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The Effect of Halothane Gas on the Hatched Chickens

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INTRODUCTION

The authors reported the effect of clinical inhalation of anesthetic on the development of quail embryo under the condition of 0.5–3.5% concentration of halothane gas treatment previously.[1,2] As the results, the ratio of growth inhibition and of mitochondrial degradation in liver tissue of embryo increased according to the concentration of the gas treated and formed LDH 3 and 4 instead of LDH 1 and 2. From these findings, the authors suggested that the pathway of glycolysis of the gas treated embryo changed to a compensatory metabolism. To investigate these facts more clearly, we studied the effect of the gas to hatched chickens.

EXPERIMENTALS

Under the condition of 0.05–0.35% halothane gas in pure oxygen, 7th day hatched chickens of High-Line series were treated 115 hours totally for each 5 hours per day. The control experiments using the same chickens not treated by the gas were performed under the air atomosphere condition. The body weight, change of serm and liver LDH patterns, and electron microscopic photographs of the liver tissue of the chickens were examined according to the previous report.[1]

RESULTS

A. Change of Body Weight

Change of body weight of chickens was shown in Fig.1. As seen in the figure the body weight of 0.05% treated chickens were almost the same as with the control. But the weight of 0.1–0.3% treated chickens were suppressed as compared with the control.

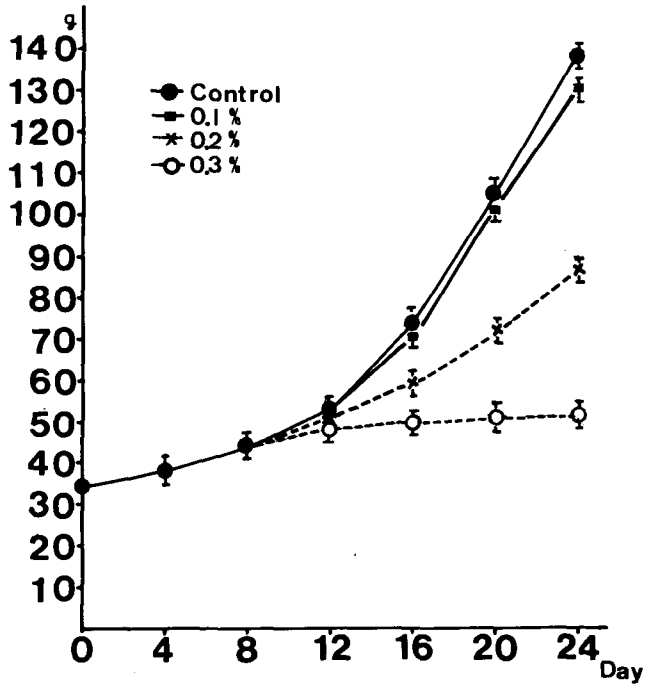


Fig.1. Change of Body Weight by the Treatment of Halothane Gas

The body weight decrease of chickens was parallel to the gas concentration used. On the other hand, on 0.35% treatment, the chickens were anesthetized within about 8 minutes and decreased body temperature rapidly and almost of them were died.

B. Serm LDH Patterns

The changes of composition of serm LDH patterns of chickens treated with 0.3% gas were shown in Table 1. LDH 1 of 0.3% treated chickens for 16 days decreased as compared with the control. On the contrary, LDH 2 and 5 were increased respectively. Although serm LDH patterns of 0.2% treated chickens changed after 24 days, the change of the LDH patterns of 0.05–0.1% treatment were not recognized.

C. Liver LDH Patterns

As seen in Table 2, liver LDH 1, 2 and 3 were recognized in 0.3% treated for 24 days chickens and LDH 1 and 2 were found in control. In the chickens treated with a low concentration rather than 0.2%, LDH 3 were not recognized after 12 days.

D. Electron Microscopic Photographs

The electron microscopic photographs of 0.3% treated chicken's liver tissue were shown in Fig.2. From the figure, partial decomposition of mitochondrial membrane, remarkable swelling, decrease of glycogen granules and vesicularization of endoplasmic reticulum were observed in the liver.

Table 1. Absorbance of LDH in Serum (%)

LDH	Hatched after 7th day	Hatched after 15th day		Hatched after 19th day		Hatched after 23th day		Hatched after 31th day	
	Before treat.	Cont.	Treat. 8th	Cont.	Treat. 12th	Cont.	Treat. 16th	Cont.	Treat. 24th
1	66.4	66.2	67.2	66.3	67.3	66.5	57.5	66.6	54.5
2	2.8	2.9	2.9	3.0	2.8	2.7	5.4	2.8	6.7
3	8.3	8.2	8.1	8.4	8.6	8.2	9.6	8.1	10.1
4	6.9	6.9	6.7	6.8	6.1	7.2	8.2	6.8	8.9
5	15.6	15.8	15.1	15.5	15.2	15.4	19.3	15.7	19.8

Table 2. Absorbance of LDH in Liver (%)

LDH	Hatched after 7th day	Hatched after 15th day		Hatched after 19th day		Hatched after 23th day		Hatched after 31th day	
	Before treat.	Cont.	Treat. 8th	Cont.	Treat. 12th	Cont.	Treat. 16th	Cont.	Treat. 24th
1	85.6	86.3	86.5	86.1	59.6	85.2	23.9	86.6	8.2
2	14.4	13.7	13.5	13.9	26.9	14.8	55.5	13.4	68.1
3					13.5		20.6		23.7
4									
5									

DISCUSSION

In order to clarify the influence of clinical anesthetic for human body, the authors investigated the effect of the development of quail embryo treated with halothane gas previously. Basford A. B. et al.[3] and others[4,5,6,7,8] cited problems the increasing rate of malformations among anesthetic rats and mouses. But the malformation of chickens treated with the gas was not recognized at all in our experiment. From the observation of liver tissue's electron microscopic photographs, it was recognized that the liver mitochondria were injured remarkably accompanied with liver damages similar to human hepatic damage reported by Tanigawa K. et al.[9] and others.[10,11] It was previously clarified that the embryo tissue treated had LDH 3, 4 besides LDH 1 and 2, and that ^{14}C-glycine uptaken to LDH 3 and 4 indicated the formation of a new compensatory metablic pathway. Schimmassek H. et al.[12] indicated that in the liver tissue of mouse treated with halothane gas for a long periods, the pyruvate kinase activities were decreased and also the ratio of lactic acid–pyruvic acid decreased. The autors considered in this report that halothane gas influenced the mitochondria of liver of hatched chickens and the coupling inhibition of electron transport system and phosphorization system were formed among them. And by the formation of anaerobic compensatory metabolism

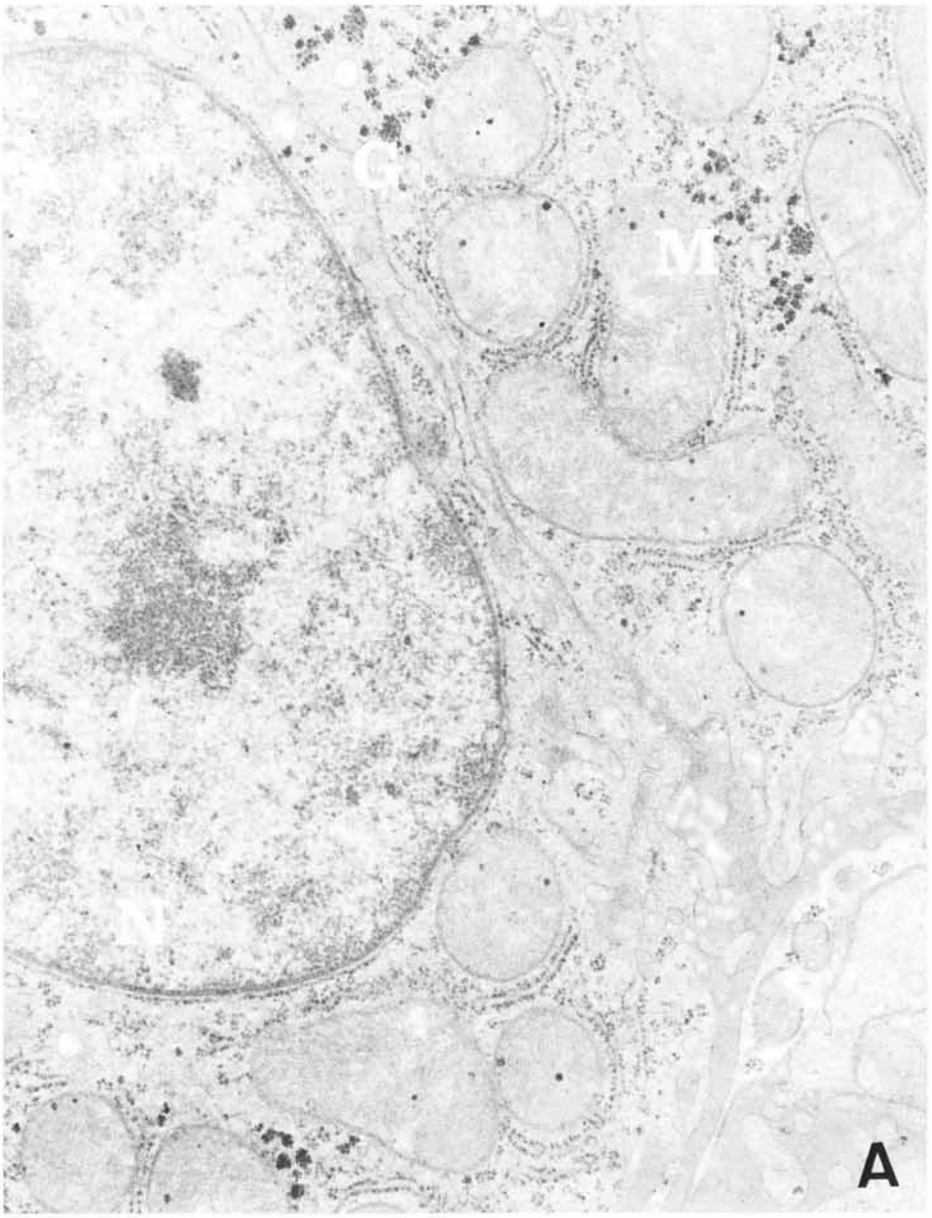
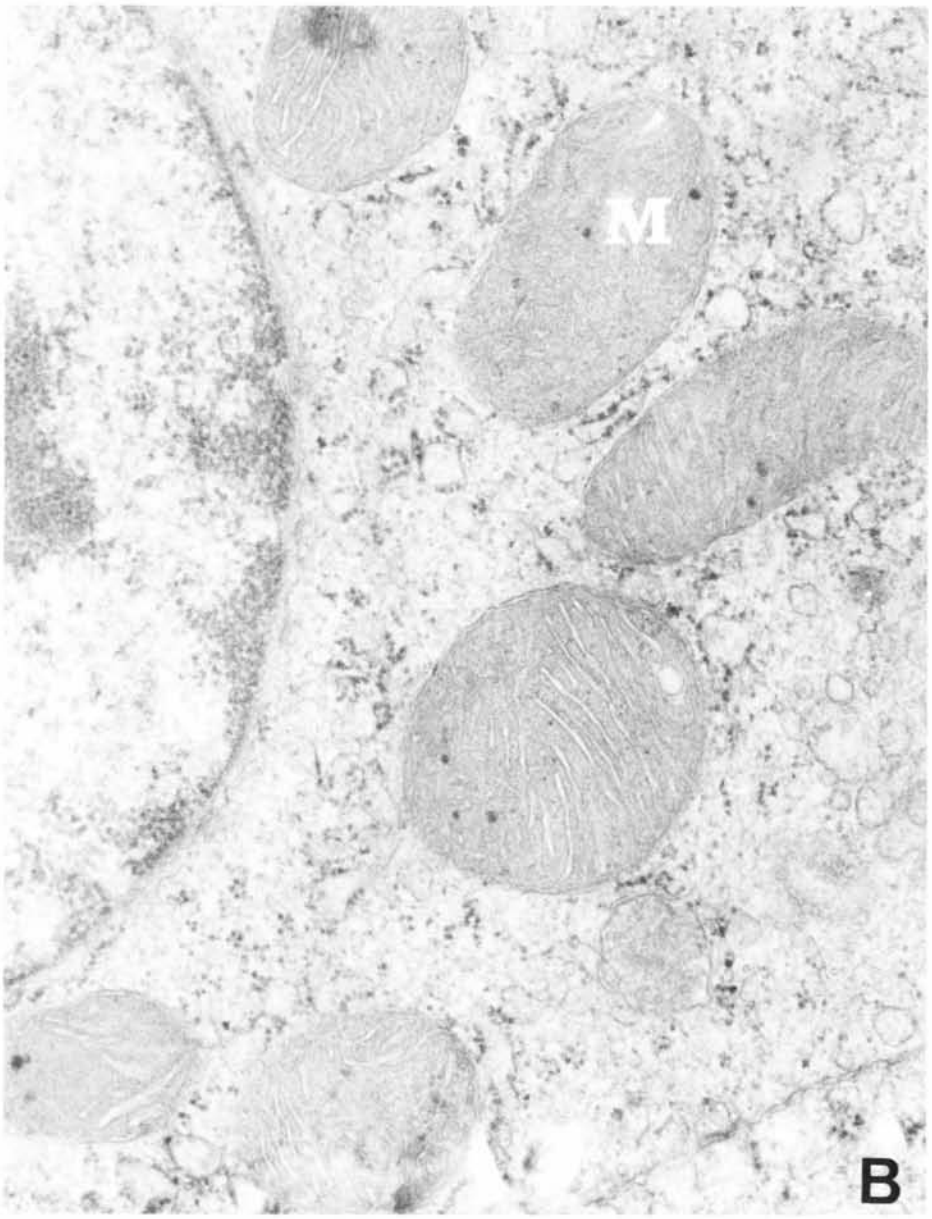


Fig.2. Electron Microscopic Photograph of Liver Cell
A) Control B) 24th Day Treatment
M: Mitochondria, **N**: Nucleus, **G**: Glycogen Granules


M
B

in the liver, the growth of chickens treated suppressed markedly, as well as Schimmassek H. et al.[12] reported on the results of the experiment of mouse treated with the same anethetic.

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