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EFFECT OF THE BURSA OF FABRICIUS OF CHICKEN ON ANTIBODY FORMATION AGAINST NEWCASTLE DISEASE VIRUS (B1 Strain)

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Chang et al. (1-4) and Glick(5) presented evidences that the bursa of Fabricius had a significant effect on the production of antibodies to S. typhimurium and sheep erythrocytes in young chickens. Bursectomy of young chickens reduced antibody production in response to the injections of S. typhimurium antigen and sheep erythrocytes, and the effect was greatest during the first few weeks after hatching and declined with increasing age. Singnificantly higher mortality was also caused by S. typhimurium in chickens from which the bursa of Fabricius had been removed.

Stubbs and Sperling (6) conducted experiments in attempts to grow a virus-induced tumor, chicken sarcoma (Strain 13) in the bursa of Fabricius. It was found, however, that no tumor growth had resulted in the chickens and that no resistance had been produced by the intrabursal application of the chicken sarcoma.

The present study was undertaken to obtain more information about the role of the bursa of Fabricius in antibody formation in chicken.

MATERIALS AND METHODS

Chickens—Fifty-four chickens, three week old hatching mates of Leghorn, were divided into three groups at random so as to provide equal numbers of males and females in each group.

Newcastle Disease Virus (NDV)—The lentogenic B_1 strain of NDV (7) was inoculated into the allantoic cavity of 10-day-old chicken embryos. The virus-infected allantoic fluid was harvested at the 48th hour after inoculation, was tested for bacteriological sterility and used as an antigen. The viral activity was titrated(8), and the end point was expressed as ELD50 as determined by the method of Reed and Muench (9). The virus had a titer of $10^{7.6}$ ELD50 per ml. of the virus-infected allantoic fluid. In virus titration, antibiotics were added so as to contain 2500 units of penicillin and 2.5mg. of streptomycin per ml. of the inoculum.

Serum Samples—Individual blood samples were taken aseptically from each bird by venipuncture in 3.0-5.0 ml. amounts and allowed to clot at room temperature. After retraction of the clot, the blood samples were held overnight in refrigerator for further retraction. The serum was then removed and inactivated by heating at 56°C. for 30 minutes. Aseptic techniques were employed throughout the proceses.

Hemagglutination-Inhibition Test (HI)—The HI test was performed by the beta procedure in the same manner as outlined by Cunningham(8) with the exception that serum-virus mixtures were inculated for thirty minutes at room temperature before addition of red blood cells. The same B_1 strain of NDV was used in the HI test.

Procedure—Of three groups of chickens, one group was selected at random as a test group and each bird of the test group was subjected to bursectomy at 3 weeks of age. One week after bursectomy, the test group consiting of bursectomized chickens and the other two control groups of chickens were inoculated intranasally with the B_1 strain of NDV.

To each nostril one drop (approximately 0.02 ml.) of the virus-infeced allantoic fluid was dropped from a needle (22 gauge) attached to the 1.0 ml. syringe, and the chickens were allowed to aspirate it. Extreme precaution was paid in order to minimize the quantitative variation in inoculating birds. The three groups of chickens were then kept under the same conditions throughout the experiment.

Individual serum samples were taken three weeks after inoculation with the virus and tested for the HI antibody titers against the B_1 strain of NDV(8).

Tests of significance were made using Student's "t" test (10,11).

EXPERIMENTAL RESULTS

The antibody titers as determined by the HI test against the B_1 strain of NDV of the three groups of chickens were shown in Table 1.

As shown in Table 2, there was no statistically significant difference in the antibody titers between the bursectomized chickens and the control chickens ($P>0.1$).

Table 1. Antibody Titers of Normal and Bursectomized Chickens Following Inoculation with the B_1 Strain of NDV.

Serum titers* (HI test)		
Group I**	Group II***	Group III***
2	4	2
2	8	4
4	16	8
4	16	16
8	16	16
16	16	16
16	16	16
16	16	16
16	32	32
16	32	32
16	32	32
32	32	32
32	32	32
32	32	32
32	32	32
32	32	32
64	64	64
64	128	64

* Reciprocal of the highest dilution of the serum

** Test group

*** Control groups

Table 2. Statistical Analysis for Evaluating the Difference in the Serum Titers for the Groups

Group	Mean**Titer	S.D.*	Comparing	Prpbability
I	3.89	±1.53	I vs. II	0.2>P>0.1
II	4.56	±1.10	II vs. III	0.5>P>0.4
III	4.33	±1.28	III vs. I	0.5>P>0.4

* Standard deviation

** The serum titers were transformed into logarithm($\log_2$).

DISCUSSION

There was no evidence in this study suggesting that the bursa of Fabricius plays a significant role in the antibody formation in young chickens in response to the intranasal inoculation of B_1 strain of NDV. The results are in contrast to those of other workers(1-5), who reported that the bursa of Fabricius had a significant role in young chickens in the formation of antibodies to S. typhimurium antigen and sheep erythrocytes. Perhaps there are differences between the type of antigens employed and the route of inoculation. In their studies, two antigenic substances, S. typhimurium and sheep erythrocytes, both cellular in nature, were employed either intramuscularly or intravenously. Smith et al. (12) point out that the proportional participation of antibody producing organs, such as spleen, lymph nodes and thymus, depends upon the route of administration of antigens. Further work is certainly indicated to explore the possibility as to whether the participation of the bursa of Fabricius in the antibody formation depends upon the nature of antigen, the route of inoculation of antigen or both.

SUMMARY

Chickens of Leghorn breed were bursectomized at 3 weeks of age and inoculated intranasally at 4 weeks of age with the B_1 strain of NDV.

There was no statistically significant difference($P>0.1$) in the serum titers (HI test) between the bursectomized chickens and the control chickens.

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抄 錄

Newcastle Virus (B_1 Strain)에 對한 抗體形成에 미치는 닭의 Fabricius' Bursa의 影響

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Chang et al. 및 Glick 등은 어린 닭에있어 Fabricius' Bursa가 免疫抗體形成에 影響를 미치는것을 觀察報告한바있다. 卽 S.typhimurium antigen 또는 羊赤血球를 注射하였을경우 Fabricius' Bursa를 摘出한 어린 닭에 있어서는 免疫抗體形成의 減少를 보았다고 하며 또한 Bursectany를 한 닭에있어서는 S.typhimurium注射로 因한 斃死率이 보다 높았다고 한다. 이러한 Fabricius' Bursa의 影響은 孵化後 처음 몇週에있어 가장 顯著하며 닭의 成長과 더불으로 점차 減少됨을 報告하고 있다. 그러나 이들의 硏究에는 그의 本質이 같은 細胞性인 抗原만이 使用되었을 뿐만 아니라 그의 接種方法도 筋肉內 및 靜脈內의 두 方法에 限하였다. 免疫抗體를 形成하는 여러 器官組織의 抗體形成에의 比率的關與는 抗原의 本質 그의 接種方法등에 따라 다르므로 여기에 筆者들은 Virus抗原인 Newcastle Virus (B_1 strain)를 經鼻的으로 接種하였을 경우의 Fabricius' Bursa의 抗體 形成에 미치는 影響를 硏究하였다. 孵化後 3週되는 Leghorn種의 어린 닭의 Fabricius' Bursa를 摘出하고 1週目後에 Newcastle Virus (B_1 strain)를 經鼻的으로 接種하였던바 HI反應에 依한 그의 血淸力價(serum titer)는 正常Control group의 그것에 比하여 統計學的으로 意義있는 差가 없음을($P>0.1$) 보았다.