the thirty-three whom we have been able to trace there have been departures from normal; thirteen were stated to suffer from headaches, and of these, four also showed signs of increased nervousness in the shape of twitching, starting when spoken to, or speech defects. One was described as "very excitable." In one case the child's behaviour was found to have deteriorated, and one was said to be less intelligent. Two children suffered from unilateral facial paralysis following the accident, but in both cases recovery took place, in one completely in two months, but in the other slight drooping of the eyelid remained after nine months. In two some deafness occurred.

In an admirable paper devoted to this subject Beckman³ tells us that all such patients recover within two years, with the exception of perhaps 5 per cent. Nevertheless the unexpectedly high percentage of unpleasant sequels emphasizes the importance of prolonged rest. Beckman makes no reference to the development of epilepsy, and apart from convulsions noted shortly after the infliction of grave brain injury, and usually speedily fatal, we have seen no evidence in children of this complication. It must occur very rarely.

Conclusions

1. Fracture of the skull occurs in childhood much more frequently than is supposed.
2. It often results from apparently trivial injuries.
3. Fracture of the base is not uncommon, and is of very grave significance.
4. Sepsis must be forestalled by operative cleansing in compound fractures of the vault and by the prophylactic use of serum in fractures of the base.
5. Medical measures should be taken to prevent undue increase of intracranial pressure.
6. In view of the proportion of sequels prolonged rest is indicated.

REFERENCES

- ¹ Fraser: *Surgery of Childhood*, i, 510.
- ² Kirmisson: *Handbook of the Surgery of Children*, p. 331.
- ³ Beckman: *Annals of Surgery*, lxxxvii, 355.

A SWIFT AND SIMPLE METHOD FOR DECIDING PNEUMOCOCCAL "TYPE"

BY

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Increasing attention has been paid during the past year to the treatment of lobar pneumonia by concentrated antipneumococcal serums.¹ The serum available from American sources (Parke, Davis and Co., and Lederle) is divalent and effective against the pneumococcal Types I and II. A supply of Type I antiserum will probably soon become generally available from the Wellcome Research Laboratories. I am at present engaged on the treatment of selected severe cases of lobar pneumonia with each of these serums.

While there is some doubt about the usefulness of Type II serum, there is good reason to consider the Type I serum of real therapeutic value. In these circumstances, the determination of the type of pneumococcus responsible for a given case of lobar pneumonia becomes a matter of urgency, first in the interests of the patient and, secondly, to avoid waste of the very costly serum.

A swift and simple method for deciding pneumococcal type is as follows. Type may be ascertained within four hours from the time of collecting sputum, or lung puncture fluid when sputum is not immediately available;

other pathological material containing virulent pneumococci may, likewise, be used.

A suitable sample of sputum is chosen and emulsified in a watch-glass with an equal volume of broth. Half a cubic centimetre of the emulsion is inoculated into the peritoneal cavity of a mouse. Four hours later the peritoneal contents are sampled by aspiration in the following manner. The mouse is grasped by the scruff between the finger and thumb of the left hand; at the same time the animal's tail is firmly held against the inner side of the palm of the hand by the third and fourth fingers. The abdomen is thus conveniently exposed and explored by means of a 1 c.cm. Record syringe with fine No. 18 rustless steel needle attached. The barrel of the syringe should be held by the third and fourth fingers of the right hand against the palm, and the plunger lifted by the right thumb and index.

Four droplets of the peritoneal exudate thus obtained are expressed on to slides, appropriately marked with grease pencil to correspond with the three chief pneumococcal types and control; the droplets are at once mixed with a platinum loopful of Types I, II, and III agglutinating serums and rabbits' normal serum. The drops are covered with cover-slips as soon as mixed, and examined at once under the microscope, using a No. 4 ocular 1/6 inch objective with plane mirror reflector, the condenser being removed. Focusing is facilitated by the grease pencil marks on the slide.

The immediate result, in the case of a positive reaction, is a conspicuous increase in size of the pneumococci, due to conjugation of coccus and homologous antibody. Brownian movement is retarded, and the pneumococci become very apparent as lanceolate bodies, surrounded by a clear, highly refractive capsular zone. Agglutination soon follows, but is accelerated if the slide is warmed on the floor of the 37° C. incubator for three to five minutes, and then again examined.

The end-result of the reaction is the aggregation of masses of agglutinated pneumococci and leucocytes; the pneumococci, sensitized by conjugation with the antibodies, are chemotactic to the phagocytes and polymorphs present in the peritoneal exudate. This characteristic reaction is seen only when virulent pneumococci are effective, belonging to the recognized serological types. The result, at times, may be a little obscured by the presence of undigested debris from the sputum, if exploration of the mouse's peritoneum is attempted too soon or the initial dose of sputum is too large. The rate at which the peritoneal cavity deals with this foreign material varies somewhat in different specimens of sputum.

The test may be carried out with equal facility at any interval exceeding three to four hours, which period, generally speaking, represents the minimum time required for sufficient multiplication of the virulent pneumococci injected and digestion of the sputum.

The agglutinating serums used have a titre of 1 in 40, and are prepared by immunization of rabbits with representative type strains, isolated from recent cases of adult lobar pneumonia. The precaution of identifying both strains and serums by agglutination and absorption tests against the standard Rockefeller types has been observed always. Macroscopic agglutination has invariably confirmed the results of microscopic tests. The microscopic method is not only simpler and more rapid, but also considerably more delicate than the macroscopic, besides being economical of serum. The advantages are such that I now use this method alone.

I make no claim that the method described here is original; the object of this communication is to make it widely known. The subject is reviewed by A. B. Sabin,² to whom the credit is due of applying rapid methods of typing pneumococci. Sabin's procedure is very similar

to that described, save that the specific agglutinating serums are diluted to eliminate coagglutinins and that smears of the mixed pneumococcal exudate and serum are made on slides, dried and stained. Sabin's method therefore sacrifices the opportunity of observing the striking and entirely characteristic change in the appearance of the cocci which follows conjugation with the specific antibody-bearing protein; and, further, his method introduces additional manipulations in the preparation, drying, and staining of the films. Neufeld, twenty years ago, applied the microscopic method to typing pneumococci, but was dissatisfied with the results he obtained with Type III. In my experience, however, no difficulty has arisen so far with this organism or with material from cases of Type III pneumonia. In any event the results with Types I and II are decisive, and are the key to early treatment.

The experiments described here have been carried out with the assistance of the Medical Research Council.

REFERENCES

- ¹ Vide Glasgow and Edinburgh reports, *Lancet*, December 27th, 1930.
² Sabin: *Journ. Infect. Dis.*, 1930, xlv, p. 469.

THE ENIGMA OF THE CHILBLAIN

BY .

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The discomforts and disabilities caused by chilblains during the winter are very real, although non-sufferers may regard the complaint as trifling. We have but a fragmentary knowledge of the subject; it is known that cold is the exciting cause, but how one individual escapes and another suffers has never been determined. Consequently it is improbable that efficient means of prevention will be found until more is known of the etiology and pathology of the condition.

The Etiology of Chilblains

Perniosis is essentially an affliction of youth, as the following analysis of 100 consecutive cases shows:

Age	Number of Cases
0-10	54
10-20	29
20-30	4
30-40	5
40-50	4
50-60	3
60-70	1

From the above it is evident that after a period of years an immunity is acquired. Certain persons are free in their early years, but suffer in middle age; strange to say, however, chilblains are seldom met with in the aged, even when serious organic disease is present.

A histological examination in the early stages shows that there is a rapid degeneration of the small vessels, accompanied by perivascular infiltration. There is not a mere transudation of serum, as some writers would have us believe, but a sudden and severe damage affecting the vessels of the papillary layer of the cutis. Attempts to produce a chilblain experimentally by the application of solid carbon dioxide, injection of histamine, etc., have failed. In a susceptible individual a chilblain commences to make its appearance about eighteen hours after exposure to cold of the requisite severity. Should the temperature remain low little alteration in the state of

the chilblain ensues, but a change of wind bringing a warmer atmosphere produces a rapid amelioration of the symptoms; and the chilblain disappears with surprising rapidity. Change of environment may also produce a striking alteration in individual susceptibility. These facts are of importance, for it is not unlikely that they explain the reputation of many of the so-called cures for chilblains.

Chilblains Associated with Other Diseases

In order to investigate some of these suggestions, I endeavoured to ascertain the relative frequency of chilblains in certain diseases of known etiology, and also to determine the incidence in various social states. A more detailed account of these inquiries has been given in a previous communication.¹ The incidence of chilblains among patients attending the casualty department of the Sheffield Royal Infirmary compared favourably with that of others in more affluent circumstances. On the other hand, statistics obtained from the medical out-patient department and from the tuberculosis dispensary in the same city indicate that the incidence rises with a disturbance of the general health, as shown below.

	Percentage Affected with Chilblains
1,000 casualty patients	5.3
1,000 medical patients	9.2
1,000 tuberculosis patients	13.2

The figures in the last group are of particular interest; for some writers, among them Darier,² allege that the chilblain is actually a tuberculide. Although the above figures give some support to this theory, it is probably more accurate to assume that tuberculosis and some other diseases which impair the general health are predisposing causes. An analysis of 1,275 patients attending the medical out-patient department affords some interesting comparisons. Taking first the abnormalities of the circulatory system, 14 of my series had various degrees of arterio-sclerosis, yet in no instance was there a history of concomitant chilblains. On the other hand, of 86 suffering from some form of heart disease there was a record of recent chilblains in 15—that is, 17.4 per cent. From these figures it appears that a gross defect in the arterial wall may exist without materially diminishing the vitality of the capillary. The frequency with which chilblains are met with in disorders of the heart may be accounted for by the lessened propulsion force, and consequent slowing of the blood stream, interfering in some way with the nutrition of the superficial vessels. An examination of patients suffering from some definite imperfection of an endocrine gland is instructive. Among the 1,275 patients referred to 12 were suffering from myxoedema, but none suffered from chilblains; 24 were under treatment for exophthalmic goitre, of whom 3 had had chilblains since the onset of hyperthyroidism; this appears to show conclusively that chilblains are not necessarily associated with excess of thyroid secretion.

"Chilblain Circulation"

Most observers will agree that many chilblain subjects exhibit some peculiarity of the peripheral circulation in winter time. This was confirmed by an investigation of 100 cases of chilblains, for of this number 51 showed an apparently abnormal circulation in the hands and feet. It must be admitted that the records are of little intrinsic value, for it is impossible to define what is meant by normal blood supply. Under varying conditions the subjects might show different responses to heat and cold; furthermore, it is incorrect to assume that the peripheral circulation is necessarily normal because it appears to be