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EFFECT OF ABDOMINAL OPENING ON WATER BALANCE IN CHICKENS

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鶏における開腹手術が水分出納に及ぼす影響

一　色　　泰

The present experiment was carried out to clarify the influence of abdominal opening (as a sham-operating) on water balance using 5-month-old single comb White Leghorn cockerels. No significant difference was observed in the water balance between operated and non-operated birds. It is assumed that the result of our previous experiments with the sham-operated chickens (as a control) is similar in to that of intact one.

擬似手術として開腹手術を施した鶏の水分出納が正常鶏と異なるかどうかを確めるために，5か月齢の単冠白色レグホーン種雄を用いて比較試験を行った。その結果，手術鶏と非手術鶏による水分出納の間に何ら有意差がみられなかった。このことは，著者らが擬似手術鶏を用いて行ったこれまでの実験成績を正常鶏とみなして差し支えないことを示すものと思われる。

Introduction

Until the present time, We have used the sham-operated birds (as a control) in experiments investigation the effect of cutting and/or ressecting some parts of the intestinal tract on the water balance in chickens[1-3]. The sham-operation was made as follows; the abdominal wall was incised, and a part of the intestinal tract was drawn out and exposed to the air for the same period of time that would be required to complete a intestinal cutting and resecting, then the exposed intestine was withdrawn into the abdominal cavity and the abdomial incision was sutured. Nevertheless, there were some questions as to the exactness of the experimental data derived from such operational conditions. To dissolve the questions, it was necessary to compare the experimental data derived from such a suspected operation to the normal condition. If the water balance in chickens is not changed with the sham-operation treatment compared to the intact ones, it would be an advantage to save the effort of conducting a sham-operation as a control in those experiments.

In the present experiment, the water balance of sham-operated chickens was compared with that of intact chickens under the same feeding condition.

Materials and methods

Twenty single comb White Leghorn cockerels, 5-month-old and weighting 1.8-1.9 kg, were used. To lessen a scattering during drinking, they were resected the comb and wattle prior to the experiment at the 2-month-old age. They were housed in individual cages during the experimental 7 days, and offered the conventional diet[3] *ad libitum*, which contained chromic oxide as a indicator substance. Water was accesible at all times, and renewed twice a day (6:00 and 12:00). The

Table 1. Effect of abdominal opening on water intake, water excretion and water recovered in chickens.

	Chick nomber	Body weight (kg)	Feed intake (g)	Water intake (ml/day)			Excreta		Water recovered		Drunk water ml/g feed	Total water Intake ml/body weight
				Drinking	From feed	Total	Quantity (g/day)	Water (%)	Volume (ml/day)	% of total intake		
Before operation :												
	1	1.98	68	95	7	102	81	81.5	66	65	1.4	50
	2	2.08	79	132	8	140	97	81.4	79	56	1.7	65
	3	2.00	104	138	11	149	140	80.0	112	75	1.3	75
	4	1.99	84	128	9	137	107	80.4	86	63	1.5	67
	5	1.80	96	127	10	137	131	78.4	103	75	1.3	76
	6	1.98	82	126	8	134	102	79.4	81	60	1.5	65
	7	2.08	116	155	12	167	148	79.7	118	71	1.3	78
	8	1.85	76	125	8	133	109	80.7	88	66	1.6	69
	9	1.83	91	127	9	136	125	79.2	99	73	1.4	72
	10	1.75	76	116	8	124	94	78.2	74	60	1.5	68
	Mean ±SEM	1.93±0.04	84±5	127±5	9±0	136±5	113±7	79.9±0.4	91±5	67±2	1.5±0.0	69±3
After operation :												
Normal birds (Control)	1	2.12	93	135	11	146	114	78.9	90	62	1.5	69
	2	2.20	108	147	12	159	133	80.5	107	67	1.4	72
	3	2.10	89	156	10	166	107	79.4	85	51	1.8	79
	4	2.32	104	163	12	175	136	77.9	106	61	1.6	75
	5	2.02	78	103	9	112	100	79.0	79	71	1.3	55
	Mean ±SEM	2.15±0.05	94±5	141±11	11±1	152±11	118±7	79.1±0.4	93±6	62±3	1.5±0.1	70±4
Operated birds	6	2.22	95	149	11	160	122	80.3	98	61	1.6	72
	7	2.26	128	152	15	167	154	77.2	122	73	1.2	74
	8	2.08	80	132	9	141	102	78.4	80	57	1.7	68
	9	2.04	94	151	11	162	127	80.3	102	63	1.6	79
	10	1.86	97	135	11	146	130	80.0	104	71	1.4	78
	Mean ±SEM	2.09±0.07	99±8	144±4	11±1	155±5	127±8	79.6±0.4	101±7	65±3	1.5±0.1	74±2

amount of water drunk was measured twice a day (12:00 and 18:00). The amont of water intake was calculated by including the moisture in the eaten feed to the water drunk. Values of the drunk water per g feed eaten and the total water intake per kg body weight were also calculated. Feed intake was determined by the chromic oxide indicator method. Chromic oxide in feed and excreta was determined by the method of Bolin et al[4]. The excreta was collected thrice a day (8:00, 14:00 and 21:00) during the last consecutive 3 days of the 7 days experimental period. For collecting the excreta, the birds were attached to the cloaca a 100 m*l* polyethylen flask covered with sylindrical vinyl. The collected excreta were completely dried in a forced-air oven at 100°C, and water excreted was calculated by subtracting dry weight from fresh weight of the excreta.

The sham-operation was conducted as follows; about 3 cm long incision was made on the abdominal wall from near the last rib to the end of the pubic, and then, a part of the rectum was drawn out and exposed for about 20 minutes was, a period similar to the one required for an operation of artificial anus in chickens. There after, the part of the rectum exposed was withdrawn into the abdminal cavity and the incision of the abdominal wall was sutured carefully. These sham-operated chickens were maintained under an ordinary feeding condition for a month after the operation, and then were used for the second water balance trial for additional 7 days in the same manner as described above.

Results and Discussion

Water inteke and excretion of the sham-operated chickens are shown in Table 1. There was little variation in the daily feed or the water intakes in chickens before operation. After operation (2nd trial), there were also no significant differences in feed feed intake and water excretion in chickens when comparing the operated and non-operated groups. Consequently, although feed intake and water excretion of the control group were significantly higher compared with the values of the sham-operated group, during the first phase (before operation) the drunk water per g feed eaten and the total water intake per kg body weight were finally similar each other in both grops at the end of the experiment.

In the sham-operated chickens, feed intake, quantity of excreta and moisture contents of excreta were almost similar to those in non-operated chickens. As shown in Table 1, water intake was also not influenced by the sham-operation; that is, drunk water per g feed eaten and total water intake per kg body weight were not changed with the sham-operation. On the other hand, water excretion in the sham-operated group was slightly higher than in the non-operated group, and average water retention was calculated as 59 and 54 m*l* in the former and latter, respectively. However, the difference in these figures was not significant statistically. The recovery retio of consumed water into feces and urine was also not influenced by the treatment of the sham-operation.

The results obtained in this study suggest that the sham-operation, that is; incision of the abdominal wall and exposing part of the drawn intestinal tract for a short time; has no effect on the water balance in chickens. At least, one or more months after the surgical and practically untouched chickens may as well be taken as the control group. It is proposed therefore, that the results of our previous experiments[1-3] with the sham-operated chickens (as a control) are essentially the same as those obtained with intact chickens as a control group.

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