

Anatomical and Ethological Changes in Poultry Affected by Osteopetrosis

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Abstract

An integral veterinary hygiene survey in a farm rearing stock layers, 4 months of age, has been performed to throw light on the unknown etiology of sporadic osteopetrosis outbreaks. Observations (ethological and anatomical) were conducted to evidence the development of the disease. The welfare of affected birds was assessed as poor after detailed analysis of all elements of housing environment. This was the cause for the development of the severe illness regardless of the fact that birds were preliminary vaccinated

Keywords: anatomical and ethological changes, osteopetrosis, poultry, welfare

1. Introduction

In poultry, osteopetrosis is a neoplastic infectious disorder caused by retro-or herpes viruses. In the veterinary practice, it is more popular as thick leg disease, marble bone disease, sporadic diffuse osteoperiostitis [1].

Numerous morphological studies have been performed on spontaneous growth on appendicular bones of chickens and guinea hens, caused by the Pts 56 viral strain. The acknowledged etiological and structural features of osteopetrosis suggested the more appropriate term leukosarcomatous osteodysplasia. Hens older than 1 month of age are affected [2].

Anatomically clinical manifestation consisted in impaired remodelling of bone diaphyses, imbalance between old bone resorption and new bone formation in the middle part of long bones. These events result in easy fracturing of bones—this is a relatively milder form of osteopetrosis [3]. Other specific signs are the excessive thickening

and deformation of long bones, bilaterally thickened legs (boot shanks), very hard and painful appendicular bones as early as the beginning of the disease. The excessively thickened boot shank is observed in the later stage of the disease [4].

The ethological signs [1, 5] consist in specifically altered behavior of birds. They are lame, with generally impeded locomotion due to thickened legs. They could hardly get up, tend to lie down, do not reach the feeders, are emaciated and lethargic [6].

In Bulgaria the disease is only sporadic because the owners of poultry farm comply with the veterinary hygiene requirements with respect to poultry welfare [5]. Yet, despite that the etiology and prevention of osteopetrosis is acknowledged, the pathology is still seen in vaccinated layers. Therefore, another factor provoking the disease is involved, regardless of the proper prevention [3].

This circumstance has motivated the aim of the present study—determination of the secondary etiology of the occurrence of osteopetrosis in stock layers.

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2. Materials and methods

To realize the study's aim, the anatomical and ethological changes in a sporadic osteopetrosis outbreak at a stock layer farm (Bovance breed, 4 months of age) were investigated. The investigation was conducted during the autumn-winter season (November). All birds were routinely vaccinated intramuscularly at one day of age with a combined vaccine against osteopetrosis. The total number of birds in the premise was 2,500, and 64 were with virologically confirmed disease.

The following methods were applied in this investigation:

- Integral veterinary hygienic evaluation (via check lists) covering all elements of the environment of layers. Used check lists are evaluated and included all of the elements, concerning the birds' growing-location of the bird farm, feeding, drinking of water, micro climate etc. Birds are with proved welfare, according to the European Union standards, if the conditions of their evaluation are in accomplishment with the veterinary medical norma.
- Investigation of the ambient temperature and humidity in the premise via acknowledged zoohygienic methods;
- Ethological observation of diseased birds—48 hours duration;
- Description of gross changes in birds affected by osteopetrosis
- Analysis of results.

3. Results and discussion

The veterinary hygiene evaluation was necessary due to the unclear etiology of the disease in this case. The vaccination has been performed according to the schedule, but osteopetrosis was proved virologically.

It was found out that diseased birds were reared in a premise without windows (complying to agrarian engineering norms) on a permanent deep litter. The light regimen was not in compliance to hygiene norms. The light day was reduced by 2 h from the reference duration of 9-10 h for birds at the respective age. Population density—overcrowding (7 birds/m²) was established vs norm of 5 birds/m². Feeding and drinking widths were not compliant to hygienic norms

consequently to inadequate population density (overcrowding). Relative air humidity was slightly increased—74% vs reference range of 60-70%.

The harmful gases content exceeded the norms: NH₃ 0.04 mg/l, CO₂ 0.5%, H₂S was not evaluated.

The ventilation system was of the overpressure type and operated properly. The heating was central and the ambient air temperature in the premise was normal (17-18°C). The all-in, all-out replacement principle at the farm was observed.

Anatomical changes consisted in bilaterally thickened (deformed) hard and painful appendicular bones. The heels were thickened at a particular extent resembling boots (Figure 1 and Figure 2).

The ethological findings were anticipated at the background of the gross anatomy bone changes in affected birds. During the 48-hour continuous observation of birds, a strongly impeded locomotion, marked lameness, pain and lying down were registered. From affected layers, 30% lied down, 50% were lame, and the rest 20% did not yet exhibit clinical signs, but were depressed and anxious.

The analysis of results showed:

- Serious deviation in the light day duration (by 2 hours lower) due to the willingness of owners to have reduce energy costs;
 - Increased population density (also by economic reasons). As a consequence, the content of CO₂, NH₃ and relative humidity were logically higher;
 - The overcrowding resulted also in deviations in feeding and drinking widths. Birds were not able to eat and drink normally and thus, health deviations occurred;
 - The increased air humidity was by reason of overpopulation. Also, there is a direct relationship between increased relative humidity and increased CO₂. They entail not only respiratory troubles, but impaired general immune response of birds making them susceptible to various viral and bacterial infections.
- When discussing the obtained results, it should be mentioned that poultry welfare is an entity of three elements:
- Hygienic and ecological—in this case, abnormal due to inadequate hygienic and ecological conditions and the development of osteopetrosis. Affected birds manifested abnormal behaviour;
 - Animal welfare state—not present, beyond any doubt due to disturbances in the first two



Figure 1. Hens affected by osteopetrosis–early stage



Figure 2. Hens affected by osteopetrosis

components—if only one of welfare elements is beyond the norm, the other two are also impaired. Despite that the birds have been vaccinated against osteopetrosis and the disease was sporadic, an integral veterinary hygiene evaluation of affected farm is deemed necessary. It should include all elements of poultry environment due to the unclear etiology. Osteopetrosis was present regardless of the vaccination, although sporadically!

The facts outline that prevention is a very important element in the development of poultry and their health, as well as their proper rearing, welfare and conformity of animal biological requirements with economic demands of men. The described case is an ample evidence for that thesis.

4. Conclusions

The analysis of obtained results allowed making the following conclusions:

1. In case of illness (here, osteopetrosis) of unknown etiology, an integral veterinary and hygienic evaluation of all elements of animal environment should be performed;
2. According to presented case, the sporadic disease occurs despite the regularly scheduled vaccination. This inevitably points out at the fact that prevention should also take into account the not less important three-component welfare of birds;
3. The proper vaccination by itself is not reliable enough for prevention of disease. The integrated approach is the most reliable method for prevention of pathologies of different nature.

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