There are instances in which well-characterized pseudo-membrane occurs on the tonsils and fauces without much swelling and without severe constitutional disturbance. A young woman came to my clinic at the University Hospital, Philadelphia, whose tonsils, soft palate and uvula were covered with a smooth, firm, grayish-white pseudo-membrane. There was little or no swelling of the parts, the membrane was clean, its edges were well defined, and on removal of the membrane the mucosa beneath bled freely. The exudation had all the characters of false membrane. The patient had scarcely any constitutional disturbance. The temperature was below 100°, and she had not felt ill enough to go to bed. After persisting for eight or nine days the membrane was gradually removed, and she recovered without any ill effects. The membrane may appear first upon the mucous membrane of the mouth, or it may attack the conjunctiva or the external auditory meatus. Occasionally the vulva, prepuce, or anus is first attacked. In rare cases the skin is involved. When the disease is epidemic, external wounds and abrasions are apt to be infected. In recently delivered women the disease may attack the uterus or vulva.

Complications and Sequelæ.—Local complications, hæmorrhage from the nose or throat, may occur in the severe ulcerative cases. Skin rashes are not infrequent, particularly the diffuse erythema. Occasionally there is urticaria and in the severe cases purpura. The pulmonary complications are extremely important. Fatal cases almost invariably show capillary bronchitis with broncho-pneumonia and large patches of collapse. In very bad cases, with extensive sloughing, the septic particles may reach the bronchi and excite gangrenous processes which may lead to severe and fatal hæmorrhage.

Renal complications are common. In my experience *albuminuria* is present in all severe cases. It may cause with the usual tests only a slight turbidity of the urine, the ordinary febrile albuminuria. In others there is a large amount of albumen, curdy in character. It is only when the albumen is in considerable quantity and associated with epithelial or blood casts that the condition indicates parenchymatous nephritis and is alarming. The nephritis may be quite early in the disease. It sets in occasionally with complete suppression of the urine. In comparison with scarlet fever the renal changes lead less frequently to general dropsy. In the large number of cases of diphtheria which came under observation at the Montreal General Hospital, I call to mind only one or two instances in which the nephritis was associated with general anasarca. Arthritis is an occasional complication just as in scarlet fever. Endocarditis, pericarditis and pleurisy are very rare events.

Of the sequelæ of diphtheria, *paralysis* is by far the most important. This can be experimentally produced in animals, as already noted, by the inoculation of the toxic albumen produced by the bacilli. The paralysis occurs in a variable proportion of the cases, ranging from 10 to 15 and

even to 20 per cent. It is strictly a sequel of the disease, coming on usually in the second or third week of convalescence. Occasionally it comes as early as the seventh or eighth day of the disease. It may follow very mild cases; indeed, the local disease may be so trifling that the onset of the paralysis alone calls attention to the true nature of the trouble.

The disease is a toxic neuritis, due to the absorption of the poison, and, like other forms of multiple neuritis, has an extremely complex symptomatology, according to the nerves which are affected. The paralysis may be local or general.

Of the local paralyses the most common is that which affects the palate. This gives a nasal character to the voice, and, owing to a return of liquids through the nose, causes a difficulty in swallowing. This may be the only symptom. The velum is seen to be relaxed and motionless, and the sensation in it is also much impaired. The affection may extend to the constrictors of the pharynx, and deglutition become embarrassed. Within two or three weeks or even a shorter time the paralysis disappears. In many cases the affection of the palate is only part of a general neuritis. Of other local forms perhaps the most common are paralysis of the eye-muscles, intrinsic and extrinsic. There may be strabismus, ptosis, and loss of power of accommodation. The neuritis may be confined to the nerves of one limb, though more commonly the legs or the arms are affected together. Very often with the palatal paralysis is associated a weakness of the legs without definite palsy but with loss of the knee-jerk.

By far the most important local paralysis is met with in connection with the heart. There may be great retardation, even to thirty beats in the minute. Bradycardia and tachycardia may alternate in the same patient. Heart-failure and fatal syncope may occur at the height of the disease or during convalescence. If they occur during the fever, the child, perhaps after an exaggeration of symptoms, presents an unusual pallor. The pulse becomes weak and rapid, but may fall to fifty, forty, or even lower. The extremities are cold, the temperature sinks, and death takes place, with all the features of collapse, within a few hours. More frequently the fatal collapse comes during convalescence, even as late as the sixth or seventh week after apparent recovery. The attack may set in abruptly, perhaps following a sudden exertion. More commonly there have been symptoms pointing to disturbed cardiac rhythm, or even fainting-spells. In some instances vomiting has preceded the serious cardiac attack. There may be no physical signs other than slight increase in the cardiac dulness and a gallop-rhythm indicating dilatation. These symptoms were formerly ascribed to cardiac thrombosis or to endocarditis. Possibly in some of the cases the result is due, as pointed out by Mosler and Leyden, to an infectious myocarditis, but in a majority of the cases the symptoms are probably due to a neuritis of the cardiac nerves.

The multiple form of diphtheritic neuritis is not uncommon. It may begin with the palatal affection, or with loss of power of accommodation

and loss of the tendon reflexes. This last is an important sign, which, as Buzzard and R. L. MacDonnell have shown, may occur early, but is not necessarily followed by other symptoms of neuritis. There is paraplegia, which may be complete or involve only the extensors of the feet. The disease may extend and involve the arms and face and render the patient entirely helpless. The muscles of respiration may be spared. The chief danger in these severer forms comes from the involvement of the heart and of the muscles of respiration; but the outlook is in many cases not so bad as the patient's condition would indicate. Of thirteen cases collected by Cadet de Gassicourt six died. The sphincters may be involved, though they are often spared.

Diagnosis.—Early in the disease it may be difficult to distinguish diphtheria from follicular tonsillitis. In mild cases it is sometimes impossible. In diphtheria the exudation forms a definite, uniform patch, situated on a deeply congested area of mucosa. In follicular tonsillitis, when the exudate oozes and if the material from the crypts coalesces, it may be extremely difficult to make a diagnosis. If the process is confined to the tonsils the nature of the case may be dubious. If, however, it extends to the pillars of the fauces and if laryngeal symptoms develop, all doubts are removed. Occasionally the true character of the disease is not manifested until a paralysis develops during convalescence. It is in these cases that the detection of the Klebs-Loeffler bacillus will be of the greatest service in making clear the diagnosis. Cover-glass preparations may be made from the membrane. Cultures should be made in the blood-serum and bouillon mixture, and inoculations performed on animals. Unfortunately, these procedures can scarcely be carried out except in well-equipped laboratories, and a ready and certain clinical method, such as we have for the tubercle bacillus, is not yet available.

Between diphtheritic laryngitis and croup a majority of writers now hold that there is no essential difference; but it is more rational to believe that there is a non-specific pseudo-membranous laryngitis. This is a point, too, which bacteriology may be able to clear up. In several cases which have been examined the Loeffler bacillus has been present. The diagnosis between the two conditions is by no means easy. In the diphtheritic form, however, there is almost invariably exudation upon the tonsils or soft palate. Between scarlet fever and diphtheria there may be some confusion The question has already been discussed.

The recognition of the diphtheritic paralysis offers no difficulties.

Prognosis.—In hospital practice the disease is very fatal, owing largely to the fact that only the severer forms are admitted. In country places epidemics may display an appalling virulence and kill nearly all the children attacked. In cases of ordinary severity the outlook is usually good. Death results from involvement of the larynx, septic infection, sudden heart-failure, diphtheritic paralysis, occasionally from uræmia, and sometimes from broncho-pneumonia developing in the convalescence.

Treatment.—Prophylaxis.—Cases of diphtheria should invariably be isolated. Physicians should insist that other children in the family be kept from school and from mingling with their schoolmates. All clothing and utensils which have been used by the patient should be thoroughly disinfected. For this purpose the clothing may be soaked for twenty-four hours and then boiled in a two-per-cent carbolic solution. For disinfecting the room sulphur fumigation may be employed, taking care that the air is rendered moist, or the floor and walls should be thoroughly scoured with corrosive-sublimate solution.

Caillé has urged the importance of a careful inspection of the tonsils and mouth in children, special attention being paid to the care of the teeth and to the tonsils, which, if swollen and irregular, should be removed. In persons liable to exposure Loeffler recommends the use of antiseptic mouth-washes, such as sublimate (1 to 10,000), chlorine-water (1 to 1,100), or thymol. After recovery at least two weeks should elapse before the child is permitted to mingle with others or to return to school.

Recently it has been announced that the blood-serum of animals rendered secure against the diphtheritic bacillus and its products can nullify the effects of the poison of diphtheria.

General Treatment.—The two indications in the treatment of diphtheria are to prevent or limit the local development of the bacilli and to combat the effects of the toxic materials which they produce.

The usual measures should be employed to insure thorough cleanliness and ventilation and to diminish the danger of infection. The air should be kept moist with steam. Mild cases require but little treatment. A fair quantity daily of liquid food, with ice to suck, and a gargle of chlorate of potash are sufficient. In more severe cases the greatest care should be taken to maintain the strength of the patient. The food should be given at stated intervals. Stimulants will be required early and should be given freely. In very young children with the pharyngeal involvement swallowing is painful, and the giving of food by the mother or nurse is a continuous struggle. In such instances nutritive enemata should be used.

We are still without a remedy capable of combating in any way the effects of the poisonous tox-albumins. Two remedies are warmly recommended—the tincture of the perchloride of iron, which may be given hourly in four or five drop doses to a child of three, and the corrosive sublimate, of which a child a year old may take as much as half a grain a day. Personally, I much prefer the perchloride of iron; and I cannot say that I have seen from the mercury, given either as the bichloride or as calomel, the specially good effects which many writers describe. I have not seen any good follow the administration of the sulphides or the benzoates or quinine in large doses. Peroxide of hydrogen has been warmly recommended.

Local Treatment.—Diphtheria is a local disease at first, and by the production of poisonous substances causes the severe systemic symptoms.

Hence the importance of local treatment. It is not well to attempt forcibly to remove the false membranes, though some writers recommend that they should be scraped off. As far as possible thorough cleanliness and disinfection of the fauces should be insured by repeatedly spraying, either with carbolic acid, corrosive sublimate (two grains to the pint), chlorine-water, boric acid, Condy's fluid, salicylic acid or peroxide of hydrogen (50 per cent solution), or local application of sulphur with iodoform is recommended. The tonsils and fauces may be thoroughly swabbed every hour or two with a solution of carbolic acid (♏xv) and perchloride of iron (ʒ ijss.) in glycerin (℥ j) and water (℥ j). Agents which are believed to dissolve the membrane are lactic acid, which may be employed with lime-water (two drachms to six ounces) and trypsin (thirty grains to the ounce).

Pepsin has also been used, and the vegetable pepsin, which may be mixed with water and glycerin.

Nasal diphtheria requires prompt and thorough disinfection of the passages. The best solutions are those recommended by Jacobi—chloride of sodium, saturated boric acid, or one part of bichloride of mercury, thirty-five of chloride of sodium, and one thousand of water, or the one per cent solution of carbolic acid. The solution may be applied with a syringe or a spray. To be effectual the injection must be properly given. The nurse should be instructed to pass the nozzle of the syringe horizontally, not vertically; otherwise the fluid will return through the same nostril. In refractory children there is sometimes great difficulty in giving these injections, in which case suppositories of boric acid may be employed, but they are not efficient substitutes.

When the larynx becomes involved a steam tent may be arranged upon the bed, so that the child may breathe an atmosphere saturated with moisture. If the dyspnœa becomes urgent, an emetic of sulphide of zinc or ipecacuanha may be given. When the signs of obstruction are marked, however, there should be no delay in the performance of intubation or tracheotomy. The diphtheritic paralysis requires rest in bed, and the avoidance of sudden exertion, particularly in those cases in which the heart-rhythm is disturbed. In the chronic forms with wasting, massage, electricity and strychnine are invaluable aids. If swallowing becomes very difficult, the patient must be fed with the stomach-tube, which is very much preferable to feeding per rectum.

XVI. ERYSIPELAS.

Definition.—An acute, contagious disease, characterized by a special inflammation of the skin caused by streptococci.

Etiology.—Erysipelas is a wide-spread affection, endemic in most communities, and at certain seasons epidemic. We are as yet ignorant of the atmospheric or telluric influences which favor the diffusion of the poison.

It is particularly prevalent in the spring of the year. This was very noticeable in the Philadelphia Hospital, in which the erysipelas wards were usually empty except in the spring and autumn months. The affection prevails extensively in old ill-ventilated hospitals and institutions in which the sanitary conditions are defective. With the improved sanitation of late years the number of cases has materially diminished. It has been observed, however, to break out in new institutions under the most favorable hygienic circumstances. Erysipelas is both contagious and inoculable; but, except under special conditions, the poison is not very virulent and does not seem to act at any great distance. It can be conveyed by a third person. The poison certainly attaches itself to the furniture, bedding, and walls of rooms in which patients have been confined.

The disposition to the disease is wide spread, but the susceptibility is specially marked in the case of individuals with wounds or abrasions of any sort. Recently delivered women and persons who have been the subject of surgical operations are particularly prone to it. A wound, however, is not necessary, and in the so-called idiopathic form, although it may be difficult to say that there was not a slight abrasion about the nose or lips, in very many cases there certainly is no observable external lesion.

Chronic alcoholism, debility, and Bright's disease are predisposing agents. Certain persons show a special susceptibility to the disease, and it may recur in them repeatedly. There are instances, too, of a family predisposition to the disease.

The specific agent of the disease appears to be a streptococcus which has been very thoroughly studied by Koch and Fehleisen. It was believed at first to have specific and peculiar morphological properties, but it is now generally held that it cannot be distinguished by any biological or chemical tests from the *streptococcus pyogenes*.

Morbid Anatomy.—Erysipelas is a simple inflammation. In its uncomplicated forms there is seen, post mortem, little else than inflammatory œdema. Investigations have shown that the cocci are found chiefly in the lymph-spaces and most abundantly in the zone of spreading inflammation. In the uninvolved tissue beyond the inflamed margin the micrococci are to be found in the lymph-vessels, and it is here, according to Metschnikoff and others, that an active warfare goes on between the leucocytes and the cocci (phagocytosis). In more extensive and virulent forms of the disease there is usually suppuration. It is stated that the inflammation may pass inward from the scalp through the skull to the meninges. This I have never seen, but in one case I traced the extension from the face along the fifth nerve to the meninges, where an acute meningitis and thrombosis of the lateral sinus were excited.

The visceral complications of erysipelas are numerous and important. The majority of them are of a septic nature. Infarcts occur in the lungs,