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## Pathology of the Esophagus and Crop of Domestic Chickens (*Gallus gallus domesticus*) in the Cases of Candidiasis

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### Abstract

*Candidiasis is an opportunistic fungal disease in poultry caused by Candida species. This case study aimed to describe the gross and histopathological features of candidiasis in local chickens. Necropsies were conducted on five local chicken carcasses from local farms in Alue Naga Village, Banda Aceh City. The esophagus and crop were collected for histopathological examination. Grossly, multifocal white lesions were observed in both organs. Histopathology revealed mucosal thickening and the presence of blastospores in the affected tissues. In conclusion, the pathological changes in these candidiasis cases included multifocal white lesions, mucosal thickening, and the presence of blastospores in the esophageal and crop.*

**Keywords:** candidiasis, anatomical pathology, histopathology, esophagus, crop

### INTRODUCTION

Chickens have high economic value so that they are kept by many people, especially in rural areas, to be used as meat and egg producers (Solihati *et al.*, 2006). Easy maintenance and a good adaptation process to the environment make chickens an option to be raised (Fitria *et al.*, 2016). The process of raising free-range chickens generally still uses an extensive system, so that production results and health problems become uncontrollable.

Health problems in chickens are often an obstacle in the chicken rearing process. One of the health problems that arise is in the form

of mycotic disorders. Mycotic disorders are caused by fungi, which consist of fungi, mold, and yeast. One type of yeast that interferes with the health of chickens is *Candida sp* which causes candidiasis. Candidiasis is one of the opportunistic diseases that affects many chickens, but this disease is still very little information and references available (Hastiono, 2003).

*Candida sp.* classified as normal flora in the digestive tract, such as in the cache, oral cavity, esophagus and proventriculus (Singh *et al.*, 2014). *Candida sp* can live as a saprobe without causing

abnormalities on various surfaces of the animal's body. This fungus can turn pathogenic causing mycosis. The pathogenic condition of *Candida sp* causes candidiasis or candidosis (Jawetz *et al.*, 1996). The incidence of mycosis by *Candida sp* is closely related to poor hygiene and a decreased state of body immunity.

In the breeding medium, the yeast grows to form a pseudo-mycelium or called *pseudo-mycelium* and manifests itself as mold, which is a group of *Candida sp* yeast such as *Candida albicans*. The pathological symptoms in the form of whitish thickening, lesions, and *ulcers* on the organs that are attacked. The organ's mucosa tends to peel off and there are areas that contain necrotizing material. Chickens affected by candidiasis will result in a decrease in body weight and egg production. Other impacts of candidiasis are that chickens become depressed, and impaired food absorption (*malabsorption*), thus causing nutrition-related problems (Jawetz *et al.*, 1996, Tabbu, 2000, and Dharma *et al.*, 2013). Microscopically, it can be seen that in the mucosa of the crop, the formation of ulcers or diphtheria membranes occurs until pseudodiphtheria and squamous epithelium undergo necrosis. In the part of the esophagus and proventriculus that have lesions, spores and *hyphae* of *Candida albicans* can be found. Diphtheria lesions can also be found on the proventriculus and intestines.

The case study of candidiasis aims to study the anatomical and histopathological pathology picture of the esophagus and crop the local chicken. The results are expected to provide information for the diagnosis, prevention and control of candidiasis in poultry.

## MATERIALS AND METHODS

### Material and Case description

The tools used during the examination consist of a set of test tube surgical tools, petri dishes, spirit lamps, gloves, masks, microtomes, *waterbaths*, *object glasses*, *cover glasses*, microscopes, and incubators. The materials used are local chicken cadavers, 10% formalin, 70%, 80%, 96% and absolute alcohol, xylol, entelan, water, albumin, hematoxilin-eosin (HE) solution, physiological NaCl.

Five local chicken carcasses from local farmers in Alue Naga village, Banda Aceh City, were taken to the Pathology Laboratory, Faculty of Veterinary Medicine, Syiah Kuala University. Then it is followed by performing a necropsy to see the changes that occur in the organ. The examined esophagus and crop organs are then collected for histopathological preparations.

### Histopathological procedure

The procedure for making histopathological preparations refers to the Kiernan (1990) method. The organs of the esophagus and crop are fixed in 10% formalin. Furthermore, the dehydration process uses a multi-level alcohol solution, which starts from 70%, 80%, 96% and absolute alcohol twice each for 2 hours. Furthermore, the clearing process uses xylol twice for 1.5 hours each. Furthermore, the process of infiltration of liquid paraffin is repeated twice each for 2 hours. The next process is embedding in paraffin. The organs that have become blocks are cut using a microtomy with a thickness of 5µm and paraffin tape placed in a tissue bath, then taken with a glass object to be further incubated into a slide warmer. Next, staining is carried out using hematoxilin and eosin. Then histopathological changes were observed using a microscope and photomicrograph creation.

## RESULTS AND DISCUSSION

### Clinical Symptoms and Anatomical Pathology

The results of clinical observations on chicken carcasses in the crop (*ingluviens*) are filled with food, the chicken looks thin and there is dirt around the cloaca. Based on the information obtained from the owner, the condition of the chicken before death was seen as lethargic, appetite decreased, the chicken experienced a decrease in body weight and food was held for a long time in the crop (Figure 1).

Clinical symptoms that occur in chickens suffering from candidiasis are weight loss, periodic vomiting, diarrhea, standing feathers and looking lethargic (Butcher and Miles, 2009). Candidiasis in young chickens causes growth disorders. Chickens that suffer from inflammation in the cloaca will see white feces around the cloaca (Tabbu, 2000). Other symptoms such as lesions on the mouth, pharynx, esophagus, and crop. However, it can occur in proventriculitis. *The ingluvitis* that occurs results in inhibition of crop emptying and enlargement of the crop. The retention of food in the crop results in chickens being unable to process food which has an impact on weight loss (Fadilah and Polan, 2004).

From the results of the necropsy, changes can be seen in the upper tract *alimentarius*. Very obvious changes are seen in the esophagus and crop. Multifocal nodules are found in the esophagus accompanied by serous exudate and hemorrhage. In the crop, there is a formation of white plaque, the crop thickens, there are prominent parts and are accompanied by lesions (Figure 2). Lesions occur due to *Candida albicans* which turns into pathogens, develops and invades the mucosa of the digestive tract. Thickening of the crop occurs in acute cases and for chronic cases, a protruding and white part will be found accompanied by the formation of ulcers (Tabbu, 2000). The case of candidiasis in the cache is high because the crop is a place to store food while it is a place for the formation of yeast colonies.

The incidence of candidiasis based on its infection is divided into endogenous and exogenous infections. Endogenous infection occurs by *Candida sp.* which is in the body as normal flora and exogenous infection occurs by *Candida sp.* which is present in the environment and then enters the body (Tyasrini *et al.*, 2006). Poor sanitation and long-term administration of antibiotics can also trigger candidiasis (Fadilah and Polana, 2004). The administration of corticosteroids can result in suppression of the fabrisus bursa which can worsen the immune system, so that it can trigger normal flora infections, especially *Candida albicans* infection (Jamin, 2012).

### Histopathology

Histopathological changes of the esophagus show very noticeable changes in the mucosal and submucosal regions. There is epithelial desquamation, infiltration of inflammatory cells and the discovery of *blastospore* in the esophagus which results in thickening of the mucosa. Epithelial desquamation is seen as a pathogenic infection of *Candida albicans* that attacks parts of the mucosa causing lesions. Some parts of the mucosa have fused with the *blastospore* and undergone parakeratosis. Heterophilic infiltration was also found in the mucosa during the necrotic period (Figure 3). The discovery of *blastospore* in the esophageal mucosa shows that *Candida albicans* is actively self-multiplying. This fungus reproduces by forming buds (*blastospores*) that continue to elongate to form pseudo-hyphae (Kreger, 1984).

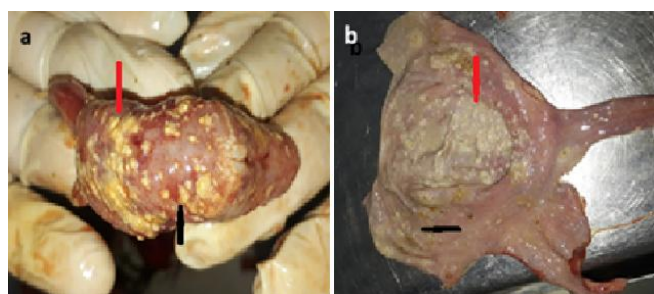
Changes in the histopathology of the crop appear to have changes that are not much different from the esophagus. Damage occurs in almost the entire mucosa with damage to the epithelial that undergoes epithelial desquamation and inflammation. Along with the epithelium, *pseudohyphae*, which is a form of self-propagating yeast, is found. On all parts that are infected and show changes in the organs, *blastospore* and *pseudohyphae* will be found (Figure 4). The formation of new tissue is seen in the mucosal part of the lamina propria that causes thickening of the tissue. Thickening of the tissue in the mucosa is seen as a form of parakeratosis and dyseratosis. In the deeper layers of the submucosa, there is edema and necrotic periods. Parakeratosis and areas of hyperkeratosis are major changes in addition to edema in cases of *Candida albicans* pathogenic infection (Asrani *et al.*, 1992).

The virulence of *C. albicans* is determined by its ability to invade and infect tissues. Virulence factors that play a role include hydrolytic enzymes such as proteinase, lipase, and phospholipase (Tjampakasari and Riana, 2006). In histopathological preparations of the crop and esophagus, quite severe damage was seen which indicated that the virulence of pathogenic agents was quite high. In an effort to grow and metabolize, *C. albicans* needs carbohydrates as a source of carbon and energy. Molecules of *C. albicans* that have adhesive activity such as manan, manoprotein and chitin. Microscopically, it can be seen in the staining of HE of the esophageal preparations and the crop that there is adhesion to the mucosa by pathogenic agents. Basri (2011) reported that the virulent factor *C. albicans* plays a role in the oral pathogenesis of candidiasis in addition to hyphae, *chlamyospores*, as well as *blastospores*. All the activity of the virulent component of *C. albicans* will penetrate into the host's mucosa until it causes candidiasis.

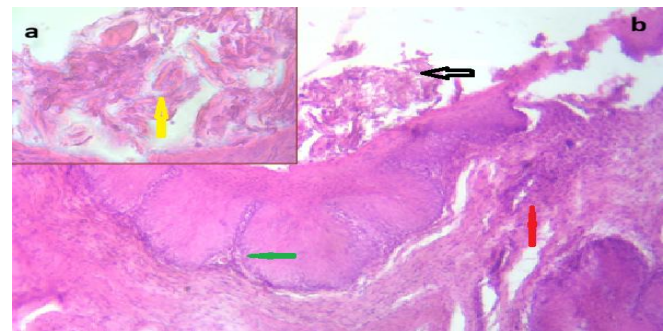


**Figure 1.** Local chicken carcasses (*Gallus gallus domesticus*).

The crop is full of food.



**Figure 2.** a. Esophagus, b. Crop. Multifocal nodules (red arrow), hemorrhagic (black arrow).



**Figure 3.** Esophageal photomicrograph (HE, a. 40x, b. 10x). Infiltration of inflammatory cells (red arrow), epithelial cell desquamation (black arrow), thickening of the submucosa (green arrow), blastospores (yellow arrow).

## CONCLUSION

It can be concluded that the cause of local chicken mortality is candidiasis disease caused by *Candida albicans* with pathological changes, anatomical changes of white lesions on the esophagus and crop. Histopathologically there is thickening of the mucosa and *blastospore* of the esophagus and crop.

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