Post-vaccinal reaction for some vaccines used against Newcastle disease in Sulaimaniyah province

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Abstract

This study was conducted to investigate the safety of the most commonly used Newcastle disease vaccines in Al-Sulaimaniyah province (LaSota and Clone30). A total of 225 one-day old broiler chicks of Ross 308 breed were investigated for their maternal-derived antibody (MDA) titers by ELISA test. Subsequently, these chicks were divided randomly into 3 equal groups; (2 treatment groups, T1 group which was vaccinated by LaSota vaccine and T2 group which was vaccinated by Clone30 vaccine). and control non-vaccinated group. ELISA test was used to investigate the antibody titers against NDV in all groups on day 10 post second vaccination at 34 days of chicks age and tissue biopsies were obtained for histopathological examination from the trachea, spleen, Bursa of Fabricius and thymus to explore the tissue changes that may induced by the vaccine. Significant variation was observed in the means of antibody titers against NDV between the control and treatment groups, whereas, no significant variation was observed between the treatment groups themselves. The histopathological examination results showed that a reactive lymphocytic response was observed in both treatment groups compared to the control group. In addition, focal epithelial sloughing and mucopurulent exudates was observed in the trachea of T1 group chicks only. The result of this study showed that the NDV vaccine of clone30 is approximately of the same efficiency and more secure than LaSota vaccine.

Introduction

Newcastle disease (ND) is a highly contagious viral disease of poultry and other birds species caused by a specific virus belonging to Avian Paramyxovirus type 1 (APMV-1) serotype of genus Avulavirus, sub-family Paramyxovirinae of family Paramyxoviridae (1,2). The virus has a wide host rang, and more than (250) species of birds have been reported as susceptible to infection (8). Strains of (ND) viruses are distinguished into five serotypes (3) on the basis of clinical signs in infected chickens and other birds. These are viscerotropic velogenic Newcastle disease virus (vvNDV), neurotropic velogenic virus (nvNDV), mesogenic virus, lentogenic virus and a symptomatic enteric virus. The virulent ND viruses can replicate in a wide range of tissues and organs resulting in sever systemic infection, whereas the low virulent ND viruses can only replicate in areas with trypsin-like enzymes such as in respiratory and intestinal tracts causing transient epithelial damage which may provide a route for secondary bacterial

infection, a common post-vaccination complications (4,5,6). Vaccination of chickens against Newcastle disease is routinely practiced throughout the word (7). Ideally, vaccination against NDV would result in immunity against infection and replication of the virus, but Realistically, ND vaccination usually protects the birds from the more serious consequences of disease, but virus replication and shedding may still occur, albeit a reduced level (12,16). It should be emphasized that in no circumstances can vaccination be regarded as an alternative to good management practice, biosecurity, or good hygiene in rearing domestic poultry(13). Vaccination against ND can be performed with either live or inactivated vaccines. Live vaccines induce higher protection and have been used in poultry industry for more than 50 years. They are based on the use of Lentogenic strains, among which Hitchner B1 and LaSota are the most popular (8). The efficiency of a live vaccine depends on its potency to multiply enough within the

chicken to induce a satisfactory immune response (9). Lentogenic strains can be used only in birds with low level of or no maternal antibodies, but not in areas where ND is caused by virulent strains and is endemic. Chicks with higher level of maternal antibodies vaccinated by the respiratory route while in the hatchery, or in the first four days of life do not respond by specific antibodies production but are still protected because of the local immunity developed, and secondary vaccination is required (11). Researchers observed that vaccination with the LaSota strain of Newcastle disease virus intranasally can induce tracheal lesions, dilation of the

tracheal surface, hypertrophy of goblet cells, their rupture and formation of excess mucus. These lesions are detrimental to epithelial integrity and function as a barrier against invading microorganisms, that might explain at the ultrastructural level the secondary complications of vaccination with LaSota strain against Newcastle disease virus (36, 38). The objective of the present study was to investigate the post-vaccinal pathological changes of different vaccine strains and routes against Newcastle disease virus (NDV) to be sure of the most safety one to be used in some poultry farms in Sulaimaniyah province\ Iraqi Kurdistan region.

Materials and Methods

Vaccines:

Commercial vials of live attenuated vaccines (Lyophilized) were bought from Regional Agency of Ceva company (France) and Intervet company (Holland) as follows:

- 1- Ceva New L® (NDV LaSota strain/ Lentogenic. Lyophilized vial of 1000 dose).
- 2- Clone VAC-30 ® (NDV Clone30 strain/ Lentogenic. Lyophilized vial of 1000 dose).

Experimental Design:

A total of 225 one-day old broiler chicks of Ross 308 breed were received from Lao-Lao hatchery\ Sulaimaniyah \ Kurdistan region \Iraq. The chicks were reared for 42 days (January, 6th- February, 17th, 2010) on floor under similar healthy environmental circumstances. The feed was formulated as balanced ration according to National Research Center (NRC) recommendations (14). The chicks were randomly divided into 3 groups (C=control group, T1=first treatment group, T2=second treatment group) of 75 chicks. The chicks in each group were further divided into 3 sub groups of 25 chicks. Chicks of control group (C group) were kept unvaccinated, whereas chicks of treatment group T1 and chicks of treatment group T2 were vaccinated on 13, 24 day old as follows:

1- Chicks of treatment group T1 were vaccinated with 0.1ml /chick (one vaccine dose) of NDV LaSota strain via drinking water, Eye-drop and Naso-drop.

2- Chicks of treatment group T2 were vaccinated with 0.1ml /chick (one vaccine dose) of NDV Clone30 strain via eye-drop and naso-drop.

Serological Examinations:

Blood samples were collected for measurement of Maternal-Derived Antibodies (MDA) by indirect Enzyme Linked Immunosorbent Assay (ELISA) (17) on 3rd, 7th and 12th days of chick's age (prior to vaccination). Other blood samples were collected for measurement of Vaccine-Derived Antibodies on day 10 post first vaccination and on days 7 and 10 post second vaccination.

Histopathological Examinations:

Tissue samples (Trachea, Spleen, Thymus and Bursa of Fabricius) were obtained from chicks of all groups for histopathological examination on days 3, 5 and 10 post first vaccination. In addition, tissue samples were obtained on days 4 and 10 post second vaccination. The obtained samples were processed for routine histo-technique and staining according to Luna (15).

Statistical Analysis

The data were collected and processed using Statistical Analysis System (SAS.1988) (37).

Results

Maternal and vaccinal – derived antibodies titers

The measurement of maternal-derived antibodies (as indicated by ELISA test) showed a marked decline of antibodies on day 12 of chicks age (Table, 1). On the other hand, the measurement of vaccinal-derived antibodies titers showed a

significant variation ($P < 0.05$) between control and treatment groups at 10 days post second vaccination (34 days of age). In addition, the antibodies titer was non-significantly ($P < 0.05$) higher in treatment group T1 than in treatment group T2 (Table. 2).

Table 1. Means of maternal-derived antibody titer (MDA) against ND virus in experimental chicks as measured by ELISA test.

Age (days)	Means $\pm$ SE of maternal-derived antibody titer
3	6823 $\pm$ 924.72
7	5789 $\pm$ 744.13
12	1589 $\pm$ 279.26

Table 2. Means of antibody titer against ND virus on 10 days post second vaccination (at day 34 of chicks age) as measured by ELISA test in chicks of all groups.

Groups	Means $\pm$ SE of antibody titer
Control	0.0 $\pm$ 717.22 ^a
Treatment T1	8097 $\pm$ 717.22 ^b
Treatment T2	7250 $\pm$ 717.22 ^b

Within a row, the titers of antibodies that do not have common small letter superscripts vary from each other ($P < 0.05$).

Clinical and histopathological findings

No signs of illness were observed on the control and treated chicks during the days that followed the first vaccination, whereas moderate respiratory signs represented by sneezing and coughing were observed only on chicks of treatment group T1 during the first few days after the second vaccination. The result of histopathological examination which was performed on days 3-5 and 10 post first vaccination and on days 4 and 10 post second vaccination showed no significant lesions in chicks of

the control group in comparison to some pathological changes in chicks of treatment groups T1 and T2 represented by focal epithelial sloughing and mucopurulent exudates in the trachea associated with blood vessels congestion and infiltration of mononuclear inflammatory cells (Figure.1 and 2) in chicks of treatment groups T1 and marked lymphocytic hyperplasia in the spleen (Figure 3 and 4), bursa of fabricius (Figure 5 and 6) and thymus (Figure 7 and 8) in chicks of both treatment groups.

Figure 1: Microscopic view of a tissue section obtained from the trachea of a chick in treatment group T1. It shows mucopurulent exudate (black thin arrow) in the tracheal lumen and focal epithelial sloughing (red thick arrows). Blood vessels congestion and infiltration with few numbers of mononuclear inflammatory cells are also apparent in the mucosal and submucosal layers, X100.

Figure 2: Higher microscopic view of the tissue section illustrated in figure 1. Mucopurulent exudate (black thin arrow) is apparent in the tracheal lumen associated with focal epithelial sloughing (red thick arrows). Blood vessels congestion and infiltration with few numbers of mononuclear inflammatory cells are also evident in the mucosal and submucosal layers, X200.

Figure 3: Microscopic view of a tissue section obtained from the spleen of a chick in the treatment group T2. It shows reactive follicular hyperplasia (red thick arrows) in the white pulp associated with blood vessels congestion and slight lymphocytic proliferation (black thin arrows) in the red pulp, X100.

Figure 4: Higher microscopic view of the tissue section illustrated in figure 3. Reactive follicular hyperplasia (red thick arrows) is apparent in the white pulp associated with blood vessels congestion and slight lymphocytic proliferation (black thin arrow) in the red pulp, X200.

Figure 5: Microscopic view of a tissue section obtained from the Bursa of Fabricius of a chick in the treatment group T1. It shows cortical lymphocytic hyperplasia (red thick arrows) and infiltration with heterophils at the periphery of the cortex in some of the bursal follicles (black thin arrows), X100.

Figure 6: Higher microscopic view of the tissue section illustrated in figure 5. Lymphocytic hyperplasia is apparent in the follicular cortex (red thick arrows) accompanied by infiltration with heterophils at the periphery of the cortex in some of the bursal follicles (black thin arrows), X200.

Figure 7: Microscopic view of a tissue section obtained from the thymus of a chick in treatment group T2. It shows cortical (red thick arrow) and medullary (black thin arrow) lymphocytic hyperplasia, X100.

Figure 8: Higher microscopic view of the tissue section illustrated in figure 7. Lymphocytic hyperplasia is apparent in the cortex (red thick arrow) and medulla (black thin arrow) of the thymic lobule, X200.

Discussion

The decline in maternal-derived antibodies that was observed on day 12 of chick age indicates that the titer of this type of immunity against NDV persists through the first two weeks of chicks age. This

finding is compatible with those reported by (18, 19, 20, 21, 22, 23, 24, 25, 26). On day 10 post second vaccination (day 34 of chicks age), a significant variation was observed in antibody titers against NDV

between the control and treatment groups. This result which is in agreement with finding of (19, 30) indicates that a protective humeral immune response was induced in both treatment groups by the NDV strain vaccine in comparison with the control group. Regarding the treatment groups themselves, a non- significant rise in antibodies titer was observed in treatment group T1 compared to treatment group T2. This finding is in agreement with (27, 28) who mentioned that NDV vaccine of LaSota strain induce superior immunity than the other lentogenic strain, however, in this study this superiority was observed but it was non-significant, this non-significance variation might be due the dose and the route used in vaccination which play an important role in the level of the induced immunity (28, 29, 31, 32). The moderate respiratory signs (sneezing and coughing) observed on chicks of treatment group T1 during the first few days after the second vaccination dose are probably attributed to the pathogenic nature of the vaccine (LaSota) used for immunization of this group as indicated by the epithelial

sloughing, and the mucopurulent exudates observed in the trachea of chicks of this group. This result is in agreement with finding of (3, 33, 34) who mentioned that NDV vaccine of LaSota strain is more pathogenic than other lentogenic vaccines. The marked lymphocytic hyperplasia that observed in the spleen, bursa of fabricius and thymus in both treatment groups is in agreement with findings of (10, 33, 34, 35, 36, 38) and it can be ascribed to the immune response that induced by the vaccines. The result of this study showed that the NDV vaccine of Clone30 is approximately of the same efficiency as the LaSota vaccine as indicated by the non-significant variation observed in antibodies titer and the marked lymphocytic response observed on spleen, bursa of fabricius and thymus in both groups. In addition, the NDV vaccine of clone30 appeared to be more secure than NDV vaccine of LaSota strain as indicated by the moderate clinical respiratory signs that were observed in treatment group T1 chicks which showed focal epithelial sloughing and mucopurulent exudates in their tracheas.

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تغيرات ما بعد التلقيح لبعض اللقاحات المستخدمة ضد مرض النيوكاسل في محافظة السليمانية

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الخلاصة

أجريت هذه الدراسة للتحقق من أمانة وسلامة أكثر اللقاحات استخداماً ضد مرض النيوكاسل في محافظة السليمانية (لاسوتا و كلون 30).أستخدم 225 فرخ دجاج لحم بعمر يوم واحد سلالة روص 308. وتم قياس معيار الأضداد للمناعة الأمية للأفراخ ضد مرض النيوكاسل باستخدام فحص الأليزا. قسمت الأفراخ بشكل عشوائي الى ثلاثة مجاميع متساوية: مجموعة المعالجة الأولى 1 (لقحت بلقاح لاسوتا) . ومجموعة المعالجة الثانية 2 (لقحت بلقاح كلون 30) ومجموعة السيطرة (غير ملقحة) .أستخدم فحص الأليزا أيضاً لقياس معيار الأضداد ضد مرض النيوكاسل للمجموعات الثلاثة في اليوم 10 بعد التلقيح الثاني بعمر 34 يوم . أخذت نماذج نسجية من القصبة الهوائية و الطحال وغدة فابريشيا وغدة التوتة لغرض الفحص النسجي لمعرفة التغيرات المرضية النسيجية الناتجة عن اللقاح. لوحظ فرق معنوي في معدل معيار الأضداد ضد مرض النيوكاسل بين مجموعة السيطرة ومجموعتا المعالجة. في حين لم يلاحظ أي فرق معنوي بين مجموعتا المعالجة ذاتهما. أظهر الفحص النسجي وجود إستجابة فعالة للخلايا للمفاوية في مجموعتي المعالجة مقارنة مع مجموعة السيطرة. فضلاً عن إنسلاخ بؤري للخلايا الظهارية ونضح مخاطي قيحي في القصبة الهوائية في أفراخ مجموعة المعالجة الأولى. أوضحت لنا هذه الدراسة أن لقاح كلون 30 له تقريبا كفاءة لقاح لاسوتا نفسها و أكثر أماناً منه.