the infection of the stump by some very bad type of micro-organism. In this case infusion of saline solution with brandy was used in addition to the hypodermic injection of strychnine, but my own opinion is that the strychnine really enabled him to rally from the shock of the operation.

DIPHTHERIA AND ITS TREATMENT BY ANTITOXIN.

By R. W. MARSDEN, M.D., M.R.C.P., etc.,
Medical Superintendent, Monsall Fever Hospital.

It is in these days a mere waste of time to bring forward facts solely with the idea of proving the inestimable value of antitoxin in the treatment of diphtheria. Its detractors are few, and of necessity largely inexperienced in its practical utility, for no one who has treated diphtheria by the old method of local disinfectants and general tonics, and then observed the marvellously regular improvement after the early administration of antitoxin, could for a moment doubt its specific nature. So long, however, as there are people whose knowledge is sufficiently deep to teach their fellow-creatures merely upon the information (*sic*) gained by misreading statistics compiled by others, so long may there be found opponents to its use, and one can only pity their ignorance, and pray not only that their number may be small, but that no one may be led into needless suffering by heeding them.

Yet, though the efficacy of the treatment by antitoxin no longer needs substantiation, a good story will always bear repetition, and moreover under different circumstances, it may be possible to bring into greater prominence certain details of the highest importance. It is with this object that I have ventured to tabulate the results in 105 cases of diphtheria observed by myself throughout their course. The cases have all occurred in this hospital between November, 1898, and March, 1900, and have been derived from two sources: (1) attacks amongst the nursing staff, (2) attacks in patients suffering from, or convalescing from, scarlet fever.

The clinical diagnosis has in almost all instances been verified by the cultivation of the Klebs-Loeffler bacillus from swabs sent to the bacteriological laboratory at Owens College. In the remaining cases not examined by Professor Delépine or his assistants the cultivations were made at the hospital. The age of the patients has varied from 18 months to 36 years, no fewer than 85 being under 12 years of age. Of the 20 adult patients 16 were members of the hospital staff.

EARLY SYMPTOMS.

In such a series of cases it is interesting to inquire, What was the earliest indication of the onset of diphtheria? Naturally in patients who are intelligent and old enough to be capable of expressing their feelings, one would expect a subjective sensation to be the first indication, and one finds that of the 20 adults 16 complained of sore throat or pain with deglutition, and 2 of sore throat accompanied by shivering. Of the other 2 cases one had a slight elevation of temperature without complaint on the previous day, whilst in the other patient pyrexia was first noted, and then inquiry elicited the information that the throat felt sore.

But turning now to the other 85 cases, in no fewer than 28 instances the thermometer revealed the onset by showing the presence of pyrexia before any complaint had been made. In 16 instances the patient complained of sore throat, in 5 there was first observed crupiness or hoarseness, in 3 others a discharge from the nose occurred for which no account could be given, and they were therefore examined bacteriologically, whilst in the remaining cases the attack was usually observed in the routine examination of the throat, which is practically universal in such a hospital as this. Without doubt, had they been adult intelligent patients, as already noted, most of the latter would have complained of sore throat, yet I am thoroughly satisfied that in a not inconsiderable number of cases general *malaise* or pyrexia is to be observed before the local symptoms have attracted the individual's attention.

TEMPERATURE.

Of course in many instances, where pyrexia was the first indication, an examination of the throat showed either congestion or definite membrane, and similarly, when sore throat

was complained of, the thermometer would often reveal the presence of pyrexia. On the other hand, in no fewer than 25 instances the temperature was throughout either normal or not above 99° F. Thus the presence or absence of pyrexia at

Chart I.

Chart II.

Chart III.

the beginning of an attack of diphtheria is extremely variable, and even when present its degree is no less variable, for in 41 cases when first observed it was between 101.2° and 105.2° F. and in 5 only was it below 101° F. Further, in 20 cases with pyrexia, owing to a delay in being able to make a clinical diagnosis of diphtheria, the course of the temperature could be observed for a longer or shorter period before the administration of the antitoxin, and the impression gained from these cases is that not only does it vary at its onset, but in its further course it is either very evanescent or very irregular, though occasionally the temperature may steadily ascend as the local symptoms become aggravated. Thus in 13 instances it had fallen to normal, or nearly so, before the antitoxin was given, in 7 of these the fall was very abrupt, and in 4 by large remissions. In the other 2 the injection of antitoxin was still further delayed, and a more gradual secondary increase in pyrexia was taking place. I believe that during the early period of an attack of diphtheria (especially the pharyngeal or

about the same time as some of the cases in my series in which no diphtheria bacilli were found. On this account they have not been included, yet I am still unconvinced that all were not diphtherial, and, observing the marked improvement which occurred in some as the result apparently of the injection of antitoxin, I have never regretted its administration. It seems to me that as diphtheria is the one acute disease affecting the nose, throat, and larynx for which we possess a specific remedy, and in which neglect of early treatment may be followed by serious and irredeemable consequences, it is our duty, when in doubt, to exclude it by administering its antidote, and thus save ourselves much future worry, anxiety, and even sorrow.

But as regards the unnecessary pain of an injection in non-diphtherial cases this is surely too trivial an objection, and the only point which requires consideration is the expense. It is well known that small doses only are, as a rule, necessary at the beginning of an attack, whereas when the toxins have been absorbed for some time the dose must be doubled, trebled, and even quadrupled; and, moreover, if left too long, these and larger doses are unavailing. It is more than aggravating, in a hospital such as this, to observe the necessary waste of antitoxin owing to the disease being too far advanced, and one cannot help feeling that the lives saved would more than counterbalance all the occasions on which the remedy may have been given needlessly.

I have purposely admitted the objection that the friends may later have to be told that the bacteriological examination was negative, since this difficulty can be readily surmounted by informing them that the test is not infallible.

DOSE OF ANTITOXIN.

It will be noted that in general the amount of antitoxin given has been comparatively small, thus 750, 1,000, and 1,500 units have been sufficient in a few cases where the local and general symptoms were very mild and the advance very slow, or where it was evident that the disease was only of a few hours' standing.

As a rule all ordinary cases with well-marked local symptoms and moderate constitutional disturbance when observed early have received 2,000 units, whereas the doses over this amount have been reserved for the cases in which the congestion and swelling in the throat, the amount of membrane formed, the degree of glandular infiltration, or the rapidity in the advance of the symptoms has denoted the probability of a severe case. A few cases also have received the larger amounts when rapidity in the production of immunity was specially urgent, for example, indications of involvement of the larynx. A repetition of the injection was only necessary in 4 cases, where the absence of a fall in the temperature or pulse-rate, or a continued advance in the local signs showed that the first dose had been insufficient.

Table III.—Dosage.

Units of Anti-toxin Given.	No. of Cases.	Remarks.
750	1	Solely nasal discharge.
1,000	14	
1,500	3	
2,000	72	
3,000	1	Two injections on successive days.
3,500	2	{ Two injections, in each after 36 hours' interval.
4,000	11	
14,000	1	{ Severe naso-pharyngeal, 3 injections, 1st dose after 3 days' illness. Fatal.
Total, 105		

It is interesting to note that in 9 of the cases which recovered the administration of antitoxin was delayed for a longer time than in the fatal case. The latter, however, was specially remarkable for its severity. Owing to the limitation of the disease at first to the nose and naso-pharynx, I was in error as to the diagnosis until the formation of membrane showed itself on the septum nasi and fauces. By this time, however, the cervical glands had become much infiltrated, and there was a considerable deposit of albumen in

the urine; 6,000 units were then injected, and on successive days further doses of 4,000 units given, yet, though the local signs steadily improved, the patient died of cardiac paralysis at the end of the third week.

TIME AFTER INJECTION OF ANTITOXIN BEFORE PYREXIA DISAPPEARS.

I have already stated that in 25 instances pyrexia was absent throughout, and that in 13 the temperature was normal before antitoxin was given. Under these circumstances one would expect that the date of the subsidence after antitoxin, *per se*, would not give any very definite information. Still in cases with pyrexia, when the antitoxin is injected during the early stages, there is no doubt that the temperature steadily diminishes after a sufficient dose, and not only reaches, but retains, the normal height within a fairly definite time.

TABLE IV.—Fall of Temperature.

Number of Cases.	Time before Temperature Settled.
5	Immediately.
12	Within 24 hours.
31	" 48 "
11	" 72 "
Total... 59	

As showing the relationship between the pyrexia and the date of injection, it is only necessary to state that of the above 59 cases where the temperature became settled within three days, in 52 instances antitoxin was injected during the first two days of illness, whereas of the remaining 8 cases, which took a longer time, the injection was more delayed in 3, and in 3 others where the injection was given on the first day, a fall in the temperature began at once, but took four days in 2 of them, and six days in the other, before the normal was reached. Of the remaining 2 cases, in 1 the injection was given after thirty-six hours' illness; lysis occurred, as in the cases just mentioned, but took seven days, whilst in the other the pyrexia was due to an intercurrent disease. I believe that in the 4 cases where the subsidence occurred slowly, a larger dose would have given a more rapid fall, but, as each day showed satisfactory progress, the injection of antitoxin was not repeated.

IMPROVEMENT IN THE LOCAL CONDITIONS.

Since the introduction of antitoxin in the treatment of diphtheria, probably no fact is more remarkable than the regularity with which the local inflammatory signs subside and the membranous formation disappears after immunity has been produced by counteracting the toxins absorbed.

Changes in the membrane being most readily noted, the results in the 99 cases where observation of these changes was possible are given in the following table:

TABLE V.—Disappearance of Membrane.

Time before Throat was Free from Membrane.	Number of Cases.
Within 2 days	18
" 3 "	45
" 4 "	20
" 5 "	11
" 6 "	4
" 7 "	1 (fatal).
Total ...	99

The regularity, as shown in the above table, with which the membrane disappears—that is, within four days in 83 out of 99 cases—is too evidently consequent upon the treatment to need further comment.

ALBUMINURIA.

The occurrence of albuminuria usually takes place early in the course of the disease. The time which elapses before it makes its appearance, the rapidity of its increase, and the amount to which it attains, however, depend largely on the type of attack, the severity of the toxæmia, and possibly, to a slight extent, on individual predisposition or vulnerability of the kidneys.

In dealing with such a large proportion of children as is contained in my series, there have of necessity been a few occasions on which the urine was not or could not be examined. However, in 96 out of the 105 the examination was made, and in no fewer than 47 instances either no albumen, or the merest trace, could be detected. This very favourable occurrence is no doubt due to the early period at which the antitoxin was injected. Of the remaining cases, in 19 there was a very marked trace of albumen, and in 23 it was in sufficient amount to give a distinct coagulum on boiling the whole column of fluid. Excluding the fatal case, in only 3 of the latter did the coagulum attain to any marked degree.

But in connection with the injection of antitoxin, a most important question is the probability, or possibility, of the production of albuminuria or nephritis by its agency. In the first place, the above-mentioned 47 cases, where at most the merest trace of albumen could be found, allow one to infer that the probability is not great. Considering, however, the other cases, in the 19 where a trace was well marked it first appeared in 9 instances during the first or second week after the antitoxin had been given, whilst in 1 case an interval of three weeks elapsed. Similarly in the 23 cases where a deposit occurred, in 3 this was first detected three days after the antitoxin, in 1 at the end of the first week, and in 8 during the second week. It is possible that this late appearance of albumen in the urine was due to the injection of antitoxin. In every one of these instances it was only of temporary duration, the longest period being about three weeks, and it must be remembered that as a rule the patients were convalescent from scarlet fever.

There were, however, 7 cases of special interest, in that the patients at the time were suffering from nephritis due to the previous attack of scarlet fever, or had recently recovered from this complication. The details of these 7 cases are as follows:

CASE I.—Male, aged 26 years. Hæmorrhagic nephritis during sixth week of scarlet fever. Gradual but very slow improvement during next thirteen weeks, then very mild attack of diphtheria, which was detected at once, and 2,000 units of antitoxin injected. Six days later marked increase in blood and albumen, accompanied by urticaria. Getting worse for three days, then improvement, and after a week return to previous condition.

CASE II.—Female, aged 2 years. Admitted with hæmorrhagic nephritis following scarlet fever. Five weeks later urine free from blood and only a trace of albumen, after another four weeks diphtheria; 2,000 units of antitoxin after four days' illness, when a slight deposit of albumen. No return of blood, and urine cleared gradually.

CASE III.—Female, aged 3 years. Hæmorrhagic nephritis fifth week of scarlet fever; seventh week no blood and only a trace of albumen; nine days later diphtheria; 2,000 units of antitoxin injected at once. No signs of any change in urine.

CASE IV.—Female, aged 8 years. Hæmorrhagic nephritis end of third week of scarlet fever. After three weeks and a half greatly improved, when diphtheria contracted; 2,000 units of antitoxin given within twenty-four hours of onset. No signs of change in urine.

CASE V.—Female, aged 4 years. Albuminuria forming slight deposit on boiling during third week of scarlet fever; return of albuminuria eighth to tenth week, when mild attack of diphtheria; 1,000 units of antitoxin given at once; amount of albumen slightly increased for next fortnight then quickly disappeared.

CASE VI.—Female, aged 9 years. Hæmorrhagic nephritis end of third week of scarlet fever. Quite recovered after three weeks. Two and a half weeks later sudden onset of diphtheria, accompanied by return of blood and considerable deposit of albumen in urine; 2,000 units of antitoxin injected at once; rapid improvement in urine. Early in second week slight increase in albumen; quite recovered before end of third week.

CASE VII.—Male, aged 5 years. Nephritis end of third week of scarlet fever; large deposit of albumen in urine; next day slight laryngitis; following day oedematous swelling behind each angle of jaw, and "croupiness" no better; nasal discharge, accompanied by very offensive smell; 2,000 units of antitoxin injected. Examination of nasal discharge showed Klebs-Loeffler's bacillus. Gradual improvement in symptoms and urine; three weeks later albumen still present and blood detected. Nephritis lasted several weeks.

An examination of the above 7 cases shows that in at least 4 there was not the slightest evidence that the antitoxin had any deleterious effect upon the kidney, while in only 1 was there an exacerbation of the condition due probably to its influence alone. One must therefore conclude that though it may have an irritant effect upon the kidney, yet this is by no means the rule, and in any case its action is only temporary.

POST-DIPHTHERIAL PARALYSIS.

In the report of the Committee on the Antitoxin of Diphtheria¹ the incidence of paralysis in different groups of cases varies from 21.7 per cent. in those receiving under 5,000 units to 27.3 per cent. in those cases which received over 10,000 units. The cases were classed according to the number of units of antitoxin given, in the belief that this would give the best means of obtaining a gauge as to the probable severity of the different cases.

Now, in considering the prevalence of paralysis, it is important to note that the first and possibly the only symptom may be a difficulty in accommodating for near objects or a slight nasal speech, and that it is precisely these two symptoms which may not be observed in very young infants. In them strabismus, coughing on each attempt at deglutition, or irregularity in cardiac rhythm may be the only signs noted, so that in a series including a number of children the actual percentage found may not be strictly accurate. Still after making every allowance for this possibility, and excluding the fatal case, the fact that paralysis was only observed in 7 out of 104 cases shows that its incidence was more than usually slight, and the explanation must again be sought in the early stage at which the antitoxin was injected. The 7 cases comprise 3 of cardiac irregularity (on the eleventh, thirteenth, and eighteenth days of illness), 1 of palatal paralysis with strabismus, 1 of paralysis of accommodation for near vision, and 2 of strabismus. In the tabulated results at the conclusion of the report quoted, it is stated that "the frequency of the occurrence of paralysis is not diminished," the statement being made upon a comparison of its incidence in the cases collected by the Committee with that occurring in a number of non-antitoxin cases admitted to the Eastern Hospital in 1894. The Committee, however, further say that "paralysis is only one of the symptoms the result of toxæmia of diphtheria," and, as would be theoretically expected, found that the earlier the toxæmia was counteracted, the less was the incidence of paralysis. Thus in 20 cases treated on the first day of the disease it was only 5 per cent., whilst in 92 cases treated on the second day it was 16.3 per cent.

My own cases support this conclusion, for only 2 of the 7 belong to the 59 cases injected on the first day, and 1 to the 26 injected on the second day, whereas the remaining 4 belong to the 19 cases in which the injection was longer delayed.

LARYNGEAL DIPHTHERIA.

Laryngeal symptoms were present in 6 cases. In 5 the onset of croupiness, hoarseness, or stridor, on crying or coughing, first attracted attention, and, on examination, in 3 of these small patches of membrane could be seen on the fauces or pharynx, whilst in 1 the disease was apparently limited to the larynx, and in the other the occurrence of croupiness was quickly followed by a serous nasal discharge. The remaining case suffered from chronic hypertrophy of the tonsils, and for a short time previously these had been acutely inflamed. They did not, however, show any signs of a membranous deposit on the surface, so that when laryngitis supervened its possible connection with diphtheria was not suspected until a rapid increase in stridor had taken place. Tracheotomy was therefore necessary, but, as in the fatal cases recorded, the break in an otherwise perfect series is to be solely attributed to the inability to diagnose the nature of the disease in its earliest stages.

In each of the other 5 cases the laryngeal symptoms had completely disappeared three days after the injection of antitoxin.

The temperature in these 6 cases is deserving of mention, for in 3 it was normal throughout, in 1 it did not exceed 99.8° F., in another being normal at first it rose to 101° F. coincidently with the appearance of a nasal discharge, whilst in the only case where pyrexia was a marked feature it was accounted for by a pre-existing tonsillitis.

SYMPTOMS ATTRIBUTABLE TO THE ANTITOXIN.

The symptoms attributable to the antitoxin (that is, erythematous, pyrexia, joint pains) have not differed materially from those so frequently described. They have been present with various doses, and have appeared chiefly from the sixth to the eighteenth day after the injection. An erythema (morbiliform, urticarial, or mixed) was most common, and

was found in 20 cases. Occasionally it was accompanied by pyrexia, and on two occasions by pains in the joints. There were also 2 cases with joint pains not accompanied by an erythema, and 1 case with pain over the lower third of the right femur.

Probably the most unusual case was that of a boy, 4 years of age, who received 2,000 units on the first day of illness. Eleven days later he had pyrexia, with slight cardiac irregularity, and a crop of wheals developed on the front of both legs, chiefly below the middle of the tibia. The wheals subsided, leaving round purplish hæmorrhagic stains, each about the size of a threepenny-piece. The stains gradually faded in two or three days.

REFERENCE.

¹ *Transactions of the Clinical Society of London*, vol. xxxi.

CERVELLO'S TREATMENT OF PHTHISIS.

By NEVELL E. NORWAY, M.R.C.S., L.R.C.P.,
Newquay.

A PRELIMINARY note on results obtained in England by the use of Cervello's "igazol," though it may seem somewhat premature, may be of interest to those who meditate giving it a trial. I saw the treatment being carried out under Professor Cervello's own direction at Palermo, and was not enthusiastic about it. A trial in three cases has, however, convinced me that it is a valuable aid to open-air treatment, especially where it is necessary to treat the patient at home, and in the following case it effected a result not possible in any other way:—

M. M., a girl telegraphist, age 25, unmarried, hip-joint disease twenty years, pulmonary tuberculosis ten years, large cavity below left clavicle. sudden pyrexia, 103° mornings to 105° in evenings, fine crepitations all over both lungs, intense cyanosis, respirations 60, pulse 120. No food beyond a little liquid to moisten the mouth had been taken for three days, and no medicine of any sort could be administered, as any attempt induced distressing vomiting and hiccough. The patient's hands were cold and clammy and she had apparently only a few hours to live, when, yielding to the wishes of the relatives, I allowed them to use a vaporiser. After it had burnt for two hours the patient slept for half an hour (the first sleep for nearly a week) and then took a little milk and water. Vomiting ceased forthwith, temperature gradually fell to 100°, and in a week was normal in the mornings. Appetite came by degrees, and the patient invariably slept when the vaporiser was used. It was used at first (on May 31st) for two hours three times a day. At the end of three weeks the girl was out of doors as much as possible, and the vaporiser was only used twice a day.

On July 16th it was noticed that she had gained 6 lbs. in three weeks and very much more altogether. The temperature was now hardly ever 100°, the respirations were 18. Crepitations had almost disappeared from the right side, and were much less in area on the left side. The cavity seemed more contracted on each examination. The girl was able to take a little outdoor exercise, and was in much the same health as before she suffered from acute military tuberculosis.

I have used "igazol" in two other cases, namely:

"B." a schoolmaster, was picked up in the street with profuse hæmoptysis. Hamamelis, opium, and calomel were given to control hæmorrhage, but the chest condition was treated with "igazol." Gradual but steady improvement has taken place, but an attempt to keep the patient out of doors all day has failed, as he feels that he must have the vaporiser at least twice a day to relieve his breathing and cough.

"M. P." is not tuberculous, but I name the case to show that the treatment is a popular one with patients, and as illustrating the soothing effects of "igazol." The patient is gouty and asthmatical, with a laryngeal spasm which awakened him every night after about an hour's sleep. He is very tired of drugs. The use of the vaporiser for two hours each evening has greatly lessened cough and laryngeal spasm. The patient uses the vaporiser regularly, and expresses himself as feeling better after doing so. The result is probably in this case due rather to the iodine than to the formalin, of which the "igazol" is composed.

This small experience is of no value in itself, except as confirming Professor Cervello's statements, but it has convinced me that "igazol" is a valuable aid to our methods of treating phthisis, and is a popular and agreeable remedy to patients.

PROFESSOR TH. ESCHERICH has been elected Dean of the Medical Faculty of the University of Graz for the academic year 1900-1901.

PRESENTATION.—Dr. Deeping, J.P., of Southend, was recently presented with a handsome silver epergne, a gold hunter watch, and an illuminated address. The inscription on the first-named was as follows: "Presented to G. D. Deeping, Esq., J.P., in appreciation of his many services to the town of Southend-on-Sea and as a token of their respect and esteem, by the residents, July 21st, 1900.—F. F. Ramuz, Mayor."

MEMORANDA:

MEDICAL, SURGICAL, OBSTETRICAL, THERAPEUTICAL, PATHOLOGICAL, Etc.

SPLINT FOR FRACTURED HUMERUS.

I HAVE found the splint shown in the accompanying diagram useful in cases of fracture of upper end of humerus. It is easily made from a flat piece of poroplastic felt of the shape here shown, and of a size suited to the patient. The dotted lines regulate the shape and size of the flaps that extend upwards round the joint, and may be varied according to the requirements of the case. The body-piece should be securely

fixed to the trunk by broad bands of stout plaster; and if great immobility of the arm is desired a band may be passed through holes made in the lower border of the arm-piece and the adjoining body piece. It is my custom to mould the appliance in the first instance to the sound side; it then, when transferred, requires only a slight refitting.

Dublin⁴

R. F. TOBIN.