On the Combinations of fixed Oil with Nitric Acid and the Nitrates of Mercury. By Mr. Reid.

[Read at the South African Institution.]

When nitric acid and hogslard, or any fixed oil, are exposed together, and heat is applied, a quantity of gaseous fluid is disengaged; the lard acquires a somewhat firmer consistence, and assumes a yellow colour. If allowed to cool without agitation, a yellow fluid subsides to the bottom, which, when examined, is found to be weak nitric acid, holding in solution a substance derived from the lard, which is precipitated when the acid is neutralized. One ounce of nitric acid was combined with six ounces of lard, the quantity of fluid amounted to half an ounce, which neutralized five drachms of subcarbonate of soda. By washing the compound with water an additional quantity of acid was procured, which neutralized four drachms of the same salt. Having combined one drachm of nitric acid with subcarbonate of soda, I found that it required four drachms for neutralization, therefore rather less than two-thirds of the acid had combined with the lard.—The compound of lard and nitric acid, when washed, did not effervesce with alkaline carbonates, but alkalies and their subcarbonates changed it to a reddish brown colour.

The theory of the action seems to be, that part of the acid suffers decomposition; nitric oxide and nitrogen being disengaged and the lard becoming oxygenized. This oxygenized lard combines with another portion of dry nitric acid; the water which it contains being separated, and exerting an attraction for the remainder of the acid, as strong as that of the lard, prevents it from suffering any further change. The compound I conceive, therefore, to be a nitrate of oxygenized lard, bearing the same relation to lard which the metallic nitrates do to the metals.

When nitric acid, holding in solution nitrate of mercury, is used, the lard acquires a brown colour, which increases in intensity till nitric oxide gas is disengaged, when it changes to a lively yellow, and a fluid subsides as in the former case, which is weak nitric acid, holding in solution nitrate of mercury. One drachm of red oxide of mercury was dissolved in two drachms of nitric acid, and afterwards was combined with ten drachms of lard. From this one drachm of liquid was obtained, which, with an additional quantity obtained by washing the compound, gave a precipitate with ammonia, which weighed twenty-three grains; therefore, as in the former case, a quantity of nitric acid remained uncombined, so here a portion remains, holding in solution a proportionate quantity of nitrate of mercury.

From the manner in which the oxide of mercury was here combined with the nitric acid, there was no nitric oxide contained in it, but if a stream of nitric oxide is passed through the solution, or if the acidulous peroxide is made by dissolving mercury in nitric acid, then the nitric oxide communicating oxygen to the lard, at once forms with the solution a compound of a yellow colour; or, if the lard is previously combined with a portion of nitric acid before adding the nitrate of mercury, the same result is obtained; it appears to me, therefore, to be a compound of nitrate of mercury, with nitrate of oxygenized lard. The common name 'ointment of nitrate of mercury' serves well to distinguish it; the compound of nitric acid and lard might with propriety be called 'nitrated lard.'

The state of combination in which the mercury exists, depends upon the manner in which the compound is formed; when the compound is formed by dissolving red oxide of mercury in nitric acid, it contains pernitrate of mercury only. When the mercury is dissolved in nitric acid as directed by the Colleges, the solution contains both pernitrate and pronitrate. In preparing the ointment of nitrate of mercury for medical purposes, as it is directed to be stirred till it is cold, the uncombined acid, and the nitrates which it retains, remain diffused

through the mass. After it is prepared, the acid thus diffused probably suffers no change, but the pronitrate present suffers decomposition, its acid being attracted slowly by the ointment, the protoxide is separated, which being blue, and the ointment itself being yellow, makes the mass appear green. This change is accelerated by heat, and therefore, if the ointment is kept melted the ointment soon acquires a green colour, after which, if it is still kept melted, the blue oxide subsides, when the ointment recovers its yellow colour. When the ointment is prepared so as to contain no pronitrate, it remains permanently of a yellow colour.

The colour of the ointment varies according to the proportion of pernitrate of mercury which it contains, a small quantity forming a light coloured ointment, the colour increasing in intensity in proportion to the quantity of pernitrate which a given weight contains. The colour also depends in some measure upon the degree to which the lard is oxygenized, for when the operation is continued some time, during which the acid continues to suffer decomposition, the lard attracting oxygen, and nitric oxide with nitrogen being disengaged, this compound forms with nitrate of mercury a darker compound than is formed from the same materials when the operation has not been carried on for any length of time.

The ointment, as usually prepared, therefore containing ingredients which are not in a state of chemical combination with it, it may be a proper subject of inquiry whether those extraneous substances tend to impair its medical properties, and, therefore, whether a preparation consisting only of materials in intimate union with each other may not be more eligible. I therefore have used the ointment when washed, and though the number of the trials I have made does not enable me to say confidently that it will be found always superior in efficacy to the other, it has fully answered my wishes. But, as by washing the ointment a part of the materials is lost, it appears to me desirable to prepare it in such a way, as that it shall be similar in composition to the ointment when washed, and so effect this without the loss of the materials, or at least of the mercury. This I think may be effected in the following manner:—First prepare an ointment of nitrated lard, wash it so as to free it from uncombined acid, and afterwards combine it with pernitrate of mercury. By this means, though a portion of acid is lost, there is no loss of the mercurial salt, and in making an ointment of the same strength as that usually prepared, we have only to calculate the additional quantity of acid required, in order that there may be left the same quantity of acid as that which is contained in it, including that in a state of combination and that which remains uncombined.

The proportions as directed by the London College are, one ounce of mercury, two ounces of nitric acid, six ounces of lard, and four ounces of olive oil. I would recommend one ounce of red oxide of mercury,* twelve drachms of nitric acid, six ounces of lard, and four ounces of olive oil. I would combine the lard with six drachms of nitric acid, using as gentle a heat as may be sufficient for the combination. For this purpose, having mixed them together, they ought to be heated gently till foam begins to form on the surface; when, removing the materials from the fire, they ought to be stirred for a few minutes and allowed to cool. They ought then to be washed with water, and again cooled without agitation, when the fluid sinks to the bottom, and may be removed by making an opening through the materials, in order that the water may be poured off. The remainder of the acid ought to be used to dissolve the oxide of mercury, which, when evaporated to dryness, ought to be triturated with the olive oil, and then the whole melted together. Thus we may obtain an ointment which contains no uncombined acid or nitrate of mercury, and, in short, similar to the ointment made in the common way when washed.

Having prepared an ointment in this manner, with pernitrate of mercury, I attempted to form one in the same way with pronitrate of mercury; but I found that the pronitrate was decomposed, its acid being attracted by the lard and oxide being separated, and when the mass was kept fluid subsiding to the bottom. It therefore does not form a compound, and ought not to form an ingredient in the ointment.

Pernitrate of mercury and lard, when triturated and exposed together, did not form a chemical compound. The lard attracted oxygen from the peroxide and combined with the acid, the protoxide falling down as in the former case.

I have observed also, that the red oxide having been triturated with an ointment suffers in the course of time decomposition, for it became blue, and when melted deposited the protoxide, but as this was a solitary case I do not know whether it arose from accidental circumstances, or whether it was in consequence of an affinity which is in every case exerted between fixed oils and peroxide.

If in preparing the ointment of nitrate of mercury rancid oil or rancid lard is used, the ointment when formed consists of two parts, which, when the mass is kept melted, separate from each other, one similar in appearance to that procured from fresh materials; the other, which is much heavier, more adhesive

* As there is always a portion of pronitrate formed when mercury is combined with nitric acid, I prefer using the red oxide which forms with nitric acid pernitrate only.

and of a green colour, subsides to the bottom. It seems to me probable, that failures may frequently have been owing to the presence of this substance in the ointment, and that therefore care should be taken that no rancid matter be used. Its presence may be readily detected by melting a portion of the ointment and keeping it fluid for a few minutes, when it will be observed at the bottom.