rather weak; since approximately forty minutes are required for complete neutralization (Ehrlich). On the other hand, the experiments of Dönitz and of Heymans show that the affinity of the toxin for nervous tissue is exceedingly strong, all the toxin being taken up within a few minutes. These two conditions alone suggest the probability of a low curative value on the part of the serum. The toxin of tetanus also has a remarkable selective action on the most vital of all organs, the central nervous system, hence a lower grade of injury may prove fatal than in other infections in which less important organs or those of greater recuperative power are involved chiefly. Furthermore, it is thought by some investigators (Meyer and Ransom, Marie and Morax) that tetanus toxin is taken up by the nerve endings and reaches the ganglionic cells by way of the axis cylinders. In this instance the toxin, to a certain extent, is isolated and perhaps less accessible to the action of antitoxin.

Concerning diphtheria, the affinity between toxin and antitoxin is relatively strong, for complete neutralization in the test-glass takes place in about fifteen minutes (Ehrlich). Clinical experience indicates that the affinity of diphtheria toxin for tissue cells is less than that of tetanus toxin, for diphtheria may readily be cured on the second or third day of the disease, whereas a cure of tetanus is rarely effected. These would seem to be favorable conditions for successful serum therapy. Although the toxin of diphtheria may attack the nervous system as indicated by the development of paralyses, yet these are seldom fatal; and on the basis of anatomic findings in fatal cases it seems probable that the greater portion of the toxin is taken up by parenchymatous and lymphatic organs, and by connective tissues, which compared with the nervous tissue are of less immediate importance for life and have greater recuperative powers. We may infer from clinical experience that diphtheria toxin is so situated in the body that it is accessible to the action of the antitoxin.

We have, therefore, the following conditions which apparently are of importance for the success of antitoxic therapy:

Conditions of Importance for Success. 1. The concentration (strength) of the antitoxin which is injected; 2, its freedom from contamination and adventitious toxins; 3, the time of its administration; 4, the quantity injected; 5, the degree of affinity between toxin and antitoxin; 6, the degree of affinity between toxin and tissue cells; 7, the amount of toxin which may be bound without a fatal issue, of which the vital importance of the organs involved and their recuperative powers are factors; 8, the location of the toxin in the body, i. e., its accessibility for the antitoxin.

What has been said relates to the curative action of antitoxin. It is evident that the action of antitoxin, when used as a prophylactic, is of a simpler nature, for in this instance the conditions approximate those of the test-tube experiment. There has been opportunity for the antitoxin to become uniformly distributed in the blood and lymphatic circulations, hence it is able to meet and to bind the toxin before the latter comes in contact with the receptors of important cells. The high value of tetanus antitoxin as a prophylactic, a value which has become evident in recent years, probably depends on this condition.

The immunity which is afforded by a prophylactic injection of antitoxin is of short duration, from two to three weeks; the antitoxin is excreted in the urine to a considerable extent, but may also be bound and assimilated by the tissues in part.

(To be concluded.)

Chinese Camphor Trade.—It is only in recent years that the Chinese have made an attempt to cultivate the camphor trees which abound in some provinces. *The Pharmaceutical Era* states that camphor first appeared as an export in the customs receipts in 1902 and that since then, and especially in the last year, there has been a considerable increase in trade.

Clinical Reports

THREE CASES OF TETANUS SUCCESSFULLY TREATED.

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A CASE OF TETANUS FOLLOWING ABDOMINAL SECTION. RECOVERY.

CASE 1.—A young man, aged 22, was referred to me by Dr. F. S. Merwin of this city, and I operated on him for tubercular peritonitis, complete recovery following. The case progressed in the usual manner, excepting that the patient had a slight rise of temperature. On the tenth day we opened the dressing and discovered a small stitch abscess, which was treated and dressed daily. On the twelfth day he began having slight twitchings of his muscles, and complained of difficulty in opening his mouth, which symptoms gradually increased until the tetanic convulsions became general and of the most violent character. On the seventeenth day, or the fifth day of the illness, we began using antitetanic serum three times daily. The spasm continued to be severe for a few days, and then became less frequent and less severe. After seventeen doses of 10 cm. each were given, his spasms ceased and complete recovery followed.

TETANUS FOLLOWING GUNSHOT WOUND. RECOVERY.

The following case was reported to the Mahoning Medical Society by Dr. Justice:

CASE 2.—Clayton M., 11 years old, shot himself with a toy pistol on July 4, 1904, in the center of the right palm. July 6 he was taken to Poland to the family physician, Dr. C. R. Justice, who removed the wad from the wound and disinfected it with peroxid of hydrogen, leaving instructions to let him know if the wound did not heal kindly. July 16 the boy was taken to the physician's office for the second dressing, when the wound was found inflamed and the boy very nervous and unsteady in his walk. Dr. Justice cauterized the wound with carbolic acid, and the patient went home. Dr. Justice was called to see him next morning at his home in Youngstown. I was called in consultation. I found that, to all appearances, the wound was partially healed. The masseter muscles were so rigid that the boy was not able to open his mouth widely. There was opisthotonos. He was lying on the bed and was very nervous, but had had no spasms. We had him sit in a chair where I could secure a better view of the wound. With firm pressure, I succeeded in squeezing a little secretion out of the wound. At this moment he had his first tetanic convulsion, which was a very severe one. We gave him chloroform and I incised the wound, which I found extensive beneath the surface and filled with gelatinous material, which I curetted out and thoroughly cauterized the cavity with pure carbolic acid. After the usual surgical dressing we put him to bed and he continued to have regular convulsions. Dr. Justice gave him, at this time, one-half ounce of antitetanic serum, and continued to do so every eight hours for three days. Owing to the distance of his residence from that of the patient, he doubled the dose, giving an ounce at a time twice a day for three days, the nurse at this time being afraid to use it. After this the nurse began to use it, and it was continued for five days, night and morning. The spasms occurred regularly for five days, he was free from them for one day, and then had one general but slight spasm, which was the last. The antitoxin was continued for a few days, using in all 54 half-ounce doses, and although so many doses were given in such large quantities in such a short space of time, only one small abscess formed from the injections. The masseter muscles were the first to become involved and the last to recover. Chloroform was used to relax the spasms when they were severe. To facilitate giving him nourishment, the patient was allowed to inhale a sufficient amount of chloroform to relax the muscles of the jaw. The patient is now in good health.

TETANUS FOLLOWING AMPUTATION OF THE THIGH. RECOVERY.

CASE 3.—Mr. A. B., aged 48, was brought into the hospital Nov. 17, 1905, with a badly lacerated thigh, having been run

over by a street car. The extremity was crushed at the junction of the middle and lower third. He had lost so much blood, and was so nearly exsanguinated that it was unwise to amputate at this time; therefore I thoroughly cleaned the wound, severed the crushed member, which was attached by skin only, tied up the stump with a wet antiseptic dressing, gave him an intravenous saline infusion, placed him in bed and waited for him to get into a condition for an amputation, which required two days and two more saline infusions. On the 21st I made a rapid amputation at the junction of the middle and lower third of the thigh. I found at the first dressing that one of the flaps had sloughed slightly, for some reason unknown to me; this caused a small suppurating surface. November 30 he complained of stiffness of the jaws, which continued for two days, when I gave him antitetanic serum subcutaneously three times a day. This did not cause any improvement, and on the fourth day, his back becoming rigid, the house surgeon, Dr. McCurdy, gave him an intraspinal injection of the serum. This caused some improvement which lasted for two days when I gave him another intraspinal injection, and repeated the same the third day. His condition being improved, although he had some little stiffness of the jaws remaining, he received no more serum, and made a gradual and complete recovery.

DISLOCATED THYROID CARTILAGE OF THE LARYNX.

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CHICAGO.

Inasmuch as dislocations in this region are of such infrequent occurrence, the symptoms are so varied and the treatment so arbitrary, the report of this case should prove of interest and value.

History.—Patient, a male, aged 20, of slender but muscular build, an athlete, at the time of receiving this injury, was half-back on a local football team. He had previously been in good health, and had suffered no injury to the larynx or in the neck. While "bucking" the opponents' line, he was hit or kicked in the front of his neck. The blow rendered him unconscious for some minutes. On recovering his senses, he complained of much distress in his stomach, but did not vomit. He had a choking sensation in his throat, breathed with great difficulty, and could talk only in hoarse, low tones. He was unable to take further part in the game then in progress, but lay around for more than an hour, thinking that his condition would gradually improve. At the end of that time, as he became no better, I was called.

Examination.—The patient's face was flushed, pupils dilated, temperature 102, breathing strident, respiration from 26 to 32 a minute. Speaking was very difficult, as the pain was very great on attempting conversation. The voice was a hoarse whisper. Anteriorly, the neck showed a noticeable flatness in the median line. Laterally, anterior to each sternomastoid muscle, was a prominence, that on the right side being more marked and somewhat lower than that on the left. The prominences moved when the patient swallowed, and their motion caused considerable pain. There was considerable swelling of the tissues in the region anterior to the sternomastoid muscle. The skin over the region of the larynx was not broken, nor did it show any marks of violence. The patient gave no history of raising blood, although he had coughed repeatedly since the accident. On palpation, there was great tenderness throughout the region of the larynx, especially when the lateral prominences were felt. It was apparent that the thyroid cartilage had been "sprung," as it were, from its seat on the cricoid. At the same time, there had been rotation in a vertical direction. The cartilage in question lay partially flattened out, anteroposteriorly, the prominences seen laterally proving to be the alæ of the cartilage. The vertical rotation had been from left to right, superiorly, causing the right ala to rest at a lower level than the left. The cartilage, as a whole, was capable of being moved considerably, but even the slightest motion caused the patient the most excruciating pain. On swallowing, the excursion of the cartilage, vertically, was less

than normally. No crepitus could be detected along the anterior angle of the cartilage, nor did the two alæ move independently. The inferior border of the thyroid cartilage was about a sixth of an inch below its normal resting place on the cricoid. The latter cartilage did not appear to have been injured in any way. The fact that the patient was rather slender greatly facilitated the examination. The pulse was rapid, but strong and regular.

Laryngoscopic examination was very unsatisfactory, inasmuch as the patient could not bear to have the mouth open for any length of time. Coughing also interfered with the examination. It could be seen, however, that the epiglottis was normal and that the vocal cords were moving faultily, since the image on the throat mirror was very uncharacteristic.

Treatment.—This was mainly by position and by digital manipulation. The patient was placed in the supine position, with a pad beneath his head, in order to relax the muscles attached to the thyroid cartilage. Then, by careful manipulation, the cartilage was elevated to its normal position on the cricoid. At the same time, rotation was made vertically, from right to left, with lateral pressure on the alæ, synchronously, toward the median line, until articulation with the cricoid was felt. The entire region of the larynx having previously been painted with the tincture of iodine to aid in reducing the swelling of the cervical tissues, the position of the alæ was maintained by small pads of cotton held in place by adhesive strips. The position of the thyroid cartilage, as a whole, was then maintained by adhesive strips placed horizontally. The dressing was completed by a pad of cotton and a few turns of a wide roller bandage. The patient was instructed to remain in bed, on his back, to suck ice, to use his voice as little as possible, and he was placed on a liquid diet.

Progress of the Case.—After 24 hours the patient's condition had improved greatly. His fever had abated, his face was not flushed, the pupils were normal and reacted well, the voice was less hoarse. There was considerable pain on swallowing and on pressure over the alæ, externally. Examination showed that the position of the cartilage had been maintained. The nausea had disappeared and the patient was able to take as much nourishment as was allowed him. The swelling of the cervical tissues had decreased considerably. The treatment described was persisted in, frequent examinations being made to see if the reduction had been maintained. Within a week the swelling of the tissues had disappeared and the pain on swallowing had decreased markedly. The voice was still hoarse, but much stronger, and speech was not attended with much pain. At the end of three weeks the dressings were removed and the cartilage was found to be very nearly normally situated. There was but slight pain on pressure over the alæ. Vertically there was a slight dropping, but functionally it gave the patient no inconvenience. The patient's voice was still husky, but was gradually improving. At the end of five weeks the patient had practically recovered. It is more than six months since the accident and there has been no recurrence of the condition.

The Postoperative Uratic Sediment in Prognosis.—M. Claret, ex-interne at La Charité, following a suggestion of his chief, Dr. Campenon, has analyzed twenty-five cases of laparotomy, with special reference to the urinary sediments occurring within the first two days. He finds that, with one exception, the cases all followed a general rule, the fatal ones showing no sediment and a hypoleucocytosis, while the others, no matter how severe the infection, showed a sediment and a hyperleucocytosis, least in the milder cases and both greater in the severer ones. In the one exceptional case the patient died on the eighteenth day after complications, the uratic sediment, which was free in the beginning, disappearing very rapidly after the second day. The phosphatic deposits were normal in the fatal cases and only slightly increased in the others. He finds that these agree with experimental facts and deduces the following rule: "The appearance during the first twenty-four to forty-eight hours after laparotomy of an abundant uratic deposit will be a sure sign of favorable prognosis. Its absence should demand all reservations as regards prognosis of recovery."