

fruit, so formed, is small, hard, ovoid, seed-like, and finely bristly pubescent. It has a grayish-green color and strong, agreeable odor. A transverse section is nearly circular in general outline, with ten projecting ribs. The *Vittæ* are numerous, two or three times as many as the ribs, and are rather small. The seed on section is somewhat crescentic. Anise is apt to be pretty dusty, and is mixed with stems and various coarse impurities, requiring frequently to be winnowed or sifted, but it is not often adulterated. In one instance, many years ago, serious trouble was caused on account of its being mixed with conium.

The properties and uses of anise are wholly those of anethol, which constitutes about ninety per cent. of its one and one-half to three per cent. of volatile oil. It contains also a rather larger amount of fixed oil and a little gum and sugar. The dose is 0.5 to 2 gm. (gr. viij.-xxx.). Excepting the oil, there is no official preparation.

*Oil of Anise.*—A volatile oil distilled from anise. It is colorless or pale yellow, of characteristic odor and taste, has a specific gravity of 0.980 to 0.990 at 17° C., and rotates very slightly to the left. At a temperature of from 14° to 19° C. it congeals. More than ninety per cent. of it is anethol, which gives its properties, and which may be more advantageously employed, as uniformity is thus secured. It belongs to the more carminative class of volatile oils, and shares the diffusive stimulant properties of volatile oils in general. It is, at the same time, of an unusually pleasant flavor and much used for purely flavoring purposes, especially as an addition to liquors. Its pleasant flavor also makes it of special use in treating the flatulent colic of infants, and in adding to medicines which have a tendency to gripe. The dose is ℥ ij. to xv. The official preparations are the *Aqua*, of one-fifth of one per cent. strength, and the *Spiritus*, of ten-per-cent. strength. The *Sp. Aurant. Comp.* contains one-half of one per cent., and the *Tincture Op. Camph.* two-fifths of one per cent. It also flavors several other preparations.

*Anethol* (C<sub>10</sub>H<sub>12</sub>O).—The active constituent of oil of anise, of which it constitutes about ninety per cent., of oil of star anise, which contains somewhat less of it, and of oil of fennel, which contains about sixty per cent. of it. It occurs both as a solid and as a liquid, the former in colorless crystalline plates. Its specific gravity at 25° C. is 0.985, and it melts at 21° to 22° C. It is freely soluble in alcohol and slowly in water. Its odor and taste are purely those of anise, and it may be used with advantage in doses of one to ten grains as a substitute for the above-named oils.

**ANISE, STAR.**—*Illicium*. "The fruit of *Illicium verum* Hook. (fam. *Magnoliaceæ*)" (U. S. P.). The species here named is the Chinese, or sweet star anise, besides which there is a poisonous Japanese species. When Linné applied the name *I. anisatum*, supposing that he had the former, he really had the latter, as his description and figure clearly show. As a result of this mistake, the poisonous species must always bear the inappropriate name *I. anisatum* L. (Syn.: *I. religiosum* Zucc.), and Hooker's later name, *I. verum*, must pertain to the useful species.

The plant is a handsome small tree. The fruit consists of the eight carpels, united to a carpophore, from which they can be easily separated, but distinct from one another. Each carpel is short, laterally compressed, "boat-shaped," pointed at the upper and outer extremity, and dehiscent at the upper and inner border. The pericarp is deep brown, rather woody, brittle, fragrant, and spicy. The seeds, which can be seen

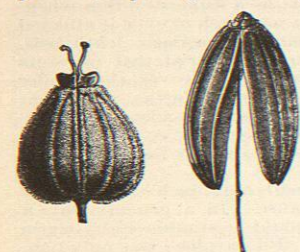


FIG. 208.—Anise, Enlarged About Six Times.

through the split in the carpel, although this is not usually wide enough to let them fall out, are also brown, but very smooth and shining. They are less fragrant than the carpels, but contain considerable fixed oil in their kernels. Both testa and pericarp show, under the microscope, numerous oil cells, and the parenchyma of the seeds reveals drops of fat.

**COMPOSITION.**—Besides sugar, gum, and oil, which, although abundant, have no practical value, star anise is remarkable for containing a large percentage (from three to five) of an essential oil, so similar in odor, taste, properties, and composition to that of anise, that no means can be relied upon to distinguish them from each other, except by the greater percentage of anethol in the latter, on account of which it congeals at a higher temperature.

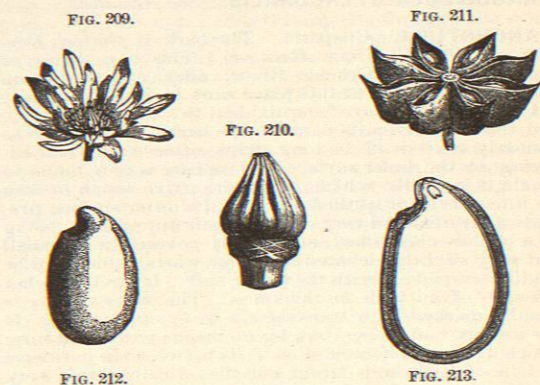


FIG. 209.—*Illicium verum*, Flower. FIGS. 210 AND 211.—Gynæcium and fruit. FIGS. 212 AND 213.—Seed, entire and in longitudinal section. (After Baillon.)

*Illicium* is never prescribed, and is recognized only as a commercial source of "oil of anise." This oil, owing to its weaker action, should not be indiscriminately substituted for oil of anise.

H. H. Rusby.

**ANKLE JOINT.**—As this joint supports the weight of the body, considerable stability is required of it. This is secured mainly by the shape of the articular surfaces, which interlock like a mortise and tenon. The tibia and

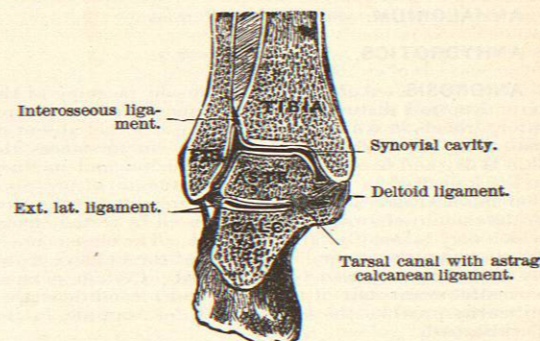


FIG. 214.—Frontal Section of Right Ankle.

fibula, strongly united by ligaments (interosseous and inferior tibio-fibular, Figs. 214, 215, and 218), form the mortise by embracing with their extremities (malleoli) the tenon-like astragalus. The joint is a hinge, its movement angular, and in a single oblique plane (corresponding to the outward pointing of the toes) through an arc of some eighty degrees. In the fœtus of six weeks (Henke and Reyher) the joint is arranged like that of

some marsupials, so as to admit of rotation, the astragalus sending a process up between the tibia and fibula. A trace of this movement remains in the adult. To

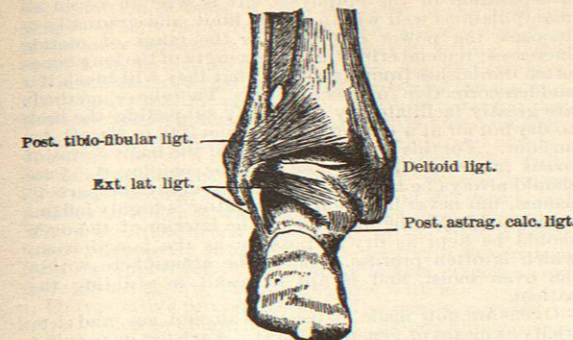


FIG. 215.—Rear View of Left Ankle.

guard against the thrust of the tibia and fibula when alighting on the extended toes (the commonest form of

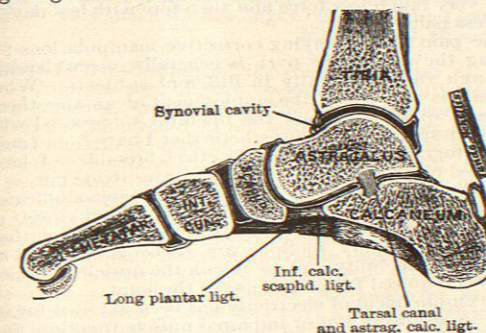


FIG. 216.—Sagittal Section of Right Ankle.

dislocation arises thus), the astragalus is narrower behind than in front, averaging 35 mm. behind and 40 mm. in front. And a slight lateral movement is therefore possible when the malleoli are thrown back in complete extension.

The malleoli are held against the articular surfaces in all positions by the elasticity of the shaft of the fibula, which bends inward when the wedge pushes the malleoli apart, springing back during extension. The axis of rotation of the curved superior surface of the astragalus (Fig. 216)

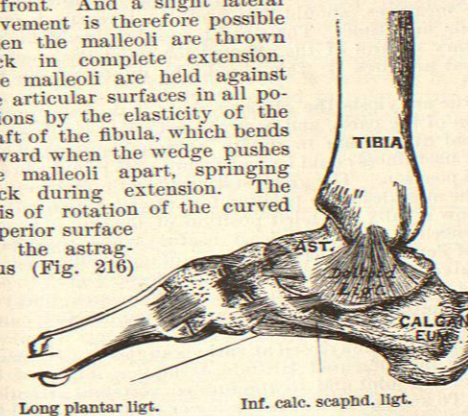


FIG. 217.—Inner Side of Right Ankle.

passes through the most fixed part of the bone, viz., the tarsal canal, touching the outer malleolus but passing below the inner, which does not descend so low (Figs. 214 and 215). The original capsular ligament (see *Arthrology*) remains in front and behind as a thin

layer of fibres connected with the synovial membrane and strengthened by the extensor tendons in front and the tendon of the flexor longus hallucis behind. Effusion into the joint usually shows first in front. On the sides strong bands are developed. The internal lateral ligament (Figs. 214, 215, and 217), also called the deltoid, from its triangular form, is the strongest of these; in dislocations usually tearing the bone apart. It is a thick bundle, ensheathing the internal malleolus and passing to the calcaneum, the scaphoid, and the calcaneo-scaphoid ligament. The tendon of the tibialis posticus strengthens it. Deeper fibres pass to the astragalus. In amputating at the ankle the joint is opened on the inner side, because of the shortness of the malleolus, and the existence of this deep band

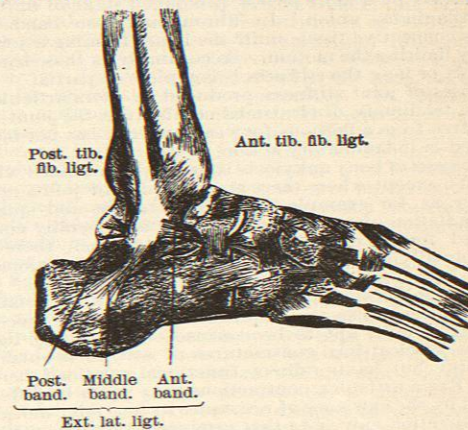


FIG. 218.—Outer Side of Right Ankle.

should be remembered. The external lateral ligament (Figs. 214, 215, and 218) is composed of three bands which radiate from the lower part of the malleolus, the anterior and posterior bands passing to the astragalus, the middle one to the calcaneum. The synovial cavity is quite extensive, communicating above with the inferior tibio-fibular articulation. It is said to contain more synovia than that of any other joint (Morris). Its capacity is not affected by the position of the foot, and no change of posture takes place during inflammation of its membrane.

Sensations of pain are sometimes felt in the ankle without lesion of the joint, caused by some injury to the long nervous trunks which supply it, viz., the long saphenous, connected with the lumbar plexus, and the anterior tibial with the sacral plexus. The vascular supply arising from twigs from the anterior and posterior tibial arteries, and discharging by both saphenous veins, may be interfered with by tight boot laces and occasion a dull pain.

Frank Baker.

**ANKYLOSIS** (sometimes spelled anchylosis).—(ἀγκύ-λος, a stiff joint). Union of the bones forming a joint, resulting in a stiff joint. Ankylosis, false or spurious, is due to the rigidity of surrounding parts. Ankylosis, true or bony, is the proper term to employ when the connecting material is bone; and ankylosis ligamentous, when the medium is fibrous" (Gould's Medical Dictionary, 1897).

**SYNONYMS.**—English: Stiff joint, fixed joint; French: Roideur articulaire, Anchylose; German: Gelenkverwachsung, Gelenksteifigkeit; Italian: Anchilosi; Latin: Ankylosis cartilaginea, Ankylosis fibrosa intercartilaginea, Ankylosis fibrosa interossea, Ankylosis ossea.

A strictly correct definition would designate a fixed angular position of a joint, but this restriction no longer obtains, the word now being used to describe joints, in whatever position, that have become more or less stiff.

Qualifying terms are used to indicate the extent of the stiffness, such as false, spurious, true, bony, ligamentous, partial, complete, incomplete, etc., all of which can be best understood with the least possible confusion if the word ankylosis is accepted as a synonym for stiffness.

ETIOLOGY.—Traumatism, gonorrhoeal rheumatism, suppuration in joints, tuberculous osteitis, tuberculous synovitis, syphilitic affections of joints, long fixation when a fracture is near or extends into a joint, osteitis deformans, etc.

PATHOLOGY.—In complete, *i.e.*, bony, ankylosis the bones forming a joint are limited by callus in the same manner that union takes place after a fracture in the shaft of a long bone, or bridging by callus takes place at one or more places around the joint. Usually osseous ankylosis is preceded by a more or less prolonged stage of fibrous or cartilaginous union. In fibrous ankylosis bands of fibrous connective tissue unite the bones forming a joint, thereby limiting the motion. Accordingly as these bands are short or long the stiffness is complete or partial.

In cases of joint stiffness produced by extra-articular, fibrous, tendinous, or cicatricial contracture the joint remains free from adhesions for years when it has not been involved in inflammatory action.

DIAGNOSIS of bony ankylosis is usually unattended with difficulty except where there are a number of joints near together, as, for example, the carpus, tarsus, and spine. This limitation of motion in one joint is generally compensated for by excess of motion in another, thereby rendering all the surrounding parts capable of functioning in a very nearly normal manner.

Fibrous ankylosis is more difficult to discern, especially if pain accompanies the required manipulative procedures. It is most apt to be confused with fibrous, ligamentous, or cicatricial contractures of soft parts outside of a joint, but having direct functional relations therewith. Extra-articular contractions may often be differentiated by the existence of resistance to free joint motion in one direction only, *i.e.*, that produced by the contracture, while the joint moves more or less freely in other directions. Muscular contracture, whether voluntary or involuntary, is but temporary, and the rigidity of the surrounding parts is clearly discernible.

As muscular rigidity is one of the most important and reliable symptoms of joint inflammation, it is a serious error to anesthetize a patient for examination of a joint until the absence of muscular fixation has been clearly proven. In such cases the anæsthetic relaxes the muscles, leaving the joint free for movements which are seriously prejudicial and which were instinctively guarded against by the patient.

If there has been no muscular fixation much may be learned by the careful study of a joint while the patient is unconscious. It can be definitely determined whether it is ankylosed or only partially so. The yielding of the soft parts above and below the joint suspected may be prevented by tightly bandaging them, the joint itself being left uncovered.

TREATMENT.—The most important part of the treatment lies in prophylaxis, prevention of the occurrence of ankylosis, or, if it is inevitable, in so disposing the parts that the best position for future usefulness may be obtained. The trend of modern surgery is greatly to shorten the time of fixation of a fractured bone, in the effort to avoid impaired joint function, as well as to secure a freedom from muscle atrophy. The earlier application of passive motion and massage is being resorted to, and many of the serious deformities which formerly followed fractures are now less frequently seen.

Each individual joint has special features and presents special difficulties that must be carefully considered in applying any form of treatment. The most useful position for a stiff joint is still subject to discussion; no general rule can be laid down. Fibrous or incomplete ankylosis may require attention to overcome a faulty position, or to increase the extent of the motion. This is to be accomplished by passive motion made in the direction of the normal action of that joint. Brisement forcé is a

term applied to the use of such force as the surgeon can judiciously apply, bearing in mind the danger of breaking the shaft of the bone used as a lever or of producing a separation of the epiphysis. It is wise to begin all manipulations well within a safe limit, and gradually to increase the power employed as the range of motion increases; remembering that the strength of the long bones often diminishes from disuse and that they will break if a sudden corrective force is applied. The above methods are greatly facilitated by previously subjecting the limb to dry hot air at a temperature of from 300° to 400° F. for an hour. For this purpose some one of the many forms of ovens made for the purpose may be employed. Care should always be taken to wrap thoroughly the parts in flannel, but never in cotton. The latter is highly inflammable and holds the moisture. The interior of the oven should be kept as dry as possible, as the perspiration, which is often profuse, renders the atmosphere within the oven moist, and is apt to result in scalding the patient.

Ovens are now made for use with alcohol, gas, and electricity as means of generating heat. Each has its peculiar advantages, but the results are not different. The effect is to soften the fibrous adhesions very much in the same way that old glued joints of wood are softened, enabling the surgeon to obtain movements of a partially stiff joint with very much less force and therefore with less danger and less pain.

The pain accompanying corrective manipulations following the use of the oven is generally inconsiderable, although varying greatly in different subjects. When the pain is very great, the employment of an anæsthetic that acts quickly enables the operator to proceed with greater despatch. The anæsthetic that I have found most satisfactory for this purpose is ethyl bromide. I have also used chloroform and at times nitrous oxide gas.

Fixation appliances of any kind are contraindicated during corrective procedures in fibrous ankylosis, as increased freedom of movements is desired rather than fixation. Voluntary motions are to be encouraged to increase the mobility and to regain the muscle function which is required for proper use of the joint.

The employment of electricity has been extolled for its effect in restoring lost or impaired muscle function, and when used by skilful physicians it is more likely to produce the desired effects than when crudely applied by a more or less non-medical attendant.

Massage is a means of restoring impaired muscle power that should not be overlooked, and, like all other therapeutic measures, should be carefully prescribed as to methods and time. The object sought should be the voluntary control of the affected joint and the mechanism that actuates it; this should be impressed on the patient.

In true ankylosis the object sought is the most useful position of the parts, and here careful study is necessary to avoid attempting to obtain a movable joint when greater usefulness could be had from a stiff joint in an approved position. The greatest diversity of opinion exists as to the most desirable position for ankylosed joints. In the elbow a fully extended position of the arm is generally conceded to be the least useful, while the exact angle of flexion has been the cause of much discussion. Some advocate a right angle, others a lesser angle, to enable the patient to bring the hand to the mouth; and yet any rigid position is more or less conspicuous and cumbersome.

The hip when ankylosed at various angles can be made useful by the increased latitude of motion imparted to the other hip joint and to the lumbar vertebral articulations. To such an extent is the lower spine reciprocal in loss of function of one or both hip joints that it has been called the third hip joint. Ankylosis of a hip at right angle to its fully extended position has frequently been observed to be useful for progression. The third hip joint has also developed in efficiency in cases in which a hip joint was ankylosed in the most approved position, *i.e.* that of almost full extension, facilitating the move-

ments of the entire pelvis in walking and especially in sitting, and approaching very closely normal action.

The arguments in favor of a fully extended leg versus slight flexion in cases of bony ankylosis of the knee appear to be about equally divided. The slightly flexed leg is certainly somewhat less in the way in sitting, and it enables the patient to develop a more graceful carriage, but all of these are cast into insignificance by the mechanically faulty position of flexion. Ashhurst refers to a case in which the knee remained straight with apparent bony union for eight years and then began to yield, and within a year was bent to a right angle and rotated. The fully extended or straight position is less liable to bend because its weight-bearing function is disposed in the mechanical position in which it was designed to act most efficiently. Where the quadriceps attachment to the tibia is maintained or properly substituted, the powerful flexors will have less opportunity of producing flexion, which, as experience has shown, tends to increase with use.

The operative procedures most frequently resorted to are: excision to obtain a false joint (pseudarthrosis); excision to obtain a better position of the limb; osteotomy, breaking the bone after partially cutting it with an osteotome; and osteoclasis, breaking the bone without any cutting. These different procedures have especial advantages in different joints, and can be fully studied and appreciated only under the headings of the individual joints.

H. Augustus Wilson.

ANNATTO (*Orleana*).—This coloring matter is obtained from the seed of *Bixa Orellana* L., a small tree of South America, belonging to the order *Bixaceæ*. The plant is also cultivated in all tropical countries. Commercial annatto is prepared in a variety of ways, having for their object the separation from the seed of its coloring matter, and its preservation in a moist or dry condition. The bruised seed is sometimes washed over a sieve and the liquid allowed to stand until the annatto subsides; or it is separated by fermentation. The product is a brownish-red, resinous substance, usually in moist masses, but sometimes in dry, brittle cakes. It has often little or no, sometimes a sweetish, resinous odor, and a saltish-bitter taste. Some lots have a very disagreeable smell, and are said by Hager to be prepared with urine. Two kinds are said to be imported from French Guiana, one without unpleasant smell, the other disagreeable. A third variety comes also from Brazil, but this is not so highly esteemed as the best French.

Annatto is a mixed substance, nearly insoluble in water, soluble in alcohol, ether, fatty and essential oils, making orange-red solutions. It consists principally of a yellow (*orellin*) and a red (*bixin*) resinous coloring matter.

The principal demand for annatto is for dyeing fabrics, but it is also extensively employed to color butter and cheese. In the tropics it is largely employed for coloring foods for table use. Internally given, it is said to be "tonic and antidiysenteric."

W. P. Bolles.

ANODYNES.—This term (*a*, privative, and *δύνη*, pain) is applied synonymously with *analgesics* (*a*, and *ἀλγος*) to a small class of drugs whose peculiar action is to relieve pain. The anæsthetics, which also relieve pain, but by suspending all sensation, together with consciousness and motility, are not anodynes.

By far the most important member of this group is opium. (For detailed account of the action of this drug, see *Opium*.) Though other remedies occasionally relieve the milder degrees of pain, opium alone can be relied upon to remove severe suffering. It has its limitations, in occasional paroxysms of agony such as attend the passage of renal and gall stones, when nothing short of absolute anæsthesia will bring relief. Here opium, in doses so high as even to endanger the life of the individual, is without effect on the pain. In the ordinary forms of severe pain a failure of opium to give relief is almost always due to improper adjustment of the dose. Of course, the subsequent ill effects of opium, such as nausea, constipation, and narcotic addiction, may be so

marked as to form a contraindication, more or less strong, to its use. But the point here emphasized is that, as an anodyne pure and simple, opium, if properly administered, is almost always successful. In certain subjects, particularly women and nervous persons, the intoxicating effect of opium predominates in the moderate doses. In such cases the dose must be cautiously increased beyond the limits usually prescribed, or else the opium must be combined with some nervous sedative, as bromide of potassium or chloral. For it should be remembered that opium is, in analgesic doses, by no means always a hypnotic. In many cases in which it completely removes pain, the patient does not close his eyes in sleep the whole night.

The common cause of failure in securing the analgesic effect of opium is conformity with a strict and arbitrary posological standard, and forgetfulness of the fact that there is much difference in the capacity of different individuals, and of the same individual at different times, for the drug. Under the influence of severe pain, the toleration for opium increases enormously. In general and pelvic peritoneal inflammations, for instance, it may be necessary, in order to get the full effect of opium, to administer it in doses up to four grains (or its equivalent in morphine) at a time, and to repeat with sufficient frequency to keep the patient just short of narcotism. This bold use of opium in pelvic inflammation has come into practice of late years, and some of the figures published of the amounts actually administered are very large. They are not given here, however, for the reason that no definite figures reported in one case should have any weight in determining the amount to be given in another case. It is needless to say that, in the case of a patient suffering from a frank peritonitis, which calls for the employment of these heroic doses, and when the individual is held just on the verge of narcotism, with respirations perhaps lowered to ten or twelve per minute, no standing order should be given in advance for a stated administration of the drug, and that each dose should be given by the practitioner himself, who should on no account leave the case, and who should have at hand atropine and a faradic battery ready for instant use in case the narcotism goes too far.

Among the derivatives of opium, morphine, as an anodyne, stands *facile princeps*. Its convulsant, constipative, and diaphoretic properties are all less than those of opium, while as an analgesic it is even more active than the drug from which it is derived. Of the other principal alkaloids, the analgesic effect upon man is in the following order: narceine, thebaine, papaverine, and codeine. The interval between the strongest of these and morphine is, however, great, one authority claiming that narceine is four times weaker than morphine, and in practice it is found that none of them can be relied upon with certainty in pain of a severe character. The promptness and effectiveness of morphine as an anodyne are usually enhanced by the hypodermic method of administration.

Chloroform is at times an anodyne. This is especially the case when injected subcutaneously in the vicinity of a nerve, as in sciatica and other forms of neuralgia. Administered by the mouth it also has a local analgesic effect, due partly, no doubt, to its revulsive counter-irritant action. It is thus of use in gastralgia and flatulent colic. The spirit of chloroform, in doses of ʒ i. in hot water, is an eligible form for the internal administration of chloroform, and the Spiritus Ætheris Compositus, commonly called Hoffmann's anodyne, may be used in the same doses for abdominal pain. The so-called chlorodyne, a British nostrum, has under various modifications been pretty widely used. One of its many formulæ is this:

Morphinæ hydrochloratis . . . . .	gr. viij.
Aquæ . . . . .	ʒ ss.
Acidi hydrochlorici . . . . .	ʒ ss.
Chloroformi . . . . .	ʒ iss.
Tinct. cannabis indic. . . . .	ʒ i.
Acidi hydrocyanici U. S. P. . . . .	ʒ iij.
Alcohol . . . . .	ʒ ss.
Ol. menth pip . . . . .	ʒ ij.
Oleoresinæ capsici . . . . .	ʒ i.

The adult dose is from five to ten drops. This may be well replaced in the same dose by the Tinctura Chloroformi et Morphinae, B. P., which was intended to be its official substitute.

Belladonna may be considered a feeble anodyne. Administered with opium it has not only a corrigent effect, mitigating some of the unpleasant symptoms of the latter drug, but is also apparently, to a certain extent, an adjuvant.

The various coal-tar products, whose name is now legion, have a certain anodyne value. Antipyrine, phenacetin, acetanilid, lactophenin, are a few among the many. (See also under *Antispasmodics*.)

Cannabis indica is a still weaker anodyne, if it deserves the name at all. Its hypnotic action can overcome a moderate degree of discomfort, but not much actual pain. It is of some repute in the treatment of chronic migraine.

There are, besides the foregoing, one or two drugs which deserve mention as local anodynes, although their commoner use is as local anesthetics. For example, cocaine is chiefly employed to produce anaesthesia, as of the cornea, or by injection to anaesthetize the field for a circumscribed operation. Its anodyne action may be obtained, however, in conjunctivitis, in painful hemorrhoids, etc. A four-per-cent. solution may be employed. But the ever-present danger of establishing the cocaine habit must always be borne in mind before resorting to cocaine as an anodyne.

Cocaine itself is much less soluble in water than its salts, e.g., the muriate; but the former is soluble in fats, while the latter are not. Hence in ointments the cocaine itself should be used, and not its salts.

Eucaine has been found in many respects a useful substitute for cocaine. *Charles F. Withington.*

**ANONACEÆ.**—(The Custard-Apple family.) A family of nearly fifty genera, pertaining almost wholly to the tropics, of both hemispheres. They yield a number of the most delicious of known fruits, such as those of *Anona* and *Duguetia*. They are classed near the Magnolias and Myristicaceae, and, like them, are rich, chiefly in the bark, in volatile oils, for which they are considerably used in domestic practice. *H. H. Rusby.*

**ANOSMIA.** See *Smell, Disorders of.*

**ANTACIDS.** See *Alkalies.*

**ANTHELMINTICS.**—Agents rendering harmless or killing worms. A *vermifuge* is an agent which expels worms, a *vermicide* one which kills them, but these terms are occasionally used as synonyms.

*A priori* any agent thus used must either be insoluble in the gastro-intestinal juices, and therefore non-absorbable, or else, if soluble, must possess the faculty of being innocuous to the host at the same time that it is destructive to the intruder. Drugs of this latter class are few, and the employment of nearly all absorbable drugs is distinctly hazardous, for their dose is necessarily large, and they not infrequently produce various phenomena of poisoning.

For convenience worms may be divided into three groups, each with its own treatment: tape worms or tenia; round worms; seat, pin, or thread worms.

**Tape Worm or Tenia.**—Drugs used in this condition are: pelletierine, and pomegranate from which it is derived, pumpkin seed, thymol, cusso, kamala, salicylic acid, silver oxide, chloroform, turpentine, and areca or betel nut.

In the treatment of tape worms the method of procedure is of as much importance as is the choice of the remedy to be employed. An absolute essential is the withholding of all food from the patient for from twelve to twenty-four hours. If this is impracticable the drug should be administered before breakfast, a light supper only having been partaken of the previous night. About three-quarters of an hour after the administration of the anthelmintic an active purge should be administered. For

this purpose an ounce of compound tincture of jalap (French Codex) will be found useful, or a large dose of calomel may be used—and calomel has the advantage of causing a profuse outpouring of bile, which seems to be particularly obnoxious to these parasites. As the desideratum is the removal of the head or heads of the worm or worms, the stools should be carefully examined for their presence, and in any case a high rectal injection should be given, preferably of saline solution, as this is most useful in bringing away the head of the tenia, which may be narcotized but not dead. It is of the utmost importance that the bowel discharges be destroyed.

Of the agents used against this worm, three are largely and successfully employed, though at times two or even three drugs may have to be successively tried, and the treatment may even then fail. *Aspidium* is most useful in the form of the oleoresin, given in four capsules of fifteen minims each, at one dose, or in two doses half an hour apart. It is not to be forgotten that oils render soluble this agent, and never, therefore, should they be employed. Pelletierine may be used as the tannate, of which the dose is three grains, or else as the liquid alkaloid prepared by Tanret; the latter is very expensive and not always obtainable. *Pepo* is most effective and may be used by taking two ounces of the powdered pumpkin seeds to make an emulsion or a confection, this amount being the usual dose. *Thymol* has quite recently been advocated, and may conveniently be given in capsules of ten grains each, one capsule being taken every quarter of an hour until two drachms are taken. *Pomegranate* is used by taking two ounces of the bark, adding this to two pints of water which is boiled down to one pint, and of this a wineglassful is taken every half-hour. *Areca nut* is a comparatively new remedy, which depends upon a volatile oil and upon its active principle, arecaine, for its efficacy; it is employed in the dose of two drachms of the powdered nut. *Kamala* and *cusso* have the disadvantage of being required in large dosage, while they are most repugnant to the taste; the former is given in syrup, in the dose of two drachms, to which has been added some hyoscyamus to prevent griping, and the latter as the powdered flower, of which half an ounce is used to make a decoction with a pint of water. Of *koosin*, the active principle of *cusso*, twenty to forty grains may be given in capsule. The dose of *silver oxide* is one grain three times a day; it is of doubtful value. Salicylic acid, one-half drachm, combined with an equal amount of sodium bicarbonate, added to a pint of water, has been recommended, but the taste of this solution is a serious drawback to its use. *Turpentine* and *chloroform* are certainly effective, but belong to the class of absorbable, and therefore dangerous, drugs. The dose of each is one drachm, and in their administration glutol capsules will be found of advantage.

Children under two years of age react badly to teniacides as a rule, and great care must be taken in treating them for this condition.

**Round Worm or Ascaris Lumbricoides.**—These worms affect children rather more than adults, and infest the upper part of the small intestine, though rarely they work their way up into the stomach, and even into the œsophagus and pharynx. Drugs used against this parasite are: santonin (the glucoside of santonica or levant wormseed); spigelia or pink root; chenopodium or American wormseed; turpentine; azedarach or pride of China; mucuna; tin. Probably the best of these is santonin, which can be conveniently administered, as it is tasteless, in powders of two grains, alone or combined with calomel. Equally useful is spigelia in the form of the fluid extract, of which the dose is two drachms, or, better, the fluid extract of senna and spigelia (unofficial) may be used in a dose of half an ounce, the senna in this case acting as a purge. Oil of chenopodium, in the dose of from twenty to thirty minims, which may be dropped on sugar, is very useful; turpentine, half an ounce, combined with castor oil, one ounce, is generally most efficient, but should not be used because poisonous effects, particularly renal inflammation, may occur from its absorption.

Azedarach has the disadvantage of requiring a large dose, two ounces of the drug being added to a pint and a half of water, which is then made into a decoction by boiling the mixture down to one pint; it is nevertheless most useful. Mucuna and tin are barbaric relics, their administration being as crude as their preparation and mode of action. They belong to the class of so-called mechanical anthelmintics. Mucuna, a West Indian plant, was used by scraping the pods of the plant of the hairs or spicules which cover them and adding to this molasses or syrup. The patient swallowed this mixture, and the spicules in their passage down the intestines were supposed to transfix the worm. The tincture and decoction have no virtue, and mucuna, so largely employed at one time, has passed away.

In treating any patient for the presence of ascariides, it is necessary, as in the case of tenia, that food be abstained from for twelve or, better, twenty-four hours; that an active purge be administered about three-quarters of an hour after the remedy has been taken; and that the bowel discharges be destroyed.

**Seat, Pin, or Thread Worms: Oxyuris Vermicularis.**—These worms generally infest the rectum and colon, and are most common in children. The following drugs are those usually employed, but anthelmintics used against the tape and round worm can be used, as many of them are equally destructive to the seat worm: quassia; saline solution; carbolic acid; lime water; iron; tannic acid and drugs containing large amounts of tannic acid, such as catechu, kino, and krameria.

Quassia is unquestionably the most efficient of this list, and has at the same time the advantage of being non-irritant and non-poisonous. A rectal injection, consisting of one ounce of the fluid extract added to a pint of water, or of a decoction made of an ounce of quassia chips added to a pint of water, is given. Before using this or any other injection the bowel should be thoroughly cleansed with soap and water, and it is imperative that the injection be retained, by pressure over the anus, for fifteen or twenty minutes, and that the region around the anus be thoroughly washed with salt and water. Failure to observe these precautions will render the treatment of little avail. Of the remaining drugs, saline solution is probably the best; carbolic acid (one-per-cent. solution) has its advocates, and is often used immediately after the quassia injection; it should not be employed, I believe, for two reasons: first, because it may cause sloughing, and, secondly, because dangerous symptoms may follow its absorption from the rectum. Alum (one ounce to a pint of water), lime water, iron, and tannic acid act as astringents.

For cleansing with soap and water and for injecting the medicament a soft rubber catheter or rectal tube will be found most useful in aiding the solution to go well up into the colon, and it is advisable to repeat the treatment two or three times at intervals of a day or so.

*Charles Adams Holder.*

**ANTHRAROBIN.**—Dioxyanthrol, desoxy-alizarin, leuko-alizarin, C<sub>15</sub>H<sub>10</sub>COH, CH, C<sub>6</sub>H<sub>2</sub>(OH)<sub>2</sub>. This is prepared by the reduction of commercial alizarin in warm ammoniacal solution with zinc dust, and subsequent filtering into water acidulated with hydrochloric acid. The resulting precipitate is washed and dried.

Anthrabin is a yellowish-white, granular powder, insoluble in water and dilute acids, slowly soluble in chloroform and ether, and freely soluble in glycerin and in ten parts of alcohol. In aqueous solutions of alkalies or alkaline earths it dissolves with a brownish-yellow color, which, through oxidation and the reformation of alizarin, rapidly turns to green and then blue. Claimed to have the same virtues as chrysoarobin, this substance has the advantages of being non-irritating, and of causing but slight staining of the skin. Clinical reports differ as to its efficacy; for example, Jackson says that it is a weak preparation and not of much value, while Behrend and others consider it superior to chrysoarobin. These latter use it as a parasiticide and stimulant to the skin,

and especially commend its use in psoriasis, pityriasis, tinea tonsurans, trichophyton, and herpes. It is employed in ten- to twenty-per-cent. ointment, or in solution in glycerin or alcohol, or in collodion. It must not be applied in the immediate neighborhood of the eye, as it has a tendency to spread. A prescription that is recommended contains anthrabin and salicylic acid, of each one drachm, in alcohol sufficient to make one ounce. Behrend's mixture consists of anthrabin 10 parts, borax 8 parts, in water 82 parts, or he uses a ten-per-cent. solution in glycerin. *W. A. Bastedo.*

**ANTHRAX.\***—(Synonyms: Carbunculus Contagiosus; Milzbrand; Charbon; Wool-Sorter's Disease; Mal de Rate; Mycosis Intestinalis; Anthracemia; Malignant Pustule; Splenic Fever.) (See also *Carbuncle* and *Furuncle*.)

A specific, highly infectious disease, common to most vertebrate animals and communicable to man (though in varying degree). The disease is not contagious in the ordinary sense of the word, but it is in a high degree communicable by means of secondary media of infection. It maintains its virulence for long periods, and suffers no deterioration from transportation or variations of climate or other external conditions. It appears as an acute intoxication, usually of a restricted part of the body, but later of the entire body, and is due to the invasion of the tissues of its host by the bacillus anthracis. The disease is primary in animals, and occurs in the human subject in two distinct forms, viz., by direct inoculation, or indirectly by eating the flesh of animals infected with anthrax or by inhaling dust which is contaminated with the poison of anthrax, as in the operations of currying hides, upholstery, mattress-making, etc. The blood, tissues, and excretions of an animal dead from anthrax are found to contain a minute organism, in the form of a rod bacillus, which has been demonstrated to be the specific and invariable cause of the disease, and may be obtained in every fully developed case of anthrax. At the point of invasion the bacillus first acts as a purely local poison, producing only a local irritation, but it soon multiplies rapidly, and later is conveyed by the circulating blood into all parts of the body, where by its enormous numbers it blocks the capillaries with embolic masses of bacilli, causing innumerable hemorrhages into the organs and tissues, and effusions into the serous cavities and cellular structures; and by its specific toxin acting upon the sympathetic nerve centres it produces great depression of the vital functions, which often ends in death within a few days.

Anthrax is the most widely spread and the most destructive of all communicable diseases which affect animals. The malady is primary in the herbivora, and is found in all countries. It is very prevalent in parts of France, Germany, Italy, Persia, North and South Africa, and South America. It is least prevalent, though not absent, in Australia, North America, and the British Isles. Epidemics of the disease often appear among cattle and sheep of affected regions, and may be fatal at the rate of from fifty to seventy per cent. of the animals attacked. It also attacks human beings in infected districts by inoculation from the lower animals, and is often attended with great fatality. All classes of vertebrate mammals are susceptible to anthrax. The disease does not spread by contact or association; it can be acquired only by the introduction of the infective organisms into the body, either through an abrasion of the skin or a defect in the mucous membranes, or by the spores of the bacilli finding their way through the epithelial lining of the alimentary canal or respiratory tract, and so causing general infection. The inoculation of these organisms produces the same fatal effect upon animals as does the infection from the original source of the primary disease. Blood taken from a diseased animal is also fatal if introduced into the tissues of another susceptible healthy animal; but if the

\*The bacteriology of anthrax will be considered in the article entitled, *Bacteria, Pathogenic*. For this reason no allusion has been made to the subject in this article.