An Address

ON

TUBERCULOSIS IN EARLY CHILDHOOD.*

BY

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This discussion was to have been opened by Professor von Pirquet of Vienna, who would have treated the subject with the authority of exceptional knowledge. His death is a loss not only to us on this occasion but also to medicine as a whole. And in deploring the loss, it is fitting that we should also pay tribute to the great and lasting value of his work. We need not attempt now to sum up and appraise the work of von Pirquet, which was not confined to the field of tuberculosis; but in that important field his great contribution was the introduction of the cutaneous tuberculin test—the first test of tuberculous infection that was at once safe, accurate, and convenient. The widespread application of the Pirquet test has revealed in the living the prevalence of concealed and apparently innocent tuberculous infection, and has also given us a method of distinguishing tuberculous and non-tuberculous disease. It would be hardly possible for a general discussion of tuberculosis to take place at the present day without a reference to the Pirquet test.

Our subject—tuberculosis in early childhood—is not only wide and complicated, it is also well worn by much previous discussion. He who attempts to discuss it again must run the risk of omitting things that may seem important, and of repeating what has been often said before. But it will be granted that it is an important subject for all those who have the medical care of children; and there may be advantage in reaffirming what is well known and in bringing up for fresh discussion familiar points of dispute.

In the first place let us define as the period of our survey the first five years of life, and compare the amount of tuberculous disease in all its forms at this time with similar succeeding periods. That can be done by taking the total deaths from tuberculosis in England and Wales for 1927. (Chart 1.) The number of deaths in the first period—about 3,000—greatly exceeds that in the later period of

CHART 1.

childhood and of puberty; thereafter in adolescence and throughout the prime of life the figures are about or exceed the 4,000 mark. The first phase of tuberculosis is therefore, as regards fatal disease, easily the most important of the whole period of childhood. But it is worth remembering that in the first period of childhood the number of deaths from tuberculosis is exceeded by those from measles and whooping-cough, and far exceeded by those from diarrhoea, bronchitis, and pneumonia. Further, all these diseases just mentioned, deadly in themselves, are known to facilitate tuberculous infection. Even with these facts in view, tuberculosis in the first five years of life is an important disease, either in relation to tuberculosis at any later period, or in comparison with the other common and fatal diseases of the same period.

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TYPES OF TUBERCULOUS DISEASE IN THE FIRST FIVE YEARS.

An accurate idea of the relative prevalence of clinical types can again be obtained by examination of the Registrar-General's death figures for England and Wales in 1927. Three are selected—meningeal, respiratory, and abdominal tuberculosis—and their relative incidence in five-yearly periods for the first half of life are shown in Chart 2; together they account for the great majority of deaths from tuberculosis in the period of our survey. Cases of disseminated tuberculosis, which also make a considerable total at this period, are not included; it is probable that the great majority of these deaths are due to a focus of primary disease in the abdomen or thorax. Cases of so-called surgical tuberculosis—glands in the neck and disease of the bones and joints—are also numerous at this period, but these make only a small contribution to the total of deaths.

CHART 2.

The chart demonstrates clearly a number of facts. Meningitis easily takes the first place in this list of deaths in the first five years; and the total for this period is far greater than at any subsequent period. Abdominal tuberculosis also causes far more deaths at this period than at any later period. The number of deaths from pulmonary tuberculosis practically equals that from abdominal tuberculosis in the first period; but although it falls in the second five years of childhood, it thereafter rapidly rises, and towers above any other type of tuberculous disease as a cause of death.

In the first five years, in England and Wales, the deaths from tuberculous meningitis are three times greater than those from pulmonary and from abdominal tuberculosis. These three types, while they do not constitute the whole of tuberculosis at this period, form the greatest and most important part of it.

I now present a survey of 254 cases of tuberculosis admitted to my ward during the past eight years; they include non-fatal cases, and their examination, together with the result of post-mortem examination, will allow a further and more accurate analysis of types of tuberculous disease at this period; some clinical features will also be discussed and some broad conclusions bearing on preventive measures will emerge. They are grouped in age periods: birth to 2 years, 2 to 5 years, and 5 to 12 years.

TUBERCULOUS MENINGITIS, PULMONARY AND ABDOMINAL TUBERCULOSIS.

Age incidence in early and later childhood.

	Birth-2 years.		2-5 years.		Birth-5 years.		5-12 years.	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Tuberculous meningitis	48	48	25	25	73	73	18	18
Pulmonary tuberculosis	17	16	10	3	27	19	22	3
Abdominal tuberculosis	35	25	46	18	81	43	23	7
Total...	100	89	81	46	181	135	73	28

The deaths given in the table do not express death rate; an unknown number of cases discharged from hospital must have died later.

A few general remarks may be made before proceeding to some observations on each of these types of tuberculous disease.

The Cutaneous Tuberculin Test.

A brief discussion on the value of the Pirquet test will be suitable here. It is a common remark that the test often fails in tuberculous meningitis and in general

tuberculosis; this has not been my experience in tuberculous children, if the test is properly performed. And in the first two years a positive tuberculin test is of great value in diagnosis and of grave significance, because at this period latent or healed tuberculosis is a rare event and active tuberculosis is generally fatal. In later childhood a positive test is of less value in diagnosis; it only permits a "tuberculous" interpretation of the clinical evidence, but in itself it has not even corroborative value. At the later period of childhood, however, a negative test is of great value in excluding tuberculous disease—although it must be remembered that the test may, although rarely, fail to appear in an actually tuberculous condition.

Latent Tuberculosis.

The existence of healed or dormant tuberculous lesions is an important fact in later childhood and in later life. Do such lesions exist in the first period of life that we are considering; and to what extent? I would offer for discussion the following statement. In the first two years of life tuberculous infection nearly always proceeds to tuberculous disease; and tuberculous disease ends in death in nearly all cases of pulmonary lesions, either by acute pulmonary tuberculosis or by meningitis, and has a like ending in a majority of cases of abdominal tuberculosis. At this period dormant or healed tuberculosis is a rare event; in the third, fourth, and fifth years it becomes more common; while the number of recoveries from active tuberculous disease also increases. In the above table of cases I have excluded a group of latent or dormant tuberculosis, where a condition of ill health seemed to be partly due to a concealed tuberculous focus, in some cases presumed to be in the thorax, in others in the abdomen, but in which no proof of active tuberculous disease could be obtained. The group was a small one, 18 in all; one only was under 2 years of age, while six were from 2 to 5 years, and the remainder above 5 years.

Dr. Agnes Macgregor, the pathologist of the Edinburgh Children's Hospital, has lately been collecting evidence on this question of latent tuberculosis in childhood from post-mortem examinations, and has kindly allowed me to give one or two of her general results. Healed or inactive tuberculous lesions are rare under 2 years; they increase after that age; and the great majority of these healed or latent tuberculous lesions are in the abdominal mesenteric glands.

The practical conclusion of this clinical and post-mortem evidence is that latent tuberculosis can scarcely be said to occur in infancy, and is uncommon in the later years of the period of our survey. And yet our clinical consciences are often troubled by this haunting fear of latent tuberculosis, throughout childhood, and particularly in the lungs. The loose statements frequently made as to the prevalence of latent tuberculous infection in early childhood are not supported either by clinical or post-mortem evidence. The problem of diagnosis at this time is the discovery of active, not of latent, tuberculosis in the thorax or abdomen.

Tuberculous Meningitis.

This type of tuberculous disease, so common and so deadly in the first years of childhood, is only the end-result of an earlier focus of disease implanted in the body; it is a secondary and not a primary type. Without post-mortem examination it is not possible to detect and locate in many cases of meningitis the primary seat of disease; this is certainly true of meningitis in childhood. In the clinical series given above of 91 cases of tuberculous meningitis in children up to 12 years, 73 occurred under 5 years; and of the latter group, this final phase occurred in nearly all without clinical evidence of tuberculous disease elsewhere. Of the total (91), post-mortem examination was made in 51, and the primary lesion was revealed in all but two; so that in the great majority of these it was now possible to re-distribute the cases of meningitis among the two other primary groups of pulmonary and abdominal tuberculosis. The results of this determination of the primary lesion in tuberculous meningitis are shown in the following table.

Primary Lesions in Tuberculous Meningitis.

Age Period.	Pulmonary.	Abdominal.	Cervical Glands.
Birth to 2 years	13	10	1
2 to 5 years	9	4	0
5 to 12 years	11	2	1
Total	33	16	2

In two other necropsies no primary tuberculous lesion was found. The number of cases (53) is perhaps large enough to warrant the general statement that nearly all cases of tuberculous meningitis are derived from a glandular or visceral focus in thorax and abdomen, a clear majority being thoracic, and a smaller number from the abdomen (the number here, no doubt, varying in different areas, according to the amount of bovine infection). It is uncommon for tuberculous meningitis to follow tuberculous glandular disease in throat and neck.

In cases of tuberculous meningitis it is uncommon, even after careful clinical examination of the throat and neck, the thorax and abdomen, to discover during life the seat of the primary focus. Occasionally, however, physical signs of a pulmonary focus may be found, and verified during life by an x-ray photograph, and after death at necropsy. The location of the primary focus is the most important thing to be done in any case of tuberculous meningitis; in most cases this essential information can only be obtained by post-mortem examination, and without this knowledge the adoption of preventive measures in the family becomes more difficult. The value of post-mortem examination in tuberculous meningitis can hardly be exaggerated in revealing the situation of the primary focus, and in a majority of cases this is a thoracic lesion.

Pulmonary Tuberculosis.

A few remarks may be made bearing upon the clinical problem of diagnosis. The difficulty of diagnosis is perhaps greater in the period of infancy, the first two years, than later, although it is never easy. In the first two years active pulmonary tuberculosis assumes a greater variety of forms. Four of these may be mentioned: tuberculous bronchitis becoming broncho-pneumonia; acute caseous pneumonia with or without acute cavity formation; chronic fibroid pneumonia with cavities; and a caseous tuberculous process at the hilum of the lung, spreading into it.

The first two, bronchitis and broncho-pneumonia, and massive caseous pneumonia may be discussed together. They occur at an age when simple bronchitis and lobar pneumonia are common conditions, and they give the same physical signs. Some clinical features are helpful in distinguishing the tuberculous conditions: the illness in these is insidious in onset and quiet in its course, and at first there is less dyspnoea and general distress; but presently there is definite weakness, pallor, and loss of flesh. This quiet but relentlessly progressive course is characteristic of the tuberculous process. The x-ray picture in tuberculous broncho-pneumonia is, of course, unmistakable. Finally, although there may be little cough and no expectoration, a throat swab will often show tubercle bacilli; and a positive tuberculin cutaneous reaction is also of much value.

As to the third type, even at an early age pulmonary tuberculosis may be a relatively slow process, lasting for many months, and associated with fibroid change and cavity formation. Here diagnosis is easier.

The fourth type, a caseous change in tuberculous glands at the root of the lung and slowly extending inwards, is more difficult to diagnose than any other type. Morbid physical signs may be absent, and at the early stage x-ray examination may also be negative. In such a case there are only the general signs of a severe progressive toxæmia.

Tuberculous pleural effusion is an uncommon event in the first two years. In my own clinical series there was not a case at this time; between 2 and 5 years there were three cases.

It is worth repeating again that tuberculous infection of the lung or the mediastinal lymph glands in the early years of life either proceeds to an active and fatal pulmonary tuberculosis or ends in meningitis; very rarely is it arrested as a healed process either in lung or gland.

Abdominal Tuberculosis.

One of the interesting things about this type is the variation in its frequency in different towns and districts of the British Isles; but whatever these local variations are, in all areas the greatest number of deaths falls in the first five years. In Scotland the number of deaths from tuberculous disease of the intestines and peritoneum is relatively much higher than in England. In London there were 16 deaths under 5 years from this condition in 1927; and in Edinburgh, with a tenth of the population, 9 deaths. Throughout Northern England and all Scotland abdominal tuberculosis is still a grave problem. In early childhood primary abdominal tuberculosis is due to infected milk, as also are a large majority of cases of tuberculous glands of the neck and at least a third of cases of tuberculous bones and joints. High rates of mortality and morbidity from abdominal tuberculosis in any area are a reliable index of widespread infection of the milk supply with tubercle bacilli.

PREVENTIVE MEASURES.

It is hardly necessary to emphasize the greater importance of preventive as against curative treatment of tuberculosis at any time of life; and this is certainly true of the first period, where in some of its clinical types the number of deaths equals the number of cases. The greatest impetus towards prevention of tuberculosis has been the conviction of the medical mind that the disease is a contagious one, transmitted from one individual to another, and the gradual persuasion of the body of the people of this truth. Another demonstration, hardly less powerful towards prevention, was that tuberculous disease in cattle can be transmitted by milk to man. It is a curious fact that Laennec and Koch, the two greatest discoverers in the field of tuberculosis, both held wrong views here, Laennec declaring that pulmonary phthisis was not contagious, and Koch that bovine tuberculosis could not be communicated to man.

Tuberculosis in childhood is peculiar in that both these kinds of contagion and transmission are powerfully at work; and this is specially true of the early period of childhood which we are discussing. As medical men we are fully persuaded of this, and we have a fairly accurate knowledge of the various methods and channels of this double transmission to the young child. If the people had the same general persuasion of the existence and danger of this double contagion, the reduction of the disease in young children would become more rapid. As it is, the mortality figures from all kinds of tuberculous disease, which have declined at every period of life, are declared by statisticians to have fallen most of all in the first five years. Education of the people in the fundamental facts is still needed, however, and ought to keep an important place in medical preventive measures. There is still need, not merely for preaching the truth, but also for denouncing error. The old heresy that tuberculosis is a hereditary disease, fatally transmitted from parents to children, still lingers in the minds of many, and blinds them to the real dangers. This propaganda of education, both by the family doctor and by the organized tuberculosis service, has gone on for many years, and has produced its effect; but with an "educated" people, and the means of reaching them so manifold, it should be possible for all to know and understand the simple essential facts of tuberculous disease in children and of its transmission by milk and man.

It is in the first two or three years of life that this twofold attack of tuberculosis is so common and so dangerous. It has been said of syphilis, but it can be said more truly of tuberculosis in early life, that it is shared between the father, the mother, and the children like the daily bread.

Hospital Statistics of Tuberculosis in Children.

The death rates given in the Registrar-General's reports are our main source of information as to the progress or decline of tuberculosis. Other figures that might be ex-

pected to give useful information are the statistics of cases and deaths occurring in the principal children's hospitals throughout Great Britain; these, however, are not presented in any uniform way; the totals given are often not of cases, but of admissions. Where cases—for example, of bone tuberculosis—are readmitted several times, it is obvious that the total numbers may give a quite misleading statement of the prevalence of the disease. It is most desirable that children's hospitals should adopt a uniform method of presenting and analysing their statistics of tuberculosis; if this were done a much more accurate and detailed survey of the prevalence and progress of the disease and of its main types in the various hospital areas could be obtained. Such a yearly survey would be of great value, both to the medical profession and to the public health authorities in each area, in stimulating and directing preventive measures.

Tuberculous Milk.

The problem of milk in relation to tuberculosis in young children is complicated. The amount of bovine tuberculosis varies a good deal in different areas, but in a large number of our towns and districts it is very considerable. In these areas the medical profession and the public health authorities are well aware of the prevalence of tuberculous milk, and are now taking more active steps to improve the situation by the provision of tubercle-free milk, better veterinary inspection, and by wholesale pasteurization of milk. It will be a long time before tuberculosis in cattle can be stamped out; in the Manchester report for 1927 the veterinary officer records an increase in the samples of tuberculous milk. Manchester is not alone in this; but in the work of Delépine it has given a lead to other places in exposing the danger by bacteriological examination of milk samples.

The widespread existence of tuberculous milk constitutes the greatest and most serious example of food poisoning in this country, and gives Great Britain a "bad eminence" in this matter over almost every other great State in the Old and New Worlds. And there is no general agreed policy, either national, municipal, or private, to meet this danger. Until all our dairy cattle are free of tubercle there are two ways of dealing with the situation—either that the public health authorities require and supervise the pasteurization of all milk supplies for young children, with the exception of certified milk, or that the medical profession unanimously recommend the boiling in the home of all milk for children. But medical opinion is not agreed as to the necessity for this step; and this division of opinion, which has lately become more marked, is chiefly due to two things. The virtue of freshness in milk, owing to recent knowledge of vitamins, has become emphasized, and unduly so. Also there is a vague but widely held belief that a mild bovine infection is widespread, and is a protective vaccination against the more dangerous human and pulmonary infection, and that although this rough uncontrolled vaccination costs many lives and much crippling disease, the price must be paid as a protection against a greater danger. It is very desirable that the medical profession should reconsider the question of sterilization of milk: we are agreed as to the prevalence of tuberculous milk and of milk-tuberculosis in children; it would be a great gain if we were agreed in recommending the sterilization of all ordinary milk used by young children. It is always hard to change the customs and habits of the people—these household laws that are older and stronger than Acts of Parliament. It is settled custom to boil our eggs; we have far more reason to boil our milk, and it is an easy matter to make good the rather dubious loss of vitamins.

Human Tuberculosis.

Pulmonary tuberculosis, with all its consequences, is not only the greater part of the problem of tuberculosis in young children; it is also the more difficult to deal with. It can be ascribed almost entirely to human infection—that is, to active tuberculosis in the father, mother, or some other individual in close contact with the young child. As we have seen, tuberculous meningitis, which causes the greatest number of deaths in the first five years of life, is in the majority of cases due to pulmonary tuberculosis. In the early years of life the child, carried in its parents' arms and closely attended by them, has that close contact which

readily allows contagion to pass to it; and this condition of nature and necessity mainly explains the height of the tuberculosis curve in the first five years, and its drop in the later years of childhood, when there is increasing freedom and separation.

Efficient prevention of pulmonary tuberculosis in the young child demands, first, the detection of phthisis in the parent or adult relative; next, measures to guard against the danger of their close contact with the child. Even so, notwithstanding all the advantages of a special service and of trained nurses who point out the dangers and how they may be guarded against, the risk of infection of the child in a crowded home must remain high. And in the young child infection is followed by disease with its high mortality. Not seldom it is the appearance of active tuberculosis in the child that gives the clue to the existence of unsuspected phthisis in one or other parent. This is one of the great benefits of notification of all forms of the disease—that from many sides information is gathered that may lead to the detection of cases of adult phthisis. The key to the problem of prevention of pulmonary tuberculosis in childhood lies in the early detection of cases of phthisis in the middle period of life, in their isolation, in their instruction in hygiene, and, above all, in reduction of their numbers. The segregation of young children from tuberculous parents and insanitary homes, as in the Grancher system in France, is not feasible as a general policy; in the few cases where it is practicable it is, of course, the most effective safeguard.

With regard to the children in a family where phthisis in a parent has been discovered and dealt with, what further preventive measures are available? Is it possible to detect and arrest early infections? This is a difficult but important question, and one that receives much attention from tuberculosis officers. In the infant and younger child it seems to me that little can be done here, for latent or dormant infections are very rare, and active disease is nearly always fatal. In abdominal tuberculosis from milk infection the case mortality is lower, and latent abdominal infection, although uncommon, may occur. The occurrence of latent pulmonary infection in the older child, its detection, its relation to phthisis in the adolescent and adult, are all important questions, which, however, lie outside the scope of our subject.

CHRONIC CERVICITIS (LEUCORRHOEA):

ETIOLOGY AND SYMPTOMS.*

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CHRONIC cervicitis (leucorrhoea) forms one of the commonest conditions met with in both hospital and private practice. The discharge is often persistent; not infrequently it is neglected; it is resistant to treatment, and the results of treatment are often disappointing. The condition may, moreover, give rise to complications, not only locally in the pelvis, but also in other parts of the body. Chronic cervicitis is therefore a subject of great practical interest and importance, and is deserving of careful study.

Chronic cervicitis may be defined as an inflammatory affection which involves the mucous membrane of the cervical canal and of the os uteri externum. It is characterized by leucorrhoea and the presence usually, but not invariably, of a cervical erosion. It is due to infection, and is accompanied by microscopic signs of inflammation.

In order to understand the condition it is first necessary to study the anatomy and development of the normal cervix. The two Müllerian ducts by their fusion form the Fallopian tubes, uterus, cervix, and vagina. At first these structures are lined by columnar epithelium. Changes occur at a later date whereby the tubes are lined by columnar ciliated epithelium, the uterus by columnar epithelium, and still later the tubular glands appear. In the cervical canal is a mucus-secreting epithelium with many racemose

glands. It is not ciliated. It does not pass through the menstrual changes of the uterine endometrium. In the vagina we see the greatest change in the original epithelial lining of the Müllerian ducts, for squamous epithelium, growing from below upwards, replaces the original columnar. Normally this squamous epithelium comes to line the whole vagina; it also covers the cervix and tends to invade the cervical canal. It is found there in a sixth-month foetus, but is later replaced by the columnar epithelium. Occasionally the columnar epithelium of the cervical canal spreads out beyond the external os over the cervix, thus producing the so-called congenital erosion or pseudo-erosion. These congenital anomalies rarely cause trouble in later life, and become covered again by squamous epithelium.

It is known that the vagina may contain organisms in its lower part within forty-eight hours of birth. The lower part of the vagina, therefore, even in a virgin, is not sterile. The upper part of the vagina normally contains the vaginal bacillus of Döderlein. This is non-pathogenic. It is believed to produce an acid substance which, with the secretion from the vagina, forms an acid medium hostile to the growth of pathogenic organisms. Thus pure cultures of streptococci and staphylococci injected into the vagina and cervical canal have been found to be destroyed within a few hours. Winter, Stroganoff, and Menge have shown that bacteria are not normally found above the external os. Curtis confirmed these observations, and has demonstrated that the cervical glands are susceptible to chronic infection.

In chronic cervicitis bacteriological investigation reveals the presence of pathogenic organisms. The organism most commonly found is the staphylococcus, either alone, but usually in combination with the *Bacillus coli*, the streptococcus, and gonococcus. Diphtheroids may also be found, but it is not certain that these should be regarded as pathogenic, for they may be found in the lower part of the vagina during health.

How is the normal protective barrier broken down and access given to these pathogenic organisms?

The invasions of organisms may be the result of a direct infection—for example, gonococcal infection. Indirect infection may follow after injuries to the cervix, such as lacerations of the cervix accompanying childbirth or abortion; or from the upward spread of infection from disease or inflammation of the vulva. The protective acid medium may also be swept away or destroyed by discharge from the uterus, the presence of vaginal pessaries, and by the use of contraceptives and vaginal douching.

Chronic cervicitis is very common. The incidence in a series of 6,483 women examined by Fulkerson was 2,150, or 33.15 per cent. Fulkerson found that the condition occurred in 78 per cent. of cases between the ages of 20 and 40. Burns found it most commonly between the ages of 30 and 40, and next most commonly between 20 and 30. That is to say, it occurs usually during the child-bearing time of life, which supports the view that traumatism of labour or abortion is an important factor in the production of the disease.

The chief symptom is leucorrhoea. This was present in 74 per cent. of Fulkerson's cases. The discharge varies greatly in colour, consistence, and quantity. It is usually of a viscid white mucoid variety, like unboiled white of egg. It may be slightly yellow or green. The discharge is usually more profuse in the morning, on resuming the erect attitude probably, and also just before and after menstruation. In cases in which the infection is of gonococcal origin it may be noticed sometimes that the discharge is more definitely yellow, and is usually muco-purulent. There may be a slight blood-stained discharge on examination or after coitus if a vascular erosion is present. General debility, anaemia, and constipation are not unusually accompanying symptoms. It is not improbable that these are the direct consequence of the absorption of toxic substances from the infected cervical canal. Not infrequently the patient complains of pruritus vulvae due to the vaginal discharge.

Sterility may result from chronic cervicitis. Burns, in a series of 84 cases, found that 37 per cent. were sterile; 39 per cent. had one or more children, no miscarriages; 25 per cent. had one or more children, one or more miscarriages; 2 per cent. had miscarriages only. Disorders of menstruation and backache do not occur unless the infec-

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