

that are protected from mosquitoes, should be filtered or boiled. In sections favorable to the disease, the individual should always sleep under netting. In suspicious cases, remedial measures should be promptly applied to all injuries received. All cases may be greatly benefited by a change to a country that is free from malarial and

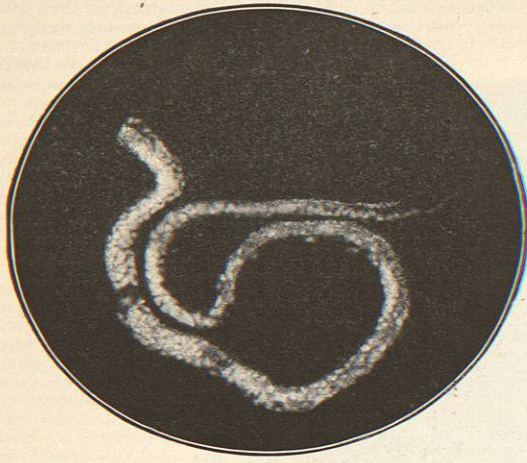


Fig. 1860.—*Filaria Sanguinis*. (Photomicrograph by Dr. Harvey R. Gaylord.)

miasmatic influences; for it has been observed that even if the disease is far advanced the severity of the paroxysmal attacks will be lessened by the removal to a different country.

Surgical interference of one kind or another has never accomplished any definite result in these cases. That the embryos which are usually lodged in the glandular structure, after being hatched, enter the general circulation of other portions of the body, is capable of demonstration.

The measures commonly adopted in connection with this condition, especially when preceded by chills and fever, are such as will most successfully combat inflammatory processes. The effect of such remedies will be to counteract the fever, lessen exudation, and diminish stasis. The medicines generally employed for this purpose are quinine, salines, phenacetine, or any other suitable antipyretic, while soothing and astringent lotions, like lead-water and opium, zinc oxide, and boric acid may be applied locally until the inflammatory action has subsided. After the intercurrent attacks, tonics, such as iron, cod-liver oil, strychnine, and mineral acids, may secure beneficial results.

The sporadic cases which are met with in our country are best treated by counteracting the cause. If the disease is the result of an ulcer on the leg, this should be promptly healed, its excrescences removed, and the limb maintained in an elevated and horizontal position. Afterward it should be methodically compressed with a rubber bandage. The toes should be separately enveloped, then the foot and ankle, and lastly the leg, so as to diminish the edema. When elephantiasis of the leg has reached such proportions that bandages no longer serve, ligation of the arteria femoralis and of the iliaca externa must be resorted to. In certain instances these measures have proved effective and they should be tried in extreme cases. In acute attacks the parts may be punctured—in order to lessen the effusion by providing an escape for the fluid—and antiseptically dressed with an astringent lotion or ointment.

In a few instances nerve-stretching and partial excision of the sciatic nerve have been followed by beneficial results. In elephantiasis of the scrotum the removal of the

offending mass by the knife sometimes becomes indispensable. The mortality resulting from heroic treatment is comparatively small. Before operating, Fayerer recommends drawing off the blood by placing the patient on his back, elevating the tumor and compressing it with an elastic bandage. The incision is to be made alongside of the cord and at the root of the penis. The skin is reflected and the cord, testicles, and penis protected by turning them out; the mass is then quickly removed, only a few bold incisions being required.

The female genitals, almost without exception, demand surgical interference. For this purpose either the knife or the galvano-cautery may be employed. The latter method is simply and especially adapted to cases of hypertrophied labia. Amputation of the leg has also been resorted to, but the operation has not been characterized by the same success as has attended it in other regions affected by the disease.

Prognosis.—The prognosis largely depends not only upon the particular form of the disease, but upon its complications. It is evident from what has been said that the disease is not necessarily fatal—even the endemic variety vastly improves under a change of climate. This is likewise true of sporadic cases. Both surgery and medicine have rendered even aggravated cases comparatively curable. The duration of life is not usually shortened by elephantiasis, since it exerts no detrimental influence upon the general constitution. Death rarely ensues from it except in those cases which involve supuration or septic infection.

The necessary literature relating to this subject is to be found in the following books: A. von Sniawarter: "Chirurgischen Krankheiten der Haut"; Hyde and Montgomery: "Diseases of the Skin," "Twentieth Century Practice of Medicine," vol. iv.; "Albutt's System of Medicine," vol. ii.; "La Pratique Dermatologique," vol. ii.; and the London Lancet and British Medical Journal, 1880 and following years. *Grover W. Wende.*

ELGIN SPRINGS.—Addison County, Vermont.
Post-Office.—Vergennes. Boarding-houses.

Access.—Via Vermont Central Railroad to Vergennes, thence three miles south by stage. This resort is pleasantly located in the Champlain valley, surrounded by beautiful scenery and delightful drives. The summer temperature generally ranges from about 50° to 70° F., and the weather is usually clear and bracing. The following analysis of the springs was made in 1889 by Henry M. Sully, of Middlebury College:

ONE UNITED STATES GALLON CONTAINS:	
Solids.	Grains.
Silica	1.19
Calcium	24.61
Magnesium	25.10
Sodium	11.30
Chlorine	.34
Sulphuric acid	87.65
Carbonic acid	1.08
Iron	Traces.
Total	151.27

Temperature when drawn, 45° F. The compounds formed by these acids and bases have not been designated by the chemist, but it can readily be seen that they would consist largely of sulphates with an admixture of carbonates and chlorides. The water contains a considerable proportion of sulphate of magnesium and some sulphate of sodium which gives it a cathartic effect. It resembles the waters of Seidlitz and Pullna in Bohemia and is valuable in chronic constipation and in blood disorders. The water is slightly opalescent when fresh, faintly alkaline to test paper, and odorless. It becomes perfectly clear after standing. *James K. Crook.*

ELM, SLIPPERY.—ULMUS, ELM BARK. "The dried inner bark of *Ulmus fulva* Mx. (fam. *Ulmaceae*)" (U. S. P.). This is a smaller and less graceful tree than the common "American," or white elm, *U. Americana*, which it in general resembles. It is a moderate-sized tree, with a

brown, rough bark, and soft, but tough, red wood. The leaves are larger and thicker than those of the common elm, and rough or pubescent beneath, and the fruit is twice as large. The expanding buds and smallest twigs are velvety. The inner bark of most elms, as well as of many other species in the order (nettles, hemp, etc.), is very pliable and tough; that of the present species is also very mucilaginous, and is valued on this account.

This is a common tree in the United States, especially in the central portions; but the demand for its bark has exterminated it from many regions, which suggests the question whether it could not be collected in such a way as not to destroy the tree, as is done with the barks of cinchonas in India.

The bark should be collected in the spring. It is "in flat pieces, varying in length and width, about one-eighth of an inch (3 mm.) thick, tough, pale, brownish-white, the inner surface finely ridged; fracture fibrous and mealy; the transverse section delicately checkered; odor slight, peculiar; taste mucilaginous, insipid." It contains no starch, a fact which affords an excellent means of detecting the numerous starchy adulterants of the ground bark.

Slippery elm bark is remarkable for the abundance of mucilage which it imparts to either cold or hot water, making a nearly transparent, thin, jelly-like, but not filterable solution. It is precipitated by neutral acetate of lead. The addition of strong alcohol to the concentrated mucilage abstracts a portion of its water without coagulating it.

The employment of slippery elm is said to have been learned from the aborigines. In medicine it is used as a pleasant demulcent, like other gums and mucilages; in sore throats, diarrheas, dysentery, inflammation of the bladder, etc.; also as a poultice. It is a very mild agent, and has hardly any value, excepting that of an unirritating protection to the parts it reaches. The crude bark, chewed and swallowed in large quantity, has been the mechanical cause of serious consequences in one or two cases.

ADMINISTRATION.—The powdered bark, stirred into hot water, is sometimes used as a demulcent drink. It, of course, includes the woody dust, and is an unsightly mixture. The official mucilage (*Mucilago Ulmi*), made from the sliced bark and strained (six per cent.), is much better. Dose indefinite. The powder can be used for poultices. It is often mixed with flaxseed for this purpose.

ALLIED PLANTS.—Several other elm barks are mucilaginous, but none so much as this. The European elm (*Ulmus campestris* L.) is official in several countries. *W. P. Bolles.*

EL PASO DE ROBLES HOT AND COLD SULPHUR SPRINGS.—San Luis Obispo County, California. Hotel and cottages.

These springs lie in the beautiful valley of the Salinas River, about 16 miles from the shores of the Pacific Ocean and 216 miles from San Francisco. They are reached by the Southern Pacific Railroad via Soledad. Access may also be had from San Luis Obispo by stage. The name of El Paso de Robles is derived from the Spanish, meaning "the pass of the oaks," from the fact that the main highway ran through this valley. For many miles this picturesque valley is covered with gigantic white oak, live oak, and cottonwood trees, and nestled in one of these cosy groves is Paso Robles Retreat. The once wild "pass in the oaks" is now transformed into a blooming resort, with cultivated grounds, and Paso Robles is a delightful little town of about a thousand inhabitants. When the Southern Pacific Railroad is completed the place will become of considerable commercial importance. Near the springs and overlooking the prosperous little town a commodious and elegant hotel is under construction. The building is of solid brick throughout. Some eighteen or twenty cottages are also found under the umbrageous oaks in different parts of the extensive grounds. On each side of the resort and valley the ever-green hills covered with forests of pine, oaks, manzanita

groves, and sweet-scented shrubbery, form a pleasant contrast to Paso Robles proper. The climate is remarkably mild and delightful all the year round, and the atmosphere is pure, balmy, and invigorating. The waters of Paso Robles are sulphurous and alkaline and range in temperature from 59° to 122° F. They comprise the "Main Hot Sulphur" spring, the "Mud" or "Moor" spring, the "Soda," "Sand," "Cold," "White Sulphur," "Iron," and "Garden" springs. The great hot sulphureted spring is located about three hundred yards from the hotel in a southeasterly direction. Over it has been constructed one of the finest bathing establishments on the coast, consisting of sixty individual bath-tubs, and a large vat, fifteen by thirty feet, for a swimming or plunge bath. The flow of this spring is about five thousand gallons per hour, and it has a temperature ranging from 105° to 110° F. The following analysis was made by Dr. Winslow Anderson in 1889:

ONE UNITED STATES GALLON CONTAINS:	
Solids.	Grains.
Sodium chloride	25.73
Sodium bicarbonate	41.19
Sodium carbonate	7.62
Sodium sulphate	7.25
Sodium iodide	Trace.
Sodium bromide	Trace.
Potassium chloride	1.57
Potassium carbonate	2.05
Potassium iodide	Trace.
Potassium sulphate	Trace.
Magnesium carbonate	2.15
Magnesium sulphate	5.11
Calcium carbonate	1.23
Calcium sulphate	2.94
Ferrum peroxide	.73
Borates	Trace.
Lithates	Trace.
Alumina	.25
Silica	1.73
Iodides and bromides	Trace.
Organic matter	1.90
Total	101.47
Gases.	Cu. in.
Free sulphureted hydrogen	3.75
Free carbonic acid gas	8.90

These waters are found to be especially serviceable in subacute and chronic rheumatism and articular affections, in blood, glandular, and cutaneous affections, and in strumous cases. In catarrh of the naso-pharynx the water, used as a hot douche, has proved beneficial. It may also be used to advantage, in the form of a hot douche, in the treatment of leucorrhoeal discharges and in engorgement of the female pelvic organs. The mud springs, about a mile and a half north of the hotel, are of decided benefit in rheumatism, arthritis, stiff joints, sprains, synovitis, glandular enlargements, chronic cutaneous diseases, etc. They range in temperature from 104° to 122° F., and have been found to be highly charged with mineral and gaseous ingredients. The mud springs cover a space of about twenty-five feet square, over which suitable bathing facilities have been established. These consist of dressing-rooms, hot sulphurous water plunges, and the mud bath. This latter is a compartment or vat four by eight feet and nearly filled with prepared moor or mud, and so arranged that the hot sulphurous water and gases rise directly into it from the ground beneath. The mud springs flow collectively about six thousand gallons per hour. About two hundred yards north of the mud baths is the Soda Spring. Its temperature is 77° F., and its flow is limited. The water is much used for drinking purposes. By allowing a small quantity of sulphureted hydrogen to escape the water becomes very palatable. According to Anderson's analysis,

ONE UNITED STATES GALLON CONTAINS:	
Solids.	Grains.
Sodium chloride	25.10
Sodium carbonate	7.25
Sodium bicarbonate	19.70
Sodium sulphate	5.05
Potassium carbonate	1.16
Potassium sulphate	.83

Solids.	Grains.
Magnesium carbonate.....	3.17
Magnesium sulphate.....	7.80
Calcium carbonate.....	5.32
Calcium sulphate.....	6.47
Iron peroxide.....	Trace.
Silica.....	.32
Alumina.....	.85
Organic matter.....	Trace.
Total solids.....	33.82
Gases.	cu. in.
Free carbonic acid gas.....	9.20
Free sulphureted hydrogen.....	1.60

The water has valuable antacid and aperient properties. It belongs to the alkaline-carbonated class. The other springs at Paso Robles are not extensively used as yet, although some of them will no doubt be found of value.
James K. Crook.

EMBALMING. See *Dead Bodies, Disposal of.*

EMBELIA.—The fruit of *Embelia ribes* Burm. (fam. *Myrsinaceae*). The fruits of this Indian shrub are nearly as large as black-pepper fruits, globular, slightly beaked, dull red and striate, becoming brown on keeping. They are said to be used to adulterate pepper. The drug is largely used in its home as a stomachic, carminative, stimulant, and anthelmintic, and also as a parasiticidal application to ringworm and similar affections. It appears to be specially useful as a tenicide. Although it is said usually to kill the worm, a purgative should be taken both before and after the administration of the remedy. Its important constituent is *embelic acid*, which is found to possess the same properties as the drug itself. Embelic acid, the formula for which is $C_8H_{14}O_2$, occurs in orange-yellow scales, soluble in alcohol, odorless and tasteless. It is given in doses of 0.2 to 0.4 gm. (gr. ii. -vi.), to be both preceded and followed by castor oil. The fruit contains also resin, fat, tannin, and a small amount of an alkaloid, which has been called *christembine*. The powdered fruit is given in doses of from 4 to 16 gm. (3 i. -iv.) or the fluid extract in corresponding amount.
Henry H. Rusby.

EMBOLISM.—That form of metastasis in which insoluble substances are transported by the blood current and lodged in some part of the vascular system is known as embolism. The material transported is an embolus. The process may occur in lymph vessels (lymphogenous embolism), as well as in blood-vessels (hæmatogenous embolism). The latter is, however, the more common and important form, and embolism is usually understood to mean this when no special modifying designation is used.

The substances which may enter the vascular system and be carried in the blood stream as emboli are of the most varied character. They may be gaseous, liquid, or solid. The most common emboli are those composed of the products of coagulation of the blood, and unless specially designated an embolus is usually understood to be derived from a thrombus. Tumor cells, living or dead tissue elements, animal or vegetable parasites, parenchymatous cells, placental cells, fat, pigment, masses of calcification, air, and various extrinsic substances may also gain entrance into the blood stream and form emboli.

The lodgment and impaction of the embolus in the vessel is due to the fact that on account of either its size or its physical properties the material transported is caught upon an obstruction in the vessel or cannot pass its lumen, and so remains either partially or wholly blocking it. Metastasis in the direction of the normal current is known as direct embolism, in the opposite direction as retrograde. The transportation of emboli from the veins into the systemic arteries without passing through the pulmonary circulation is designated crossed or paradoxical embolism. This may occur in case of a patent foramen ovale or a persistent ductus Botalli.

The importance of the embolism depends upon the nature of the embolus, its size, and the anatomical location

and relation of the obstructed vessel. Emboli containing tumor cells or infective agents, as bacteria, are the most injurious (septic emboli); those consisting of dead tissues or substances incapable of growth act only mechanically in obstructing the circulation (bland or aseptic emboli). Hard or sharp-pointed substances may injure the vessel wall and lead to the formation of an aneurism. Toxic or infective emboli may weaken the wall of the vessel and also produce aneurisms. Large emboli may seriously interfere with the nutrition of the part supplied by the obstructed vessel. Embolism of small arterioles or capillaries may produce a very slight disturbance of nutrition or none at all. If the embolus does not completely occlude the vessel no serious circulatory disturbance may be caused, but the complete closure of the vessel usually follows from the formation of an induced or secondary thrombus. If the obstructed vessel has abundant collateral anastomoses beyond the point of obstruction no disturbance of nutrition of any consequence may occur; but if the obstructed vessel is a terminal artery poorly provided with collaterals, degeneration or necrosis of the part supplied by it will result from an insufficient supply of nutrition (anaemic and hemorrhagic infarction).

Direct Embolism.—Embolism in the direction of the normal blood current is of most frequent occurrence. The substance forming the embolus is carried along by the blood stream until it is caught by some obstruction or swept into a channel so narrow as to prevent its farther passage. It follows, therefore, that direct embolism can occur only in the pulmonary and systemic arteries, heart, and portal vein. Emboli found in the right side of the heart or pulmonary arteries have their origin in the systemic veins; those found in the systemic arteries arise in the pulmonary veins or left heart. Portal vein emboli take their origin from thrombi either in the main trunk or in its contributing branches. The course and site of lodgment of the embolus is determined by the size, form, weight, and character of the material composing it, as well as by the force and volume of the blood stream, the size of the blood-vessels, the angle at which they are given off, the position of the body, etc. Consequently emboli arising in the systemic veins or right heart are more frequently carried into the pulmonary arteries supplying the lower lobes of the lungs, and more frequently into those of the right lower lobe than into those of the left. Emboli from the left heart more frequently pass into the thoracic aorta than into the carotid or subclavian arteries. The left carotid arising from the highest point of the aortic arch is more likely to receive emboli than the right carotid. Likewise the left common iliac artery, being more directly in the line of the current in the abdominal aorta, receives emboli more often than the right iliac. Since the conditions in the systemic veins are much more favorable for thrombosis, embolism of the pulmonary arteries is much more common than of the systemic arteries. Of the latter the small branches in the lower extremities are most likely to receive emboli, but in the great majority of cases this event is not diagnosed clinically, inasmuch as the symptoms produced are of much less importance than those caused by embolism of the renal arteries, splenic, etc.

If the embolus completely closes the lumen of the obstructed vessel, it is styled an obturating embolus. Spherical emboli are most likely to do this, but an elongated portion of a thrombus may be folded several times upon itself and pushed into a vessel several times its own diameter, completely obturating the lumen. This happens very often in the case of long pieces of thrombi washed out of the femoral veins and in this manner blocking up the largest branches of the pulmonary artery. Similarly, irregular thrombi of soft consistency may be pushed into a vessel so as completely to fill it. If the embolus is hard and firm there may still be some space left for the blood to flow, but this is usually soon closed by secondary thrombosis. Cylindrical, elongated, flat or irregular emboli may be caught at an arterial bifurcation and be pushed partly into both branches, either wholly or partly blocking them (straddling or riding embolus).

Large soft thrombi may break up and the resulting emboli may fill a large number of small branches. Emboli arising in the systemic veins small enough to pass the pulmonary capillaries may lodge in the cerebral or renal capillaries.

Retrograde Embolism.—A retrograde transportation and impaction of an embolus is more likely to occur in the lymph stream than in the blood, and plays a very important part in the lymphogenous metastasis of tumors. Under especial conditions retrograde embolism may occur also in the veins, usually in the large veins near the heart. The cause of the retrograde transportation may lie either in a reflux flow from the heart and great veins into the hepatic veins or the veins of the neck, head, or arms; or in case of extreme venous stasis an embolus may be gradually pushed backward in the vein by abnormal venous pulse waves proceeding from the heart. This event is most likely to occur in dilatation of the right heart with tricuspid insufficiency. Any condition which increases the pressure in the veins near the heart favors also a retrograde embolism—decreased negative pressure in the thorax, disturbances of respiration, prolonged and difficult expiration, cardiac insufficiency, etc. If the venous valves remain adequate the embolus may be caught on them, but in the extreme distention of the vessels they become insufficient and allow the embolus to pass. Retrograde metastasis has been observed in the hepatic, cerebral, mesenteric, renal, pulmonary, axillary, and coronary veins, pampiniform plexus, and dural sinuses. It has been most frequently observed in the case of tumor metastasis, but retrograde transportation of liver cells and infective emboli has also been reported. In the case of non-infective thrombotic material it would be very difficult to establish a diagnosis of retrograde embolism.

Paradoxical Embolism.—The passage of emboli through an open foramen ovale or persistent ductus Botalli without passing through the pulmonary circulation is known as paradoxical or crossed embolism. An opening in the foramen ovale in the shape of a narrow oblique slit is found in a relatively large number of autopsies. Under conditions of disturbed pulmonary circulation in which the pressure in the right auricle becomes greater than that in the left, the slit in the foramen is widened and its membranous edges are bulged into the left auricle. The opening may be so enlarged that not only small emboli may pass through it, but thrombi arising in the right side of the heart may extend through it into the left auricle. Masses of tumor cells and liver cells, the latter in cases of traumatic laceration of that organ, have been found obstructing the opening. Aside from such autopsic evidence the diagnosis of crossed embolism is impossible. The metastasis of certain large-celled tumors is best explained by the assumption of paradoxical embolism, but the possibility of even large tumor cells passing through the pulmonary capillaries without setting up lung secondaries must be borne in mind.

VARIETIES OF EMBOLI.—**Bland Emboli.**—These are composed for the greater part of thrombotic material which does not contain toxic or infective agents; but no sharp line can be drawn between them and septic emboli, inasmuch as emboli may contain pathogenetic organisms and yet not give rise to septic processes, because of the action of the protective forces of the body inhibiting their growth. The practical criterion is not the absence or presence of micro-organisms in the embolus but the effect of the latter upon the vessel wall at the point of lodgment. A bland embolus is accordingly one whose effects are purely mechanical. Besides thrombotic material, pigment granules, dead cellular elements, fat, masses of calcification, extrinsic substances such as carbon or metal dust, etc., may produce only mechanical effects.

Infective Emboli.—Because of their frequent occurrence and the serious conditions resulting from them infective emboli containing pathogenetic micro-organisms are of very great pathological importance. In addition to the purely mechanical effects produced by them they show

at the point of lodgment the characteristic effects of the bacteria which they contain. These effects are chemical in nature, the result of the specific products of the organism, and are characterized by degeneration or necrosis of the vessel wall, hemorrhages, inflammation, suppuration, gangrene, etc. As a result of the weakening of the wall through the injury or destruction of its inner coat an aneurism may be formed (aneurysma mycotic-embolicum). The metastasis of emboli containing pyrogenic organisms gives rise to the condition known as pyæmia. The primary focus of the embolism is usually an infective venous thrombus formed at the point of entrance of the bacteria, which may be in any part of the body. From this thrombus emboli may arise and convey the bacteria to other parts of the vascular system, where having lodged they may multiply and produce poisons which exert their characteristic effects upon the vessel wall and surrounding tissues. From these secondary foci other emboli may be given off and the process indefinitely repeated.

There may be no evident primary focus and the secondary lesions may form the only features of the disease; or, as in the case of malignant endocarditis, infective thrombi may form upon the valves of the heart and give origin to infective emboli, though the primary entrance of the bacteria into the vascular system cannot be discovered (cryptogenic infection). Embolism of bacteria alone from the primary focus, either singly or in masses, may occur without the formation of an infective thrombus at this point. These may become attached to the vessel wall, multiply, and set up their characteristic changes. In this manner bacteria arising in infective thrombi in the systemic veins may pass the lung capillaries and produce their effects in the systemic arteries or capillaries. As mentioned above, not all emboli containing pathogenetic bacteria give rise to secondary lesions at the point of lodgment. This may be explained by an increase in the vital resistance of the body or a diminished virulence of the bacteria due to conditions arising either in them or in the body.

Tumor-cell Emboli.—Very rarely benign tumors may extend into blood-vessels and give rise to emboli which may develop into secondary growths of the same nature as the primary. In the metastasis of malignant tumors embolism plays a much more important rôle, as it is the chief factor of their spread through the body. Both carcinoma and sarcoma very frequently break into blood-vessels, loosened tumor cells are carried away in the blood stream, and from the emboli thus produced secondary growths arise. It may be emphasized here that this embolism is always one of tumor cells and not of parasites which may cause the formation of such cells. The structure of sarcoma particularly favors hæmatogenous metastasis, inasmuch as the cells of a sarcoma not infrequently form the wall of the blood-vessels of the tumor, or are separated from the blood stream by an endothelial layer only. On the other hand, the spread of carcinoma into the lymph spaces favors lymphogenous metastasis, and in general it may be said that sarcoma and carcinoma are characterized respectively by hæmatogenous and by lymphogenous metastasis. Large masses of tumor cells coming from the systemic veins may block the orifices of the right heart or the pulmonary artery and cause sudden death. As a rule, however, the mechanical effects of emboli composed of tumor cells are unimportant when compared to the significance of the tumor metastasis. More frequently the secondary growths of malignant tumors arise from capillary emboli rather than from those of large size. Tumor cells of small size may pass the pulmonary capillaries without lodgment and give rise to secondary growths in the systemic capillaries. Both the retrograde and the paradoxical varieties of embolism of tumor cells have been observed.

Emboli of Animal Parasites.—The *Filaria sanguinis*, *Bilharzia hæmatobia*, and the *Plasmodium malariae* may be found in the blood of the human body, and under certain conditions may block the capillaries or smaller arterioles. *Echinococcus* cysts in the heart wall may