

the skin in cases of *acne rosacea*, and may be used as a cosmetic in this mortifying disease. The author has seen excellent results from the free application of bismuth in cases of *eczema* when there was much serous exudation. Under the crusts thus formed healing proceeded satisfactorily. In *intertrigo* and in the *erythema* which occurs about the genitals of infants, dusting the affected surface with bismuth soothes the pain and promotes healing. Bismuth is one of the numerous applications to the eye in cases of *chronic conjunctivitis* and *granular lids*. It is also used as an injection, mixed with mucilage, or with cocoa-butter in the form of a suppository, in *chronic gonorrhœa* and in *gleet*, and in *leucorrhœa*. ℞ Bismuthi subnitrat., gr. vj; hydrarg. chlor. cor., gr. ss; tinct. camphoræ, ℥ jss; aquæ ad ʒj. M. Lotion for skin-diseases.

The best vehicle for the administration of bismuth is milk. It should be given before meals as a rule when employed in stomach-disorders.

Authorities referred to :

FOX, DR. WILSON. *The Diseases of the Stomach*, London, 1872, pp. 93, 94, 139, 179, 203, etc.

NOTHNAGEL, DR. HERMANN. *Handbuch der Arzneimittellehre*, Berlin, 1870, p. 297, et seq.

SQUIRE. *Companion to the British Pharmacopœia*, eighth edition, p. 58.

STILLÉ, DR. ALFRED. *Therapeutics and Materia Medica*, vol. i, p. 183.

TROUSSEAU ET PIDOUX. *Traité de Thérapeutique et de Matière Médicale*, vol. i, p. 200.

WALDENBURG UND SIMON. *Handbuch der allgemeinen und speciellen Arzneiverordnungs-Lehre*, Berlin, 1873, p. 195, et seq.

ARSENICUM.

Arsenic.—*Acidum arseniosum*; *arsenious acid*. *Acide arsénieux*, Fr.; *Arsenige Säure*, Ger. Dose, $\frac{1}{30}$ — $\frac{1}{10}$ grain.

Arsenii Iodidum.—Iodide of arsenic. Is an orange-red, crystalline solid, entirely soluble in water, and wholly volatilized by heat. Dose, gr. $\frac{1}{5}$.

Liquor Acidi Arseniosi.—Solution of arsenious acid. Dose, ℥ ij—v.

Liquor Arsenii et Hydrargyri Iodidi.—Solution of iodide of arsenic and mercury; Donovan's solution. Dose, ℥ ij—v.

Liquor Potassii Arsenitis.—Solution of arsenite of potassium; Fowler's solution. (Arsenious acid, bicarbonate of potassium, compound spirit of lavender, and distilled water.) Dose, ℥ ij—x.

Liquor Sodii Arseniatis.—Solution of arseniate of sodium; Pearson's solution. Dose, ℥ ij—xx.

Arsenic in solution is better for internal administration than the solid arsenious acid, and, of the three solutions (official) mentioned above, Fowler's is the best. Arsenious acid, when administered in

the solid form and at short intervals, may act with unexpected violence.

When a course of arsenic is begun, large doses should be prescribed, and the quantity administered should be regularly reduced. In this way chronic arsenical poisoning is avoided. When continually increasing doses are given, the arsenic accumulates, and toxic symptoms are quickly induced. As a rule, unless very small doses are prescribed, arsenic should be taken after meals. Some subjects are soon seriously affected by even small doses of arsenic. For this reason, when the idiosyncrasies of the patient are unknown, it were better to make tentative experiments with a few small doses before beginning with large ones. A few drops of laudanum given with arsenic will enable it to be better borne by some susceptible subjects.

ANTAGONISTS AND INCOMPATIBLES.—The salts of iron, magnesia, and lime, and astringents, are chemically incompatible. The arseniate of iron, although not actively so, does cause toxic symptoms if continued in full medicinal doses. The hydrated sesquioxide of iron, *freshly precipitated*, and in a soft magma, is the antidote to *arsenic in solution*. About eight grains of the antidote are required for each grain of the poison swallowed. As the hydrated sesquioxide of iron is harmless, it should be given in teaspoonful to tablespoonful doses, every few minutes. In every case of poisoning by arsenic, prompt efforts to secure evacuation of the contents of the stomach are necessary. Large doses of the antidote may be given with the emetic employed. In the absence of the hydrated sesquioxide of iron, magnesia, chalk, and lime-water may be given freely. These agents act in part, and probably chiefly, mechanically, by enveloping the particles of arsenic, and so hindering absorption. It is held by some that freshly precipitated hydrate of magnesia is more effective as an antidote than the hydrated sesquioxide of iron. Large draughts of oil, milk, and substances containing mucilage, by protecting the mucous membrane, render important service in cases of arsenical poisoning. Dialyzed iron, later experiences show, is quite as efficient as the hydrated sesquioxide, and is always ready. It is an important point to favor rapid elimination of the poison when the patient survives the acute symptoms. This is accomplished by the use of diluent drinks, skimmed milk, slightly alkaline mineral waters, etc.

SYNERGISTS.—All those agents which promote constructive metamorphosis are synergistic to arsenic.

PHYSIOLOGICAL ACTIONS.—Applied to the tissues, arsenic excites violent inflammation and causes destruction of the part; it is, therefore, an escharotic. Great pain attends its action. In consequence of the high degree of inflammation which it excites, when applied in sufficient strength, absorption does not follow its local use, but weak applications may excite dangerous symptoms by diffusion into the blood.

Symptoms of poisoning follow the inhalation of arsenical fumes. Numerous instances have occurred in which wall-papers colored with arsenical pigments have poisoned the occupants of an apartment. Garments covered with aniline dyes, fixed by arsenical mordants, have induced local ulcerations and systemic symptoms from absorption of arsenic. Applications to a large portion of even the unbroken integument, and to ulcerated surfaces, have, in numerous instances, excited dangerous symptoms, and have produced fatal results. That arsenic, wherever applied, manifests a selective action on the mucous membrane of the respiratory and digestive tracts, is a curious fact.

Arsenic, in small medicinal doses, promotes the appetite and digestive functions, and improves the body nutrition. It increases secretion of the gastro-intestinal mucous membrane, and hastens the peristaltic movements. Arsenic diffuses into the blood with facility. It probably enters into combination with the red blood-globules. It certainly lessens the excretion of carbonic acid, probably also of urea; in other words, it checks the retrograde metamorphosis. It stimulates the cerebral functions and induces a feeling of well-being, and in some subjects decided mental exhilaration.

In larger doses, yet not in quantity to produce acute poisoning, and when full medicinal doses have been administered for a lengthened period, arsenic causes more characteristic physiological actions than are described above. As regards the digestive organs, the following phenomena occur: A metallic taste; increased flow of saliva; nausea, vomiting of glairy mucus, epigastric pain, and soreness; diarrhoea, tenesmus, and sometimes dysenteric stools. As regards the circulatory and respiratory organs: the action of the heart becomes irritable and feeble, palpitations, cough, oppressed breathing, œdema of the eyelids, general œdema, and albuminuria occur. As regards the skin: itching of the eyelids, urticaria, eczema, pityriasis, psoriasis, and falling out of the nails and hair. As regards the nervous system: disorders of motility—trembling, stiffness, and contraction of the joints, disorders of sensibility, herpes zoster.

Notwithstanding the effects above described are so frequently observed to follow the use of arsenic, it is undoubtedly true that a certain degree of *tolerance* may be established when doses in themselves toxic can be taken with impunity. This state has been produced in a course of the legitimate administration of arsenic, and has been witnessed on a considerable scale among the arsenic-eaters of Styria and Southern Austria. The arsenicophagi begin the habit of arsenic-eating at an early age, and become habituated to the use of enormous doses. They find that this practice is serviceable in several respects: they improve in bodily condition, gain in breathing-power, and become stronger and more pugnacious, and also more salacious.

When arsenic is swallowed in sufficient quantity to cause the symp-

toms of acute poisoning, the phenomena produced are of two kinds—gastro-intestinal irritation and cerebral effects. The former is much the more common. The following are the symptoms of the gastro-intestinal form of acute arsenical poisoning: Burning at the epigastrium and radiating thence over the abdomen; violent and uncontrollable vomiting; great dryness of the mouth and fauces; intense thirst; intestinal irritation, bloody and offensive stools, retracted abdomen; strangury, priapism, suppression of urine or bloody urine, and in females menorrhagia; rapid and feeble action of the heart, oppressed breathing; great agitation and restlessness; shrunken features, cold breath; involuntary evacuations; collapse—consciousness being retained to the last. In the cerebral form of acute poisoning, without any symptoms of gastro-intestinal irritation, the patient is suddenly put into a condition of profound insensibility and coma, not unlike extreme opium narcosis.

Recovery from the effects of acute arsenical poisoning is rarely complete. For a long time afterward a considerable degree of gastro-enteric irritability will persist, and life may at last be lost from the continued operation of this pathological state on the function of nutrition. An irritable state of the skin and stiffness of the joints may also continue for some time, and paralysis may supervene, accompanied with neuralgic pains, numbness, formication, etc.

The changes found after death in the gastro-intestinal mucous membrane are those due to an irritant: deep redness, erosions, ecchymoses, and softening. These alterations are also produced when toxic effects are caused by the external application of arsenic. More or less redness of the tracheal and bronchial mucous membrane and congestion of the lungs have been observed. It must not be forgotten that arsenic has caused a fatal result without producing any gastro-intestinal lesions except some uncharacteristic redness. Fatty degeneration of the liver, kidneys, spleen, and other organs, has been observed in cases of acute poisoning, even when the symptoms have existed for a few hours. The icterode hue of the skin and the albuminuria which occur in the course of chronic arsenical poisoning are probably due to fatty degeneration of the liver-cells and of the renal epithelium.

Arsenic, although like other mineral poisons it tends to accumulate in the system, is nevertheless eliminated with considerable rapidity. If the patient survive a week after the ingestion of a toxic dose, it is difficult to detect it in the body after death. If the poison is retained and death ensues before elimination can take place, it undoubtedly retards putrefaction. Arsenic is eliminated by various organs—by the liver, intestinal canal, kidneys, and bronchial tubes—and some of the symptoms produced by it probably have their origin in the local effect of the poison on the channels of excretion.

The quantity of arsenic required to produce a fatal effect varies ac-

ording to the state of the stomach and the susceptibilities of the patient. Ounces have been swallowed without producing even serious symptoms, because promptly rejected by vomiting. When the stomach is full of food, absorption is slow and vomiting is easily induced, and hence a toxic dose may not under these circumstances produce any of the phenomena of poisoning. A half-grain of arsenious acid has caused symptoms of poisoning (Taylor), and, according to the same authority, from two to four grains may prove fatal to an adult. Much depends on the idiosyncrasies of the individual, which, as has been stated above, differ greatly in different persons. These facts should not be forgotten in prescribing strictly medicinal doses of arsenical preparations.

From this general survey of the effects of arsenic, we may properly proceed to study the results of more minute investigations. Virchow has pointed out the similarity in the *post-mortem* appearances of arsenic and of cholera. The cholera-fungus of Klebs and the characteristic rice-water contents of the intestinal canal were not wanting to complete the resemblance. Hoffman has since fully confirmed these observations. Croupous exudations are sometimes encountered in the stomach and intestines, and crystals of arsenic have been found imbedded in the false membrane. This result is due to the action of arsenic when swallowed in powder, and is not produced when the poison is taken in solution (Filehne, Lesser). The gastro-intestinal inflammation, present in a large proportion of cases, is due in part to the local action of the arsenic, in part to its selective action, but this fact does not justify the statements of Böhm and Unterberger that a larger dose of the poison is required to destroy life by the intravenous injection than by the stomachal administration. Lesser holds with the authorities in general that arsenic, in common with other poisons, is more fatal by intravenous injection. In a small proportion of cases, as has been stated, gastro-intestinal inflammation does not occur, but the effects of the poison are expended on the nervous centers; several hours after the ingestion of a large dose, delirium, followed by coma, and convulsions come on, and with these albuminuria, occasionally urinary suppression. The relation of the attacks of eclampsia to the albuminuria has not been settled. In still other cases the gastro-intestinal disturbance, the rice-water discharges, the collapse, simulate the algid stage of cholera. The remarkable fall in the blood-pressure of the abdominal vessels produced by arsenic certainly throws light on these phenomena (Böhm and Unterberger).

The experiments of Sklarek have demonstrated that arsenic decidedly impairs sensibility, leaving the motor functions untouched. In the human subject, however, as the result of acute poisoning, and sometimes after the acute symptoms have subsided, certain paralyses develop. They may be preceded by numbness and tingling, and may

be accompanied by contractures which disappear in curable cases, and remain permanently in incurable cases. The paralysis may be limited to a single member, and when several are thus affected the usual form of paralysis is paraplegia; but all four members may be thus disabled. The rectum and bladder are not affected (Christison). These clinical observations by Christison are confirmed by the researches of Ringer and Murrell, who have shown that Sklarek's statements were incorrect, and that motor paralysis precedes sensory paralysis in the frog poisoned by arsenic. (*See* Ponteland Poisoning Cases, "Lancet," September, 1866.)

The effects of arsenic on the circulation are not the same in cold and warm blooded animals, for, according to Sklarek, in the former the action of the heart is slowed, then arrested, while in the latter the action of the heart persists after the cessation of respiration (Böhm and Unterberger, Lesser). This fundamental difference in the action of arsenic on the two classes of animals requires us to accept with caution the observations made on the vaso-motor system of the cold-blooded. It has been pretty definitely ascertained that arsenic causes a fall in the blood-pressure, which is especially strong in the abdominal blood-vessels (Böhm and Unterberger).

A fact of great importance, first ascertained by Saikowsky, is the fatty degeneration of the liver, kidneys, heart, and other organs. The case of Grohl and Mosler, reported in the same volume of Virchow's "Archiv" containing Saikowsky's paper, is confirmatory more or less completely of the observations in the latter. They found, as their figures well exhibit, fatty degeneration to a greater or less extent in the glandular epithelium of the intestinal canal, and less conspicuous evidences of the same change in the kidneys, the liver, and the muscular tissue of the heart. As the extent of the change is determined largely by the duration of the case, when death occurs in a few hours, or in a day or two, little alteration is discernible.

The effect of arsenic on the function of nutrition is as yet involved in doubt. It is a recognized fact that arsenic promotes constructive metamorphosis when administered in medicinal doses. It has been ascertained by Saikowsky that it arrests the formation of glycogen by the liver, and C. Schmidt has shown that it lessens the excretion of carbonic acid and urea. Although doubt has been thrown on these statements, they seem to be supported by the observations of Lesser on the temperature, which has been constantly and considerably depressed under the action of lethal doses. The effect of arsenic in lowering the functional activity of the respiratory center is a fact which supports the same view, for a diminution in the quantity of oxygen admitted to the blood must necessarily lessen the rate of oxidation. On the other hand are the adverse experiments of Kassel, a medical student under Prof. Gäthgens, and Gäthgens himself, which appar-

ently demonstrate an actual increase in the amount of urea excreted. Arsenic has an anti-fermentative action; but it is not universally destructive of the minute organisms on the presence of which the various fermentations are dependent. Thus it is poisonous to *Torula cerevisia* and to some micrococci, but not to all, and it does not impair the activity of certain animal ferments, as pepsin, pancreatin, etc. (Johannsohn, Schäfer, and Böhm). On the trophic system it acts as a depressant when taken in considerable quantity. The dust from arsenical wall-papers has induced a cachectic state, accompanied by headache, vertigo, and tinnitus (Donkin). Aniline dyes fixed by a mordant of arsenic have excited ulceration of the nails, phlegmon of the hands, and anæsthesia and paresis of the extremities (Clemans).

THERAPY.—The preparations of arsenic are applicable to the treatment of the diseases of those tissues upon which it has a selective action.

No remedy is more useful than arsenic in the so-called *irritative dyspepsia*, manifested by these symptoms: a red and pointed tongue, poor appetite, distress after meals, the presence of the food causing intestinal pain, colic, and the desire to go to stool. Drop-doses of Fowler's solution, given before meals, quickly relieve this state of things. The effects of the arsenic are frequently favored by the conjoint administration of a little laudanum.

In some cases of the *vomiting of pregnancy*, a drop of Fowler's solution given before each meal will afford astonishing relief. The particular indications for its use are these: vomiting of food, followed by retching and straining, the vomited matters being streaked with blood, or blood alone being thrown up; these symptoms accompanied by gastralgia and pain between the scapulae.

The vomiting of *chronic gastric catarrh*, especially the alcoholic form, is relieved by one or two drops of Fowler's solution taken before meals. It effects a cure in these cases by relieving the morbid state of the mucous membrane on which the vomiting depends. Arsenic is also very beneficial in these small doses in *chronic ulcer of the stomach*. It checks the vomiting, relieves the pain, and improves the appetite for food. It is not equally effective in the *acute ulcer*. Although arsenic exercises but little influence over the progress of these cases, it is very serviceable in *cancer of the stomach*, by diminishing the pain and checking the vomiting. *Gastralgia* and *enteralgia*, when idiopathic, are sometimes made to disappear in a very surprising manner by the same remedy, but there are no certain indications of the kind of case to which it is best adapted.

In the treatment of stomach-disorders, only small doses of arsenic are admissible. Large doses, by creating an irritation of the gastric mucous membrane, will only defeat the end in view.

That form of *diarrhoea* which consists merely in an intolerance of

the presence of food, an evacuation of the undigested aliment taking place soon after it is swallowed, is cured by arsenic. *Chronic diarrhoea* and *dysentery* (entero-colitis), especially when dependent on the changes induced by chronic malarial infection, are often greatly benefited by the same remedy. In these cases, two drops of Fowler's solution with five drops of laudanum should be given before meals. Attention to the diet is, of course, imperative. *Constipation*, when due to deficient secretion and dryness of the fæces, is sometimes overcome by small doses of Fowler's solution.

Arsenic is one of the numerous remedies proposed for the treatment of *epidemic cholera*. It is a curious circumstance, first demonstrated by Virchow, that some cases of acute arsenical poisoning are not distinguishable by their symptomatology or morbid anatomy from cases of epidemic cholera.

Arsenic has been used with success in the treatment of the *jaundice* due to catarrh of the bile-ducts succeeding to catarrh of the duodenum. It seems to the author to be better adapted to cases of *jaundice* of *malarial* origin. Excellent results are obtained by the persevering use in small doses of arsenic in *cirrhosis*. As arsenic tends to accumulate in the liver, and as it produces fatty degeneration of this organ, the curative effect in the above-named disorders may depend on this selective action.

There is no doubt that arsenic promotes in a very decided manner the constructive metamorphosis. It is one of the most valuable agents which we possess in the treatment of *chlorosis* and *anæmia*. It is especially adapted to those cases in which iron does not agree or fails of effect. The efficiency of iron in these disorders is much increased by combination with arsenic.

Cases of *acute coryza* and *hay-asthma* are often decidedly relieved by this remedy. *Chronic catarrh of the broncho-pulmonary mucous membrane*, *emphysema*, *sclerosis of the lungs*, are maladies in which arsenic, long used in ordinary medicinal doses, is capable of effecting considerable amelioration. We have no single drug of equal utility in the chronic forms of *phthisis*, but it is not serviceable in caseous pneumonia. It is said, and this statement corresponds to the author's observation, that, when there are much hectic and rapid disintegration of the pulmonary tissues, arsenic is not beneficial. Besides the stomach administration of arsenic in the above-mentioned maladies of the respiratory organs, it is used with advantage by the process of fumigation. The following is the formula of Trousseau for arsenical cigarettes:

Arsenite of potassa.....	15 grains.
Distilled water.....	1 ounce.

Unsize white paper is thoroughly moistened with this solution, dried and cut into twenty equal parts, and each part rolled into a

cigarette. Two or three of these are smoked daily for the relief of *chronic bronchitis, emphysema, spasmodic asthma, phthisis, hay-asthma*, etc. The arseniate of soda may be used in the same way, and under the same conditions; for example, take a half-drachm to one drachm of arseniate of soda, one ounce of distilled water, and moisten a bit of unsized paper with the solution, so that every piece of a given size shall contain a determined quantity of the arsenic, ordinarily from one fourth to one grain. When the cigarette is lighted, the patient inhales the smoke by a single inspiration, and this inhalation is practiced three or four times a day. In cases of *acute and chronic coryza*, great advantage is obtained by snuffing into the nares the fumes of arsenical cigarettes. The arsenite of antimony, according to Dr. Lucien Papillaud, is especially serviceable in pulmonary affections.

When, in consequence of feebleness of the heart, there are present *short breathing* on making slight exertion, and *cedema of the feet and ankles*, especially as these symptoms occur in old people, arsenic is indicated. Attacks of *angina pectoris* may be lessened or prevented by the persistent use of arsenic in the interval.

Certain disorders of the nervous system are greatly benefited by the use of arsenical preparations. The author has seen it extremely useful in *cerebral congestion*, for the treatment of which it was originally recommended by Dr. Lemare-Picquot. It is indicated when there are commencing atheromæ of the cerebral vessels, sluggish venous circulation, puffiness of the eyes, tendency to drowsiness, and intellectual torpor. In the *melancholy* and *hypochondria* of the aged, it gives great comfort, and frequently entirely dispels the gloomy fancies which take possession of the mind under these circumstances. The arsenic acts most favorably when combined with minute doses of opium; viz., two drops of Fowler's solution, with three to five drops of tincture of opium, given three times a day. Arsenic is one of the remedies successful in the treatment of *neuralgia*. Generally its curative influence is indirect, and exerted through the improvement in the bodily nutrition which follows its administration. It is directly curative, however, in the cases of *hemicrania*, and other *neuralgic* of *malarial origin*, but it holds a place strictly secondary to quinine in these affections. It is certainly one of the most effective remedies which we possess in the treatment of *chorea*. In this disease, large doses—five minims *ter in die*—must be given. Young subjects, it should be remembered, bear large doses of arsenic, relatively, better than adults. Cases of *epilepsy* have been reported cured by arsenic, but these were probably instances of *epileptiform vertigo* caused by stomach-disorder, in which this remedy is undoubtedly of great utility. Charcot has found the subcutaneous injection of Fowler's solution of real value in *paralysis agitans*. The same expedient has succeeded in *local chorea* and *histrionic spasm*. The injection should be made into the affected muscles, whenever practicable.

Arsenic produces, in the course of its medicinal administration, affections of the skin, and notably those dependent on an unknown state of the trophic nerves. In the treatment of various skin-affections we avail ourselves of this physiological fact, and set up by means of arsenical preparations a *substitutive* action in the skin. It follows, that arsenic will not be serviceable in *acute* affections of the skin, and experience demonstrates that, whenever active cell-proliferation is taking place, arsenic is contraindicated. It is most serviceable when the affection of the skin is superficial in its seat—in the epidermis and the superficial layers of the derma. In cases of *psoriasis* much good may be expected from it, but, the more chronic the disease, the more beneficial is it. When the arsenic begins to exert an influence on *psoriasis*, the skin appears more inflamed, but this is an evidence that the curative action is taking place, and the remedy should then be persisted in. *Acute eczema* is rather exasperated by arsenic, but *chronic eczema*, especially *eczema squamosum*, is often greatly benefited by it. When eczema infests the vulva, anal region, and scrotum, arsenic is said to be useful, but its efficacy in these cases is largely determined by the chronicity of the attacks. *Pemphigus* is an affection of the skin which, as was more particularly shown by Mr. Hutchison, is curable by arsenic, but the more chronic the disease the more certainly beneficial the remedy. In old cases of *acne*, especially *acne rosacea*, arsenic is sometimes serviceable, but it is often very disappointing. The author has not observed much good to follow the use of arsenic in the acne which occurs at puberty and for some years subsequently. In all cases of acne the strictest attention to diet and a proper hygiene is very important. Arsenic given with bromide of potassium lessens or prevents the very disfiguring *acne* which appears in the course of the administration of that agent. *Furuncle* (boils) is successfully treated by the long-continued use of arsenic. This practice is strongly urged by Dr. Delioux de Savignac. A succession of boils is the indication for the use of this remedy.

In the treatment of skin-affections, Fowler's solution is the arsenical preparation most frequently employed. The commencing dose need not be larger than five drops three times a day, given after meals. It is better to commence with the maximum dose, and to diminish the amount gradually. As arsenic needs to be administered for a long time in skin-diseases, such toxic symptoms as irritation of the eyelids, puffiness of the eyes, and epigastric pain and soreness, are apt to arise. These symptoms are indications for the use of laxatives, and for a reduction in the dose of the remedy, but not for its entire suspension. In order to prevent relapses, the use of arsenic should be continued, in diminishing doses, for some time after the entire disappearance of the eruption.

Arsenic is not serviceable in *skin-diseases of syphilitic origin*. In

very chronic cases of this kind the compound solution of arsenic, iodine, and mercury—Donovan's solution—is sometimes very effective, but the curative effect is here due to the iodine and mercury, rather than to the arsenic.

Arsenic is very useful in a certain form of *chronic arthritis*. The cases to which it is adapted are those in which the joints become tumid and stiff and painful in consequence of a peculiar state of the nervous system; indeed, the condition is one allied to neuralgia, the trophic nerves being involved. This is a malady very different from that kind of chronic rheumatism or rheumatic gout which is accompanied by nodosities of the joints, in which arsenic has been recommended, but over which, according to the experience of the author, it exerts no control.

Arsenic has seemed to the author remarkably beneficial in *diabetes* of hepatic origin. It has also been found useful by Johannsohn. Brunton reports good results from its administration in *albuminuria*, apparently due to defective digestion of albumen.

Amenorrhœa, when due to functional inactivity of the ovaries, and *menorrhagia*, when produced by anæmia, are equally benefited by the preparations of arsenic, especially when combined with iron. *Spermatorrhœa*, if dependent on a weak and relaxed state of the seminal vesicles, and *functional impotence*, are sometimes greatly improved by full doses of the arseniate of iron. It is often advantageous to combine the arseniate of iron and ergotine, as follows: ℞ Ferri arseniat., gr. v; ext. ergotæ, ʒ ss. M. Ft. pil. no. xxx. Sig.: One night and morning.

Next to quinine, arsenic has the most important position in the treatment of *malarial fevers*. It may be used to prevent the recurrence of attacks of *ague* when quinine for any reason is not admissible. As regards acute malarial toxæmia, arsenic is more useful as an adjunct to quinine than as the sole remedy. The treatment of acute cases may be formulated as follows: large doses of quinine to interrupt the paroxysms, and at the septenary periods; arsenic given daily to prevent relapses. It plays a more important rôle in chronic malarial diseases. As has been shown by Boudin, arsenic diminishes the engorgement of the spleen. The author has witnessed the rapid disappearance of *malarial jaundice*, and the cure of the alterations in the glandular appendages of the intestinal mucous membrane, under its use. It is most useful generally to combine iron with arsenic in the chronic form of malarial disease. ℞ Mas. ferri carbon., ʒ j; acidi arseniosi, gr. j. M. Ft. pil. no. xx. Sig.: One three times a day. ℞ Quininæ sulph., ʒ ij; ferri sulph. exsic., ʒ j; acidi arseniosi, gr. j. M. Ft. pil. no. xx. Sig.: One three times a day. Boudin justly insists upon abundant alimentation during a course of arsenical treatment of intermittents, and, with a view of preparing the digestive organs, administers a prelimi-

nary emetic to relieve the stomach of the *embarras gastrique*. Arsenic has also been used as a *prophylactic* against malarial infection, and as a remedy for various intermittent diseases due to malarial influence. The author has seen excellent results from the use of small doses of Fowler's solution three times a day in *typho-malarial fever*. When there is much diarrhœa, a few drops of tincture of opium should be added to each dose of arsenic. In doses of half a drop to one drop of Fowler's solution, the tongue cleans, the skin becomes moist, and the delirium lessens in a most remarkable manner, sometimes. When arsenic is used alone in the treatment of intermittents, large doses are necessary. Ten drops of Fowler's solution may be given after meals to adults, but in a few days—three, four, or five, according to the susceptibility of the patient—the dose must be reduced two drops each day until four drops are reached. If the stomach does not become disordered, slight irritation of the conjunctivæ and puffiness of the eyelids may be disregarded.

There can be no doubt that the long-continued use of small doses of arsenic exercises a favorable influence over the course and progress of *epithelioma*. It has appeared, indeed, to be useful in *scirrhus*, especially as this morbid process manifests itself in the stomach. *Rodent ulcer*, which is closely allied in its nature to epithelioma, is also improved by it. With the internal use of the arsenical preparations may be conjoined the local applications of arsenious acid. Many physicians, notably Dr. Atlee, of Philadelphia, entertain the belief that the long-continued use of arsenic retards the growth of *uterine cancer*. It appears to the author to be certain that arsenic is useful in epithelioma, but he regards it as improbable that it exerts a curative influence over the other forms of cancer, although it alleviates some of the distress experienced by the subjects of cancer of the stomach. Billroth reports a case of *multiple lymphoma* cured by the use of arsenic.

External Uses of Arsenic.—An arsenical paste having the following composition is used to destroy the sensibility of a carious tooth: arsenious acid, ij; sulphate of morphia, j; sufficient creosote to make a paste. A small quantity of this is applied by a bit of cotton-wool to the carious portion of the tooth.

Arsenious acid is sometimes employed to destroy cancerous growths. But, as it is extremely painful, and as the danger of absorption is great, other escharotics, as, for example, the chloride of zinc, are generally preferred. When it is used, the operator should be careful to employ an arsenical paste of sufficient strength to set up a limiting inflammation, and thus prevent absorption. From one sixth to one fifth of arsenious acid is the proper proportion, and it may be mixed with calomel, starch, or other impalpable powder. If the surface to be destroyed is large, a portion of it should be submitted at a time to the action of the escharotic. Poultices should then be ap-

plied until the slough separates, when a healthy granulating surface is obtained. The excessive pain caused by the escharotic may be much alleviated by combining morphine and carbolic acid in the arsenical paste, or by the use of morphine hypodermatically until the escharotic action ceases.

An arsenical paste prepared as follows is sometimes used as a depilatory: quicklime, $\frac{3}{4}$ ss; yellow sulphide of arsenic, grs. xx; starch, $\frac{3}{4}$ ij. Sulphide of barium and oxide of zinc is a more efficient combination. Esmarch's caustic is composed of: Arsenious acid, one part; morphia sulph., one part; calomel, eight parts; and pulv. acaciae, forty-eight parts. Mix. Sprinkle thickly every day on a surface either raw or denuded of cuticle by a blister.

In addition to the above local uses of arsenic, the results achieved by its hypodermatic injection should be mentioned. Dr. Radcliffe was the first to employ this practice in cases of *local chorea* of the head and neck, and in *histrionic spasm*. In these affections Fowler's solution or Pearson's, in doses of two to ten minims, diluted with an equal measure of water, is thrown into the affected muscles daily, sometimes curing after some weeks of treatment. In obstinate cases of general chorea the subcutaneous injection of arsenic is now practiced, with good effects, a cure resulting more speedily than by the stomachal method of administration. Arsenic used by this method has proved to be the most effective remedy for *lympadenoma*.

Authorities referred to:

- GÄTHGENS, C. *Zur Kenntniss der Arsenwirkungen*. *Centralblatt f. d. med. Wis.*, 32, 1875, p. 529.
- GIES, DR. THOMAS. *Experimentelle Untersuchungen über den Einfluss des Arsens auf den Organismus*. *Archiv für experimentelle Path. und Pharm.*, vol. viii, p. 176.
- GROHE, FR., UND MOSLER, FR., PROFS. *Zur Kenntniss der Veränderungen innerer Organe bei acuter Arsenvergiftung*. *Virchow's Archiv*, Band xxxiv, p. 208.
- HEBRA, PROF. DR. *On Diseases of the Skin*. Syd. Society edition, 1868.
- HERMANN, PROF. DR. *Lehrbuch der experimentellen Toxicologie*, Berlin, 1874, p. 224. *Arsenverbindungen*.
- HOFFMAN, PROF. DR. *Arsenikvergiftung und Cholera*. *Virchow's Archiv*, vol. 1, p. 455.
- HUNT, THOMAS, MR. *On the Treatment of Chronic Diseases of the Skin*. *The Lancet*, vol. i, 1846.
- ISNARD, M. *Bulletin Général de Thérapeutique*, vol. lxxxiv, p. 80. *Ibid.*, vol. lxxii.
- JOHANNSON, NICOLAI. *Ueber die Einwirkung der arsenigen Säure auf Gährungs Vorgänge*. *Archiv für experiment. Pathol. und Pharmacol.*, vol. ii, p. 99.
- KOSSEL, ALBRECHT. *Zur Kenntniss der Arsenwirkungen in Prof. Gäthgens Labor. zu Rostock*. *Archiv f. exper. Pathol. u. Pharm.*, vol. v, p. 128.
- LESSER, A. *Archiv für path. Anatomie und Physiologie*, 1873, p. 398, and 1874, p. 603.
- LOLLIOT, M. *Bulletin Général de Thérapeutique*, vol. lxxv, p. 338.
- MARMÉ, W. *Vergleichende Versuche über die Wirkungen der arsenigen Säure und der Arsensäure*. Abstract in *Virchow und Hirsch*, vol. i, 1876.
- MARSDEN, DR. ALEXANDER. *A New and Successful Mode of treating Cancer*, London, 1869, p. 96.

- PONTELAND POISONING CASES. *The Lancet*, September 22, 1866, p. 337.
- ROUTH, DR. C. H. F. *Obstetrical Transactions*, vol. viii, p. 290.
- RINGER AND MURRELL. *Journal of Physiology*, vol. i, p. 217.
- SCOLOSUBOFF, DR. *Sur la localisation de l'arsenic dans les tissus à la suite de l'usage des Arsenicaux*. *Archives de Physiol. Norm. et Path.*, vol. v, p. 563.
- SKLAREK, DR. W. *Archiv für Anat. und Physiologie*, 1866, p. 41. *The Physiological Effects of Arsenious Acid*.
- SCHÄFER, F., UND BÖHM. *Ueber den Einfluss des Arsen auf die Wirkung ungeformtes Fermente*. *Virchow u. Hirsch*, vol. i, 1872.
- SHULZ, DR. H. *Weiterer Beitrag zur Theorie des Arsenwirkung*. *Archiv für experiment. Pathologie u. Pharmacol.*, vol. xiii, p. 256.
- UNTERBERGER, S. *Mitgetheilt von Prof. Böhm. Beiträge zur Kenntniss der physiologischen Wirkungen der Arsenigen Säure*. *Ibid.*, vol. ii, p. 89.
- VIRCHOW, R. *His Archiv*, vol. xlvii, p. 524. *Choleraähnlicher Befund bei Arsenikvergiftung*.

THE SIMPLE BITTERS.

Quassia.—*Quassi amer*, Fr.; *Quassienholz*, Ger. The wood of *Picræna excelsa* Lindley (*Quassia excelsa* Swartz; Nat. Ord. *Simarubaceæ*), U. S. P.

PREPARATIONS.—*Extractum Quassiae*. Extract of quassia. Dose, gr. j—gr. iij.

Tinctura Quassiae.—Tincture of quassia (10 parts to 100 of diluted alcohol). Dose, \mathfrak{m} v—3 j.

Extractum Quassiae Fluidum.—Fluid extract of quassia. Dose, \mathfrak{m} v—3 ss.

COMPOSITION.—Quassia-wood contains a crystallizable bitter principle, neutral, called *quassin*.

Gentiana.—*Gentian, gentiane*, Fr.; *Bitterwurzel*, Ger. The root of *Gentiana lutea* Linné (Nat. Ord. *Gentianaceæ*), U. S. P.

PREPARATIONS.—*Infusum Gentianæ Compositum*. (Not official.) Compound infusion of gentian. (Gentian, bitter orange-peel, coriander.) Dose, 3 j— $\frac{3}{4}$ j.

Tinctura Gentianæ Composita.—Compound tincture of gentian. (Gentian, bitter orange-peel, cardamom, alcohol.) Dose, 3 ss—3 ij.

Extractum Gentianæ Fluidum.—Fluid extract of gentian. Dose, 3 ss—3 ij.

Extractum Gentianæ.—Extract of gentian. Dose, gr. j—gr. v.

COMPOSITION.—Gentian contains a peculiar principle, *gentianine*, and an acid, *gentisic acid*.

Gentiana Catesbæi.—Blue gentian, American gentian. This indigenous remedy may be used as a substitute for the foreign gentian, and similar preparations to the official formula for gentian, as above, may be prepared from it.

UNOFFICIAL FORMULÆ.—*Mistura gentianæ alkalina*. Dilute hydrocyanic acid, \mathfrak{m} iij; bicarbonate of soda, grs. xv; compound infusion of gentian to oz. j.

Mistura Gentianæ et Sennæ.—Infusion of gentian, drachms vj;