A T H E S I S

for

THE DEGREE OF DOCTOR OF MEDICINE

of the University of Glasgow

on

"STUDIES ON MARASMUS INFANTILIS"

presented to the University

on

1st JUNE, 1914.

by

H. B. MORGAN,

of the

HOSPITAL FOR SICK CHILDREN,

Great Ormond Street,

London, W.C.

In this Thesis I propose to deal chiefly with the Medical causes of Marasmus. The surgical causes of Marasmus such as:-

> Congenital defects of various organs especially those connected with the Alimentary System - from Cleft palate to various congenital strictures &c. of the Lower alimentary tract,

are not considered as being within the purview of this thesis.

The great mass of Public Health data and the grave sociological question underlying the general conditions predisposing to marasmus have been so well dealt with in various official publications and some text books (e.g. Forsyth's[+] Children in Health and Disease) that no general attempt has been made to deal with this aspect of the question. This thesis has been narrowed down to a consideration of the purely medical causes, and every attempt has been made to exclude the Public Health and national aspects. This has often been a task of great difficulty. Aspects of the question so overlap one

---

+ Forsyth: Children in Health and Disease.

another that in places it has been found impossible to avoid a word or two beyond the medical aspect. But the question of environment, ante-natal and post-natal hygiene of the mother and child, prematurity, proper feeding, the ignorance and helplessness of mothers, parental habits, especially alcoholism and the many other manifold bearings of the subject and the discussion pertinent thereto as to the share of environment and heredity have been avoided as aspects of sociological interest already dealt with in official reports.

The condition of Marasmus has been dealt with (if one may put it that way), rather as an infection or post-infective condition: it is of course not always one or either of these: but this method was considered best for the purpose of this work.

The chief medical causes of Marasmus are:-

i. Congenital Syphilis.

ii. Tuberculosis.

iii. Some form of enteritis (infantile diarrhœa or a chronic infection of organisms causing infantile diarrhœa or the post-infective state.

iv. A very few cases in which K.L.B. found.

v. Some as yet undetermined causes in the remaining cases of Marasmus.

It is difficult to write a thesis on Marasmus, most aspects of the subject have been touched and fringed, but many things remain unexplained: there has been much theorising: the subject is as old as the hills and it is difficult to find something new - though I think I have been fortunate enough to hit on at least one unexplained aspect (the association of the K.L.B.) the opinions of which originated with myself and for which I was subjected to much chaff by my colleagues. Their opinions, however, gradually underwent a change, as the proof of the frequent association of the K.L.B. and Marasmus accumulated.

Marasmus is the rubbish heap of diseases of children: When a child wastes and the cause of the condition is obscure the term Marasmus comes to the rescue. Some think that some children are born with an inherent defective absorbing apparatus or defective assimilating apparatus.(Hutchinson)[+] Others ascribed the condition - or defects if such be present - as due to varying degrees of infection by a pathogenic virus.

All sorts of conditions from a septic dental focus to a generalised infection have been described in exceptional instances as a cause of Marasmus, but it will be found that certain common conditions predominate

---

[+] Hutchinson - Lectures on Diseases of Children. p.104.

in any returns. Some seek the cause in some obscure disturbance of tissue metabolism. Nobecaut and Maillet[+] before the Societé de Pédiatrie in Paris on 14.10.12., e.g. dealt with Athrepsia (Atrophy) and Azotalmia.

They describe 15 cases, in seven of which urea more than a gramme a litre, and eight more than ½ gramme a litre.

In another comparative series of 27 cases, in which Athrepsia due to other causes - urea always below ½ gramme.

Eric Pritchard[++] lays stress on the value of correct feeding, not too much or too little.

Hutchinson in his work, Lecture IX (an excellent lecture) restricts the term "marasmus" only to those cases in which no organic disease or other cause for the wasting condition can be observed. This is an ideal plan, but the difficulties arise in general practice where a medical practitioner, may, say, be suspicious of tuberculosis in a wasting infant, and yet from a refusal of an autopsy has to certify the death as due to Marasmus. This same difficulty - that of obtaining consent for an autopsy - obtains in rate aided Institutions,

---

[+] Abstract B.J., Child Dis. 1913, p.124.

++ Pritchard. "Brit. Journ. Child Dis. Febry 1914, No.122. pp. 49 - 96.

in voluntary hospitals the case permission is taken as granted, unless a definite refusal is given 12 - 24 hours after death. For scientific accuracy of course the term Marasmus should only be employed where all our scientific knowledge fails to establish any cause for the condition and may be death. Many cases of Marasmus if kept alive long enough recover - and the cause of their condition remains in obscurity.

With regard to the subject of Infantilism the condition of the subject is too chaotic, its types not sufficiently classified to render any discussion of the subject valuable in a general thesis of this character. It occurs too frequently in children above my age limit. Zondel[+] includes some general diseases &c, like tuberculosis in its causation: but it is doubtful if such a classification would hold.

In this thesis I have made no attempt to cover all the ground of Marasmus - so well done in many modern text books but only to write of those conditions which for the past two years (and before) I have personally observed in these cases and think, in my humble opinion, worthy of record, mention or emphasis.

I propose to frame the thesis in the following way:-

(After Introduction)

PART I. Refers to the association which I have observed between the presence of the Klebs Loeffler bacillus, and weakened wasting tissues.

[+] Zondel, Practitioner, November 1913, p.681 - with Bibliography.

I have limited the age of my cases to 2½ years.

The investigations and work of which this Thesis is the outcome were carried out by me during my 11 months tenure of the position of Assistant Resident Medical Officer at the Park Hospital for Children, Hither Green, London, S.E., and has continued up to the present.

The Park Hospital - really the Metropolitan Children's Infirmary - offered unrivalled facilities for the study of Marasmus. It is one of the largest institutions of its kind in the world. It was not used as a hospital for acute cases, but under the Local Government Board's orders "for weak, debilitated and convalescent children", the Metropolitan Asylum's Board allotted the Park Hospital from its Fever Service for the reception and treatment of such children. The scheme has been badly worked, and it amounted to this that the Park Hospital, exceptionally well equipped, and beautifully situated received the refuse of the Metropolitan Poor Law Infirmaries, including their non-thriving cases of Marasmus. Such a collection of marantic children has probably never been gathered together in such a medical institution in the world: the field therefore for a study of Marasmus - clinical and otherwise - was exceptional: and I availed myself to the full of the unique opportunity. Every facility was

afforded me for my bacteriological investigations.

The death rate at this Institution for 1912 was 6.6 per hundred.

2,360 admissions - 155 deaths

Deaths under 1 year 82

" " 2 years 36

" " 3 years 132

293 cases of Marasmus were admitted.

325 " " Congenital syphilis.

296 " " Debility (many of these in older children)

92 " " Enteritis.

In a corresponding Institution at Carshalton, only 79 cases of Marasmus and 9 congenital syphilitic cases were admitted in that year.

881 cases of Marasmus were admitted (as such) to the Park Hospital, from its opening up to the present).

A child before admission then passes through the following hands:-

Private practitioner (perhaps).

District Medical Officers (Poor Law).

Metropolitan Infirmary.

Metropolitan Asylums Board Children service:

it is supposed to be admitted to the latter with a certificate of freedom from infection, a regulation frequently neglected.

The marantic cases thus selected from transfer

are the worst cases: no improvement was obtained as expected under medical treatment elsewhere and so sent on.

The mortality of these cases is high in hospitals (see Local Government Board's report and Diseases of Children, Batten &c.+), for only the worst and most prolonged cases are admitted, and in them the power of assimilation sometimes appears completely lost.

These remarks are especially applicable to the cases at the Park Hospital, and the statistics from there are of a very different kind from those from any other Institution. The cases sent to the Park were sent to remain there till death or recovery - for if they were sent back to their Infirmary they were immediately sent back. The cases had to be admitted, and were thus seen in old stages, and especially the terminal stages of their marantic condition. Occasionally the post-mortem appearances could be seen and studied, but this, as in most public institutions did not occur frequently. In voluntary hospitals such cases are seen in their acute or at most subacute stage.

The clinical picture of the marantic infant has been so vividly described in many admirable textbooks on the Diseases of Children that I do not

---

+ Garrod, Batten and Still: Diseaes of Children.

propose to elaborate that aspect. One of the best chapters on Marasmus occurs in the Diseases of Children text-book - the output of the consulting staff of the Hospital for Sick Children, Great Ormond Street. In spite, however, of a voluminous literature on subjects relating to Marasmus and a fair amount on Marasmus (or any of its synonyms) it is strange how little classified is the subject or how little light has been thrown on it in recent years. The difficulties in the way are great, but they are not unsurmountable. My studies led me to try to correlate the proportionate incidence of various diseases in the causation of marasmus. The Registrar General's annual returns attempt unsuccessfully to do so by the statistical method from unchecked diagnoses, through all the maze of possible fallacies in classification of causes of deaths and of imperfections in certification &c. Admittedly the task, though important, is a difficult one. I have tried from the medical standpoint, with my results checked usually by my institutional colleagues, to so arrange the cause index of Marasmus that our recorded experience at the Park Hospital and elsewhere may prove of some use: and incidentally for the special purpose of this Thesis I have been led to record some observations, to be, I hope, carefully

verified by others in the future, of my experience in cases of Malnutrition and Marasmus.

The subject is of national importance for the gradually increasing perennial interest in Infantile Mortality and the causes appertaining thereto. After due regard, however, is paid to the fact that the inaccuracy of the stated cause of death is very great in infancy, it is satisfactory to note from official publications that the infant mortality rate from all causes has been steadily falling for some years - a decrease of 24 % from 1881 to 1910: this decrease has been noted all over the world and occasionally a poorer country (e.g. Ireland) occupies a most favourable position in this respect.

In 1911 the "group of five"[+] (developmental and wasting diseases) accounted for well over half the total mortality in first three months of life: and a comparative return of the occupation of the parents revealed the astounding fact that medical men instead of, as their vocation would indicate, leading the list with the lowest infant mortality of their offspring are beaten by artists (27) and merchants (30) as against their figure of 39: while naval officers (41) and solicitors (41) run them very close: the death rate among children is inversely

---

+ Cd 5263 table p. 28 and table VI in Appendix III.

proportional to social status of population - the "complex of poverty" having varying but due homage paid to it by the annual loss in infants."

Infantile Mortality has generally been regarded as occupying a specially important place in the test of national well being:-

In 1908 Death rate in England and Wales

= 14.7 per 1000

and of total deaths at all ages in England and Wales in 1908 $\frac{1}{5}$th occurred in infants in 1st year - a truly appalling figure.

The mortality figure varies in different towns: but a general but slow improvement is taking place.

In 1910 the infant death rate was 30% lower than in 1901:

" " " general " " was 20% lower than in 1901:

This question is of course intimately linked up with that of Summer Diarrhœa and its sequelæ: and the work for this Thesis really started in an attempt to compare the bacteriology of the fæces of healthy infants with those suffering from Marasmus. While my coprological investigations were being carried out - combined with my clinical routine work in my 4 wards of marantic children I experienced great difficulty

in classifying the various fæcal organisms: but when the Local Government Board report was published+, the work of four research scholars who were working on the same subject with the classification suggested by Graham Smith, it proved to me the futility of pursuing my investigations in this direction. I had then examined bacteriologically more or less on similar lines with their lines, though without knowledge of their methods, close on 90 specimens of fæces of which 52 were from marantic children. Their reports covered the whole field and my conclusions from my small number of specimens (only 90) gave remarkably similar results, though I came to the conclusion that though Morgan's No. I bacillus had been found frequently in cases of marasmus with a previous history of diarrhœa, yet from its occurrence in the fæces of ostensibly non-marantic children, I regard the association of this bacillus with Diarrhœa as one not sufficiently proven to enable anyone to come to any trustworthy conclusion on the likelihood of its playing a part in the causation of the disease.

Diarrhœa (or its cause enteritis) is an important cause of Marasmus. The difficulty of obtaining an accurate history in these cases was enormous, as ignorant parents of the working classes varied greatly

---

+ Cd 6341.

as to what constituted diarrhœa.

In 1910 Diarrhœa and Enteritis caused 12% of total infant mortality.

and in 1911 " " " caused 28% of total infant mortality.

It is not only in the mortality from its acute phase, that Summer Diarrhœa or Enteritis plays havoc with our infantile death rate, but in its morbidity the post-acute or chronic or convalescent stage. It leaves behind it a trail of Marasmus and this legacy of weakened tissues has an effect on the death rate by its ready fall in the struggle with infection. It seems that the infantile tissues are so poisoned by the toxins of the infective agent in diarrhœa, and their recovery so slow and tedious that for a long and varying length of time the balance in favour of continued tissue metabolism is a purely marginal one: if kept going however for some time, provided there is no re-infection or other intercurrent infection, recovery will gradually though perhaps slowly take place. "Keep them alive" as one writer has said "and they will possibly recover." Recovery of course depends in great part on proper treatment - if possible in properly administered medical institutions.

Scholberg and Wallis+propound the hypothesis that the mal-nutrition after the acute gastro intes-

---

+ Cd 6341.

tinal toxæmia may be due to:-

(a) diminution of the pancreatic secretion from pathological over-stimulation during and subsequent to the infective process: or

(b) toxic suspension of the pancreatic cellular activities;

and they describe experiments in support of this view. The hypothesis is quite a reasonable one, in my opinion, if extended to all the other cellular activities and not restricted to the pancreas. It is obvious that the exotoxin of the virus of summer diarrhœa has a general systemic action and its toxic action on young cells may have the effect of suspending their functional activities, leading to a general disturbance of anabolic processes.

The features which I have observed in my series of marasmic cases and which to my mind have not been sufficiently emphasized in medical literature are:-

(1) The varying reaction marasmic infants make to acute infections. There can be no doubt that there are some as yet unexplained causes at work, either the nature of the change of an enfeebled young constitution to outside poisons, or of some modification of the action of toxins, when acting on such disordered, enfeebled and marasmic tissues.

Pitt quite correctly wrote that in marasmic children acute diseases (may) produce few symptoms: they sometimes have pneumonia and yet nothing to attract attention.

He also states that some have acute nephritis - a condition I have not met with.

A marantic infant with a concurrent acute affection may have a persistent subnormal temperature (not a terminal condition as they recover), or the temperature may be normal or at any height from 100^{0} to 102^{0}: the infant meanwhile may look extremely ill or not infrequently just a little "more poorly" than usual.

These observations demonstrate what difficulties lie in the sufficient treatment of such cases. Owing to the obscurity of symptoms of an acute condition, - so marked as to deceive even the trained eye - the ignorant or indifferent or unobservant parent may let the child remain without treatment - and statistics of marasmus in acute hospitals may be nullified to this extent - that the terminal acute condition observed post-mortem may only be the superimposed acute illness (the immediate cause of death) on the other obscure chronic cause of the marantic condition.

(2) The very slow improvement - even in cases without clinical signs for months (no chest, heart or thoracic trouble) - under ideal conditions of environment and medical attention: this stage of subsidence - no improvement in the marantic condition, the general appearance, no gain in weight - to be followed if the child be kept alive sufficiently long - by a stage of recovery or reaction in two ways:- either

(i) a sudden marked change - rapid rise of temperature, sudden improvement in general well being, colour, interest in surroundings, &c.: or

(ii) a very gradual slowly progressive improvement - in all symptoms.

Barbour,+ whose clinical picture of the condition is an excellent one, calls attention to this point and remarks that convalescence in children after acute illnesses is usually slow - though only for a while in statu quo. A probable explanation of some cases of Marasmus is that the condition is one of a very tedious and slow convalescence after an acute, observed or unobserved illness, with or without marked and obtrusive signs. It is possible to imagine young infantile tissues, perhaps premature,

---

+ P. F. Barbour - Am. Prac. and News, Louisville 1903, XXXV. p. 353-357. Discussion p. 397-405, and Pediatrics, N.Y. 1903, XV, 397-409, and p. 414. Tetany p. 697.

so completely poisoned by the exotoxins of some infecting agent, that their cellular manifestations of activity and vitality are so paralysed and affected as to render their function of continued growth all but impossible. Individual cells or systems can but keep themselves alive, secretion may be at a standstill, and there is a general disturbance of the systemic metabolism. Such a disturbance would have a greater effect the younger the tissue attacked (Pitt),+ as a blow which would destroy a young growing plant would but cut the bark of the full grown tree.

It is important to remember that recovery from such a toxæmia in young tissues may be very slow and tissue metabolism may seem at a standstill for a long time. Not only the absorptive, but the assimilative functions may be in abeyance: in such cases a response to even ideal feeding could only be expected after the cell had recovered from the poisoning - though the recovery would be quicker in ideal surroundings than in those where ignorance, indifference and squalor and poverty and dirt held sway. The poisoning may only attack some cells, and so tissue metabolism may continue to an extent sufficient to enable us to keep the infant alive. The

---

+ G. N. Pitt - Guy's Hosp. Gazette, London 1901. XV, pp. 493-500.

degree of poisoning must always be considered as a proportionate one, great in some cases and less in others, all shades of gradation intervening.

(3) The terminal stage, if the infant is dying from asthenia, is an infection by post-mortem organisms - as demonstrated by purpuric rashes, sapraemic toxaemia, and large ante mortem patches of discoloration (not in dependent parts usually, though it frequently occurs here).

(4) That the condition is an infective or post infective one usually (though not invariably) - bad feeding, or even prematurity merely predisposing in greater or less degree to the action of infective agents. For example, to artificial feeding are generally attributed some cases of Marasmus. The point is missed that it is not artificial feeding per se that is the root of the trouble. It may be good artificial feeding (as in medical institutions) or bad artificial feedings, as in the homes of parents with no ideas of cleanliness, hygiene or asepsis. Bad artificial feeding with its multiple opportunities for infection and poisoning of the gastro-intestinal mucosa may be a potent factor in the production of marasmus, but it is not all in my opinion.

We find good, frequently excellent results in medical institutions where children in various stages of malnutrition and marasmus are cared for and artificially fed. Marantic infants, with cleft palate, do not do badly. The greater the care, the more marked the individual nursing, the better the result.

The younger the child bottle or hand fed - by bad artificial feeding, the less, of course, its chances of survival. It is rather what artificial feeding stands for - in the homes of the parents, especially if of the working classes. This view is admirably expressed in the most important Report of the Local Government Board on Infantile Mortality+ "not that artificial feeding is itself harmful, but abandonment of breast feeding without adequate cause (an important factor of the excessive mortality) implies indifference &c., on the part of the mother." And indifference in homes of poverty and squalor heralds danger to the infant's life.

(5) The harmful administrative tendency to herd all such cases to-day in one large ward. I am convinced this is a bad arrangement.

The ideal system would be to have separate single special wards in specially designed institutions with a trained nurse constantly in attendance

---

+ Cd 6909.

day and night. The marantic infant should never be allowed to lie for one moment in soiled clothes: and his skin should be kept as clean as possible. The infant should have careful individual attention. Some marantic infants thrive better in dirty homes than in some institutions, for this reason; at home in spite of the poverty, unhygienic surroundings &c., he received individual care and attention by a mother. He is cleansed as soon as he is soiled. In under-staffed institutions, too frequently the marantic child has to lie, wearing himself out with irritability and peevishness, whining constantly, for long periods in his excreta, till it is his turn to be washed. Often he has to take his meals in this condition. This lying in excreta should be absolutely prohibited - and careful supervision, especially at night, insisted on.

Failing single rooms, the marantic infants should be installed in small wards, to hold at most six: or in general institutions be distributed in the adult wards.

Herded in one ward, marantic children do not thrive well as a rule. Infection is easily spread - diarrhœa in varying degrees passes from cot to cot, and so on. Even when no infection is present, their recovery seems to be hindered by the presence of other

marantic children, with their malodorous skin emanations, and stools &c.

Frequently transfer to wards with older children has been the turning point on the recovery road, In these wards, too, they tend to receive more special attention.

Marasmus may of course be purely a starvation inanition from insufficiency of food (not usually seen in institutions) or may be due to defective digestion from organic disease or prematurity.

(6) The tendency to vicious circles in Marasmus - one condition predisposing to another and so to another, and so on.

Post-mortem little macroscopical evidence of disease is found in the pure cases of marasmus (no cause of death really found). Holt's[+] description of the appearances of the gastro-intestinal tract holds.

In my series of marasmus (post-mortem), the purely marasmic cases invariably showed a highly congested mucous membrane with occasionally hæmorrhages.

Tetany which I observed in 6 cases I regarded as a terminal sapræmic (toxic) condition, none of the cases recovering and the tetany occurring 2-3 days

---

+ Holt - Diseases of Children.

before death and continuing till just before death.

Patches of œdema I also regarded as an ante-mortem sign.

Potter[+] regards the œdema occasionally met in chronic cases of Marasmus as an entirely different condition from the œdema in cases of diarrhœa and he did not regard it as an ante-mortem sign.

+ Potter - Pediatrics N.Y. 1904: XVI. pp. 129-136.

Official publications:-
Local Government Boards Annual Reports (Medical Supplement: 1908-1913.
Cd 5263) specially good - excellent
Cd 6909) tables and charts.
Cd 7181
Cd 6341.

P A R T   I.

This part of my Thesis deals with an interesting aspect of the Marantic condition: viz., that appertaining to the association between a marantic condition and the continued presence of the Diphtheria Bacillus in the nasal or faucial regions (chiefly the former). While systematically pursuing my investigations into the study of the causation of Marasmus I began a systematic swabbing of the nostrils and throats of all the cases under my care - with subsequent implantation on culture media.

The technique was as follows: 1st only in suspected cases, latterly (9 months) as a systematic routine, every child on admission had a swab taken of each nostril and throat: The swab was immediately smeared on to a sloped tube of Löffler's blood serum, the tubes being carefully labelled with the name of the child, the region of the swab, the ward and the date. In the earlier investigations smears from the swabs were made on to glass slides and stained by Löffler's methylene blue, and Gram's stain - but owing to the negative results obtained this method was given up. The inoculated tubes were immediately taken to the laboratory and incubated. After a

varying period, - usually 6-12-18-24 hours, a smear from the culture tube was made on a glass slide and stained. If no suspicious organisms were found in 6-8 hours it was further incubated and examined at intervals later. If suspicious organisms were seen, by the ordinary Löffler's blue stain, three other stains were employed for confirmation of the morphological characters of the Klebs Löffler bacillus viz:

Gram's stain.
Pugh's toluidin blue stain.
Neisser's stain; and usually
Cobbett's stain.

Usually on the morphological characters alone a diagnosis of bacteriological diphtheria was made: but in order to secure scientific accuracy, an attempt was then made to isolate the Klebs Löffler bacillus in pure culture as quickly as possible. This was done by the method of transfer from one inoculated tube to another till a pure growth was obtained. The medium always used was Löffler's blood serum.

The media were supplied in tubes (sterile) ready for use to the Park Hospital from the M.A.B. Laboratory at Sutton.

The media before use were tested - by incubation for 48 hours at 37°: a growth was never obtained.

If a suspicious result was obtained from a culture of a nasal swab or even in suspected cases a negative result, swabs were continued to be taken every alternate day till one was convinced of the freedom from K.L.B. In addition a routine swabbing of all the cases in my wards was done at varying intervals, usually once a fortnight, never less than once every three weeks.

In some cases (see figures) after the K.L.B. had been isolated in pure culture, the culture was transmitted to the Metropolitan Asylums Board Laboratory to test for its virulence. In one case though there were obvious K.L.B. in a mixed culture, the organism could not be isolated in pure culture. The mixed culture was then transmitted to Laboratory at Sutton to isolate and test for virulence. A report was returned that the organism could not be isolated in pure culture - and no test for virulence was made.

Then in the Laboratory of the Park Hospital, I proceeded after isolation to pass the organism through culture media (broth) containing 1% solution

of the various sugars and carbohydrates - to test the reaction of the organism in the various media.

His' media could not be supplied by the M.A.B. Laboratory at Sutton, but as advised by Gordon, broth media with the various carbohydrates were readily supplied me for the investigations. Media containing mannite, sorbite and dulcite could not be obtained from the M.A.B. Laboratory. For permission to obtain these from his laboratory I am deeply indebted to Professor R. T. Hewlett of King's College Laboratories. Each isolated strain was passed through the sugars and carbohydrates - and for their reactions see table.

That the bacillus isolated in pure culture was the Klebs Loeffler bacillus was proved by the morphological characteristics and special staining methods + typical acid reaction in certain sugars, + occasionally by experiments on animals (M.A.B. laboratory, Sutton).

Glucose, Lævulose, Galactose always +

Lactose, Saccharose, Mannite, Sorbite and Dulcite usually -

+ = acid production
- = No acid
0 = Not tried

BROTH: 48 hrs. at 37° C. For 10 days

	Glucose	Lævulose.	Maltose.	Galactose.	Arabinose.	Raffinose.	Lactose.	Saccharose.	Mannite	Sorbite.	Dulcite	Litmus Milk
I.	+	+	+	+	-	+	-	-	-	-	-	+ No C
II.	+	+	+	+	+	+	+	-	-	-	-	+ No C
III.	+	+	+	+	-	-	-	-	-	0	0	+
IV.	+	+	-	+	-	-	-	-	-	0	0	+
V.	+	+	-	+	-	+	-	-	-	-	-	+
VI.	+	+	+	+	-	+	-	-	-	-	-	+
VII.	+	+	+	+	-	-	-	-	-	0	0	+
VIII.	+	+	+	+	-	-	+	-	-	-	-	+
IX.	+	+	-	+	+	+	-	-	-	-	-	+
X.	+	+	+	-	-	-	-	-	-	-	-	+
XI.	+	+	-	+	-	+	-	-	-	-	-	+
XII.	+	+	-	+	+	-	-	-	-	-	-	+
XIII.	+	+	+	+	-	+	-	-	-	-	-	+
XIV.												

	Glucose	Lævu-lose	Malt-ose.	Galac-tose.	Arabin-ose.	Raffin-ose.	Lac-tose.	Saccharose.	Man-nite	Sorbite	Dul-cite	Litmus Milk
XV.	+	+	+	+	+	-	+	-	-	-	-	+ No C
XVI.	+	+	-	+	-	+	-	-	-	-	-	+
XVII.	+	+	+	+	-	+	-	-	-	-	-	+ No C
XVIII.	+	+	+	+	-	-	-	-	-	0	0	+
XIX.	+	+	+	+	-	+	-	-	-	-	-	+ No C
XX.	+	+	+	+	-	-	-	-	-	0	0	+
XXI.	+	+	+	+	-	+	-	-	-	-	-	+

Having regard to the frequency with which, comparatively speaking, the K.L.B. were found from nasal swabs the question arose as to the reason for this frequency.

First it was considered that the frequency might be due to the location.

The Park Hospital was a fever hospital from 1897 to 16th July 1910: for a period of four months it was thoroughly disinfected, rewashed, repainted &c., and adapted for children's work. On 14th November 1910 it was formally opened as a children's hospital. I am told that for a period of three months after its re-opening there was not a case of an infectious disease.

The idea then that this relative frequency of K.L.B. might be due to the persistence of K.L.B. in the environment had to be abandoned.

It was found, however, that many of the staff employed in the time of the Fever Service had been retained for children's work: no systematic swabbing for possible diphtheria carriers had (so far as I could find out) ever been made - and the possibility of the staff in the wards under my care - consisting of cases of marasmus - being the disseminators of the K.L.B. among my enfeebled patients had to be considered. I made certain by swabbing and

culture that none of the nursing staff in my ward were carriers of the K.L.B. Besides if carriers are present all the children run the same risk of infection and yet some harboured the K.L.B. and others did not.

The subject then narrowed itself down to the following questions:-

Were cases of marasmus specially liable to harbour the ubiquitous K.L.B. in their nasal passages?

If so, why no obvious symptoms of infection?

Was the presence of the K.L.B. the cause of the marasmus - a case of a chronic mild diphtheritic infection? or

Did the K.L.B. prefer tissues of enfeebled development?

In other words was the presence of K.L.B. a propter or post condition?

In none of the current text books on Diseases of Children (chapters on Marasmus or Malnutrition or Atrophy &c.) is any reference made to the possibility or probability of even a few cases of Marasmus being due to a chronic long standing infection from an organism such as the K.L.B., which while localising itself to one site produces its pathogenic effects by its diffusible toxins. Such an omission pointed either

(a) to the fact that much work had been done on the subject and no such relationship or association had ever been found to exist.

or (b) to the fact that little or no work had been done on the subject - and that the references to the literature of the subject were very scanty.

The latter I found to be the case.

In chapters on Diphtheria amongst Infectious Diseases - no suggestion is made of the possible effect of a mild nasal infection of K.L.B. on young or young and enfeebled tissues.

Goodall[+] writes "When Diphtheria is limited to the nasal passages toxæmia very seldom results. The patients present only the slightest constitutional symptoms, and often none at all. Hence this form of the disease is often overlooked or not recognised." The last paragraph is an accurate observation, and it holds with redoubled force in infancy, and especially in my experience in the infancy of enfeebled marantic children. But the former two paragraphs are not strictly accurate, or only so in adult cases, when applied in the cases under review in young children.

The frequency of paralytic complications (up to the time the cases left my care) was not great: a fact all in favour of the view that the infection was a slow, chronic, mild but long continued one: the cardiac complications though watched for were very rare.

+ Goodall - On Infectious Diseases Chapter (Diphtheria) - Batten, Garrod and Still (editors) Diseases of Children.

Goodall speaking of Diphtheria generally writes:-

"The more toxic the case, the more is paralysis to be expected" (though this is not always or necessarily so) and "The faucial type" by offering a greater surface for growth and consequent elaboration of toxins is more likely to be followed by paralytic complications.

That the nasal form of chronic diphtheria may pursue a mild course has been recognised for ages past.

Jenner,[+] in his treatise "On Fevers and Diphtheria 1849-1879" reviewing the forms of diphtheria, mentions the nasal form, hints at its course being often protracted, and emphasizes the danger of a sudden spread from a mild infection. Nothnagel[++] also agrees on the protracted course and says that the germs possess a low degree of virulence.

After working at this subject for over 6 months, from October 1912 to April 1913, I wrote a brief article embodying the principles of this research in the Hospital for May 1913. I hazarded the thesis with this object. I was myself fully convinced of its importance. A careful search in medical litera-

---

+ Jenner - On Fevers and Diphtheria 1849-1879.pp.503-509.

++ Nothnagel - Encyclopædia of Practical Medicine: pp. 82-84.

ture had however prpved nearly fruitless. References - even bacteriological ones - were very scanty. And I wrote with the object of trying to focus attention on a thesis which if scientifically incorrect would draw criticisms: and with the object of learning whether the subject had been dealt with before. No criticisms were offered. No references to previous work were mentioned, but conversation with my medical friends and colleagues stimulated me to prosecute the matter further.

My article appeared in May 1913. Three months later I came across a paper by Conradi,+ written in March 1913 with a full bibliography, on the same subject. My work, as my medical colleagues at the Park Hospital can testify, had begun nearly six months previous. An annotation of Conradi's article subsequently appeared in the British Journal of Children's Diseases August 1913.

No further references to the subject have been discovered. I find therefore that I was the first in England to prosecute these researches and to publish, quite unaware of Conradi's article, a resumé of the principles underlying the subject.

+ Conradi:- page 512 of March (1913) & Aug. 1913 B.J. Ch. Dis.
Muenchener Medizinische Wochenschrift.

The statistical evidence of the prevalence of Diphtheria: the K.L.B. varies (Graham Smith+) in Bacteriology.

Among Contacts:

In (1) Infected families: varying:

Probably correct (Park and Beebe 1894) 50%.

(2) Persons attending on sick:

48 % (Richmond and Salter 1898)

12.5% (Pugh 1902).

(3) Persons in close connection with sick in Hospital wards and Institutions.

Lister (1898) - organisms resembling K.L.B. 48 %:

Park and Beebe (1898) - 9 %:

Gross (1897) 7.6 %:

(4) Scholars of infected schools:

varying: Graham Smith - 10.4 %:

(5) Contacts not in any of above classification:-

Maude (1899) - 41 %

+ Graham Smith (editor) - The Bacteriology of Diphtheria. (Cambridge Univ: Series).

Among Healthy individuals:

From morphological characters

the Massachusetts Board of Health 1902

say = 2.89 %.

Pugh (1902) "In large centres of population where diphtheria always exists, diphtheria bacilli are to be found in a not inconsiderable proportion of school children."

Hewlett and Murray - found K.L.B. in 58 out of 385 persons.

The virulence of the organism has seldom been tested.

The latter observers tested 3, and found virulence in one strain isolated.

Of Nasal examinations:

The figures are given as:

Contacts	6.3 %.
Non-contacts	1.5 %.
Schools	1.9 %.

As to the occurrence of K.L.B. in notified persons:

Novy found the organism in 82.4 %:

The Pasteur Institute in 73 %

Woodhead (1896) of 12,172 cases certified to M.A.B. Hospitals, 20 % showed no

evidence of diphtherial infection.

Figures for 1912 in Helena Ward, Great Ormond Street, 7 %: means of starting epidemics outside: cases of C.P. treated 172: number K.L.B. after operation: 13.

Josias and Tollemer state that of 709 cases(of clinical diphtheria?) - only 81 % showed bacteriological evidence of the disease.

Of 30,000 cases the Massachusetts Board of Health (1905) the K.L.Bacilli were only found in 71 %.

In my series of 217 of Marasmus (admitted as such) to the Park Hospital during my tenure of office the K.L.B. was definitely found in 32 (including contacts) = over 13 %. Excluding contacts (taken as such) 22 = over 10 %: - a percentage which is considerably higher (five times) than the Massachusetts Board of Health found in healthy individuals - though of course the marantic infants could not be considered as healthy individuals.

The subject is important, in marasmus, from two standpoints:-

(a) The individual patient -

(1) Liability to sudden onset of acute symptoms.

(2) Persistent malnutrition.

(b) The public - the risk of dissemination of K.L.B. to other children in institutions and as "diphtheria carriers" to start epidemics outside.

(b) From the public and sociological point of view it is important that the possibility of chronic K.L.B. infection in these children be remembered. The indisputable fact that in infancy the diphtheritic process starts in the nasal mucosa is not sufficiently recognised by medical practitioners and too frequently the neglect of a nasal discharge has led to disastrous results.

Rolleston (J.D.)+ in a paper (with bibliography) mentions some institutional epidemics in sucklings and notes that most of Schlicter's++ and Reither's+++ cases occurred in children naturally feeble or exhausted

---

+ Lancet - September 24, 1910 p. 947.

++ Schlicter - Archiv. für Kinderheilkunde XIV. p. 129.

+++ Wiener Klinische Wochenschrift. 1897. p. 666. (9 nasal diphtherias).

by previous illnesses. One unrecognised case of K.L.B. infection admitted into the wards of an institution, or discharged from such an institution (whether infected before or subsequent to admission) into crowded urban areas may be the means of originating either serious or mild epidemics of any variety of diphtheria.

I have noticed in one or two cases, the sudden development of symptoms of clinical diphtheria (grave toxæmia, involvement of the naso-pharynx, fauces and larynx by diphtheritic membrane - with consequent embarrassment of respiration) after a varying period (months or weeks) of a chronic nasal discharge (which no one had taken the trouble to examine bacteriologically).

The following case (not counted in my series) illustrates this point:-

One night on doing the night round (in addition to my own) for a colleague (a locum) - I was asked in one of his wards (12 p.m.) to see a dying marantic child. "The child has been dying by degrees for days, and everything possible has been done for it " said the nurse in charge - "but we might just look at it."

I looked: the child looked moribund and gasping for breath. On pulling down the bed clothes I found marked recession of the lower ribs and intercostals. The child was obviously dying of acute toxæmic diphtheria (subnormal temperature) without anti-toxin. Examination of its fauces revealed patches of membrane on both tonsils and uvula. The respiratory distress was great, but the respiration, strangely enough was not very noisy or crowing.

16,000 units of Diphtheria Antitoxin given almost immediately subcutaneously into abdominal wall failed to save the child who died at 3.30 a.m.

P.M. Diphtheritic membrane on tonsils, uvula and larynx.

Greatly emaciated marantic infant. The intravenous injection was not tried, owing to the difficulty of finding a vein - and the grave condition of the child.

On immediate enquiry I found that a nasal discharge - slight - had been reported for about a fortnight - and occasionally slightly blood stained during the last week. No notice apparently was taken of this slight but most important danger signal.
I found on looking in the report book of the nurses that the nasal discharge had been noted and reported.

The child had been marantic for a long time, and its gradual sinking seemed to have been taken as part of its general condition and not due to an acute stage of a chronic infection.

This case illustrates the important point of how quickly marantic children succumb to an acute stage of a chronic infection. The child had had a nasal discharge - not examined - noticed and reported for two weeks: suddenly for some reason, the organism either gains in virulence from feeding on fading tissues or the general condition gradually becomes weaker and weaker till a point is reached - the breaking point - when the organisms gain control, multiply and flourish and kill the marantic child in a few hours.

Case No. X. - one of the infected contacts - illustrates how quickly such children succumb to an acute infection(K.L.B.) - (infected from Case No. 1).

The child had been carefully examined by me from head to foot on the 21st January - nothing to report: slight nasal discharge, throat nil: last seen at 3 p.m., apparently as usual.

At 6 a.m. I was awakened to see the child: for condition (see case).

Acute diphtheritic toxæmia and infection.

In spite of injection of 6000 units of diphtheria toxin and immediate transference to a Fever Hospital, death ensued next day.

In other cases the onset of symptoms of clinical diphtheria was so gradual (not included in series) as to raise doubts as to whether there was really an incubation period in diphtheria.

The other aspect from the individual is the persistent malnutrition and asthenia from the absorption of the toxin (modified or not) and the chronic struggles of the juvenile and weakened tissue against the infection, even though mild or chronic.

Conradi in his article remarks that Heubner's[+] conception of "Larvierte Diphtherie" (latent or masked diphtheria) viz: a latent course of the diphtheritic disease in weakly child i.e. a weakened reaction in debilitated individuals has been frequently misconstrued, especially by Sir P. W. Williams[++] who included cases of local diphtheritic manifestation without the general symptoms of the disease under the term. Certainly Williams seemed to have widened the term "Latent Diphtheria" to include all cases "when no such pathological conditions (as commonly occurs in diphtheria) are unaccompanied by obvious

---

+ Heubner - Lehrbuch der Kinderkrankheiten.

++ Latente Diphtherienfektionen. The Journ. of Laryng. XXV. (ref. Srch. f. Kinderheilt, 54, S. 183).

illness or by symptoms sufficiently characteristic to be recognised as diphtheria."

He (Williams) recognised 3 types.

(A)

(B)

(C)

In (A) Patient - not clinically ill - anæmic - pulse increased - sometimes nasal catarrh: faucial redness or subacute tonsillitis or sore throat: or otorrhœa.

He quotes: One case - infant prematurely born ($7\frac{1}{2}$ months).

Admitted 2 days old.

Dec. 24 - some nasal discharge: not clearing up.

Seen in January - thought simple rhinitis.

Febry. 6 - cultures from nasal discharge (now for 6 weeks) positive for K.L.B.

Nasal passages not thoroughly inspected.

Child died with no symptoms pointing to true nature of disease.

He quotes Kuhn's case:

(Journal of Laryngology Febry. 1909) -

Baby 2 weeks - infected with K.L.B. from maternal genitals in parturition.

(B) With local diphtheritic lesions but no general symptoms.

(Conradi objects to these being included)

(C) No local lesions - no general signs and yet presence of K.L.B.

(All Conradi's seem to belong to this group and he suggests K.L.B. only present as parasites).

Williams certainly included Class C - and rightly so in my opinion: in his conception of Latent Diphtheria: He quotes Hewlett's researches - proved long ago that organisms inhaled and mostly coming in contact with the nasal mucosa were quickly removed by natural means in healthy subjects. When they are retained it is no longer a contact infection but a local infection and "if no general symptoms arise the case is one of latent diphtheria."

Conradi makes light of the nasal catarrh if present and regards it as an accidental symptom, as

---

Medico-Chirurg. Trans. vol. lxxviii, 1895 (Bibliog.) and Fate of micro-organisms in Inspired Air. Lancet 11. 1. 1896.

Hewlett's Bacteriology. Page 600.

the catarrh reappears and disappears. He insists that diphtheritic inflammation of the nasal mucous membrane has a characteristic appearance. He quotes Heubner's description of diphtheritic rhinitis and excludes his cases from such a description:

But K.L.B. have been found in different varieties of rhinitis:

(a) Fibrinous rhinitis.

(b) Atrophic rhinitis.

(c) External rhinitis, and

(d) In most cases in which Heubner's description obtains - diphtheritic rhinitis.

It cannot be too clearly emphasized that K.L.B. may be found in all varieties of rhinitis, in some as an accidental contamination, in others as the actual cause: the form the rhinitis assumes depends on a variety of conditions, such as virulence of organisms, previous state of nasal mucous membrane, general health of individual &c.

In Marasmus the rhinitis and rhinorrhœa may be so slight - amounting at times to a very slight catarrh only (which may disappear at varying periods to reappear) - as to attract no attention - as in Conradi's case and some of my own.

+ Cambridge Series p. 358-361.

From this mild form all stages with varying degrees of catarrh, varying numbers and virulence of organisms, up to forms which show not only local symptoms but disturbance of the general metabolism.

In none of my cases did I find the bacilli from the faucial or pharyngeal swabs - always from the nasal, while Conradi obtained results from pharyngeal swabs in two cases.

In Conradi's cases the bacilli remain localised and never spread - say from nose to pharynx. I have seen cases - usually contacts from "marasmic diphtheria carriers" - in which the bacilli spread from the nose and involving the faucial, set up a severe form of Faucial Diphtheria, (not included) where the bacilli from the nose (frequently present) evidently travelled to the pharynx and set up an acute clinical diphtheria.

I agree with Conradi that very frequently (not even nasal catarrh) pointing to a suspicion of K.L.B. being present and his point that "in the nasal and pharyngeal secretion of very weakly infants true and also virulent diphtheria bacilli may for varying lengths of time be present without giving rise to clinical symptoms" but I disagree with his subsequent conclusion "and are therefore obviously only to be regarded as secondary parasites." Whether they always remain harmless parasites he would not like to say.

Some epidemiologists take up the apparently strong position that the real question of importance is the virulence or non-virulence of the organism. But the question is not important - not even in the case of adults, still more so in the case of children of enfeebled vitality as were my patients at the Park Hospital.

Certain axioms (of more or less relative value) may be stated:

(1) An organism may be virulent for a child, and especially a marantic child, and be non-virulent for an adult.

(2) An organism may be virulent for an animal, (even the standard animal of usual test conditions) and be non-virulent for human beings.

(3) An organism may produce pathogenic effects in human cases and be non-virulent to standard animal.

Cases have occurred time after time, according to the medical officers of the M.A.B. fever hospitals, in which K.L.B. organisms isolated in pure culture for a severe case of faucial clinical diphtheria, has been sent for report to the M.A.B. laboratory at Sutton, and returned as non-virulent.

Again cases of organisms isolated from children (3-6 years) - cases of bacteriological nasal diphtheria - without any clinical symptoms having been reported on as "virulent".

No statistics are available from the M.A.B. Hospitals of such reports, and they could not be obtained for the purposes of this thesis.

The question of the virulence of the organism is therefore to my mind of secondary importance. The important point is to regard the K.L.B., in spite of its ubiquity, as a pathogenic organism. Its temporary involvement or continued presence in the nose of children of enfeebled vitality is to be specially considered in two aspects:-

(a) As part of the difficult problem of carriers, and

(b) With regard to its pathogenic effect on the individual or infant. The effects, according to the reaction of the tissues may be nil, or owing to the prolonged slow dosage by toxin a gradual development of a still further condition of enfeeblement and malnutrition.

True cases of bacteriological nasal diphtheria occur in children without obvious constitutional symptoms or even without any apparent effect on the patient: but these cases, chiefly cases of rhinitis, with or without membrane, occur mostly in older children. My cases are, I consider, in a different category.

And even if very slight symptoms of constitutional (even of local) involvement obtrude themselves, this may be very easily explained by the definite

amount of reaction of the tissues against the infection. The tissues have been so stimulated to neutralise the toxin or toxone, that they have over-produced the anti-substance - with consequent little signs of toxæmia. The child, and especially older children, may appear in good health. The younger the child, however, who is the victim of this chronic infection the greater the chances (as a rule) of some constitutional evidence of infection - as in pallor, malaise, languor, &c. The reaction of the child's tissues to the presence of the K.L.B. and its toxin may be sufficient to obviate any definite symptoms. In a marantic or enfeebled child such is not the case: the tissues may make a fight by elaborating and continuing to elaborate as much antitoxin as they can - this may just be in sufficient amount to neutralise the bulk of the toxin, leaving a little toxin to act and produce its slight effects. This process may go on from day to day - and the child , if the cause be undetected from the slow, long continued toxin poisoning, may steadily, if slowly deteriorate - and go downhill. Each step down the hill renders it a more ready victim to the attacks of other viruses.

It is not even necessary to consider the child as with enfeebled tissues from the start. Such a

process of chronic toxæmia, providing the balance be always slightly in favour of the poisoning agent or its toxin will have the effect of gradually reducing a child from a state of health to a state of flabbiness and pallor and so on to a stage of malnutrition.

Goodall again writes: "The degree of severity (of attacks of diphtheria) varies - even in faucial diphtheria. So long as the patch of exudation is small, and so long as there is no absorption of toxin, there is hardly any sign of illness sufficiently obvious to attract attention."

The first paragraph is a truism, true in theory as proved in practice. It is difficult however to think of their being no absorption of toxin, even if the patch of exudation be of the tiniest", for in that case all the accepted opinions about the diffusibility of such exotoxins as diphtheria and tetanus would have to be recast. Rather the freedom from symptoms can be explained by the more or less immediate neutralisation of the exotoxin, first by the small amount naturally present in the tissues, and later, by the production or over-production of the antisubstance by the stimulated tissues.

My own opinion from my experience points to the view that, in a certain number of selected limited

cases, the enfeebled condition progressing on to malnutrition and marasmus is due to an original infection - mild in the first case - with the K.L.B., that the infant has passed into the stage of a "Diphtheria carrier" and that the primary cause of its condition is an infection with K.L.B. On this, of course, may be superimposed other conditions of medico-sociological interest such as poverty and its congeners, dirty surroundings, bad environment, bad feeding, poor antenatal nutrition of the mother &c. The vicious circle in disease is quite marked in cases of Marasmus. One infection or degree of enfeeblement renders the infant more liable to another and so on.

The evidence however in favour of this view is not at all conclusive. The hypothesis is one difficult of proof. All that can be done at present is to call attention to the presence of K.L.B. in the nose or nasal secretion of a few cases of Marasmus. The relationship of its presence to the marantic condition is an open field for the expression of opinions, pro and contra.

Instead of the view to which I tend, it might quite safely and reasonably be held that the presence of the K.L.B. is a post-marantic condition; that

the K.L.B. may like to inhabit poorly nourished tissues of low vitality.

Even this association, this possible presence of the K.L.B. is of value, and raises the whole question of diphtheria carriers. If virulent bacilli are isolated from their nasal mucous membrane, these marantic children harboured in institutions, placed in wards with other cases of marasmus, may be the means of originating institutional epidemics.

In "Bacteriology of Diphtheria" page 311, Park and Beebe's case of a child, age not stated, admitted into a hospital ward in an anæmic condition and with a chronic coryza. Five days later four children in his neighbourhood developed diphtheria. Two of these died. Bacteriological examination for K.L. Bacillus positive. There are so many recorded instances that the question of the spread of infection by diphtheria carriers may be taken as proved.

It may be that enfeebled and marantic children harbour the K.L.B. by being kissed and fondled out of sympathy with their wasting or wasted condition by dirty and careless mothers and neighbours, and so any passing chance of infection falls their way.

That K.L.B. infection in the case of poorly nourished children is a real danger is well exemplified by the precautions now taken at the Hospital for Sick Children, Great Ormond Street, W.C., in certain surgical wards to which by selection a large majority of the cases of cleft palate are sent. The children with these congenital defects are poor specimens of humanity, frequently in a state of malnutrition and marasmus, the reason for which is obvious. It has been found by experience that K.L.B. infection - especially the nasal type is much more frequent in these wards than in the other surgical wards. The frequency of post operation nasal discharges lead to the frequent swabbing of the noses for K.L.B., and from now onwards, the nasal cavity is to be swabbed prior to, and at varying intervals after operation - to ascertain the correct proportion of K.L.B. infection. One case frequently has given rise to a number of other cases in the ward.

The importance of the question lies in the fact that one K.L.B. carrier admitted into, or discharged from, the ward may at any time be the centre of a small institutional epidemic or a focus for the spread of infection outside in crowded urban districts.

Conradi emphasises this point - the one of the greatest practical importance in the whole series of observations - viz: - that "in the nasal and pharyngeal secretion of very weakly infants true and also virulent diphtheria bacilli may occur for a varying length of time without giving rise to clinical symptoms and are therefore obviously only to be regarded as secondary parasites". Whether they always remain harmless parasites he would not like to say. Much as one shrinks from differing from such an authority as Professor Conradi, one feels compelled to differ from his conclusion that they are "parasites". I have(as noted) seen cases where they have spread to the fauces after causing nasal catarrh for some weeks - which points to the fact that if harmless parasites at first, they do not remain so.

I do not think they are ever parasites. Absence of clinical symptoms plus the presence of the K.L. B., do not necessarily suggest that the latter are parasites. It may well be and I think it the more likely explanation that the slight amount of toxin production has been neutralized by antitoxin or so modified by the pabulum as considerably to modify its action,

To consider the Klebs Loeffler Bacillus as parasites, would require the recasting of most of the prevalent views as to its pathogenicity, and effects by diffusible exotoxins . The idea is a plausible one:

but further study and research is needed before it can be said definitely that they are saprophytes. I incline to the view of their pathogenicity, even if it is admitted that pathogenicity has been proved to be modified by environment, pabulum and other factors.

It is only since the year 1909 that "bacteriological diphtheria"has figured in the M.A.B. returns under a separate classification:

Figures:

	Cases of bac. diphth.	Deaths.
1909	210	3
1910	222	2
1911	356	7
1912	375	4
Total up to 1912 of	1163 with	16 deaths.+

Of the 4 deaths in 1912 all are stated to have occurred from intercurrent diseases and the cause of two, viz: empyema and tuberculous meningitis are stated. Such cases of bacteriological diphtheria include:-

(1) Pure carrier cases - in which no clinical symptoms, but K.L.B. present.

(2) Cases in which clinical symptoms are stated to have been present but which have cleared up before admission and K.L.B. found.

Dr. Goodall writes "I am afraid it is impossible to obtain a return of these two groups separately": and also in answer to a query of mine as to

+ P. 167, M.A.B. annual report, 1912.

the frequency of K.L.B. in marantic infants he adds "I cannot say that I have come across many instances of bacteriological diphtheria in marasmic infants, with or without a nasal discharge. The few I have seen have come from children's hospitals such as that in Great Ormond Street. Nor am I acquainted with any references to this particular class of cases."

Dr. J. D. Rolleston, the editor of the British Journal of Children's Diseases, writes: "I am afraid I don't know of any papers relating to the subject except Conradi's and your own" ..... "I shouldn't like to say that infants with nasal diphtheria tend to be marantic because I have seen plenty who have harboured D.B. for a long time without obviously suffering therefrom." "Of course marantic children are more liable to develop nasal diphtheria than others" (reason not stated) ....

The striking features in my series of cases were:-

I. The presence and persistence of K.L.B. in the nasal cavity of marasmic children, who remained asthenic and making little headway in spite of the most careful and carefully supervised institutional nursing, careful medical attendance to diet, treatment &c. and in spite of an ideal environment (with the exception of a climatic one).

II. The fact that the degree of nasal catarrh varied - never so marked as to suggest to the ordinary medical observer (nasal diphtheria) or sometimes an entire absence of nasal catarrh - with no indications for nasal swabbing.

The latter feature is the one laid stress on by Conradi; he regards any catarrh as accidental, as he found the bacilli before the catarrh appeared: I regard the catarrh as part of the infection. I hold that all stages of the presence of K.L.B. may be seen in such infants from a mere contact infection or the tiniest area of infection by K.L.B. to involvement, from the entire absence of nasal catarrh to the profuse blood-stained purulent streaming catarrh of a typical nasal diphtheria.

Previous to my insisting on correct observations in my wards at the Park Hospital the nasal discharge was seldom noted as blood-stained: but subsequently all stages of blood-stained nasal discharge (if catarrh persist) were reported to or noted by me (in those of my cases which had catarrh) - from a mere trace or suspicion of blood to obvious hæmorrhage. The hæmorrhagic stage seldom lasted long and frequently appeared and reappeared: and nasal examination (the difficulties of which are great in marasmic infants and the examination consequently often incomplete) never revealed a patch of membrane anywhere on the nasal mucosa. Posterior rhinoscopy was never attempted.

All the regular routine of a properly administered medical institution was carefully performed at

the Park Hospital - regular weekly weighings, and occasional examination of fæces for ova and worms &c. - all features of institutional life done.

On investigating the records at the Park Hospital previous to my residence there I found that there had been

50 cases of Diphtheria sinde 1910.

22 cases were clinical Diphtheria.

28 cases were Nasal Diphtheria in marantic infants (transferred to Fever Hospitals as cases of Bacteriological Nasal Diphtheria).

5 of these latter cases had a nasal discharge on admission (slight) which on examination and culture same day (24-36 days) proved positive for K.L.B. (morphological characters).

Of the 28 cases of Nasal Bacteriological Diphtheria, the organisms were tested for virulence on 7 occasions, and was only non-virulent in 2 cases.

From an investigation and perusal of the records and notes, many cases of marasmus who harbour K.L.B. would seem to be of a nature similar to those of my series (though not having seen the cases I cannot be certain) - The cases were diagnosed and described as cases of Marasmus and K.L.B. were found from the nasal passages, 5 on the day of admission.

A recent visit to the Park Hospital (April 1914) revealed the fact that one infant had died - and the cause of death had been attributed to Nasal Diphtheria. I cull the following (the records are of the briefest in this case) from the Autopsy Record book:-

> Infant - one month old - female - came in with a diagnosis of Marasmus: typical specimen - great wasting: chronic inflammation of nasal passages - no membrane:
>
> Lungs clear:
>
> K.L.B. isolated from nose 24 hours before death, though suspected for a week:

(And this by a successor who was inclined to accept my view with great scepticism).

The question of a diphtheria septicæmia has been raised by E. Morgan[+] who mentions a case:

An infant, 7 months old - had vomiting - with progressive loss of weight.

A fortnight later nasal discharge noticed - K.L.B. found.

Antitoxin injection followed by some improvement, but later temperature rose to 102° and kept high.

Bloody nasal discharge again occurred and an organism like K.L.B. (but non pathogenic to guinea pig) isolated from cultures of blood (cat. jugular vein). No autopsy.

+ American Journal of Children's Diseases, 1913. V. p.317.

With regard to a scientific explanation of the association of Klebs-Loeffler Bacillus and marasmus - the subject bristles with difficulties.

(1) Some (a few medical superintendents of the M.A.B. fever Hospitals with whom I have conversed) hold that clinical diphtheria in adults is seldom, if ever, followed by weakness and cachexia. This is contrary to the view of the patients who often date a weakened condition from an attack of diphtheria.

(2) Columbet[+] however as I pointed out in "The Hospital" of June 21st, 1913 (a copy of which is incorporated with his thesis) mentions four groups, as the sequelæ of unrecognised diphtheria in the adult and into his fourth group - Post diphtheritic cachexia - it requires little imagination to place unrecognised cases of diphtheria in infancy and in marasmus.

It is now known that the constitution of diphtheria toxin is quite complex and toxins break down to toxoids. A summation of small continual doses of diphtheria toxin may produce a state of weakness and ill health. Teisier[++] and Guinard in their researches have proved that the action of diphtheria toxin is modified when acting on starving and enfeebled tissues and of the two hypothesis

---

[+] Columbet - Press Medicale. April 1913.

[++] Teisier et Guinard - Influence de la diète de l'inanition sur les effetc de certaines toxines microbiennes. La Semaine Med. 1897 p. 67. (ref. Zentralbl. f. Bakteriol., 21. S. 702)

submitted viz: -

either (1) the toxin in contact with starved cellular elements are destroyed or modified before attaining the fulness of their effects.

or (2) the toxin would not act or would act slowly because of the lack of elements (in the enfeebled organism) on which they depend for their fermentative activity to arrive at the production of the immediately active poisons,

they inclined to the latter view.

The important point is the action of diphtheria toxin is modified by contact with enfeebled tissues of low vitality or gradually enfeebled tissues, and this in my view explains the absence of prominent clinical signs in these cases and on another hypothesis the preference of K.L.B. for "their home" in tissues of weak vitality.

Toxone is an original product of the K.L. Bacillus, and at one time it seemed to me probable that the condition may be the result of a toxonaemia. To toxones are usually attributed the post-paralytic paralysis - very few of which I saw in my marasmic cases. Some had some cardiac arrhythmia, a few nystagmus, and one a peculiar unsteady gait - one or two nasal regurgitation. From a scientific point of view, granting Klebs-Loeffler Bacillus be present

(not a mere contact infection) and that the very diffusible exo-poisons are absorbed in daily continual small amounts, the effects may be due to

(1) A. The small doses of toxins

B. Modified Toxins or toxoids on tissues of infancy and enfeeblement.

C. Toxone

or (2) The constant stimulation of the weakened infantile system to react to produce antibodies to neutralise or attempt to neutralise one or other of the possible factors of (1).

It may be that in such conditions one or other of the factors of the elements on either side (toxin or body) which are held to account for the action by Erhlich's theory is lacking.

But this is mere theorising. It is sufficient I think to point out the association, its probable or possible effects, to ask for further research on the subject, to express tentatively certain views, which subsequent knowledge may serve to confirm.

With regard to the treatment of such cases - whether they be regarded as K.L.B. carriers or the K.L.B as mere saprophytes on marantic tissues - difficulties arise. Occasionally fresh air is the best treatment. The injection of Diphtheria Antitoxin improves some for a time.

Local treatment is also unsatisfactory - the difficulty being to get into actual contact with the source of the organisms, and if that be unsuccessful, local

treatment is unavailing.

Rolleston[+] tried spraying the nasal or faucial area with cultures of staphylococcus Pyogenes Aureus - as suggested by Schiotz. The treatment was ineffectual in the nasal cases. His case No.8 - "not a very bright sped men" (he writes) - aged three months died 19 days after the spraying but he does not feel inclined to attribute the death to the spraying, but rather to the concurrent congenital syphilis.

Hewlett and Nankiwell[++] have reported very good results from the use of an endotoxic vaccine: Goodall has a view that the carriers of the Klebs-Loeffler Bacillus are harmless, but this view has fortunately not been accepted.

[+] M.A.B. Annual Report 1912, p.263.

[++] Lancet 1913 I, 1802.

Schreiber - Deut. Med. Woch 1913, p.928

Zangemeister - Do Do Do 1913 p. 977.
(new born infants.

Of the Klebs-Loeffler Bacilli isolated a number were tested for virulence at the M.A.B. laboratory: -
The organisms were isolated in 20 cases.
In 17 cases sent to be tested for virulence.

Total	Virulent	Non virulent	% of virulence.
17	9	8	nearly 53%

In one case organisms could not be isolated in pure culture.

In most of my cases I had to agree to transfer the cases to an M.A.B. Fever Hospital after finding the Klebs-Loeffler bacillus, and it is gratifying to be able to state that in all (but one) of my cases of Marasmus the findingswere confirmed. The one doubtful case was one in which Klebs Loeffler Bacillus was also isolated from the aural discharge; it was thought it might be the Bac. auris of Graham Smith, This view was not held when the sugar reactions were mentioned. In many casestoo, the cultures were confirmed as Klebs Loeffler at the Kings College Laboratories when I was taking out the D.P.H. course.

MARASMUS AND DIPHTHERIA.

H. B. MORGAN, Junior Assistant Medical Officer, Park Hospital for Children, Hither Green, S.E.

The unscientific term marasmus, which literally means a wasting, has been commonly stated in death certificates as a cause of death. Latterly it has been fashionable to substitute the indefinite terms atrophy or debility in the same class of case. The condition marasmus, however, is not a disease, but only a symptom, of toxæmia. It has long been recognised that many cases classed as marasmus are really cases of congenital syphilis or infantile tuberculosis. In some cases the diagnosis can only be made *post-mortem*. Excluding these causes there still remains a certain varying proportion of cases in which a most careful autopsy, with subsequent histological examination and even perhaps animal inoculation, reveals no grounds for a diagnosis of either syphilis or tuberculosis. From a careful clinical study of the great number of marantic children treated in the wards under my control at the Park Hospital for Children, the conclusion is irresistible that the marantic condition results purely from a chronic toxæmia. Many of the children had one or other of the infectious diseases, others had not. The condition of some dated from an acute illness, others slowly and gradually wasted away. Was the marasmus a sequel to a severe attack of an acute fever, a protracted convalescence, or was it essentially a slow, chronic, insidious poisoning? Many observations favoured the latter view, and investigations were undertaken, based on this thesis, for the purpose of testing the accuracy of the view or the reverse. A negative result was considered likely to prove as valuable as a positive one.

Diphtheritic Toxonæmia.

Investigation early demonstrated that the part played by the diphtheria bacillus in the causation of marasmus was not sufficiently realised or emphasised. In some cases of marasmus the condition is really one of chronic diphtheritic *toxonæmia*. There were no manifestations of diphtheria as clinically recognised. The frequency, however, with which marantic children suddenly developed diphtheria was striking. These were sporadic cases, and gave rise to no further infection in the ward. Nasal discharges, watery, mucous, or purulent, were present more or less in about 65 per cent. of these children. In the rest there was no evidence of any rhinitis or rhinorrhœa. The throat and faucial condition appeared usually quite normal.

The term marasmus is very loosely applied; but the typical marantic child's weight is much below the normal; the degree of emaciation varies; pallor and anæmia are usually striking, the actual degree depending on the duration of the marantic condition and the reaction of the infantile system against the toxone. The anæmia is a secondary one. The skin is loose, pale, and often puckered. The child is irritable and restless, lies moaning and crying itself to exhaustion point almost all day. His appetite is good, and he is apparently never satisfied even when filled to nauseation with properly diluted milk feeds. He reacts very indifferently to thermogenetic or fever-producing poisons. Though he is obviously ill, a condition, which in a healthy infant would cause marked pyrexia, barely accounts for a rise of a degree in his case. This is not so in every case, but it is frequently seen. The conditions of the stools vary: they may be quite normal, or relaxed and with a varying depth of green.

In a few cases a culture on Loeffler's blood serum from a swab of the nose or nasal discharge would show the presence of colonies of the diphtheria bacillus. More frequently cultures from swabs of each nostril and the fauces have to be taken on many occasions (5 to 8 times) before a positive result is obtained. The frequency with which the presence of the diphtheria bacillus is proved in these cases of marasmus depends to a large extent on the assiduity and persistence of the search. A few stray, suspicious bacilli may occasionally be found in smears from primary cultures; in such cases the search should be continued with redoubled energy and swabs taken frequently. Smears from such cultures should always be stained by Neisser's or Cobbett's method. The difficulties of the search are enormous. Even, however, in cases of clinical diphtheria, the bacillus on cultural examination is not found in about 21 per cent. of cases; the percentage in cases in which there are absolutely no signs suggestive of diphtheria (except an occasional rhinorrhœa) would proportionately be very much less.

The Production of a Vicious Circle.

The theory is that in such cases of marasmus the diphtheria bacillus produces a larger amount of toxone than usual; or the toxin for some unknown reason is converted into toxone. The diphtheria bacillus may be present but unable to obtain a stronger hold. The vitality of such children is low; their tissues may lack some constituent necessary for a virulent growth and spread. Membrane is never or seldom seen in these cases of chronic diphtheria in marasmus. A very small factory of diphtheria bacillus is present in the nasal mucous membrane or post-nasal area, producing a very small and limited, but constant, amount of diphtheria toxin and toxone. Against this poisonous exotoxone the child's tissues are incessantly engaged. While not in sufficient amount to produce acute and prominent clinical manifestations the exotoxone has the effect of ultimately producing symptoms of cachexia, slow, progressive loss of weight and emaciation, and, concomitantly, pallor and anæmia. The other symptoms are sequelæ of this result—and so a vicious circle of symptomatology is apt to be produced, all depending on this unobtrusive microbic influence.

It is well known that membranous rhinitis in adults, now recognised as due to the diphtheria bacillus of a virulent nature, is often attended with few general symptoms, and practically without risk to life. The adult is better fitted to withstand the effects of the toxonæmia than the infant.

Recently Colombet, a French writer, in a thesis

on the sequelæ of unrecognised diphtheria in the adult, recognised four groups: (1) Nervous, with or without paralysis; (2) cutaneous; (3) cardio-renal; and (4) diphtheritic cachexia—viz. extreme weakness, wasting, anæmia (due to diminution in number of red cells), palpitation, and tachycardia.

Classification of Marasmus.

Marasmus in the infant seems easy of classification into the fourth group. As the condition is due to an exotoxonæmia the paucity of pathological changes *post-mortem* is easily understood. The condition is due to long-continued absorption in small doses of a certain poison elaborated and manufactured by the bacilli. The production of a chronic diphtheritic condition in susceptible animals seems confirmatory of these theses. Clinical records and investigations in four wards of marantic children during the past eight months also favour this view. Investigations are being continued—coprological, serological, hæmatological—to test the accuracy of this theory and for recording a few facts as to the bacteriology of the condition. Statistics and records are being accumulated. The bacilli are being tested for the carbohydrate reactions of the Klebs-Lœffler's bacillus, and so far with confirmatory results. The virulence of the organisms isolated varies. On a few occasions the bacilli were only isolated or found some hours after death, as the culture medium was inoculated twelve to sixteen hours before death. Previous search in such cases had been negative. This is interesting, as two months ago—some months after these investigations were in progress—a case of bacillary septicæmia due to this organism was described in the *American Journal of Children's Diseases*. The bacillus was found in some organs and in the blood after death.

The literature on the subject is very scanty. Standard works on diphtheria have no references to this relationship between diphtheria and marasmus. The case reported above was regarded as a rarity. And the search for references has so far had little result.

The Sociological Point of View.

This question is of great sociological interest from the point of view of infantile mortality. If the thesis ultimately proves to be scientifically accurate, it is evident that the ubiquitous diphtheria bacillus in its relation to the home conditions and environment of these weaklings will have to be further studied. For frequently this diphtheritic toxonæmia is superimposed on either a syphilitic or tubercular condition. In a case of congenital syphilis under my care the condition was unsuspected till the child suddenly developed pneumonia. An accompanying nasal discharge proved on examination to contain Klebs-Lœffler bacilli in pure culture.

Many observers have confirmed the observation that the diphtheria bacillus is present in a certain proportion of apparently perfectly healthy people and in a "not inconsiderable proportion" of school children. These constitute the vexed problem of "diphtheria carriers." Considerable discussion has taken place as to their virulent or non-virulent condition. In considering the relation of this bacillus to marasmus it must be remembered that young tissue is very susceptible to bacillary infection, and a bacillus which may prove merely saprophytic to a school child of moderate physique and colour may be quite harmful to an infant reared under economic conditions the reverse of favourable to its development. Even this modified bacillus may be capable of producing this toxonæmia and marasmus in a susceptible infant.

Toxone is an original product of the diphtheria bacillus. This hypothesis of marasmus necessitates the view that according to Ehrlich's side chain theory of immunity the toxone on absorption stimulates the production of antitoxin (antitoxone), but never in sufficient amount to neutralise completely the whole of the toxone. The free toxone attaches itself by its "toxophore" and "haptophore" groups to the "toxophile" and "receptor" groups respectively of the cell protoplasm, and by this union or combination exerts its deleterious effect. By the slow, long-continued action of this combination a marantic condition with its train of sequels is produced. The toxone is always being manufactured by this "factory" in the nasal area and in sufficient amount to preponderate over the amount of antitoxone produced by the body cells.

In a further article it is hoped to review a series of cases with clinical records in illustration and in support of this thesis.

Cancer Research in Denmark.

What may turn out to be a research of tremendous importance has been published lately by Professor Fibiger, of Copenhagen, in the *Berliner Klinische Wochenschrift*. This observer a long time ago discovered in some rats certain papillomatous-looking tumours of the stomach which proved, on miscroscopical examination, to be cancerous, and also to contain in their interior parasitic worms of the nematode genus. For some time he was unsuccessful in the search for further material of the same sort to work on, but at last he came across the same condition in rats from a sugar refinery. Two-thirds of these animals harboured the nematode worms, and nine out of forty had also the peculiar stomach growth in association therewith. Fibiger tried by artificially infecting rats with the worms to reproduce the stomach cancer, but failed. Thinking that this might indicate an intermediate host, he hit upon the cockroach, which insect existed in large numbers at the sugar works. By feeding rats on these cockroaches he produced thirty-six cases of this particular stomach tumour out of fifty-seven rats. In a few of the cases secondary growths also appeared, and these did not contain nematodes. The hypothesis of an intermediate host was further proved by feeding cockroaches on the fæces of the rats wherein the ova of the worms are contained. It is still matter for speculation whether these observations prove that any irritant may set up cancerous tissue changes; or whether they point to a specific cancer parasite. If the latter, further research with this clue to help should result in its discovery.

CASES OF MARASMUS WITH KLEBS LOEFFLER BACILLUS.

Recorded Cases:

Williams	.....	1
Conradi	1913	10
Heubner	1894	3
Ballin	.....	2
Morgan	.....	22 + 10 = 32
[Reither	(institutional epidemic)]	9.

R E F E R E N C E S.

DERSELLE - Ueber Carriate Diphtherie. D. Med. Wochenschr. 1894.

BECK - Diphtherie (Kolle-Wassermann)

SCHILLER und STENGER - Ein Beitrag zut Pathogenese der Diphtherie. Berlin. klin. theriebazillen aut der Mundschleinbant gesunder Menschen. Zeitschr. f. Hygiene, XXXI. 433.

GABRIEL - Nachuntersuchungen fiber das Zeitliche Verschwinden der Diphtheriebazillen Berl. klin. Wochenschr. 1908. No. 23.

BLOCKMAN - Zur Diagnose der Carrierten Diphtherie in Jungeren Kindesalter. Berl. klin. Wochenschr. 1911. No. 38.

BALLIN - Ueber das Vorksommen von Diphtheriebazillen beinn gewohnliden Schnuppen der Sanglingle Jahrbuch f. Kinderheilk 58.

R. NEUMANN - Virulente Diphtheriebazillen bei einfacher Rhinitis. Zentralb. f. Bakteriol, 31, No.2.

STOOS - Das regelmassige Vorkommen von Diphtherieoder Pseudodiphtheriebazillen in dem gewohnlichen Schupften des Kindes 31 Bericht des Jennersden Kinderhospitals in Berlin. (ref. Arch. f. Kinderheilk, 32, S 401).

SCHAPS - Welchen West het der Diphtheriebazillen nachweis für die Diagnose der Diphtherie im Sanglingsalter. Jahrb. f. Kinderheilk 10.

E. MULLER - Untersuchungen über das Vorkommen von Diphtheriebazillen in der Mundhohle von nich diphtheriebazillen Kindern innerhalb einas grosen snales. Jahrb. f. Kinderheilk 43.

Above bibliography from Conradi's article in March 1913 in Muenchener Med. Woch. of March 1913 (page 512).

W. BEZER - Deut. med. Woch. No. 50. of 1912 . (Annotation in B.M.J. of 21. 6. 13).

MORGAN - Hospital, May 1913.

The following cases are illustrative of the conditions just mentioned:-

CASE I.

D. S.- age 5/12,- admitted from Paddington Infirmary on 6.9.12. Disease (?)

On admission: Notes record:- green stools, fretful - moaning all day: ulcer on fraenum of tongue.

13.11.12. Child seen by me for first time - indefinite vesicular eruption on trunk - typical marasmus. N.D. noticed.

30.11.12. Chest clear. Von Pirquet's reaction: (human and bovine negative): Mother said one of her sisters died of Pulmonary Tuberculosis - no other case in family on both sides.

7.12.12. Not improving - in spite of careful dieting and individual attention. Emaciated, pale, shrivelled infant: glands in groin palpable. No V.D. Micropolyadenitis cervicis: Has the R.M. all over.

21.12.12. Fracture of tibia in middle of shaft noticed - cause unknown, transferred to Surgical ward.

15.1.13. Union just commencing: cough: few râles at bases: Wassermann negative.

24.1.13. N.D. for two days gradually more profuse than usual: blood stained to-day: throat nil: stools green: rhonchi in chest. Culture negative - culture every second day.

2.2.13. Culture from nasal swab yesterday: positive for Klebs Loeffler Bacillus. Throat nil. Weight 12 lbs. 14 ozs.

This case in interesting from two aspects:-

(1) the varying amount of nasal catarrh, appearing and disappearing: sometimes nil.

(2) The fact that while looking over former records I came across the name of this child who had been transferred as a Bacteriological Nasal Diphtheria after two weeks residence at the Park Hospital, and had been readmitted (after I suppose the K.L.B. was supposed to have disappeared from her nose) at age of 5 months - after about six weeks absence: and she had been harbouring K.L.B. for months (the new medical staff being unaware of her previous history).

The children are admitted to the Park Hospital from the Dispensaries with only a diagnosis - and no history - a state of things which should not be allowed to continue.

CASE II.

J. E. C.- age 1 ½ years - male: admitted from Lambeth Infirmary on 22.8.12 - with a diagnosis of Congenital Syphilis.

On admission: bossy forehead - spleen enlarged - green stools - scars on scalp (right temporal and frontal bone) and on sternum (former lesions?) - no teeth. Large double inguinal scrotal hernia (always down): emaciation and pallor marked.

5.9.12. Mother says scar on head due to "abscesses". Phimosis: anterior fontanelle widely open and prolonged backwards and forwards.

24.10.12. Seen by me for the first time: Marked cachexia: facies very suggestive of diagnosis being correct: pale yellowish sickly looking infant - emaciation - abdomen "pot belly".

4.12.12. Wasserman negative (Child on Hyd.c̄ cret. powders since admission gr I.

6.12.12. Von Pirquet's test (human and bovine) negative. N.D. looked for and noticed - culture cocci.

13.12.12. Patch of dulness over both bases of lung, with tubular breathing.

15.12.12 Culture of nose positive for K.L.B.

This illustrates the fact that the Klebs Loeffler Bacillus parasitism or infection may be superimposed on some other chronic affection, causing malnutrition.

CASE III.

D.B. - age 10 months - female: admitted from Paddington Infirmary on 4.2.13 (after residence there since 11.1.13) diagnosis of bronchitis.

On admission: poor physical condition - pale and anaemic - appetite very poor - skin dry and clear: Heart and abdomen nil. Lungs, with harsh R.M.

13.2.13. Profuse left eye discharge - marantic child.

21.2.13. Cough - occasionally cyanosis of extremities - not improving.

25.2.13. Stools green, offensive and slightly relaxed. Mother gave a tubercular history - no history of specific disease.

Child not breast fed, owing to abscess of left breast when infant three days' old.

Child well till three months old when suddenly diarrhoea and sickness and blood in stools: attack occurred as soon as taken off Nestle's milk per bottle and put on cow's milk: obstinate constipation when on cow's milk (child screaming on defaecation):

Attended at Sick Children's Hospital, Paddington Green for three months - operated on mouth and nose

(to prevent "consumption going to brain") - not improving, so sent to Paddington Infirmary and so on here:

7 children (6 alive) and 3 miscarriages:

Mother has a cough.

Mother's mother alive but consumptive.

Father has 7 sisters and 2 brothers (5 sisters died of consumption).

5th child died of "rapid consumption".

Patient is seventh child.

26.2.13. Pinched features - pulse weak - pallor and anaemia extreme: lost 16 ozs in last fortnight: costal nodes prominent:

Lungs with harsh R.M. and scattered sonorous rhonchi.
Wassermann negative: Von Pirquet's test (human and bovine) negative.

6.3.13. Lungs clearer in front - still marantic and emaciated.

10.3.13. Profuse purulent bilateral otorrhoea.

13.3.13. Pale shrivelled and marantic. Lungs fairly clear.

19.3.13. Culture of nose positive for K.L.B.: no nasal discharge.

Only Klebs Loeffler Bacillus infection found. Another interesting feature was that K.L.B. was isolated from otorrhoea - proved K.L.B. by sugar reactions (not Bac. auris of Graham Smith).

CASE IV.

B.S.- age 2 years - male: admitted from the Hampstead Infirmary on 6.3.13 (after residence there since 21.1.13) - with diagnosis of debility.

On admission: Heart, lungs and abdomen nil: blood stained Nasal discharge.

12.3.13. Still blood stained nasal discharge - excoriation of skin around nose: not looking well:

21.3.13. Right otorrhoea - still blood stained N.D. troublesome cough - grinding of teeth during sleep - glands in neck
Lungs clear - no adventitiae, but child has a cough.

22.3.13. Culture of nasal discharge now shows pure culture of K.L.B. (previously negative).

Suspected from day of admission - but only proved definitely Klebs Leoffler Bacillus fourteen days later.

CASE V.

R.D.- age 10 months - male, admitted from Paddington Infirmary on 14.2.13 with "Marasmus". Weight 11 lbs, 1 oz.

On admission: tachycardia - cardiac arrhythmia - irritating moist cough.

11.2.13. No nasal discharge, emaciation, extreme sunken fontanelle.
Lungs - harsh R.M. nothing definite: stools green, relaxed and occasionally offensive.

28.2.13. Von Pirquet's test (human and bovine) negative.

14.3.13. Appetite good - not improving - irregularities in abdomen (glands ? or faecal masses?) Lungs - rhonchi and scattered crepitations.

8.5.13. No nasal discharge. Cultures from nasal swabs positive for K.L.B.

Weight 13 lbs. 8 ozs.

On admission: tachycardia and cardiac arrhythmia, noticed, could not be explained: continued more or less. Only discovered on systematic routine swabbing - no other cases in this ward at the time.

CASE VI.

L.W. - age 5 months - female - admitted from Marylebone Infirmary on 6.5.13 with Bronchitis and Marasmus.

On admission; Nasal discharge.

10.5.13. N.D. blood stained.

13.5.13. Culture from nasal swabs positive for K.L.B.

Transferred to Fever Hospital.

Suspected on admission and definitely proved a week later.

CASE VII.

J. Burrows: age 1 2/12 - admitted from Whitechapel Infirmary on 1st February 1912 - "Congenital Heart."

21st February - Loud systolic bruit.

13.3.12. Cyanosis - very thin - lungs clear: little change from week to week.

12.7.12. Gradually getting thinner and paler - cyanosis much less marked.

12.12.12. Culture from nasal swab - positive for K.L.B., child transferred.

(A case in the ward of my colleague Dr Garrow). Congenital Heart disease - gradually got thinner and paler - so much paler that cyanosis much less distinct.

On return from The Fever Hospital some months later child's physical condition much improved, but cyanosis most marked.

CASE VIII.

J.P. - age 6 months: - male: admitted from Camberwell Infirmary on the 25th Oct. 1912 - with a diagnosis of whooping cough.

On admission: obviously marantic, with left internal strabismus.

22.11.12. Von Pirquet's reaction (human and bovine). Negative.

29.11.12. N.D. first noticed - some nasal obstruction: cough: increasing pallor.

6.12.12. Alternating internal strabismus with bilateral horizontal (internal and external) nystagmus. (Nystagmus oscillatorius horizontalis): no opacities on cornea: no head nodding. N.D. slightly less.

20.12.12. Definite snuffling - some degree of recission of lower ribs in inspiration: rhonchi in chest.

22.12.12. Cough + frothy mucus from mouth - purulent rhinorrhœa - throat slightly injected. Nystagmus as before: pupils react normally.

30.12.12. Nasal regurgitation reported - some respiratory difficulty: some recission of lower limbs: no paralysis of limbs: no arrhythmia (cardiac) Palatal paralysis.

31.12.12. Cough troublesome: still N.D.: great restlessness: great respiratory distress. Culture of nasal swabs always negative up to the present.

12,000 units of Diphtheritic Antitoxic Serum given.

1.1.13. Difficulty in swallowing - gradually worse - being fed nasally for two days - laboured and sighing respiration: moribund: dyspnœa

+ recission of intercostal spaces.

Lungs - with all manner of adventitious sounds. When being fed, cyanosis and twitchings of face and limb.

Death 1.1.13.

No temperature till 31.12.12. when rose to 101.6° and remained thereabouts will death.

2.1.13. Culture from nasal swab taken yesterday positive to-day for K.L.B. (always negative previously.

I was more suspicious of this case being Nasal Diphtheria than any other, and yet in spite of all care, swabbing always proved negative, till swab taken 24 hours after death - positive result in culture first as child died: no membrane: nasal regurgitation.

PART II.

TUBERCULOSIS AT MANASSAS.

TUBERCULOSIS AND MARASMUS.

Diagnosed tubercular disease accounted according to official publications for death rate (under 1 year) per 1000 in 1908 of 4.7.

While vaguely diagnosed respiratory diseases like Bronchitis and Bronchn. Pneumonia for one of 20.4.

And in the same year

Atrophy and marasmus accounted for a death rate per 1000 of 15.

And Premature births (19.9) and

Congenital defects (6.7) of 26.6

Total death rate (under 1 year) = 120.4 per 1000.

A great many of the deaths under Bronchitis and B. Pneumonia would be found if scientific accuracy could be attained to fall under tuberculosis.

The extreme difficulty of diagnosing tuberculosis in infancy is admitted by all. This and the lack of autopsies account for the want of precision and the accurate apportionment of deaths to tuberculosis.

+ Cd. 5263.

Any test that attempts to come to the rescue of the diagnosis of tuberculosis in infancy should receive great consideration: of the many tests proposed, the one in most general use, chiefly because of its facility of performance and freedom from danger, as well as in a proportionately large number of cases (some observers think) its reliability as to evidence of previous tuberculization, is von Pirquet's cutaneous reaction. The literature as to the value of this test, as is that dealing with the different aspects of tuberculosis is now voluminous, and yet the opinions of experienced users of the test vary. A few selected references from a vast number are appended.

Monti Guarnieri* performed the reactions in 121 children, at ages varying from 4 months - 8 years: He had 76 negative cases with 12 deaths (7 tuberculous)

17 slightly positive cases with 3 deaths (all tubercular)

28 strong positive cases - no deaths.

Cruchet++ thinks the reaction if possible of great value, though he admits that it is frequently negative, even when tuberculosis present.

Slade+++ is of opinion it is the most reliable test from the scientific point of view, but though harmless of absolutely no value "beyond" 5 years.

* Osp. d. Bamb. d. Milan.

+ Cruchet - Journ. de med. de Bordeaux 1913 LXXXIV. p. 543.

++ Slade - Medical Record 1913, XXXIII, p. 1079.

Other observers have obtained varying results with Von Pirquet's cutaneous reaction - some of which may be due to varying technique and strength of tuberculin. I found subcuticular needle pricks over an area the size of a large pin's head the best, as the infant cried less and was less restless than with scarification. Pure Koch's old tuberculin (supplied by M.A.B. Laboratory) used.

Von Pirquet obtained positive reactions in

25 % of children (aged 1-2 years) and

33.3 % " (aged 3-4 years) and

a gradual increase in advancing years in early life.

Naugli on the other hand states that failures in children clinically tuberculous are not uncommon.

Von Pirquet obtained no reaction under 6 months and Radcliffe+ states that the test is relied on in Von Pirquet's clinic under 2 years, while Calmette, while relying on it, admits a 4 % margin of error among infants.

These figures compared with

Hamburger's statistics (Vienna) of

autopsy tubercular findings:

1	- 3 months	-	4 %
3	- 6 "	-	18 %
6	- 12 "	-	23 %
2nd	year	-	40 %

+Fifth Annual Report King Edward VII Sanatorium, Midhurst.

Blumer says "tuberculosis rare under 2 years" and relies on Von Pirquet's test up to 2 years, and says a negative reaction of greater value than a positive one.

In B. Leckie's series of cases

3 cases of syphilis failed (as against Farre+ and Nicholas who obtained good results).

And he truly observes "no doubt the reaction is most marked in vigorous individuals, irrespective of the intensity of the infection."

His conclusion that the test is of no diagnostic or prognostic value is a view with which I entirely agree. Certainly in my series of cases a whole sheaf of negative results were obtained in cases where one would have expected a positive result (cases with a history of parental pulmonary tuberculosis on one or either side).

My experience leads me to the conclusion that, especially in marasmus, where a test of this kind if reliable would be invaluable, no reliance can be placed on the test. It is to be noted that Von Pirquet failed to get results in advanced or cachectic cases.

+ Farre - Bulletin Société Medicale des Hôspitaux 1910.

Most marantic infants are cachectic: there seems to be some relation between the state of vitality of the tissues and the reaction. Marasmic infants as a rule react indifferently. A marasmic child may be very ill (not in terminal stages) with a subnormal or even a normal temperature.

While discussing this subject it is always of great value to remember (as Béraneck[+] states) that "the vaso-dilator or auxiliary toxin (which originates the reaction) is produced not only by the tubercle bacillus but also by the bacillus typhosus, K.L. Bacillus, spirochæta pallida and other organisms" and Arloing's observations confirm this view.

With a view to ascertain correctly the incidence of tubercular infection in my series of marantic infants I performed Von Pirquet's reaction in 178 cases. A positive reaction was obtained only in 19 cases:

6 of these cases died (positive reaction) - reaction confirmed on autopsy in 4 cases (the unconfirmed case being one of Marasmus (no other lesion found) and the other, one of Broncho-pneumonia (no macroscopic evidence of tubercle, but the brain in each case was not examined as parents refused permission to open the cranium).

+ Control and Eradication of Tuberculosis, Ch.VIII.p.110.

Of 19 autopsies performed by me

the tubercular cases were 5 = 26 %:

(3 of P.T., one of Miliary Lung Tuberculosis and Broncho-Pneumonia and one of Enlarged Bronchial Glands (T.B.).

The Von Pirquet's reaction negative in 2 cases of P.T. and the case with Miliary Tuberculosis of Lung, viz: negative in 3 out of 5 = wrong in 60 % of cases.

Harbitz[+](Norway) has recorded figures of the age incidence of tuberculosis by post-mortem examination and guinea-pig inoculation as follows:-

In 1st year (40 out of 161 autopsies) = 20 %

" 2nd year (25 out of 91 ") = 27.5 %

" 3rd year = 31 %

and so on, the later years showing an increasing frequency of tuberculous infection.

Medin's[++]figures, from the records of the Children's Infirmary, Stockholm, from 1842-1911 inclusive - from the autopsies of 1st year infants:

7630 cases - 623 found to have tuberculosis (though not necessarily the cause of death) = 8 %.

My series of autopsies in marasmus show a per-

+ Harbitz - Norsk. Mag. f.Laegevid. 1913. LXXIV. p. 1. (Abstract B.Journ. Child.Dis. April 1913,p.172)and International Tuberculosis Congress 1912 (Brit.M.J. April 20th, 1913, p. 905.

++ Medin - Arch f.Kinderheilk 1913,Baginsky Festschrift, p. 482.

centage of 26 %: certainly the number is too small to render a dogmatic assertion advisable, but from the general experience of other writers, and the frequency of a history of the exposure to infection, the probability is in favour of their accuracy - with regard to Marasmus. If we take this percentage of Marasmus to Tuberculosis as correct, 26 % of the living cases who had marasmus in infancy were temporarily 'cured' (a purely relative term) of their tuberculosis.

It seems the general view that the prognosis of tuberculosis in infancy - under 2 years of age - is very grave. The difficulty of correcting a diagnosis of tuberculosis in infancy has already been pointed out: but adults are "cured" of tubercular lesions, why not so in infants. The general view seems to be this: If a marasmic child recovers and thrives, the case is seldom one due to tuberculosis. The prognosis however of tuberculous cases in infancy and in marasmus is not unfavourable. Many cases of marasmus due to this cause retrogress to a "cure": it is not always a progression to a fatality.

One case in my experience is worthy of record. My colleague, Dr. R. P. Garrow, at the Park Hospital, asked me to see a marantic child in consultation with him. He had diagnosed the case as one of General

Tuberculosis, with extensive involvement of the lungs. The child was merely "skin and bone". Every form of treatment had been tried, and I was asked the probability of success of tuberculin treatment. I advised, in this case, against tuberculin treatment, gave a very grave prognosis, and advised that the child should be transferred to a single separate special ward - to die. The diagnosis on examination was quite correct. From the day of her transfer the child started to improve, and has continued up to the present, now improved out of all recognition. The improvement was as marked in the physical signs in her chest as in her general condition and colour. By the end of six months, all adventitious sounds had cleared up in the lungs, and beyond a sub-resonant note on percussion her chest seemed normal - a child that 6 months before had been separately and independently diagnosed as a case of Pulmonary tuberculosis + general tuberculosis.

Had the tuberculin treatment been advised and the child put on very small doses, the improvement may quite erroneously have been attributed to the remedy.

Cozzolino[+] admits the difficulties of a differential diagnosis of chronic pulmonary lesions are great,

---

+ Cozzolino - La Pediatria 1912,XX. p. 273.

but asserts that neither glandular nor pulmonary tuberculosis is necessarily fatal during the 1st year of life, as some would have us believe.

Czerny[+] quite rightly hits the true mean. The course of tuberculosis in children is various: some heal quickly: others lead to death from dissemination. This is a view to which I adhere: it is especially true in cases of Marasmus. Czerny goes on to deal with the site of the tubercular lesion, and states that the "abdominal glands are more often affected than the thoracic: commonest to find both affected and no tuberculosis of lungs or intestines at the same time." He truly affirms that apical pulmonary disease is not rare even in infants, and chronic phthisis does occur in young children, even with chronic cavitation.

This brings us to the oft discussed and still unsettled question of the seat of election of tubercular disease and the paths of infection. My view can only be stated from the point of view of Marasmus, but my experience in other children's ailments serves only to confirm it.

It may be taken as proved (Leonard Findlay)[++] that tubercle bacilli can pass through the healthy

---

+ Czerny - Arch. f. Kinderheilk 1913. Baginsky Festschrift 1913. p. 242.

++ Leonard Findlay - Brit. Journal Chil. Dis. November 1913 - p. 502.

intestinal mucosa. My view is that in infants and adults the seat of election of tubercular disease is the lungs, and the path of infection in children is chiefly the abdominal route, though infection by other routes do occur. For some unknown reason, the tubercle bacilli have a liking for pulmonary tissue. The lymphatic system (glands &c.) are only infected by being the path of absorption of the infection and to the fact that it serves as a filtering medium to infection and the vanguard of the body against attack.

Dora Mantoux[+] in one of the best French theses on Tuberculosis in recent years mentions two outstanding facts in her experience of tuberculosis in infancy with which mine agree.

(1) The tendency to generalisation - the younger the infant or child, the more marked is this tendency.

(2) Bronchial glands were always the most important focus (because, I hold, the filtering medium is the seat of election of the disease). She states that lesions suggesting infection by intestines were exceptional (with which I disagree).

Medin's[++] figures support hers:

Out of 623 found tuberculosis on autopsy.

In 287 cases, the lungs or bronchial glands (separately or combined) were affected.

Only in 6 cases - intestines and mesenteric glands were involved.

+ Dora Mantoux - Thèsis de Paris 1912-13, No.3.

++ Medin - Arch.f.Kinderheilk 1913, Baginsky Festschrift. p. 482.

During last 18 years (1894-1911), no case of primary tuberculosis of Intestines or Mesenteric Glands observed.

The most important point in my view in my opinion is the predilection of the lungs to tubercular infection by whatever route. The region found affected by tuberculosis on autopsy is affected by two considerations:-

(1) The chronicity or length of time from the original infection.

(2) The fact that in infants general dissemination even from a small focus is a frequent and striking feature.

The longer the time of the primary infection (say from the intestinal route), the greater the chances of the lungs being found involved. The earlier the autopsy to the original infection the greater the likelihood of infection (or the results of tubercular infection) being found on the path to the lungs - which is as follows:- intestine, intestinal lymphatics, mesenteric lymphatic glands, and so on by the lymphatic system to the bronchial and root glands and so on to the lungs. But it is to be remembered that in any stage of the passage of infection or stage of a disease the tubercular process may become disseminated - by lymphatic or blood stream.

Lapage and Mair+ give the percentage of lymphatic gland infection at 17 %: and state that the

---

+ Lapage and Mair - Lancet 1913, I. p. 959.

mortality from tuberculosis rises in the 1st year, reaches maximum in the 2nd year and then falls rapidly.

Both Lederer[+] and Cassel[++] have remarked on the frequency of pulmonary tuberculosis in infancy.

Rist[+++] emphasizes the initial localisation of tuberculosis in the lung: in his experience the apices are usually free of tuberculosis, and the most typical lesion is a small cavity, size of a cherry, in the right lower lobe, with a "collection of caseous glands."

Leroux[++++] also states this view (no reference to the apices) and agrees that the primary seat is the base or the middle part of the lungs. He relies very little on clinical examination, and praises radiography.

Sluka[+++++] reports that an advanced tuberculosis of the upper lobes, starting from the hilus glands

---

\+ J. Leder - Monatschr. f. Kinderheilk 1913, XII. p. 211: (3 cases P.T.) and with A.V. Koneschegg p. 140 (5 cases).

++ J. Cassel - Arch. f. Kinderheilk, 1913. Baginsky Festschrift 1913, p. 131.

+++ Rist - Ann. de med. et chir. inf. 1912, XVI. p. 579.

++++ Leroux - Arch. de med. des enf. 1913, XVI, p. 641.

+++++ Sluka - Wien. klin. Wochenschr. No. 8, 1914.

is not uncommon in infants and children, but a tuberculosis "commencing" in the apex of the lung is very rarely seen.

In my experience of marasmus, pulmonary tuberculosis involving the apex of the lung is much more common than supposed. In some series, 3 cases of pulmonary tuberculosis (2 quite definitely apical, with cavitation) were diagnosed during life and confirmed on autopsy. The other case was expected but not so definitely. In one case the apical cavity 2 inches by 1 inch:

At the Park Hospital the total number of autopsies under 2½ years, 60 % in marasmic children, since the Hospital opened as a Children's Infirmary is as follows:

Total number of autopsies = 133.

of which Pulmonary tuberculosis = 9 = 6.6 %

Non-pulmonary " = 29 = 21.6 %

∴ 28.2 %

Of the latter, the proportions are:

Miliary tuberculosis	= 10
General tuberculosis	= 8
Tuberculosis of spleen	= 2
Tuberculous Broncho Pneumonia	= 2
Tuberculous Bronchial Glands	= 1
Tuberculous Meningitis	= 6

J. T. Wall[+] in an excellent monograph on post-natal causes of Infantile mortality states that negroes are specially liable to Marasmus owing to the ignorance of the mothers: he gives the percentage relation of infant deaths to births in Columbia in the years 1875-1891 at a figure varying from:

32.77 to

15.12.

In Great Britain in 1908,[++] the infant mortality in terms of births = 121 per 1000

= 12.1 %.

Summary.

In my experience:

(1) Tuberculosis accounts for 20% of cases diagnosed under Marasmus.

(2) Pulmonary tuberculosis is not infrequent: and apical pulmonary tuberculosis not rare.

(3) The lung is the tissue of the body specially predisposed to tubercle.

(4) Recoveries from marasmic tuberculosis or tuberculosis in infancy are fairly common.

+ J. T. Wall - Amer. Journal Obst. 1912, LXVI, p.1063.

++ L.G.B. Annual Report (Med. Off. Supplement) 1908.

TUBERCULOSIS REFERENCES.

HOLT - Diseases of Infancy and Childhood Ch. X - p. 1071 (1909).

TUBERCULOSIS IN INFANCY (Tuberculosis among Children in Scotland).

PHILIP - Control and Eradication of Tuberculosis Ch. VIII. p. 408.

FINKELSTEIN - Lehrbuch der Sanglingskrankheiten page 153 (1905).

BRUCE LECKIE - British Med. Journal, May 16, 1914, p. 1066-1067.

PRITCHARD - Practitioner 1913, I. p. 280.

LAPAGE - British Medical Journal 1912. II. p. 1375., and British Journal of Children's Diseases 1912, p. 493, and 532.

PART III.

CONGENITAL SYPHILIS.

Another frequent cause of the Marantic condition is Congenital Syphilis: all cases of congenital infection with the spirochæte pallida do not necessarily conform to the classical descriptions of hereditary syphilis in text books, which apply with more truth to older children than in infancy: rather as pointed out by Goodhart and Still[+] "Marasmus may be the only symptom of congenital Syphilis - an important point to remember &c". Sometimes craniotabes is observed. The

---

[+] Goodhart and Still. Diseases of Children. p.881, (latest edition)

recent observations of Leroux and Labbé[+], however, rather point to the view which they state, from records of 32 cases, that craniotabes is an osseous dystrophy which may be caused by many conditions (one of which is congenital syphilis). The presence of craniotabes according to this view does not per se confirm a diagnosis of syphilis. The view is also gaining more general acceptance, chiefly to the stimulating effect of the Royal Commission on Venereal Diseases, that parental syphilis is responsible for a large number of the premature births and congenital defects (which combined account for over 26 in the infant mortality rate of 120.4. per 1000.

Not only is syphilis responsible for many of the deaths formerly and now registered under premature births and congenital defects, but for a large number of the cases of Marasmus.

Marcus of Stockholm (Arch.f. Dermatol.u. Syphil. Bd. 116, 1913) gives an interesting account of congenital syphilis in a special hospital for such children. He is in favour of the exclusively maternal infection theory.

[+] Leroux and Labbé, on Craniotabes. Ann.de Méd. et Chir. Inf. 1912, XVI, p.481.

	% of congenital syphilitic infants.
Untreated mothers	90.2
Mothers - not treated during pregnancy.	82.3
" treated during pregnancy	45.6

He treats according to the principle of Fournier - Neisser - Welander, intermittently for years.

Detré[+], in attempting to gauge accurately the incidence of hereditary syphilis as a cause of prematurity, after a study of 205 cases and relying on the Wassermann reaction accords to Hereditary Syphilis the most prominent place. There is a high mortality (4.9%) in relation to frequency of prematurity (30%): some cases of hereditary syphilis may show itself only by retarded growth: he says rickets is observed when there is a double infection of tuberculosis and syphilis.

An admirable article on the subject appeared in the Practitioner from Dr McCarthy[++], my predecessor at the Park Hospital - where most of his work was done. He quotes Fournier and Hochsinger's statistics to prove that only about 25% of syphilitic infants grow up into comparatively normal adults. I am convinced of the accuracy of most of his observations. The virulence or prominence of symptoms in the child varies with the activity of the disease during conception, and of maternal treatment during pregnancy. With regard to the Wassermann reaction in congenital syphilis, he concludes that "while a positive reaction invariably denotes the existence of syphilis, a negative reaction must be regarded as having only a very relative value". He did in his work not only marantic children under 2½ years but also older children. But this observation and the one "that the disease may enter upon a latent phase as a result of specific treatment, or for other

---

[+] Detré - Thèses de Paris 1911-12, No.308.

[++] McCarthy - The Practitioner. March 1913.

reasons not yet understood" I regard as holding with particular force in cases of Marasmus. A negative reaction in a marasmic child does not necessarily exclude a syphilitic basis. Other factors (also mentioned by McCarthy) in the family history have to be considered, as well as the collective information obtained by the Wassermann reaction in the family.

He did a total of 57 Wassermann reactions at the Park in children of all ages: -

Of 16 under 4 years of age with manifest symptoms, all gave a positive reaction.

Of 14 cases with craniotabes do.
Cachexia, in which syphilis suspected from history, only 9 positive.

Of 27 older children, with well marked stigmata, 22 positive.

57 cases, 47 cases were positive.

I had done a series of 85 cases in conjunction with my colleague (Dr R.P. Garrow) who was in charge of the ward of suspected syphilitics. Of these 65 were done at the Belmont Laboratories in 1912-13 from blood supplied from us, and in the case of the other 20, the test was performed by me at the Park Hospital, with the assistance of Dr Garrow, and of Dr Hart of the King's College Laboratories, the latter of whom enabled us to obtain the necessary reactions. All the cases were in marasmic children, some clinically were congenital syphilitics.

Of 17, whose clinical picture was that of congenital syphilis, with pallor and wasting - the reaction was positive in 8 = 47%

Of 26 cases, whose parental history rendered a syphilitic basis likely, the reaction was positive in 4 cases = 15%

Of 42 other marasmic cases, no manifest clinical symptoms and suspicious history, the reaction was positive in 3 cases = over 7%

The reaction according to Wassermann's original technique was done by us.

15 Positive returns in 85 cases.

All these children were on treatment at the time and for some months before the test.

The congenital syphilitics with various mercurial drugs, and most of the cases of Marasmus on Hyd. c. Cret. (which seems to exercise, on pure impirical grounds, a wonderful effect in a good many cases of Marasmus).

The treatment before the test would of course affect our positive reactions in a marked way, but in state aided institutions, this difficulty could not be surmounted.

Two of the cases of congenital syphilis were subsequently found to harbour the Klebs Leoffler Bacillus in their nasal passages (see other part of thesis)

Much research is still needed to enable us

to rely on the results of the Wassermann reaction in marasmus as much as we do in adult life.

Taking the 197 marasmic children (Marasmus such as would be accepted by the average medical man) admitted to the Park Hospital during my residence: -

(a) 17 were diagnosed before as Congenital Syphilis.

(b) 4 doubtful ones gave a positive reaction.

(c) 3 Cases of Marasmus gave a positive reaction.

24 cases taken as congenital syphilis out of 197 = 12.2%
(though only 8 of 17 gave a positive reaction (a))

Proportion of Congenital Syphilis to Marasmus may be taken at about 12%.

CONGENITAL SYPHILIS REFERENCES.

MOTT - English Speaking Conference on Infant Mortality.

CHURCHILL - Amer. Journ. Child. Dis. 1912, p. 362.

ANDRONESCO - and SARATZEANO - Presse medicale 1912, XX. p. 271.

VARDEN - "Syphilis in infancy and early life" Atalanta Journ. Rec. Med. 1911, LVIII. p. 423-427.

PART IV.

It has long been accurately observed [illegible] ate of infantile diarrhoea (enteritis) may be followed [illegible] loss of weight and gradual [illegible] to [illegible] This is a matter [illegible] every day experience. The difficulty of [illegible] children [illegible] condition of [illegible] on [illegible] caused by the [illegible] of the virus [illegible] is that they come to a standstill [illegible]

PART IV.

[illegible] recently [illegible] diarrhoea [illegible]

[illegible] in childhood. [illegible] age [illegible] the term generally [illegible] Public Diseases? See table IV and V [illegible] and [illegible] think it is probably a phenomenon [illegible] illness. I noticed among [illegible] cases which I was of opinion were [illegible] The whole subject is still [illegible]

P A R T IV.

It has long been accurately observed that an acute attack of infantile diarrhœa (enteritis) may be followed by a progressive loss of weight and gradual wasting - to a condition of marasmus. This is a matter of every day medical experience. The difficulty of bringing such children back to their normal condition of metabolism is astounding. Evidently the infantile tissues have been so poisoned by the exotoxin of the virus causing the enteritis that they come to a standstill - some to recover very slowly, others, their assimilative functions in abeyance, to progress steadily downhill. The statistics and investigations into the organisms occurring in infantile diarrhœa have been well done (as I observe later) in official publications.

A group of cases has however been described by Poynton, Armstrong and Nabarro of chronic recurrent diarrhœa in childhood. Only two of their cases however come within my age limit. The term generally used for these is Cœliac Disease(see their IV and V cases) - and they think it is possibly a phenomenon "grafted upon the original illness". I noticed among my cases at the Park four cases which I was of opinion were cases of this condition. The whole subject is still in obscurity and

---

Proceedings of the Royal Society of Medicine (Medical Section) 1913, Vol VII, pp. 10 - 32.

requires further investigation. Ascites is sometimes noticed - once in a fatal case described by Poynton and Paterson in the coming issue of the Lancet 30th May 1913+. Infantile diarrhœa may be regarded as a predisposing cause of a marantic condition; and the probability of two infections should never be forgotten.

Many of my cases had a previous history of diarrhœa and vomiting - in an acute or chronic form - but the frequency of the history and the doubts of its reliability render it not a very trustworthy factor in the causation of the marantic condition. It is therefore difficult to gauge its true proportion

---

+ Lancet, May 30, 1913, p.1533.

OTHER IMPORTANT CAUSES OF MARASMUS

+ Dr Melville Dunlop in a paper before the Edinburgh Medico-Chirurgical Society on 6th May 1914 emphasises the importances of undetected empyema as a cause of marasmus.

Before diagnosing Marasmus one ought (he says) to exclude three conditions: -

Tuberculosis,

Congenital Syphilis, and

Empyema.

Many cases thought to be tuberculosis or marasmus had the chest full of pus: he gave a series of 98 cases of empyema (proportion of Marasmus not stated) in three of which tubercle bacilli were found.

In my experience of Marasmus, empyema, though the chest examination was complete and thorough on many occasions, was never found associated with the condition: and the clinical picture he depicts of his cases does not agree with those of our series: the facial expression in our series was never "anxious and frightened," though it may have been "pinched".

The physical signs, he suggests were not found by me: and a high leucocytosis (except a slight explainable one) was never met with. No cases of empyema were found in our autopsies.

+ Med. Press and Circular May 13. 1914 - p.497.

Cases of empyema could scarcely have been missed at our careful weekly or biweekly institutional examinations. His experience may or may not be a general one: and it must be remembered that he was speaking from the point of view of Empyema rather than from Marasmus.

[illegible] V.

[illegible] A [illegible] B.

PART V.

T A B L E S A to F.

TABLE "A".

STATISTICS OF "WASTING"

under 2½ years at

Park Hospital for Children, Hither Green, S.E.

ADMISSIONS.

Period.	Disease.	No. of Cases so diagnosed before admission.	No. of Cases. so diagnosed after admission.	Per-centage
From 9th Oct.1912 to 28th Aug.1913.	Marasmus - pure	182	108	54.8
	- c̄ bronch-itis	0	5	2.5
	- c̄ Enter-itis	0	3	1.5
Total Cases = 197.	- c̄ Broncho pneumonia.	0	31	15.7
	- c̄ Active disease	0	5	2.5
	Tuberculosis (General & Pulmonary)	0	21 10 confirmed post mortem.	10.6
	Congenital Syphilis	15	17 + 7 positive Wassermann = 24	2.1
From opening of Hospital 14th Nov.1910 to 9th Oct.1912.	Marasmus	379	317	77.5
	- c̄ Enter-itis	1	24	5.8
	- c̄ Bronch-itis	1	10	2.4
	- c̄ B.P.	0	11	2.7
	- c Pleurisy	0	1	.27
(Total cases = 409).	Tuberculosis General & Pulmonary	3	7	1.7
	Congenital Syphilis	25	39	9.53

T A B L E B.

AT THE PARK HOSPITAL.

Total P.M. = 65.

Marasmus - pure	33	=	50 %
- - tubercular	3)		
	)		
	)		
Tuberculosis	10)	=	20 %
Congenital Syphilis	2	=	3 %
Broncho-pneumonia	10	=	20 %
Endocarditis	2	=	3 %
Infectious Diseases	5	=	4 %

T A B L E "C".

IN THE HOSPITAL FOR SICK CHILDREN , GREAT ORMOND STREET, for the same period, November 1910 - April 1914.

The figures from the Autopsy Records are as follows:-

"All cases of wasting" (excluding exceptional and surgical cases).

CHRONIC CONDITIONS:-

Tuberculosis:			
General	115)		
Pulmonary Tuberculosis	17)		
Abdominal "	3)	=	40.4 %
	135		
Marasmus	81	=	24.2 %
Congenital Syphilis	11	=	3.4 %
Prematurity	18	=	5.3 %
Hydrocephalus	11	=	3.4 %
Empyema	10	=	3 %
Congenital Heart Disease	5	=	1.5 %
Status lymphaticus	12	=	3.5 %

May be acute or chronic condition:

Diarrhœa and Vomiting	25	=	7.49 %
Broncho-pneumonia	26	=	7.5 %
	334		

T A B L E "D".

STATISTICS AT THE PARK HOSPITAL.

Age Limit - 2½ years - "Wasting".

Period.	Disease.	Males.	Females.
From 9th Oct. 1912. to 28th Aug.1913.	Marasmus	50	58
	- c Bronchitis	2	3
	- c Enteritis	3	0
	- c Broncho-pneumonia	14	17
	- c Cœliac Disease	4	1
	Tuberculosis	14	7
	Congenital Syphilis	13	11
		100	97
	Total Cases = 197.		
From Nov.1910 to Oct. 1912.	Marasmus	159	192
	- c Enteritis	2	3
	- c Broncho-pneumonia	2	2
	Tuberculosis	20	16
	Congenital Syphilis	17	11
		200	224
	Total = 424.		

TABLE E.

AUTOPSY RECORDS IN MARASMUS AT THE PARK HOSPITAL.

No.	Diagnosis	Sex.	Age.	P.M. findings.	Who did P.M.
1.	Marasmus	M.	4/12	Nil	
2.	Marasmus	F	2	Nil	H.B.M.
3.	Marasmus	F	5/12	Nil	H.B.M.
4.	Marasmus	F	6/12	Nil.	
5	Marasmus	M	8/12	Nil	H.B.M
6	Marasmus (gastro-enteritis)	M	6/12	Nil	H.B.M
7.	Marasmus (enteritis)	M	14/52	Nil	H.B.M
8.	Marasmus	F	7/12	Nil	
9.	Marasmus	F	1 7/12	Nasal Diphtheria and wasting.	
10	Marasmus	F	11/12	Nil	
11.	Marasmus	M	9/12	Wasting - Broncho-pneumonia - K.L.B. found in trachea.	
12.	Marasmus	M	1	Nil	
13	Marasmus	M	11/12	Nil(Convulsions before death).	
14	Marasmus	M	1½	Old and recent pleurisy with adhesions and fluid.	
15	Marasmus	M	1 5/12	Nil	
16	Marasmus	M	7/12	One adhesion near apex on outer aspect - otherwise Nil.	H.B.M
17	Marasmus	M	1	Nil	
18	Marasmus	M	8/12	Nil	

TABLE E. Continued.

No.	Diagnosis.	Sex.	Age.	P.M. Findings.	Who did P.M
19.	Marasmus	M	1	Nil.	
20	Marasmus	M	4/12	Nil	H.B.M
21	Marasmus	M	6/12	Nil	H.B.M
22	Marasmus	M	1 4/12	Convulsions - some enlargement of mesemteric & bronchial glands - no caseation.	H.B.M
23.	Marasmus (Gastro-enteritis.	M	1	Nil - some small patches of lung collapse.	H.B.M
24.	Marasmus (Eczema)	M	1 6/12	Chronic B.P. - beads of purulent matter from bronchioles. Liver - with fibrosis.	H.B.M
25.	Marasmus	F	8/12	Tubercles in lung (few) stomach small: colon enormously dilated: (Hirschsprung's disease)	
26.	Marasmus	M	1 3/12	Broncho-pneumonia(slight) Rt.lung Bronchial glands enlarged. No pleural adhesions. Mesenteric glands slightly enlarged. No tubercle bacilli found.	
27.	Marasmus (tubercular?)	M	2	Lungs (R.upper lobe) with tubercle Neck glands) tubercular. Thoracic glands) Mesenteric ")	
28	Marasmus	F	1	Adhesions between gall bladder and liver and colon and intestines. Nil otherwise - history of diarrhœa.	
29.	Marasmus	F	1	Nil.	
30	Marasmus	M	4/12	Consolidation and emphysema in Rt.lung. Endocarditis (aortic & mitral valves). Granular vegetations.	

TABLE E. Continued.

No.	Diagnosis.	Sex.	Age.	P.M.Findings.	Who did P.M.
31.	Marasmus	M	3/12	Nil.	
32.	Marasmus	F	1 1/12	Nil.	
33	Marasmus	M	5/12	Glands round bronchi & trachea enlarged - no pleural adhesions. History of enteritis.	H.B.M.
34.	Marasmus	M	1½	No pleural adhesions. Scattered areas Broncho pneumonia. Irregular red patches. History of enteritis.	
35.	Marasmus	M	6/12	Trachea and bronchi reddened - no pleural adhesions.	
36	Marasmus	M	2	Basal diaphragmatic pleural adhesions - otherwise nil - history of enteritis.	H.B.M

Above constitute cases of Marasmus in P.M. records at Park Hospital since opening in November 1910.

Of 36 autopsies on Marantic children (diagnosed as such)

Diphtheria (K.L.B. found) accounted for two: but not in my time.

Endocarditis for 1.

Evidences of tubercular disease in 3.

In most of the others - no cause could be found for the death and it was labelled Marasmus.

TABLE F.

TUBERCULAR AUTOPSY FINDINGS AT THE PARK HOSPITAL.

No.	Diagnosis.	Sex.	Age.	Post Mortem Findings.
1.	Bronchitis	M.	10/12	Miliary tubercle at apex, few at lower lobe.
2.	Pulmonary & general Tuberculosis.	F.	2 3/12	Lungs (all lobes) tubercular - advanced. Tubercles on lungs, spleen, mesenteric glands.
3.	Pulmonary Tuberculosis & enteritis.	M.	1	Tubercles Rt. lung. Left lung one solid mass of caseous tubercular area.
4.	Tuberculosis	F	1 2/12	Advanced caseous purulent tuberculosis at apex. Bronchial glands caseous.
5.	Lobar Pneumonia	M.	2½	Adhesion in R.Pleural cavity.
6.	Bronchitis	M	2	Both lungs advanced T.B.
7.	General Tuberculosis	M	1	Bronchial glands caseous - Tuberculous.liver with tubercles; mesenteric glands +.
8.	Chronic Bronchitis	M	2	Tuberculous meningitis: Some congestion of Rt.Lung.
9.	Marasmus	F.	1 2/12	Miliary tubercles - on lungs and pleura. Bronchial glands caseous.
10.	General Tuberculosis	M	1 5/12	Meninges, lungs, liver, spleen, kidneys - glands.

From the above tables (especially Tables B and C) of statistics the following conclusions are arrived at - always bearing in mind that the Park Hospital is a Hospital for more or less chronic cases, while the Great Ormond Street Hospital is one for more or less acute cases:-

(1) In cases of wasting or marasmus, a cause of death is not found in about 50 % of cases.

(2) Tuberculosis accounts for about 30 % of the cases:

40 % of all autopsies from autopsy records of Acute Hospital.

20 % of all autopsies from autopsy records of Chronic Hospital.

(3) Congenital Syphilis accounts for 3 %,

(but if prematurity included = 9 %):

Leaving only 11 % to be divided among other causes, of which Broncho-Pneumonia, Enteritis and Empyema claim most.

It is to be remembered that these last named three causes may not be of a chronic nature, and it is difficult to judge of their true value in their causation of marasmus, as the condition, especially in the first two, may be purely a terminal phenomenon.

It may be taken the percentage incidence of causes of marasmus is as above stated.

In conclusion I wish to express my deep indebtedness [illegible] colleagues at [illegible] for much help, [illegible] and [illegible]agement, to the Medical Superintendent, [illegible] and special thanks are due for the very facili[illegible] afforded me for these investigations, and I am [illegible] for the tests carried out at [illegible] laboratory and for the various culture media [illegible] supplied for the work.

Over 1000 [illegible] examined [illegible] course of [illegible].

PART VI.

The points [illegible] emphasise are:-

SUMMARY.

(1) The [illegible] in [illegible] infants and [illegible].

(2) The frequency [illegible] in infants [illegible] tendency to generalisation [illegible] infection.

(3) The [illegible] for [illegible].

(4) The difficulty [illegible] congenital syphilis [illegible] in cases of Marasmus.

(5) The still high proportion of cases in which cause of [illegible] condition [illegible] even in post mortem examination.

In conclusion I wish to express my deep indebtedness to my colleagues at the Park for much help, criticism and encouragement, to the Medical Superintendent, Dr R.H. Birdwood and special thanks are due for the many facilities he afforded me for these investigations, and I am also grateful to the M.A.B. for the tests carried out at the Sutton Laboratory and for the various culture media freely supplied for the work.

Over 1000 swabs and over 4500 cultures were examined in the course of the investigation.

The points in the thesis which I wish to summarise and emphasise are: -

(1) The frequency of the Klebs Loeffler Bacillus in the nasal passages of marantic infants, and its possible effect on their condition.

(2) The frequency of pulmonary tuberculosis in infants in my age limit - and the tendency to generalisation of tuberculosis the younger the age of infection.

(3) The unreliability of the cutaneous skin reaction for purposes of diagnosis in marasmus.

(4) The difficulty of ascribing to congenital syphilis its correct proportion in cases of Marasmus.

(5) The still high proportion of cases in which cause of marantic condition unexplained - even in post mortem examination.

APPENDIX.

A P P E N D I X.

CASE 1.

,J.J. - age 4 months, male - admitted from Stepney Infirmary on 19.10.12.
Admitted a mere skeleton - extreme emaciation: buttocks red. Heart - no murmurs. L - harsh R.M.

30.11.12. Internal strabismus - left - noticed Cardiac arrhythmia. Still typical marantic specimen.

9.12.12 N.D. noticed - not thriving.

14. 1.13 Profuse left otorrhœa - N.D. as before, occasionally bloodstained.

1. 2.13 Still N.D. - troublesome hacking cough, sometimes in irritating paroxysms. All manner of adventitious sounds in lungs (no definite localisation).

2. 2.13 Cough bad - breathing with extreme difficulty - some considerable recession of lower ribs and suprasternal notch - very pale and wizened, gasping for breath: throat nil, R.M. very distant posteriorly: not partly subresonant. Attack of difficult respiration from 4 p.m. to 7 p.m. No exudation or infection in throat. N.D. much less and watery.

2. 2.13 12 p.m. still coughing in paroxysms, with great dyspnœa: restless, moaning and crying: recession of lower ribs and indrawing at suprasternal notch - very wizened appearance. Difficulty in deglutition, so cannot be fed by the bottle.

3. 2.13 Swabs from R. and L. Nostril and throat negative: only cocci and diplococci (gram positive and gram negative) very little respiratory difficulty - still coughing in paroxysms; occasionally very severe: otherwise lying quiet, listless and with very quiet respiration. Throat quite clear - no exudation: no N.D.

4. 2.13 No distress - sinking - P.M. Endocarditis.

CASE 2.

H.A. age 10 months - male - admitted from Lambeth Infirmary on 14.11.12 (a week in Lambeth Infirmary) with a diagnosis of "Rickets".

On admission - thin, pale and irritable: marantic: teething: facies of congenital syphilis: frontalbosses: diaphragmatic sulcus and distended abdomen - large flat broadened out skull. Heart and lungs nil.

18. 2.12 Alternating strabismus: left pupil always more dilated right even when contracted in bright light: depressed nasal bridge. Wassermann reaction positive. Teething - upper incisors with central depression. N.D. noticed: culture suspicious.

12. 2.13. Mother epileptic: has to be spoon fed: tachycardia and slight arrhythmia.

16. 2.13. Convulsions - squint masked - slight head retraction - difficult respiration. On examination: Pneumonia of Right Lower Lobe and Middle Lobe

17. 2.13. N.D. swab - taken from Right Nostril yesterday at 2 p.m. - no tracheal or laryngeal involvement - no symptoms of diphtheria, except toxæmia (which may be attributed to pulmonary condition.) Culture after 14 hours - mixed cocci + K.L.B. No discharge from left nostril. No dyspnœa, but slight recession of lower ribs: 12,000 units of Diphtheria Antitoxin - injected as a precautionary measure. Mother gives a syphilitic history: perforations in throat: weak minded.

18. 2.13 Purulent N.D. - only from right nostril. Vomiting of feeds - no retching - without effort (reported simply as return of feeds).

19. 2.13. N.D. from both nostrils.

21. 2.13. Head retraction - meningeal irritation (?): anxious facies: no strabismus now: more emaciated than ever.

28. 2.13. Antitoxin urticarial rash all over - sharply defined borders - much better - taking feeds.

5. 3.13. Pneumonic pulmonary condition - child improving.

1. 3.13. Still K.L.B. in nose - transferred.

CASE 3.

W.W. - age one year - male - admitted from Kensington Infirmary on 19.12.12. with "Rickets and Bronchitis".

On admission: Lungs, with an occasional rhonchus.

10. 1.13. Crepitations on right side a. and p. - no dyspnœa but respirations slightly hurried: pallor - cough - no cyanosis: N.D.

14. 1.13. Pneumonia.

24. 1.13. Pneumonia (typical) better.

27. 2.13. Mother gives a family history very suggestive of tuberculosis. Weight at birth 5½ lbs - premature infant: at various hospitals told it was Rickets and bronchitis: no syphilis. N.D. for months.

8.13.13. Cultures up to present always negative but today positive for K.L.B: child comfortable: pale and marantic, but no dyspnœa or respiratory distress: throat nil. Profuse purulent N.D.

CASE 4.

S.R. age 15 months - male: admitted from Poplar and Stepney Sick Asylum on 25th March 1912 with a diagnosis of "Gastro-Enteritis".

On admission heart and lungs nil.

13. 4.12. N.D. reported.

12.10.12. 1st seen by me: right otorrhœa - gaining weight.

19.11.12. Von Pirquet's test (Human and Bovine) negative.

20.11.12. Mother says in a letter that Father died of Consumption: child has had whooping cough and has even now a slight whoop in cough. N.D. continues. Lungs nil.

2. 1.13. Culture of nasal swab positive for K.L.B.

CASE 5.

E.T. - age 12 months - female: admitted from St George's East Infirmary on 28.9.12 with "Marasmus": weight 12lbs 4ozs.

12.10.12. 1st seen by me: typical specimen. R.M. roughened all over pulmonary area: occasional crepitations: cough: N.D.

7.12.12. Cough: pallor increasing: N.D. more profuse.

12.12.12. Some ulcer on frenum of toe: throat nil - no exudation on tonsils: N.D. as before.

2. 1.13. Culture taken yesterday positive for K.L.B. no rise of temperature.

CASE 6.

A.M.E. - age 8 months - female - admitted from Paddington Infirmary on 2nd May 1912: weight 8lbs 12ozs.

12.10.12 1st Seen by me: typically marantic: scars on both sides of neck: few scattered rhonchi and harsh inspiratory R.M. in lungs: No N.D.

14.10.12. Von Pirquet's test (Human and Bovine) Negative. No N.D.

7.11.12. Emaciation and pallor increasing: cough No N.D.

2.12.12. Culture from nasal swab positive for K.L.B. No temperature. Weight on transfer 8lbs 12ozs.

CASE 7.

E.A. - age two years - female - admitted from St Pancras Infirmary on 30.9.12. Marantic: Heart nil.

21.12.12. No adventitious sounds in chest. Culture from nose positive for K.L.B.

CASE 8.

C.V.L. age 12 months - male: admitted from Hackney Infirmary on 25.9.12 (there since 1.7.12) with Broncho-Pneumonia (convalescent)

On admission: pale weakly anæmic child - râles at both bases - Heart - with musical systolic murmur at apex.

11.10.12. 1st seen by me: marantic: N.D.

24.10.12. VonPirquet's test Negative. Cough: crepitations - at bases.

2. 1.12. Slight N.D: slight faucial infection. Culture from nasal swab - positive for K.L.B.

CASE 9.

J.B. - age one year - admitted from Whitechapel Infirmary on 16.10.13 with Marasmus. Weight 7 lbs 10ozs.

On admission - N.D: markedly marantic.

27.10.12. Right otorrhœa.

4. 1.13. Conjunctivitis

2. 2.13. Whooping Cough?: occasionally slight convulsions and cyanosis.

30. 5.13. N.D. always present - more profuse today: glands in neck palpable: throat nil: Von Pirquet's test (Human and Bovine) negative.

14. 6.13. Rhinorrhœa continues.

17. 6.13. Profuse purulent N.D. - nasal obstruction: child seems fairly comfortable: still very pale and anæmic: culture of nasal swab positive today for K.L.B. Weight 11 lbs 5 ozs.

CASE 10.

K.K. - age eight months (female): admitted from St George's East Infirmary on 6.3.13. - diagnosis ? weight 8 lbs 6 ozs: N.D. present.

On admission: Lungs clear: Heart nil: green stools.

20. 4.13. Measles.

19. 5.13. Still N.D. - improving.

13. 6.13. Heart and lungs nil - rhinorrhœa less: child comfortable. Culture of Nasal swab - positive for K.L.B.

17. 6.13. Culture again positive: Weight 11 lbs 4 ozs.

CASE 11.

Wm. C.D. (or H) - age one year - (male) - admitted from Bethnal Green Infirmary on 16.12.12. with diagnosis of "Acute Bronchitis and poorly nourished child".

On admission: chest clear: Heart nil: Marasmus

20. 2.13. N.D. noticed.

1. 5.13. 1st seen by me: blood stained and profuse purulent rhinorrhœa. Lungs with harsh R.M.

6. 5.13. Rhonchi and crepitations in lungs: N.D. blood stained.

20. 5.13. Still as above: Nasal condition improving.

10. 6.13. Mucous and watery rhinorrhœa - seldom purulent now: occasional rhonchi in chest.

20. 6.13. Rhinitis and rhinorrhœa - cultures positive for K.L.B.

CASE 12.

W.G. - age five months - male - admitted from Poplar Infirmary on 21.1.13. - with diagnosis of Marasmus. Heart, lungs and abdomen - nil on admission.

7. 3.13. Von Pirquet's test negative (Human and Bovine)

22. 4.13. Green stools - not improving:

21. 5.13. Measles - slight attack:

30. 5.13. Recovered but for cough.

13. 6.13. Submaxillary glands palpable: throat nil, no difficulty in swallowing.

17. 6.13. Temperature 99.4°. Cultures from nose positive for K.L.B. Weight 8 lbs 8 ozs.

CASE 13.

H.H. - age one year - male: admitted from Paddington Infirmary on 18.12.12. - with diagnosis of bronchitis.

On admission: Lungs, with hard cough whistling R.M., sunken abdomen: no strabismus: Heart normal.

30. 1.13. Purulent N.D.

14. 2.13. Mother suffering from P.T. Her father died of comsumption (no other case in family) One other child (3 years) had"consumptive bowels"in infancy.

5. 4.13. Persistent N.D., cough-emaciation extreme: Lungs with bronchi . Cultures from nasal swabs positive today for K.L.B.

CASE 14.

J.H. age one year - male: admitted from Southwark Infirmary on 24.4.12 - with "Wasting"

On admission: Heart and Lungs nil: no discharges:

20. 6.12. Occasional N.D.

11.10.12. -Seen by me for 1st time: enlarged glands in posterior triangle of neck: throat nil: slight sores on head.

7. 2.13. Gradually improving - unsteady gait - N. D. still present: no spinal deformity.

27. 2.13. Forward festinant gait and stamping (paralysis of legs): Heart and Lungs nil.

13. 3.13. Recurring dermatitis of scalp.

27. 3.13. N.D. blood stained today.

28. 3.13. Cultures from nasal swabs positive today for K.L.B. N.D. for some time and unsteady gait (diphtheritic paralysis?) no cardiac arrhythmia: no squint.

SUPPOSED CONTACTS.

SUPPOSED CONTACTS

CASE 1.

E.A.C. - age two years six months - female: admitted from St George's West Infirmary on 30.5.12. Pale, flabby marasmic child. Heart and lungs nil. No discharges - slight V.D.

14. 8.12. Gums spongy.

19. 8.12. Punctate erythema on trunk and limbs.

13. 9.12. Culture of V.D. - staphylococci and streptococci.

8.11.12. No V.D. now - still irritable.

29.11.12. Improving - chest clear: pallor.

21.12.12. No nasal discharge reported but culture of Nose Swab showed on 16.12.12. K.L.B. and on 21.12.12. - cocci and K.L.B.

3. 1.13. Nasty N.D.

24. 1.13. No N.D.

27. 1.13. discharged - no K.L.B. at present gained 8 lbs in weight.

CASE II.

F.G.L. - age seven months - male. admitted from Lambeth Infirmary on 27. 6.12. diagnosis "congenital syphilis". Weight 7lbs 10 ozs.

On admission : - "child has a poor home". Buttocks red - stools green - heart normal. Lungs - with scattered rhonchi, back and front. Put on Pulv. Hyd. c cret. gr.½ b.c.d.

3. 7.12. Swelling and redness of ankles - specific epiphysitis: very pale: cough: temp. for four days at 100°F. till

29. 8.12. Gaining steadily.

5. 9.12: Losing weight - pale, wasted sickly looking child.

1.11.12. Tongue always protruding.

2.12.12. N.D. more profuse. Fauces clear: croupy cough: some inspiratory suction of lower intercostal spaces.

3.12.12. Face flushed - throat with Exudate: swab positive - K.L.H.
11.30 a.m. Tracheotomy - very comfortable subsequently.

16.12.12. Swab still positive - doing very well - sent away.

CASE III.

F.B. - age five months - male - admitted from Islington Infirmary on 25th July 1912: with a diagnosis of Adenoma of Umbilicus (tumour removed 3.7.12.) weight 9 lbs 6 ozs. Marantic infant.

1.11.12. First seen by me: Rhinorrhœa noticed.

17.12.12. N.D. blood stained.

12. 1.13. K.L.B. in culture of nasal swab. Weight 10 lbs 6 ozs.

CASE IV.

C.J.H. - age 12months - male - admitted from Lambeth Infirmary on 8th Nov. 1912 with diagnosis of "Malnutrition - Rickets".

On admission Heart and lungs nil: markedly marantic: manifestations of rickets very slight: N.D.

16.11.12. VonPirquet's test (Human and Bovine) Negative. N.D. increasing: cough.

10.12.12. N.D. profuse: throat nil: some consolidation at right apex? slight retraction of lower intercostal spaces.

14.12.12. K.L.B. positive. Rhonchi in chest. Listless - not improving - N.D.

1. 1.13. Rhonchi and cough: examination of throat suddenly showed membrane on right tonsil. 12,000 units of diphtheria antitoxin injected. Death (1.1.13.)

CASE V.

H.S. - age six months - male - admitted from Stepney Infirmary on 25.2.13, with a diagnosis of Wasting.

On admission: typically marantic : flea bites on trunks and limbs: lungs with bronchi. Weight 9 lbs 2 ozs.

7.3.13. Von Pirquet's test (Human and Bovine) negative occasionally vomiting. No N.D.

30. 5.13. Slight improvement.

14. 6.13. Culture from nasal swab - suspicions of K.L.B. (Neissers stain negative)

15. 6.13. Today culture positive - K.L.B.

CASE VI.

L.B. - age one year - male - admitted from St Pancras Infirmary on 6.1.13. as "Marasmus - enlarged glands".

On admission: Heart, lungs and abdomen healthy. No discharge(except rhinorrhœa): no sores - green stools. Several enlarged lymphatic glands on right side of neck: throat nil. Culture of N.D. negative for K.L.B.

18. 2.13. Mother suffered from "Phthisis"

26. 2.13. Lungs (child): generalised rhonchi - few râles - no dulness. N.D. bloodstained: culture negative - only cocci.

4. 3.13. Streaming N.D. - sore in right cheek with abscess formation - discharging. General condition weaker - losing flesh (6 ozs) No pyrexia at any time. Lungs clear. Heart - tachycardia: regular.

5. 3.13. Culture of N.D. and cheek sore positive for K.L.B.

CASE VII.

F;C. - age one year - male - admitted from Marylebone Infirmary on 15.4.13 ć Bilateral Otorrhœa and Bronchitis. Heart and lungs nil. Weight 14 lbs.

19. 41.13. Profuse N.D. Temperature 101°: culture negative.

20. 4.13. Mother interviewed - has a markedly depressed nasal bridge.

29. 4.13. Wassermann reaction negative: no otorrhœa.

6. 4.13. Still N.D.

7. 5.13. Culture positive for K.L.B.

CASE VIII.

E.H. - age 15 months - female - admitted from Poplar Infirmary on 11th March 1913 with Marasmus and Bronchitis.

On admission: weight 13 lbs: Heart and lungs nil. Cough.

28. 4.13. Reported to have dysphagia.

1. 5.13. Seen by me for 1st time: temperature 99°: cough: Lungs full of harsh roughenings and rhonchi.

5. 5.13. Profuse green N.D. - noticed 1st time: noisy respiration.

8. 5.13. Cultures from each nostril positive for K.L.B.; child marantic - with a lung condition: no dysphagia: throat nil: no cervical adenitis.

CASE IX.

C.G. - age four months - female: admitted from Bermondsey Infirmary on 28.10.12. with "Marasmus - Diarrhœa".

On admission: purpuric eruption on chest, abdomen and back: Heart, lungs and abdomen nil.

23.11.12. Not improving - mere skin and bone. Senile looking: stools relaxed and offensive, sometimes pasty. Profuse Right otorrhœa.

29. 1.13. Slowly improving - slight gain in weight.

1. 3.13. Occasional thick N.D.

3. 4.13. N.D. blood stained - only ½ normal weight, but improving.

5. 4.13. Cultures from nasal swabs positive today for K.L.B.

CASE X.

E.B. - age one year - female - admitted from Bermondsey Infirmary on 25th October 1912 (after 4 day's residence there).

On admission: Heart and Lungs nil: skin clear.

5.12.12: Not improving - occasional green stools. N.D.

12.12.12. Von Pirquet's test (Human and Bovine) negative.

9. 1.13. Child apparently improving - chest clear.

10. 1.13. Reported to have convulsions at 3.45 a.m. to 7.15 a.m. - more on right than left, but twitchings on both sides. Pallor extreme.

18. 1.13. Very persistent cough - very quiet and drowsy.

20. 1.13. Green stools.

21. 1.13. Careful weekly examination - heart, lungs and abdomen nil: throat nil: occasional very slight N.D., child restless.

22. 1.13. Called to see child at 6 a.m., some difficulty in swallowing - swelling on right side of neck: temp. this a.m. 102.2°: "poorly" during the night: deposit on both tonsils and base of uvula (both sides) - N.D. profuse and purulent.