

An Outbreak of Marek's Disease in Adult Layer Chickens in Umuahia, Abia State, Nigeria

C. Okonkwo^{1*}

¹Department of Veterinary Medicine, College of Veterinary Medicine, Michael Okpara University of Agriculture, Umudike, Nigeria.

Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/ARRB/2015/18418

Editor(s):

(1) George Perry, Dean and Professor of Biology, University of Texas at San Antonio, USA.

Reviewers:

(1) Otolorin, Gbeminiyi Richard, Dept. of Veterinary Public Health and Preventive Medicine, Ahmadu Bello University, Nigeria.

(2) Saka S. Baba, Faculty of Veterinary Medicine, University of Maiduguri, Nigeria.

Complete Peer review History: <http://www.sciencedomain.org/review-history.php?iid=975&id=32&aid=9754>

Case Study

Received 20th April 2015
Accepted 27th May 2015
Published 13th June 2015

ABSTRACT

Between the months of May and August, 2014, a disease outbreak in two small poultry farms consisting of 600 and 550 Isa Brown layers both located in Umuahia, Abia state was reported to the Veterinary Teaching Hospital of Michael Okpara University of Agriculture Umudike. The two flocks, ages 31 and 41 weeks respectively, were vaccinated with MD vaccine mixed with gentamicine at day old. The clinical signs observed in the layers were paleness of the comb, emaciation, marked reduction in egg production, low morbidity and mortality rates of 4.7% and 2.3% in the first farm and 9.5% and 2.7% in the second farm. Postmortem revealed prominent neoplastic nodular lesions in their visceral organs. The histopathology of the affected organs of the birds showed highly pleomorphic lymphoid proliferation of the tissues. Based on the clinical signs, postmortem lesions and histopathology, the disease was diagnosed as acute Marek's disease.

Keywords: Marek's disease; pleomorphism; visceral organs; neoplastic; nodular lesions; lymphoid leucosis.

1. INTRODUCTION

Marek's disease (MD) is a lymphoproliferative and neuropathic disease of domestic chicken

and less commonly of turkeys and quails, caused by a highly contagious, cell associated, oncogenic herpes virus. It is characterized by the presence of T-cell lymphoma and the infiltration

*Corresponding author: E-mail: chidi707@yahoo.com;

of nerves and organs by lymphocytes [1-3]. It occurs at 3 – 4 weeks of age or older and is most common between 12 and 30 weeks of age [4]. MD is the only vaccinally controllable neoplasm in birds [5], and is the most common lymphoproliferative disease of chicken causing severe economic loss in the poultry industries of many countries [6]. Whereas [7] and [8] reported a high incidence and persistence of MD in the Northern and South-Eastern part of Nigeria respectively, [9] observed a high seroprevalence of MD in the South-western part of the country. The annual losses due to MD world over have been estimated at more than 1 billion US dollars [10,11]. The losses are due to increased mortality, depressed performance, and cost of development, production and use of vaccines for disease control [12]. Control of the disease is based on effective vaccination, good biosecurity and selection for genetic resistance, [12].

The disease has a complex pathology and manifests in a number of overlapping syndromes therefore posing a high diagnostic task.

The neoplastic manifestations of MD can resemble those of avian lymphoid leucosis (A.LL). The greatest difficulty comes in distinguishing between A.LL and forms of MD sometimes seen in adult birds in which the tumour is lymphoblastic with marked liver enlargement and absence of nerve lesions [4]. Although age of the birds, clinical signs and presentations of neoplasm are important tools in differential diagnosis, basing the diagnosis only on these parameters may be misleading [5]. On the other hand, seriological differentiation of MD and A.L.L. cannot provide definitive diagnosis since the presence of antibody to the viruses bears no relation to the development of the diseases, [1]. While gross appearance can provide indications of the nature of neoplasm, histopathological lesions are therefore essential for accurate diagnosis [4,12].

In this report, the birds presented with clinical signs, morbidity and mortality pattern and gross post-mortem lesions with the semblance of A.L.L. The histological examination of the affected tissues however led to the diagnosis of MD.

2. CASE REPORT

2.1 Materials and Methods

On the 7th of May, 2014, 3 carcasses of 31 week old Isa Brown layer were presented to the

Veterinary Teaching Hospital of Michael Okpara University of Agriculture, Umudike, Umuahia. The 600 layer capacity farm had recorded a reduction in egg production from 67% at week 28 to 55%, emaciation, loss of appetite and paleness of the comb, morbidity and mortality within the three weeks of outbreaks of 4.7% and 2.3%.

On the 8th of August 2014, another four carcasses of the same breed of layers from a different farm but of 41 weeks of age were submitted for necropsy. The farmer complained of a gradual loss of weight, loss of appetite, paleness of the comb, a morbidity and mortality of 9.5% and 2.7% in his 550 layer capacity farm. The two flocks were sourced from the same hatchery which had a history of administering mixture of Marek's disease vaccine and gentamicin to the day old chicks. The later was for the treatment of pullorum infection in the hatchery to reduce early chick mortality.

2.2 Clinical Observations

Clinical observations were made on the carcasses before necropsy.

2.3 Pathology

Gross Lesions: The birds were examined for lesions in the various visceral organs like the liver, spleen, bursa of Fabricious, lungs, ovary, kidneys, intestines and the sciatic nerves.

Histopathological lesions: The affected organs were harvested in 10% formalin for histopathological studies. Tissues from the organs were fixed in paraffin wax and thin section made out of them. The sections were glued to glass slides, stained in haematoxylin and eosin (H and E) stain and viewed for changes using light microscope.

3. RESULTS

Clinical Signs: Clinical signs observed included pale comb, emaciation, reduction in egg production and low morbidity and mortality.

Gross pathology: The severity varied from carcass to carcass but was less in the younger flock. The typical lesions are shown in Fig. 1.

Liver: The liver was markedly enlarged with prominent grayish white nodules distinctly raised above the surface. The nodules ranged

from 5 mm to 4 cm in their diameter and were firm in consistency but smooth when cut.

Spleen: The spleen was enlarged and had large grayish white nodules almost similar to the ones seen on the liver. Nodules were firm but smooth on cutting.

Lungs: The lungs which were slightly congested had soft cauliflower-like tumours on the surface. The tumour formation turned the lungs into a spherical mass that sank in water.

Ovary: The ovary had tumours which turned the immature follicles into soft pale jelly-like bubbles that gave the ovary a spherical mass. Those that were not severely affected had tiny immature follicles that appeared atretic.

Intestines: The intestinal serosa and its mesenteries had near uniform nodular tumours. The nodules were soft and had diameter of approximately 1 cm.

The kidneys were enlarged but had less involvement of the tumour growth.

The sciatic nerves and bursa of Fabricius were apparently not involved as they appeared normal.

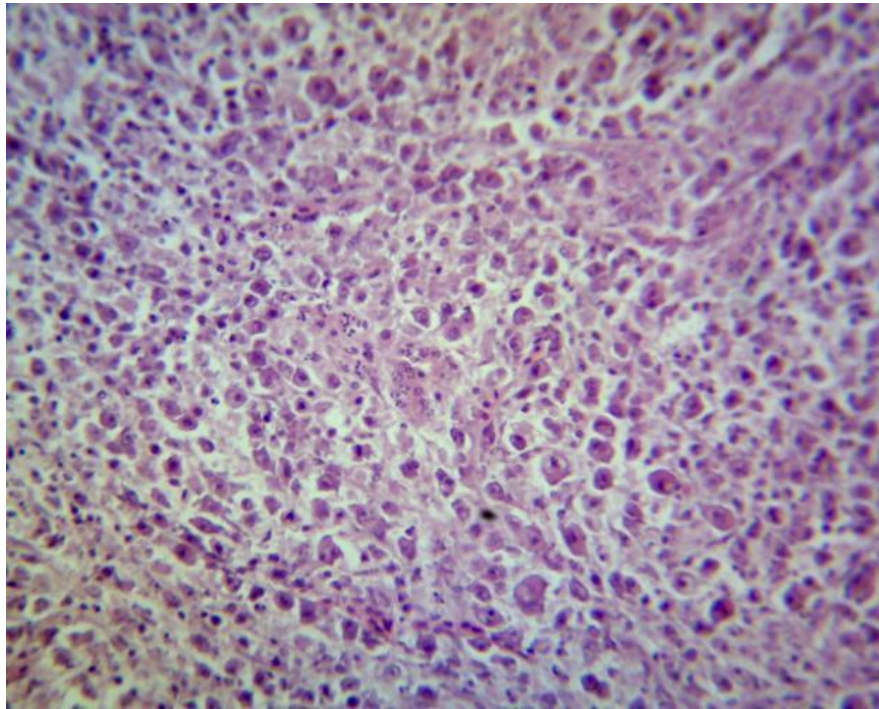
Histopathology: The microscopic lesions (Fig. 2) consisted essentially of numerous proliferating lymphoblastic cell mainly small and medium lymphocytes, plasma cells and lymphoblast. All the affected organs exhibited marked pleomorphism of the invading neoplastic cells. The normal architectures of these organs were obliterated in most cases. There was an evident hyaline degeneration of the cardiac muscle fibers and massive interstitial pneumonia and epithelization of the lungs due to the neoplastic invasion. Exudates within the alveoli spaces were obvious.

4. DIAGNOSIS

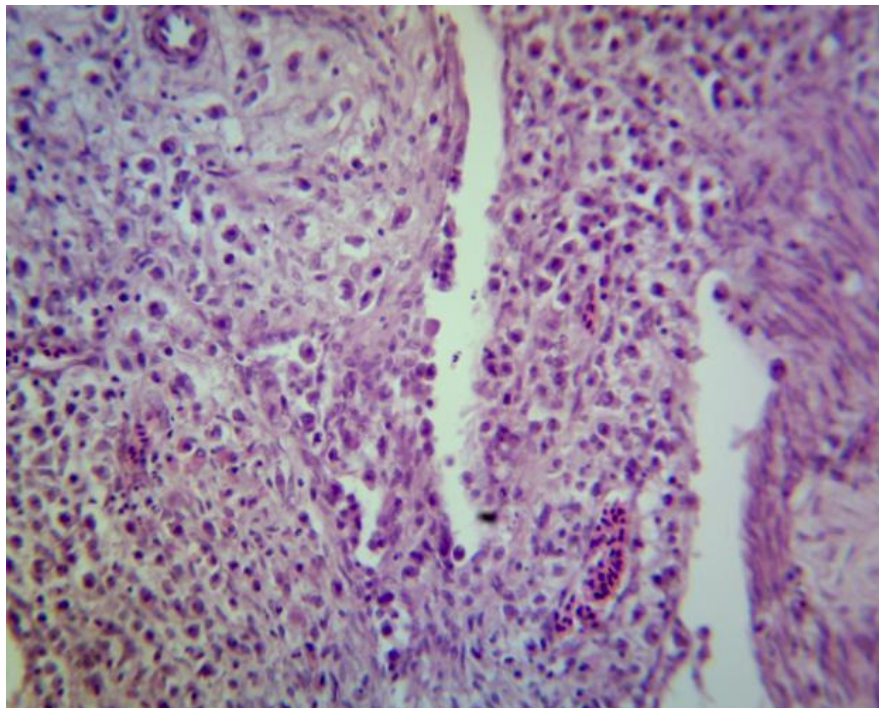
Diagnosis was made based on history, clinical signs and post-mortem lesions which included the gross and histopathology of affected organs. The clinical signs and pathological lesions were almost similar in both cases. However, the older case showed a more severe involvement.



Fig. 1. Photographs of visceral organs of affected chickens markedly affected by nodular neoplastic growth (x 0.5); (A) liver,(B) spleen, (C) lungs, (D) ovary, (E) heart



A



B

Fig. 2. Photomicrographs of H and E (x40); stained section of liver (A), and ovary (B), from the affected chickens. Note the typical pleomorphism of the numerous proliferating lymphoblastic cells and obliteration of the normal parenchyma of the organs

5. DISCUSSION

Marek's disease is a commercially important neoplastic disease of poultry responsible for serious economic losses due to both mortality and depressed performance [12]. Although MD is more of a remarkable entity presenting with clear gross lesions in most cases, the problem arises by virtue of close similarities between the gross lesions of acute MD and A.L.L. [5]. The several manifestation of MD makes the diagnoses even more demanding.

In these outbreaks, the clinical signs, and gross lesions in the visceral organs were more of features of A.L.L. The absence of either peripheral nerve involvement or paralysis would have supported this view, but according [4] nerve lesions are always absent in MD of adult birds as observed in this study. Histologically, the heterogenous populations of lymphoid cells seen in almost all the affected organs were highly suggestive and almost diagnostic of MD [13,14]. This pleomorphism of the neoplastic cells has equally been observed by [14,15] unlike what is seen in A.L.L. where according [16,17] cells show little or no pleomorphism.

The history of the MD vaccine mixed with gentamicin may explain why there were apparent vaccine failures in these farms as the gentamicin could have partially denatured the MD vaccine, an effect [18] had observed earlier on. This probably resulted in a low level of immunogenicity and partial vaccine failure hence the low morbidity and mortality observed despite the obvious signs of acute MD involvement. [19] had earlier on observed that the tumour of acute MD can be differentiated from A.L.L. by the birds in acute MD mostly being sexually immature shown by the small ovaries and testicles in affected birds, a feature that was observed in a number of the posted birds.

6. CONCLUSION

The outbreaks of MD in these farms are associated with the administration of MD vaccine partially denatured by gentamicin thus making it an undesirable practice. This probably led to a partial loss of potency rather than an outright vaccine failure. This could explain the low morbidity and mortality observed. Although the age and presenting clinical signs observed were highly suggestive of A.L.L., the histology was typically those of MD buttressing its importance

as the major diagnostic tool in differentiating it from other apparently similar neoplasms.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Biggs PM. Differential diagnosis of avian lymphoid leukosis and Marek's; Commission of the European Communities. Houghton poultr. Research station, Huntingdon, Cambs. 1976;P E 17 2DA UK.
2. Hirai K. Ed. Marek's Disease; Current topics in microbiology and immunology. Springer; Berlin; 2001.
3. Davidson F, Nair V. Eds. Marek's disease: An evolving problem. Elsevier Press, Amsterdam. The Netherlands and Boston, USA; 2004.
4. OIE Terrestrial Manual. Chapter 2. 3.13. Marek's Disease. 2010.
5. Adene DF, Akpavie SO. An overview of Marek's Disease and the options in its control: In: Poultry Health and Production, Principles and Practices (Ed) Adene DF. Stirling – Horden Pub (Nig) sLtd. Ibadan. 2004;107-127.
6. Jordan FTW, Pattison M. Leukosis/Sarcoma, 4th edition, W.B. Saunders comp. Ltd Uni. Press, Cambridge. 1998; 123-132.
7. Nawathe DR, Ojeh CR, Onunkwo, O. Incidence of Marek's disease in Northern states of Nigeria. Vet. Rec. 1978;102:128.
8. Okwor EC, Eze DC. Outbreak and persistence of Marek's disease in batches of birds reared in a poultry farm located in Nsukka, South East Nigeria. Int J. of Poultr. Sci. 2011;10(8):617-620.
9. Oni OO, Owoade AA, Seroprevalence of Marek's disease virus antibody in some poultry flocks in Southwestern Nigeria. Anim. Prod. Res. Adv. 2009;5(1).
10. Morrow C, Fehler F. Marek's disease; a worldwide problem" In Marek's Disease. An Evolving Problem, eds, Davidson F. and Nair V. London: Elsevier Acad. Press. 2004;49-61.
11. Nair V. Evolution of Marek's disease – A paradigm for incessant race between the pathogen and the host. Vet. J. 2005;170: 175-183.

12. Payne LN, Venugopal K. Neoplastic Diseases: Mareks, avian leukosis and reticuloendotheliosis. *Rev. Sci. Tech off. Int. Epiz.* 2000;19(2):544–564.
13. Calnek BW, Witter RL. Marek's diseases. In: *Diseases of Poultry*; 10th Ed (Calnek BW, Banes HJ, Beard CW, Mac Dougald LR, Saif YM, eds). IOWA State Univ. Press. Ames. 1997;369–413.
14. Randall CJ. Viral Diseases. In: *Diseases and disorders of the domestic fowl and turkey*. 2nd Ed. Mosby – Wolfe Times Mirror Intern. Pub. Ltd. Bachelona Spain. 1991;71-78.
15. Kamaldeep PC, Sharma N, Juidal, Narang G. Occurrence of Marek's disease in vaccinated poultry flocks of Haryana (India). *Intern. Journ of Poult. Sc.* 2007;6(5):372–377.
16. Fadly AM, Witter RL, Smith EJ, Silva RF, Reed WM, Hoerr FJ, Putnam MR. An outbreak of lymphomas in commercial broiler. Breeder chicken vaccinated with fowlpox vaccine contaminated with reticuloendotheliosis virus: *Avian Pathol.* 1996;25:1:35–47.
17. Fadly AM, Nair V. Leukosis / Sarcoma Groups. In: *Diseases of Poultry*; 12th Ed, Saif YM, Fadly AM, Glisson JR, McDougald LR, Nolan NK, Swayne DE, eds). Blackwell Pub. Ltd. Ames, IOWA 50014, USA. 2008;514-535.
18. Eidson CS, Page RK, Kleven SH. *In vivo* and *In vitro* studies on the effects of gentamicin sulphate on the efficacy of turkey herpes virus vaccine. *Poult. Sci.* 1978;57(6):1519-25.
19. Chanhan HVS, Roy S. Mareks Disease. In: *Poultry Disease, Diagnosis and treatment*. 2nd Ed. New Age international (P) Ltd. Ansari Rd. New Delhi. 2007;73–79.

© 2015 Okonkwo; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://www.sciencedomain.org/review-history.php?iid=975&id=32&aid=9754>