

the trunk to the periphery. It paralyzes the heart, its action ceasing in the diastole. The voluntary muscles soon lose their irritability, and become stiff.

Preyer maintains that large doses of hydrocyanic acid paralyze the heart at once; that moderately fatal doses deprive the blood of oxygen; and that as belladonna paralyzes the peripheral branches of the vagus, and at the same time stimulates the nervous centres of respiration, atropia in these cases hypodermically injected will prevent death.

OPIUM AND ITS PREPARATIONS.

SMALL doses of opium excite tetanus in frogs; on the other hand, birds, namely, ducks, chickens, and pigeons, cannot be poisoned by crude opium, the aqueous extract, nor black drop (acetum opii), given internally; and morphia salts must be given in enormous doses. Morphia employed hypodermically in very large doses never causes sleep nor stupor, but convulsions. Thebaia is a tetanising agent inferior only to strychnia and brucia. Narcotina, almost without effect on man, destroys birds in doses of two to seven grains when used hypodermically. Codeia is a fatal convulsive agent to pigeons. Meconia given internally causes emesis, but is harmless when injected under the skin. Narceia has no perceptible influence except to disturb the respiration slightly. Cryptopia in doses of one-fifth to one-half a grain has no effect. None of these agents cause sleep in pigeons, ducks, nor chickens. (Dr. Weir Mitchell.)

Dogs, cats, and rabbits, require large doses of opium to produce stupor or sleep, which is generally accompanied by convulsions. In the lower animals like frogs, it appears that opium only excites tetanus; but as we ascend in the animal

kingdom the soporific effects become apparent, and are most marked in man. Yet race modifies the effects of opium, for it drives the Javanese and Malays into a temporary madness; and even among Europeans its effects vary considerably in different individuals. In some persons, especially women, it produces much excitement but no sleep, the excitement being sometimes pleasant at other times extremely disagreeable. Whilst in some instances it fails to induce sleep, it soothes, and pleasant ideas occupy the mind; but on the other hand, with other persons it induces restlessness, excitement, and even delirium.

Preparations of opium, applied by means of poultices or friction, are absorbed by the unbroken skin.

Poultices containing laudanum are used to allay the pain of superficial and even of deep-seated inflammations, and enough may be absorbed in this way to produce deep sleep. Friction increases the absorption considerably; thus liniment of opium, well rubbed in, relieves neuralgias, pleurodynia, and myalgia. The abraded skin absorbs still more freely, and preparations of opium or morphia are applied to irritable, cancerous, and simple sores. Morphia dissolved in glycerine and spread on lint, is a useful application to a painful cancerous sore.

The hypodermic injection of morphia, originated by Dr. Alexander Wood, is now extensively employed to relieve pain, produce sleep, prevent spasm, and for other purposes, and is preferable to the administration of the drug by the mouth. Its action is more rapid; its effects are more permanent; and it neither destroys the appetite nor constipates the bowels. Dr. Anstie maintains that "anodynes and hypnotics ought never to be administered by the mouth in acute diseases attended by anorexia." At first not more than a sixth part of a grain should be injected; a larger quantity sometimes produces serious symptoms.

An injection not unfrequently causes a good deal of excitement, giddiness, even intoxication, great nausea, and repeated vomiting, followed by considerable depression. Often,

indeed, the patient is unfitted for work during the rest of the day. These inconveniences, however, can mostly be avoided by keeping the patient recumbent for some hours after the injection. Belladonna seems to obviate these unpleasant symptoms if combined with morphia, in the relative proportion of 20 parts of morphia to 1 part of atropia.

An injection occasionally produces redness of the face, contraction of the jaw, dyspnoea, clonic spasms of the limbs, hammering frequent pulse, which symptoms last about five minutes, followed by violent sweating on their decline. These symptoms are said to occur when the injection directly enters a vein (Nussbaum, Muhe, and Hausman). The system becomes habituated to opium by long persistence in hypodermic injections, so that not only must the quantity be increased, but on discontinuing their use a patient suffers the depressing effects of an opium-eater deprived of his opium. Sometimes so severe are these sufferings, that patients declare that the distress occasioned by the intermission of the injection is worse than the pain itself. The injection may be made in any part of the body; but, for the sake of convenience, it is better to choose a place where the skin is loose. A fold of skin should be pinched up firmly, and then the needle is thrust quickly through it into the subcutaneous tissue. If patients dread the slight pain of the puncture, the sensibility of the skin may be first deadened by the ether spray. Immediately after the injection, a sharp smarting pain is felt; and in many cases, a large flat weal, like that of urticaria, soon arises. If care is taken to make the solution as nearly neutral as possible, the pain is much reduced. It should be remembered that these injections sometimes leave a hard horny cicatrix; hence, it is important to inject some part of the skin covered by the clothes.

Eulenberg states, that the sensibility round the punctured spot is lessened if the injection is made over a superficial sensory nerve; and that the sensibility of the whole skin territory of this nerve is somewhat blunted.

A single injection sometimes cures recent and even long-

standing sciatica, facial and other neuralgias; but it usually gives only temporary relief, and the injection must be repeated from time to time.

Injections continued for days, weeks, or perhaps months, sometimes cure obstinate cases of neuralgia and its allies. Sometimes every second day, or twice a week is sufficient to mitigate the pain, and after a time to cure. A single injection frequently cures lumbago at once; but, as the mere insertion of a needle is often equally efficacious, some of the speedy cures attributed to the injection must be due to the effect of unintended acupuncture. Hypodermic injection relieves the pain of severe pleurodynia, but most cases of pleurodynia yield to milder treatment. It is particularly efficacious in the pain of renal, biliary, and intestinal colic. Although not often required, a mild morphia injection will allay severe toothache. Morphia injections are sometimes needed to relieve the pain of acute inflammations, like pleurisy and pneumonia, but are rarely required unless the suffering is severe or persistent.

Morphia injections are used to produce sleep. Morphia, subcutaneously injected, acts more speedily and in smaller quantities than when swallowed.

Morphia is injected to produce sleep in acute mania, delirium tremens, chorea, etc. In delirium tremens, even when bromide of potassium and chloral have failed, an injection often speedily produces sleep. A morphia injection is useful in chorea, when the movements prevent sleep, and when wakefulness, by weakening the patient, increases the movements. Dr. Clifford Allbutt employs morphia injections in dyspepsia of an irritable kind, when the patient is spare, fretful, keen, hasty or absent in manner, with a tongue too clean, red at tip and edges, small pulse, and broken sleep.

Dr. Allbutt strongly recommends a morphia injection in the dyspnoea of heart disease, and in disease of the large vessels; in the pain of angina pectoris, and of intra-thoracic tumours. By removing dyspnoea, it permits sleep, and recruits the worn-out patient. It strengthens the heart, and so removes

congestion of the lungs and face. Dr. Allbutt considers it less useful in aortic than in mitral disease. The author has long employed these injections in heart disease, and can corroborate Dr. Allbutt's statements.

Dr. Spender employs morphia injections to arrest the severe vomiting of pregnancy, and other obstinate and dangerous forms of vomiting. An injection often arrests persistent hiccup, and sometimes puerperal convulsions; it has likewise been successfully employed in tedious labour, produced by a rigid os utero.

Dr. T. J. Gallaher, of Pittsburg, and more recently Dr. John Patterson, of Constantinople, have witnessed great benefit from the hypodermic injection of morphia in cholera, even in the stage of collapse. The cramps and vomiting cease, the patient falls asleep, the skin gradually becomes warm, and the pulse returns. They employ one-fourth to one-eighth of a grain of morphia, and usually one or two injections suffice. In the early stages the patient falls asleep and wakes almost well. Dr. Patterson has employed this treatment for children.

Dr. Braithwaite has successfully given small doses of morphia hypodermically in hæmoptysis.

Mr. Buxton Shillitoe strongly recommends for carbuncles and boils the local application of an extract of opium, the consistence of treacle. The extract must be thickly smeared three or four times a day over and around the swelling. Applied early, it often causes the boil to abort; or it limits its progress, and eases pain. After the extract, Mr. Shillitoe applies a plaster, composed of equal parts of soap, opium, and mercury, spread on thick leather. Should suppuration set in, he lets out the matter, and applies a poultice over a small hole cut in the plaster.

Dropped into the eye, laudanum and solutions of morphia cause smarting, redness, and slight inflammation of the conjunctiva. They contract the pupil, but less so than if administered in other ways. Opium, however, is never used specifically to contract the pupil, Calabar bean effecting this more

safely, easily, and thoroughly. Opium wine, dropped into the eye, is used to relieve the pain of conjunctivitis, and by slight stimulation to improve the condition of the membrane. The wine of the present Pharmacopœia, containing spices, must not be so employed, as it would aggravate the mischief; but the wine of the Pharmacopœia of 1864 must be used. Mixed with either tannin or creasote, opium is often introduced into the hollow of a painful tooth; and if the pain is produced by inflammation of the exposed pulp, this application often gives relief.

The absorption of a somewhat full dose of opium produces much disagreeable dryness of the mouth and throat. The same annoying symptom follows likewise on the hypodermic injection of morphia.

The preparations of opium are rarely used for their topical effect on the throat, but the author thinks that their good effects are due to local action on this part. For instance, many coughs, as in some cases of phthisis, are really owing to the condition of the throat, where this part is red, inflamed, and even ulcerated,—a condition which excites much irritation, and a frequent hacking cough, troublesome especially at night. This cough is much relieved by the topical application of morphia dissolved in glycerine, honey, or treacle, or some other viscid substance, which causes the mixture to linger some time over the irritable membrane. It is well known that the cough of chronic phthisis is often best treated by directing the patient to retain a weak solution of morphia in glycerine, honey, or mucilage, for some time in the pharynx, so as to blunt the irritability of these parts, and so allay the cough. Hence, too, the excellent effects of morphia lozenges allowed to dissolve slowly in the mouth. Even over coughs entirely dependent on lung disease, opium or morphia, administered so that the medicine clings for some time in contact with the structures just outside the larynx, appear to have a greater influence than when the medicine is conveyed quickly into the stomach. This result is referable probably to the fact, heretofore insisted on, that drugs appear

to possess remedial virtues over the organs of the body even when applied only to the orifice of the passages leading to them.

The following is a good formula to allay coughs: Morphia, one-fortieth part of a grain; spirits of chloroform, three minims, in a drachm of glycerine, syrup of lemons, diluted honey, or treacle, repeated frequently, at times only when the cough is troublesome, till the paroxysm is subdued.

It is often taught that morphia should not be given in catarrh or bronchitis. When the expectoration is abundant, and there is duskiness of the skin showing deficient oxidation, opiates or other narcotics that may produce profound sleep must of course be given very guardedly, otherwise, the expectoration, during sleep, may accumulate in the lungs and give rise to serious results. On the other hand we meet with cases with very free expectoration, with very little rhonchus, and no signs of obstructed oxidation, with very violent and frequent cough. In such cases opiates relieve cough and lessen expectoration, for the secretion of mucus in the bronchial tubes is certainly stimulated by violent coughing, for when this is allayed the expectoration becomes much less abundant. That coughing may excite secretion in the bronchial tubes is shown by the common fact, that if a patient can restrain his cough the expectoration becomes less, without any signs of accumulation in the lungs.

Taken into the stomach, opium lessens both its secretion and its movements, and consequently checks digestion. Its retarding effect on digestion is well exemplified by the well known fact, that the food vomited hours afterwards, when an opiate is given too near a meal, is only very partially digested. Nay, according to Bernard a hypodermic injection may have this effect, for he found the crops of pigeons kept full after a hypodermic dose of morphia. Here we have a sufficient reason why opiates should not be given shortly before or after a meal, unless indeed it is intended to diminish appetite or to hinder the natural movements of this organ.

Opiates not uncommonly excite nausea and vomiting, symptoms very apt to occur in the morning after a night dose.

Opium, or its alkaloid, morphia, is given to quell the pain of many stomach affections, and to check the vomiting which may accompany them. Thus it is useful in cancer and chronic ulcer of this organ, and in chronic gastritis from excessive indulgence in alcoholic drinks. Morphia, in small doses, combined with tonics, taken a short time before meals, is very efficacious in removing the pain, the nausea, and want of appetite so often connected with alcoholism. In the treatment of gastrodynia with heartburn Graves employed morphia in small doses, combined with bismuth.

The effects of opium on the intestines are identical with those on the stomach; that is to say, it checks both secretion and movement, thus constipating the bowels in health, and restraining diarrhœa in disease. Constipation, one of the disagreeable consequences following an opiate, is much less marked when morphia is employed hypodermically.

Opium, or its alkaloid, morphia, is very frequently and very beneficially given in both acute and chronic diarrhœa. It is useful in the acute forms, after the expulsion of the disturbing irritant. It is, moreover, of great use in the chronic diarrhœas of tuberculosis, dysentery, and other organic diseases.

In typhoid fever, opium, in small doses, given at night, may serve a double purpose. In wakefulness, with delirium, whether of the boisterous or muttering kind, opium will often produce sleep, and thus check the delirium, while at the same time it will control or even subdue the diarrhœa.

There is a form of dyspepsia and diarrhœa which yields to small doses of opium. There is probably increased peristaltic action of the stomach and intestines, so that the food, soon after it is swallowed, is forced in a half-digested state through the pylorus into the intestines, where, owing to its crude condition, it acts as an irritant, exciting the vermicular action already acting unduly, so that a diarrhœa of partially digested food occurs soon after a meal. The patient suffers from a sensation of emptiness and hunger, which is relieved for a short time by food; but the meal being imperfectly digested,

and expelled through the anus long before it can be absorbed, the system is imperfectly nourished, and these uncomfortable symptoms soon recur. The characteristic symptoms are—sinking at the stomach, relieved for a short time by taking food, and the occurrence of an evacuation of partially digested food immediately after a meal, nay, sometimes even before it is finished, and generally at no other time. This complaint, perhaps the most common form of chronic dyspepsia in children of six to twelve years of age, is quickly arrested by administering from two to five drops of tincture of opium a few minutes before each meal, which seems to check the excessive muscular action, and so enables the food to tarry a sufficient time to undergo digestion. Still more effective is arsenic in this condition.

Colic of the intestines is well combated by small doses of opium or morphia frequently repeated. As this painful affection is generally accompanied by, and is dependent on, constipation, a purgative should likewise be given. The opium assists the purgative by relaxing that contraction of the intestines which hinders the passage of the intestinal contents.

Opium quiets the intestinal movements in inflammation of the peritoneum and of the intestines, or in wounds of the abdomen.

Opiates are administered by the rectum for a variety of purposes. Laudanum is usually injected, mixed with an ounce of decoction of starch, at a temperature of 100° or thereabouts, and is very effectual in checking acute and chronic diarrhœas; and in those severe forms of diarrhœa which sometimes carry off young children in a few hours, an injection of this kind is often the speediest way of controlling the dangerous flux. When other methods fail, the same injection often checks the purging of typhoid fever, or of tubercular ulceration of the intestines or of dysentery. It is highly useful in pain of the bowels and of the organs in the neighbourhood of the rectum. Thus an opiate injection will generally subdue the pain and frequent micturition of cystitis, and the pain arising from various uterine diseases. Sometimes a suppository of opium

or morphia is introduced into the rectum as far as the finger can conveniently carry it, but the injection of the laudanum and starch is more effectual.

Opium mixed with gall ointment is an excellent application to painful bleeding piles, and to fissures of the anus, which cause excruciating pain with each evacuation. Mild purgatives should be simultaneously employed.

Opium injected into the rectum is absorbed, and affects the distant organs of the body. Sometimes a rectal injection will induce sleep when the ordinary method of administering it by the mouth completely fails. In obstinate forms of dyspeptic sleeplessness, or the wakefulness of convalescents from acute disease, the injection of laudanum by the rectum may be tried, and will often prove successful. Both Dupuytren and Graves state that, in delirium tremens and traumatic delirium, this mode of giving opium is preferable to its administration by the mouth. The dose of laudanum injected into the rectum must depend on the nature of the case. If employed to relieve local pain, a small quantity will generally suffice; but to produce sleep a dose must be given about threefold or fourfold that administered by the stomach—at least, so it is generally taught; but an ordinary medicinal dose, even when given by the rectum if well cleared out previously by a simple enema or a purgative, is often amply sufficient to ensure sleep.

The active principles of opium readily pass unaltered into the blood; for, whether the opium is swallowed or injected under the skin, it induces the same symptoms.

To one unaccustomed to opium a small dose produces “a soothing and luxuriant calm of mind, followed in the course of forty or fifty minutes by a disposition to sleep;” if this does not happen, it gives “general repose of both body and mind, undisturbed by pain.” The pulse at first quickens, slightly, in ten to twenty minutes by eight to ten beats; but in half or three quarters of an hour, it again falls; at first it is made stronger and more resistant. The mouth and pharynx are dry, and perspiration often breaks out. Larger doses, as from two to three grains, generally produce at first much ex-