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ON

POISONING BY THE FIXED ALKALIES.

By M. ORFILA.

(Continued from page 263.)

CONCLUSIONS.

First, If a liquid that has been vomited, or found in the digestive canal, is alkaline before and after it has been subjected to prolonged ebullition, and that being evaporated to dryness and treated with boiling alcohol of 44°, as has been already said, it leaves in the silver crucible in which the operation has been carried on, a matter soluble in water, which restores the blue color of reddened turmeric paper, and which having been filtered, is not rendered turbid by carbonic acid gas, and gives a precipitate like potass with the chloruret of platina and the perchloric acid, if we cannot affirm that ingestion of potassa purified by alcohol, potassa cum calce, or of carbonate of potass has taken place into the stomach of the individual suspected to have been poisoned, we may at least show that there are great probabilities in favor of the fact. Reserve is requisite in such a case, because it is not impossible, although very unlikely, that the person in question may have taken a large quantity of certain kinds of food naturally containing a greater amount of the salts of potass soluble in alcohol, than those I experimented on, and that the potass obtained by these experiments was derived from these salts.

On the other hand we might state decidedly that ingestion of potass, purified by alcohol, potassa cum calce, or of carbonate of potass had taken place, and consequently poisoning, if after having found a free alkali or its carbonate by the processes just indicated, we were to learn that the individual had suffered a little while after eating or drinking, from vomiting of sanguinolent or black matters, which did not effervesce, and which restored the blue color of reddened litmus paper, from severe pain in the abdomen, purging, and from other symptoms similar to those caused by caustic poisons.

The conclusion in favor of poisoning may also be drawn in those cases where the presence of the alkali has been ascertained, as has been already said, but several of the symptoms which would be expected are absent, yet on examination of the body, the tissues of the alimentary canal, and of the stomach in particular, are found to be softened, inflamed, ecchymosed, ulcerated, sloughing, or even perforated in several places.

Secondly, If a solid that has been vomited, or is found in the alimentary canal, restores the blue color of reddened paper, preserves its alkalinescence after having been boiled in concentrated alcohol, and its alcoholic solution treated in accordance with the analytical process already described, behaves itself

like potass with carbonic acid, the chloruret of platina, and the perchloric acid, then the same conclusions may be drawn as from the liquid previously spoken of.

It would be difficult, not to say impossible, to declare precisely in many cases, whether the alkali which had been taken, and afterwards dissolved in alcohol, was pure and caustic, or a carbonate, because the carbonate of potass, which is insoluble in alcohol when it is not mixed with organic matters, can be dissolved in this menstruum with the assistance of certain alimentary fluids with which it may be mixed (*vide* 12th Experiment); and that if, in order to resolve the problem, recourse is had to an acid to ascertain whether there would be effervescence, still error might arise; in fact caustic potass passes readily to the state of carbonate, when it is treated with organic matters, so that effervescence might take place, even if the potass had been administered in the caustic state; and on the other hand, the want of effervescence would not prove that the alkali had been taken in the caustic state, because it often happens that in the midst of these organic matters, a very small quantity of carbonate of potass may be decomposed by acids, and the slight effervescence that would result not be detected. It matters little, after all, that in many cases of this kind we are not able to solve this problem, the real essential point is to ascertain that potass exists in the suspected matters in one of the three forms already spoken of.

Thirdly, If the experiments made upon the liquid or solid matters that have been vomited, or are found in the digestive apparatus, should be without result, and potass should be obtained by acting on the liver, spleen, and kidneys, by boiling water, alcohol, &c. (*vide* 10th Experiment), we might then assert that this alkali had been introduced into the animal economy by means of absorption. Such results, together with those furnished by the symptoms and lesions of structure, would authorise the expert to declare that poisoning by potass had taken place. At the same time, it must not be asserted that a person has not been poisoned by potass or its carbonate, because it is impossible, by following the process indicated, to obtain either caustic potass or its carbonate from the matters vomited, or those found in the digestive apparatus; it may be that a dose of potass, capable of producing serious symptoms, may be introduced into a stomach containing a considerable proportion of acid, or a notable quantity of acid articles of food, that it may have caused an energetic irritant action, and have been ultimately changed into one or more salts, insoluble in alcohol. In such a case, the nature and progress of the disease, the anatomical lesions, &c., must be the guide, and from them, perhaps, we may obtain presumptive or probable evidence of poisoning.

I shall not terminate this paper without throwing a *coup d'œil* on the observations made some time since by Bretonneau, concerning the action of potass on the animal economy.

"In the dose of two scruples or more," says this physician, "this alkali, introduced into the stomach of dogs, has constantly caused vomiting, marasmus, and death. Extensive ulceration of the œsophagus, and the destruction of the epidermoid tunic, having appeared to be the principal cause of the vomiting, the alkali was applied to the stomach near its pyloric orifice, by means of a *porte-caustique*, so that its action was confined to the parietes of that viscus. In this way two or three scruples could be passed in successively, at longer or shorter intervals, without causing death. A more or less serious idiopathic affection of the stomach was induced, attended with vomiting of a frothy, mucous, soapy, yellow, bloody character, and sometimes of pure blood. But after two days' rest, during which the animal showed little desire for food, without there being developed any sympathetic disturbance of the functions of animal or organic life, it was apparently restored to its usual state. The lesions discovered many weeks afterwards in the stomach of those of the animals which were killed by strangulation, would not have been suspected on seeing their voracity, petulance, and gaiety. In many of them the mucous membrane was found to have been destroyed in nearly its whole extent. In some parts the muscular and peritoneal coats were also affected, and formed thick, rough, deep cicatrices, which were very apparent even on the external surface of the stomach."

The results of my experience are as follows:—I have upon two occasions introduced into the stomachs of two robust dogs, of middle size, two scruples and a half of solid potassa cum calce, cut into twelve little bits. The animals were fasting, and each piece of alkali reached the stomach without having touched the œsophagus, because it was pushed by a metallic stem through a large elastic catheter, which was passed down to the pylorus, and I ascertained, at the end of the experiment, that the catheter had not been pierced. In a third experiment I injected the same quantity of potassa cum calce, dissolved in eighty scruples of water, into the stomach of another dog, also fasting. I used a syringe and large catheter for this purpose, in order that the alkali should not come in contact with the œsophagus. These animals vomited frequently, especially during the first hour after the poisoning, frothy, bloody matters, and even blood containing much potass; they experienced all the symptoms usually caused by this alkali, and died, one at the end of twenty, another thirty, and the last forty-six hours after the ingestion of the poison. The stomachs were very much inflamed, ecchymosed, ulcerated, and sloughing in places; the mucous membrane was destroyed in parts, but there were not any signs of perforation. The two upper thirds of the œsophagus were totally unaffected, whilst the lower third was in nearly the same state as the stomach.

The difference between the results of my experiments and those of M. Bretonneau arises from the fact that he did not introduce all the caustic at once, but injected it in different proportions at longer or shorter intervals; if, therefore, each time the animals

have thrown up a notable quantity of the poison, as it appears from the statements of M. Bretonneau, we can easily understand the cause of the poison not proving fatal. Notwithstanding all this, the facts narrated by the learned physician of Tours are very important, inasmuch as they prove that these animals can live and eat voraciously while the stomach is the seat of such very serious mischief.

SODA.

Soda purified by Alcohol.—The physical properties of soda purified by alcohol, its action upon blue colors, on carbonic acid, and on the nitrate of silver, are the same as those of potass purified by alcohol. The chloruret of platina only renders the solutions of soda turbid, when they are very concentrated; then a canary yellow precipitate is formed, less granular and less adherent to the glass than that yielded by potass; the perchloric acid does not cause the formation of any deposit, whilst a gelatinous and transparent precipitate is obtained with the siliceous phthorhydric acid.

A weak, aqueous solution of pure soda restores the blue color of litmus paper reddened by an acid, and is not precipitated either by the carbonic, perchloric, or siliceous phthorhydric acid, nor by the chloruret of platina. The nitrate of silver acts upon it as on a solution of potass in water, unless the solution is too weak. In that case, the liquid should be evaporated until it is sufficiently concentrated to afford, with the re-agents spoken of in the preceding paragraph, the precipitates which indicate a concentrated solution of soda.

Soda cum Calce, and Carbonate of Soda.—In these two states soda will be distinguished from that purified by alcohol, by adopting the process already described for recognising potass purified by alcohol, potassa cum calce, and the carbonate.

Mixture of Pure Soda and Aliment, and with the matters ejected by vomiting, or remaining in the digestive apparatus, the soda having attacked the tissues of the canal.—The action of this alkali on eau sucrée, tea, coffee, albumen, gelatine, bouillon, bile, blood, and the organic tissues, being the same as that of potass, the same steps in analysis should be followed as for that alkali.

Conclusions.—The conclusions to be drawn from the experiments that have been instituted relative to poisoning by soda, do not differ from those respecting poisoning by potass. At the same time, it must be borne in mind that the alcoholic solution of many articles of food in a normal state, evaporated to dryness, incinerated according to the directions in the 5th Experiment, yields, when treated with water, an alkaline ash containing carbonate of soda; it is, therefore, possible to be deceived, and to look upon this carbonate as a proof of the presence of a certain quantity of soda or its carbonate taken as a poison, when it ought to be regarded as soda existing naturally in the food. I will here give the result of experiments made in order to solve this important question. 1st, The matters obtained from the digestive canal of an animal poisoned by soda, as well as those that have been vomited, if they still contain any traces of the alkali, when they have been dried at a gentle heat, and afterwards dissolved in boiling concentrated alcohol, powerfully restore the blue color

of litmus paper, previously reddened by an acid; the alimentary substances, of which mention has been made, treated in the same manner, do not yield an alkaline solution. 2ndly, The ash obtained by decomposing at a red heat in a silver crucible, the alcoholic solution of soda resulting from poisoning, being treated with boiling water, will furnish a solution which will powerfully restore the blue color of reddened paper, and which, having been evaporated, will give a gelatinous, transparent precipitate, with siliceous phthorhydric acid; and if it is very concentrated, a slightly granular canary yellow precipitate, with the chloruret of platina; the perchloric acid will not render it turbid. The ash resulting from a mixture of two or three quarts of animal liquids (wine, bouillon, coffee, bile), treated in the same manner, has never given me an aqueous solution capable of precipitation by the phthorhydric acid and the chloruret of platina, although it restored the blue color of reddened test paper. If I could affirm that it would never be otherwise—that is to say, that in no case would the ash obtained from a normal mixture of food yield an aqueous solution, precipitable by the siliceous phthorhydric acid and the chloruret of platina—I would not hesitate to conclude, after having obtained these precipitates with an ash resulting from an *alkaline* alcoholic solution, that soda had been taken as a poison; but such a proceeding would be rash in the extreme, because it is not impossible that certain aliments, taken in great quantity, and treated as I have advised, might yield an ash which, dissolved in water, would give, with the before-named re-agents, precipitates analogous to those which would result from a small quantity of soda taken in its free state. In such a case we must be very circumspect, and, in ascertaining that the alkali found is soda, not give an opinion on its origin but with great reserve, unless the symptoms experienced by the patient and the anatomical lesions should aid in removing the difficulty. I should attach little importance to the *quantity of the precipitates* obtained by the siliceous phthorhydric acid and the chloruret of platina in a case of poisoning, unless they were so abundant as to render it impossible to attribute them to the presence of soda obtained from the food; in any other case it would be difficult, if not impossible, to judge from the quantity of the precipitate, whether the soda was taken as poison or with the food.

BARYTES AND ITS CARBONATE: THE CHLORURET OF BARIUM.

Pure Barytes.—It is solid, grey or white, according to whether it is anhydrous or hydrated, and soluble in water. The concentrated aqueous solution restores the blue color of reddened paper, and gives a white precipitate with carbonic, sulphuric, and the siliceous phthorhydric acids. The carbonate of barytes, if it is not too coherent, is dissolved in an excess of carbonic acid; the sulphate is insoluble in water and in nitric acid, and the phthorosilicate is gelatinous. The very diluted solution of barytes also restores the blue color of reddened paper, and is precipitated by carbonic and sulphuric acids, by which it is distinguished from the very dilute solution of strontian, which is not precipitated by sulphuric acid.

Barytes mixed with Food, with Vomited Matters, and with those contained in the Digestive Canal.—If

the proportion of barytes contained in these matters is small, it will not be found in the solution, because it will have been changed into an insoluble carbonate, phosphate, or sulphate; by the soluble carbonates, phosphates, or sulphates contained in the organic matters; in that case the liquid will not restore the blue color of test paper previously reddened by an acid. If the dose of barytes, on the contrary, exceeds three or four grains, the liquid will in general render the reddened paper blue. Let us allow that such is the case. After having ascertained the alkaline condition of this liquid, it must be evaporated to dryness in a porcelain capsule at a gentle heat, the mass treated with pure nitric acid, diluted with five or six times its weight of boiling distilled water; the liquid is next to be filtered after a few minutes boiling, and then evaporated in a porcelain capsule, until it is carbonised, and no longer gives out any smoke; the carbon is to be detached with the blade of a clean knife, and incinerated in a platina crucible; the ash will contain caustic barytes or its carbonate, and a little of the binoxide of barium, according to the proportion of nitric acid and of organic matter contained in the carbon; it will happen most frequently that the greater part, if not all the barytes, is in the caustic state; the ash is to be boiled in distilled water and filtered, and the solution will give all the characteristics of the water of barytes. Fearing lest a portion of the barytes has been changed into carbonate during incineration, the ash exhausted by the boiling water must be treated by dilute nitric acid; the filtered liquid evaporated to dryness and calcined in a platina crucible, will yield caustic barytes, and a little of the binoxide of barium.

The next thing to be sought for is the portion of barytes, decomposed by the soluble carbonates and sulphates, contained in the organic matters. With that view, the solid matter remaining after the first treatment by diluted nitric acid, is to be dried in a porcelain capsule, then incinerated in a platina crucible, maintained at a red heat; two hours are sufficient for the decomposition of the carbonate of barytes, and for the change of the sulphate into the sulphuret of barium. The ash is to be treated with pure diluted nitric acid, which will disengage sulphuretted hydrogen, precipitate sulphur, and give a soluble nitrate of barytes; to obtain the latter, the liquid must be filtered, and evaporated in a small porcelain capsule; the solid nitrate of barytes, calcined in a platina crucible, will leave caustic barytes mixed with a little binoxide of barium.

If the organic mixture in question does not contain free barytes, and consequently does not restore the blue color of reddened paper, instead of treating it at first with dilute nitric acid, after having dried it, it should be carbonised in a porcelain capsule, then incinerated as has been already directed, to decompose the carbonate and sulphate which have been formed.

If it is requisite to discover the barytes which may be found in the tissues of the digestive canal, or in the other viscera, from absorption or combination, these organs cut into small pieces must be boiled in distilled water for an hour, and the filtered solution treated as has been already directed, when speaking of barytes mixed with food, &c. If the aqueous solution does not yield any barytes, it must be sought for in the

tissues, which have already undergone the action of boiling water by carbonising them with concentrated and pure nitric acid, then by keeping the ash in a platina crucible at a red heat, in order to decompose the carbonate and sulphate of barytes contained in these viscera, as a consequence of the change of a soluble compound of barytes into the carbonate or sulphate.

Carbonate of Barytes.—This salt is solid, white, insipid, insoluble in water, and soluble with effervescence in dilute nitric acid; sulphuric and siliceous phthorhydric acids act upon the nitrate as upon barytes. By evaporating this nitrate to dryness, and calcining the product in a platina crucible, barytes mixed with a little binoxide of barium is obtained.

If the carbonate of barytes is mixed with organic matters, we must begin by examining whether the liquid portion of these matters contains a soluble salt of barytes. It is possible that a portion, and even the whole of this carbonate has been changed in the digestive canal into the acetate or the chloruret of barium, by means of the acetic and hydrochloric acids contained in the stomach. To discover this we must act as already directed, when speaking of barytes mixed with food. If this change has not taken place, the organic matters must be dried in a porcelain capsule, and the product treated with diluted nitric acid, according to the directions previously given. Caustic barytes mixed with a little binoxide of barium will be finally obtained.

With the carbonate as with the barytes, the operations should be pushed far enough to discover the portion of barytes which may have been absorbed or passed into the state of sulphate, and be found in the solid mass, or in the organs already treated with dilute nitric acid; all that is requisite is to carbonise the remaining solids by nitric acid, then to calcine the ash for two hours at least, at an intense red heat, in order to obtain the sulphuret of barium or the carbonate of barytes, which is to be decomposed by dilute nitric acid; the liquid filtered, evaporated, and calcined, will leave caustic barytes, mixed with a little binoxide of barium.

Chloruret of Barium.—This is solid, white, pulverulent, or crystallised in square plates, possessing a very sharp acrid savour, without action on test-paper, soluble in water, and insoluble in strong alcohol.

Concentrated or Dilute Aqueous Solution.—It yields with the soluble carbonates a white precipitate of carbonate of barytes soluble in nitric acid; this precipitate, treated with carbon in a platina crucible, leaves caustic barytes mixed with a little binoxide of barium; the soluble sulphates will precipitate a white sulphate of barytes insoluble in water and in pure nitric acid; this sulphate calcined with carbon will give the sulphuret of barium; the nitrate of silver will give a precipitate of the chloruret of silver, insoluble in water and in cold or boiling nitric acid, and soluble in ammonia.

Chloruret of Barium mixed with Organic Liquids, with Vomited Matters, and with that found in the Digestive Canal.—Eau sucrée, tea, albumen, gelatine, and milk, are not rendered turbid by this salt. Bouillon and wine give precipitates only from the salts they contain, and which form insoluble salts with the chloruret of barium, such as the sulphate, tartrate, phos-

phate, &c. The organic mixture is to be evaporated to dryness in a porcelain capsule, and the product treated with boiling distilled water, in order to dissolve out the chloruret of barium it may contain; the filtered solution is to be dried in a porcelain capsule until it is carbonised and no longer gives out any smoke; the carbon is then to be incinerated in a platina crucible, and the ash boiled in dilute nitric acid; the nitrate dissolved, filtered, evaporated to dryness, and decomposed by fire in a platina crucible, leaves barytes. If, instead of subjecting the ash to the action of nitric acid, it were treated with water, there would not be an atom of barytes obtained in general, because during incineration the chloruret of barium is changed into the carbonate of barytes from the action of the carbonates of potass and soda contained therein on the chloruret.

The solid matter not dissolved by the water is dried in a porcelain capsule until it is carbonised; the carbon is then incinerated in a platina crucible, to change the sulphate of barytes it may contain into the sulphuret of barium. It is important to know that the chloruret of barium, unless it exists in rather a large quantity in these matters, passes constantly and almost entirely into the state of insoluble carbonate or sulphate of barytes, so that the aqueous treatment of suspected matters evaporated to dryness will scarcely yield any. It must be sought for, therefore, in the part insoluble in water; I have often mixed two or three grains of the chloruret of barium with two or three hundred scruples of a mixture of bouillon, milk, and coffee, without being able to discover an atom in the aqueous treatment, whilst I easily obtained a notable proportion of barytes by incinerating the mass which the water had not dissolved.

When it is requisite to discover in the viscera, or in the tissues of the digestive canal, the chloruret of barium which may have been absorbed, or perhaps combined with the parietes of the stomach or intestines, these organs are to be boiled for an hour in distilled water in a porcelain capsule, and the liquid and remaining solid matter are to be treated as directed, when speaking of barytes absorbed and contained in the viscera. In this way I have discovered barytes in the liver, spleen, and kidneys of a dog I had poisoned with six scruples of the chloruret of barium dissolved in 180 scruples of distilled water; the animal lived three hours and a half, and was opened immediately after death. The aqueous decoction of these organs did not yield any barytes; but the solid matter exhausted by water, carbonised by nitric acid, then heated for two hours in a platina crucible, has yielded the sulphuret of barium, which I decomposed by hydrochloric acid; on filtering, I found that the liquid contained chloruret of barium.

LIME.

Lime is solid, white, or greyish white, possesses a caustic savour, and is slightly soluble in water.

Concentrated or Dilute Aqueous Solution.—It restores the blue color of reddened paper, and gives a white precipitate with carbonic and oxalic acids; the carbonate is easily dissolved in an excess of carbonic acid, whilst the oxalate is insoluble in an excess of oxalic acid, but soluble in nitric acid; pure sulphuric acid does not give a precipitate with lime water.

Lime mixed with Food, Vomited Matters, and with

that found in the Digestive Canal.—Albumen, gelatine, bouillon, and milk, do not occasion any change in lime water. Red wine gives a violet-colored, tea a red ochre, and human bile a brown precipitate.

1st Experiment.—I mixed together a pint of bouillon, as much milk and coffee, and forty scruples of bile; this was saturated with lime water, and two grains of the hydrated alkali were added; the alkaline condition of the liquid having been proved by test paper, I dried the mass in a porcelain capsule, and treated the product for twenty or twenty-five minutes with boiling distilled water, which dissolved the free lime as well as the organic matters. The solution, of a reddish brown color, was filtered and evaporated until it was carbonised, and no longer gave out any smoke; the carbon was then incinerated in a platina crucible kept at a red heat for an hour, in order to change the carbonate of lime into quick-lime; by treating the ash with boiling water, a solution was obtained, which, after having been filtered, behaved like lime water with reddened paper, and with carbonic, oxalic, and pure sulphuric acids. If the ash is not heated sufficiently in the crucible, the lime will be in the state of carbonate insoluble in water, and, to discover it, the ash must be treated with weak nitric acid, and prove the presence of a salt of lime in the filtered nitrate.

The mass dried in the porcelain capsule, and treated already with boiling water, was heated for several minutes with pure nitric acid, diluted with five or six times its weight of water, in order to remove that portion of lime which may have been changed into the carbonate or oxalate of lime, by the acids or salts contained in the food; the nitric liquid was filtered, evaporated, and carbonised in a porcelain capsule; the ash was then incinerated in a platina crucible, and quick-lime obtained.

A similar experiment was made with a compound containing a quart of bouillon, a pint of milk, as much coffee and red wine, and about forty scruples of bile, without any lime being added. The result was that there was found as much quick-lime as in the previous experiment, owing doubtless to the soluble salts of lime contained in the boiling water, with which the food was prepared, and especially to the tartrate of lime, contained in the cream of tartar of the wine.

3rd Experiment.—A similar mixture of food without bile having been prepared, it was saturated with lime water, and twelve scruples of lime water containing half a grain of lime, afterwards added. The white of an egg dissolved in water was added to the mixture to render the liquid limpid on filtration; it was boiled for several seconds, and filtered when cold; the liquid was of a reddish yellow color, perfectly limpid and sensibly alkaline. Carbonic acid gas was passed through it without causing any precipitate; the liquid being slightly acid, heat was applied to drive off the gas, but it still continued acid and transparent. On the addition of the oxalate of ammonia, a precipitate of the oxalate of lime ensued, which, washed, dried, and calcined in a platina crucible, furnished quick-lime. The same experiment repeated without the addition of lime, gave the same results, only that there was rather less oxalate precipitated.

4th Experiment.—The same animal compound was mixed with a scruple of quick lime instead of half a

grain. The mixture was evaporated to dryness, and the product treated with sixty scruples of cold distilled water, which were shaken together for a quarter of an hour, and the liquid filtered was strongly alkaline; a current of washed carbonic acid gas having been passed through it, it became turbid immediately, but the precipitate disappeared as the water became saturated with carbonic acid gas; the solution was boiled for several minutes to drive off the excess of gas, the precipitate collected, washed, dried, and calcined in a platina crucible at a red heat, when it yielded quick lime and its carbonate, but the quantity obtained was not by any means equal to that used.

It follows, then—

First, That when it is requisite to discover quick lime in a case of poisoning, we must, after having ascertained the alkaline condition of the suspected matter, evaporate it to dryness if it is not in the solid state, treat the product with cold distilled water, filter, and pass an excess of carbonic acid gas through the liquid; it must then be boiled for several minutes to precipitate the carbonate of lime, which must be washed, dried, and calcined in a platina crucible, when lime or its carbonate may be obtained; there is not in fact any liquid food or vomited matter, which will yield a precipitate of the carbonate of lime when carbonic acid gas is added, unless lime has been mixed with it.

Secondly, Serious mistakes may be made if the process pursued in either the 1st or 3rd Experiments be adopted.

Thirdly, The carbonic acid gas does not precipitate all the quick lime introduced into the stomach, because a portion has been changed into a salt by the free acids contained in the food or in the alimentary canal, and probably because another portion is retained by organic matters, with which it has formed a soapy compound.

Fourthly, It would be imprudent to declare that a person had not been poisoned by lime, because it could not be discovered by means of carbonic acid, because the poisoning may have resulted from a small quantity given before or after the ingestion of acid liquids, such as wine, &c., in which case the lime would be changed into a soluble or insoluble calcareous salt, which carbonic acid could not decompose. In such a case the expert must strengthen his opinion by corroborative evidence, such as the symptoms, cadaveric alterations, &c.—*Journ. de Chimie Médicale.*

MEDICO-LEGAL RESEARCHES ON THE BLOOD.

By LOUIS MANDL, M.D., Paris.

USE OF THE MICROSCOPE IN MEDICO-LEGAL RESEARCHES.

M. Orfila was the first who attempted to apply the microscope to the elucidation of questions connected with medical jurisprudence. In 1827 he speaks of this mode of investigation in his *Memoirs on the Blood and Semen*. It is to be regretted that his labors were not attended with better results; we shall presently explain the circumstances which prevented M. Orfila from deriving more benefit from his microscopic examination of the blood and semen: he discovered