

Comparison of Globulin in the Phases Before, During, and After Giving Therapy in Cattle Suspected Foot and Mouth Disease (FMD)

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Abstract

Cattle are ruminant livestock that have high economic value and have an essential meaning in people's lives. Cattle infected with foot and mouth disease (FMD) can cause high financial losses. Examination of blood protein in the form of globulin can be used to assess the health development of cattle. This study aims to determine the average comparison of globulin in cattle suspected of FMD before, during, and after therapy. This study used 6 cattle suspected of having FMD from farms spread across the Kalasan area, Sleman, Yogyakarta. Blood sampling was carried out in the phase before the administration of therapy, during the administration of therapy, and after the administration of therapy. The phase before giving therapy is the phase when the cattle show the first clinical symptoms and has not been given therapy. The phase during the administration of therapy is the phase of the cattle that have been given therapy, which is on the fourth day after the first clinical symptoms appear. The phase after giving therapy is the phase where the cattle have shown clinical records. Blood samples were taken from the jugular vein and put into EDTA vacuum tubes for total protein analysis and non-EDTA for albumin analysis. The globulin value is obtained from the reduction of total protein and albumin. The average globulin in the pre-therapy phase was 3.99 ± 0.66 g/dL, during the therapy phase was 4.28 ± 0.86 g/dL, and in the post-therapy grade was 4.09 ± 0.70 g/dL. Statistical analysis using the One Way Anova test showed that the average globulin between the phases before, during, and after therapy administration did not show a significant difference ($p > 0.05$). This study can conclude that giving therapy to cattle suspected of FMD tends to increase globulin levels compared to before and after giving therapy.

Keywords: antibody; inflammation; symptom; virus

Introduction

Foot and mouth disease (FMD) is a highly contagious viral disease in all livestock including cattle, buffalo, pigs, sheep, and goats. This disease is caused by an RNA virus that belongs to the genus Aphovirus in the Picornaviridae family (El-deen *et. al.*, 2017). This disease has very detrimental

effects on livestock, including weight loss, decreased milk production, reproductive failure, and loss of energy which results in decreased productivity (Faruk *et. al.*, 2021). FMD-infected livestock can show physiological changes. This physiological state can result in variations in blood globulin levels (Permana *et. al.*, 2021). Globulin can be one of the indicators used to assess the

health development of livestock infected with FMD. Globulin is a type of blood protein that acts as an antibody (gamma globulin) in the body's immune system. Globulins also function to help regulate the function of the circulatory system. Globulin analysis can be a potential test for monitoring the health status of cattle infected with FMD, especially those related to immunology. This is also by Rahman *et. al.*, (2018) changes in globulin levels from normal values can be used as predictors of health conditions. Based on this, researchers were finally interested in conducting research on the comparison of globulin levels in cattle suspected of FMD before, during, and after the administration of therapy, to evaluate the health development of PMK cattle during the rearing process.

Materials and Method

This study used 6 cattle suspected of FMD, consisting of 4 adult cattle (2-8 years), 1 young bull aged 1.5 years, and 1 male calf aged 7 months. The diagnosis of the disease was established based on the observed clinical symptoms, namely hypersalivation, thick mucous discharge from both nostrils, lesions on the nasal mucosa, anorexia, and lesions between the hooves of the cattle. The sampling location is in the Kalasan livestock area, Sleman, Yogyakarta. Blood sampling in FMD was carried out using a 10 cc syringe with a needle size of 18G (One Med Health Care, Surabaya). 70% alcohol is used as an antiseptic at the blood sampling site. Blood samples were taken from the jugular veins of the cattle, and stored in Ethylene Diamine Tetraacetic Acid (EDTA) vacuum tubes (One Med PT. Intisumber Hasil Sempurna, Surabaya) and non-EDTA vacuum tubes (One Med PT. Intisumber Hasil Sempurna, Surabaya). The method used in this study was approved by the Ethical Clearance Commission of the Faculty of Veterinary Medicine, Gadjah Mada University with number 078/EC-FKH/Int./2022.

The blood sample that has been obtained is then analyzed to see the globulin level. The value of globulin concentration is obtained from reducing the total protein concentration with albumin. Total protein examination was carried out using a refractometer (Atago, Japan). While the examination of albumin using Cobas® Pro

Integrated Solutions (Roche, Switzerland) with the Colorimetric Assay method.

The globulin data obtained was then analyzed using Statistical Product and Service Solution (SPSS) software version 16.0 (USA). Statistical analysis was performed using One Way Analysis of Variance (ANOVA) and then continued with the Duncan Multiple Range Test (DMRT) post hoc test. The significance used in this statistical analysis was $p < 0.05$ to see differences in globulin levels before being given therapy, during therapy, and after giving therapy to cattle suspected of FMD.

Results and Discussion

This study was conducted on cattle with clinical symptoms suspected of being infected with the FMD virus. Clinical symptoms observed in cattle during the study process (Figure 1-2) included thick mucus discharge from both nostrils, foamy hypersalivation, lesions on the nasal mucosa of cattle, anorexia, and lesions between the cattle's hooves.

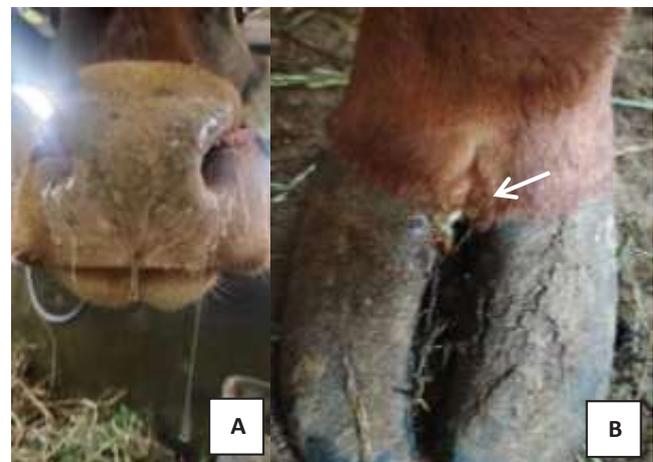


Figure 1. Clinical symptoms in cattle with suspected PMK, (A) thick mucus discharge from both nostrils, (B) lesions between the hooves of the cattle.

Table 1 showed the average globulin in cattle infected with FMD before giving therapy, during giving therapy, and after giving therapy respectively is 3.99 ± 0.66 g/dL, 4.28 ± 0.86 g/dL, and 4.09 ± 0.70 g/dL. The normal number of globulin in cattle is $2.2-4.2^*$ g/dL (Faruk *et. al.*, 2021).

Statistical analysis showed that there were no significant differences in phase globulin



Figure 2. Clinical symptoms of cattle suspected of FMD, (C) lesions on the nasal mucosa of cattle, (D) foamy hypersalivation.

concentrations before, during, and after administration of therapy in cattle suspected of FMD ($p < 0.05$).

Table 1. Mean globulin in cattle suspected of FMD before being given therapy, while being given therapy and after being given therapy

Foot and Mouth Disease Cattle	N	Globulin Average (g/dL)	Globulin Reference
Before giving therapy	6	3,99 ± 0,66 ^a	
During therapy	6	4,28 ± 0,86 ^a	2,2 - 4,2*
After giving therapy	6	4,09 ± 0,70 ^a	

The same superscript letter (^{a,a}) in the same column shows no significant difference ($p > 0.05$)

*(Faruk *et al.*, 2021)

Globulins are blood proteins consisting of alpha, beta, and gamma globulins. The main function of alpha and beta globulins is as a carrier molecule for lipids, several hormones, various substrates, and other essential body substances, while gamma globulin (immunoglobulin) is an antibody that plays a role in immunity. The gamma globulin fraction is the largest part of globulin (Arifin, 2022). In the phase of giving therapy, the concentration of globulin has increased from the previous phase. According to Rosida (2016), an increase in globulin concentration can be affected due to an increase in antibody synthesis. The same thing was also expressed by Endang *et al.* (2002) hypergammaglobulinemia can occur due to increased production of immunoglobulins by plasma cells. Immunoglobulins are antibodies produced by plasma cells as a form of immune

reaction or the body's defense against disease or organisms. The continuous frequency of exposure to the same antigen causing the boosting phenomenon can also affect the increase in antibodies. In addition, acute inflammation also affects the increase in globulin (beta globulin) (Endang *et al.*, 2002). Inflammation is one of the body's responses to tissue injury or infection and is a natural process in maintaining the body's homeostasis due to the presence of foreign substances or compounds (Anuar & Levita, 2018).

The concentration of globulin in the phase after administration of therapy is known to have decreased from the previous phase and is within the normal range. Cattle suspected of having FMD in this phase show clinical recovery, this is supported by therapy in the form of antibiotics, anti-inflammatories, and antipyretics. According to Wulandani (2022), there is no specific treatment for FMD cases, so the treatment given aims to reduce clinical symptoms and prevent secondary infections. Improved livestock conditions certainly affect globulin concentrations to normal because the virus can be neutralized properly by the immune system. Supportive therapy is used to help the immune system work optimally in cattle with suspected FMD, namely vitamin B complex and brown sugar water. Vitamin B complex plays a role in energy, protein, and fat metabolism so that it can maintain a healthy body (Megawati *et al.*, 2021). Giving brown sugar water can reduce stress and improve livestock performance. According to Joris & Fredriksz (2019), brown sugar contains 66.187% sucrose which is part of carbohydrates and has the main function as an energy producer.

Conclusion

It can be concluded that giving therapy to cattle suspected of FMD tends to increase globulin levels compared to before and after giving therapy.

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