sary to place the child under expert care in a children's diabetic home.

Progress

The diabetic progress of the child should be regularly watched and changes in treatment made where indicated. The child should be seen every month for three months after the initial stabilization and thereafter every three months.

With careful treatment, complications are usually rare for the first ten years from onset, but as with adult diabetes, cardiovascular complications—e.g. retinopathy, albuminuria, peripheral vascular disorders and hypertension tend to occur more frequently with successive years.

Diabetic cataracts occur in about 1 to 2 per cent. of cases for which the treatment is surgical. Neuropathy is rare. Hepatomegaly and retardation of growth are usually the result of poor diabetic control or occur in the very mild untreated cases. They usually respond to correct control of the diabetes.

Conclusion

Diabetes in childhood, although unfortunate,

has with correct modern treatment a reasonable prognosis. The prognosis, however, of children developing diabetes under ten years of age is not as good as with older children as they tend to develop diabetic complications sooner, possibly due to the greater difficulty in controlling their diabetes. The cue to success is intelligent care by the parents and obtaining the child's fullest co-operation.

It must always be remembered that no general account can give in detail the requirements for treatment of an individual child. Children are usually insulin sensitive and each child's problems can only be dealt with as they arise, guided by experience and a sound knowledge of the fundamental principles of diabetic treatment.

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MENINGOCOCCAL MENINGITIS

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Purulent meningitis is the major incident of meningococcal infection. It is, in most cases, the culminating event in the progress of *Neisseria meningitidis* from the nasopharynx into the blood and on to the brain coverings.

The disease was differentiated by Vieusseux of Geneva (1805)¹ and has since been reported in epidemic and endemic incidence from all parts of the world. Following its natural course meningococcal meningitis has a heavy mortality (40-70 per cent.)², and a morbidity hardly less terrible. This was the expected result of infection until the effective introduction of sulphonamide drugs in 1938. The greatest recorded³ epidemics coincided with the two World Wars; 1915-1918 gave 10,259 cases with 5,883 deaths in the United Kingdom and 1940-1945, 38,900 cases with 7,880 deaths in England and Wales, the reduction in mortality from approximately 60 per cent. to 20 per cent. being almost certainly due to the introduction of sulphonamide treatment.

Epidemiology

The meningococcus is a relatively common, usually innocuous, inhabitant of the human nasopharynx. The organism can be differentiated into Groups I and II serologically but at least 90 per cent. of pathogenic meningococci recovered from epidemic clinical cases belong to Group I⁴. There seems little doubt but that a mutant of increased invasiveness and virulence precipitates clinical infection in suitable circumstances⁵. If these circumstances favour respiratory spread of infection (poor ventilation, over-crowding etc.), then the pathologically potent mutant reaches more hosts and an epidemic results. Thus mutation can condition the occurrence of isolated cases and these, given exceptional environment, can start an epidemic.

The incidence of meningococcal disease is low compared with many other infections in temperate climates, varying from 0.1 per 1,000 to 2.6 per 1,000 of the population. It is seasonal in winter

and spring and, although potentially affecting any age group, it is commonest in infants, young children and young adults. The sexes are equally affected. Immunity develops with age and exposure to infection and repeated attacks of the disease are comparatively rare. Even during epidemics the vast majority of persons infected develop only carrier states and it may thus be suggested that a personal lack of resistance largely determines clinical attack in the unfortunate few who develop the disease. This host factor, as well as mutation of the organism, must have an influence upon epidemic spread.

Pathology

From being a simple nasopharyngeal inhabitant, the organism gains access to the blood stream causing bacteraemia or septicaemia. Thereafter, through the cerebral vessels the disease spreads to the meninges. There are thus three pathologico-clinical stages: the infection may stop at any of these, or it may advance from one to the other with variable speed between the extremes of minutes or days. Autolysis⁶ of the meningococcus releases endotoxin to contribute to the toxic clinical picture and cause much damage to vascular endothelium⁷. The organism is thus frequently found in association with purpuric lesions, of which the 'spotted fever' rash is an example. Metastases of the same sort may be found anywhere in the patient's tissues and these lay the foundations of the exotic forms of meningococcal disease reported from time to time.

The purulent meningitis extends throughout the subarachnoid space and may involve considerable lengths of cranial and spinal nerves, while development of bacterial inflammation in the brain and cord substance may be expected on occasion. As the meningitis proceeds, organization of the purulent exudate tends to block the cerebral foramina and may interfere with the smooth flow of cerebro spinal fluid, causing ventricular dilatation and compression of nervous tissue. Fulminating septicaemic forms of the disease may result in death at a stage when the tissues, including the central nervous system, are merely the seat of acute inflammatory oedema and before definitive meningitis has had time to develop.

Diagnosis

Meningococcal infection clearly has three stages. The primary lesion in the nasopharynx is of little clinical interest except in connection with carrier or epidemiological investigations. Yet it must exist before the more serious consequences can follow. The septicaemic stage of the disease logically precedes the meningitis

and may be of short, almost unnoticed, duration, or it may be of fulminating severity, or intermittent and prolonged, or sometimes not followed by meningeal infection at all. In the ordinary form of the disease it may be difficult to distinguish signs and symptoms due to the septicaemia, since meningitis frequently supervenes rapidly. However, initial febrile symptoms with rigors and, in some 20 per cent. of cases, a petechial or purpuric rash, indicate the presence of septicaemia. Blood culture will in many cases confirm this. Polymorphonuclear leucocytosis and, quite frequently, herpes simplex lesions around the mouth develop early. After a widely varying interval intense headache, generalized pains, muscular irritability (evidenced by nuchal rigidity, head retraction and positive Kernig's sign), hyperaesthesiae, explosive vomiting and drowsiness progressing to delirium or coma, are labels of the meningitic infection. Of these signs probably headache, neck rigidity and vomiting are the most constant and significant. In small infants major indications may be lacking and it is well to suspect meningitis in the case of a baby with unexplained pyrexia¹⁰.

With these signs a specimen of cerebrospinal fluid must be examined *without delay*. The fluid pressure will be high, increase of neutrophil cells causes turbidity often to a purulent degree, protein is increased, sugar is diminished and chlorides reduced, if vomiting has been in any way severe. The typical organism can be recognized by Gram's method of staining and subsequent culture, in untreated cases, usually confirms this, although culture of meningococci is sometimes disappointing.

There is usually no reason why the diagnosis cannot be completed within an hour of recognizing the primary signs of meningitis^{8, 9}. If these signs are doubtful, or if the possibility of meningitis has even occurred to the clinician, cerebrospinal fluid should be examined without delay. In this way a proportion of normal fluids will be tested but early cases of meningitis will not be missed and treatment will be available in good time—a matter of the greatest importance in these days of potent chemotherapy. It might be added that a clinician undertaking the care of cases of meningitis ought to be able to undertake accurately the biochemical and bacteriological investigation of cerebro spinal fluid at any hour of the day.

Some 6 per cent. of cases of meningococcal disease in one large series were found to exhibit unusual features¹¹ nearly always associated with fulminating septicaemia. These cases have massive purpuric rashes and may develop encephalitic rather than meningitic signs early. Such cases, too, are frequently associated with

TABLE I
DOSAGE OF SULPHONAMIDES
SEVERE INFECTIONS (ENDANGERING LIFE)

	Adults	Children		
		0-3	4-10	11-15
Initial dose	2-4 g. intravenously 1.5 g. by mouth	0.5 g. intravenously 0.5 g. by mouth	1 g. intravenously 0.75 g. by mouth	1-2 g. intravenously 1 g. by mouth
Followed by: First period, two to three days	1.5 g. four-hourly	0.5 g. four-hourly	0.75 g. four-hourly	1 g. four-hourly
Second period, two days (approx. two-thirds of dose of first period) ..	1 g. four-hourly	0.5 g. six-hourly	0.75 g. six-hourly	1 g. six-hourly
Third period, two days (approx. one-third of dose of first period) ..	1 g. six-hourly	0.25 g. six-hourly	0.5 g. six-hourly	0.5 g. six-hourly

adrenal cortical degeneration or haemorrhage and, consequently, exhibit clinical signs of adrenal insufficiency, especially severe peripheral vascular failure. The rapidity of development of some of these cases is almost unbelievable; a case seen personally died five hours after the onset of the first symptom and before admission to hospital could be arranged.

Like any other infection there are *formes frustes*, mild or abortive attacks which are liable to be overlooked. These varieties of the disease may become chronic and ultimately result in morbidity and fatality owing to arachnoid adhesions and hydrocephalus.

Management

Needless to say all cases of probable meningococcal infection should go to hospital. There, they should be examined by a senior clinician experienced in the diagnosis and treatment of cases of meningitis. Here lies the secret of success, for speed in diagnosis and in the application of appropriate therapy can save lives. Doubt and delay, even if only for a few hours, can be fatal.

A specimen of cerebrospinal fluid must be obtained by lumbar or cisternal puncture and examined immediately. It is common practice to give 15,000-20,000 units of *crystalline* penicillin intrathecally at the first puncture, if the fluid is turbid. There is a slight risk of convulsions, however, and when a meningococcal aetiology can be reasonably presumed, intrathecal penicillin can be omitted. Blood for culture is taken at the same time. The diagnosis being confirmed, sulphathiazole or sulphadiazine must be given systemically (never intrathecally), in full doses as recommended for severe infections (M.R.C. 1943)¹² as quoted in Table I below:

In most cases penicillin is not required but may be given intramuscularly as adjuvant treatment when fulminating disease warrants the use of every available therapy¹³.

Patients with meningitis need the best of general nursing care, in isolation, and by special nurses if at all possible. Care of the mouth, skin, bowel and urinary functions and feeding all merit the greatest attention. Adequate rest is very important; restless delirium is probably best controlled by paraldehyde, 5-8 ml. given intramuscularly. Many patients require catheterization, some oxygen and some need intravenous fluids to correct dehydration. During periods of coma, nasal feeding will be necessary. Should adrenal insufficiency be suspected energetic treatment includes Eucortone in large doses, e.g. 10-40 ml., intramuscularly every 2-4 hours and intravenous drip transfusion of plasma, dextran or concentrated albumen. Some prefer cortisone, but the role of this drug is not yet clear. Therapy must be given intravenously or intramuscularly while vomiting persists. Rapid improvement is to be expected in most cases within a week and complete recovery is almost the rule. Infancy and old age tend towards an ill prognosis as also does the fulminating variety of the disease. But by far the most important factors in recovery are accurate early diagnosis and efficient therapy.

Nowadays, the prevalent uncontrolled use of chemotherapeutic agents results in some cases of meningitis receiving part treatment before diagnosis. This can make identification of the organism difficult, although patient search through several films of well centrifuged cerebrospinal fluid deposit is usually successful. If there is still doubt, treatment must continue on clinical grounds.

Comment

The criterion of diagnosis of meningococcal meningitis is the identification of the organism in the cerebrospinal fluid; the same holds good for any variety of meningitis. The usual clinical signs of meningitis are common to all varieties of the disease. Most types of purulent meningitis are eminently treatable today. It follows, therefore, that all forms of septic meningitis should be handled in the same way.

Speed of recognition of the clinical state of meningitis and speed of identification of the organism, followed by correct treatment can result in vanishing death rates. Yet the national fatality ratio (deaths per 100 notifications) in meningococcal disease still stands at about 22¹⁴. Since 1946, I have treated 104 patients suffering from meningococcal meningitis with no deaths and a total ascertained morbidity of one case deaf. Nine of these cases were of the severe septicaemic variety and 17 were admitted in a state of coma. It is of interest that in no case was evidence of subdural effusion obtained. Dr. Banks has reported a mortality of 7.4 per cent. among 706 cases coming under his care¹⁵.

The facts concerning other varieties of meningitis, notably pneumococcal and influenzal, are without doubt as serious and, therefore, the management of cases of meningitis needs re-appraisal in order to make the best use of the powerful chemotherapeutic substances now available.

It is suggested that the following steps are necessary if the best results are to be obtained:

1. Admission to hospital of any patient suffering from a disease suggestive of meningitis.
2. Immediate examination on admission to hospital by a senior clinician much experienced in the diagnosis and treatment of meningitis.
3. Examination of the cerebrospinal fluid *within the hour*.
4. Immediate application of appropriate therapy.
5. An efficient nursing service able to apply isolation nursing techniques.

It is further suggested that these conditions can best be fulfilled in this country by any large infectious diseases hospital. This is the more necessary since meningitis is often simulated by poliomyelitis, mumps, Weil's disease and other highly infectious conditions.

In relation to meningitis, medical and nursing staff must adopt an attitude of mind which constantly suspects the disease, regards lumbar puncture as a simple technique, senses the urgency of the condition and realizes the providential opportunity chemotherapy offers for spectacularly good results.

Note by Dr. H. Stanley Banks

It is not perhaps generally realized that meningococcal disease has become one of the main killers among the infectious diseases, even in non-epidemic years. In 1952 and 1953 in England and Wales, deaths from meningococcal infections were only a little less than those from poliomyelitis; they exceeded the deaths from whooping cough and from measles, and were far greater than those from diphtheria and scarlet fever combined. I am indebted to Dr. Ian Taylor, Epidemiologist to the London County Council, for permission to quote the following London figures of deaths in 1953:

Meningococcal infections 27, poliomyelitis 21, whooping cough 16, measles 6, dysentery 5, encephalitis 5, scarlet fever 1, typhoid nil.

During the first quarter of 1954, there were 12 meningococcal deaths and no deaths from other infectious diseases.

The fatality ratio for meningococcal infections in London during the years 1948 to 1952 was 33, 25, 23 and 35 per cent. of notifications respectively. Even if such high figures are partially discounted by under-notification, they are deeply disturbing. They call for enquiry and probably revision of our present methods of dealing with this infection. In 1952 the age incidence of notifications and deaths in London was:

Age	Notifications	Deaths	Fatality Rate Per cent.
0-4 years	53	24	45
5-14 years	30	2	7
15+ years	14	3	21

The main problem seems to concern infants and pre-school children, and to a lesser extent, adults. It remains to be determined to what extent this high mortality is associated with fulminating septicaemic forms or with the ordinary form of meningitis diagnosed too late or treated inadequately. In all these forms a very low case fatality rate was reported towards the end of the last war in many series of service personnel for whom prompt and efficient facilities for diagnosis and treatment were available at all hours of the day. Dr. Macrae's plea, therefore, for all cases of meningococcal infection admitted to hospital to be seen within the hour by an experienced senior clinician is cogent and timely. The present organization for dealing with serious acute cases in many hospitals is quite inadequate. Such acute cases should not be left to an inexperienced house physician until the next day or later. They should be sent to hospitals where there is an experienced resident medical staff. I wonder how many hospitals which so lightly undertake

the treatment of acute meningitis would care to compete with Dr. Macrae's record of 104 cases of meningococcal meningitis treated since 1946 with no deaths and a total ascertained morbidity of one case of deafness?

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Book Reviews

HISTORICAL REVIEW OF BRITISH OBSTETRICS AND GYNAECOLOGY, 1800 to 1950

Edited by J. M. MUNRO KERR, R. W. JOHNSTONE and MILES H. PHILLIPS. Pp. viii + 420. Edinburgh: E. & S. Livingstone Ltd. 1954. 30s.

The 25th anniversary of the Royal College of Obstetricians and Gynaecologists was a fitting occasion to publish this most enterprising and excellent book. It was written as a sequel to Spencer's 'History of British Midwifery, 1650 to 1800.' It reviews the next 150 years and ends with a wide summary of contemporary subjects.

The names of the three editors guarantee a high level of interest and accuracy. The first two editors are themselves responsible for the twenty chapters comprising the historical section, which is divided into three parts, each covering fifty years. Bethel Solomons concludes with a chapter on Obstetrics and Gynaecology in Ireland since 1800.

There then follows a section devoted to special subjects, varying from 'Puerperal Sepsis' by Leonard Colebrook to 'Obstetrical Societies and Clubs' by Eardley Holland. The last section of the book is concerned with gynaecology in its various aspects, both historical and contemporary. Particularly interesting is the story of Wertheim's visit to this country in 1905, and the performance of his new abdominal operation for carcinoma of the cervix at St. Mary's Hospital, Plaistow, when he was assisted by Lockyer.

In a brief review it is difficult to do more than mention the eminent contributors who have written essays on each special subject. This is certainly a book which all interested in the subject ought to possess.

D.W.S.G.

CHEMOTHERAPY IN THE TREATMENT OF TUBERCULOSIS

Pp. 60, with six illustrations. London: N.A.P.T. 1954. 5s.

The National Association for the Prevention of Tuberculosis have collected into this booklet eleven papers read at a meeting held in Cambridge in September 1953. The papers cover chemotherapy in the treatment of tuberculosis, and the booklet is recommended to our readers.

ANTISERA, TOXOIDS, VACCINES AND TUBERCULINS IN PROPHYLAXIS AND TREATMENT

By H. J. PARISH, M.D., F.R.C.P.E., D.P.H. Third edition. Pp. x + 227. Edinburgh: E. & S. Livingstone Ltd. 1954. 21s.

During the training of a medical student very little detailed information is given on the many prophylactic agents at his disposal. As a result when faced by the problem of, say, immunizing a family going overseas most practitioners need a handy reference book giving complete details of immunizing methods. This book can be safely recommended to every doctor who may have to carry out any type of immunization procedure. He will also find that the book is full of interesting general information and that it is very readable.

R.H.G.