

## Histomorphological Study of the Bursae of Fabricius of Broiler Chickens during Gumboro Disease in Algeria Area

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**Abstract:** The eastern part of Algeria has recently witnessed an unprecedented spread out of the infections bursal disease virus (Gumboro disease). This has consequently aroused a heated debate among poultry-industry professionals. Preliminary observations have shown that the bursa of Fabricius is the most sensitive organ to the virus. Therefore, this work is an attempt to study the morpho-histological aspect of the bursa of Fabricius during IBDV infection. One hundred and twenty broilers (ISA 15), were taken from two chicken coops, each one was sixty; clinically healthy broilers were taken from the first coop and used as a control sample. broilers with pathognomonic lesions of Gumboro were taken from the second coop. The study has shown that the bursa is the most sensitive organ to pathological stress of IBDV (Infectious Bursal Disease Virus) and that the macroscopic appearance illustrates three phases; A phase of fast hypertrophy during days 3 and 4 post infection, followed by a two-day quick-involution phase and another relatively slow involution phase that runs from day 6 to day 8 post infection; a state of atrophy is reached then. The study has also shown that, IBDV infections produce histological lesions mostly in the lymphoid tissues such as the bursa of Fabricius, thymus, and spleen. Degeneration and necrosis of lymphoid B cells; especially the medulla of the bursal histological unit (follicles) were observed.

**Key words:** Broiler chickens • Bursae of Fabricius • Gumboro disease • Histomorphology,

### INTRODUCTION

As Algeria witnesses a rapidly-increasing urban population and demand for animal protein, poultry production in this country has in turn witnessed a remarkable development and become highly important. However, it seems that the development of serious diseases of different causes is still away of being got-rid of in poultry farms. These diseases affect negatively the national and global economy not only by the losses and the decrease in productivity they entail, but also by the costs they cause through the intervention of public or private veterinary staff [1].

One of these diseases is "Gumboro" or "the infectious Bursal Disease" which evolves in an enzoo-epizootic way in Algeria and in almost all countries of the Maghreb - a contagious viral infection of poultry is at the top of the list of the most important avian diseases [2].

Gumboro is most common in the type Gallus; of which the greater receptivity is at ages ranging from 3 to 6 weeks. Infection occurs orally either directly or indirectly; by all possible fomites contaminated by the droppings [3, 4].

The aim of our work is to study the histomorphology of the bursa using subjects affected by the Gumboro disease.

### MATERIALS AND METHODS

The study of the impact of pathological stress of Gumboro on the lymphoid organs of chickens was conducted in a poultry farm located in the municipality of Ras El Ayoun (a small town located in the east of Batna "Algeria") which is known to be Gumborogenic [5].

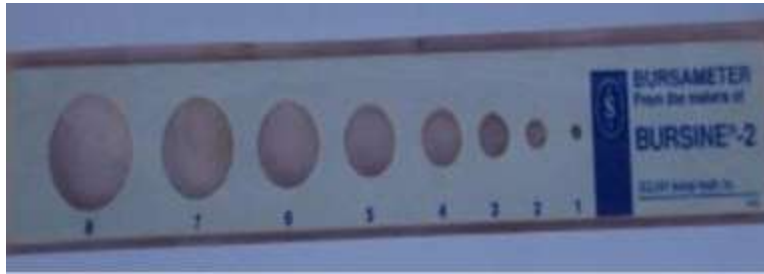


Fig. 1: The bursameter

A hundred and twenty broilers were taken from two chicken coops and were used in this experiment. Sixty clinically healthy broilers were taken from the first coop (where 2000 subjects have been raised) and used as a control sample. Sixty subjects with pathognomonic lesions of Gumboro, were taken from the second coop from day 3 post infection (D 24) at the following ages: 24 d, 25 d, 26 d, 27 d, 28 d, 29 d (10 subjects were taken at each age). The subjects had already been confirmed IBDV (Infectious Bursal Disease Virus) positive by the veterinary inspection of the region of Batna by means of a combination of characteristic clinical symptoms and lesions found at post-mortem examination and confirmed by the laboratory after detection of viral antigen in lymphoid tissues.

**Morphometric Study:** The animals were weighed before being killed by cervical subluxation and the bursae of Fabricius were collected. A bursameter, a flat plastic ruler with eight calibrated holes from the narrowest (1) to the widest (8) (Fig. 1), was used to measure the size of the bursa.

To measure the diameter of the bursa of Fabricius, we put the bursameter on an aluminium foil. Then, we try to pass the collected bursae through each of the 8 bursameter holes. As a result, the hole through which the bursae passe corresponds to its size [6].

**Histological Study:** The work was performed in the histology laboratory at the agro-veterinary institute of Taoura (Souk Ahras University). The collected bursae of Fabricius were subjected to a macroscopic and histological study. The following technique was adopted to prepare histological slide:

Tissues obtained from chickens were fixed in 10% formalin for 24 hours and then underwent successive passes through the various compartments; dehydrated in increasing concentration of ethanol, then cleared in xylene and finally soaked in paraffin [7, 8].

The residence time of the fragments in the automat is 24 hours. The blocks were then cut to a thickness of 5  $\mu$ m with a microtome [7]. The sections were placed into a flotation bath at 37° C. Then, they were placed on the slides with adhesive (egg white) and dried on a hot plate. The sections were stained with Mayer's Hematoxylin and Eosin (H & E) [9-11].

The histological structures of the bursae were observed using an optical microscope (low and high magnification).

## RESULTS AND DISCUSSION

**Morphometry of the Bursa of Fabricius of Broiler Chickens Affected by Infectious Bursal Disease Virus (IBDV):** The pathological stress investigated in this study is Gumboro disease; the most targeted organ by the IBDV is the bursa (the target cell of the virus is, in fact, the B lymphocyte at an immature stage). Other lymphoid organs remain intact.

Clinical signs, necropsy finding and the lesions in gumboro disease and the macroscopic appearance of the Bursa of Fabricius are shown below (Figs 2 and 3). The development of the bursal size shown in (Fig. 4) illustrates three phases:

A phase of fast hypertrophy during days 3 and 4 post infection, followed by a two-day quick-involution phase. Then, another relatively slow involution phase that runs from day 6 to day 8 post infection when a state of atrophy is reached.

**Histology of the Bursa of Fabricius of Chicken Affected by Gumboro Disease:** The morphometric changes of the bursae of Fabricius collected from the affected broiler chicken were accompanied by histological changes (Fig. 5).

The characteristic lesions shown in Figure 5 are those of the acute phase of the infection, but they appear also in other forms of the disease [12-14].



Fig. 2: Clinical signs and typical lesions during necropsy in gumboro disease. (A) prostrated broiler chicken with ruffled feathers; (B) hypertrophy of the bursa of Fabricius, (C) petechiae on the chest and thigh muscles, BF: Bursa of Fabricius, P: petechiae.

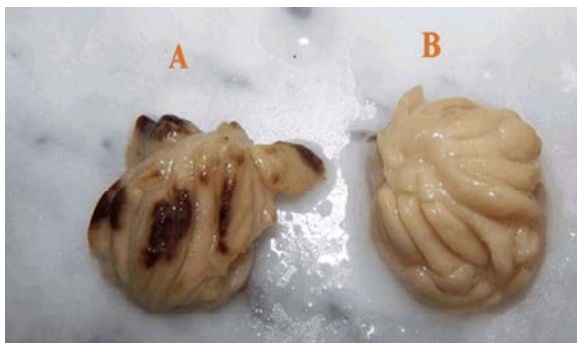


Fig. 3: Macroscopic appearance of the bursa of Fabricius. (a) A bursa affected by IBDV (blood spots), (b) healthy bursa.

Lesions of the bursa, considered pathognomonic, change according to the infection phase [15-17]. However, it is important for diagnosis to know the evolution of the lesions.

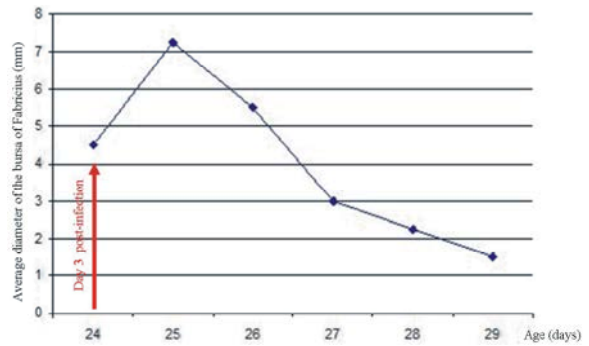


Fig. 4: Evolution of the average diameter of the bursa of Fabricius in broiler chicken during Gumboro disease according to the age(3-8 days post infection).

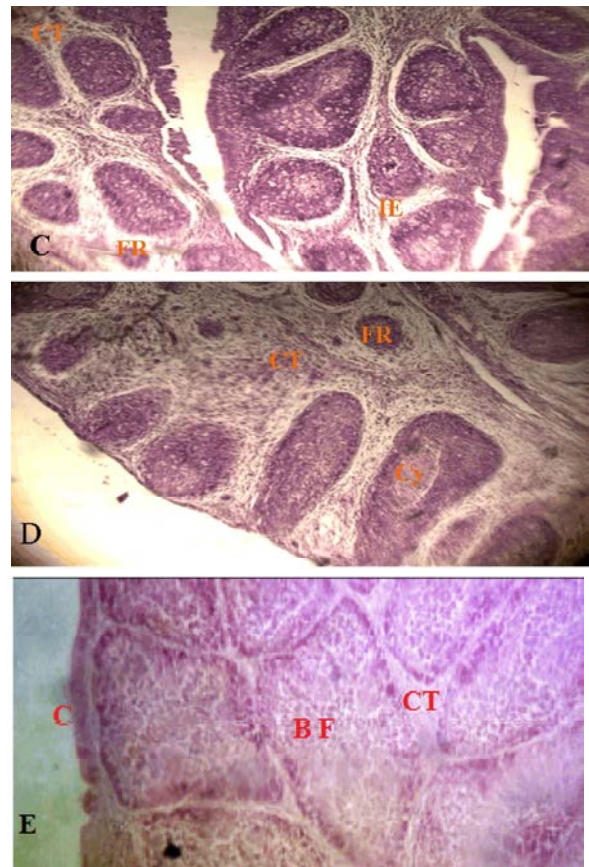


Fig. 5: Histological aspect of the bursa of Fabricius taken from a chicken.

(C) Day 4 post infection, presence of interfollicular edema; follicles in degeneration phase (H and E  $\times 100$ ), (D) Days 5-8 post infection, lymphocyte depletion and intrafollicular cysts. (E) Histology of normal bursa of Fabricius at the 4<sup>th</sup> week (H and E  $\times 100$ ), FR: Follicle regressed, Cy: Cyst, IE: interfollicular edema, CT: connective tissue, C: Capsule, BF: Bursal Follicle.

Cheville, [18] has already thoroughly explained the weight kinetics of the bursa during twelve days post infection. On the third day post infection, the bursa began to grow in size and weight due to edema and hyperemia. On the fourth day, the weight doubled. On the fifth day, the weight was normal again, but the atrophy continued. On the eighth day, the bursae weighed only a third of their original weights.

According to Lukert and Saif [16], the macroscopic appearance of the bursa of Fabricius also varies depending on the phase of the disease; on the second or third day post-infection, a yellow and gelatinous transudate on the surface of the serous membrane is observed, salient longitudinal traces are found on the surface and changes colours from white to cream. When the weight of bursa is normal again, the transudate disappears.

For histological lesions of the affected organs, there are several evaluating systems; the one suggested by Henry *et al.* [19], they give a score of 1 to 5 according to the intensity of the lesion.

Microscopic lesions of the bursae appear 48 hours after inoculation and consist of degeneration and necrosis of lymphocytes in the medulla in a limited number of follicles of the bursae. The reversibility of histological lesions of the bursae depends on the importance of the destruction of the reticuloendothelial system [20].

The clinical signs, the enzootic evolution, the macroscopic and histological aspects (lesions) are consistent with those reported previously by various authors for the diagnosis of infectious bursal disease [13, 14, 16, 20-22].

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