ON THE

COMPOSITION OF THE MECONIUM,

AND OF THE

VERNIX CASEOSA OR LUBRICATING MATTER OF THE NEW-BORN INFANT.

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The microscopical character of meconium is very distinctive, and well displays its compound nature. It may be examined advantageously either mixed with water, or in a saturated solution of common salt; or merely compressed between two plates of glass. Using either method, its appearance is much the same,—it exhibits a confused mixture, of globules, plates, and molecules.

The globules about $\frac{1}{3000}$th of an inch in diameter, are very abundant, and form a principal part of the whole. Judging from their form and size, their insolubility in water and alcohol, they may be inferred to consist chiefly of mucus.

The plates, which are tolerably abundant, are of two kinds. One kind is of irregular form, somewhat granular, varying in size from about $\frac{1}{2000}$ to $\frac{1}{1000}$ of an inch in diameter, insoluble in water, alcohol, whether hot or cold, and the dilute acids

and alkalies, after the manner of epithelium scales; which I believe them to be. The other kind are of a regular form, chiefly rhomboidal, of great thinness, and perfect transparency, insoluble in water and acids and in cold alcohol, but readily soluble in hot;—properties sufficiently indicative of cholesterine.

The molecules vary in size from $\frac{1}{8000}$ to $\frac{1}{20000}$ of an inch in diameter;—and, as they are insoluble in water, and in most part soluble in an alkaline ley, they may be considered as consisting chiefly of fatty matter. They constitute a very small part of the whole.

Besides these ingredients admitting of being distinguished by the microscope, to which the meconium owes its thick consistency and viscid nature, there is another portion, the soluble part, with which they are imbued, and from which the mass derives its colour and taste, and probably its power of resisting putrefaction, and which seems identical with the colouring and sapid matter of bile, being soluble in water and alcohol.*

The specific gravity of meconium, deprived of air,

* This property of meconium is remarkable. After more than three months, a portion put by in a bottle containing a good deal of air, closed to prevent the drying of the substance, was found unaltered in colour, and presenting the same appearance under the microscope as when first examined; the only perceptible difference was, that its upper surface was covered with a mould, or mucor, like that of cheese, formed of connected globules, each about $\frac{1}{8000}$th of an inch in diameter.

exceeds that of water.* It sinks in a saturated solution of common salt of the sp. gr. 1148. It may be mentioned in confirmation of what has been already stated, that this mixture of meconium and brine affords, after standing a time, a kind of mechanical analysis or separation of its ingredients. The mucus globules and epithelium scales, dyed of a dark green by the colouring matter, find their place of rest at the bottom, whilst in the supernatant fluid, slightly turbid, and of a bright greenish yellow hue, numerous plates of cholesterine, and a smaller number of fatty globules and molecules, are found suspended.

The quantities of meconium which I have obtained have been too small to admit of accurate analysis, and the determination of the proportions of the ingredients of any one specimen. It may be briefly mentioned, that every specimen that I have examined (some voided just after birth, others taken from the intestines of still-born children) has been very similar, and, in accordance with the results of the microscopical examination, composed chiefly of mucus globules and epithelium scales, and of biliary matter, containing, besides the colouring and sapid matter of the bile, a small portion of cholesterine, of margarine and oleine, with a little free acid,

* It is readily deprived of air, by crushing it under water by the pestle in a mortar, more readily than by the air-pump, owing to its tenacity; in this respect resembling cork, which, composed of elastic cells, floats *in vacuo* on water many months, and yet immediately sinks when forcibly compressed, using small portions.

probably the carbonic, judging from the want of effects of nitrate of silver in precipitating it, and from the circumstance that the redness imparted to litmus paper was removed by heat.

In one instance—a specimen obtained from a healthy child immediately after birth—the proportion of water was determined;—of matter soluble in hot alcohol, separating on cooling, chiefly cholesterine and margarine; of matter soluble in cold alcohol, chiefly oleine, and the colouring and sapid matter of the bile; and of matter insoluble in this fluid, whether hot or cold, chiefly epithelium scales and mucus: the results per cent. were about as follow:—

23·6	mucus and epithelium scales.
·7	cholesterine and margarine.
3·0	colouring and sapid matter of bile and oleine.
72·7	water.
100·0	

These proportions, I believe, may be considered pretty correct; that of the colouring matter indeed is a little too low, owing to the difficulty there is in extracting it from the mucus and epithelium scales, with which it appears to combine as a dye, staining them permanently.

A portion of the same meconium was incinerated. It burnt after becoming semifluid, with a bright flame, and left ·69 per cent. of reddish ash, chiefly peroxide of iron and magnesia, with a trace of phosphate of lime and common salt: the magnesia,

seemed to be the predominant ingredient and uncombined.

The character of the vernix caseosa under the microscope, is not less distinctive than that of meconium. Being immiscible with water, it can only be well examined by using the compressor: thus seen, compressed between two surfaces of glass, it is found to be composed of granular plates and molecules; the plates constituting the principal part, and producing a tessellated appearance, not unlike the representation of an old Roman pavement, or rude cyclopian wall. The plates have the properties of epithelium scales, the granules, those of fatty matter, as also the molecules. The plates are insoluble both in weak acids and alkaline leys and in cold and hot alcohol; are of irregular form, varying in size from about $\frac{1}{666}$ to $\frac{1}{1000}$ of an inch in diameter, and very thin. Their granular character is greatly diminished, by the action both of a solution of potassa, and by boiling alcohol after drying, by which also the molecules are dissolved.

The vernix caseosa is apparently lighter than water, on which it floats: but this is owing to the air entangled in it, as is proved by subjecting it, immersed in alcohol, to the action of the air-pump, after which it sinks in water, at 60° Fahr. A specimen thus treated was found to be of the sp. gr. 10039, and it probably still contained a little air,—it being extremely difficult to exhaust the whole from a substance so constituted, of which proof is afforded by the circumstance that if the trial is made

with the air-pump, using water instead of alcohol, although a considerable portion of air is exhausted, as is indicated by the ebullition produced, yet sufficient remains to keep it bouyant. Proof of the same is afforded by boiling it in water: even after several hours' boiling, the whole did not sink. It may be worthy of remark, in confirmation of its specific gravity being only a very little above that of water, that towards the boiling point most of it rises towards the surface, (its specific gravity diminishing with elevation of temperature like that of fatty matter,) and again subsides as the water cools down to the temperature of the air.

From the circumstance also of the epithelium scales being coated with, or enveloped in fatty matter, the vernix caseosa is retentive in a remarkable degree, of the water which forms a part of it. It required ten hours' exposure over a steam bath, to expel from eight grains the whole of the water belonging to it, when it was reduced to 1·77 grain.

Of a butteraceous consistence in its ordinary state at a temperature of 60°, it hardens on reduction of temperature, and becomes almost semifluid when its temperature is raised, as to 100°,—admirably adapting it for a lubricating substance in parturition. But when the whole of its water is expelled, then even at the temperature 212° it loses its quality of lubricity, and is converted into a hard mass of a greasy feel,—the dried epithelium scales, doubtless, absorbing the portion of fatty matter, in the same manner as flour absorbs the butter or lard

mixed with it, forming when baked a crisp paste. When thoroughly dried, the fatty matter which it contains is readily extracted by the action of boiling alcohol, of sp. gr. ·838. From what is witnessed when thus treated, it may be inferred, that the fatty matter is of two kinds, one being deposited on the cooling of the alcohol, the other being retained in solution, the former having the character of margarine, the latter of oleine.

A single specimen of the lubricating matter, of great purity, taken from a healthy infant immediately after birth, subjected to analysis, with the intent of determining the proportion only of the principal ingredients, was found to consist of—

13·25	epithelium plates.
5·75	oleine.
3·13	margarine.
77·37	water.
100·00	

A portion of the same was incinerated: it burnt with a bright flame, and left a very small quantity of white ash, hardly $\frac{1}{50}$th of a grain, although 40 grs. was the quantity consumed, weighed before drying. This ash, in a drop of dilute muriatic acid, dissolved, emitting a distinct smell of sulphuretted hydrogen; and the solution was clouded by adding a little ammonia, indicating the presence of a minute portion of phosphate of lime and sulphur—the latter in union probably with lime or potash.

Theoretically considered, as regards the origin of the two substances treated of, the preceding results seem to point out distinctly that both are excretions, the meconium chiefly derived from the liver, as I believe is commonly admitted by physiologists,— and the lubricating matter from the skin.

M. Raspail is of opinion, that a portion of the meconium consists of intestinal villi,— founding his conclusion on microscopical observations.* I have sought in vain for the appearances which he describes;—the utmost I have seen has been a solitary filament now and then, mixed with the plates: often indeed there has been an appearance of a greater number, but these on careful inspection have proved to be the margins of plates of cholesterine, from their position having a linear or filamentous appearance.

Vauquelin and Buniva after examining the vernix caseosa, were led to infer that it is not an excretion from the infant, but a deposit on its surface of a peculiar nature from the liquor amnii, derived from its albuminous part by a certain change.† This view, I apprehend, cannot now be sustained, and does not require to be controverted. Bichat saw the unreasonableness of it, and rejected it merely from the circumstance that no such deposit is found on the umbilical cord, or on the inner surface of the

* Nouveau Système de Chimie Organique, ii. 466.

† Ann. de Chim. xxxiii. 274.

amnios, and came to the conclusion which seems most just, that it is derived from the skin of the fœtus, and is a secretion similar to that which takes place after birth in many parts of the cutaneous system.*

* Anatomie descriptive, v. 393.