof-garden was equipped with canvas curtains to be used in case of storm or high winds, desks, chairs, etc., and converted into a schoolroom. Here the children remained during the day throughout the entire

EQUIPMENT AND ORGANIZATION.

The Refectory Building, which is shown in the accompanying cuts, was admirably adapted to the needs of a hospital school. On the spacious roof a large outdoor schoolroom was fitted up and, except for short intervals during the day when the children went inside for meals, baths, examination, etc., was the place where they spent the entire day whether studying, resting or playing. All the strictly school equipment was provided by the Boston School Department, the remainder by the Consumptives' Hospital. Various rooms in the building were adapted to the needs of the nurses, teachers and others. On the ground floor were located the kitchens, dining-rooms, baths, coat-rooms and toilets.

Although the Hospital School was maintained jointly by the two departments above mentioned,

The Refectory Building, Franklin Park.

winter in spite of the hardest storms and coldest weather.

An excellent account of the work of the School to January, 1909, was published by Dr. James J. Minot and Miss Hyams, of Boston, in the fifth annual report of this Association.

The first winter of this undertaking was marked by such striking success as to call forth general approbation, and to be considered as amply justifying the demands for further development. The work was transferred to the joint control of the Boston Consumptives' Hospital and the Boston School Department, Oct. 12, 1909. Since that date until its close, Jan. 31, 1911, the institution has formed a part of the Boston Consumptives' Hospital, and it is to the work of this period that we especially invite your attention.

the Institution was regarded strictly as a hospital, or day camp, and formed an integral part of the Boston Consumptives' Hospital. As such it was administered by the superintendent of the hospital, and the medical duties performed by the medical staff. The immense advantage of such an arrangement is at once apparent. Records of all kinds used were uniform with and formed a part of those at the Out-Patient Department, and were returned to the files there after the discharge of the child. All teachers were furnished by the School Department, and held to the same requirements regarding general work as in the ordinary public schools. The children, however, were regarded strictly as sick children, and their entire life in the school regulated in accordance with orders of the visiting physician.

At entrance, each child was assigned a number and provided with a reclining chair, blankets, thick overcoat, paraffined canvas bag with a detachable blanket lining in which to sit or recline, woolen cap, mittens, overshoes, individual drinking-cup and toothbrush; all of which were numbered.

The cases admitted came largely from the Out-Patient Department, although to some small degree directly from the public schools or private physicians. By arrangement with the school nurses, all debilitated, anemic or undeveloped children were singled out, examined by the school physicians, and all positive or suspected cases referred by them to the Out-Patient Department for diagnosis. Many children from tuberculous families were also sent for examination by the nurses of the department. Other agencies have

children; tubercle bacilli were found in nine. A culture was made as a routine of all cases of sore throat, and the child isolated at home under the care of the visiting nurses until the report of the examination was known. Likewise, all cases in any way suspicious of the acute exanthemata were sent home and kept under observation until the condition could be safely regarded as non-contagious. In spite of the fact that during the course of the last year several cases of contagious diseases appeared among the children, these rules were so carefully carried out that no case of contagion occurred. The nurse was furnished with written instructions covering all possible emergencies. One of the visiting physicians was always on telephone call, and every medical question of importance referred to him.

Three physicians were regularly in attendance,

Open-Air Schoolroom, Refectory Building.

co-operated in making this dispensary the center for this special work. In consequence, the children admitted to the Hospital School were referred from this source, although a few were accepted on the recommendation of their family physician.

The School was kept open on Saturdays and holidays, experience having demonstrated the bad results of repeated regular absence from the routine of treatment.

The Boston Board of Health gave the School every possible assistance, and, by special arrangement, all specimens of sputum and throat culture were examined in the city laboratory. A specimen of sputum from every child, so far as it could be obtained, was sent to the laboratory, and if negative, the examination repeated at weekly intervals. In all, sputum was obtained from but thirty-eight

as a rule at least four visits each week being made. Once each month every child was given a complete physical examination. The daily observations regarding the condition of the children were left to the nurse.

Those cases needing examination of the nose, throat or ears were referred to the Out-Patient Department. A considerable number had tonsils and adenoids removed. Those with teeth needing care were systematically sent to their own dentist, if they had one, or if not, were taken by the nurse to the Harvard Dental School for treatment. Other special conditions were treated in special clinics.

To place the child under ideal hygienic conditions during the day and allow him to return to bad home conditions at night is obviously ineffective. Every effort was, therefore, made to inves

tigate the homes and to improve the conditions so far as possible when unfavorable. To some extent this was done by the visiting nurses from the Out-Patient Department, but chiefly by a trained social worker who gave all her time to the home work. She devoted her efforts particularly to the improvement of the conditions in the sleeping rooms, and to the selection of a diet suitable to the child. The results in this field have, we believe, been most gratifying.

The entire staff of the institution comprised three physicians, a nurse, social worker, dietitian, five teachers, a cook, two maids and a janitor.

We wish especially to emphasize the fact that the Hospital School was in the strictest sense a hospital, organized and administered as such. It was not maintained for the "debilitated" or "anemic" child, but for the tuberculous only. The child was always referred to the superintendent for admission, as in any hospital, and discharged by him according to the patient's condition as given by the visiting physician. The doctor was in command, laying down not only the rules for the general course of treatment, but usually for the individual in particular. The prime object of the Hospital School was not so much to remove tuberculous children, dangerous to others, from the public schools, as to cure them and to make them healthy adults. To this end lessons were regulated entirely with regard to their physical condition; the nurse, in the absence of the physician, being the sole judge of the amount and type of instruction indicated. Competition in studies was never stimulated by the teachers unless the condition of the patients admitted, and there was no pressure of work for advancement, as in the ordinary public schools.

PROGRAM.

At entrance the physical condition of the child was determined by one of the visiting physicians, and depending on this, he was placed in one of three groups. The daily program for each of these groups was arranged with reference to the amount and nature of the study, exercise and work. Those in Group I were required to follow the regular routine of the school, which included a systematic assignment of work, exercise and study. In Group III no work and a minimum of study and exercise was permitted. Group II was intermediate. Individual exceptions were, of course, frequently made. Absolute rest in the case of those with active tuberculosis was less rigidly enforced than would be considered wise in the treatment of adults. We have felt that the child should not necessarily be active, but should be occupied.

Work of various kinds under supervision was arranged and graded so far as possible to suit the ages and fitness of children to perform it. In small groups the available children were assigned for each week to a schedule of duties. These consisted in setting and clearing the tables, washing dishes, sterilizing the eating utensils,

dusting, assisting the nurse, watering the flowers, and other such occupations.

On their arrival, at 8.15 A.M., the children first washed their hands and prepared for breakfast, which was served at 8.30. At 9, all the children were required to go to the wash room to brush their teeth. Those not assigned to work then went to the open-air room on the roof, where they were given breathing exercises and school work according to their condition. A few of the sicker patients remained in their steamer chairs for the greater part of the time. During the cold weather the school routine was frequently interrupted by short periods of light exercise. From 11.30 to 12, games were allowed. At noon school work ceased and the children prepared the roof for the rest hour. They then filed to the wash room to prepare for dinner at 12.30. Following dinner, the teeth were brushed and all basins and other utensils used in the wash room packed in the sterilizers. By 1.30 they were again in their places on the roof, where they rested in steamer chairs until 3. In the winter the children were kept warm during this period of rest by sleeping bags and blankets. At the close of the rest period exercises, singing, talks by nurses or teachers, and similar exercises occupied the time until 3.30, when the temperatures were taken and the chairs put away. By 4, they had again finished with the same preparations for the table, and sat down to supper. Beginning at 4.30, they were dismissed in small groups, a teacher accompanying them as far as the Dudley Street Transfer Station.

On Saturdays and holidays, and during the summer, the teachers not being present, the work of the school was considerably changed. Volunteer workers took them for walks, supervised them in games, gave them talks on nature or hygiene topics.

The children were not allowed to use ordinary handkerchiefs while at school, but were furnished with paper napkins instead, which, after being used, were placed in paper bags and at the end of each day burned in the furnace.

DIETS.

Investigation of a considerable proportion of the homes of the children showed that over 50% had received charitable aid of some sort, and in a majority of these homes a proper and adequate diet was not given the child. In many instances, however, it should be stated that the family seemed able to provide a suitable diet, but through ignorance or neglect did not. Our social worker, therefore, devoted much time to instructing the mothers as to the needs of the child and the best methods of preparing the food. In the treatment of children with tuberculosis, the first essential is the provision of an adequate diet, for we must not only meet the need for increased resistance to combat the disease, but also for a relatively large amount of nourishment to answer the demands of a growing organism. Open-air treatment without attention to adequate feeding may be a positive detriment, since by

increasing the demands for heat, the fuel requirements of the organism are materially increased.

In the work of the Hospital School the closest attention was given to the question of nutrition. At intervals the children brought lists of the food eaten at home for a period of several days, and in the diet prescribed every effort was made to supplement this diet in such a way as to provide a total suited to the particular needs of the individual child. So far as possible, the food served was of the kind which can be provided by the families of the class from which the patients were drawn. A minimum cost was also a determining factor in its selection. This department was entirely in the hands of an expert dietitian, who devoted her entire time to the work. Throughout the year experiments were carried out on selected groups of children to determine the diet best adapted to their needs. Every serving in such cases was carefully weighed, its caloric value reckoned and the results tabulated. The results were tested by the course of the weight curve and observation of the general symptoms. The diet, for example, furnished to a group of thirty-five boys and girls of average age, thirteen, and average weight, sixty-six pounds, during a test period of two months, gave the following: Protein, 114 gm.; carbohydrates, 394 gm.; fat, 113 gm. The fuel value of this diet was approximately 3,100 heat units, or 100 calories per kilo of weight. In general this is much higher than the standards ordinarily accepted as necessary for children of this age, but it must be remembered that the test was made during the winter months, when, in spite of warm clothing, the heat radiation is considerably increased, that the children were in the open air for the entire day, and that the amount of muscular work done was probably somewhat above the average. No inconvenience whatever resulted from the large amount of protein ingested, and the diet in every way appeared to be admirably suited to the children. The following varieties of foods made up the bulk of the diet: Milk, butter, bread, crackers, dried fruits, cocoa, rice, cereals, jams, simple puddings, soups, meats and vegetables.

The following menu calculated with reference to the calories furnished is given as an illustration of the average diet.

Breakfast. Cocoa, graham gems and butter, stewed prunes.

Luncheon. Baked beans and brown bread, milk, apple or orange.

Supper. Milk, bread with jelly.

	Amount. Grams.	Proteid. Grams.	Fat. Grams.	Carbo- hydrates. Grams.	Calo- ries.
Cocoa (2 cups),	510	19.07	23.42	37.86	451
Graham gems (2),	57	5.07	1.03	29.70	152
Butter,	28	.28	23.80		223
Stewed prunes,	28 (dry)	.59		20.50	87
Baked beans,	91	6.28	2.28	17.84	120
Brown bread,	241	13.01	4.34	113.51	559
Apple,	113	.34	.34	12.20	55
Milk (3 glasses),	755	24.92	30.20	37.75	538
Bread,	57	5.19	.91	30.38	154
Jelly,	19	.20		14.74	61
Totals,	1,899	74.95	86.32	314.50	2,400

During the first ten months of the year 1910, with an average attendance of 64.25, the average cost of raw food materials per child per day was thirteen and one-fifth cents.

BATHS.

One of the most important features of the work in the Hospital School was, we believe, the system of bathing carried out. A portion of the large room in the basement of the Refectory was fully equipped with shower baths, sinks, racks, etc., and used for a wash room. Each child was supplied with an individual basin, soap, toothbrush, mug and comb, all of which, as in the case of the blankets and other articles mentioned above, were marked with the registration number. For the proper care of these the patients were held strictly responsible. Once each week, with few exceptions, every member of the group of children was required to take a shower bath, the teachers usually assisting the nurse in the work of supervision. Paper napkins were used in the place of hand towels, and tooth picks for nail cleaners. After being used both were burned in the furnaces.

COST.

The first cost of equipment was as follows:

Blankets, clothing, etc.,	\$1,208.21
Household, kitchen and dining-room supplies, hardware and equipment,	1,065.51
Furniture and furnishings,	357.75
Repairs,	158.97
Electric fixtures,	50.33
Plumbing,	43.96
Medical equipment,	14.66

Total capital expenses for school, \$2,899.39

For the year 1910-11 the total general operating expenses were \$8,231.60, or a cost per patient, per day, of 56 cents. This is exclusive of the School proportion of the general hospital administrative expenses, estimated as \$1,277.34, which if added brings the per capita cost per day to 65 cents.

It should be clearly understood that the term "general operating expenses" covers many items not ordinarily included in the cost of such an institution. During the year twelve adults besides the children were furnished regular meals.

RESULTS.

Considering the relatively short period covering the existence of the Hospital School, exact figures of the results are of questionable value. Everyone at all familiar with tuberculosis in children realizes the uncertainty of diagnosis in many instances, and the difficulties in determining the results of treatment. It is furthermore impossible to give any precise account of the influence of such an organized effort in other ways than directly on the physical condition of the individual. The favorable influence on the conditions in the homes has frequently been noted by the nurses and social worker. Opposition on the part of the parents to any of the methods employed at the school have been the rarest exception, and in most instances we have received their hearty

co-operation and approval. The demonstration of the fact that tuberculous children can be treated in the open air during the cold and stormy winter months without discomfort to the child and with enormous physical benefits has proved a great object lesson to the community. To this School and the public interest which it has aroused is, it seems fair to state, due the general movement in Boston for open-air rooms in all school buildings. Far more attention is of late given to the ventilation of schoolrooms, as well as to the physical condition of the school child.

The general results of treatment have, on the whole, been extraordinarily satisfactory. After admission the children show, almost without exception, an immediate improvement in their physical condition in response to the life in the open air, rest and feeding, and the teachers have frequently noted a striking development in the mental powers also. As a rule they enter into the routine of the school with enthusiasm, and we have never observed any hardship from the life in the open air, even during the most severe winter weather. On several occasions when discharged, the child begged to be allowed to remain.

From Oct. 12, 1909, when the Hospital School was taken over by the Boston Consumptives' Hospital, until its close, Jan. 31, 1911, a total of 191 children, 94 boys and 97 girls, were treated. One hundred and seventy-four of these were treated during the year ending Jan. 31, 1911.

The following table gives the grouping of the 191 children according to age and sex.

Ages.	Boys.	Girls	Totals
4 years,	..	1	1
5 years,	1	3	4
6 years,	6	3	9
7 years,	4	5	9
8 years,	9	7	16
9 years,	9	8	17
10 years,	16	12	28
11 years,	16	12	28
12 years,	12	12	24
13 years,	9	13	22
14 years,	7	16	23
15 years,	2	4	6
16 years,	3	1	4
Totals,	94	97	191

The condition at entrance is given below:

Stage at onset.	Boys.	Girls.	Totals.
Suspected,	4	1	5
Stage 1,	61	66	127
Stage 2,	24	21	45
Stage 3,	3	9	12
Tuberculous glands,	1	..	1
Unknown,	1	..	1
Totals,	94	97	191

It will be seen that the patients classed as Stage 1 comprise 66%, those as Stage 2, 24%, and those as Stage 3, 6% of the total.

Tabulation of the 184 cases, comprising those actually tuberculous, according to the results of treatment shows the following:

	Arrested.	Im- proved.	Un- improved.	Un- known.	Non- tuber- culous.	Totals
Stage 1,	51	53	8	11	4	127
Stage 2,	13	23	7	1	1	45
Stage 3,	0	6	5	1	0	12
Totals,	64	82	20	13	5	184

These figures cannot be accepted, however, as truly representing the success of the treatment given, since no account is taken of the length of stay, regularity of attendance, unfavorable home conditions and many other factors which manifestly exert an important influence on the effectiveness of treatment. Furthermore, the term "arrested" has been employed in a very restricted sense. Several at least of the improved might have been included in this group, but were under observation too short a time to warrant the use of the term "arrested." The "unimproved" were chiefly of two groups: First, those who were too sick to be at the School, having been admitted because no place in a hospital could be provided for them; and second, those who attended for only a short period or very irregularly. The closing of the school further made it necessary to discharge all patients, irrespective of their conditions. About one hundred were registered at the school just before its closing. Taking these facts into consideration, therefore, the results seem to us extremely satisfactory.

The response to treatment is well indicated by the table of gains and losses in weight for the entire group of 191 patients:

WEIGHT.	
Number gaining,	147
Number stationary,	16
Number lost,	17
Unknown,	11
Total,	191

The 33 cases who either remained stationary or lost weight were made up very largely of those whose attendance was very irregular, or whose home conditions were bad. Many belonged to the second and third stage of the disease. The largest gain in weight was twenty-seven and three-quarters pounds. Gains of eight to twelve pounds were not infrequent.

Recently an attempt has been made to learn the present disposition of the 174 cases treated during the past year. One hundred and fifty-six were found, and the record is given in the following table:

Condition at discharge.	Stage at entrance.	Public schools.	Left the city.	Working.	At home.	Day camp, hospitals, etc.	Dead.	Totals.
Arrested	1	34	8	1	1	—	—	44
	2	9	2	—	—	1	—	12
	3	—	—	—	—	—	—	—
Improved	1	36	5	3	4	5	—	53
	2	9	—	3	3	6	—	21
	3	1	—	—	3	1	1	6
Unimproved	1	2	—	—	4	3	1	10
	2	—	1	—	1	2	2	6
	3	—	—	—	3	1	—	4
Totals,		91	16	7	19	19	4	156