The pH of Cecal Secreta in Chickens

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In the previous paper¹⁾, the pH of cecal contents was almost constant around at 6.8 when a conventional diet was fed, and it was always lower than the pH of lower ileal contents. Moreover, the cecum showed a stronger buffer action than the small intestine did.

The present experiment was carried out to clarify the influence of cecal secreta on the buffering action shown in the cecal contents.

Experimental

Twelve 3-month old single comb White Leghorn cockerels, weighing 1.2-1.3 kg, were housed in individual cages and divided into 3 groups of 4 birds each. One group was fed a conventional diet *ad libitum*, the second group was forced-fed¹⁾ 30 g of the conventional diet mixed with 15 ml of 0.5 N HCl twice a day (8 : 00 and 17 : 00), and the third group was fed whole grain wheat *ad libitum*. The feeding period was 4 days.

The pH of cecal secreta was measured as follows: after the cecal contents were removed by washing with 0.9% NaCl solution¹⁾, a needle-type electrode (Toa Denpa, GC-185) was inserted into the cecal lumen through the cut at the cecal apex, and the pH was continuously recorded by using a pH meter (Toa Denpa HM-5A). The pH of the lower ileum was also estimated by the similar procedure in case of the cecum.

Ulnar cutaneous blood was sampled five hours after the last feeding, and the blood pH was also measured as reported by NAKAHIRO *et al.*¹⁾.

Results and Discussion

The pH of the diets used was 6.5 in the conventional diet, 4.1 in the conventional diet mixed with 0.5 N HCl and 6.0 in the whole grain wheat.

Time course changes in pH of the cecal and the lower ileal secreta in the chickens fed the various experimental diets are given in Fig. 1.

Even though the chickens were given the diets showing various pH values, the pH of the lower ileal secreta was statistically constant throughout the experimental period. In contrast, the pH of the cecal secreta showed completely different figures. When the chickens were fed the conventional diet, the pH of the cecal secreta fell down from the initial pH of 7.3 to 7.0 at 5 minutes after initiation, and thereafter remained constant. When the conventional diet mixed with HCl or the whole grain wheat was fed, the pH of the cecal secreta declined for 10-20 minutes at most after initiation, and thereafter remained constant at about 6.0. The initial and the final pH of the cecal secreta were statistically different ($P < 0.05$) in all cases. No statistical difference was found between the pH in the chickens fed the conventional diet mixed with HCl and the whole grain wheat, whereas the pH in the conventional diet fed chickens was statistically higher than

Fig. 1. Changes in pH of the cecal and ileal secretions when various diets were fed (Mean of 4 birds $\pm$ SEM)

that in the others ($P < 0.05$).

According to NAKAHIRO *et al.*¹⁾, the pH of the lower ileal contents showed an almost constant value, being 7.3-7.7, irrespective of the diets given, and this pH value is almost comparable to 7.4-7.6 of the ileal secretions in this experiment. The pH values of the cecal contents of chickens fed the conventional diet, its mixture of HCl and the whole grain wheat were 6.9 ± 0.2 , 6.2 ± 0.1 and 5.8 ± 0.1 , respectively. These values were almost the same as those of the cecal secretions observed in the present experiment. ASHCRAFT²⁾ reported that the pH of the cecal contents of the chickens ranged from 5.0 to 6.7 when the various kinds of milk products were given. From the results of the authors and ASHCRAFT²⁾, it may be concluded that the pH of the cecal contents depends on the pH of the cecal secretions, and also that the pH of the cecal secretions is influenced by the diets fed.

The pH of the ulnar cutaneous blood was quite constant, being 7.3-7.4, irrespective of the diets fed. This figure is almost comparable to the results of the previous report¹⁾. The results also show that the pH of ileal secretions and the blood pH were very close and almost constant in all cases, whereas the pH of cecal secretions was significantly lower than the blood pH. Especially, the feeding of the acidified diet distinctly lowered the pH of cecal secretions, but not the pH of ileal secretions. This fact suggests that the hydrogen ion is selectively secreted into the cecum to maintain the constant pH in the chicken body. However, the reason is not clear why the feeding of the whole wheat grain lowers the pH of cecal secretions.

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