

SALTS OF GOLD.

About the year 1810 M. Chrestien, of Montpellier, called the attention of the medical world to the preparations of gold, and published in his *Méthode Iatroleptique*, the formulæ of the salts he employed. Since that time several physicians have experimented with this remedy, and have not succeeded as M. Chrestien did; though, on the other hand, many have been equally happy in the results; so that the salts of gold may now be mentioned as efficacious remedies in syphilitic complaints. Nor can I conceive how M. Chrestien should have so far misunderstood my opinion, as to think that I held these medicines in no esteem.

Besides M. Chrestien, Dr. Legrand (*De l'or, de son emploi dans le traitement de la syphilis récente et invétérée, &c. &c.* Paris, 1828) has published a long series of observations, confirming the benefit to be derived in syphilitic and scrofulous disorders from auriferous salts.

Four preparations of gold are now principally employed in medicine, namely, the chloruret or muriate of gold, the chloruret or muriate of gold and soda, the oxide of gold, and the oxide formed by tin, or the *purple powder of Cassius*. Finely divided gold has also been employed.

Mode of preparing the Chloruret or Muriate of Gold.

Take one part of fine beaten gold, cut it into small pieces, and introduce it into a white glass phial: then pour upon it three parts of *aqua regia*, (composed of one part of nitric and two parts of hydrochloric acid,) and heat the whole in a very small sand bath. The solution of the gold is soon effected, and the liquor is then to be evaporated until the smell of chlorine is perceived; a thing easily ascertained, for at a certain stage of the process, nitric acid alone is disengaged, immediately after which commences the decomposition

of a part of the chloruret that is formed. The containing vessel is then to be allowed to cool, when the chloruret soon passes to a crystalline mass of beautiful yellow needles. In this state the chloruret of gold is as pure as is requisite. Not containing an excess of hydrochloric acid, it is not deliquescent, for which reason it may be kept in a vessel stopped with paper only, without danger of its undergoing any change.

Physical and Chemical Properties.

Chloruret of gold is always very acid, but does not owe this property to any foreign acid. Its taste is styptic and exceedingly disagreeable. It is only deliquescent when it has an excess of hydrochloric acid. It dissolves easily in water, to which it communicates a fine yellow colour. It produces with animal and vegetable matters a purple violet hue, and stains the epidermis. Exposed to a moderate heat, it passes to the state of proto-chloruret: with a stronger heat, and in a closed vessel, it gives out chlorine without water, leaving for residue nothing but metallic gold. As regards its composition, two parts of gold ought to furnish at least three parts of chloruret.

Mode of preparing Chloruret of Gold and Sodium, or Muriate of Gold and Soda.

Dr. Chrestien seldom uses the pure chloruret of gold in medicine, but combines it with chloruret of sodium, so as to form a double salt or muriate of gold and soda. We are indebted to MM. Figuier and Javal for all that is known concerning this double salt, either of soda or potass.

M. Figuier's mode of preparing the chloruret of gold and sodium is to dissolve four parts of gold in aqua regia, evaporate the solution to dryness, pour 32 parts of water on the product, and one part of chloruret of sodium, and concentrate the fluid to half its weight or 16 parts; on cooling, crystals are obtained composed

of 69.3 chloruret of gold, 14.1 chloruret of sodium, and 16.6 water.

M. Javal has made similar observations on the chloruret of gold and potassium.

Physical Properties of Chloruret of Gold and Sodium.

These double salts have a beautiful yellow colour, and exhibit the form of quadrangular elongated prisms. They attract moisture, but less forcibly than the acid chloruret.

Mode of preparing the Oxide of Gold.

The oxide of gold used by M. Chrestien, is prepared by means of carbonate of potass. The following is a method which gives a more exact and more economical product than the process of the Parisian Codex.

Introduce any quantity of chloruret of gold into a white glass phial, and pour upon it six or seven times its weight of boiling water, in order to dissolve the chloruret; then add gradually crystallized baryta until the liquor has lost its acidity, which may be ascertained by immersing a slip of blue turnsol paper in it, which will not change colour. Boil the liquor for a short time, and leave it to cool, in order to filter it: wash the precipitate several times with warm water; collect all the washings, and evaporate them nearly to dryness; let this saline mass cool, and dissolve it in water, by which means a fresh quantity of oxide is obtained, which may be added to the preceding. The evaporation may be repeated. These liquors contain only very small quantities of gold, which may be separated by common and well-known means; this, however, is scarcely necessary.

The oxide of gold remaining on the filtre is then to be washed with boiling water until the washings no longer form a precipitate with nitrate of silver, upon which it is to be washed once or twice with water,

acidulated with nitric acid; by this means the small portion of carbonate of baryta that may have formed during the process, will be withdrawn. A few washings with pure water are to be practised, and we are informed of their being free from baryta, by the absence of all precipitation, on the addition of sulphuric acid. Thus purified, the oxide of gold is to be dried in the manner previously described.

By this process, which was perfectly successful in M. Caventou's hands, a quantity of chloruret of gold, containing three grammes of the metal, yielded at least three grammes of oxide. Not more than half this quantity is obtained when subcarbonate of potass is used, because the chloruret of potassium that is formed, and the excess of alkali, retain a great quantity of oxide of gold in solution, as was the case in MM. Pelletier and Javal's experiments.

Properties of Oxide of Gold.

The oxide of gold in the state of hydrate is yellow, but dry it is violet approaching to black. Whatever precautions have been used in the drying of it, it is never altogether soluble in hydrochloric acid: a residue is always left, which is small indeed, and formed in consequence of a portion of oxide passing to the metallic state during the process of drying.

Sulphuric and nitric acids, dilute or concentrated, exert no action on the oxide of gold. This property may serve to isolate it from other oxides of the same colour, that have been intentionally mixed with it, such as the oxide of copper, the deutoxide of iron, &c.

Preparation of Oxide of Gold, by Tin; or the Purple Powder of Cassius.

Dissolve chloruret of gold in 16 times its weight of cold distilled water: prepare a weak solution of protohydro-chlorate of tin acidulated with hydrochloric acid. Add the latter solution of the former, by small portions,

until no more precipitate forms. Filter the liquor, and wash the precipitate with boiling water, until the washings yield no deposit on the addition of nitrate of silver. The precipitate dried at the temperature of boiling water, is the purple powder of Cassius, which appears to be a combination of deutoxide of tin and metallic gold.

Action of the Salts of Gold on the Animal System.

According to M. Orfila, three-quarters of a grain of muriate of gold, dissolved in a gros of distilled water, and introduced into the jugular vein of a large strong dog, produced difficult and stertorous respiration, suffocative symptoms, and slight vomiting, all which grew worse, until they ended in death. In another experiment, half a grain of the deuto-muriate dissolved in two gros and a half of distilled water was injected into the jugular vein of a small dog: the symptoms here supervened with frightful rapidity, and in four minutes the animal was dead. The third experiment was on a strong dog, and two grains of the salt were dissolved in a gros and a half of distilled water: in this instance the animal died in three minutes.

On opening the bodies of these animals the poison was found to have more particularly acted on the respiratory and circulating organs, and eminently on the blood itself. The lungs were livid, gorged with blood, did not crepitate, were wrinkled, of an unnatural colour, and scarcely floated on water. The heart was violet-coloured, the left cavities being filled with black blood, the right ventricle contracted. So rapid had been the action of the salt on the blood, that on opening the crural artery, a few moments after death, a reddish-brown blood quickly becoming black, flowed from it. The mucous membrane of the alimentary canal was not affected.

M. Orfila has also introduced chloruret of gold directly into the stomach of several animals, in order to ascertain its immediate effects on that organ. By an

opening made in the œsophagus three grains of chloruret were introduced into the stomach of a small dog; the animal languished for two days, and perished on the third. Another dog was made to swallow a solution of ten grains of muriate of gold in an ounce of distilled water; the animal vomited thrice, and foamed at the mouth: two days after he was able to eat; on the fourth day he refused food, and died on the night of the seventh. In the first animal the mucous membrane of the stomach was found to be inflamed, red, and ulcerated: in the second it was also ulcerated, and in a state of suppuration. In both animals the muriate had acted in a manner resembling that of corrosive substances.

M. Chrestien states, that the muriate of gold is much more active than corrosive sublimate, but does not irritate the gums to the same extent: given in the dose of a tenth of a grain per diem, it occasioned in one instance a smart fever. The frequency of the pulse is considerably increased, and a general excitation prevails. This excitation which he deems essential to the success of the remedy, if properly managed, never involves any palpable disturbance of the functions. The mouth, tongue, appetite, and stools continue to be natural: the urine and transpiration are generally increased. If the dose be pushed too far, however, there is risk of producing a general erythism, and inflammation of some organ. The fever caused by this is accompanied with an unusual and unvarying heat of the skin.

M. Cullerier has seen patients that were unable to bear the muriate of gold in any manner. In these instances he finds it produce gastric irritation, redness of the throat, dryness of the tongue, colicky pains, and purging.

According to the same authority, the general effects of hydrochlorate of gold and soda are, a sense of internal heat, headache, dryness of the mouth and throat, anxiety, gastric irritation, constipation, or else diarrhœa, and acceleration of the circulation. I was once consulted by a patient, to whom muriate of gold had

been imprudently administered, though he had only taken the tenth of a grain in a cup of milk for eight consecutive days. At the end of that time he was seized with a most intense gastritis, accompanied with numerous nervous symptoms, such as cramps and acute pains in the limbs, tremors, and sleeplessness. This irritation allayed, there still remained extreme heat of the skin, want of sleep, and fatiguing erections. Notwithstanding a most severe diet, this state of excitement was continued for three years, and the patient was unable to take wine even when considerably diluted.

Cases for the Employment of the Preparations of Gold.

The preparations of gold had been used in medicine previous to the date of M. Chrestien's use of them: they had even been recommended in the treatment of syphilitic affections, by Gabriel Fallopi, so far back as the sixteenth century. But besides disorders of that character, M. Chrestien says, that he has used the remedies in question with success in the majority of the diseases of the lymphatic system, in scrofula, goitre, different herpetic disorders, scirrhus, and even tubercular phthisis. Lalouette, in his *Traité des Scrophules*, also strongly advises the employment of the salts of gold. Many physicians who have repeated M. Chrestien's experiments have failed to obtain such successful results; though others, as Gozzi, Niel, Destouches, Risuens, &c. have found them effectual. M. Duportal has also related two cases of cure effected by this means; one of an ulcer of the face resembling cancer, and that had resisted the more ordinary remedies. (Ann. de Physique et de Chimie, t. 78.)

M. Cullerier did not consider muriate of gold as a specific in syphilis, though he cured many cases with it. His nephew has administered the muriate of gold and soda to a certain number of the patients of the Hôpital des Vénéériens: the age, sex, and constitution

of these patients were various, as were also the symptoms treated, being those of recent syphilis, ulcers, buboes, pustules, excrescences; or of ancient date, as ulcerated throat, palate, nose, &c., exostoses, and periostoses, cutaneous pustules, and pains of the bones.

In the first cases of the first series the effects of the salts were equally rapid with those of mercury; in others the benefits were less palpable; and in some instances no advantage whatever was obtained, in which case mercury became necessary.

In the secondary disease he obtained the same quantum of success; the symptoms were ameliorated in one or two cases: only one was entirely cured, and in others it was administered in vain.

Mode of Administration.

M. Chrestien has united the compounds of gold with soluble extracts of plants; with sugar, to form lozenges: with syrups and with cerates, to be rubbed into the soles of the feet. MM. Duportal and Pelletier disapprove of these mixtures, inasmuch as the vegetable and animal matters, dissolved or not, decompose the acid solution of gold and reduce it to the metallic state. So likewise M. Proust states that there are few vegetable juices, acids, gums, sugars, or extracts, which do not possess the property of deoxidising gold: these substances should therefore be avoided. The best mode of using the salts of gold is that of friction on the gums; and of the salts, the hydrochlorate of gold and soda is to be preferred. It has been employed at the Hôpital des Vénériens in powder, reduced by fifteen, twelve, ten, eight, and even four times its weight of some vehicle. Starch or lycopodium powder washed with alcohol, appears to preserve the auriferous salts the best. With other powders, as liquorice, marsh-mallow, &c. their decomposition is certain to take place more or less readily.

Frictions with the Muriate of Gold and Soda.

M. Chrestien recommends the following formula:—

Crystallized muriate of gold and soda 1 grain.
 Powder of iris root washed with alcohol,
 to withdraw its soluble parts 2 grains.

Lycopodium powder is generally preferable to that of iris.

Divide the first grain into 15 parts, and then into 14, and so on gradually until an eighth is the strength of each powder. One of these is to be rubbed into the tongue or gums once a day: it is rarely necessary to employ more than 4 grains thus divided for the cure of primitive venereal symptoms, as chancres, buboes, &c.: even three are often sufficient.

M. Girardot, of Warsaw, says that he has cured military men without any interruption on their part of their duties. He maintains, that 30 to 40 grains of the salt is required in cold climates to produce benefit. On the other hand, in a very hot latitude, as that of the Mauritius, large doses are tolerated and are requisite. M. Chrestien observes that in Poland and the Mauritius 30 grains do no more than 5 or 6 at Montpellier. In these large doses an eighth of a grain is the commencing dose, and is rapidly increased to half a grain at each friction. Such doses are more particularly requisite when syphilis is complicated with scrofula: in such case, even in France, they may be carried beyond 4 grains.

Pills of the Oxide of Gold.

Extract of the bark of mezereon root 2 gros.
 Oxide of gold by potass 6 grains.

Mix carefully, and divide into 60 pills. The six grains of oxide may be replaced by one grain of the triple muriate.

M. Chrestien recommends these pills in scrofula and lymphatic congestions. He commences with one per diem and gradually rises to eight.

Should the state of the tongue and mouth prevent frictions on them, Dr. Niel advises another mode of application. A small blistered surface is established on the side of the throat, and is dressed morning and evening with an ointment, composed of a grain of lard and a grain of gold divided by mercury. At the same time, a grain of the oxide of gold is given internally in the course of the day. After a week, half a grain of the divided gold and of the oxide are added to the doses. In a fortnight the divided gold is replaced by an ointment, containing the tenth of a grain of muriate of gold and soda, which may be increased as far as the sixth of a grain. During this period the internal treatment with gold is still continued.

Should the irritation from friction with the muriate of gold on the tongue be excessive, the following cerate may be applied to blistered surfaces on each side of the neck:—

Gold divided with mercury..... 1 gros.
Lard 1 ounce.

And when the blisters are becoming dry, for this oxide may be substituted an ointment composed of 10 grains of muriate of gold and soda and half an ounce of lard. In the course of four months such treatment seldom fails to be eminently successful in secondary syphilis.

Dr. Simoneau, of Florence, attended a patient who, at the same time that he had a seton in the back part of the neck, was afflicted with deep syphilitic ulcers of the mouth. Dr. S. immediately commenced to dress the seton with muriate of gold and soda, with the best effects upon the ulcerations.

SALTS OF PLATINA.

The processes for obtaining the salts of platina are precisely the same as those employed for the salts of