

grains of opium, or a scruple of morphine. The author has met with a patient who took a scruple of morphine a day subcutaneously. When opium is given by the stomach, for the relief of a chronic painful disease, to maintain a constant effect increasing doses are necessary. The power of the stomach to absorb opium is doubtless impaired by frequent repetition of the dose, and in consequence of the local action of the drug on the nerves of the stomach. Besides this, the susceptibility of the cerebro-spinal system steadily declines. The proof of these statements is afforded by the action of morphine when used subcutaneously for long periods. A gradual increase of the dose becomes necessary in order to produce a given physiological effect; but the increase is much slower than when it is administered by the stomach.

Great pain lessens the influence of opium upon the centers of conscious impressions. The quantity in grains is of much less importance than the quantity as measured by the physiological reactions. Uræmia, or the retention in the blood of urinary excrementitious matters, is supposed to increase the narcotic influence of opium; but some facts, to be hereafter presented, render it probable that the state of uræmia and the influence of opium on the brain are antagonistic.

THERAPY.—*Stomach-pain*, whether simply neuralgic (*gastralgia*), or excited by the presence of food (*irritative dyspepsia*), or due to *ulcer* or *cancer*, is relieved by opium. The preparations of morphine are better than the crude drug, as a rule, in these cases. The endermic application is an excellent mode of procuring relief. The subcutaneous injection, practiced in the epigastric region, is still more effective. Morphine is frequently combined with bismuth, or zinc, or silver salts, in painful stomach diseases. ℞ Bismuthi subcarb., *vel* subnitrat., ʒ iij; morphinæ sulph., gr. j—grs. ij; pulv. aromat., ʒ j. M. Ft. pulv. no. xij. Sig.: *A powder in milk before each meal.* The following formula is also useful, notwithstanding its unchemical relations: ℞ Zinci oxidi, ʒ ss; morphinæ sulph., gr. j—grs. ij. M. Ft. pil. no. x. Sig.: *One pill, three times a day, before each meal.* A half-grain of the oxide of silver may be substituted for the oxide of zinc in the above formula.

Inflammatory pain, due to corrosive poisons, to *peritonitis*, etc., requires opium. When the stomach is irritable, and the symptoms urgent, the best mode of using the remedy is the hypodermatic injection of morphine. Many kinds of *nausea and vomiting*, stomachal or reflex in origin, are arrested by opium preparations. In vomiting of cerebral origin, or produced by uræmia, or caused by cirrhosis, the use of opium is contraindicated. When vomiting is caused by irritant matters, opium is prescribed after the stomach is emptied. The vomiting which accompanies the passage of *biliary or renal calculi*, *dysmenorrhœa*, etc., is best relieved by opium. Very severe cases of *sea-sickness*, and of the *vomiting of pregnancy*, may be sometimes

arrested when all other means fail, by the subcutaneous use of a minute quantity of morphine (one twentieth to one twelfth of a grain).

Nothing is more common than the prescription of opium in *diarrhœal diseases*, but it is often used without a just appreciation of the conditions requiring it. In *acute diarrhœa*, caused by irritating aliments, such astringent laxatives as rhubarb, or mild salines, should precede the use of opium. When the evacuations are watery, the best results are obtained by a combination of opium with mineral acids, or acetate of lead. In *acute dysentery* opium is a very important remedy, but it is often injudiciously employed. If there be fever, much tenesmus, and the stools consist of mucus and blood, the exhibition of opium should be postponed until salines have emptied the intestinal canal of its contents, and have depleted the distended vessels. An excellent method of administration, especially when the dysenteric inflammation occupies the rectum, is an enema of starch or milk, or a suppository, containing opium in some soluble form. In *chronic dysentery* opium is indispensable. It is usually combined with arsenic, or with the salts of silver, copper, or zinc. In the chronic dysentery of malarial origin, the best results are obtained by a combination of arsenic and opium, according to a formula already given; in that form which succeeds to the acute disease, opium and sulphate of copper, or zinc, or nitrate of silver, or vegetable astringents.

Nothing can be more satisfactory than the treatment of *cholera-morbus* by the hypodermatic injection of morphine. It is always desirable to secure the expulsion of irritating matters before resorting to opiates. For an ordinary case of cholera-morbus from one twelfth to one sixth of a grain of morphine suffices. In true *cholera* the utility of opium is most evident in the preliminary diarrhœa, but is entirely without avail in the stage of collapse. Mischief not unfrequently results from its use, for patients emerging from the condition of collapse are either directly narcotized by the opium which had lain unabsorbed in the stomach, or the cerebral symptoms of the secondary fever are greatly intensified by it. In *cholera infantum* opium must be used with caution, if not avoided. The subjects of this malady are easily narcotized, and the nervous system—an unknown morbid state of which bears some close relation to the gastro-intestinal disorder—is rendered so irritable by opium that the symptoms are aggravated by it.

The following formula embodies a truth of great practical importance: *As a rule, opium does harm in all gastro-intestinal maladies in which there is a deficiency in the proper secretion, or a suspension of the functions, of the liver and kidneys.*

Opium gives a degree and kind of relief in *hepatic, renal, and saturnine colic*, which no other remedy or combination of remedies

affords. The most prompt and effective form in which the remedy can be administered is the hypodermatic injection of morphine. This relieves the pain, and relaxes the spasm of the affected tube, and at the same time checks the depressing vomiting which attends these cases. The quantity of morphine required will vary from one fourth to one half a grain. As the effect is immediate, the most prudent practice consists in the administration of a small quantity (one sixth to one eighth of a grain) for the first dose, in order to test the physiological capabilities of the patient, and following this in fifteen minutes with a dose of similar size if the first is well borne and the pain persists.

Opium, in small doses, is a valuable tonic to a *weak and dilated heart*. When administered simultaneously with digitalis, it obviates one of the dangers which may be caused by that agent. In the so-called *passive hæmorrhages*, in which not only is the blood altered in quality but the tension is low, small doses of opium sustain the powers of life, and by increasing the arterial tension lessen the transudation through the vessel-walls. Under these circumstances, the dose of opium should not as a rule exceed five minims of the tinctures, and it should generally be given in combination with ergot, digitalis, tannic and gallic acids, acetate of lead, etc.

The important observation was made by Bernard, and afterward illustrated and confirmed by Nussbaum, that the hypodermatic injection of morphine, administered before the inhalation begins, prolongs the stage of *chloroform narcosis* with a less quantity of the anæsthetic, diminishes the danger of cardiac paralysis, and prevents the after-nausea and depression.

Opium is the most important agent which we possess in the treatment of various *inflammations*. Its efficacy depends upon several factors: it relieves pain, quiets restlessness, and thus removes from the inflammatory process one of its most important elements, viz., an irritable and parietic state of the nerves of the affected part. Besides these effects, opium raises the tonicity of the vessels, helps to maintain the continuity of the blood-current, and hinders the migration of the white corpuscles of the blood. It is especially in inflammations of the serous membranes that its highest utility is manifest, e. g., *pleuritis, peritonitis, arachnitis*. Good reasons exist for believing that the hypodermatic injection of morphine will sometimes cut short (jugulate) these maladies, if administered just at their onset. If the period for obtaining such a fortunate result has passed, the course and duration of these diseases can be greatly modified by the judicious use of opium. The quantity of opium required will be determined by the effect; the pain should be relieved, the pupils somewhat contracted. A full dose should be administered at the beginning of treatment (two to three grains of opium—a half grain of morphine), and a given physiological

effect be maintained by the regular use of smaller doses. Pain is probably the surest guide, for the existence of pain indicates that decided opium narcosis has not been attained.

In *peritonitis*, whether *puerperal, traumatic*, or the extension of *intestinal inflammation*, no fact of therapeutics is better established than the curative power of opium. Besides its immediate influence over the inflammatory process, its indirect action, in maintaining the necessary quietude of the intestines, is of the greatest service. In *arachnitis, pachymeningitis, basilar meningitis*, there are clinical facts which tend to show that small doses of some opiate preparation really accomplish more than any other remedies. The author is convinced that we possess no means of treatment of *cerebro-spinal meningitis* so effective as the opiate treatment. The same rule as to the quantity required, as that given for peritonitis, should be observed: that quantity of opium should be administered which will relieve the pains and rigidity. The best results are obtained by the hypodermatic injection of morphine. When effusion takes place, and stupor and coma ensue, the utility of opium is ended.

In *parenchymatous inflammations*, experience has shown, opium is much less useful. When pain is a prominent symptom, it can be employed to relieve it; in small, stimulant doses, it may be given to maintain the action of the heart. In *pneumonia* opium is a remedy of very doubtful utility. Its narcotic action certainly disposes to pulmonary congestion, although it may be cautiously used to allay pain and moderate cough. Although this was the general professional opinion, and is now largely held, there are those who entertain very different views regarding the utility of opium in pneumonia. Thus, Prof. A. L. Loomis, of New York, maintains that the disease may be aborted, or at least decidedly modified in severity, by the subcutaneous injection of morphine in the first stage (congestion) of this disease.

In *fevers—typhoid, typhus, and eruptive fevers*—opium was formerly much more frequently prescribed than at present. The cold baths, antipyretics, and more favorable hygienic influences, have lessened the violence and diminished the mortality from fevers. The maniacal excitement and the low, muttering delirium are not so frequently observed now as formerly, and hence the use of opium in these affections has greatly declined. The discovery of chloral has also diminished the use of opium as an hypnotic. Nevertheless, when there is much restlessness, wakefulness, subsultus, and delirium, opium may render important service. When the delirium is of the low, muttering kind, a small quantity of morphine (one eighth to one sixth of a grain) may suffice to procure quiet and refreshing sleep. When the delirium is violent, combination of tartar-emetic with opium, on the plan of Graves, may have a very happy effect. Or opium may be combined with belladonna, or chloral—the former when the condition

is one of great depression, the latter when the delirium and wakefulness are excited in character. In *measles* and *scarlet fever*, when there is a condition of profound depression, the eruption being tardy in making its appearance, and is dusky in hue and ill-defined, beneficial results are experienced from the use of opium, especially when combined with camphor.

A threatened paroxysm of *intermittent fever* may be aborted by the hypodermatic injection of morphine (one fourth of a grain). This practice has a high degree of importance in the *pernicious intermittents*, when time is not afforded for an effective use of quinine. The febrile heat of *intermittent and remittent fevers* may be diminished, and the sweating stage induced earlier, by the use of opium in moderate doses (ten minims of the deodorized tincture every two, three, or four hours). The addition of morphine to quinine enables the latter to be better borne by the stomach, counteracts some of its unpleasant effects on the brain, and increases its therapeutical power. When no contraindication to the use of morphine exists, it is good practice to combine it with quinine in the treatment of intermittent and remittent fevers.

Narcotine has decided antiperiodic power, and may be given as a substitute for quinine when reasons exist to prevent the use of the latter. From five to ten grains of pure narcotine may be administered. As an antiperiodic it ranks after arsenic, salicine, and even apiol.

As an *hypnotic* opium is very frequently used in affections of the nervous system. The stimulant properties of crude opium, or its official preparations, render it less serviceable than morphine in the group of cases generally requiring an hypnotic. There can be no doubt that remarkable curative results have followed the hypodermatic injection of morphine in *acute mania*. The following are the indications for the use of morphine in mental disorders: prolonged wakefulness, maniacal excitement, persistent refusal of food, drink, or medicine, destructive and suicidal tendencies. As respects individual subjects, the state of the arterial tension furnishes a guide to the use of morphine. If the tension of the arterial system is low, a small dose is required. When the pulse is quick, and the arterial tension high, a large dose of morphine, by over-excitation, causes paresis of the sympathetic, and thus reduces action, an indication for the full influence of the agent. Large doses of morphine, when given subcutaneously, require the utmost circumspection in maniacal cases, especially in obese and aged subjects. Besides acute mania, excellent results have followed from the use of morphine in *lypomania* (Krafft-Ebing, Voisin), in *chronic mania*, and *melancholia*. Probably the best effects have been witnessed from opium in *melancholia*. In this mental disorder, which is a condition of depression, the best form for the administration of opium is the tincture, and the dose required is the stimulant and not the narcotic dose. The author is impelled to add the

caution so well expressed in the following words by Maudsley: "It will be well to have in mind that neither opium by the mouth, nor morphine hypodermically injected, will always quench the fury of acute mania, and that successive injections of morphine, followed by brief snatches of fitful sleep, have been followed also by fatal collapse."

It was formerly held that large and increasing doses of opium were necessary for the cure of *delirium tremens*, the theory being entertained that to procure sleep was to insure recovery. It is now known that to re-establish digestion and to support the powers of life by suitable nutrients are in a large proportion of cases the only means needed to quiet delirium and to cause sleep. Opium, if used at all, must be given cautiously. Chloral has to a large extent taken its place as an hypnotic in this disease, but cases are not unfrequently met with in which morphine agrees better, and is more effective in inducing quiet.

Some cases of *sunstroke*, *coup de soleil*, or "thermic fever," are rapidly cured by the hypodermatic injection of morphine. When the patient is able to swallow, good effects follow the conjoined administration of tincture of opium and brandy. The cases benefited by this treatment are characterized by pallor of the face and weakness of the heart—heat exhaustion.

Epilepsy and *epileptiform* seizures may be sometimes prevented by the timely administration of morphine hypodermatically. This treatment is best adapted to epilepsy, the attacks of which occur at night, to *petit mal*, and to *convulsive tic*. It is improper in epileptoid seizures due to tumor or other coarse organic lesion of the brain. In suitable cases, this treatment procures most decided amelioration in the condition of the patient, but may induce the opium habit.

The remarkable fact has been demonstrated by Loomis, of New York, that we have in the hypodermatic injection of morphine the most important agent for the cure of *uræmic convulsions*, *puerperal and non-puerperal*. It is true this mode of treatment had been originally practiced by Scanzoni, but Loomis has, more especially, drawn attention to its real power and utility. "The most uniform effect of morphine so administered is, first, to arrest muscular spasms by counteracting the effect of the uræmic poison on the nerve-centers; second, to establish profuse diaphoresis; third, to facilitate the action of cathartics and diuretics, especially the diuretic action of digitalis."

In *chorea* Trousseau has carried the administration of morphine to an extraordinary extent. He restricts its use to severe cases, which appear to have a singular insusceptibility to the action of opium even in enormous doses. When the jactitations are incessant, preventing sleep, or persisting in spite of sleep, the utility of morphine is very great. It is most effective when combined with chloral. In these severe cases of chorea, the only limit to the quantity of morphine is the

effect produced. It is evident, from the experiences of Trousseau, that very large doses are required, and that curative effects are thus obtained to which small doses are entirely inadequate. The subcutaneous method is more efficient than the stomach administration.

In *tetanus* and *hydrophobia* the use of morphine has been chiefly palliative. M. Demarquay has, however, applied morphine, by deep injection into the tetanized muscles, with greater success than heretofore. He carries the needle deeply into the tetanized muscles, and, if possible, to the point of entrance of the nerves. He injects in this way the masseters, the sterno-cleido-mastoid, the neck and sacro-lumbar muscles, etc. The relaxation of the muscles of mastication thus induced permitted the nourishment of the patients. Of three cases thus treated during the siege of Paris two recovered and one died, but the death was due to pyæmia and not to tetanus.

The most important uses of opium and its various preparations are in the relief of *pain*. In surgical practice its administration is indispensable to prevent or mitigate *shock*, to quiet *pain*, and to check *inflammation*. To particularize on these points would require an epitome of surgery for illustration. Before the administration of chloroform, morphine should be injected hypodermatically, to diminish the dangers of the inhalation and to secure relief to the after-pain of the surgical operation. Nothing is more universal in surgical practice than the administration of an opiate after an operation of any magnitude, for the objects above named.

The most signal service is rendered by opium and its preparations in the various *neuralgiæ*. The most effective mode of administration is by subcutaneous injection, and the remedy should be inserted in the neighborhood of the affected nerve, notwithstanding that relief is afforded by the injection at any point. In *tic-douloureux*, *brachialgia*, *cardialgia*, *gastralgia*, *hepatalgia*, *nephralgia*, *sciatica*, and *pelvic neuralgia*, immediate relief is afforded by this remedy, and the relief is not temporary and palliative merely, but curative in numerous instances. It appears to be especially curative in *sciatica*. It is a remarkable fact that morphine inserted under the skin, and especially in the neighborhood of affected nerves, exerts a curative power which it does not at all have when administered by the stomach. An efficient method of using morphine in the treatment of neuralgiæ, according to Brown-Séquard, consists in applying it in a finely-divided state to the derma, denuded by a blister. Lafargue proposed the method of inoculation, which consists in inserting morphine into the skin by means of a lancet-puncture. These clumsy and painful processes are by no means equal to the hypodermatic method.

The enchanting sense of relief to suffering wrought by opiates, and especially by the subcutaneous use of morphine, leads to the morphine-habit. It is a singular fact that in these cases the pains which were

cured by the remedy return when it is withdrawn, and other painful sensations appear of an even more distressing kind. In practicing the hypodermatic method for a long period in severe cases of neuralgia, the utmost care should be used to avoid the morphine-habit.

In the *neuroses of the respiratory organs*, great relief is often afforded by the use of opium in some of its forms. No remedial agent will so quickly cut short a paroxysm of *asthma* as the hypodermatic use of morphine. The paroxysms of difficult breathing which occur in *emphysema* are also readily relieved in the same way. But there is great danger of establishing the opium-habit in these chronic cases. In an allied disease—*hay-fever*, *hay-asthma*, or *autumnal catarrh*—the hypodermatic use of morphine is quite as effective as in spasmodic asthma. An *incipient catarrh* may be aborted by a full dose of Dover's powder, taken at the very outset of the inflammation. Morphine and quinine combined are rather more effective than Dover's powder in these cases. Opium, or some of its preparations, enter into the composition of expectorant mixtures to *allay cough*.

The hypodermatic injection of morphine has been shown to possess a high degree of utility in cases of *dilated heart with difficult breathing*, and *general œdema*. The eighth to the sixth of a grain suffices for this purpose. The effect it has is to quiet and regulate the action of the heart, to allay the distress of breathing, and to permit rest and sleep in the recumbent position. An occasional dose only is necessary (two or three times a week).

Opium is a very important addition to our resources in the treatment of *diabetes*. It must be given in considerable doses, as Pavy has shown. From six to twelve grains a day are necessary, in order to produce a decided impression. It checks the bulimia—the inordinate appetite—allays thirst, diminishes the flow of urine and the excretion of sugar, and, probably, arrests or prevents the changes in the nervous system which accompany or are causative of this disease. Although many cases are decidedly ameliorated, it can not be said that any have been cured by opium. Codeine, an alkaloid of opium, seems to be more effective in this disease than the crude opium or any of its preparations. It must be given in full doses. Besides checking the waste, it apparently exercises an influence over the central nerve-changes, and thus has a curative action as well as merely palliative.

EXTERNAL USES OF OPIUM.—A solution of morphine in distilled water is an excellent astringent anodyne in *conjunctivitis*, and, combined with atropine, in *iritis*. ℞ Morphine sulph., grs. iv—grs. viij; aquæ destil., ℥j. M. Sig.: *A few drops to be put into the eye as necessary.* ℞ Morphine sulphatis, grs. iv; zinci sulphatis, grs. ij; aquæ destil., ℥j. M. Sig.: *Lotion for iritis and other inflammatory affections of the eye.* The last formula, omitting the zinc, is an excellent application in *earache*, the external meatus being filled with it, and in

toothache, a few drops on cotton being placed in the hollow of the tooth.

Local inflammatory swellings, painful in character, can be relieved somewhat by poultices containing laudanum. Frictions with laudanum are serviceable in *lumbago*, *sciatica*, *myalgia*, and similar superficial painful affections. An infusion of opium (3j—Oj), applied hot, is an excellent application to *inflamed joints*, *inflamed testicle*, etc.

ON THE COMBINED USES OF OPIUM AND BELLADONNA, MORPHINE, AND ATROPINE.—The conjoined use of these agents is so important a subject from the point of view of practical therapeutics, that the author purposes to consider it under this head. Although a physiological antagonism as respects a part of their action unquestionably exists, it does not extend throughout their whole range of influence in the organism. The balance of actions furthermore produces results which neither is capable of singly. Hence the importance of a more direct presentation of these points than has been heretofore given.

Both act on the brain, atropine causing delirium, hallucinations, and disturbed sleep; morphine producing stupor, somnolence, hebetude of mind. Both relieve pain, but this effect is much greater in the case of morphine. Both produce disorders of motility, staggering, difficulty of co-ordination of muscular movements, vertigo, confusion of mind, and headache. The reciprocal influence exerted upon each other, when they are administered together, modifies in a remarkable manner their physiological effects.

Morphine corrects the illusions and phantasms produced by atropine. In small doses (e. g., one ninety-sixth of a grain) atropine increases the hypnotic power of morphine, with the result of causing a less disturbed and more nearly normal sleep than is produced by morphine alone. If, however, the quantity of atropine be in excess of what is necessary to establish the physiological balance in the cerebrum, it overrides the action of morphine and asserts its own peculiar power of inducing phantasms, illusions, and hallucinations.

The pain-relieving power of morphine is rather increased than diminished by atropine. The disorders of motility are enhanced by the mutual reactions of the two agents. The after-headache, vertigo, nausea, and depression of the heart's action caused by morphine, are to a large extent prevented by the conjoined administration of atropine. When a large quantity of opium, or morphine, is given by any of the modes of administration, its immediate depressing effects are counteracted by the simultaneous use of belladonna or atropine. Morphine produces contraction of the pupil, and a tetanic condition (according to Graefe) of the muscle of accommodation; atropine causes dilatation of the pupil and contraction of the ciliary muscle. When used together these effects may be precisely balanced. It requires but a minute quantity of atropine to overcome the action of

morphine on the pupil. When these effects on the pupil are balanced, it does not follow that the muscle of accommodation is in a normal condition, for visual defects remain. Morphine prevents the contraction of the arterioles produced by atropine, and, as a necessary consequence, the subsequent relaxation of the muscular fiber.

Morphine depresses the action of the lungs; atropine is a powerful respiratory stimulant. Morphine produces pallor of the surface, and reduces the external temperature; atropine causes redness and injection of the skin, and elevation of the body-heat. In some experiments the author ascertained that while atropine alone raised the pulse to 105 from 72, atropine and morphine combined depressed the pulse of the same subject to 60.

Both morphine and atropine produce dryness of the mucous membrane of the mouth and fauces. Morphine suspends, and atropine increases, the peristaltic movements. The sickness and nausea caused by morphine are, to a considerable extent, lessened or prevented by atropine.

Morphine lessens and atropine increases the functional activity of the kidneys; on the skin their effects are opposed; hence, when used in combination, the urinary secretion is rather increased than diminished by them. Both produce dysuria.

THERAPEUTICAL APPLICATIONS OF OPIUM AND BELLADONNA.—Whenever opium is used to *relieve pain*, to *procure sleep*, to *relax spasm*—there being no inflammatory action present—belladonna should be combined with it, unless some contraindication should exist to the action of the latter. This formulated expression is more especially applicable to the hypodermatic use of morphine.

In the various *psychical disorders*, in which the general condition is sthenic, opium or morphine should be used alone. When power is deficient, the forces depressed, the temperature rather below than above the normal, belladonna or atropine should be combined with the opium or morphine. For the relief of *insomnia* the combined action of these agents is much more effective than either singly. The proportion in which the alkaloids should be used is about as follows: $\frac{1}{120}$ — $\frac{1}{100}$ of a grain of atropine to $\frac{1}{2}$ and $\frac{1}{4}$ of a grain of morphine.

In the *various convulsive disorders* in which opium or morphine may be used, especially hypodermatically, atropine should be combined with it.

The *neuralgic* are best treated by morphine and atropine combined, for the following reasons: the combination is more effective, the after-unpleasant effects of either are prevented to a considerable extent.

The *neuroses of the respiratory organs*, of the *abdominal viscera*, etc., are, as a rule, more successfully treated by morphine and atropine in combination, than by either separately.

In surgical diseases and operations of various kinds, the combination of morphine and atropine has most important and varied applications, among which may be enumerated: to render safer and to prolong ether or chloroform narcosis; to prevent or relieve shock; to save suffering; to relax muscles; to facilitate operative procedures.

The combined administration of morphine and atropine is of the greatest service in obstetric practice: to relieve the teasing pains of the first stage; to procure sleep in the course of an exhausting labor; to quiet after-pains; to facilitate the performance of various obstetric operations; to arrest puerperal convulsions.

Authorities referred to:

- ALBERS, DR. J. H. F. *Virchow's Archiv*, Band xxvi, p. 229.
 ALLBUTT, DR. T. C. *The Practitioner*, vol. iii, p. 342. *Ibid.*, vol. v, p. 327.
 ANSTIE, DR. F. E. *Stimulants and Narcotics*, American edition. Article *Alcoholismus*, *Reynolds's System of Medicine*. *The Practitioner*, vol. i, No. 1, etc.
 ASCHE, DR. *Schmidt's Jahrbücher*, Band cxxv, pp. 331-337.
 BARTHOLOW, DR. ROBERTS. *Manual of Hypodermatic Medication*, fourth edition.
 BERNARD, CLAUDE. *Bulletin Général de Thérapeutique*, vol. lxxvii, p. 241, et seq.
IBID. *Archives Générales de Médecine*, 1864.
 BOIS, DR. A. *De la Méthode des Injections Sous-cutanées*, Paris, 1864, p. 17.
 COURTENAY, DR. E. M. *West Riding Lunatic Asylum Reports*, vol. ii, p. 254.
 DA COSTA, DR. J. M. *Pennsylvania Hospital Reports*, 1868.
 DEMARQUAY, DR. *Bulletin Général de Thérapeutique*, October 15, 1871, p. 229, et seq.
 ERLIENMEYER, DR. A. *Die subcutanen Injektionen der Arzneimittel*, dritte Auflage, Neuwied, 1866.
 EULENBURG, DR. A. *Die hypodermatischen Injektionen der Arzneimittel*, zweite Auflage, Berlin, 1867, p. 96, et seq.
IBID. *Lehrbuch der functionellen Nervenkrankheiten*, Berlin, 1871, p. 166, etc.
 FLÜCKIGER AND HANBURY. *Pharmacographia*, p. 40, et seq.
 FRONMÜLLER, DR. *Klinische Studien über die schlafmachende Wirkung der narkotischen Arzneimittel*, Erlangen, 1869.
 HARLEY, DR. JOHN. *The Old Vegetable Neurotics*.
 HUNTER, CHARLES. *On the Speedy Relief of Pain and other Nervous Affections by means of the Hypodermic Method*, Churchill, London, 1865.
 HUSEMANN, DRS. AUG. UND THEOD. *Die Pflanzenstoffe*, p. 111, et seq.
 HUSEMANN, DR. THEODOR. *Handbuch der gesammten Arzneimittellehre*, Berlin, 1875, zweiter Band, p. 1055, et seq.
 HUTCHISON, DR. JAMES H. *Pennsylvania Hospital Reports*.
 KRAFFT-EBING, DR. R. VON. *Bulletin Général de Thérapeutique*, January 30, 1870, p. 474.
 LAWSON, DR. HENRY. *Sciatica, Lumbago, and Brachialgia*, London, 1872.
 LOOMIS, DR. A. L. *Lectures on Diseases of the Respiratory Organs, Heart, and Kidneys*, New York, 1875, p. 450.
 MAUDSLEY, DR. H. *The Physiology and Pathology of the Nervous System*, and *Reynolds's System of Medicine*.
 MEDICO-CHIRURGICAL TRANSACTIONS, vol. 1, p. 561, et seq.
 MITCHELL, DR. S. WEIR. *American Journal of Medical Sciences*, 1869-'70, also in conjunction with Morehouse and Keen.
IBID. *Injuries of Nerves and their Consequences*.
 NOTHNAGEL, DR. HERMANN. *Handbuch der Arzneimittellehre*, p. 1, et seq.

- REISSNER, DR. *Bulletin Général de Thérapeutique*, January 30, 1870, p. 89.
 ROBERTSON, DR. C. LOCKHART. *The Practitioner*, May, 1869, p. 272.
 ROSENTHAL, M. *Klinik der Nervenkrankheiten*, Stuttgart, 1875.
 STILLÉ, DR. ALFRED. *Epidemic Meningitis, and Therapeutics and Materia Medica*.
 TAYLOR, DR. A. S. *On Poisons*, third edition, London, 1875, p. 547.
 TROUSSEAU, A. *Clinique Médicale*, vol. ii, p. 196.
 WARD, DR. J. BYWATER. *West Riding Lunatic Asylum Reports*, vol. i, p. 152.
 WOLFF, DR. O. J. B. *Archiv für Psychiatrie und Nervenkrankheiten*, Band ii.

Humulus.—Hops. The strobiles of *Humulus lupulus* Linné (Nat. Ord. *Urticariaceæ*, *Cannabineæ*).

Lupulina.—Lupuline. The glandular powder separated from the strobiles of *H. lupus*. (U. S. P.) *Lupuline*, Fr.; *Hopfendrösen*, Ger.
Infusum Humuli.—Infusion of hops ($\frac{3}{4}$ ss—Oj). Dose, a teacupful or more. (Not official.)

Tinctura Humuli.—Tincture of hops (twenty parts to one hundred). Dose, $\frac{3}{4}$ ss— $\frac{3}{4}$ ij.

Oleoresina Lupulinæ.—Oleo-resin of lupuline. Dose, \mathfrak{m} v— $\frac{3}{4}$ ss or more.

Extractum Lupulinæ Fluidum.—Fluid extract of lupuline. Dose, $\frac{3}{4}$ ss— $\frac{3}{4}$ ij.

COMPOSITION.—Hops contain *lupuline* (described above), a tannic acid, an essential oil composed in part of *valerol*, *trimethylamine*, and a liquid volatile alkaloid, *lupuline* (?).

PHYSIOLOGICAL ACTIONS.—Hop is an aromatic stomachic tonic, and as such promotes the appetite and digestive power. It is slightly astringent also. The action of the heart is somewhat increased, the cutaneous circulation excited, and diaphoresis produced.

In a very slight degree, hop first causes cerebral excitement, followed by calm and a disposition to sleep. Experience has shown that it possesses some anaphrodisiac property, and lessens the functional activity of the testes and the apparatus of erection.

THERAPY.—As a stomachic tonic hop is quite as serviceable as many more rare and costly medicines. It is useful in *atonic dyspepsia*, simple *flatulent colic*, and *mild diarrhoeas*.

The power of a hop pillow to quiet the mind and to induce sleep seems to be well established, but its influence is, doubtless, largely due to imagination and the association of ideas. The tincture of lupuline and the oleo-resin are useful remedies in mild cases of *delirium tremens*. They serve a double purpose—as a stomachic tonic and cerebral sedative. A combination of fluid extract or tincture of lupuline and tincture of capsicum is probably the best substitute for alcoholic stimulants, when the habit of their use is to be discontinued. \mathfrak{R} Ext. lupulinæ fluid., tinct. capsici, $\mathfrak{a}\mathfrak{a}$ $\frac{3}{4}$ j. M. Sig.: One or two teaspoonfuls as necessary. The condition known as *horrors*, or the wakefulness and excitement which just precede the attack of *delirium tremens*, may often be quite removed by free use of this combination.