is the granulomatous tumor, characterized by the presence of numerous lymphoid and epithelioid cells, among and in which are seen the glanders bacilli. These nodular masses tend to break down rapidly, and on the mucous membrane form ulcers, while beneath the skin they form abscesses. The glanders nodules may also occur in the internal organs.

Symptoms.—An acute and a chronic form of glanders may be recognized in man, and an acute and a chronic form of farcy.

Acute Glanders.—The period of incubation is rarely more than three or four days. There are signs of general febrile disturbance. At the place of infection there are swelling, redness, and lymphangitis. Within two or three days there is involvement of the mucous membrane of the nose, the nodules break down rapidly to ulcers, and there is a mucopurulent discharge. An eruption of papules, which rapidly become pustules, breaks out over the face and about the joints. It has been mistaken for variola. This was carefully studied by Rayer and is figured in his monograph. In a Montreal case this copious eruption led the attending physician to suspect small-pox, and the patient was isolated. There is great swelling of the nose. The ulceration may go on to necrosis, in which case the discharge is very offensive. The lymph-glands of the neck are usually much enlarged. Subacute pneumonia is very apt to develop. This form runs its course in about eight or ten days, and is invariably fatal.

Chronic glanders is rare and difficult to diagnose, as it is usually mistaken for a chronic coryza. There are ulcers in the nose, and often laryngeal symptoms. It may last for months, or even longer, and recovery sometimes takes place. The diagnosis may be extremely difficult. In such cases cultures should be made and portions of the pure culture inoculated in the guinea-pig. The animal dies within thirty hours, and the testicles are found to be enormously swollen and already in the condition of abscess.

Acute farcy in man results usually from the inoculation of the virus into the skin. There is an intense local reaction with a phlegmonous inflammation. The lymphatics are early affected, and along their course there are nodular subcutaneous enlargements, the so-called farcy buds, which may rapidly go on to suppuration. There are pains and swelling in the joints and abscesses may form in the muscles. The symptoms are those of an acute infection, almost like an acute septicæmia. The nose is not involved and the superficial skin eruption is not common.

The disease is fatal in a large proportion of the cases, usually in from twelve to fifteen days.

Chronic farcy is characterized by the presence of localized tumors, usually in the extremities. These tumors break down into abscesses, and sometimes form deep ulcers, without much inflammatory reaction and without special involvement of the lymphatics. The disease may last for months or even years. Death may result from pyæmia, or occasionally

acute glanders develops. The celebrated French veterinarian, Bouley, had it and recovered.

The disease is transmissible also from man to man. Washer-women have been infected from the clothes of a patient. In the diagnosis of this affection the occupation is very important. Nowadays, in cases of doubt, the inoculation should be made in animals, as in this way the disease can be readily determined.

Treatment.—If seen early the wound should be either cut out or thoroughly destroyed by caustics, and an antiseptic dressing applied. The farcy buds should be early opened. In the acute cases there is very little hope. In the chronic cases recovery is possible, though often tedious.

XXIX. ACTINOMYCOSIS.

Definition.—A chronic inflammatory affection produced by the actinomyces or ray-fungus.

Etiology.—The disease is wide-spread among cattle, and occurs also in the pig. It was first described by Bollinger in the ox, in which it forms the affection known in this country as "big-jaw." Examples of the disease were common in the cattle killed at the abattoir in Montreal. In man the disease was first described by James Israel, and subsequently Ponfick insisted upon the identity of the disease in man and cattle.

In this country and in England the disease is rare, and only a few cases have been described. Although familiar with the affection in cattle since 1878, and constantly on the lookout for the disease, no instance has fallen under my personal observation.

The *parasite* is a fungus belonging to the species *Cladothrix*. In both man and cattle it can be seen in the pus from the affected region as small yellowish granules from one half to two millimetres in diameter. Microscopically these bodies are seen to be made up of threads which radiate from a centre and present bulbous, club-like terminations. Böstrom has recently published an elaborate research on their structure and development.

The parasite has been successfully cultivated and the disease has been inoculated, both with the natural and artificially grown fungus.

The Mode of Infection.—The fungus has not been detected outside the body. It seems highly probable that it is taken in with the food. The site of infection in a majority of cases in man and animals is in the mouth or neighboring passages. In the cow, possibly also in man, ears of barley or rye have been carriers of the fungus.

Morbid Anatomy.—In the earliest stages of its growth the parasite gives rise to a small granulation tumor, not unlike that produced by the *bacillus tuberculosis*, which contains, in addition to small round cells, epithelioid elements and giant cells. After it reaches a certain size there

is great proliferation of the surrounding connective tissue, and the growth may, particularly in the jaw, look like, and was long mistaken for, osteo-sarcoma. Finally suppuration occurs, which, according to Israel, may be produced directly by the fungus itself.

Clinical Forms.—(*a*) **Alimentary Canal.**—Israel is said to have found the fungus in the cavities of carious teeth. The jaw has been involved in a number of cases in man. The patient comes under observation with swelling of one side of the face, or with a chronic enlargement of the jaw which may simulate sarcoma. In the case described by Bodamer at the German Hospital, Philadelphia, the swelling involved the right side of the face, the temporal region, and the neck; there were numerous sinuses, and the case had the appearance of chronic necrosis of the bones.

The tongue has been involved in several cases, forming small growths, which in one instance were primary, in the others secondary to disease of the jaw. In the intestines the disease may occur either as a primary or secondary affection. At the Charité in Berlin in 1884 I saw with Oscar Israel a remarkable instance in which there were actinomycotic ulcers in the small intestines. Cases have been reported of pericæcal abscess due to the fungus. An instance of primary actinomycosis of the large intestine with metastases has also been described. The liver may be affected primarily, as in the case reported by Sharkey and Acland.

(*b*) **Pulmonary Actinomycosis.**—In September, 1878, James Israel described a remarkable mycotic disease of the lungs, which subsequent observation showed to be the affection described the year before by Bollinger in cattle. Since that date thirty-four instances have been reported in which the lungs were affected. Hodenpyl has analyzed these and reports two cases from the Roosevelt Hospital.

It is a chronic infectious disorder of the lungs, characterized by cough, fever, wasting, and a muco-purulent, sometimes fœtid, expectoration. The lesions are unilateral in a majority of the cases. Hodenpyl classifies them in three groups: (1) Lesions of chronic bronchitis; in one case the diagnosis was made by the presence of the actinomyces in the sputum. (2) Miliary actinomycosis, closely resembling miliary tubercle, but the nodules are seen to be made up of groups of fungi, surrounded by granulation tissue. This form of pulmonary actinomycosis is not infrequent in oxen with advanced disease of the jaw or adjacent structures. (3) The cases in which there is more extensive destructive disease of the lungs, bronchopneumonia, interstitial changes, and abscesses, the latter forming cavities large enough to be diagnosed during life. Actinomycotic lesions of other organs are often present in connection with the pulmonary disease: erosion of the vertebræ, necrosis of the ribs and sternum, subcutaneous abscesses, and occasionally metastases in all parts of the body.

Symptoms.—The fever is of an irregular type and depends largely on the existence of suppuration. The cough is an important symptom, and

the diagnosis in eighteen of the cases was made during life by the discovery of the actinomyces. Death results usually with septic symptoms. Occasionally there is a condition simulating typhoid fever. The average duration of the disease was ten months. Of the thirty-four cases all died except two. Clinically the disease closely resembles certain forms of pulmonary tuberculosis and of fœtid bronchitis. It is not to be forgotten in the examination of the sputum that, as Bizzozero mentions, certain degenerated epithelial cells may resemble the fungus. The radiating leptothrix threads about the epithelium of the mouth sometimes present a striking resemblance.

(*c*) **Cutaneous Actinomycosis.**—In several instances in connection with chronic ulcerative disease of the skin the ray-fungus has been found. It is a very chronic affection associated with the development of tumors which suppurate and leave open sores which may remain for years. It resembles tuberculosis of the skin.

(*d*) **Cerebral Actinomycosis.**—Bollinger has reported an instance of primary disease of the brain. The symptoms were those of tumor. A second remarkable case has been reported by Gamgee and Delepine. The patient was admitted to St. George's Hospital with left-sided pleural effusion. At the post-mortem three pints of purulent fluid were found in the left pleura; there was an actinomycotic abscess of the liver, and in the brain there were abscesses in the frontal, parietal, and temporo-sphenoidal lobes which contained the mycelium, but no clubs. A third case, reported by O. B. Keller, had *empyema necessitatis*, which was opened and actinomyces were found in the pus. Subsequently she had Jacksonian epilepsy, for which she was trephined twice and abscesses opened, which contained actinomyces grains. Death occurred after the second operation.

Diagnosis.—The disease is often mistaken for and is in reality a chronic pyæmia. The only test is the presence of the actinomyces in the pus. Metastases may occur as in pyæmia and in tumors. The tendency, however, is rather to produce a local purulent affection which erodes the bones and is very destructive. In cattle the disease may cause metastases without any suppuration; thus in a Montreal case the jaw and tongue were the seat of the most extensive disease with very slight suppuration, while the lungs presented numbers of secondary growths containing the fungus.

Treatment.—This is largely surgical and is practically that of pyæmia. Incision of the abscess, removal of the dead bone, and thorough irrigation are appropriate measures.