

THE EXCRETION OF NITROGEN AFTER UPPER GASTRO- INTESTINAL TRACT OBSTRUCTION.

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A high level of non-protein nitrogen in the blood is characteristic of the toxemia incident to upper gastrointestinal tract obstruction (1, 2). The explanation for this change is not entirely clear. Whipple, Cooke and Stearns found an increase in nitrogen excretion in the dog after intestinal obstruction (3), and no marked evidence of renal insufficiency (4). They attributed the heaping up of non-protein nitrogen in the blood to accelerated protein destruction caused by some toxic body arising in the wall of the obstructed gut. More recently there has been a tendency to doubt the existence of a toxic body and to consider the increase in the non-protein nitrogen of the blood as a true retention due entirely to renal insufficiency, possibly caused in turn by dehydration. Convincing proof for this view is lacking. The high blood urea concentration observed in children suffering from water loss produced by gastrointestinal tract disturbances, has also been interpreted as due to renal insufficiency without any adequate proof (5). Gamble and Ross (6) in studying experimentally the dehydration of rabbits, after pyloric obstruction, make a similar assumption.

The question can be settled only by determining accurately the nitrogen excretion. In experimental pyloric and intestinal obstruction this is most difficult, since collections of urine can seldom be accurately made on account of vomiting. We have shown that the toxemia incident to obstruction of the cardiac end of the stomach is similar to but more marked than that following high intestinal or pyloric obstruction (7). Since here no vomiting is possible, the urine can be quantitatively collected. We have also found that if the pylorus is obstructed for 48 hours and then released, although the vomiting

ceases, making urine collections possible, the toxemia often continues. We have determined the non-protein nitrogen excretion in six dogs with obstruction of the cardia, in two after obstruction and release of the pylorus and in two control dogs.

TABLE I.
Excretion of Nitrogen after Upper Gastrointestinal Tract Obstruction.

Dog	Duration of experiment	Blood (mg. per 100 cc.)				Urine (per kilo of body weight per 24 hrs.)		Operation
		Beginning		End		Amount	Total non-protein nitrogen	
		Urea nitrogen	Non-protein nitrogen	Urea nitrogen	Non-protein nitrogen			
days	mg.	mg.	mg.	mg.	cc.	gm.		
1	4	....	....	....	....	13.0	0.141	None (control)
2	5	....	....	....	....	5.5	0.122	" "
				Average		9.3	0.132	
3	3	16.6	26.0	58.8	167.0	29.0	0.391	Obstruction of cardia
4	4	9.8	44.4	66.5	116.0	19.7	0.248	" " "
5	2	16.1	33.0	30.1	59.0	19.8	0.217	" " "
6	3	12.6	27.7	27.9	51.8	24.5	0.337	" " "
7	3	25.2	50.5	30.1	78.0	23.3	0.230	" " "
8	3	9.8	28.9	46.8	82.5	19.8	0.266	" " "
				Average		22.7	0.289	
9	7	38.5	59.5	11.9	35.3	41.8	0.557	Pylorus obstructed for 48 hrs. and released
10	10	98.1	132.0	14.7	25.2	25.0	0.413	" "
				Average		33.4	0.485	

The animals were kept in metabolism cages. All operations were done under anesthesia with aseptic technique. No food was given but water was allowed *ad libitum*. The non-protein nitrogen in the urine was determined by a micro Kjeldahl method (8), the urea nitrogen of the blood by the Van Slyke and Cullen modification of the Marshall method (9), and the non-protein nitrogen by the Folin and Wu method (10).

EXPERIMENTAL OBSERVATION.

The blood and urine findings are shown in Table I. All figures have been reduced to kilo of body weight per 24 hour period. The average excretion of non-protein nitrogen in the control animals per kilo for the 24 hour period is 0.132 gm. and the fluid excretion 9.3 cc. After cardiac obstruction the average of six dogs is 0.289 gm., an increase of 119 per cent. The water excretion is also increased from 9.3 cc. to 22.7 cc. per kilo per 24 hour period. The non-protein nitrogen excretion in two dogs, after obstruction and release of the pylorus, was 0.485 gm., an increase of 267 per cent, and water excretion 33.4 cc. per kilo per 24 hour period.

DISCUSSION.

In both cardiac obstruction and after obstruction and release of the pylorus there is a very marked increase in non-protein nitrogen and water excretion, as compared with the controls. With the increase in nitrogen excretion in the animals with cardiac obstruction there is also an increase in the non-protein nitrogen of the blood. These findings could only be explained by a marked increase in protein destruction. Dog 4 showed an increase in urea nitrogen from 9.8 mg. to 66.5 mg. per 100 cc. of blood. It has been shown that for every gm. of nitrogen retained as urea in a man weighing 70 kilos there is an increase of 1.33 mg. of urea per 100 cc. of blood (11). If these figures are applied to this dog the increase in urea nitrogen in the blood would in addition correspond to an excretion of 0.314 gm. of nitrogen per kilo per 24 hour period as urea alone. Mackay and Mackay (12) have shown that in fasting in rabbits there is a marked increase in protein destruction. This they consider secondary to the marked water loss since the increase is not due to kidney retention. Our animals also had a marked water loss. Whether the increased protein destruction is due to this cause or some toxic body is not determined. The nitrogen excretion, after pyloric obstruction and release of the pylorus, is high. The urea nitrogen and non-protein nitrogen of the blood was decreasing and some nitrogen was thus washed out. This could account for only a fraction of the nitrogen excreted, however.

SUMMARY AND CONCLUSION.

After obstruction of the cardiac end of the stomach and after obstruction and release of the pylorus there is a marked increase in non-protein nitrogen excretion.

This increase is due to accelerated protein destruction, which may result from the great fluid loss, or to the action of some toxic body.

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