SUSCEPTIBILITY OF QUAILS TO FOWL AND PIGEON POX VIRUS INFECTION

By
Manal Awad and Khodier, M.H.
Veterinary Serum and Vaccine Research Institute, Abbasia, Cairo

SUMMARY

An experimental infection with fowl pox virus was carried out to groups of susceptible quails and chickens. It was found that quails were resistant to fowl pox virus showing no signs of pox lesions while infected chicken showed the characteristic fowl pox lesions. On the other hand, experimental infection of quails and pigeons with the virulent pigeon pox virus induced specific lesions of pigeon pox in both of them. Vaccination of quails and pigeons with pigeon pox vaccine induced similar levels of cellular and humoral immune responses in both birds as measured by serum neutralization test (SNT) in embryonated chicken eggs and lymphocyte blastogenesis assay. So, it could be concluded that quails are susceptible to pigeon pox virus (PPV) infection and must be vaccinated with the specific vaccine.

INTRODUCTION

As world's population is rapidly increasing, there is a severe demand of food especially animal protein. Nowadays, quail's protein has been efficiently increasing the animal protein resources in the world *(Ebeid, 1992).* Beside commercial production, quails have an outstanding potential for village and backyard production, which increase their susceptibility with endemic diseases. There are some common viral disease problems, which threaten the quail production. One of these problems is the avian pox infection which could be transmitted through the contact between quails and other birds as poultry and pigeons *(Ibrahim, 1983, Poonacha and Wilson, 1981, Reed et al., 1985).*

As a golden goal of the present study, it was of interest to the susceptibility of quails to fowl and pigeon pox infections as a step to detect the most suitable vaccine for such birds to combat this serious disease, through the evaluation of their immune response to fowl and pigeon pox vaccines.

MATERIALS AND METHODS

1. Birds:

1.1. Quails:

Forty five susceptible quails, 45 days old, were used to investigate their susceptibility to some avian pox viruses, and evaluate their immune response to fowl and pigeon pox vaccination.

1.2. Chickens:

Ten susceptible chickens were used as control for testing of susceptibility of quails to fowl pox virus and the probability of virus transmission.

1.3. Squabs:

Ten susceptible squabs were used as control in the test of quail susceptibility to pigeon pox virus and virus transmission between them. All birds were screened and found to be free from pox virus antibodies using SNT.

2. Embryonated chicken eggs:

Embryonated chicken eggs 9-11 day old were used for serum neutralization test (SNT).

3. Viruses:

3.1. Fowl pox virus:

A virulent isolate of fowl pox virus having a titre of $10^{7.5}$ EID_{50}/ml, obtained from Pox Vaccine Research Department, Veterinary Serum and Vaccine Research Institute (VSVRI), Abbasia, Cairo, was used for testing quail susceptibility.

3.2. Pigeon pox virus:

A virulent local isolate of pigeon pox virus having a titre of $10^{7.2}$ EID_{50}/ml obtained from Pox Vaccine Research Department, VSVRI, was used for testing quail susceptibility and challenge.

4. Pigeon pox vaccine:

Attenuated egg adapted Hungarian strain of pigeon pox vaccine was obtained from Pox Vaccine Research Department, VSVRI, Abbasia, Cairo, with a titre $10^{7.4}$ EID_{50}/ml was used for testing quail susceptibility.

5. Samples:

Blood and serum samples were collected at different intervals from vaccinated quails for detection of the cellular and humoral immune responses.

6. Chemical and biological reagents:

Heparin (Nile Co., Egypt), fetal calf serum (FCS), Roswer Park Memorial Institute medium (RMPI), ficol hypoque medium, phytahaemagglutinin (PHA), MTT (3-(4,5 dimethyl thiazol-2YL) 2,5 diphenyl tetrazolium bromide), sodium dodecyl sulphate (SDS), trypan blue stain and 96 well tissue culture plates were used for lymphocyte transformation assay. These reagents were obtained from Sigma Chemical Co., USA.

7. Testing the susceptibility of quails to experimental infection with fowl pox and pigeon pox viruses:

Twenty susceptible quails were divided into 2 groups (10 quails/group). The first group was infected with fowl pox virus by wing web (w.w) method according to *Seeliger and Price (1956)*. In addition, 10 susceptible chicken were infected with the same virus as susceptible controls. The second quail group was infected with virulent pigeon pox virus by feather follicle (FF) method according to *Tripathy and Reed (1997)*. Ten susceptible squabs were infected with the same virus as susceptible controls. Observation of the lesions on all bird groups were recorded.

RESULTS AND DISCUSSION

Over the past three decades, a considerable interest in commercial quail farming has risen in many parts of the world. In developing countries, quail farming offers a viable and practical solution to the problem of animal protein shortage.

Pox infection in quails is one of the most important problems affecting the quail rearing industry, specially when avian pox infection is considered endemic in Egypt, this increases the infectivity of quail, as for other birds, to this common infection *(Crawford, 1986 and Davidson et al., 1980)*. This study overviewed the probability of quails to attack avian pox infection (either fowl or pigeon pox).

Testing the susceptibility of quails and chickens to experimental infection with virulent fowl pox virus showed that quails not infected with fowl pox virus while chickens showed severe pox lesions.

On the other side quails and pigeons exposed to infection with pigeon pox virus, the observations revealed that both quails and pigeons showed the cutanuous form of pox as shown in Photo (1). The lesions began as local small white foci and then became rapidly increased and yellowish in cold. Papules are appeared on the 5th day post infection followed by the vesicular stage and scab which lasted for 1-2 weeks. These findings agree with those described by *Tripathy and Reed (1997)*.

As a result of studying the infectivity of pox virus to quails, it was necessary to test immune response of quails to its specific vaccine. So, susceptible quails were vaccinated with pigeon pox virus, and challenged with virulent pigeon pox virus. The results represented in table (1) revealed that pigeon pox vaccine protected all the vaccinated quails while the unvaccinated controls showed signs of pox infection.

Monitoring the immune response of the vaccinated birds, cellular immune responses are detected earlier than humoral responses *(Tripathy and Schnitzlein, 1999);* it was of great importance to follow the cellular immune responses during the first few days after vaccination using lymphocyte blastogenesis, as expressed in table (2).

The humoral immune response was estimated by serum neutralization test applied on serum samples collected weekly post vaccination in embryonated chicken eggs. The results were screened in table (3).
N.B. Neutralizing index is considered positive when it is > 1.5 *(Cottral, 1978).*

From table (3) the results indicated that pigeon pox antibody level induced in vaccinated quails represented the same immune response that induced in vaccinated pigeons, where the antibody level increased to be protective between the 2nd to the 4th week post vaccination which agreement with *Tripathy and Reed (1997).*

From the obtained results, it can be concluded that quails should be completely protected by vaccination with pigeon pox vaccine. On the other hand, this vaccination could help in mass production of quails until further studies for preparation of specific quails pox vaccine in Egypt.

REFERENCES

Boutler, E.A. (1957): The titration of vaccinal neutralizing antibody on chorio-allantoic membrane. J. Hyg., 55: 502-512.

Cottral, G.E. (1978): Pox Viruses. In Manual of Standardized Methods for Veterinary Microbiology, ed. G.E. Cottral, Cornell University Press (Ithaca and London), p. 273-291.

Crawford, J.A. (1986): Differential prevalence of avian pox in adult and immature California quail. J. Wild Dis., 22: 564-566.

Davidson, W.R.; Kellogg, F.E. and Doster, G.L. (1980): An epornitic of avian pox in wild bob white quail. J. Wild J. Dis., Apr, 16 (2): 293-298.

Ebeid, S.K. (1992): The role of quails in transmitting some zoonotic bacterial diseases to man. M.V.Sc. Thesis, Fac. Vet. Med., Alex. Univ.

Ibrahim, M.A. (1983): The use of irradiation in the preparation of combined inactivated fowl cholera and Newcastle disease vaccine with the use of quails in the conducted experiment. M.V.Sc. Thesis, Fac. Vet. Med., Zagazig Univ.

Mayer, S.P.; Ritts, G.d. and Johnson, D.R. (1974): Phytohaemagglutinin induced leukocyte blastogenesis in normal and avian leucosis virus infected in chicken. Cellular Immunol. 27 (1): 140-146.

Mosmann, T. (1983): Rapid calorimetric assay for cellular growth and cytotoxicity assays. J. Immunol. Methods, 65-55.

Poonacha, K.B. and Wilson, M. (1981): Avian pox in pen-raised bob white quail. J. Am. Vet. Med. Assoc., 11: 1264-1265.

Reed, W.M.; Dhillon, A.S. and Winterfield, R.W. (1985): Avian pox outbreak in two flocks of bob white quail. Proc. 32nd North Central Avian Dis. Conf.

Seeliger, K.C. and Price, R.J. (1956): Evaluation of immunity to fowl pox. 1. Immunization of young chicks with pigeon and fowl pox vaccines. Poult. Sci., 35: 372.

Tripathy, D.N. and Reed, W.M. (1997): Diseases of Poultry: Pox, 24: 643-659.

Tripathy, D.N. and Schnitzlein, W.M. (1999): Encyclopedia. Fowl pox virus (poxviridae), pp. 576-582.

Photo (1): Pox lesions on quails infected with virulent pigeon pox virus

Table (1): Vaccination of quails with pigeon pox vaccine and challenged with virulent pigeon pox virus

Bird statement	Number	Challenge results		Protection %
		Positive	Negative	
Vaccinated	10	0	10	100 %
Control	5	5	0	0 %

Table (2): Cellular immune response of quails vaccinated with pigeon pox vaccine by lymphocyte blastogenesis assay

Mean lymphocyte blastogenesis stimulation index		
Days post vaccination	Vaccinated quails	Non-vaccinated quails (controls)
0	0.208	0.210
1	0.223	0.207
3	0.382	0.213
5	0.485	0.209
7	0.507	0.210
10	0.527	0.204
12	0.495	0.206
14	0.290	0.212

Table (3): Pigeon pox virus neutralization antibodies in vaccinated quails

Weeks post vaccination	0	1	2	3	4
Mean neutralizing index	0.0	0.7	1.4	2.2	2.0

الملخص العربي

قابلية عدوى السمان بفيروس جدرى الطيور

منال عوض و محمد حسن خضير

معهد بحوث الأمصال واللقاحات البيطرية – العباسية

تم خلال هذه الدراسة إجراء عدوى تجريبية لمجموعات من السمان والدجاج بفيروس جدرى الدجاج الضارى حيث تبين أن السمان غير قابل للعدوى بهذا الفيروس حيث لم تظهر عليه أى أعراض، فى حين ظهرت الأعراض المميزة لجدرى الدجاج على الدجاج المعدى.

وعند إجراء عدوى تجريبية بفيروس جدرى الحمام الضارى لمجموعات من السمان والحمام ظهرت أعراض مميزة لجدرى الحمام فى كل من السمان والحمام الأمر الذى يدل على قابلية السمان للعدوى بفيروس جدرى الحمام.

وبتحصين مجموعة من السمان والحمام بلقاح جدرى الحمام تبين أن كلاهما يستجيب مناعياً بمستويات متقاربة كما أوضح ذلك نتائج اختبار المصل المتعادل فى البيض المخصب وبقياس المناعة الخلوية المتكونة فى الطيور المحصنة ومن ذلك يتضح أن للسمان القابلية للعدوى بجدرى الحمام ويجب تحصينه باللقاح المناسب له.