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of this city. A considerable quantity of cochineal, grown mouldy and in a state of fermentation, emitted a most disagreeable smell; the oxymuriatic acid gas destroyed all these putrid emanations, allowed us to approach the cochineal without fear, and we were able to save a part of this precious commodity.

XIII. *Memoir upon Animal Fat, and some Medicinal Preparations which are administered through that Medium.*
By M. VOGEL*.

FAT has been a long time the object of chemical inquiries. Some have occupied themselves with establishing its characters, and others in ascertaining the propriety of its application in the healing art. The late M. Vogel, professor of chemistry at Gottingen, is one of the first whose attention was occupied in discovering the nature of this substance. On directing his observations to distillation, he perceived that human fat yielded a liquid product which had all the properties of an acid.

The author of this memoir was desirous of ascertaining the difference which existed in the fat of animals whose exercises are violent, such as the wolf, the hare, &c., as well as that of some carnivorous birds; but the difficulty of procuring a sufficient quantity at one time compelled him to defer his labours to a future period.

His first experiments had for their object to examine hog's lard, *per se*, and combined with other substances. Although this labour is still incomplete, it may lead to some very useful observations on the preparation of medicines.

Effects of Light on Animal Fat.—It is well known that fresh lard well purified is without any smell, and of a mildish insipid taste. Exposed for two months to the solar rays, without the contact of the air, it acquires a very rancid penetrating smell, a bitter taste, which burns the throat,

* From *Annales de Chimie*, tome lviii. p. 154. Extracted by M. Bouillon Lagrange from an Essay read in the Pharmaceutical Society of Paris by the late M. Vogel, Chemical Instructor in the School of Pharmacy at Paris.

and changes from a white to a yellow colour, without, however, acquiring any acidity. When the contact with the air is added to the solar rays, the same phænomena take place, and it always becomes acid.

Caloric.—Fat melts at 32·34 of Reaumur (90·21 Fahr.). At this temperature it remains in fusion without undergoing decomposition ; but when the temperature is pushed beyond 80° (174° Fahr.) it begins to be decomposed.

The author did not think necessary to describe the distillation of hog's lard : this operation has been already performed, and its products examined, by Messrs. Von Crell, Guyton and Thenard ; he only observes that fat, when well washed, does not yield ammonia upon distillation, while that which has not been washed yields very sensible traces of it. The water in which muscular substances have been washed, the cellular tissue of which is not exactly separated, takes away from it a notable quantity of gelatinous animal matter which accompanies the membranes ; it is this animal gelatinous matter which produces the ammonia in distillation.

Sulphur.—Fat mixed with half its weight of sulphur sublimed and washed, forms what is vulgarly called sulphur pomatum.

This compound was examined four days after its preparation, as well as a similar mixture a little older, and no traces whatever of sulphuric acid were discovered. By a slow fusion in B. M. we separated, by decantation, a quantity of fat ; and on passing the rest through fine linen, we obtained the greatest part of the fat employed : it had a gray colour, a bitter, sharp, and very strong taste ; it congealed much more quickly than common fat when cooled, and it blackened silver vessels.

Thus there is sulphur dissolved in this compound : it will even be found in solution, every time it is employed in friction. The elevation of the temperature facilitates this solution.

We know how rapidly sulphur penetrates through places far remote from the spot where it was made use of in the shape of pomatum : this is not so surprising when we reflect that the sulphur is in solution. I am ignorant, says
M. Vogel,

M. Vogel, if sulphur, divided by any other vehicle, (thick mucilage or gelatine, for instance,) acts in an analogous manner. I suspect, however, that when it is employed in friction, divided by means of one of these bodies, its results would be different from those of sulphur dissolved in fat.

If we raise the sulphurated fat to the boiling point, and if it is hastily decanted and cooled, a part of the sulphur is precipitated; but if it has been allowed to cool slowly, the sulphur then crystallizes in beautiful needles.

When we distil in the open fire sulphurated fat in a luted glass retort, and receive the products over mercury, we obtain a great quantity of gas, which, being collected and examined, appears to be a mixture of plenty of sulphurated hydrogen gas, carbonated hydrogen gas, and a little carbonic acid gas. We never found any sulphurous acid gas, as several chemists have asserted.

From the moment that the elastic fluids cease to pass, white thick vapours are perceived, condensing with difficulty, and there is sublimed at the neck of the retort a yellow matter, which was merely fat mixed with a little sulphur: the liquor of the receiver looked milky; it yielded, upon cooling, small white crystals; this was merely sulphur in minute division. The retort contained a brilliant prismatic charcoal in abundance.

Sulphurated hydrogen gas, passed through melted fat, effected no change on it, and was not dissolved in it.

Phosphorus.—I melted, says the author, half an ounce of fat in B. M.; I added, after the fusion, two grains of good phosphorus, very transparent; I kept the whole for about a quarter of an hour at the same temperature: I took care not to agitate the liquid too much, in order to avoid the action of the air, which would have acidified the phosphorus.

When the fat was cold, I recovered a part of the phosphorus which was not dissolved. This fat had a slight smell of garlic, and a disagreeable taste; it reddened turnsole; it formed a very abundant black precipitate with the nitrate of silver, and a less abundant precipitate of the same colour with the neutral nitrate of mercury at the minimum.

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As the heat of the B. M. was not sufficient to dissolve the phosphorus employed, I made other mixtures of fat and phosphorus in different proportions, which I brought to the boiling point : this method favoured its solubility. After many trials, I ascertained that one ounce of fat, at a slight ebullition, can dissolve five grains of phosphorus, a part of which is precipitated upon cooling.

This phosphorated fat was washed several times in boiling water : the washings were acid, blackened the nitrate of silver, and formed a flaky precipitate with lime water : this water had taken from it its acid property, but not that of blackening the nitrate of silver : thus, one part of the phosphorus remained in a true solution without acidifying.

These two kinds of phosphorated fat, that which had been prepared in B. M., and that prepared by ebullition, either washed or not, emitted no light in the dark at a temperature of 10·15 (50·27 Fahr.), nor even by rubbing with the hand ; but if the temperature was raised to 60° (140° Fahr.), the luminous effects were a little visible. The phosphorated fat, the undissolved phosphorus of which had been carefully separated, did not shine in the ordinary temperature.

I distilled twelve grains of phosphorus with two ounces of fat : the matter soon assumed a charry appearance, much more speedily than common fat submitted to the same operation ; there was liberated at the beginning, phosphorated hydrogen gas, which took fire in the receiver ; and we afterwards obtained under a bell-glass, in the mercurial apparatus, phosphorated hydrogen gas and carbonated hydrogen gas. The receiver contained fat which had been blended with phosphorus and phosphorated hydrogen gas. After cooling, it took fire with the contact of the air, and burned the fat rapidly.

Whatever is the temperature, therefore, employed to dissolve phosphorus in fat, there is formed every time a greater or less quantity of phosphorous acid :—this inclines me to think that the same thing happens in many other phosphorated compounds.

M. Bouillon Lagrange last year, in his lectures upon fixed
and

and volatile oils, has presented analogous results ; he has shown, that the solution of phosphorus in one or other of these oils can never be considered as a regular medical application ; that there is immediately formed a small quantity of acid, and that this quantity increases through time.

All the experiments hitherto mentioned were made with the contact of the air, the result of which always was an acidification of the phosphorus,

I did not omit to repeat several experiments without the contact of air, such as M. Boullay had announced in one of his reports to the Pharmaceutical Society.

In a small flask, almost entirely filled with melted fat, I put a morsel of phosphorus. I hastily corked it, and heated it for five minutes in B. M. : a part of the phosphorus was dissolved ; and I remarked, with M. Boullay, that fat was not acid, but that it blackened the nitrate of silver. A few minutes afterwards, upon decanting or agitating liquid fat in the open air, it acquires acidity,

This speedy change, therefore, gives us little hope of finding a sure or constant medical application in the solution of phosphorus, in spite of the processes continually recommended for this purpose. The physician, therefore, can never be certain of the quantity of phosphorus, because the contact with the air is unavoidable.

Being desirous of knowing the action of fat upon phosphorated hydrogen gas, I passed a piece of fat under a bell-glass filled with mercury ; I liquefied it with lighted charcoal, which I carried round about the bell-glass ; at the same time I passed phosphorated hydrogen gas into it : there was very little apparent absorption. For the greater certainty, I varied the experiment in the following manner :

Into a cylinder nearly ten inches long and eight lines in diameter I poured melted fat until it was full ; having carried it to the mercury tub, I made phosphorated hydrogen gas pass into it, so as to drive off a part of the fat ; I corked the cylinder below the mercury with a linen stopper ; I plunged it for some minutes in hot water to keep the fat in fusion ; I shook the mixture continually until it cooled ; I uncorked it below the mercury, it rose five or six lines above

above its level ; the gas which remained in the cylinder did not inflame in the air, but took fire immediately on the approach of a lighted candle.

The gas was thus entirely decomposed, and the whole quantity of phosphorus was decomposed. I attribute the cause of this absorption not only to the loss of phosphorus, which, without doubt, had diminished the volume of the gas, but also to its temperature ; since it was recently liberated, and had passed through the hot fat, which would consequently dilate its volume a little.

The fat which remained had all the characters of phosphorated fat ; it soon became acid in the air.

The Acids.—As the sulphuric and muriatic acids are not very interesting, the latter having even no action at all upon fat, I directed my attention chiefly to the phænomena presented by the nitric acid.

This acid has become a valuable agent in the hands of the chemists. To the action of this acid upon organized bodies we are indebted for a great number of discoveries.

It is well known how much facts have multiplied since we have been able to explain the changes which take place upon animal and vegetable compounds.

Berthollet has in some measure paved the way by his important labours upon animal substances ; and the experiments of Messrs. Fourcroy and Vauquelin have left us nothing more to desire on that subject. These gentlemen have considerably enlarged the sphere of our knowledge in this department, so difficult of comprehension, and so useful in the science of medicine.

M. Fourcroy was the first who ascertained the action of the nitric acid upon fat. M. Alyon and several other chemists have since presented interesting results on the subject.

I treated fat in the manner prescribed by Messrs. Fourcroy and Alyon for making the oxygenated pomatum. The latter observes, that it does not stand in need of washing, as it is not acid : I repeated the process prescribed by him with one ounce of acid at 32° to the pound of fat ; I employed afterwards nitric acid of an inferior strength, from 30° down to 24° ; the oxygenated fat was always acid.

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I made this experiment in a retort in the pneumatic apparatus, and I obtained azotic gas as the produce: this gas was not disengaged pure, as M. Alyon announced; it was mixed with nitrous gas and carbonic acid gas, as justly observed by M. Van Mons.

Fat thus oxygenated, of a hardness equal to suet, melts at the temperature of 36° or 38° of Reaumur, (96° to 100° of Fahr.)

I boiled it with water, which acquired a citron yellow colour from it, had a bitter and sharp taste, reddened turnsole paper, and constantly precipitated the acetate of lead and nitrate of mercury. This water distilled in a retort, almost to dryness, yields a colourless white liquor which contains a quantity of acetic acid; it does not then precipitate the above metallic solutions.

The washings of fat, evaporated to the consistence of a thick liquid, deposit, upon cooling, a tenacious brown substance, which attracts humidity from the air. The liquor being decanted and exposed to evaporation in a stove, an infinity of very brilliant white needles crystallize in it. I took these crystals at first for oxalic acid; but lime-water was not in the least affected by them; besides, they had no other of the properties of the oxalic acid: we shall see their nature a little further on.

However often we may wash oxygenated fat, its yellow colour and its acidity never leave it. After the twelfth boiling it is still yellow, and the water coming from it reddens turnsole.

Alcohol acts differently: on boiling it with oxygenated pomatum, it dissolves a very great quantity of it; upon cooling, plenty of flakes are separated from it, which, being collected and dried, yield an oxygenated fat which is singularly bleached. The fat remaining is also whiter; the alcohol acquires a yellow colour, and becomes acid: it retains enough of matter in solution, to be abundantly precipitated by water.

I evaporated this alcohol; plenty of yellow acid fat remained; water effected its solution in part.

Boiling alcohol, frequently employed to wash oxygenated fat,

fat, does not completely take off its acidity ; it rather dissolves it for the most part, and this last liquor is still acid.

Since the acid adheres so intimately to the fat, I tried to separate it from the latter by salifiable bases, and I made use of lime-water, which I boiled with oxygenated fat ; the fat lost its alkalinity, and acquired a colour of a citron yellow. This neutral liquor, which I regarded more as a combination of lime with an acid, than fat, was abundantly precipitated by the acetate of lead.

Evaporated to the consistence of a syrup, it is discoloured by the nitric and muriatic acids, which form in it a whitish precipitate ; at the same time, when we pour the acid, a very rancid odour is manifested.

Barytes water acts upon oxygenated fat in a more efficacious manner. The orange yellow colour which the water acquires from it is equally destroyed by the acids. I poured into it a quantity of sulphuric acid sufficient to carry off the barytes ; I boiled the whole, and I filtered the liquor while boiling.

The filtered liquor, which contained no barytes, was in a great measure evaporated in a sand-bath ; small fine needles were crystallized mixed with silky tufts, not precipitable by lime water, insoluble in alcohol, and which were not sublimed in close vessels.

When fat is boiled with concentrated nitric acid, and the ebullition is continued, adding water from time to time, a white crystalline powder is formed upon cooling.

This substance is rough to the touch, insoluble in alcohol, much more soluble in boiling water than in cold water. By its combination with the bases, and by several other characters, I was convinced that it was mucous acid*.

Fat thus oxygenated at the maximum is soft, of a brown colour, sensibly soluble in water, and very soluble in alcohol. Its washing was saturated by potash ; from this resulted a leafy salt, attracting humidity from the air, and

* Beef suet, although it decomposes less strongly the nitric acid, also yields mucous acid.

which

which liberated acetic acid upon treating it by the sulphuric acid*.

The precipitate formed by the acetate of lead in the washing of oxygenated fat, is nothing else but the fat itself combined with oxide of lead, and which carries with it a little mucous acid; the former floats above; when the precipitate is decomposed by the sulphuric acid.

Oxygenated fat being very soluble in alcohol, a great part of it may be precipitated by water. By the energetic action of the concentrated nitric acid upon fat, there is a notable quantity of nitrate of ammonia formed, of which we may be convinced by mixing potash or quicklime with the washings.

Oxygenated Muriatic Acid.—The action of this acid upon fat not having been yet described, I think it may be useful to enter into some details.

I passed a great quantity of oxymuriatic acid gas into fat kept in fusion in B. M., the gas, before arriving at it, passing through a vessel containing water. The fat absorbed a very great quantity of it. I continued to pass it until the bubbles no longer arose.

After cooling, the fat was considerably augmented in weight; its whiteness became dirty, and its consistence was entirely changed; it was soft, resembled an oily thick liquid, which might be easily poured from one flask to the other, even at the temperature of 10° (50° Fahr.): in the air, white vapours of acid are disengaged at the commencement.

Having left it nearly two months in the air, it resumed a little more solidity, but never that of common fat, much less that of oxygenated fat: its taste was rancid, not sensibly acid, leaving behind it a slightly bitter taste, which burns the throat. The simple muriatic acid is so combined with fat, that by washings in boiling water I only took off a very small quantity of it. The nitric acid disengages the above acid from it in abundance, with effervescence and

* Rancid fat, and very old suet, also furnished me with acetic acid upon treating them in this manner:

white

white vapours. What is singular is, that the nitric acid is no longer decomposed in it, notwithstanding the quantity employed; and the fat acquires neither colour nor solidity. I shall now proceed to speak of the effects of the metals on fat.

[To be continued.]

XIV. *Report made to the Class of Physical and Mathematical Sciences of the French Institute on the 6th of January 1806, by M. PINEL, upon the advantageous Results obtained by M. DESGENETTES, from the Use of Fumigations of Oxymuriatic Acid.*

M. GUYTON and myself were directed to report to the society on the use of fumigations of oxymuriatic acid gas employed by M. Desgenettes according to the ordinary processes, and upon the results he obtained from it. These fumigations seem not only to have had an influence upon the salubrity of the air, but also in the cure of diseases.

The author of these observations remarked, at first, that the military prisons of the capital regularly furnished a number of cases of adynamic fevers to the hospitals, which frequently spread to the patients in the nearest beds, and also to the nurses; he adds, that for nearly a year past no such infections have taken place. M. Desgenettes also observed that gangrenes, being common among the wounded, were also greatly checked: the specific smell of the gangrene was not annihilated, but, according to him, it was modified by the fumigations.

Another general observation made by M. Desgenettes was, that for several years the scurvy had been very frequent; that three persons, in particular, had been affected with it in a very violent manner; and, in short, one of them had been shut up from the rest on account of the insupportable infection spread by torrents of sanious saliva. Nevertheless, by means of fumigations, this specific smell was neutralized. It seemed to be concentrated, as it were, round the patient. The nurses were then permitted to sleep near these scorbutic

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