

Detection of the Immune Response in Broiler Breeders, and Their progeny to Newcastle Disease Vaccine.

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Summary

This trail was suggested to evaluate the amount of inherited haemagglutination inhibition (HI) antibodies for Newcastle Disease (ND) from hens to their own progeny via yolk, blood samples were collected from broiler breeders at 51st week of age aiming the collection their sera, these hens were previously vaccinated with ND-killed vaccine at the age 5 and 120 days respectively via subcutaneous route; and ND-alive vaccine at 1 and 18 days then monthly intervals by aerosol, random samples of eggs were collected from panels or hatchery machines either after 24h., to detect amount and location of HI antibodies through them, day old chicks were submitted to the same protocol of blood collection as well as mothers. The results showed that the combination manner of vaccines is an ideal way of HI antibodies peak elevation, these antibodies can pass vertically from dam to progeny through yolk, and the yolk material can be used to detect the HI antibody titer by routine process.

Keys word: immune response, broiler, Newcastle, vaccine.

تحديد الاستجابة المناعية للأمهات وأفراخ دجاج اللحم للتلقيح بلقاح مرض نيوكاسل

عادل صبر عكار

قسم التحليلات المرضية المعهد التقني الكوت-هيئة التعليم الفني

الخلاصة

أجريت هذه التجربة لمعرفة مقدار الأضداد المناعية المثبّطة لتلازن خلايا الدم الحمر لمرض نيوكاسل المورثة من أمهات أفراخ دجاج اللحم لأنسالها خلال صفار البيض, تم اخذ عينات دم من أمهات دجاج لحم بعمر 51 اسبوعاً (ملقحة بلقاح مرض نيوكاسل الحي^(†)) بعمر يوم واحد وعمر 18 يوم ثم على فترات متساوية يفصل بينها شهرٌ كاملٌ وملقحة بلقاح مرض نيوكاسل الزيتي^(†) عند عمر 5 ايام وعمر 120 يوماً) بغية استحصال أمصالها, واخذت عينات بيض عشوائياً من المداجن وبيض بعد إدخاله إلى المفقس لمدة 24 ساعة لتحديد كمية ونوعية الأضداد المناعية لمرض نيوكاسل, ثم أخذت عينات دم من الأفراخ الفاقسة حديثاً بنية جمع أمصالها. اجري اختبار اثباط تلازن خلايا الدم الحمر لعينات المصل المحصل من عينات دماء الأمهات وانسالها, وكذلك ايضا لصفار البيض عند المرحلتين اعلاه. أظهرت النتائج ان طريقة التلقيح باللقاح الحي متبوعاً باللقاح الزيتي هي الطريقة الانسب لاعطاء اعلى معيار للاضداد المثبّطة لتلازن خلايا الدم الحمر مع إمكانية توريث هذه الأضداد من الأمهات إلى الأفراخ وان هذه الأضداد يكون مكانها خلال فترة الحضان هو كيس المح وان محتويات كيس المح يمكن ان تستخدم للتقصي عن الاضداد المثبّطة لتلازن خلايا الدم الحمر بالطريقة التقليدية.

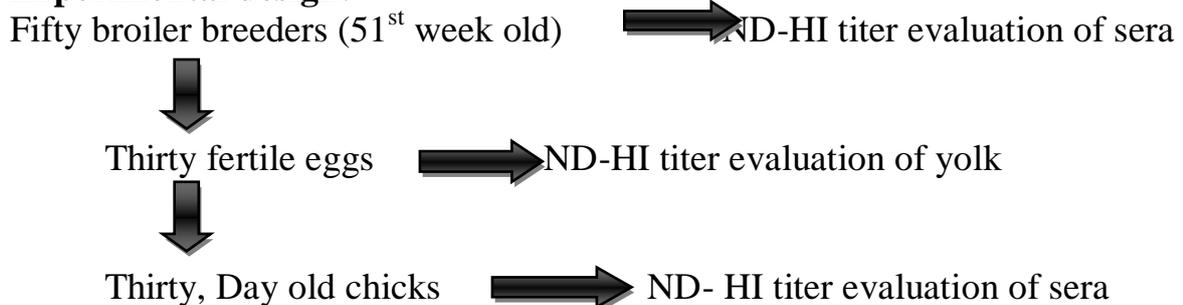
Introduction

Newcastle disease (ND) is a viral disease of wild and captive birds with high morbidity and mortality [1], this disease is caused by a non-segmented, negative-sense, single-stranded RNA virus called paramyxovirus which is a member of the genus *Rubulavirus* in the family *Paramyxoviridae* [2]. Newcastle disease virus (NDV) is synonymous with avian paramyxovirus 1 (APMV-1), while pigeon paramyxovirus 1 (PPMV-1) is a variant of NDV but the pathogenesis and pathogenicity in both chicken and pigeon is the same, now a days, this virus has had got several variants (APMV-1 to -9) [3]. In nature ND virus is with different virulence, highly virulent ones cause the serious outbreaks and called (velogenic) or (Exotic Newcastle Disease-END), other are intermediate called (mesogenic), and the rest are non-pathogenic called (lentogenic) [4]. The virus stimulates host body to produce two types of antibodies after natural infection or vaccination; these are virus neutralizing (VN) and haemagglutination inhibition (HI) antibodies [5]. ND seems to be endemic in Iraq [6], ND outbreaks often occur once or twice a year at regular intervals affirming the endemicity of the virus [7]. Many species of birds showed sufficient antigen divergence that it could be compartmentalised, more or less as a different virus [8]. Unlike chickens and turkeys, pigeons, sparrows, and pet birds may infect at faecal-oral route other than respiratory route due to unclosed bird-to-bird association exist [9]. With less severe clinical signs and lower mortality rate [10].

Natural protective inherited antibodies or passive immunity may play critical role in progeny protection [11], in more recent studies [12 and 13] IgY* is sequestered across the follicular epithelium of the ovary into the yolk by a receptor-mediated transfer involving specific sequences found on IgY but not on IgM or IgA isotypes. The amount of transferred IgY is correlated with the amount of IgY present in the maternal circulation [11], in the embryonated eggs IgY is found in the yolk throughout the incubation period [12], but reach in higher concentration at 6-8 days after incubation, and continues to be transferred for at least 48h after hatching, so peak level of maternally-derived antibodies are not necessarily at 1 day of age [13].

Materials and methods

Experimental design:



(*): In avian species, IgG is called IgY.

- Broiler breeders: random, fifty broiler breeders' hens were submitted to the test, they were fifty one weeks old, the blood samples were collected from jugular vein by using sterile syringes with needles; then the blood samples put in sterile test tubes in slant position over night at room temperature to obtain the sera [14]. The sera obtained put in sterile containers with screw caps at freezing temperature (-20°C) till time of test.
- Eggs: random thirty fertile and embryonated eggs were used to collect yolk material by using sterile and disposable syringes with needles, the yolk materials placed in sterile containers with screw caps, then the samples submitted directly to HI-test.
- Chicks: thirty, day old chicks were selected randomly from the hatchery machine, those chicks were euthanized to collect their sera as same protocol as mentioned in broiler breeders (*see above*).

Statistical analysis: all data had been submitted to F-test for comparison between different quantitative values, and *Chi* square-test for qualitative values, this procedure was followed by application of space of confidences for all trails at 99% to detect the lesser differences between groups at ($p > 0.01$) [15].

Results

HI results:

- HI titer of the hens: the titer of hens is markedly elevated, and this elevation was significantly overcomes the titer of all the rest; peak elevation in immunity of these hens showed in figure 1.
- HI titer of the yolk: The results of this test showed that there were differences in data of tested yolk of eggs from panels and hatchery machines at two periods; but with no significant differences between these two groups (*see table 1*).
- HI titer of chicks: chicks at day old gave a relatively high amount of HI antibodies (table 1); the antibody titer was with significant difference higher than HI antibody titer of the egg yolk at any, and with significant difference lower than HI titer of hens (*see figure 1*).

Table 1: HI-titers at different periods of age:

No.	Group	Mean	SE
1	HI-titer of the hens	96.6 a*	± 21.109
2	HI-titer of the yolk/panels	17.9 c	± 2.43
3	HI-titer of the yolk/hatchery machine	15.8 c	± 2.678
4	HI-titer of the chicks	22.4 b	± 4.066

(*): Different letters refer to significant differences.

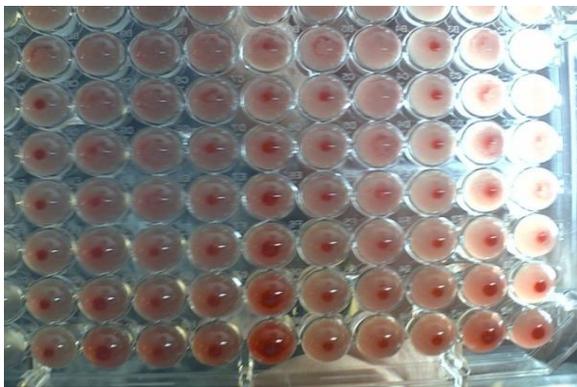
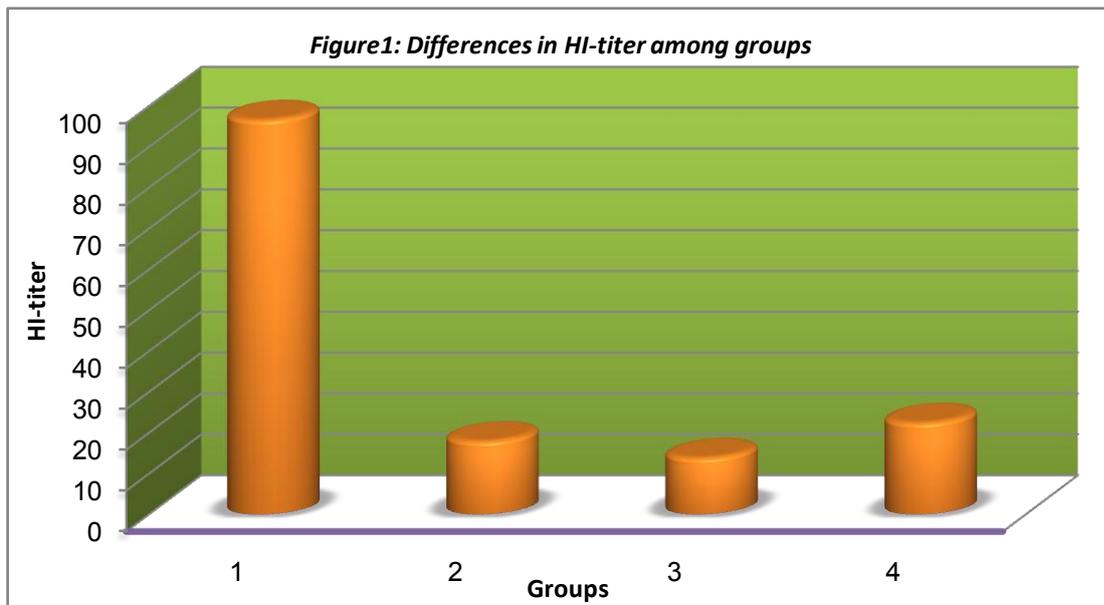


Figure 2: HI test of the yolk material (inferior view)

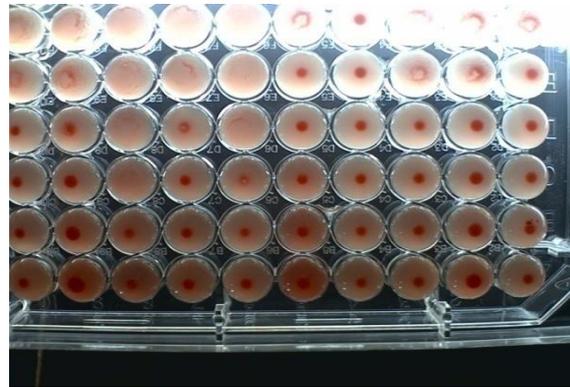


Figure 3: HI test of the serum (inferior view)

Discussion

Newcastle disease is a serious disease of wild, captive, and domesticated birds in all over the world [6], it may cause huge commercial losses in poultry industry due to high mortality, cost of vaccines, cost of vaccines application crews, cost of weight gain loss, and secondary complications in survival birds [5], although ND vaccination programs may protect as high as 96% of poultry population [7], it still an additional fee need to be paid; thus, the high protective vaccination program, the lower cost application is emerged [2]. In the other hand maternal antibodies (as passive immunity) may protect the new generation till the end of the first three weeks of age [11]; these antibodies may complicate with acquired antibodies (active immunity) [7]. Nevertheless, these maternal antibodies are not confined to yolk or yolk sac, the yolk is chief place of their higher concentration, and all scattered antibodies in egg white are with lower value in protection [13]. No practical tool yet in use to evaluate antibodies in yolk, so, the central idea was to use the HI test for this purpose. HI titer was high in all samples of dams, and their progeny, agreed with [11], due to the vaccination program applied, this met with [7]. The results showed that the amount of HI titer in eggs was significantly lower than newly hatched chicks;

this may refer to scattered antibodies in the egg white rather than those in the yolk [8]; or that there are some maternal antibodies begin to migrate from yolk material to embryo through umbilical cord, or being introduced into the oropharyngeal route (the non-significant lowering in HI titer between the two groups of yolk test) [13].

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