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Da Costa

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## Modern Surgery - Chapter 13. Tuberculosis and Scrofula

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### XIII. TUBERCULOSIS.

TUBERCULOSIS is an infective disease due to the deposition and multiplication of tubercle bacilli in the tissues of the body. It is characterized either by the formation of tubercles or by a widespread infiltration, both of these conditions tending to caseation, sclerosis, or ulceration.

A *tubercle* is a non-vascular infective focus, appearing to the unaided vision as a semi-transparent gray mass the size of a mustard-seed. The microscope shows that a gray tubercle consists of a number of cell-clusters, each cluster constituting a *primitive tubercle*. A typical primitive tubercle shows a center consisting of one or of several polynucleated giant-cells surrounded by a zone of epithelioid cells which are surrounded by an area of leukocytes. When the bacillus obtains a lodgment the fixed connective-tissue cells multiply by karyokinesis, forming a mass of nucleated polygonal or round cells, called *epithelioid* from their resemblance to epithelial cells, and at the same time the blood-supply of the growth is limited by occlusion of surrounding vessels through multiplication of the cells of their endothelial coats, and also because of the pressure of proliferating perivascular cells. Some of the epithelioid cells proliferate, and others attempt to, but fail for want of blood-supply. Those which fail to multiply succeed only in dividing their nuclei and enormously increasing their bulk (giant-cells). Giant-cells, which may also form by a coalescence of epithelioid cells, are not always present. The presence of irritant bacterial products induces surrounding inflammation and numbers of leukocytes gather about the epithelioid cells (Fig. 61).

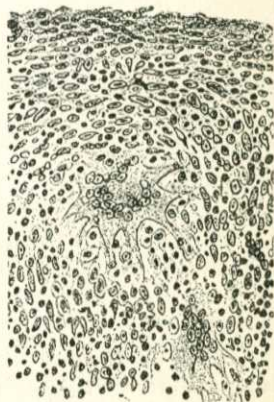


Fig. 61. — Synovial membrane, showing giant-cells (Bowly).

The bacilli, when found, exist in and about the epithelioid cells, and sometimes in the giant-cells. A tubercle may caseate—a process that is destructive and dangerous to the organism, and which resembles and yet differs from fatty degeneration. Deprivation of blood-supply may result in fatty degeneration. *Caseation* is due to a coagulation-necrosis arising from direct microbial action upon a cellular area which contains no blood-vessels, the nutrition of the area being cut off by obliteration of surrounding vessels. This process starts at the center, and the entire tubercle becomes converted into a soft yellowish-gray mass. Caseation forms cheesy masses, which may soften into tuberculous pus, may calcify, may become encapsuled by fibrous tissue, or may be replaced by an area of sclerosis.

A tubercle may undergo sclerosis, which is an attempt on the part of Nature to heal and repair the part. Coagulation-necrosis occurs in the center of the tubercle; “hyaline transformation proceeds, together with a great increase in the fibroid elements, so that the tubercle is converted into a firm, hard structure” (Osler). Infiltrated tubercle is due to the running together

of many minute infective foci, or to widespread infiltration without any formation of foci. Infiltrated tubercle tends strongly to caseate.

The *bacillus of tubercle*, discovered by Koch in 1882, is a little rod with a length equal to about half the diameter of a red blood-corpuscle. It can be stained with anilin, and this stain is not removable by acids (it being the only bacillus except that of leprosy which acts in this way). In its growth the tubercle bacillus causes the formation of toxins, and the absorption of toxins induces constitutional symptoms. The bacilli exist in all active lesions: the more active the process, the greater is their number. They may be widely distributed, and are occasionally, though rarely, identified in the blood. They may not be found, having once existed, but having been subsequently destroyed. Bacilli, when present, can easily be overlooked. In an active tuberculous lesion, even if the bacilli be not found, injection of the tuberculous matter into a guinea-pig will produce lesions in which they can be demonstrated. Bacilli exist in enormous numbers in phthisical sputum, but are not found in the breath of consumptives. Their great medium of distribution is dried sputum mixed with dust. They are found in the milk of tuberculous cows, and sometimes in the meat of diseased animals.

**Hereditary Transmission.**—Infection may be due to hereditary transmission. Congenital tuberculosis is occasionally, though rarely, seen. Tuberculosis is apt to appear in young children. Some think this is due to infection from without upon tissues whose resistance is lowered by hereditary predisposition; others think it is due to a tardy development of the germs transmitted by heredity. That the disease may be present in a latent form is shown by the experiment in which the viscera of the fetus of a consumptive mother showed no tubercles, but produced the disease in guinea-pigs when inoculated.\*

**Inoculation-tuberculosis.**—Tuberculosis may arise by inoculation, inoculation-tuberculosis being seen in leather-workers and in those who dissect tuberculous bodies (butchers and doctors are liable to anatomical tubercle). Osler mentions as other causes of inoculation the bite of a tuberculous patient, the washing of infected garments, and circumcision in which suction is employed by an individual with phthisis. Granulation tissue, chronic abscess, and areas of dermatitis may be infected from without (G. R. Fowler).

**Infection through the Air and Food.**—Infection through the air is very common. The bacteria of the dried sputum adhere to particles of dust and are carried into the lungs. Infection by meat, milk, and other foods may arise by this dust settling upon them in quantity, but it may also be due to disease of the animals from which the materials were obtained. Milk is a vehicle of contagion. It is dangerous if the udder contains tuberculous lesions. Tuberculosis of the udder may arise early even in a mild case. Some observers maintain that the milk from a tuberculous cow is dangerous even when an ulcerated udder does not exist. Of late, doubt has been expressed as to the possibility of infecting a human being with bovine tuberculosis, and the doubters maintain that bovine tuberculosis and human tuberculosis are two different diseases. Koch questions whether men are really susceptible to bovine tuberculosis, and says if they are susceptible, infection from this source is extremely rare. He does not consider it necessary to take any precautions

\* Quoted by Osler from Birch-Hirschfeld.

to protect human beings from bovine tuberculosis. Ravenel strongly opposes the views of Koch, and maintains that the bacillus of bovine tuberculosis is highly pathogenic for man ("University of Penna. Med. Bull.," xiv, 238, 1901). Ravenel, in support of his contention, reports 3 cases of tuberculosis of the human skin due to bovine inoculation ("Phila. Med. Jour.," July 21, 1900). Nocard reports 2 cases of individuals who wounded themselves while cutting the meat of tuberculous cattle. Each patient developed generalized lesions and died.

**Elements Favoring Infection.**—Infection is favored by hereditary predisposition—that is to say, by hereditary tissue-weakness, which, by maintaining a lowered momentum of nutritive processes, lessens the normal resistance to infection. Hutley studied 432 cases of tuberculosis. In 23.8 per cent. one or both parents had the disease (the father alone in 11.5 per cent., the mother alone in 9.9 per cent., and both in 2.4 per cent.).

Tubercle tends to arise at points where the normal resistance of the tissue is lessened by disease or injury, the process of phagocytosis being in such a spot limited in activity, and the germicidal power of the body-fluids being at a low ebb. The organisms, which are destroyed by healthy cell-activities, are victorious when those activities are diminished. Catarrhal inflammations of the air-passages favor phthisis, and slight traumatism is not unusually followed by a development of tubercle. Severe traumatism is rarely followed by tuberculous trouble. It is probable that in a slight traumatism a sufficient number of leukocytes do not gather, and a sufficient amount of serum is not effused to kill the bacteria. Lowered health, impure air, and improper or insufficient food all favor the development of tubercle. When an area becomes tuberculous, it is not unusual for indican to appear in the urine. Any tuberculous process tends to spread locally and to produce inflammation. A tuberculous area is always a danger to the system; from this as a focus dissemination may occur, tuberculous lesions appearing in a distant part or general tuberculosis setting in.

**Scrofula** is not a disease. It is a condition of the tissues in which low resisting power makes them hospitable hosts to invading bacilli of tubercle. It is met with particularly, but not exclusively, in children. Some observers teach that scrofula is tuberculosis of bones, glands, and joints; others teach that it is latent tuberculosis until some cause lights it into activity; while still others say that it is a tendency rather than a disease. It is certain that some lesions of scrofula are not tuberculous (eczema capitis, facial eczema, corneal ulcers, granular lids, and chronic catarrhal inflammations), and that they result from ill health, poor nutrition, bad air, and improper diet. A person who is recognized as of a scrofulous type may never develop tuberculous lesions. It is unquestionable, however, that strumous subjects are peculiarly apt to develop true tuberculous lesions. These lesions often appear after a tissue or an organ has become the seat of a primary non-tuberculous inflammation; the bacilli, which could not live in the healthy tissue, thrive in the tissue weakened by disease. Scrofula is generally of congenital origin, one or both parents being tuberculous, scrofulous, or in ill health; it may, however, be acquired as a result of poor food, bad air, crowding, and general lack of sanitation. The scrofulous are very prone to develop tuberculous lesions of the bones, the joints, the lungs, and the lymphatic glands. There are two types

of scrofula—the sanguine and the lymphatic. **The Sanguine or Angelic Type:** Those with oval faces, clear skins, large blue eyes, long lashes, long and slender bones, a small amount of fat, precocious minds, and a nervous manner. Such children are often graceful or even beautiful. **The Phlegmatic Type** (the classical scrofula): Those with stolid countenances, thick lips, thick noses, thick and muddy skin, dark and coarse hair, swollen necks, heavy bones, clumsy movements, ungainly figures, dulness of apprehension, and feeble emotions.

**Tuberculous Abscess.**—For description of this, see page 122.

**Tuberculosis of the Skin.**—Tuberculosis of the skin may arise from inoculation with material derived from a bovine or human source. It is frequently found that some other member of the family labors under tuberculous disease or that some family predecessor, direct or collateral, suffered from it. Stelwagon ("Diseases of the Skin") includes all cases under five heads: (1) tuberculosis ulcerosa; (2) tuberculosis disseminata; (3) tuberculosis verrucosa; (4) scrofuloderma; (5) lupus vulgaris.

**Tuberculosis Ulcerosa.**—The disease arises by a mucous outlet and is usually secondary to internal tuberculous disease. Small miliary tubercles form which caseate and are converted into ulcers. The ulcers are shallow, round or oval in outline, with soft edges, the floor being composed of sluggish or edematous granulations covered with a crust. The discharge is scanty and seropurulent. In some cases there is but one ulcer; in others there are two or several, and the fusion of ulcers produces a serpiginous outline. The ulcers do not heal, but gradually and steadily advance. Such ulcers are met with about the mouth, the genital organs, and the anus.

**Tuberculosis Disseminata.**—This occurs only in children; it is acute in onset and widespread. One type is polymorphic: spots, papules, pustules, and crusted ulcers existing, and lymphatic glands being enlarged. Another type follows one of the exanthemata and presents "a rough resemblance to flat lupus tubercles, to sluggish acne papules, and to lichen scrofulosum" (Stelwagon). **Lupus** begins usually before the age of twenty-five, but is met with often in individuals in middle life. It is most usual upon the face, especially the nose. It is a very chronic and extremely destructive disease. Three forms are recognized: (1) *lupus vulgaris*, in which pink nodules appear that after a time ulcerate and then cicatrize partly or completely. These nodules resemble jelly in appearance; (2) *lupus exedens*, in which ulceration is very great; and (3) *lupus hypertrophicus*, in which large nodules or tubercles arise. Lupus may appear as a pimple, as a group of pimples, or as nodules of a larger size. The ulcer arises from desquamation, and is surrounded by inflammatory products which, by progressively breaking down, add to the size of the raw surface. The ulcer is usually superficial, is irregular in outline, the edges are soft and neither sharp nor undermined, the sore gives origin to a small amount of thin discharge, the parts about are of a yellow-red color, the edges are solid and puckered and scar-like, and there is no pain. The sore is often crusted, the crusts being thin and of a brown or black color; it may be progressing at one point and healing at another; it is slow in advancing, but often proves hideously destructive. The scars left by its healing are firm and corrugated, but are apt to break down. Clinically it is separated from a rodent ulcer by several points. The rodent ulcer is deep, its edges are everted, and

the parts about filled with visible vessels. It is not crusted, has not a puckered edge, its edges and base are hard and rarely show any tendency to healing.

**Tuberculosis Verrucosa.**—**Anatomical tubercle**, the *verruca necrogenica* of Wilks, is due to local inoculation with tuberculous matter. It is met with in surgeons, the makers of post-mortems, leather-workers, and butchers, usually upon the backs of the hands and fingers. It consists of a red mass of granulation tissue having the appearance of a group of inflamed warts. Pustules often form.

**Scrofulodermata** or **tuberculous gummata** are chronic inflammations of the skin, the granulation-tissue product of which caseates, mixed infection occurs, and small abscesses, sinuses, or ulcers form. A *tuberculous ulcer* has a floor of a pale color, and has no granulations at all, or is covered with large, pale, edematous granulations. The discharge is thin and scanty. It is surrounded by a considerable zone of purple, tender, and undermined skin, which is apt to slough. When healing occurs, the skin puckers and usually inverts.

**Tuberculosis of Subcutaneous Connective Tissue.**—In this form of tuberculosis tuberculous nodules form and break down (tuberculous abscesses). In the deeper tissues these abscesses are usually associated with bone, joint, or lymphatic gland disease (see Cold Abscess, page 122).

**Tuberculosis of the Mammary Gland.**—(See page 125.)

**Tuberculosis of Blood-vessels.**—It is certain that bacilli in the blood or in tuberculous emboli may establish intravascular tuberculosis.

**Tuberculosis of nerve** is excessively rare. Tuberculous neuritis may arise in the course of general tuberculosis. A nerve lying in a tuberculous area may itself become tuberculous. It rarely does so, however. In fact, nerves resist infections though in the midst of them, and for this reason have been called the "aristocrats of the body."

**Pulmonary Tuberculosis.**—In adults the lungs are more commonly affected than any other structure. The lung affection may be primary or may be secondary to some distant tuberculous process. Pulmonary tuberculosis belongs to the province of the physician and requires no description here.

**Tuberculosis of the Alimentary Canal.**—A tuberculous ulcer of the lip occasionally occurs, and may be mistaken for a cancer or a chancre. A tuberculous ulcer of the tongue is commonly associated with other foci of disease. Such ulcers are separated from cancer by their soft bases and edges and by the rarity of glandular enlargements, and from syphilitic processes by the therapeutic test. Confirmation of the diagnosis is obtained by cultivations and inoculations. Tubercle may affect the pharynx, palate, tonsils and very rarely the stomach. It is thought that the acid gastric juice must protect the stomach from tubercle, because tubercle bacilli are frequently introduced into the stomach, but the organisms very rarely lodge and multiply in the stomach-wall.

**Intestinal tuberculosis** may follow pulmonary tuberculosis, but it may arise primarily in the mucous membrane of the bowel or result from tuberculous peritonitis. Intestinal tuberculosis causes diarrhea and fever, may resemble appendicitis, and may cause abscess and perforation. True tuberculous disease of the appendix occasionally occurs. Tuberculosis of the cecum is by no means as rare as we used to believe (page 736). Fistula in ano is frequently

tuberculous, and when it is the lungs are very often involved, the pulmonary lesion being usually primary (page 855).

**Tuberculosis of the Liver.**—Tuberculous disease of the liver causes cold abscess or cirrhosis.

**Peritoneal tuberculosis** may be primary, infection having been by way of the blood, may be part of a diffused process, or may follow intestinal tuberculosis, the serous and muscular coats of the bowel having been at some point in contact or a follicular ulcer having perforated (Abbe). The germ may have entered by the Fallopian tube. It may be due to ovarian or Fallopian tuberculosis, or to ulceration of a tuberculous appendix. It usually causes ascites, tympany, and tumor-like formations composed of adherent bunches of bowel or omentum or distended mesenteric glands (page 743).

The **heart muscle** is rarely attacked by tuberculosis. In fact, valvular lesions of the left side of the heart actually protect the individual from pulmonary tuberculosis. Non-tuberculous endocarditis may arise in the course of a tuberculous process elsewhere. Tuberculous endocarditis does *very rarely* occur.

The **pericardium** may be attacked with primary tuberculosis, or the process may be secondary to pleural tuberculosis.

**Tuberculosis of the pleura** is not uncommon. Tuberculous pleurisy may be acute or chronic. In some instances mixed infection takes place and suppuration occurs. The tuberculosis may be primary, but is usually secondary to pulmonary tuberculosis, and may be due to direct extension or to rupture of an area of pulmonary softening. A primary pleurisy not due to traumatism is very apt to be tuberculous.

**Tuberculosis of the brain** induces meningitis and hydrocephalus (page 617).

**Tuberculosis of the membranes of the spinal cord** is seen alone or in association with tuberculous inflammation of the brain.

**Tuberculous disease of fascia** is common; in fact, fascia is peculiarly prone to infection. Fascia may be attacked primarily, and when it is the disease is apt to spread rapidly and widely and to produce most disastrous results. The elder Senn regards tuberculosis of the intermuscular septa of the thigh as a very grave condition, which, if extensive, demands amputation of the limb. Secondary tuberculosis of fascia is far more common than the primary form, the original focus of disease being in bone, joint, tendon-sheath, or lymph-gland.

**Tuberculosis of muscle** is rare. Instances of primary tuberculosis have been reported. Secondary tuberculosis is more common, but even this condition is rare, muscle seeming to have a high degree of resistance.

**Tuberculous disease of bone** is very common in youth, and is usually preceded by a sprain or a contusion, which is oftener slight than severe. The injury establishes a point of least resistance, and in the damaged area the bacilli are deposited and multiply. The organisms may be deposited directly from the blood, or may arrive in an embolism from a distant tuberculous focus (lung or lymph-gland), which embolus is caught in a terminal artery in the end of a long bone and causes a wedge-shaped infarction (Warren).

Tuberculous osteitis, as a rule, begins just beneath the articular cartilage or in the epiphysis (Warren). The products of the tuberculous inflammation

may be absorbed, may be encapsuled by fibrous tissue, or may caseate (page 177).

**Tuberculous disease of the joints** is called "white swelling" and also pulpy degeneration of the synovial membrane. Joints are especially liable to tuberculosis in youth, although the wrist and shoulder not infrequently suffer in adult life. Joint-tuberculosis is often preceded by an injury. The tuberculous process may begin in the synovial membrane. Primary synovial tuberculosis is most often met with in the knee-joint. Usually the disease begins in the head of a bone, dry caries resulting, necrosis ensuing, or an abscess forming which may break into the joint.

**Tuberculosis of lymphatic glands** is known as "tuberculous adenitis." It is the most typical lesion of scrofula. The common antecedent of tuberculous adenitis of the neck is slight glandular enlargement as a result of catarrhal inflammation of the mucous membrane of the mouth. Tuberculous adenitis is most frequent between the third and fifteenth years. A person not of the tuberculous type may acquire tuberculosis of the glands, but the disease is unquestionably of much greater frequency in those who are recognized as predisposed to tuberculosis. Tuberculous glands may get well, may even calcify, but usually caseate if left alone. Long after healing they may break down and soften (residual abscess of Paget). Tuberculous glands very frequently suppurate because of mixed infection. Though at first a local disease, tuberculous glands may prove to be a dangerous focus of infection, furnishing bacteria which are carried by blood or lymph to distant organs or throughout the entire system. Glandular enlargement is in rare instances widely diffused, but it is far more commonly localized. Enlargement of the cervical glands is most common. Tuberculous disease of the mesenteric gland is known as *tabes mesenterica*.

Cervical lymphadenitis may be confused with lymphadenoma. The former, as a rule, first appears in the submaxillary triangle; the latter, in the occipital or sternomastoid glands. Tuberculous glands weld together, they are apt to remain localized for a considerable time, and they tend to soften. They may be accompanied by other tuberculous manifestations. Lymphadenoma from the start affects many glands; it may arise simultaneously in several regions, although in some cases there is a distinct beginning in one region. Lymphadenoma shows very little tendency to suppurate, and does not break down except late in the course of the disease, and is accompanied by great debility and anemia. Malignant gland-tumors infiltrate adjacent glands and other structures, binding skin, muscles, and glands into one hard, firm mass.

**Tuberculosis of tendon=sheaths** (tuberculous tenosynovitis) is discussed on page 559.

**Tuberculosis of the Kidney.**—(See page 944.)

**Tuberculosis** may attack the **Fallopian tubes, ovaries, or uterus.**

**Tuberculosis of the urethra, prostate gland, seminal vesicles, and bladder** is considered in the section on Regional Surgery.

**Tuberculosis of the Testicle.**—This disease is not rare. It is sometimes primary, but is usually preceded by tuberculosis of the kidney, bladder, or prostate. But one testicle is affected in the beginning, but the other gland



is apt to be attacked later. The tuberculous mass softens, becomes adherent to the scrotum, and breaks or bursts, exposing the damaged testicle (*fungus of the testicle*). The cord is apt to be involved in tuberculosis of the testicle.

**Diagnosis of Surgical Tuberculosis.**—The diagnosis may be determined by purely clinical facts. It may require the use of the microscope, cultivation experiments, or inoculations. In a suspected tuberculous lesion remove a portion of the tissue if it be accessible (by Mixter's cannula), and make sections, stains, and cultivations. If no bacilli are found, inoculate a guinea-pig with the suspected material. If it be tuberculous, the animal will develop miliary tuberculosis in a few weeks. The tuberculin test is occasionally employed.

*Tuberculin in Diagnosis.*—Tuberculin is used extensively for diagnosing tuberculosis in cattle. It is said that in a tuberculous animal an injection of tuberculin produces a marked and characteristic reaction. Many observers maintain that the same is true of tuberculous human beings. Czerny has shown that in renal tuberculosis bacilli are often absent from the urine, but an injection of tuberculin will cause them to appear plentifully.

The reported results of the serum test in human beings are variable. The value of the test is not certain; its results are irregular; a negative result certainly does not positively rule out the existence of tuberculosis; it is not certain that the procedure is absolutely innocuous, and it is certain that the method is entirely useless and possibly dangerous unless employed by a trained and skilful man.

**Prognosis.**—The prognosis varies with the age, sex, duration, extent, and situation of the lesion. The prognosis is best in children, and is better in males than in females. Tuberculosis of the skin gives a fair prognosis. Tuberculous adenitis is often cured. Any tuberculous lesion is, however, a menace to the organism, and tends strongly to recurrence. When phthisis exists, the performance of any surgical operation on any part of the body may cause the awakening and rapid spread of the pulmonary lesions. In such subjects only operations of necessity are to be advised and that method must be selected which requires the least period of confinement to bed and to the house.

**Treatment.**—Destroy the bacilli present and radically remove infected areas which are accessible. Never be satisfied with the removal of part of a diseased focus. Incomplete operations are apt to be followed by diffuse tuberculosis, because many pathways, vascular and lymphatic, are opened to infection. Among the many drugs which have been recommended for local use we mention the following: iodine, carbolic acid, guaiacol, arsenious acid, corrosive sublimate, chlorid of zinc (Lannelongue), phosphate of iron, balsam of Peru (Landerer), camphorated naphthol, oil of cinnamon, cinnamic acid (Landerer), and iodoform.\* Iodoform used locally upon or in tuberculous areas is of great value, and there is no drug which takes its place. Lupus may be treated by the application of blue ointment; by curetting, cauterizing with carbolic acid, and dressing with iodoform; by excision, followed in some

\* See article upon "Tuberculosis," by George Ryerson Fowler, Brooklyn Med. Jour., Nos. 8 and 9, 1894.

instances by sliding in of a flap of sound tissue or immediate skin-grafting. If treating a nodular and non-ulcerated area, wash it with a 2 per cent. solution of corrosive sublimate and inject several nodules with camphorated naphtol, one drop for each nodule. In seven or eight days inject other nodules, and so on. Koch's lymph has cured some cases of lupus. The x-rays are undoubtedly curative in many cases of lupus. Enlarged glands of uncertain character and very recent tuberculous enlargements should be treated by rubbing ichthyol into the skin over the glands and treating the patient hygienically, and by the internal administration of antituberculous drugs. If this plan fails to cure, the glands should be removed. When glands break down they should be removed, or should be opened, curetted, and packed. The rule must be to completely dissect out enlarged lymphatic glands which fail to quickly respond to treatment, removing capsules and glands. In any tuberculous trouble climate is of very great importance. Osler sums up climatic necessities as "pure atmosphere, equable temperature, and maximum amount of sunshine." Open-air life is imperative. The patient must have a well-ventilated sleeping-room, and his house should be free from dampness. Nourishing diet is essential. To secure a gain in weight is a constant aim. Give meat, milk, cream, butter, and cod-liver oil. The oil is poorly borne in hot weather, during which period it should be discontinued. Advancing doses of arsenic, quinin, and stimulants have their uses. Beechwood creasote is a valuable remedy. It should be mixed with an equal amount of alcohol and be given in milk one hour after each meal. The initial dose is 10 drops of the mixture, and the dose is advanced day by day until 50 or 60 drops are being taken at one time, at which point the dose is lowered or the administration is suspended for a time. While giving creasote be watchful for symptoms of its toxic action. Guaiacol in 5-drop doses is distinctly valuable. (For treatment of tuberculosis of bones, joints, peritoneum, pleura, etc., look under special regional headings.)

*Bier's Method.*—A few years ago Bier set forth a new plan for treating tuberculous lesions. It consists in causing venous obstruction and passive congestion. In the area of passive congestion the tissue-cells form antitoxins which kill the bacteria or attenuate their virulence. The treatment is founded upon the principle announced by Laennec, that "cyanosis is antagonistic to tubercle." The plan is applied particularly in joint-tuberculosis. An elastic band three inches broad is placed around the limb, above the seat of disease, and it is applied sufficiently tight to cause congestion. Several pieces of lint ought to be interposed between the skin and the band. By applying a flannel bandage from the periphery to the lower border of the disease the congestion is limited to the area of trouble. The patient should wear the band continually and move about with it on. Some people wear it without any inconvenience, but others complain greatly after wearing it but a short time. Bier and others have reported cures.

*Finsen's Treatment with Concentrated Light.*—Finsen has proved that concentrated chemical rays from sunlight and also from electric light have germicidal power. He applies these rays using an apparatus which concentrates actinic rays and intercepts heat-rays. Local areas of tuberculosis are often benefited or cured by this method, but it must be used for months.

*Koch's Tuberculin.*—The specific treatment by Koch's tuberculin or parato-

loid has excited widespread interest. It has not fulfilled the expectations which many entertained, but does benefit some cases, notably lupus. A serious drawback to the value of Koch's tuberculin is that it often causes fever and inflammation to a dangerous degree. In some cases, as Virchow showed, it produces acute miliary tuberculosis. Koch's lymph is a glycerin extract of a culture of tubercle bacilli, and the usual dose is 1 milligram, given hypodermatically into the back by Koch's pistonless syringe. After it has been used for a time the dose may be increased to 10 milligrams, or even much more. Bergmann gave 1 gram. Koch's lymph causes inflammation and necrosis of tuberculous tissue by the action of certain antitoxins. Many cases it improves. Some cases it apparently cures, but the disease is apt to return. In pulmonary tubercle it must not be given if there be much fever or extensive consolidation. Chiene used tuberculin largely in joint cases by giving two or three doses a day and increasing the dose. It is best to associate other treatment with the lymph. Koch has recently modified his tuberculin. He makes it as follows: dried cultures of bacilli are mixed with distilled water, and the mixture is agitated in a centrifuge. Two layers separate. The upper layer is the old tuberculin. The lower layer is the new tuberculin. The new tuberculin is given hypodermatically, at first in very small doses, but finally in doses as large as 20 milligrams. It is not to be given in far advanced cases or cases with much fever.

Hunter, of London, declares that Koch's old lymph contains one principle which causes fever, another with causes inflammation, and a third which produces atrophy of tuberculous foci without either fever or inflammation. This third desirable element he believes he has isolated in what is called a "derivative of tuberculin," a modified lymph. Some remarkable results have followed the use of this material; its administration seems entirely safe, and it should thoroughly and carefully be tried to ascertain its true rank as a remedy. The injection of serum obtained from animals refractory to tubercle has been employed, but Richet and Hericourt have seen no benefit from the plan. Maragliano, of Genoa, uses a serum which he believes can cure tuberculosis. He immunizes animals not by injection of living cultures, but by employing the toxic principles extracted from them. Progressive vaccinations immunize a dog. The serum of the animal is injected for the cure of tuberculosis in man or other animals. If injected along with tuberculin, it neutralizes the general and local reaction of the latter agent. The serum has apparently benefited some cases, but is certainly useless against mixed infections.\*

\* Brit. Med. Jour., 1895, ii, 444.