

Pathologic Studies On Skin Affections Of Fowl Pox

Abd El-Moneim A Ali, Mohamed H Mohamed and Neama A Moustafa*

Pathology Department, Faculty of Vet Med, Zagazig University

Sector of Vet Med, Sharkia Governorate*

ABSTRACT

Between January 2005 to November 2007 in different flocks, breeds, ages, sexes and localities (commercial chickens and private farms) in Sharkia Governorate, 1750 out of 20000 chickens (8.75%) showed cutaneous lesions of Fowl pox. Specimens from such lesions were collected, fixed in 10% of buffered neutral formalin and routinely processed for histopathological examination.

The chickens exhibiting cutaneous form of fowl pox were in poor body condition with a prominent keel and marked atrophy of musculatures with anorexia, a decrease in egg production (layers) and cyanosis of the skin. The mortality rate was 1%. Single or multiple warts with a crust in variable size of gray to yellow or dark brown discoloration were seen on the comb, wattle, legs and eyelids. Microscopically, the affected skin showed hyperplasia of the epidermal covering epithelium with ballooning degeneration of keratinocytes, eosinophilic intracytoplasmic inclusion bodies (Bollinger bodies) and heterophilic infiltrations and mixed with mononuclear cells extending into dermis. In the chicken embryo inoculation (CAMs), the appearance of pock lesions and the intracytoplasmic inclusions were diagnostic to the fowl pox.

Finally, it could be concluded that the fowl pox is an economically important disease of commercial poultry because it can cause a drop in egg production and mortality as well as it is also one of the most important reasons of carcasses condemnation at slaughter.

INTRODUCTION

Avian pox infection is a common viral disease of domestic and wild birds especially in the tropical and subtropical countries (1). Outbreaks of the disease still affect the poultry industry in many countries, with infection occurring through the mechanical transmission of the virus to injured skin or through transmission by mosquitoes and mites (2). Despite the variety of hosts, pox virus infection is manifested either cutaneously or diphtheritically and both of them may occur in the same bird (3). In the cutaneous form, the proliferative lesions are primarily confined to featherless areas of the skin (4, 5). In the mild cutaneous form pox disease, flock mortality is usually low; but it may be high when the flock is affected by a secondary infection, usually in poor environmental condition (5-9).

The cutaneous lesions were erosions, crusts and nodules on the comb, wattle, eyelids, legs, toe and commissure of the peak (10-12). These nodules were microscopically represented by acanthosis, ballooning

degeneration and eosinophilic intracytoplasmic inclusion bodies "Bollinger's bodies" (13-15). Pustular lesions showed superficial crusts consisted of epidermal hemorrhages, necrosis and bacterial colonies (2-4, 16, 17). The predominant inflammatory cells with avian pox were lymphocytes and histiocytes (2).

The present work was conducted to study the prevalence, clinical signs and pathological lesions of fowl pox in Sharkia Governorate.

MATERIALS AND METHODS

Skin lesions suspected fowl pox were randomly collected from (commercial layers and breeder farms) "1750 out of 20000 chickens (8.75%)" during the period between January 2005 to November 2007 from different flocks, breeds, ages, sexes and localities in Sharkia Governorate. Thirty, 11 day-old embryonated chicken eggs were used to confirm the disease on the chorioallantoic membrane (CAM). The eggs were injected with 0.2ml suspension of the affected tissue

(18). After 5 days the embryos were examined for deaths and plaque formation on the CAM. Specimens from such lesions were collected, fixed in 10% of buffered neutral formalin and routinely processed for histopathological examination (19).

Vaccination against fowl pox virus had been carried out prior to expected exposure to the disease virus. Areas that have mosquitoes throughout the year often use two vaccinations, one early and one later for permanent protection were done.

RESULTS

Clinical Signs and Macroscopical Findings

The chickens exhibiting cutaneous form of fowl pox were in poor body condition with a prominent keel and marked atrophy of musculatures. Anorexia, depression, a decrease in egg production (layers) and cyanosis on the skin were noted besides unilateral or bilateral blindness (sticked eyelids). The mortality and morbidity with an average in different examined flocks were 1% and 8.75%, respectively (Table 1).

Table 1. Number and the localization of farms, type of disease, number of birds within the farm, morbidity and mortality rate.

No.	Localization of farm	Type of disease	No.of birds	No.of diseased birds	Morbidity rate	Mortality rate
1	Meat-Abu Ali	Fowl Pox	5000	600	12%	1%
2	Menia-El Ameh	Fowl Pox	10000	800	8%	1%
3	Abu-Hamad	Fowl Pox	5000	350	7%	1%
Total			20000	1750	8.75%	1%

The diseased birds revealed small multifocal, dome shaped, sessile warts to coalescing nodular lesions in variable sizes (1-2 cm in diameter) and of gray to yellow or dark brown discoloration. These nodules were observed on the comb (Fig. 1), wattle, between the thigh and other featherless parts of the body. When the wart-like scabs coating the extensive thick lesions were removed, a variable amount of caseous exudates admixed with blood was found. In some cases, brown crusty papules were detected at the commissures of the beak, around the external nares and on the eyelids. Erosions, crusts and nodules were rarely seen around the vent, on the legs and toes with missing nails or digits. Some birds showed focal small amounts of yellow caseous material in the subcutis overlying the keel.

Microscopical Findings

The affected skin and feather follicles showed varying degrees of epithelial

hypertrophy, hyperplasia and acanthosis covered by eosinophilic necrotic material (Fig. 2), ballooning degeneration of keratinocytes with vacuolations of the cytoplasm and intraepithelial vesicles (Fig. 3). Numerous degenerated and enlarged keratinocytes, especially in the epithelium of the stratum spinosum and feather follicles, contained various sizes of solid eosinophilic cytoplasmic inclusions "Bollinger's bodies" (Fig. 4). The majority of these inclusions showed central pale zone "ring-shaped inclusions" (Fig. 5). Inclusions distended the cell cytoplasm, producing cell necrosis with pyknotic or absent nuclei (Fig. 6). The superficial epidermis of the lesions was ulcerated with eosinophilic amorphous keratinaceous crusts (Fig. 7), necrosis and a heterophil-rich inflammatory cell population besides clumps of bacterial colonies. Degeneration of feathers and bacterial colonies were observed in the feather follicles. The latter were infiltrated with lymphocytes and few heterophils (Fig. 8).

The underlying dermis showed edema, congested blood capillaries, hemorrhages and hemosiderosis of dark brown pigments. Large perivascular and interstitial infiltrates of lymphocytes and histocytes were noted (Figs. 9, 10). Occasionally, fibroblast proliferation and fibrosis were detected in the areas of old lesions. In few vaccinated hens, amyloidosis could be seen as pale eosinophilic material dispersed among the feather follicles. The underlying musculatures showed hemorrhages, hyalinization and focal Zenker's necrosis with few lymphocytic infiltrations. In some cases, the dermal collagen was hyalinized and focally covered by single layer of regenerated epithelium (Fig. 11). Cellulitis, serofibrinous exudate deposition and heterophil infiltrations were also noticed.

CAMs were detected as positive for fowl pox virus and showed the characteristic gross and microscopic pock lesions. The latter were consisted of hyperplasia and hypertrophy of their lining epithelium with ballooning degeneration and intracytoplasmic inclusions (Figs. 12). Edema, congested capillaries, extravasated erythrocytes and few round cells infiltrations were noticed on the mesenchyma.

DISCUSSION

Between January 2005 to November 2007 in different flocks, breeds, ages, sexes and localities (commercial chickens and private farms) in Sharkia Governorate, 1750 out of 20000 chickens (8.75%) showed cutaneous lesions of fowl pox with poor body condition, a prominent keel and marked atrophy of musculatures. Anorexia, depression, a decrease in egg production (layers) and cyanosis on the skin were noted besides unilateral or bilateral blindness (sticked eyelids). The mortality among the examined flocks was 1%, which may be attributed to that fowl pox lesions on eyelids and mouth commissure which interfere with reaching of the bird to food and water. Also the secondary bacterial infection may complicate the condition. Our results were similar to those recorded by several investigators (5-9).

The gross lesions were consisted of single or multiple nodules with a crust in variable size of gray to yellow or dark brown discoloration. These lesions were mostly on the unfeathered skin as comb, wattle, legs and eyelids. Our findings were similar to several previous studies (4, 5, 10-12).

Microscopically, varying degrees of epithelial hypertrophy, hyperplasia and acanthosis covered by a necrotic material, ballooning degeneration of keratinocytes with vacuolation of the cytoplasm and intraepithelial vesicles were noticed. Numerous and enlarged keratinocytes, showed various sizes of solid or ring-shaped eosinophilic intracytoplasmic inclusion bodies (Bollinger bodies). Such inclusions were diagnostic for pox virus. The latter showed substances between the mature particles which were composed of lipid-like liquid or low-electron density granular to filamentous material. The lipid-like material was dissolved by xylene during the tissue processing to give the inclusion, ring-shape appearance. Necrosis and degeneration of the epidermis and feather follicles with bacterial colonies were observed. Our results are consistent with those reported by previous authors (13-15).

CAM of 11 day-old chick embryos was inoculated with suspensions of affected tissue and observed 5 days later for deaths and plague formation (pock lesions). Marked hyperplasia of the epithelial cells of the ectoderm were noticed. These cells were swollen and revealed the characteristic inclusion bodies. The mesoderm (mesenchyma) was edematous, congested and with slight amount of proliferation of fibroblasts. Few round cells and extravasated erythrocytes were also observed in the mesoderm. Our results are in accordance with, that cited by Triphy and Hanson (18).

Finally, it could be concluded that fowl pox is an economically important disease of commercial poultry because it can cause a drop in egg production and mortality as well as it is also one of the most important reasons of carcasses condemnation at slaughter.

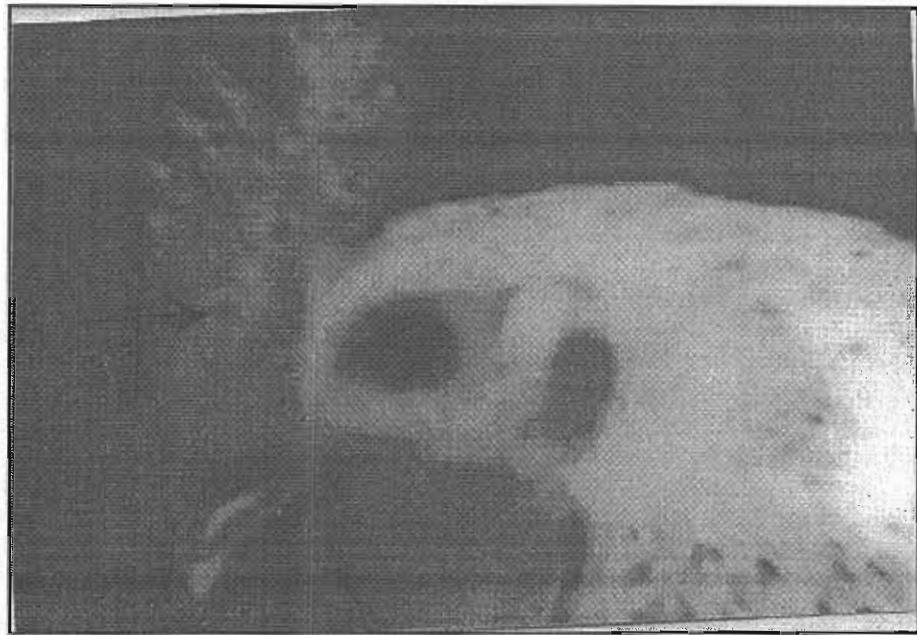


Fig 1. Fowl pox showing small multifocal dome shaped sessile warts on the comb (arrow).

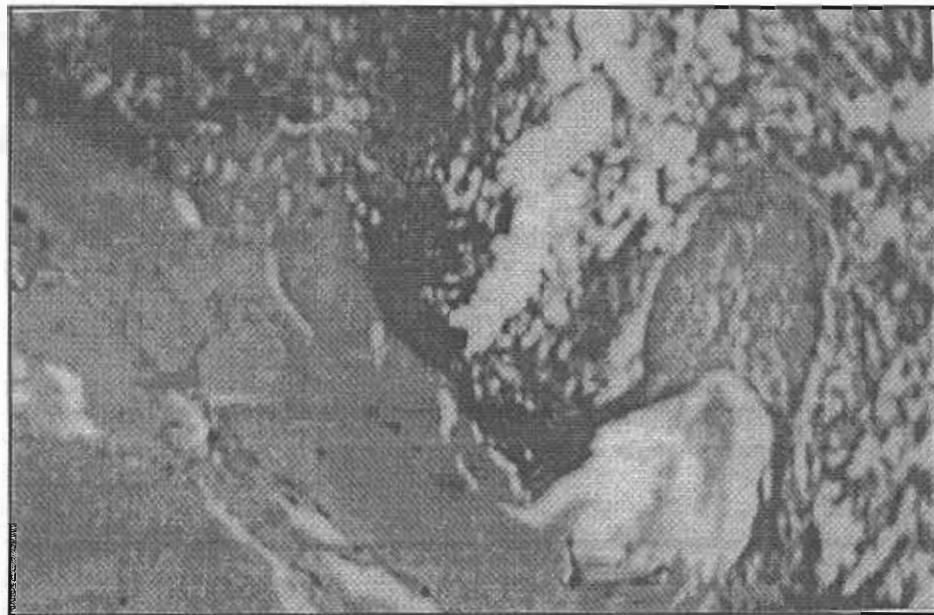


Fig 2. Fowl pox showing acanthosis of the epidermal cells, which covered by eosinophilic necrotic material, HE x 300.

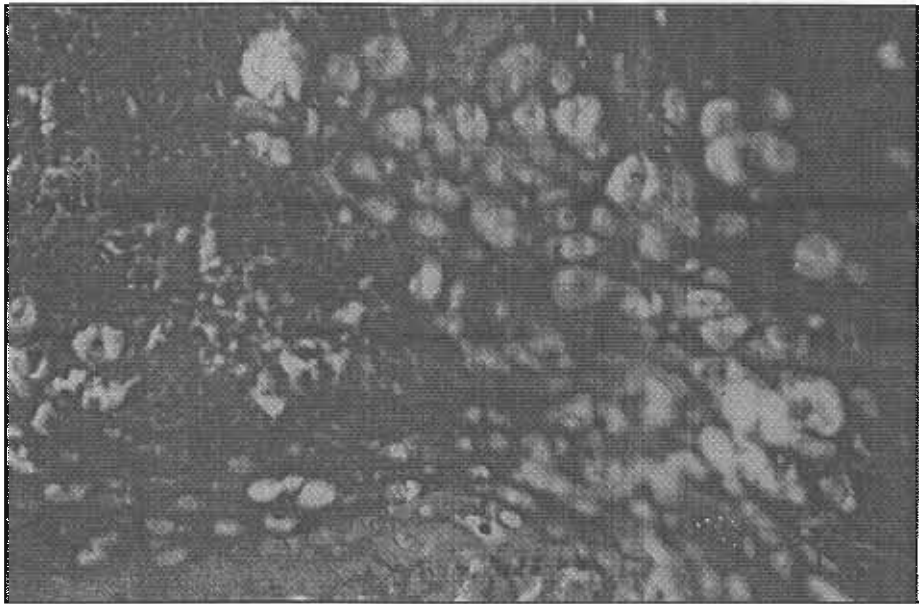


Fig 3. Fowl pox showing vacuolations of the cytoplasm and intra epithelial vesicle, HE x 1200.

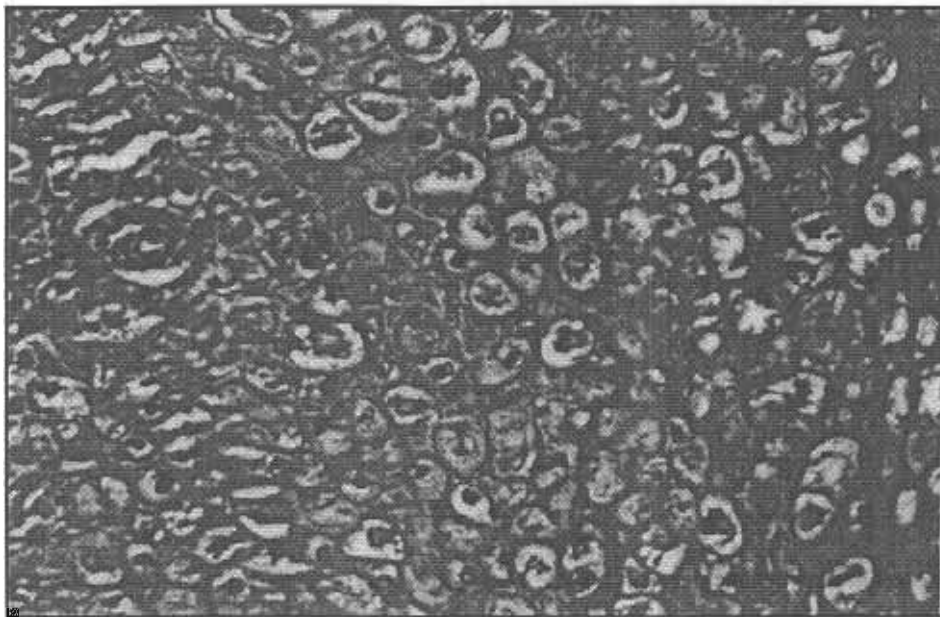


Fig4. Fowl pox showing various sizes of solid eosinophilic cytoplasmic inclusions (arrows), HE x 1200.

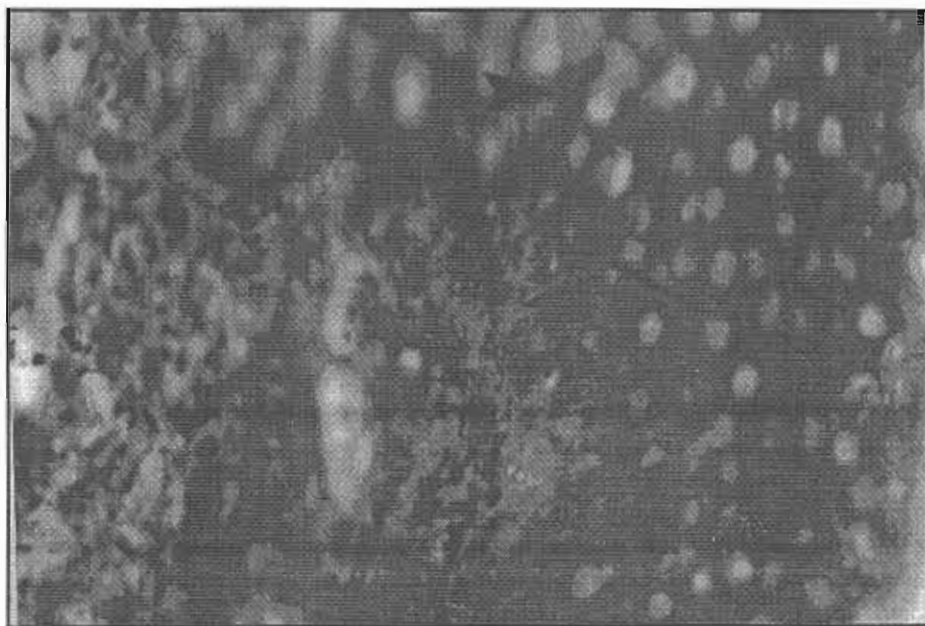


Fig 5. Fowl pox showing inclusions (arrow) with central pale zone "ring-shaped inclusions", HE x 1200.

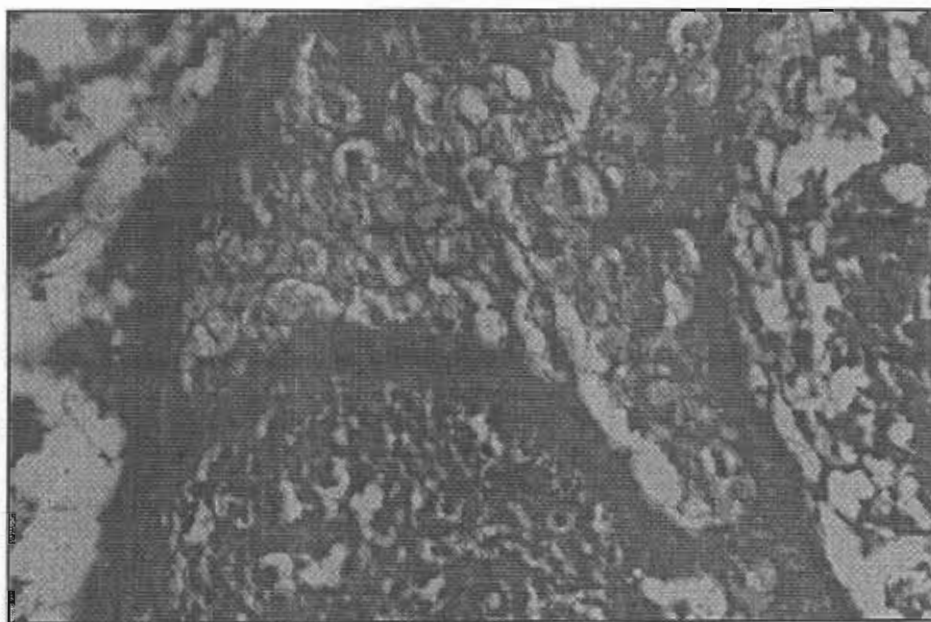


Fig 6. Fowl pox showing epidermal cell necrosis with pyknotic or absent nuclei (arrow), HE x 1200.



Fig 7. Fowl pox showing eosinophilic amorphous keratinaceous crust (arrow), HE x 150.

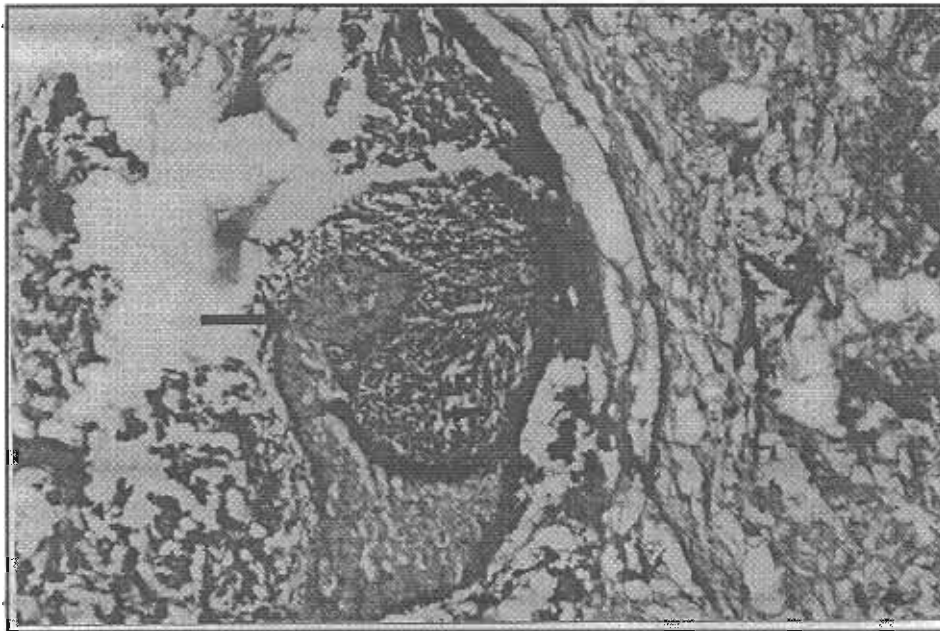


Fig 8. Fowl pox showing degeneration of the feather follicle and lymphocytes infiltration (arrow), HE x 300.

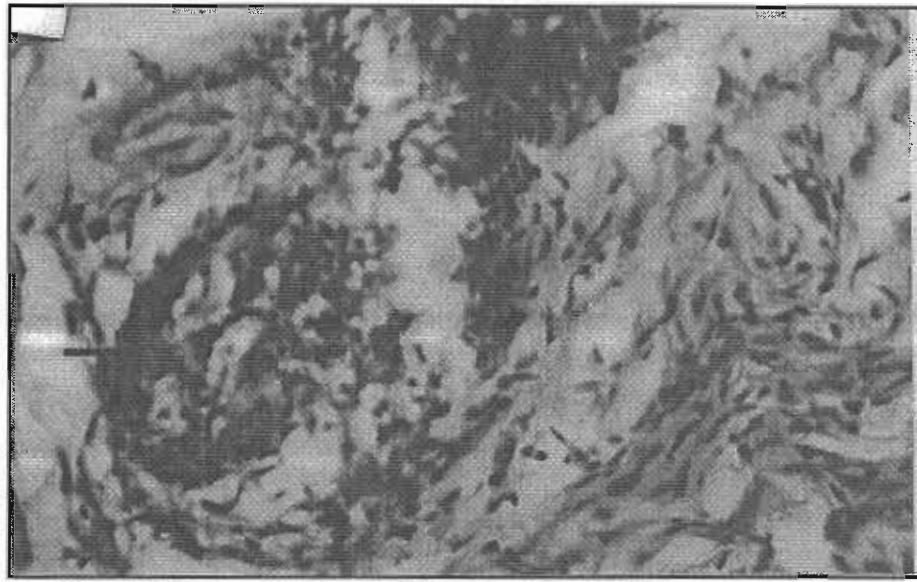


Fig 9. Fowl pox showing perivascular lymphocytes and histiocytes infiltration (arrow),HE x 300.

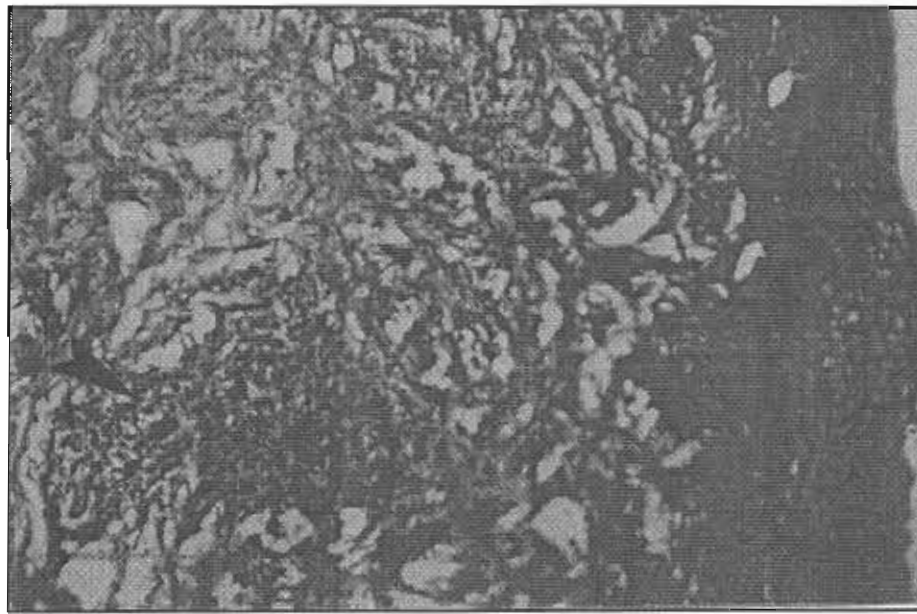


Fig 10. Fowl pox showing interstitial aggregation of lymphocytes and histiocytes (arrow head), HE x 300.

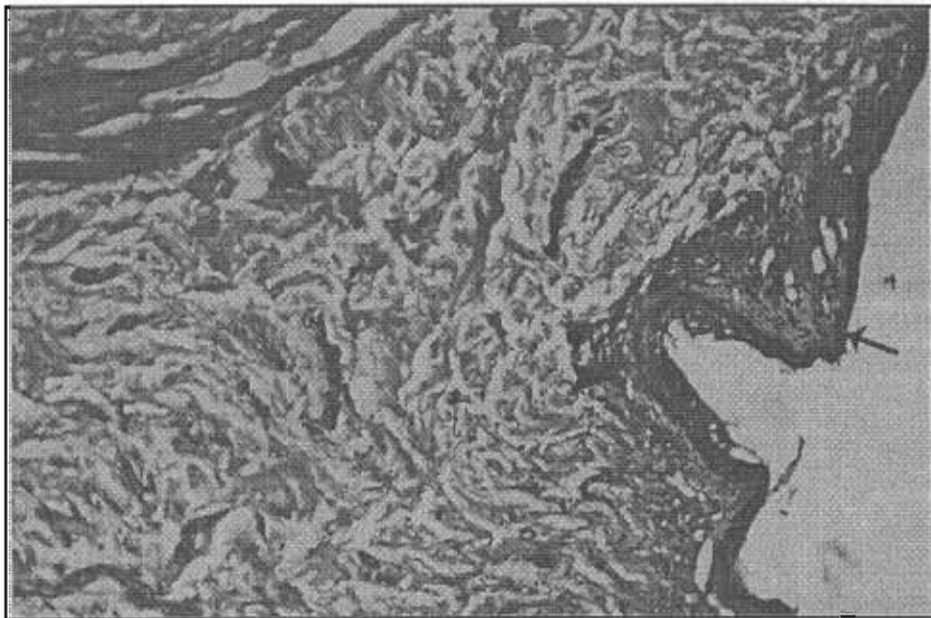


Fig 11. Fowl pox showing hyaline degeneration in the dermal collagen which covered by single layer of regenerated epithelium (arrow), HE x 300.

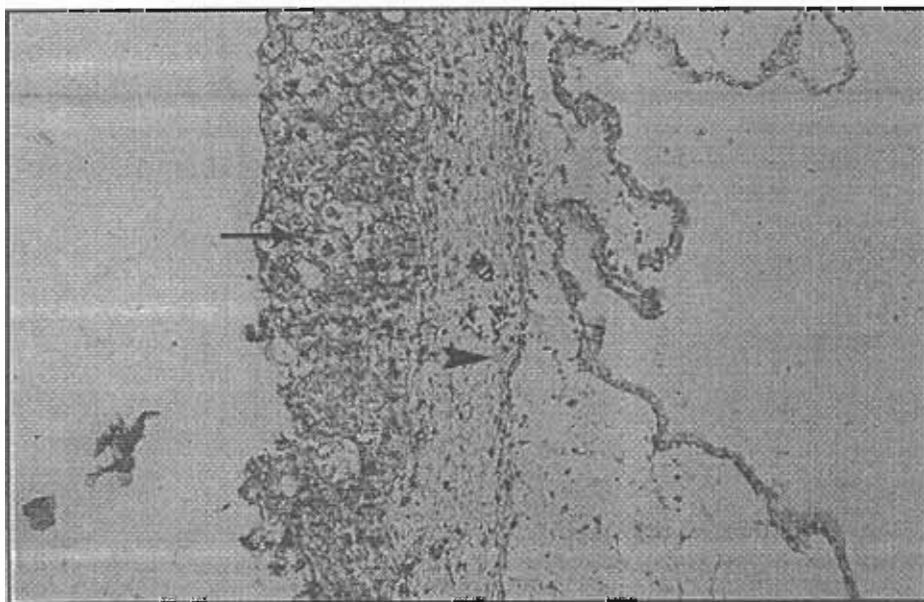


Fig 12. Fowl pox showing hyperplasia and hypertrophy of the lining epithelium with eosinophilic intracytoplasmic inclusions (arrow) and edema in the mesenchyma (arrow head), HE x 150.

REFERENCE

1. **Saif YM, Barnes HJ, Glissons JR, Fadly AM, McDougal LR and Swayne DE (2003):** Diseases of poultry 11th Edition. Editorial Board for The American Association of Avian pathologists. Mosby-Wolfe.
2. **Beytut E and Haligür M (2007):** Pathological, Immuno-histochemical, and Electron Microscopic Findings in the Respiratory Tract and Skin of Chickens Naturally Infected with Avipox virus. *Turk J Vet Anim Sci.* 31(5): 311-317.
3. **Tsai SS, Chang TC, Yang SF, Chi YC, Cher RS, Chien MS and Itakura CI (1997):** Unusual lesions associated with avian pox virus infection in rosy-faced lovebirds (*Agapornis roseicollis*). *Avian Pathol* 26: 75-82.
4. **Deoki NT and Reed WM (2003):** In Chief XM Saif. *Poult Dis* 11th Edition, 9:253-265.
5. **Nakamura K, Tanimura N, Tsukamoto K, Okamatsu M, Mase M, Imada T, Kubo M, Yamaguchi S, Irishio W, Hayashi M and Nakai T (2006):** Pathology of cutaneous fowl pox with amyloidosis in layer hens inoculated with fowl pox vaccine. *Avian Dis* 50: 152-156.
6. **Gortázar C, Millán J, Höfle U, Buenestado FJ, Villafuerte R, Kaleta EF (2002):** Pathology of avian pox in wild red-legged partridges (*Alectoris rufa*) in Spain. *Ann NY Acad Sci* (969): 354-357.
7. **Yoshikawa MGT and Alam J (2002):** Histopathological studies of fowl pox in Bantams. *Int. J. Poult. Sci.* (1): 197-199.
8. **Pennycott TW (2003):** Scaly leg, papilloma and pox in birds. *Vet Rec* 152, 444-451.
9. **Medina FM, Ramirez GA, Hernández A (2004):** Avian pox in white-tailed Laurel-pigeons from the Canary Islands. *J Wild Dis*, (40): 351-355.
10. **Woodruff CE and Goodpasture EW (1930):** The relation of the virus of fowl pox to the specific cellular inclusions of the disease. *Am J Pathol* 6:713-720.
11. **Ledingham JCG and Aberd MB (1931):** The etiological importance of the elementary bodies in vaccinia and fowl pox. *Lancet* 22: 525-526.
12. **Minbay A and Kreier JP (1973):** An experimental study of the pathogenesis of fowl pox infection in chickens. *Avian Dis* 17: 532-539.
13. **Tripathy DN and Hanson LE (1976):** A smear technique for staining elementary bodies of fowl pox. *Avian Dis* 20: 609-610.
14. **Tanizaki E and Kotani T and Odagiri Y (1986):** Pathological changes of tracheal mucosa in chickens infected with fowl pox virus. *Avian Dis* 31: 169-175.
15. **Gülbahar MY, Çabalar M, Boynukara B (2005):** Avipoxvirus infection in Quails. *Turk J Vet Anim Sci*, (29): 449-454.
16. **Bolte AL, Meurer J, and Kaleta (1999):** Avian host spectrum of avipox viruses. *Avian pathol* 28: 415-432.
17. **Mete A, Borst GHA and Dorrestein GM (2001):** Atypical pox lesions in two Galapagos doves (*Nesopelia galapagoensis*). *Avian Pathol* 30:159-162.
18. **Tripathy DN and Hanson LE (1989):** A laboratory manual for The Isolation and Identification of Avian Pathogens, 3rd ed. American Association of Avian Pathologists, University of Pennsylvania. New Bolton center.
19. **Bancroft JD and Stevens A (1996):** Theory and practice of Histological Technique. 3rd Ed Churchill, Livingston, Edinburgh, London, Melbourne and New York.

الملخص العربي

دراسات باثولوجية علي بعض الإصابات الجلدية لمرض جدري الطيور

*عبد المنعم أحمد علي، محمد حامد محمد، نعمه عارف مصطفى
قسم الباثولوجيا - كلية الطب البيطري - جامعة الزقازيق
مديرية الطب البيطري بالشرقية*

في الفترة من يناير ٢٠٠٥ الى نوفمبر ٢٠٠٧ في محافظة الشرقية في مختلف المراكز في مزارع الدواجن و الأسواق تم حصر ١٧٥٠ طائر من أصل ٢٠٠٠٠ طائر أظهروا إصابة جلدية لمرض جدري الطيور. العينات تم أخذها من مختلف الأنواع و الأعمار و الأجناس و تم إعدادها للفحص الباثولوجي تحت الميكروسكوب. الطيور التي أظهرت إصابات جلدية كانت في حالة جسدية سيئة و تعاني من قلة الشهوة للطعام و عندها ضمور في العضلات و نقص في إنتاج البيض. نسبة الوفيات كانت ١% و ظهر زوائد جلدية و قشور من مختلف الأحجام و يتراوح لونها ما بين الأصفر و البني الغامق علي العرف و الدلايات و الأرجل و جفون العيون. تحت الميكروسكوب الجلد اظهر فرط تنسج في بشرة الجلد الظاهرية مع وجود إنتباخ إنحلافي في الخلايا القيراتينية حيث كانت تحتوى علي اجسام مدمجة (أجسام بولينيغر) في السيتوبلازم. تم حقن بيضة الدجاج المخصبة (العشاء اللفائفي) للتحقق من ظهور آفة بثرية الجدري في الدواجن.

في النهاية يمكن التوصل إلي أن مرض جدري الطيور من أهم الأمراض التي تؤثر علي صناعة الدواجن حيث أنه يؤثر إقتصادياً علي تلك الصناعة نتيجة لقلة إنتاج البيض و إعدام الطيور المذبوحة في المجزر.