thickened and injected, and adhesions may form between the opposing surfaces. The articular cartilages are distorted, perhaps eroded and partly absorbed in cases of long duration. The capsule and ligaments of the joint and the tendon sheaths adjacent to the affected articulation are thickened. Atrophy of the muscles in the vicinity of a chronically rheumatic joint is by no means uncommon, especially when single large articulations (knee, shoulder, hip) are involved. Atrophy from disuse is likely to occur if the joint becomes ankylosed. Peripheral neuritis and pressure from exudation on the muscles themselves or their nutrient vessels have also been designated as factors in the muscular wasting.

Symptoms.—The conspicuous symptoms are pain and stiffness in the affected joint. Most commonly the onset is slow and insidious. The pain usually becomes more severe during rainy weather, particularly in the variable climatic conditions of spring and autumn. The stiffness is most marked in the morning and after rest, and lessens after exercise. The pain is apt to be increased by movement, and is often very troublesome at night. The affected joints may be tender upon palpation, but swelling, if present, is usually slight. The inflammation is rarely of sufficient intensity to cause redness of the joint. The course of the disease is as a rule afebrile, but if many joints participate in an exacerbation there may be a slight and transient rise of temperature. The disease may be monarticular, involving a single large joint, the knee, shoulder, or hip in particular, but generally a number of joints, both large and small, are implicated. The joints, if the disease is of some duration, are likely to creak or grate when moved, because of the dryness and roughness of the articular surfaces. In cases of long standing the joints are enlarged and distorted, the mobility is decreased in varying degrees, and they may become completely ankylosed. Muscular atrophy takes place, and the patient may, in the severest cases, become bedridden. The joint changes when established are usually persistent, and do not shift from one articulation to another as in rheumatic fever. In mild cases the general health may remain wellnigh unimpaired, but in the severer and more painful cases gastric disturbances, emaciation, anæmia, and neuralgias may be present with varying intensity. Other complications are not common, but chronic endocarditis, with resultant valvular defects, may be associated with the joint changes.

Diagnosis.—Chronic articular rheumatism may require to be differentiated from chronic articular gout and arthritis deformans, although in the majority of cases the diagnosis is easily made.

Gout is more apt to affect the smaller joints. There is usually a history of acute attacks involving the great toe-joint, tophi if found are distinctive, and the evidences of arteriosclerosis and granular kidney are much more common in gout than in chronic rheumatism.

It is difficult, and readily may be impossible to distinguish between arthritis deformans and chronic rheumatism in the early stages. In more advanced cases the former presents greater deformity of the joints, while rheumatism tends rather to ankylosis with comparatively slight alteration in shape, and moveover is likely to attack a larger number of articulations than arthritis deformans. It is proper to state that by some writers arthritis deformans is regarded as an advanced stage of chronic rheumatism.

Prognosis.—The presence of chronic rheumatism is, as a rule, not incompatible with a long life, but it is essentially a chronic ailment, and the majority of cases are obstinately resistant to all therapeutic measures. In exceptional cases great improvement or apparent cure may take place; in many the disability and pain may be much relieved; in some the disease may seriously affect many joints and render the patient helpless.

Treatment.—If circumstances permit, the patient should live or at least spend the winter months in a warm, equable, dry climate, such as that of Southern California or the South of Europe. Otherwise the utmost care should be taken to shield the subject from dampness, cold, and bad weather by good shelter and warm clothing. The digestive functions should be maintained in good order, enemata and laxatives being employed when they are required. The diet should be regulated so that it is digestible and ample in order to keep the nutrition of the body at its best. Moderate exercise should be taken when possible. A daily cold sponge followed by a good towelling is usually helpful, and those who find that the sponging disagrees with them should employ the dry friction alone.

Local treatment is of prime importance. Counter-irritation should always be used, by means of stimulating liniments or by painting with tincture of iodine; by the application of a series of small blisters; or by "striping" the painful joint with the Paquelin cautery, or, what answers as well, with a glass rod, the end of which has been heated in an alcohol flame. The application of ichthyol and iodine, salicylic acid (gr. xxx. to ℥ i.) or belladonna ointments, is at times of much service. Systematic massage and passive movements are useful, especially for the prevention of ankylosis and atrophy, and for the lessening of swelling and stiffness. Electrical treatment may or may not be of service, but is always worth a trial.

Hydriatic measures of various kinds should not be omitted. At home a hot bath at night often mitigates pain and secures a more restful sleep; so also do hot fomentations of the painful joints. Or, finally, the affected joint may be wrapped in three or four thicknesses of linen wrung out of cold water and covered with flannel and oiled silk or, in lieu of the latter, thick brown paper.

Complete and systematic hydriatic measures, including also the hot-air treatment (baking the affected joints) generally require a daily visit to, or, if practicable, a stay of some duration in, an establishment provided with the necessary apparatus and trained attendants, particularly in the sanatoria which avail themselves of natural medicinal and thermal waters. Among the latter are the Hot Springs of Arkansas and Virginia, Richfield Springs of New York State, Banff on the Canadian Pacific Railway in the Rocky Mountains, Mt. Clemens in Michigan, and Santa Rosalia* in Mexico. Here and in Europe a variety of baths—Turkish, Roman, sand, mud, and peat—have been employed. Thorough and persistent hydrotherapeutic treatment usually secures great relief, and even in obstinate cases a permanent cure is sometimes obtained.

Medicinal treatment is not very satisfactory. As a rule the administration of iron, quinine, strychnine, arsenic, and other reconstructives is helpful; so also is a course of cod-liver oil, mixed fats, or extra butter and cream in the dietary. Iodides, guaiacum, colchicum, alkalies, and bichloride of mercury, are occasionally useful. The salicylates are unquestionably beneficial during marked or subacute exacerbations.

Glentworth R. Butler.

RHEUMATISM, MUSCULAR.—(Synonyms: Myalgia, rheumatic myositis.)

Definition.—A disease characterized by (1) stiffness and soreness on motion of certain muscles; (2) tenderness on deep pressure over certain points in their substance; and occasionally (3) a general constitutional reaction.

Cause.—Muscular rheumatism is probably, like the articular variety, a local manifestation of a general toxæmia. Of the primary causes little is known. Some cases are probably of infectious origin. Others seem to belong to the group of auto-intoxications whereof gout is the classic type.

Morbid Anatomy.—Adler (New York *Medical Record*, vol. lvii., p. 529) describes the process as follows: In one or more places hyperæmia, sometimes accompanied by small hemorrhages, takes place, followed by emigration of cells into the interstitial tissues, crowding between the bundles of muscle fibres and even between the single fibrils. Soon the interstitial tissue proliferates actively, bringing about an infiltration of the muscle, which varies in extent and density according to the intensity of the process. In the milder cases the process ends here, the infiltrating material is absorbed, and the muscle returns to practically the normal condition. In severe cases, however, there is more extensive formation of new connective tissue, which compresses the muscle fibres so that they degenerate and are absorbed. In cases of the severest type, there results a hard white mass of cicatricial tissue, in structure like a bit of tendon. Often the process is not confined to the muscles. The neighboring joints, fasciæ, tendons, and especially nerves, may be involved. The nodules are recognizable on palpation by a trained hand. They are not necessarily found in the spot where the pain is felt, for if a nerve be involved, the pain will usually be referred to the peripheral distribution of that nerve.

Clinical History.—The disease most commonly affects one of four localities as follows: (1) The deltoid muscle; (2) the lumbar muscles (lumbago); (3) the intercostal muscles (pleurodynia); and (4) the sterno-mastoid muscle (torticollis, wry-neck). The relative frequency of these locations is hard to ascertain, for many patients are not sick enough to go to bed, and hence go to the dispensary rather than to the hospital. Less frequently we find the trouble located in the muscles of the head, especially the suboccipital region, and occasionally in the muscles of the jaw. Adler (*loc. cit.*) reports three cases of rheumatism in the abdominal muscles, one case simulating biliary colic, the other two suggesting appendicitis. No one of the voluntary muscles is altogether exempt.

The disease may be ushered in by a chill, a febrile movement, and all the signs of an acute infectious disease. This is uncommon. Most patients develop their symptoms gradually, and the disease runs a subacute course, although it is rarely without some fever. The pain is not usually excessive. It is increased by attempts to use the affected muscles, and also by lying upon the affected side. It is dull and aching in character, and very tiresome and wearing. In some cases, where nerves are involved, the pain is paroxysmal and radiates over a wide surface. Such cases are often puzzling.

Diagnosis.—In typical cases this is very easy. Lumbago and wry-neck are common enough, and not easily confused with anything else, although in the former case pyelitis, and in the latter, deep cervical cellulitis, must be thought of. Deltoid rheumatism has been confused with necrosis at the upper end of the humerus. Intercostal rheumatism may be mistaken for pleurisy. Suboccipital rheumatism may be confused with neuralgia, neurasthenic headache, or migraine. Abdominal rheumatism may simulate disease of the liver and gall bladder, the appendix, or the uterine adnexa. In doubtful cases the diagnosis must be made by palpation of all the muscles in the region where pain is felt. "The infiltration varies in size, shape, and consistency. After subsidence of the acute stage the infiltrations may be recognized by careful palpation. . . . They may be round, fusiform, or flat, hard and firm or soft and doughy, with surface smooth or uneven. . . . While normal muscles react upon a certain vigorous grip with contraction of the part touched, the diseased tissue will react with diminished vigor or not at all; it also shows diminution of the normal elasticity. After the acute stage is past, although the muscle resumes its function without pain, yet the diseased areas remain tender upon pressure. . . . When examining, it is necessary to compare the two sides of the body. Aside from other changes, the diseased side will always be found abnormally sensitive" (Adler, *loc. cit.*).

Course and Prognosis.—The course is uncertain. Some cases clear up rapidly, others are very obstinate. In a general way it may be said that muscular rheumatism runs a slower course than the articular variety, and also has a greater tendency to relapse, as slight lesions usually remain in the muscle substance after the subsidence of the attack. It also has a strong tendency to become chronic. Therefore the prognosis as to complete recovery should be guarded.

Treatment.—In all but very mild cases the patient should be put to bed whenever possible, in order that the affected muscles may be at rest. A brisk purge is essential, if it be our aim to promote elimination of the toxins. Further treatment depends upon the cause of the attack, in so far as the cause can be made out. If the affection be a true rheumatism, the salicylates must be given in full doses for two or three days; if it be an auto-intoxication, the salicylates are generally useless, and an eliminative treatment, as for gout and allied conditions, must be adopted. An exclusive milk diet, with the bowels freely opened every day, is useful, and this may be given to the walking cases, provided they will take enough—at least four quarts a day, and six if possible. Milk is diuretic, and comparatively free from toxalbumins. Local treatment, in the shape of counter-irritation in various forms, is usually necessary. It may take the form of a blister, or a few quick strokes with the actual cautery at white heat, or acupuncture, or painting the skin over the affected muscle with guaiacol, or the oil of wintergreen, or a twenty-five-per-cent. alcoholic solution of menthol crystals. W. G. Thompson recommends injections of sterilized water into the deeper parts of the substance of the muscle. Adler commends massage very highly, but declares that the masseur must be specially trained to the work. Of course massage cannot be used until after the acute stage is passed.

The after-treatment of these cases is highly important. The patient must keep his skin in healthy activity by daily bathing. Overclothing must be avoided. The test of this is, that there shall be sufficient for comfort, but it must be so regulated that in any ordinary weather the skin shall not be moist except after brisk exercise. Moderate and regular daily exercise, in open air and daylight, promotes complete oxidation of the food, and thus protects the system against auto-intoxication. Regarding diet, it may be said that the albumins should be somewhat restricted. Alcoholic liquors should be taken only in small quantities. A good whiskey, well diluted, is probably the least harmful stimulant. Large quantities of water—four pints a day—should be taken to keep all the urinary salts in complete solution. Over-fatigue and sudden violent exertion are to be avoided.

Donald M. Barstow.

RHEUMATOID ARTHRITIS.—(Synonyms: Rheumatic gout; deforming arthritis; chronic rheumatic arthritis; rheumatic joint; osteo-arthritis.)

Definition.—A chronic and progressive disease of the joints characterized by deforming changes in the synovial membranes, cartilages, and bone, with peri-articular bony outgrowths which interfere to a greater or less extent with the mobility of the affected articulations.

Etiology.—As a rule the disease develops between thirty and fifty years of age, although it may occur in children under twelve. It exists with preponderating frequency in women, from one-half to four-fifths of the cases occurring in this sex, especially at the time of the menopause. Sterility and uterine or ovarian disease apparently predispose. There is in some cases a family history of a tendency to gouty or other disease of the joints, or to tuberculosis of the lungs; and two or more cases may occur in the same family. Worry, grief, mental shock or overwork, exposure to cold and dampness, insufficient diet, and local traumatisms appear at times to be exciting causes. There are two theories as to the essential cause of the disease; one, that it is of nervous origin; the other, that it is a chronic infection. According to the former theory the disease is akin to the arthropathies of nervous origin. Thus the joint changes in arthritis deformans are very similar to those which may occur as a result of locomotor ataxia, syringomyelia,

* "Santa Rosalia, a city of Southern Chihuahua, Mexico, on the Mexican Central Railway, 325 miles south of El Paso. It is celebrated for its hot sulphur springs, long known to be curative by the natives, and much resorted to by invalids. They are especially useful in inflammatory rheumatism. Population estimated at 8,000."—From "The Universal Cyclopædia and Atlas." Newly revised edition. Appleton & Co. 1901.

hemiplegia, and injuries of nerve trunks. The not infrequent presence of neurotrophic phenomena, such as marked muscular atrophy, glossy skin, and alterations in the nails and bones, is of some significance; so also is the occurrence of numbness, tingling, and severe pain, involving special nerves or nerve trunks. Moreover, the joint lesions are usually symmetrical.

On the other hand, the idea that the disease will prove to be a chronic infection is gaining adherents, although a specific microbic agent has not as yet been identified. In favor of this view is the fact that, in a considerable proportion of cases, arthritis deformans follows an acute infection, especially gonorrhœa and epidemic influenza. In some instances the onset is acute and the joints are red, swollen, and painful; and in children there may be splenic enlargement and swelling of the lymphatic glands.

Pathology (or Morbid Anatomy).—The morbid changes begin in the cartilages of the affected joints, which after proliferating become softened and, especially in the centre and at the points of greatest pressure, are absorbed or worn away. The exposed articular bone surfaces become smooth and ivory-like (eburnated). The proliferating cartilages and synovial membranes at the border of the joint form an irregular fringe of nodules and polypoid bodies which ossify (osteophytes) and interfere more or less seriously with the mobility of the joint. The ends of the bones may become enlarged, and the ligaments are greatly thickened. Complete ankylosis is not infrequent, due principally to the locking of the joints by the osteophytic growths (Haygarth's nodosities) and the thickened ligaments. In elderly persons and in cases of long duration the articular ends of the bones may undergo wasting, so that the head of the humerus, or of the femur (morbus coxæ senilis), may practically disappear, causing partial dislocations and false joints. The affected articulations are more or less misshapen and the deformity may reach an extreme grade. When the hand is affected the fingers frequently bend laterally toward the ulnar side. The great toe is deflected toward the outer border of the foot. The vertebræ when diseased may be completely ankylosed by bony outgrowths, and the spinal column thus consolidated. Atrophy of the muscles about the joint, sometimes of extreme degree, is of common occurrence.

Symptoms.—Five varieties of the disease are recognized—the general progressive form, the monarticular form, the vertebral form, the form affecting children, and Heberden's nodes.

The *general progressive* form may be acute or chronic. The *acute* outbreak occurs especially in young women in connection with parturition and lactation, or in older women at the menopause; it is occasionally observed in children. The symptoms resemble those of rheumatic fever. A number of joints become swollen, seldom reddened, and there is a moderate rise of temperature. The subjects become anæmic, low-spirited, and lose flesh and strength. In some instances the disease may greatly improve, only to renew its onset under the influence of further child-bearing or nursing.

The *chronic* variety is that which is observed in the majority of the cases. As a rule one or two joints, usually of the hands, are first involved; then those of the knees and feet and other articulations; finally, in the severest cases, all the articulations may be implicated. The involvement is usually symmetrical. The earliest symptoms are slight swelling in or about the joints, and pain on movement with impaired mobility. There may or may not be effusion into the joint. The pain may be extremely severe and continuous, or slight and variable. It is usually worse at night and during the exacerbations. The disease progresses irregularly, days or weeks of improvement alternating with renewals of pain, swelling, and stiffness. Slowly the joints become deformed by ligamentous thickening and the formation of bony outgrowths. The mobility of the joint decreases and creaking or grating is felt or heard upon motion. In the end the joint may be completely immobile, owing to the checking action of the osteophytes and the fibrous thickening of the capsular ligaments. The disused muscles waste away, and when contractured may give rise to persistent flexion of the affected members. In the worst cases the patient is bedridden and almost if not quite helpless. In one case under observation practically every joint in the body was ankylosed; even the lower jaw was wellnigh immovable. Tingling, numbness, glossy or pigmented skin, onychia, rapid muscular atrophy, and increased reflexes have been observed. Anæmia and gastro-intestinal disturbances are not uncommon, especially during the exacerbations of the disease. The heart is not often involved, but in one personal case, that of a young woman, there were advanced arteriosclerosis and an aneurismal dilatation of the aorta.

The *monarticular* form affects especially the hip, knee, or shoulder, occurs mainly in old people, and not infrequently is an apparent sequel to an injury. The pathological changes are similar to those of the chronic general form, and the muscles early undergo atrophy. When affecting the hip the disease constitutes the morbus coxæ senilis, the anatomical alterations of which have been described.

The *vertebral* form, spondylitis deformans, is a progressive rigidity of the spine, due to ankylosis of the vertebræ. Two types are described. The first is the so-called spondylitis rhizomelia (Strümpell-Marie), which attacks men only at or beyond middle age. It begins usually in the hip-joints, which become ankylosed, the process subsequently extending to the spine and shoulder-joints, very rarely to the knee-joints. The spine becomes rigid, the ribs flexed, and there is some kyphosis. The dorsal and gluteal muscles are atrophied and exostoses are found upon the vertebræ and sacral bones. There is but little pain attending the process. In the second (Bechterew-Marie) type the disease begins in the spine, which becomes ankylosed and kyphotic, the shoulders stoop, the head is lowered and carried forward, and there is much intercostal pain, with anæsthesia, muscular atrophy, and other signs of involvement of the roots of the spinal nerves. The hip- and shoulder-joints are slightly if at all affected. The disease is often hereditary. There is little doubt that both types are forms of arthritis deformans, and are not, as formerly supposed, independent diseases.

Heberden's nodes, knobby enlargements of the proximal ends of the terminal phalanges of the fingers, are much more common in women than in men; they begin, as a rule, between thirty and forty years of age. They are regarded as indicative of a long life, but it has been stated that cancer occurs with undue frequency in women who have such nodosities. While the nodes are forming the affected joints may be tender and swollen, perhaps slightly reddened. Exacerbations may be excited by dietary errors, or slight accidental traumatisms; but in most instances the attacks alternate with periods of quiescence without apparent cause. Fortunately, those who develop Heberden's nodes seldom have the larger joints affected.

The *juvenile form* occurs more frequently in girls than in boys and, as a rule, before the second dentition. While the disease may be a replica of that affecting grown persons, the most important class of cases differ in many respects from the adult affection. The onset may be acute, with fever, possibly with chills, but generally the first symptom is a slight stiffness in one or two joints, others slowly becoming affected. There is no crepitus in the affected joints, and the main anatomical change is a general thickening of the periarticular tissues and enlargement of the joint with little or no alterations in the bones. The mobility of the joint is impaired, perhaps totally destroyed. There may be marked atrophy of the muscles. The most interesting feature of the malady is a general and marked swelling of the lymph glands, occurring especially in the cases attended by fever and increasing with the latter. The spleen also is enlarged and palpable. Profuse perspirations are rather common. The heart is rarely affected. The subjects are anæmic, weak, and ill-developed.

Diagnosis.—In the early stages it is always difficult and frequently impossible to distinguish arthritis deformans from chronic rheumatism. When the disease is well developed the diagnosis is seldom in doubt. The peculiar joint deformities in advanced cases are quite characteristic. The more acute cases may be mistaken for rheumatic fever, but the slighter fever, the lesser pain, redness, and swelling, and the usual absence of cardiac complications separate it from the latter. From gout arthritis deformans is distinguished by the absence of chalky deposits and, usually, of cardio-renal disease, as well as by the fact that gout usually attacks the metatarso-phalangeal joint of the great toe.

Prognosis.—In a majority of cases the progress of the disease is arrested, leaving several joints more or less crippled. In other cases the disease advances irregularly, with periods of quiescence, and persists throughout the life of the patient. A few become helpless and bedridden. As a rule the milder forms of the disease are not incompatible with fair health and a long life, but the disability may be very great.

Treatment.—It is of prime importance to maintain the general health at its highest point. Plenty of fresh air, daily cool or cold sponging followed by vigorous toweling, well-ventilated sleeping-rooms, ample hours for sleep, daily exercise according to ability, laxatives and digestive tonics when needed, and a liberal dietary of meat, eggs, milk, butter, wine and malt liquors, should be considered essentials.

Local treatment embraces cold or hot compresses covered with oiled silk, and left on for two or three hours at a time, massage carefully given and long continued, persistent hot-air treatment (baking), small and repeated blisters, "striping" from time to time with the thermo-cautery, friction with ointments containing iodine and ichthyol, systematic passive movements, and even the forcible breaking of adhesions in selected cases.

Hydriatic treatment should be begun early and is of great value. At home a nightly plain hot bath, hot Nauheim bath, or hot-air bath may be employed. If the patient is able he should go to a hydriatic establishment in connection with a natural thermal or medicinal water, such as the Hot Springs of Virginia or Arkansas, Mt. Clemens in Michigan, Richfield Springs of New York, Green Sulphur of Florida, or Sharon Springs; Bath in England; Baden, Wiesbaden, Aix-les-bains, Carlsbad, Gastein, Homburg, or Wildbad on the continent of Europe, or the sand baths, mud baths, and peat baths of various localities.

Electricity may be employed, but its effects are uncertain.

Medicinal treatment is at times very helpful. Iron, arsenic, and cod-liver oil in full doses are the remedies that are especially indicated. Iodide of potassium (five to ten grains), or the syrup of the iodide of iron (ten to twenty minims) three times daily are especially useful if there is much periarticular thickening. In the acute polyarticular attacks the salicylates are unquestionably of great value. *Glentworth R. Butler.*

RHIGOLENE.—Of the products of the fractional distillation of petroleum the lightest is obtainable as a fluid by condensation, and consists mainly of the paraffin *butane*, a body gaseous under ordinary conditions. This condensed distillate is termed *cymogene*. The distillate of next higher boiling-point boils at about 18° C. (64.4° F.). Such distillate consists largely of the fluid paraffin *pentane* ("amylic hydride"), C_5H_{12}, and is the substance commonly known as *rhiogolene*. Rhigolene is a colorless, mobile fluid of slight and not unpleasant odor and taste; very light, very inflammable, and, as its boiling-point predicates, very volatile. It mixes in all proportions with common (ethylic) ether. Rhigolene was proposed by B. W. Richardson as a substitute for ether for the production of local anæsthesia by freezing, after his method. Because of the low boiling-point of rhigolene—lower than that of ether—the cold produced by the evaporation of a spray of rhigolene is very intense and very rapidly attained. Dr. Richardson observed an area of skin become hard, white, and insensible at the expiration of *two seconds* after beginning the driving upon it of a rhigolene spray. But such very rapid freezing Dr. Richardson found to be undesirable, because the intense cooling of the superficial frozen area prevents the abstraction of heat from below, and so limits unduly the depth to which the anæsthesia can be carried. Hence Dr. Richardson proposed a mixture of rhigolene and anhydrous ether in equal parts. Rhigolene dissolves camphor, spermaceti, and iodine, and has been used by Richardson, again, as a solvent of those bodies for use for local applications. A rhigolene solution of camphor and spermaceti together Richardson found to make an excellent conjoint cooling anodyne and healing application to burns. The vapor of rhigolene, inhaled after the manner of vapor of chloroform, is readily taken, and produces general anæsthesia with great rapidity. But in this application rhigolene has shown itself dangerous, and has never come into practical use.

Edward Curtis.

RHINOSCLEROMA.—A chronic infectious disease affecting chiefly the nose, the mucous membrane of the mouth, pharynx, and larynx. It is due to a bacillus resembling in some respects the bacillus of Friedländer, and is characterized by the formation of diffuse and nodular swellings of extreme hardness, often followed by dense cicatrices. It is a disease of extreme chronicity, and has not been found to be amenable to any form of treatment.

The disease was first described by Hebra in 1870 as a tumor formation situated in the nose or its vicinity. The growth is constant, but exceedingly slow; it is hard and indurated and sharply circumscribed, the surrounding tissue showing no inflammatory or other change. The growth appears in the form of smooth nodes of various size or as a diffuse induration. The surface is smooth and shiny, and either of a brownish-red or normal color. It is painless in itself, but painful on contact. It produces no danger to the organism save by mechanical interference with respiration.

Kaposi gave a more detailed description of the process in 1873. In this he calls attention to the frequent involvement of the soft palate, due to the extension of the process from the nose. It begins in the mucous membrane of the side of the nose or in the cartilaginous septum. It may produce narrowing and even complete closure of the nares, and from the nose it extends to the pharynx, to the upper lip, to the hard palate, and to the alveolar processes of the upper jaw.

We owe our chief knowledge of the disease to two monographs, one by Mikulicz (*Arch. f. Chirurgie*, 1876, vol. xxvii.), and the other by Wolkowitsch (*Arch. f. Chirurgie*, 1889, vol. xxxviii.). There have been in addition a series of publications of single cases often giving detailed histological reports, and the discovery of the bacillus by Fritsch in 1882 has been followed by a long series of articles on the presence of the bacillus, its relation to the lesions, its cultural characteristics, morphology, etc.

The investigations of Mikulicz were made on two cases. One of these had lasted for sixteen years, and the growth had so interfered with function that operative removal of a considerable part of it became necessary. The growth began on the inner surface of the left nostril as a small nodule, which gradually increased in size. Nodules accompanied by diffuse induration almost completely closed the nose and extended to the septum and the upper lip. The affected parts were dark red and extremely indurated. The nose, which was at first greatly enlarged, gradually sank and its form was lost. The infiltrated upper lip was drawn upward and backward, and the entire area affected became a flattened indurated mass. There was gradual narrowing of the mouth, which became so hard and stiff as to interfere with eating. The opening finally became so narrow that only the point of the small finger could be passed into it. An operation was performed consisting in enlargement of the

mouth by extensive removal of the indurated tissue about it. The entire upper lip and a part of the cheek were adherent to the alveolar processes. The middle of the hard palate was covered with irregular cicatrices, which extended to the soft palate and were joined with similar cicatrices in this. The diseased tissues, although so hard to the touch, gave little resistance to the knife and the hemorrhage was slight. In the second case the disease appeared as an enlargement and induration of the nose, which after five years became double in size. The tissue removed was similar in character to that removed in the first case, and was so hard that fair microscopic sections could be made of it in the fresh state.

At the time of the publication of Wolkowitsch the disease had become much better known. Quite a number of cases had been published, and on account of the extent of the lesions in the pharynx, which had been largely neglected by the first authors, the name pharyngoscleroma had been proposed as a substitute for rhinoscleroma. It had been further found that the disease often extended into the lower part of the larynx, and especially on the lower surface of the vocal cords and sometimes into the trachea. The laryngeal and tracheal lesions have been specially studied by O. Chiari and Bendler. In 1873 Gerhardt described under the name of "chorditis vocalis inferior hypertrophica" a form of disease of the larynx which he characterized as a chronic inflammatory hypertrophy of the vocal cords leading to stenosis. From a review of the literature he concluded that the condition had been known before, but not recognized as an independent disease.

Langhofer in 1880 studied the condition histologically, and found the lesions characteristic of rhinoscleroma. He held the two conditions to be the same, and that scleroma could appear in the larynx and trachea independently of any affection of the nose. This was shortly confirmed by O. Chiari, and in 1885 Chiari and Rhiel collected thirty cases of rhinoscleroma, in nine of which the disease had extended into the larynx. In Bandler's case, which was studied from autopsy, the larynx was stenosed in high degree by a thick, hard mass of tissue extensively ulcerated. The trachea was stenosed; its wall was 0.75 cm. thick. This thickening came chiefly from the mucosa and submucosa, which was converted into a hard mass of tissue, partly covered with thickened epithelium and partly ulcerated. On the inner surface of the trachea there were radiate cicatrices. The infiltration extended down to the bifurcation, and for a distance of from 1 to 1.5 cm. into the primary bronchi. The lesion extended up to the pharynx and nares, but without altering the external appearance of the nose.

Wolkowitsch gave a complete clinical and anatomical description of eleven cases, together with short descriptions of all of the cases which he could collect from the literature. In his first case ulceration was prominent. The disease often begins with the appearance of a nodule or as an induration, either at the sides or in the median line of the nose. In certain cases the induration extends over the whole nose and down to the lip, or the chief extension may be backward, or it may extend in both directions. Ulceration is rarely a prominent feature, but in certain cases large crater-like ulcerations, with elevated indurated edges, are formed; they present some similarity to carcinoma.

In other cases the growth seems gradually to fill up the nose. It grows more rapidly from the interior than from the exterior. The nose becomes enormously enlarged and flattened laterally.

The disease is usually found in the lower classes, and it is difficult to get information as to the manner of onset. Sometimes catarrh was noticed as the first symptom. When ulceration is present, the ulcers discharge a thin fluid which is often offensive. There may be external nodules which represent an extension from the interior and give but little idea of the extent of the process. The upper part of the nose is not affected, so that the sense of smell is not lost as long as the external opening is left. In rare cases the disease begins in the pharynx and larynx, and the disease of the nose is secondary and may not appear. The lachrymal sac has been secondarily affected in a few cases, and the disease has also extended into the Eustachian tube. The deeper parts are rarely affected, but in some instances both thickening and ulceration of the cartilage and of the bones has been found. When the disease appears in the nostrils there is a great tendency for it to extend to the upper lip, especially upon the external surface. The nodules are often covered by a network of veins. The gums are thickened; irregular, hard, dark or bluish-red nodules, which sometimes extend to the mucous membrane of the palate, are formed on them. The teeth lose their direction, become pressed forward or backward, and often thrown out. The disease is almost invariably symmetrical, affecting chiefly the middle line and extending equal distances laterally. The growth extends very slowly but continuously. In one of Mikulicz's patients there was more rapid growth at each pregnancy. Like so many affections of the skin there is a continuous peripheral extension with central cicatrization and contraction. There seems to be but little tendency for the lesions to become the seat of pyogenic infections or other secondary processes.

In one case a carcinoma developed in the lesion after the disease had existed for twenty-five years.

The first histological examination was made by Kaposi, who regarded the process as a sarcoma. He found the papillary body and superficial corium thickly infiltrated by small cells, while the deeper layers showed a thick connective-tissue network with slight cellular infiltration. The next investigation was that of Geber, who disagreed with Kaposi, and considered the disease a chronic inflammatory process and not a tumor. Mikulicz also regarded it as a chronic inflammation. Microscopically, he found areas of round-cell infiltration, and, among these, cells which were much larger and paler, with a pale vesicular nucleus. The growth was sharply separated from the normal tissue. Proceeding from the normal tissue to the growth the first change seen was atrophy of the sebaceous glands and the hair follicles. The infiltration was chiefly in the deeper layers of the corium, the papillary body showing little change other than atrophy. Mikulicz considers that the lesions in the epithelium are due to the deep cellular infiltration; the vessels passing through this are in part compressed, and they serve rather the nutrition of the growth than that of the normal tissues. The sweat glands also become atrophied. The connective tissue at first is unaltered, its fibres being simply pressed apart. In places it loses its fibrillar character and the intercellular substance becomes homogeneous. Nerve bundles may be found running through the infiltration, but they seem to be especially resistant. The muscles are destroyed much earlier than the nerves. They are atrophied, often show the degenerative proliferation of nuclei, and in places where the infiltration is more rapid they become hyaline. Fat cells are often present to a considerable extent. Mikulicz thinks that the large cells arise from the connective tissue.

Cornil and Alvares in 1883 called attention to the appearance of hyaline masses in the large cells first described by Mikulicz. They found that the bacteria were in relation to the hyaline masses, which, as they supposed, in part represent the bacterial capsules, and in part are due to a hyaline degeneration of the cells brought about by the bacteria. Wolkowitsch believed that the large cells represented a special form of degeneration of the granulation cells. The hyalin has the general characteristics of hyalin as described by von Recklinghausen. The cells occasionally break down and leave the hyalin free. The peculiar refraction of the fresh tissue and its peculiar induration are due to the hyalin.

The rhinoscleroma bacillus was first described by Fritsch in 1882 in all of the twelve cases which he investigated. The bacilli have been found constantly by every investigator. They are present in large numbers, and are chiefly in the large cells, though they may be found between them; they vary somewhat in size; they are short,

often appearing in double form, and they present some resemblance to the pneumococci, but they are usually much larger. The capsule formation is a permanent characteristic and may be demonstrated even in the tissues. The best way of showing them is to harden the tissue in one-per-cent. osmic acid and then to stain it with some aniline color. The capsules by this means become very prominent, and have a grayish-brown color.

From the appearance of the organism and from its cultural characteristics it was considered by many to be identical with the bacillus pneumoniæ of Friedländer, and a great deal of the bacteriological literature has been on this subject, but the general opinion now is that it is distinctly different. The organism in culture has the following characteristics: It forms a mucoid cap-like colony on gelatin plates; no gas in sugar-agar; no acid in milk-sugar bouillon. The best description of the differential diagnosis between the scleroma bacillus and Friedländer's bacillus is that of Paltauf, who investigated fifteen cases. The principal points of difference between the two are these: first, the superficial whitish extension of the scleroma bacillus on gelatin is drier and more consistent than the corresponding growth of Friedländer's bacillus; second, there is an entire absence of gas formation in sugar-agar; and, third, the organism develops very imperfectly on acid media.

The geographical distribution of the disease is narrow. The first cases were seen in Austria, and the disease has always been more frequent there than elsewhere. The disease is also not uncommon in Russia, where Wolkowitsch studied his cases, but Central America and chiefly the republic of San Salvador seem to be the principal seat of the disease after Austria. Cases have also been observed in France, Germany, Belgium, and Cairo. Only five cases have been reported in the United States, and only one of these was a native American.

The disease belongs to the general class of granulation tumors. The large cells are of the epithelioid character, and resemble the epithelioid cells formed in tuberculosis, and the masses of them may suggest some similarity to tuberculous granulation tissue. They do not undergo caseation, nor is there any necrosis in mass. They are particularly prone to hyaline degeneration, which appears to be due to the action of the bacilli, which they often contain in large numbers. With their complete hyaline degeneration they disappear, and their place is taken by dense masses of connective tissue, to the contraction of which the cicatrization is due. The formation of these masses of large cells appears to be the primary and essential process; the other lesions are those common to all similar processes. It is probable that we must regard the disease as due to the bacillus which is always associated with it. The disease is a peculiar one, and the bacillus is in relation with the cell formation, which constitutes its histological specificity. It is an organism which is easily cultivated, but no characteristic lesions can be produced by inoculation of animals. It is pathogenic only in large doses. In spite of its similarity to Friedländer's bacillus and to the group of the bacillus mucosus capsulatus, both in morphology and in some cultural characteristics, it should be considered to be an independent organism. None of these organisms lead to a proliferation of tissue, and their general action is to produce exudations. The narrow geographical distribution of the disease also points to a distinct etiology. In view of the wide distribution of the bacillus mucosus capsulatus, it is unlikely that a variety of this would have so restricted a field. *W. T. Councilman.*

RHINOSCOPY. See *Nasal Cavities, Diseases of: General Diagnosis.*

RHODANIDES. See *Sulphocyanides.*

RHUBARB.—*Chinese Rhubarb; Rheum*, U. S. P.; *Rhei Radix*, B. P.; *Radix Rhei*, P. G.; *Rhubarbe de Chine, Rhubarbe de Muscovie, Rhubarbe de Perse*, Codex Med., etc.

The dried rhizome and larger roots of *Rheum officinale* Baill., *Rheum palmatum* L., and probably of other species of *Rheum* (fam. *Polygonaceæ*), deprived of the outer corky layers.

The general features of the rhubarb plant are well illustrated by the common garden pie-plants, *R. rhaponticum*, etc. There are twenty or more species, all from Southern and Central Asia, the drug being collected in Northwestern China, Thibet, and the adjacent regions. Both of the above-named species have been introduced to cultivation in Europe, and have produced a drug identical in its essential features with Chinese rhubarb. The second named has not been cultivated upon a commercial scale, but *R. officinale* is quite extensively so cultivated in England. The product is smaller, retains more of its bark, is more spongy, and less esteemed than the Chinese product.

The underground portion consists of a short, thick, erect rhizome, which gives off several thick roots. These are dug in the autumn and the rhizomes and roots preserved separately, the former constituting the most and the more highly esteemed portions of the drug. They are two or three times as large as the roots. The outer corky bark layer is removed and the pieces are dried, mostly by being suspended upon strings passed through perforations made for the purpose.

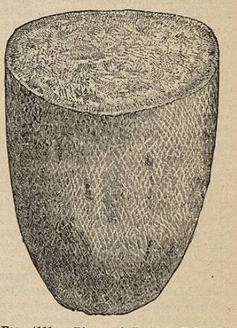

FIG. 4111.—Piece of Round Chinese Rhubarb, showing the white lozenge-shaped reticulation on its surface and the irregular medullary rays on the section. (Baillon.)

DESCRIPTION.—Rhubarb occurs mostly either in unevenly barrel-shaped pieces—from two to five inches in length and one-third to two-thirds as thick, the ends truncated, the surface showing the angular markings left by peeling, though these are more or less rounded off—or in longitudinal halves or slices of such barrel-shaped pieces. Usually the pieces are perforated by a rather large hole. The surface is of a bright light yellow and covered with a fine powder, which should consist of the rhubarb substance, but is sometimes powdered curcuma. That which has been kiln-dried or "high dried" possesses a surface roughened with broad ridges, separated by broad grooves, the latter frequently discolored to appear smudgy or blackish. The surface is less powdery. Underneath this superficial powder the surface of rhubarb is found reticulated, the oblong or lozenge-shaped ends of the reddish-brown or deep yellow-brown medullary rays being separated by intersecting bands of a grayish-white parenchymatic tissue. The fracture is irregular but not at all fibrous, and of a grayish-red color. Upon transverse section the larger (rhizome) pieces show, near the periphery, a nearly continuous circle of pretty stellate fibro-vascular bundles, these being wanting in the root pieces. Upon this transverse view the direction of the medullary rays is seen to be very irregular, less so toward the periphery. Rhubarb possesses a peculiar fine aroma, which, however, becomes coarse, heavy, and a little empyreumatic in the high-dried form. When chewed it produces a very gritty effect between the teeth, is mucilaginous, colors the saliva yellow, and imparts a bitter, astringent, and somewhat aromatic taste.

Powdered rhubarb is frequently adulterated, more especially with turmeric or curcuma. This may be recognized under the microscope by its large, solitary, oval