

centre of the charming city of Ypsilanti, on the line of the Michigan Central and the Lake Shore and Michigan Southern Railroad. The bathing establishment contains forty large well-ventilated bath-rooms, besides parlors for ladies and gentlemen, smoking and reading rooms, and other adjuncts of a modern first-class institution of this kind. The water of this well has been in use since 1848, and has become widely known. The baths are highly recommended in uterine inflammations and congestions, in skin diseases, sciatica, and inflammatory rheumatism and gout. Internally the water is said to be valuable in constipation, dyspepsia, chronic alcoholism, and in hay fever. It is also used—by means of insufflation, in a douche, and in the form of a gargle—in nasal and pharyngeal catarrh. The following analysis was made by James H. Shepherd, of the Ypsilanti High School, in 1884.

ONE UNITED STATES GALLON CONTAINS:	
Solids.	Grains.
Magnesium sulphate	103.76
Potassium sulphate	35.33
Ferrous salts	Traces.
Calcium sulphate	173.05
Magnesium bromide	10.97
Sodium sulphide	8.42
Phosphates	Traces.
Silicon dioxide	19.81
Calcium carbonate	57.26
Borates	Traces.
Sodium chloride	1,573.62
Lithium salts	Traces.
Calcium chloride	143.35
Barium salts	Traces.
Magnesium chloride	128.09
Strontium salts	Traces.
Organic matter	Traces.
Total	2,256.26
Sulphureted hydrogen gas, 26.84 cubic inches.	

The bath-house is connected with the new Occidental Hotel, where ample arrangements are made for the comfort of guests. Ypsilanti also contains several well-known mineral wells. The most important of these are the Ypsilanti and Owens Wells. They are highly charged with mineral ingredients, and are also of the saline-calcic class.

James K. Crook.

MORBIDITY. See *Vital Statistics.*

MORBUS MACULOSUS WERLHOFFII.—(Purpura; Blutfleckenkrankheit.)—**DEFINITION.**—A disease characterized by the spontaneous appearance of transitory hemorrhagic areas in the skin, mucous membranes, and internal organs, and rarely associated with hemorrhages from the mucous membranes.

Extravasation of blood into and beneath the skin occurs more or less constantly in a great variety of diseases and conditions, and as such is commonly known as "secondary or symptomatic" purpura. Besides this group we have a second in which the purpuric eruption, appearing without apparent cause and unaccompanied by marked constitutional symptoms, is in itself the chief symptom. To this is given the name "primary, essential, or idiopathic" purpura. Though strictly speaking a symptom only, in the latter case we may consider it a disease.

From the large group of diseases with subcutaneous extravasations of blood Werlhof, in the latter part of the last century, isolated one to which he gave the name purpura hemorrhagica, a term probably corresponding more or less closely with primary purpura. Later writers separated purpura simplex as a distinct disease, and established purpura urticans as one of its subdivisions. Finally, peliosis rheumatica and Henoch's purpura were described. Such a division, however, except for the purposes of clinical work, is not warranted, since no fundamental differences separating these various forms exist. We find, instead, a variation in the severity of certain symptoms, with the various types constantly merging the one into the other.

Hoffmann, Litten, and others prefer to group all varieties of essential purpura under the term morbus maculo-

sus Werlhofii, and to consider them from a general standpoint. In this broad sense the term is here used.

ETIOLOGY.—Accurate knowledge concerning the cause of purpura is entirely wanting, in most cases no explanation of the condition being possible. Its appearance is spontaneous and primary, never endemic or epidemic. Previous physical condition seems to be unimportant.

In a series of two hundred cases, McKenzie has shown the disease to be slightly more common in men than in women, and that seventy-seven per cent. of all cases occur during the first three decades of life. Other writers believe the disease to be somewhat more common at the age of puberty.

Such conditions as poor food, wet, exposure, fatigue, debility and starvation, though often enumerated, cannot be shown to be of more etiological importance in purpura than in many other diseases. Purpura is found with the same frequency among all classes. It is never hereditary. The hemorrhagic diathesis is not infrequently associated with certain nervous conditions (severe neuralgia, nervous shock, etc.), as pointed out by Weir Mitchell and others, and to these the relation appears certain.

Venous stasis, though in itself not sufficient to produce the disease, is undoubtedly an important factor. The character of the blood in some cases suggests a possible influence in producing the condition. We may find anemia of a secondary or even a pernicious type, leucocytosis, and changes in its chemical composition, specific gravity, and reaction.

Silbermann and Koehler, working upon animals, were able to produce the subcutaneous hemorrhages by the use of certain ferments and toxic substances injected directly into the veins. In a few cases bleeding occurred from all the internal organs as well as into the skin. Silbermann regards purpura as a primary blood disease, "causing slowing of the current, stasis with the formation of thrombi, and subsequently degeneration of the vessel walls," leading to extravasation of blood into the tissues.

Much in the nature and course of the affection suggests an infectious origin, and many attempts have been made to isolate micro-organisms from the blood. In 1884 Petrone found in the blood of a purpuric patient small round bodies which he considered spores of a bacillus, to which he gave the name of bacillus purpure. Rabbits inoculated from the cultures developed the typical lesions, and careful examination of the tissues demonstrated the presence of the bacilli in the capillaries. Letzerich obtained similar results and considered purpura a characteristic infectious disease. He was himself finally stricken with the disease, and from his own blood grew cultures of a bacillus probably identical with Petrone's, which by inoculation into animals produced purpura. The bacilli and spores were constantly found in the petechiæ. Girmard, Tizzoni, Giovannini, and Kolb report the isolation of various bacteria from the blood and petechiæ of patients suffering from purpura. In spite of these striking results, we must await more conclusive evidence. We are justified only in saying that in many cases of purpura the infectious origin seems unquestionable.

Arjelio believes the cause to be one of auto-intoxication through the absorption, by the intestines, of decomposed albumin.

SYMPTOMS.—A few symptoms are found more or less constantly in all grades of purpura.

Lesions in the Skin.—The cutaneous hemorrhages show an extraordinary variation. They may be round, oval, or irregular, single or confluent, and in rare cases indurated. Though commonly less than 1 cm. in diameter, they may be present as very large areas, or even the entire skin may be involved. In all cases these appear without local inflammation or hyperæmia, and on normal skin. The location of the spots is more often on the lower legs and feet, frequently on the arms and belly, more rarely on the face and chest. Their appearance is sudden and in crops, as it were. At first of a blood-red color, the areas almost immediately begin to fade, if superficial, first assuming a purplish tint, then a yellowish-green, later becoming a pale brown, the whole process

requiring from two to eight days. When the hemorrhage is deep, a bluish color is very often present; and if a considerable effusion of blood takes place, pigment is deposited which persists for weeks or months, and microscopically for years. Deep effusions of blood between the bones and periosteum give a faint blue color with deep induration, over which the skin is movable.

Hemorrhages.—In the severe forms of this disease actual bleeding from the mucous and serous surfaces occurs. Epistaxis is the form most frequently met with, but hemorrhage may also come from the throat, gums, stomach, intestines, kidneys, or bladder, or the blood may escape even into the serous cavities. Retinal hemorrhages are seldom seen.

Blood.—The blood in the majority of instances gives evidence of no striking changes, but in very severe forms one finds marked anemia of a secondary character. In a few cases observed by Ajelio, Spietschka, Billings, and others, very profound diminution in the hæmoglobin, a considerable leucocytosis, increased blood plates, slight degeneration in the red corpuscles, and presence of a few blasts are recorded. In general, no uniform results have been obtained.

Fever of a moderate degree is often present, rarely hyperpyrexia. The pronounced febrile cases are usually of the severest form, and almost invariably end fatally.

Gastro-intestinal Symptoms.—Apart from anorexia these are wanting, or are only slight, except in the worst forms of purpura. Intense abdominal cramps, resembling the crises of locomotor ataxia or the colic of chronic lead poisoning, accompanied by vomiting and diarrhœa, are pronounced in occasional instances.

Albuminuria without evident nephritis of definite character is sometimes found, especially late in the course of the disease.

Throat Symptoms.—Osier calls attention to the occurrence of moderate symptoms of sore throat with local necrosis.

The symptoms of purpura are subject to extreme variations, both in their intensity and in their grouping, in many cases changing quickly from one type to another while under observation. As emphasized above, no accurate division of the disease into varieties is possible, but for purposes of description and clinical study we may describe three main forms, namely, purpura simplex, purpura rheumatica, and purpura hemorrhagica. The prominent symptom of the first is the subcutaneous ecchymoses, of the second the arthritic phenomena, and of the third the bleeding from mucous surfaces. By many authors a fourth form is described, the so-called Henoch's purpura, in which the combination of marked abdominal symptoms, subcutaneous hemorrhages, and joint manifestations, are the distinctive symptoms.

Purpura Simplex.—Suddenly without prodromes, and in the majority of cases unaccompanied by constitutional symptoms, ecchymoses develop on the extremities. The eruption but seldom invades the trunk and face. In exceptional cases there may be constitutional disturbances, as slight fever, malaise, moderate digestive symptoms, rapidly increasing anemia of a mild order, and even slight swellings with pain in the legs or arms. There is commonly slight diarrhœa. The patient usually recovers in a few days, but some cases have proved fatal after only a short course.

Under the name of *purpura urticans* are included those cases in which the ecchymoses take on the form of urticaria.

Purpura Hemorrhagica.—The name morbus maculosus Werlhofii, which we have used to include all primary purpuric diseases, is often restricted to this form. To this group belong all severe and obstinate cases of purpura in which bleeding takes place from serous or mucous surfaces. It is often observed without fever or prodromes, but more frequently the attack is ushered in by definite constitutional disturbances (headache, malaise, pains all over the body, diarrhœa, and vomiting), which after a few days are followed by hemorrhages into the skin and bleeding from mucous membranes. In excep-

tional cases, this last-mentioned symptom precedes all others. The bleeding, although it comes more commonly from the nose or mouth, may also come from the lungs, stomach, intestines, kidneys, or bladder. Not infrequently the hemorrhage becomes profuse and uncontrollable, leading to alarming symptoms. The presence of moderate pain in the joints with local œdema and tenderness does not exclude cases from this group. Anæmia is frequently present, occasionally of an extreme character; in one of Billings' cases the hæmoglobin sank rapidly to fifteen per cent., and the red cells to 560,000 per c. mm.

A separate but needless division of purpura hemorrhagica sometimes made is that of *purpura fulminans*, this term being applied to cases which are of a very violent nature. The acute onset, rapid course, and death in from one to five days, strongly suggest a septic fever.

Purpura Rheumatica (Peliosis Rheumatica, Schönlein's Disease).—The occurrence of an eruption either purpuric, urticarial, or erythematous, together with definite arthritic phenomena of pain and swelling, gastro-enteric symptoms, and a prolonged course, characterizes this affection. It is a disease of young adults. Unlike purpura hemorrhagica, this form almost never shows a sudden onset; for several days or a week the patient complains of weakness, sore throat, fever, anorexia, vomiting, and other general symptoms. These are followed by shooting pains and stiffness in the muscles and joints, the typical course showing the earliest involvement in the lower extremities. The œdema, though exceedingly variable, is at times intense and may occur in any part of the body, even on the face. The rash, which frequently appears in the vicinity of the affected joints, ordinarily corresponds to the simple purpuric type, but may show urticarial wheals or even nodular infiltrated areas and vesicles. In the case of a young woman whom I saw at the Massachusetts General Hospital, the urticarial spots appeared with great regularity late every afternoon for a period of eight days. In the same case there was considerable necrosis of the soft palate and both tonsils. Opinions differ widely as to the relation of this disease to rheumatism, but at present we have no definite evidence of any rheumatic origin.

Henoch has described another form of purpura which occurs mainly in children, and is marked by ecchymoses beneath the surface of the skin, bleeding from the mucous membranes, joint manifestations, renal and gastro-enteric symptoms. Diarrhœa and vomiting with intense abdominal cramps are especially characteristic, as are also the occurrences of malæna and hæmatemesis.

PATHOLOGICAL ANATOMY.—The petechiæ and ecchymoses constitute the only constant lesions. The conditions in the tissues in the immediate vicinity of the extravasations are of considerable interest. Many of the small blood-vessels show a very marked thickening with hyaline degeneration, and in many instances even necrosis of the wall, associated with extensive thrombus formation. About the vessels the connective tissue is densely infiltrated with blood corpuscles and blood pigment. Although this is not a constant occurrence, the muscle may show small hemorrhagic areas. Depending upon the severity and type of the disease, the mucous membranes and internal organs may likewise give evidence of hemorrhage. In a few instances, collections of blood have been found beneath the periosteum of the bones. No arthritic changes can be demonstrated beyond a moderate hemorrhage into the synovial membrane. Not uncommonly the spleen, Peyer's patches, and the lymph nodes are enlarged and contain much blood pigment.

COMPLICATIONS AND SEQUELÆ.—The complications which are most serious and which are most frequently encountered, are those arising in consequence of the internal hemorrhages, either parenchymatous or into serous cavities. Nephritis sometimes develops, even years after the purpuric attack. Rarely pneumonia or œdema of the lungs complicates the disease.

COURSE AND PROGNOSIS.—As in its symptoms, the course of purpura in all forms is subject to great variations, depending very largely upon the severity. In gen-

eral it may be said that the majority of patients recover. When the disease is of a mild character, the course is short, varying from a few days to weeks, seldom more than three, and occasionally terminating with only one crop of spots, but more frequently only after there have been several crops. The duration of the more marked types of the disease, especially those with hemorrhages from mucous membranes, is much more protracted, being rarely less than several weeks, often as many months, and, through the occurrence of relapses, even years. In the worst forms, the patient often dies within a few days from the onset. With the arthritic type, repeated relapses are apt to occur, thus making the convalescence protracted even for months or years. A fatal issue is seldom seen.

DIAGNOSIS.—Purpura so often accompanies other diseases that a diagnosis of the primary form may be difficult. One must always consider the possibility of the toxic form following various poisons, as mercury, phosphorus, and mineral acids, as well as the infectious purpura secondary to smallpox, scarlet fever, diphtheria, typhoid, measles, septicaemia, and syphilis.

Hæmophilæa, especially in the new-born, in some instances very closely resembles purpura of the hemorrhagic kind; but in the former the presence of hereditary factors, together with the bleeding from the umbilicus, and occasional jaundice, ordinarily suffices to differentiate them.

Scurvy.—In this disease we may have extravasation of blood into the subcutaneous tissues and muscles, giving indurated, hemorrhagic spots and patches not unlike purpura, but close attention to the circumstances and previous health will throw much light upon the diagnosis. Furthermore, the swollen and bleeding gums of scorbutus are never found in the latter disease. This disease, unlike purpura, may be endemic or epidemic.

Primary Anæmia and Leukæmia, coming on acutely with hemorrhage, must not be forgotten, since only a blood examination in certain cases serves to distinguish them from purpura.

Pseudoleukæmia may, in rare cases, present even greater difficulties, and can be certainly diagnosed only in the presence of enlarged spleen and lymph nodes.

Rheumatism, when accompanied by a hemorrhagic skin eruption, bears only a superficial resemblance to hemorrhagic purpura. In rheumatism there are, as a rule, higher fever, profuse sweats, much more marked pains in the joints, which move with greater frequency from one joint to another, considerable exudation into the joints, and more common association of cardiac complications.

Erythema of the exudative type, if causing ecchymoses, gives a picture suggestive of purpura; but the color of the skin, being due to congestion in the blood-vessels, disappears with pressure, to return when the pressure is removed.

Malignant Endocarditis can be readily distinguished by the presence of cardiac lesions.

TREATMENT.—For primary purpura, no treatment has given very satisfactory results. Rest in bed for a long period is desirable in all cases, and essential in severe forms, since the prolonged rest seems to lessen the chances of relapse as well as the severity of the attack. Mental activity, excitement, overwork, exposure to cold, and trauma of the skin must be provided against. The sick-room should be cool, the diet light and nutritious, and without stimulants of any kind. Acid drinks may be of advantage. If there is any tendency to constipation, mild cathartics, such as castor oil and cascara, or enemata, may be employed to advantage. Of considerable help are warm baths to which chlorides or carbonates have been added.

Of drugs, turpentine, according to McKenzie, is the most reliable remedy. When the coagulability of the blood is much diminished, Wright recommends the use of calcium chloride in twenty-grain doses, and claims to have seen excellent results following its use. Werlhof claims to have found in sulphuric acid a specific. When the bleeding has been marked, ergot, acetate of lead, tan-

nic acid and gallic acid in a few instances appear to have been of service. Osler and others advise the use of Fowler's solution given to the limit of tolerance. In cases of Schönlein's disease, the salicylate compounds appear beneficial, but give no such results as in rheumatism, and must be used with care. If collapse should occur the usual treatment by stimulants, by the employment of heat, or by injections of decinormal saline solution, should be adopted.

After-care demands a carefully regulated diet and a quiet life in the open air. Tonics may be employed if indicated, also iron and arsenic in the presence of anæmia. With the slightest tendency to a return of the purpuric symptoms, it is imperative that the patient should return to bed.

An examination of the urine should be made from time to time for a considerable period, since albumin has been known to appear even after the lapse of months, and in some cases a chronic nephritis has developed.

Edwin Allen Locke.

MORPHINE.—*Morphina* (C₁₇H₁₉NO₃ + H₂O = 302.34). An alkaloid obtained from opium.

ORIGIN.—Morphine is of great interest as being the first alkaloid ever discovered and probably of more medicinal importance than any other article of the materia medica. Its origin and occurrence are fully discussed under the title *Opium*. Its occurrence in the vegetable kingdom elsewhere than in the poppy capsule is not positively proven, but it is probable that it exists in minute amount in the milk juice of Argemone. Its preparation consists essentially in repeated macerations of the opium in distilled water, by which the morphine salts are dissolved out, filtering the solution, and adding alcohol and ammonia water, by which latter the salts are decomposed and the morphine is precipitated. The resulting crystals contain more or less impurities, consisting of other alkaloids, coloring matter, etc., and require repeated purification processes.

DESCRIPTION AND TESTS.—Colorless or white, shining, prismatic crystals, or fine needles, or a crystalline powder, odorless, and having a bitter taste; permanent in the air.

Soluble, at 15° C. (59° F.), in 4,350 parts of water, and in 300 parts of alcohol; in 455 parts of boiling water, and in 36 parts of boiling alcohol; also soluble in 4,000 parts of ether.

When heated to about 75° C. (167° F.), morphine begins to lose its water of crystallization. Heated for some time at 100° C. (212° F.), it becomes anhydrous. At 254° C. (489° F.) it melts, forming a black liquid. Upon ignition, it is consumed without leaving a residue.

Morphine has an alkaline reaction upon litmus paper. When crystals of morphine are sprinkled upon nitric acid (specific gravity 1.250 to 1.300), they will assume an orange-red color, and then produce a reddish solution gradually changing to yellow.

On shaking a small portion of morphine, in a test tube, with 10 c.c. of chlorine water, the latter will acquire a yellowish color. On now carefully pouring a small amount of ammonia water on the surface of the liquid, a brown or reddish-brown zone will form at the line of contact of the two liquids.

If to a neutral one-per-cent. solution of morphine, made by the careful addition of dilute sulphuric acid, a few drops of ferric chloride T. S. be added, a blue color will be produced which is destroyed by acids, alcohol, or heating.

On treating morphine with cold, concentrated sulphuric acid free from nitric acid, the liquid should not at once acquire more than a faintly yellowish tinge (absence of more than traces of *narcotine*, *papaverine*, etc.); and the subsequent addition of a small crystal of potassium permanganate should produce only a greenish, but no violet or purple, color (difference from *strychnine*).

On precipitating a solution of any of the salts of morphine by ammonia water, dissolving the washed precipitate in sodium hydrate T. S., shaking the solution with an equal volume of ether, and evaporating the ethereal solu-

tion, no appreciable residue should remain (absence of *narcotine*, *codeine*, etc.).

On adding 4 c.c. of potassium or sodium hydrate T. S. to 0.2 gm. of morphine, a clear, colorless solution, free from any undissolved residue, should result (absence of, and difference from, *various other alkaloids*).

ACTIONS AND USES.—In a general and brief way, morphine may be described as the typical somnifacient and general analgesic, with moderate locally analgesic powers also, a depressor of the motor spinal centres, an inhibitor of the pulse, a paralyser of the respiration, a mild antipyretic, and an inhibitor of general metabolism and of all secretions and excretions excepting the perspiration. The ordinary effects upon man are as follows, and occur in nine-tenths or more of those who take it: A short spell of conscious comfort and good feeling; freedom of thought; bodily and mental calm; a warm, pleasant, slightly numb feeling, especially in the finger tips and toes; absence of hunger; slight dizziness and absent-mindedness; dryish tongue; indifference to slight annoyances and discomforts; diminished pupils; sleepiness, and, if yielded to, sleep. Upon waking, if the dose is an ordinary medical one, more or less un-comfortableness, slight nausea or aversion to food, dry tongue, and the omission of the next regular stool. There is probably an undercurrent of each of the other classes of effects in every case, but in a typical one like the above they are so entirely overshadowed by the brain stupor as to be unnoticed.

The specific effects of morphine may be described as follows:

Absorption, Circulation, and Elimination.—Morphine is readily absorbed from the stomach, slightly less quickly from the rectum, more slowly from the vagina, very little from the skin, and almost not at all from the bladder. From the air passages, administered in spray or powder, enough is absorbed for local effect, and but little more; from abraded surfaces and granulations absorption is irregular, and may be too little to be of any benefit, or, on the other hand, too much for safety. From subcutaneous injections it is diffused with great regularity and effectiveness. In man, the usual time of absorption of a medicinal dose is as follows: By the stomach, empty or in active condition, the first symptoms appear in fifteen or twenty minutes, the full effect in, say, an hour; by the rectum, one must allow from one and one-half to twice as long, and about one-third larger dose for the same results; by the vagina, at least twice the time and twice the dose for any general effect; by the skin, only local results can be looked for. Hypodermatically, the first effects are generally felt in from three to five minutes, and the full influence in from fifteen to thirty. In the system it circulates as morphine, and a certain amount of it (what portion is not definitely known and probably varies under different conditions) is so eliminated. It is believed to be chiefly eliminated in the urine, as a result of which poisoning is readily induced when, for any reason, this channel of elimination is inactive. It is now known that much of it is excreted into the stomach and intestines, a varying portion of which is liable to be again absorbed. Advantage is taken of this fact, in opium poisoning, to destroy the morphine, by various methods, as the successive portions thus enter these organs. An appreciable amount is excreted by the liver and appears in the bile, and another small portion may make its appearance in the perspiration. In nursing mothers, morphine is very apt to make its appearance in the milk, and fatal cases of poisoning of infants have thus occurred. The question of the oxidation of morphine in the system, to any appreciable extent, is an open one, though this method of destruction in the stomach, in cases of poisoning, by the use of such agents as potassium permanganate, is thoroughly established. Owing to the action of the drug in checking those excretions upon which its elimination depends, poisoning is especially liable to result, through accumulation in the system, and this highly important fact should ever be borne in mind during its prolonged administration. The doses should

not be brought so close together as to fail in affording sufficient time upon the one hand for elimination and upon the other for tolerance to be established.

Idiosyncrasy.—Great variation is observed among individuals as to the effects produced upon them by morphine. In almost all cases, except when large doses are introduced suddenly into the circulation, it is possible to observe a primary stage of excitation before that of depression comes on, and it is in this direction that the differences referred to are most plainly visible. In very sensitive subjects, or those in whom control is less perfect, this primary stage may border on intoxication, being accompanied by a mildly convulsive condition of the spinal centres. In the after-effects of the drug, idiosyncrasy again strongly asserts itself, one subject waking refreshed and with but slight disagreeable sensations, while another suffers from headache, nausea, and general malaise. Itching is a frequent symptom and becomes extreme in some individuals. Again, the intestinal effect differs greatly in different persons, differences which can be understood only through a knowledge of the mechanism of the action of the drug upon this part of the system.

The action of morphine in inducing constipation is the effect of depression of the motor functions; yet it is possible for large doses to paralyze the inhibitory power of the splanchnic nerves, thus permitting increased peristalsis, with a laxative result. Thus has been explained the effect of opium in overcoming the constipation of lead colic, in which condition such inhibition is excessive. The somnifacient effect of opium is to be explained by its direct depressing effect upon the centres, in which the order of effects proceeds regularly from the higher to the lower faculties. It is customary to think of the existence of a primary stage of stimulation as accounting for the early symptoms of exhilaration; but it is doubtful if this be not merely a manifestation of the first stage of depression, affecting the cerebral inhibitory powers. How morphine acts in inducing a powerful and extreme contraction of the pupil is uncertain. Most physiologists are inclined to charge it to stimulation; but it is more in line with its known effects in other directions to regard it as the result of inhibitory depression.

The primary cause of the diminished secretions resulting from the action of morphine is believed to be a depression of the secreting centres.

The action of morphine upon the circulation, and more especially upon the respiration, and in other ways than those mentioned above, is more conveniently considered in connection with the toxicology of the subject.

Therapeutical Uses.—Among all the uses of morphine that of relieving pain undoubtedly stands at the head. There is no form of pain which cannot be relieved or wholly removed by its use, nor in which it may not be employed, subject of course to special contraindications. In this line may be cited its use as an anodyne in relieving an irritable cough. Although the modern use of codeine, heroine, etc., has to a great extent taken its place, morphine is still largely used and is of great value in such cases. It also gives great relief in pleurisy, although its employment should here be accompanied by great caution since it favors the formation of adhesions. Many cases of vomiting are relieved by morphine, even when the seat of the irritation is not directly in the stomach.

Morphine is of the greatest value in the treatment of peritonitis and other abdominal inflammations, though opium is here to be preferred, as elsewhere stated.

It is frequently of great value in surgical operations, not only to relieve the patient and afford sleep after the operation, but, with or without other anaesthetics, to deaden sensation as a preliminary thereto.

As a diaphoretic morphine is not a good agent, opium, especially in connection with other drugs, being preferable.

Morphine is a valuable supporter of the system, both in acute cases in overcoming shock, and in the exhaustion of disease, although its depressing effect upon the