Occurrence of *Laminosioptes cysticola* mite in broiler poultry and proposed solutions to prevent infestation

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Abstract Native poultry is among the most important sources of meat and protein supply in Iran that has long been bred in various regions. Internal and external parasites are the main reasons for their reduced growth and production. *Laminosioptes cysticola* is a cystic mite that is mostly found in the subcutaneous layer and surface of muscles of several birds. It can rarely cause lesions in other organs such as abdomen, lungs and peritoneum. The life cycle of *L. cysticola* has not been known completely yet, but after hatchery, the whole life cycle would be passed in the subcutaneous layer or on muscles. In the present study, 400 pieces of native chicken in the north Sistan–Baluchestan and Kerman provinces are monitored over 3 years for infestation with *L. cysticola* mites and its prevalence is determined (2.75%). Considering the infestation with this parasite in the southeast of the country (and probably in the remaining poultry), spraying and disinfection of chicken runs are recommended. This is the first report on the prevalence of this parasite in Iran.

Keywords Chicken · *Laminosioptes cysticola* · Mite

Introduction

Laminosioptes cysticola, the subcutaneous mite of the fowl, belongs to the Laminosioptidae family. The parasite has been determined as a mite of fowl cyst and is found in different birds such as chickens, turkeys, geese, pigeons, pheasants, psittacines, and passerines (Kettle 1995; Martins et al. 2010). There are various reports from all over the world, indicating its universal spread. Female mite has about $.011 \times .25$ mm length. *L. cysticola* is described as a small oval parasite associated with mortality in poultry. It has been reported that *L. cysticola* is mostly located in subcutaneous tissues, muscles, lungs, peritoneum and abdominal viscera. The female parasite releases eggs into the subcutaneous tissue, where it penetrates. Adult and newborn mites feed from soft tissues and finally die. The dead parasites would be found encysted in collagen and these cysts may contribute to calcification (Soulsbey 1982; Hopla et al. 1994; Eslami et al. 2009; Martins et al. 2010). There is less information about the life-cycle of *L. cysticola*, its treatment, and prevention. The existence of parasites is only detected by the presence of small, flat and oval nodules in the subcutaneous tissue. These nodules include a caseous or calcified content, centrally formed around the dead mites. The significant problem of *L. cysticola* mite, which affects performance, is reduction of birds' meat quality for human's consumption because of these nodules. Previous studies showed high prevalence of parasitic disease in poultry and other birds in Iran (Rouhani et al. 2014; Ebrahimi et al. 2015). In addition, it is likely that some parasites and cysts remain in various parts of the poultry and be consumed with free-range chicken meat, causing food-borne infection (Soulsbey 1982; Ruff 1999; Martins et al. 2010). The present study aims to obtain accurate and comprehensive information about the prevalence of *L.*

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cysticola and its clinical symptoms in infested poultry in the southeast of Iran.

Materials and methods

Study area

The present study was performed in Sistan–Baluchestan and Kerman provinces, south-east of Iran, between December 2010 and November 2011. This area (31°1'N

Fig. 1 Hip muscle of a chicken. The *L. cysticola* cysts are seen in the subcutaneous layer and surface of muscle (arrows)

61°3'E) has an altitude of 480 m above the sea level, a hot-dry climate, a mean annual temperature of 30 °C, and about 57 mm of rain fall annually. 400 birds were assessed using parasitological and histopathological tools (Fig. 1).

Results

A total of 400 pieces of poultry were collected (250 pieces from Sistan and 150 pieces from Kerman) during the study period. Overall prevalence was 2.2% (9/400). Prevalence rate was 2% (5/250) in Sistan county and 2.6 (4/150) in Kerman. In microscopic studies, parasites with .15–.2 mm length and .07–.12 mm wide were observed in cysts at the complementary stages (Fig. 2). This parasite causes shedding of feathers and secondary infection with pathogenic bacteria. Its main symptoms include itching, wasting, growth retardation, and even death.

Discussion

Laminosioptes cysticola has been detected in various species such as fowl, turkey, pheasant, goose and pigeon. Geographical distribution of *L. cysticola* seems to be widespread, which has been reported in some species of birds in the USA, Mexico, Britain, Poland, Chile and Brazil (Martins et al. 2010; Soriano-Vargas et al. 2010). The first incidence of *L. cysticola* in Iran was reported by Razmi and

Fig. 2 Morphological characteristics of *Laminosioptes Cysticola*. (A1) anterior region, buccal cavity (bc); (A2) leg I; (A3) leg II; (A4) coxal apodemes; (A5) leg III; (A6) posterior end, anal opening. (B1) enlarged view of anterior region (B2) leg I; (B3) leg II; (B4) coxal apodemes

Kalidari (Kaliner 1970). Life cycle of this mite is not recognized completely (Soulsbey 1982), but it has been found that the whole life cycle occurs in subcutaneous and deeper tissues. Therefore, white to cream-color nodules appear in these regions (Kettle 1995). There are some reports about the existence of this mite in laying birds. In addition, a relationship has been found between this parasite, neurological lesions and clinical signs such as lethargy and drooping wings in turkeys (Kaliner 1970; Smith et al. 1997). Although *L. cysticola* has low pathogenesis in birds, it can decrease the quality of the carcass. Therefore, it is of great importance in the public health. It also may cause allergies in susceptible people (Martins et al. 2010). The present study showed that the prevalence of this parasite in the southeast of Iran is low compared to other parts; but it can even cause reduced growth and loss in poultry. Before causing direct losses, it causes wasting and reduced growth followed by death in poultry. Growth is retarded and laying eggs are reduced or interrupted in infested poultry, which eventually causes huge economic losses. One of the infested breeds in Sistan is the Afghan hen and rooster that are of particular importance and highly priced for their beauty.

Authors' contributions H. Tavakkoli and M. Khoshima Shahraki designed the study, performed the research, and collaborated on the manuscript writing. E. Moeini and J. Khedri collaborated on the sample collection and laboratory tests. All authors commented on the drafts of the manuscript and approved the final draft.

Compliance with ethical standards

Conflict interest The authors declare that there is no conflict of interests regarding the publication of this paper.

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