

## PAPERS READ BEFORE THE CHEMICAL SOCIETY.

XXII.—*New Tests for some Organic Fluids.*

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IN the course of the investigations connected with the establishment of the ammonia process of water-analysis, it soon became apparent that Chapman, Smith, and myself had in our possession a new instrument of chemical research, and in using this instrument I have, I believe, come across some very characteristic properties of the commoner animal fluids. When an animal fluid is mixed with excess of potash, evaporated down in contact with the alkali, and then maintained at a temperature of about  $150^{\circ}\text{C}$ . for some time, it evolves a certain fixed proportion of ammonia. This having been accomplished, a further quantity of ammonia may be got by boiling the residue with alkaline solution of permanganate of potash. Now, for certain animal fluids, the quantity of ammonia yielded by a given weight or volume of the animal fluid is characteristic; and the relative quantities of ammonia obtained by potash and by permanganate of potash are likewise characteristic. Thus are provided two new criteria of these animal fluids, which may become of some importance in practical biology, and especially in some of those enquiries which the medical jurist is called upon to conduct.

My investigations on this subject are far from complete, but still they are sufficiently advanced to enable some idea to be formed of the scope and possibilities of such work.

Of all the animal fluids, I know of only one which yields a large proportion of ammonia to caustic potash, and that fluid is urine. On the other hand, urine is distinguished by the smallness of the yield of ammonia to permanganate of potash.

Milk yields about half as much ammonia to potash as to permanganate of potash.

Blood yields about one-fifth as much ammonia to potash as to permanganate of potash.

White of egg, moist, just as it occurs naturally, gives about one-fourth as much ammonia to potash as to the permanganate.

Gelatin, strange to say, gives no ammonia (or only the least trace) to potash, and a good quantity to permanganate.

It is, moreover, a fact, pregnant with interest, that if the preliminary heating to  $150^{\circ}\text{C}$ ., with caustic potash be omitted, and if the boiling

with permanganate be at once proceeded with, only that quantity of ammonia is obtained which would have been yielded to permanganate of potash if the entire process had been gone through. I have, in another place, insisted upon this being interpreted to mean that casein and albumin are chemical compounds into which urea enters as a constituent part, and that gelatin contains no urea.

I will next give the experimental numbers.

100 cubic centimeters give—

Name of fluid.	Ammonia by potash at 150° C.	Ammonia by perman- ganate of potash.
Urine (human) .....	0·90 gram.	0·05 gram.
Milk of cow .....	0·13   "	0·28   "
Blood of sheep .....	0·46   "	2·20   "
Liquid white of egg (hen) .....	0·32   "	1·30   "
Dry solid gelatin (100 grams) .....	0·   "	10·   "

These numbers must be looked upon as fair approximations, and may require a little rectification in the progress of the enquiry.

With regard to the possible applications of this work to the elucidation of questions before the medical jurist, I would suggest, just as an instance, the possibility of distinguishing between a spot of milk and a spot of white of egg on a cambric handkerchief, for these investigations are appropriately carried out on minute quantities.

In conclusion, it may, perhaps, be useful to state, that in the above experiments, 5 c.c. of the animal fluid were mixed with water in a 500 c.c. flask, and diluted up to the 500 c.c. mark, thereby forming a dilute solution, whereof 1 c.c. contained  $\frac{1}{100}$  c.c. of the animal fluid; that 5 or 10 c.c. of this dilute liquid were usually taken for one experiment, and that a delicate little retort fitted to a delicate little Liebig's condenser was employed. The retort was heated in an oil-bath. The ammonia was measured by the Nesler test. Further details of this kind of work may be found in the little book on Water-Analysis, by Chapman and myself.