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Short Communication

# Pathological Examination of Deep Pectoral Myopathy in House Reared Broilers

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## Abstract

Deep pectoral myopathy (DPM) is a disease characterized by focal necrosis, hemorrhages, and green discoloration in the pectoral muscle of broilers and turkeys. The lesions of the affected muscles are usually detected during dissection after slaughter. DPM causes significant economic losses in the poultry meat industry. The purpose of this study was to investigate the gross and microscopic findings in a house-reared broiler flock with DPM. In this study, the pathological findings of 12 house reared 100-120-day-old broilers with DPM were examined. All birds were clinically healthy but hemorrhages and green discoloration were detected on the pectoral muscle mass during dissection. Samples were collected from the lesioned muscles for a histopathological examination, which revealed necrosis, hyalinization, and hemorrhage. Inflammatory cell infiltration and atrophy of breast muscles was present in some cases. DPM was diagnosed based on gross characteristics and microscopic findings.

***Keywords:*** *Deep Pectoral Myopathy (DPM), Pathology, Broiler*

# Köy Koşullarında Beslenen Broylerlerde Saptanan Derin Pektoral Myopatide Patolojik İncelemeler

## Özet

Derin Pektoral Myopati (DPM), broyler ve hindilerin pektoral kaslarında fokal nekroz, kanamalar ve yeşil renk değişikliği ile karakterize bir hastalıktır. Etkilenen kasların lezyonları kesimden sonra ve et parçalama sırasında fark edilir. DPM etlik kanatlı endüstrisinde önemli ekonomik kayıplara neden olabilen bir hastalıktır. Bu çalışmanın amacı köy koşullarında yetiştirilen bir broyler sürüsünde saptanan DPM olgusunun makro ve mikroskobik bulgularını incelemektir. Bu çalışmada, 12 adet köy koşullarında yetiştirilmiş, 100-120 günlük broylerlerde saptanan DPM'de patolojik bulgular incelenmiştir. Bütün tavuklar klinik olarak sağlıklı görünümde iken kesim sonrası et parçalama işlemi sırasında pektoral kaslarda kanama ve yeşil renk değişikliği fark edildiği bildirildi. Histopatolojik inceleme için lezyonlu kaslardan örnekler alındı. Mikroskobik incelemede pektoral kaslarda nekroz, hiyalinizasyon ve kanamalar izlendi. Bazı olgularda yangısal hücre infiltrasyonları ve göğüs kaslarında atrofi mevcuttu. Hastalığa karakteristik makro ve mikroskobik bulgulara göre DPM tanısı kondu.

***Anahtar sözcükler:*** *Derin Pektoral Myopati (DPM), Patoloji, Broyler*

## INTRODUCTION

Deep pectoral myopathy (DPM) or Oregon green muscle disease is a hidden and degenerative condition characterized by focal necrosis of the pectoral muscle in poultry. The disease involves the wing elevating muscle known as the deep pectoral muscle or *M. supracoracoidus*; hence, it is referred to as degenerative myopathy of the supracoracoideus [1-3]. The lesions often affect the muscle symmetrically and vary in color from hemorrhaged to a green discoloration. However, these symptoms are rarely detectable until the affected muscles are dissected. The disease appears as a surprise before preparation because of the unpleasant aspect. DPM is not a contagious disease, and the symptoms are not detectable in living animals [1,2,4].

Two forms of DPM reported; one results from normal muscular activity (spontaneous DPM), as it can be reproduced by repeated contraction of the pectoral muscles through electrical stimulation, and the other form occurs

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by inducing birds to flap their wings (induced DPM) [2]. The only affected pectoral muscle is the supracoracoid muscle. DPM appears to be the consequence of oxygen associated with wing flapping [1,2,4]. Blood circulation increases significantly during contraction of the pectoral muscle to supply oxygen and nutrients to the muscle. Insufficient blood supply to the myoglobin can cause ischemia and DPM [2].

DPM has caused important economical loses in the broiler industry [5]. The disease was first described in 1968 in turkeys, in 1975 in broiler breeder hens, and in 1980 in young broiler chickens [4,6,7]. DPM has been reported in North America and Europe [1-7]. There is no report about DPM in Turkey, and this is the first study about DPM in Turkey. The aim of this study was to examine naturally occurring DPM in broilers using pathological methods.

## MATERIAL and METHODS

In this study, 12 broilers (nine males and three females) with DPM were used. The chickens originated from a flock consisting of 100 animals that a household reared and that were slaughtered by the owner. The broiler chickens were 100-120 days old and weighed 3.5-4.0 kg. The flock has been comprised of >60 birds but most had been previously slaughtered. These 12 birds were the last remaining animals in the flock and were slaughtered together. No DPM had been diagnosed previously in any slaughtered bird from the flock. Lesions of different severities were observed from hemorrhage to green discoloration during the necropsy.

The lesioned pectoral muscle samples were fixed in 10% buffered formalin for the histopathological examination. After routine processing of fixed samples, they were embedded in paraffin, sectioned to 5 µm with a Leica RM 2155 rotary microtome (Leica Microsystems, Wezlar, Germany), stained with hematoxylin-eosin (HE) and Masson's trichrome methods and examined microscopically.

## RESULTS

All chickens were >3 months old and heavier than 3.5 kg. They were freely reared in the garden of the owner' home. No clinical sings were observed before slaughter. The owner stated that he also had laying poultry and slaughtered them occasionally but there were no DPM case in the layers of the same age or broilers slaughtered previously.

The carcasses of the broilers were normal on a gross examination. DPM was detected during dissection of the pectoral muscles. The lesions were localized to the middle and deep layers of the pectoral muscle. All affected pectoral muscles were greenish, pale, and swollen and covered by a fibrinous, sometimes hemorrhagic membrane *(Fig. 1)*. The cut surface of the green, dry, friable necrotic and hemorrhagic tissue was evident. The lesions were generally focal but some were diffuse in the pectoral muscle. Gross bilateral lesions were more common than unilateral lesions in the present study. Lesion severity was related to body weight, and lesions were more diffuse and severe in heavier chickens.

**Fig 1.** Gross appearance of the breast muscle from broilers with deep pectoral myopathy (DPM); pale yellow-green discoloration and necrosis *(arrows)* and hemorrhage *(arrow head)*

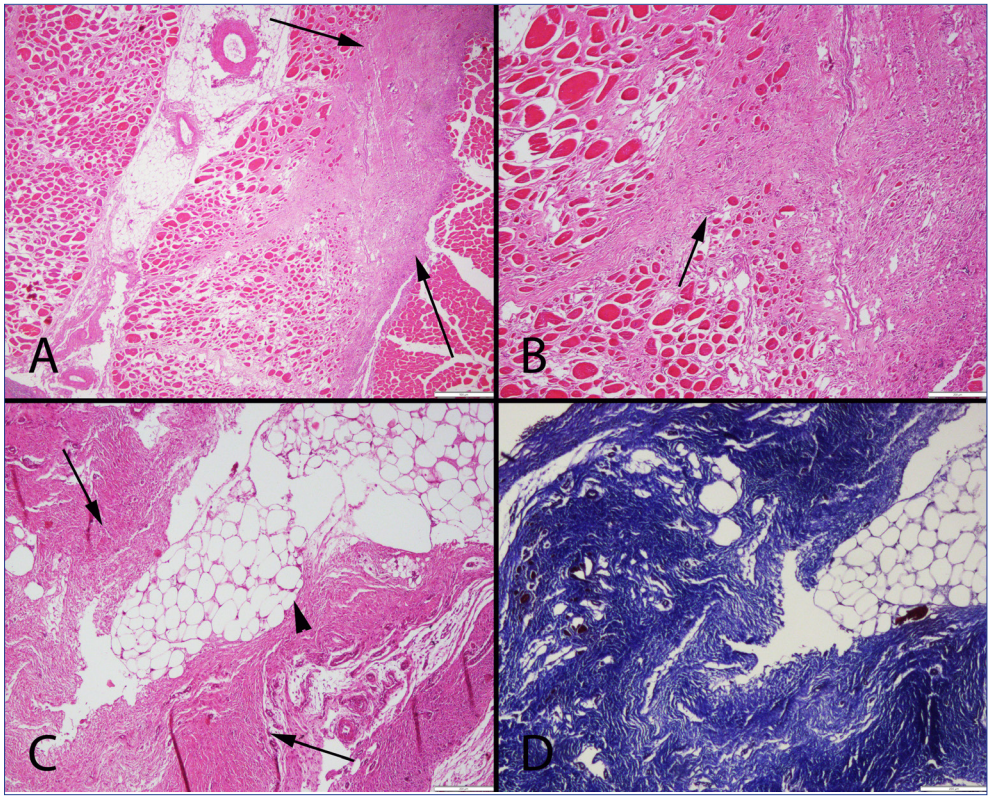


**Fig 2.** Microscopic appearance of the muscle with lesion, (A) numerous degenerated muscle cells and connective tissue *(arrows)*, (HE), Bar = 500 µm, (B) higher magnification of the lesioned area of the pectoral muscle, HE, Bar = 200 µm, (C) old and chronic lesion. Muscle fibers were replaced by fibro-adipose tissues, HE, Bar = 200 µm. (D) Fibrous tissue forming in the pectoral muscle, Masson's trichrome, Bar = 200 µm

The microscopic investigation revealed an acute inflammation characterized by heterophillic leucocyte and macrophage infiltration, edema, hyperemia, and hemorrhages in the affected area, particularly in early DPM lesions. Degenerative or necrotic changes and edema were commonly observed in these cases. Large necrotic areas, swollen, hyalinized and necrotic muscle fibers with hemorrhagic zones were observed in the chronic cases. Infiltration of inflammatory cells, mainly macrophages and lymphocytes, was seen around the lesions. In some cases, the breast muscles were atrophied *(Fig. 2)*. In addition, hyalinized areas and newly formed fibro-adipose tissue were observed in some cases.

The owner stated that it was impossible to detect DPM when the carcasses were inspected and that it appeared during muscle dissection. The unpleasant appearance of the meat was usually noticed during cooking in the kitchen.

## DISCUSSION

In the present study, DPM was diagnosed in a house-reared broiler flock. The birds were heavy because of their long life expectancy (100-120 days) and prevalence was significantly higher in birds >110 days. This finding was in agreement with previous studies suggesting that DPM is more prevalent in heavy birds [1,2,8,9]. In addition, the typical chronic lesions were observed because of the older ages and heavier body weights of the chickens in the present study.

DPM is becoming more common problem in the broiler industry worldwide, especially in broilers grown to heavier body weights. Numerous studies have reported that rapid body weight gain in broilers may result in various forms of degenerative chronic diseases of muscle such as DPM [1,2,10,11]. In this study, broilers of numerous chicken breeds were reared together with this flock, and DPM was only observed in the broilers. This result supports the idea of a possible predisposition in broiler chickens.

According to some researchers [1,2], the condition appears to be more common in males than females. However, there is some disagreement on this matter [12]. The problem is also seen more frequently in free-range broilers [13]. In this study we observed a higher prevalence in male house-reared broilers.

The lesions can occur in acute or chronic forms. The supracoracoid muscle appears pale and swollen and is covered by a fibrinous or hemorrhagic area in the acute lesions. The necrotic tissue may be white to green color. The lesions are generally limited to the deep layer of the supracoracoid muscle. In chronic cases, the muscle is necrotic and green in color. The cut surface of a lesioned muscle is dry and friable [2,3]. All lesions in the present study were chronic and characteristic because of the older and heavier birds.

The histology of the affected muscle typically had large zones of swollen and necrotic muscle fibers. An inflammatory reaction, particularly macrophage infiltration, was seen in early stages of the lesions. Fibro-adipose tissue formations

were characteristic of older or chronic lesions and the affected parts of the deep pectoral muscle were replaced by adipose tissue. The breast mass was usually atrophied and thin. The main cause of these histopathological lesions is associated with circulatory failure [2]. A histopathological examination of the chickens in this study showed excessive fibrous and adipose tissue indicating the chronic form of the DMP.

The main cause of the disease is related to insufficient blood flow, oxygen, and nutrients for muscle contraction [13]. This finding also supports this hypothesis because the birds were heavy and moved freely. DPM is not a contagious disease and no bacteria can be isolated from affected muscle [8,14].

Classical knowledge indicates that the major cause of DPM is increased bird activity that results in wing flapping, increased body weight, and stress factors, such as excessive noise, that disturbs the birds. Owners should consider these factors to prevent the disease.

The present study demonstrated that DPM can cause meat loss in house-reared broiler chickens, particularly in heavier birds. The main lesions were located deep in the pectoral muscles, which generally had chronic lesions. Postmortem and microscopic examinations are needed to confirm the disease because no clinical findings or guidelines exist for this disease. This study also indicates that DPM may be a problem in the Turkish broiler industry.

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