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Thoraxial Antigen-G of House Fly *Musca domestica* (Muscidae: Diptera) on Serum Immunoglobulin Level of Goats

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ABSTRACT
The proper control of pathogenic diseases on livestock will have an impact on livestock production itself. An opportunity to control the disease could be done by using insect antigen as an alternative solution. This experiment aims to evaluate the role of insect thoraxial antigen-G extracted from *Musca domestica* on serum immunoglobulin levels of goat under a traditional care. The subject animals were twelve local breed goats reared at Sentrum Agraris Lotta (SAL) which were divided into two groups, the first group received thoraxial antigen of *M. domestica* and the second one was applied to the animals in control group. A total of 10 µL of TMd antigen-G was applied through a subcutaneous injection to the treated animals. The period of incubation was 14 days, and then a blood sample was collected through jugular veins to measure the protein serum levels. The results showed that average value of serum protein level of animals in treatment group was significantly higher compared to animals in control group ($P < 0.05$). The conclusion of this study is that insect thoraxial antigens extracted from *M. domestica* could be used to enhance the immune system of goats.

Keywords: *immunity, antigens, goats, insect*

1. INTRODUCTION

Thoraxial antigen serum (TAS) of Muscidae consists of various substances. One of the most important components of TAS is the saliva. Saliva is produced in the salivary glands located in the thoraxial segment [13]. The main protein in the salivary gland is antigen-5. This antigen has been reported by the previous authors which can increase antibodies in calves [11, 14]. Thoraxial glandular protein extract of *Stomoxys calcitrans* (Muscidae: Diptera) was used to enhance antibody production in foals [7]. Insect protein has also been known [12] to play a role in improving the accumulative weight of experimental animals. Local goat farms in various tropical countries are generally identified as small-scale farm. The rearing of these animals is still done traditionally. In terms of livestock quantity, most are considered as small-scale business.

TAS has the potential to increase antibodies in goat livestock, but until now there has been no scientific information regarding the use of TAS to improve the immune system of goats. Therefore, we conducted research aimed at evaluating the role of insect antigen-G extracted from *M. domestica* on serum immunoglobulin levels of goat under a traditional maintenance. Furthermore, this livestock production is quite difficult to develop because of animal health problems [9]. In terms of the environment, it can be seen that the control of pathogenic agents is still relatively low. As a consequence of this type of maintenance pattern, the mortality rate in their goats was high.

There are several main obstacles faced by farmers' community in facing challenges mentioned above: first is the knowledge aspect and the second is the economic aspect. Lack of knowledge is a limitation in increasing local livestock production, because the farming community who carries out such activities has a limited level of education in running and developing this kind of farm. Economic aspects have a major impact in overcoming environmental and livestock health problems [7]. Farmers tend to choose traditional medicines that are reasonably priced but have not yet been clinically tested. Furthermore, this method is considered as their primary choice to avoid medical expenses.

To overcome this condition, scientific breakthroughs are needed in order to improve the immune system of local goats. Several studies have elucidated the power of insect antigen as an immunity enhancer and can be used as a new alternative to support the efforts in increasing production in traditional farms [8].

1.1. Materials and Methods

1.1.1. Location

This experiment was conducted as a part of works to study the antigens extracted from larva and thoraxial antigens of adult flies reared at the Center of Agricultural Training (SAL) Lotta Pineleng located in Minahasa, North Sulawesi, Indonesia.

1.1.2. Thoraxial antigen Serum (TAS)

The antigens-G were extracted from insect thoraxial of *M. domestica* age 6 to 8 days old. Insect rearing were done with few adaptations from previous protocol [1].

1.1.3. Experiment animals

Twelve kids of local breed (about 2 months old) were divided into two groups: A1 was the control group and A2 was the group treated with antigen (TAS) from *M. domestica* as a promoter antigen to enhance serum antibody production.

1.1.4. TAS injection and blood collection

The antigens were injected subcutaneously to the six goats in treatment group. After 14 days, blood samples were collected through jugular vein. After several minutes, 2.5 ml of blood samples were centrifuged to obtained serum, and then a semi-quantitative process/analysis was done by using portable refractometer brix to get the measurement of serum antibody level of goats. During data collection, environmental conditions were mainly marked by hot climates while the experimental animals were in healthy conditions.

1.1.5. Data analysis

The data of the effect of TAS extract proportion level were statistically analyzed with t-test, and the quality classification level of animal serum immunoglobulin quality was statistically analyzed according to Mann-Whitney [11] by using SPSS software version 22.

1.2. Our Contribution

This paper presents scientific information about the potential of serum antigens released from the *Musca domestica* species in increasing serum immunoglobulin aimed at developing organic food production.

1.3. Paper Structure

The paper is arranged with several section, starting by general information on the recent achievement of immuno-enhancer extracted from insects. The next section is about the preliminary study by using insect thoraxial-antigen to influence the goat's immunoglobulin. After that the next section is the discussion of TAS consequence on immunoglobulin proportion level in the experiment animals.

2. RESULTS AND DISCUSSION

The TAS effect on immunoglobulin level of goats was detected by a %brix value. The data of control group and treatment groups value ranged from 8.75% brix and 11.52 %Mbrix. It was observed that an average proportion of immunoglobulin level of group A1 animals as control group was 9.45 %brix which was lower than in treated animals that reached to 10.50 %Brix. According to the statistical analysis it showed significance differences between groups A1 and A2 ($P<0.05$).

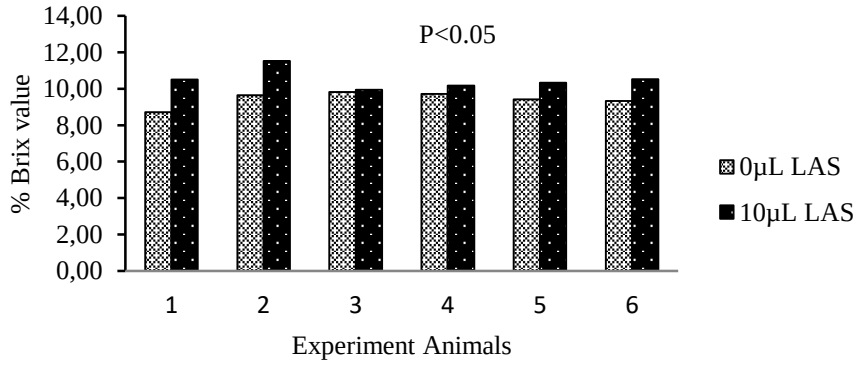

Figure 1 Effect of thoraxial antigens on imunoglobin serum

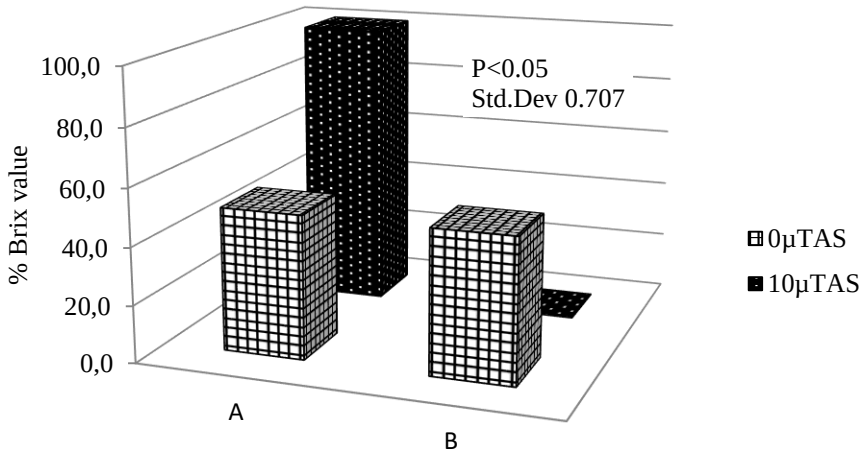

Figure 2 Quality level of immunoglobulin serum of experiment animals

All goats in group A2 which were treated with 10µl of TAS showed a higher level of immunoglobulin protein compared with the animals in A1 control group (0µL TAS). The effects of thoraxial antigens extracted from insects as an immunity enhancer observed in this study are similar to the studies conducted by some of the previous authors. A study reported by [11] demonstrated the ability of crude salivary gland extract (SGE) to stimulate immunodominant antibody responses in exposed cattle. Thorax of *M. domestica* contains protein-enriched fraction (PEF) that showed an excellent hepatoprotective activity as well as the potential for clinical application in therapy for liver diseases. This PEF was identified as antiviral, immunomodulatory, and has free radical scavenging activities after being tested in laboratory experiment by [2]. Similarly, [3] recorded a high immunoresponse in mice after using a protein-enriched fraction isolated from the larva of *M. domestica*.

The results indicated that although animals in control group that did not received any thoraxial antigen have an average %Brix value that was significantly lower than the treatment group but 50% of goats had same category (A) which appeared in treatment group. The category 'A' was the blood serum, which has good quality of immunoglobulin levels (more than 10gr/L). While, in the group treatment all animals (100%) had category A blood serum. This result can be linked to the role of insect antigens in antibody production [9].

3. CONCLUSION

The thoraxial antigens serum, extracted from adult insects of *Musca domestica* can increase the level of immunoglobulin protein in goat livestock.

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