

## CHAPTER 1 INTRODUCTION

### 1.1 Background

Broiler farming is a poultry industry that plays an important role in self-sufficiency of food needs in Indonesia, especially meat consumption. The Ministry of Agriculture through the Director General of Animal Husbandry and Health (Febrinastri, 2018) stated that the projected demand for chicken meat (carcass) in 2018 is 3,051,276 tons, with an average monthly requirement of 254,273 tons. According to Badan Pusat Statistik (2017), this figure is a surplus number compared to 2017, which was 1,848,061 tons. This shows that the level of demand for animal protein increases from year to year with a significant increase along with the increasing of the population of Indonesia. The poultry farming industry can also move other related industries, especially in agriculture, including the culture of corn, rice bran, palm oil cake and soybean meal (Widiastuti, 2015).

The industry of broiler cannot just succeed without obstacles. The obstacle faced by farmers is not only to maintain the feed ratio and to maintain the quantity and quality of meat, but also the parasite constraints, one of which is called coccidiosis. Coccidiosis that is often called bloody diarrhea disease is a poultry intestinal disease caused by protozoa of the genus *Eimeria* (Michels et al., 2011). Michels also stated that the *Eimeria* life cycle is direct and transmitted through the oral stage of the oocyst as its infective stage.

According to Chapman (2010), there are seven *Eimeria* species identified in chicken, there are *E. acervulina*, *E. brunetti*, *E. maxima*, *E. necatrix*, *E. praecox*, *E. mythic* and *E. tenella*. Coccidiosis is very detrimental to farmers because

clinical symptoms that occur are weight loss and decreasing egg yield, along with anorexia and poor use of feed, pale comb, and dehydration, mucus and / or bloody diarrhea (Hamid et al., 2018) cause huge losses in the world of animal husbandry. *E. tenella* (haemorrhagic typhlitis) and *E. necatrix* (hemorrhages from the small intestine) are considered the most pathogenic, *E. brunetti* (necrotising enteritis) which is slightly less pathogenic, *E. maxima* and *E. acervulina* which cause mild to severe enteral catarrhalic, and *E. mythic* and *E. praecox* are considered low pathogenic species (Chapman, 2014).

Coccidiosis control initially depends on coccidiostat found in commercial food on the market, the frequent use of coccidiostat can cause side effects, namely drug resistance and drug residues left in livestock products (Oematan and Kusumaningrum, 2014). The latest antimicrobial as a coccidiostat which is mixed in feed as a prevention of coccidiosis in fact causes high drug resistance and high drug residues cases in food stocks. This case makes the antimicrobial inefficient, both economically and environmentally (Clarke et al., 2014). Indonesian government's anticipation against drug resistance and food residues, Directorate General of Livestock has issued Law No. 18 of 2009 Article 22, paragraph 4c prohibiting uses of feed mixed with certain hormones and / or antibiotic feed additives (Sumanto, 2016). Therefore, an alternative treatment is expected to reduce or replace the use of coccidiostat. Laserpuncture is chosen as an alternative treatment used in this research.

Spleen plays multiple roles in the body. Spleen contains lots of macrophages and is a place to produce active lymphocyte and antibodies. The close contact between these cells in the blood circulation plays an important role

in the body's defense against microorganisms, foreign particles and abnormal cells and in removing old or abnormal erythrocytes (Matheos et al., 2013). According to research performed by Hardani (2007), *Eimeria* infection caused changes in the microscopic figure of white pulp in the spleen of broiler chickens at 6th day of infection. High lymphocyte proliferation occurred in the spleen white pulp as a humoral and cellular immune response to *E. tenella* infective stage showed a visible increase in white pulp and germinal center diameter.

Adikara (2014) stated that the technology of using LASER (Light Amplification by Stimulated Emission of Radiation) on laserpuncture that is shot at the acupuncture point as a biological receptor which has links with related organs that can provide stimulation, radiation and inhibition effects on livestock by using a stimulation of 0.1-0.5 joule. This method is upgrading method from previous traditional acupuncture method by inserting needle at a certain point become using laser beam as alternative to stimulate acupuncture points.

Alternative treatment and prevention aim to improve the immune system against *Eimeria* can be used in various ways; one of them is laserpuncture technology. According to Soekwanto (2016), shooting laserpuncture at Wei Gen point or GV-2, near the bursa of fabricius on broiler chicken can increase humoral and cellular antibodies and also increase the immune system. Also by stimulating ST-4 or Hu Men point located in the corner of the caudo-ventral mouth will increase the absorption of nutrients by digestion.

Based on the background above, lasercupuncture as alternative treatment is expected to provide the size, diameter of germinal center and weight changes of broiler chicken spleen infected by *Eimeria tenella*.

## 1.2 Identification of Problems

Problems that can be formulated from this research:

1. Does laserpuncture shooting on Wei Gen and Hu Men has an effect on increasing the length, width and weight changes of chicken spleen infected by *Eimeria tenella*?
2. Does laserpuncture shooting on Wei Gen and Hu Men increase the diameter of germinal center?
3. Does the effect of laserpuncture effectively occur after or prior to infection?

## 1.3 Theoretical Base

Infection that occurs inside the body activates the body's immune system which is a group of organs that produce special cells that work together to fight infection or the entry of foreign objects into the body in the form of antigen. Chicken has several organs of the body's defense systems such as bursa of fabricius, thymus and spleen. Bursa of fabricius regresses after the age of 20-24 weeks and the thymus will become atrophy, replaced with fat tissue (Febriana, 2008).

There are two basic types of defense systems that are closely related to each other, namely the non-specific immune system and the specific immune system. Non-specific immune system is a system that responds to antigens that enter the body in general. Specific immune system is a system that attacks and responds to specific antigens that enter the body, is specific because it can adapt itself to antigens that come into direct contact and produce specific cells (Subowo, 2009).

Cases of intracellular pathogens, such as coccidiosis, will stimulate Th1 produce IL-2. Th1 immune response activates cytotoxic T cells (CTL) to detect and destroy infected cells. CTL will target schizonts and parasitic sexual stages. IFN- $\gamma$  is secreted and macrophages and NK cells are activated. When the Th1 response is successful, there will be a decrease in the number of oocysts (Yun et al., 2000). IL-2 will then stimulate an increase in responsiveness of B cells in the germinal center so that responsive B cells will enlarge and proliferate into two groups of cells, namely groups of cells that produce antibodies called plasma cells and other groups that act as memory cells (Hardiani, 2007). The memory cell is then able to typically recognize a pathogen for the first time it is encountered. During the second exposure the same pathogen will cause an increased immune response. B lymphocyte proliferation occurs due to the presence of antigens in the body will cause the germinal center diameter to enlarge.

Adikara (2017) stated that stimulation at the acupuncture point in the form of stimulation can cause an increase in energy at the acupuncture point and continue through the meridians. Laserpuncture contains electrical impulse, it will cause chemical changes in membrane cells which results in increased permeability of sodium ions (Na) potassium (K) ions and calcium (Ca) ions to membrane cells. Ca signaling is important in the context of T cell activation and differentiation activation of T cells can cause an increase in the IFN- $\gamma$  and IL-2 (Mukti, 2015; Chen et al., 2017)

Laserpuncture is shot at the GV-2 point, called the Wei Gen, which is an acupuncture point to increase humoral and cellular antibodies for avian and ST-4

point which is called Hu Men to increase the absorption of nutrients by digestion (Adikara, 2017).

#### **1.4 Aims of Research**

The purpose of this research is to investigate if laserpuncture shooting on Wei Gen and Hu Men points can increase the size, diameter of germinal center and weight changes of chicken spleen infected by *Eimeria tenella*.

#### **1.5 Outcomes of Research**

The results of this research are expected to provide information and additional references and to proof that laserpuncture shooting on Wei Gen and Hu Men points increased the size, diameter of germinal center and weight changes of broiler chicken spleen infected by *Eimeria tenella*.

#### **1.6 Hypothesis**

The hypothesis proposed in this research is:

Laserpuncture increase the size, diameter of germinal center and weight changes of broiler chicken spleen infected by *Eimeria tenella*