

## SOME SERUM ENZYME ACTIVITIES IN ETTAWA CROSSBRED GOAT

### *Aktivitas Beberapa Enzim Serum pada Kambing Ettawa*

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#### ABSTRACT

The present study was carried out to investigate the activity of alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), and creatinine kinase (CK) in Ettawa crossbred goat. A total of 43 Ettawa crossbred goats with physiological status of different groups (young male, young female, adult male, adult female, pregnant goat, and lactating goat) with clinically healthy were used in this study. Clinical examination and blood sampling was carried out in accordance with clinical standards described by Baumgartner (1999). Blood sampling was performed at 7:00 to 8:00 am. Examination of enzymes activity in the serum was examined using standard method as described by Kraft and Duer (1999). The result showed that the activity of AST, ALT, and ALP in goat serum have comparable level to other ruminants. Meanwhile, the CK activity is higher than the value stated in the literature for other small ruminants.

Key words: enzyme activity, Ettawa crossbred goats

#### ABSTRAK

Penelitian ini bertujuan mengkaji aktivitas enzim alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), dan creatinine kinase (CK) pada kambing peranakan Ettawa. Sebanyak 43 ekor kambing peranakan Ettawa dari berbagai kelompok status fisiologis (jantan muda, betina muda, jantan dewasa, betina dewasa, betina bunting, dan betina laktasi) yang secara klinis sehat dan tidak cacat digunakan dalam penelitian ini. Pemeriksaan klinis dan pengambilan sampel darah dilakukan sesuai dengan skedul pemeriksaan dan pengambilan sampel sesuai dengan standard klinik yang diuraikan Baumgartner (1999). Pengambilan sampel darah dilakukan pada jam 7.00-8.00 wib. Pemeriksaan enzim di dalam serum diperiksa dengan menggunakan metode standar sebagaimana diuraikan oleh Kraft dan Duer (1999). Aktivitas AST, ALT, ALP di dalam serum memiliki level yang sebanding dengan level pada ruminansia lain. Sementara itu, aktivitas CK lebih tinggi dibanding nilai yang dinyatakan di dalam literatur untuk ruminansia kecil lainnya.

Kata kunci: aktivitas enzim, kambing peranakan Ettawa

#### INTRODUCTION

Many enzymes register important physiological variations due to age (growth, aging), sex, genital stage (gestation, nursing), diet, physical exercise and other variables (Coppo et al., 2002). Age also determine the variation in enzyme activity in the local goats in Israel (Bogin et al., 1981). Breed, age, and physical activity greatly affect to the level of creatinine kinase (CK) enzyme activity in serum of pig, sheep, goat, and horse (Kraft and Duerr, 1999) dog and cat (Hartmann, 1990). Juma et al. (2009) states that alkaline phosphatase (ALP) activity increase in pregnant goat. High activity of ALP found in young animals than adult animals was reported in local goats in Israel (Bogin et al., 1981), goat in Landrace (Mbassa and Poulsen, 2003), and cows Angoni in Mozambique (Otto et al., 2000). Activity of aspartate aminotransferase (AST) in various species such as horse, cow, and sheep did not show much variation as well as alanine aminotransferase (ALT) activity in cattle and pig (Kraft and Duerr, 1999). Sarmin and Widiyono (2007) reported that the activity of AST postnatal goats in female young goats is higher than males. ALP and ALT activity were not influenced by sex, and only ALT was influenced by age. Wosnik (1991) reported that the highest individual deviation for the value of ALP enzyme

activity found in goats and able to reach 700.00 IU/L. This confirms that the status of ALP enzyme activity is different in various species, thus, important to establish the specific reference values for Ettawa crossbreed.

#### MATERIALS AND METHODS

Forty three clinically healthy adult Ettawa crossbred with physiological status of various groups (young male, young female, adult male, adult female, pregnant female, and lactating female) were used in this study. Clinical examination and blood sampling were carried out in accordance with clinical standards described by Baumgartner (1999). Blood sampling was performed at 7:00 to 8:00 am. Examination of enzymes activities in the serum were examined using standard methods as described by Kraft and Duer (1999). Before blood sampling performed, animal research should not do strenuous physical activities and not administered by hormones, antibiotics, and intravenous glucose and electrolyte solution. In addition, the animals were fasted several hours before blood sampling. Blood samples were taken from jugular vein, and then the serum was performed by centrifugation and stored at 20° C. Enzymes in the serum were examined using standard methods as described by Kraft and Duer (1999).

## RESULTS AND DISCUSSION

The average value and reference range of activity of some enzymes in goat serum were shown in Table 1.

**Table 1.** Activity of some enzymes in the serum in Ettawa crossbreed goat

| Parameters | Mean±SD       | Reference range |
|------------|---------------|-----------------|
| AST (IU/L) | 86.62±72.96   | 45.35-241.80    |
| ALT (IU/L) | 24.12±5.66    | 11.45-37.32     |
| ALP (IU/L) | 633.72±838.70 | 38.90-2689.40   |
| CK (IU/L)  | 135.62±75.41  | 4.35-350.40     |

ALT= alanine aminotransferase; AST= aspartate aminotransferase; ALP= alkaline phosphatase; CK= creatinine kinase

The mean of AST activity in the serum was ranged between 86.62±72.96 IU/L. Physiological range of AST for Ettawa crossbreed is at the level of 45.35-241.80 IU/L. Aspartate aminotransferase activity in Ettawa crossbreed shows the different with the range of values for AST of some goats suggested by previous researchers equal to 12.00-122.00 IU/L (Mitruka and Rawsley, 1981), from 59.05 to 73.95 IU/L on local goat of Iraq (Juma et al., 2009), 4.00 to 8.20 IU/L on West African Dwarf goat (WAD) in Owerri, South East Nigeria (Opara et al., 2010), and 50.00-96.00 IU/L on the mountain goat captured in Cascade Range of Washington State. Similarly, the activity of AST in goat has a higher value than the AST activity in cattle (up to 80.00 IU/L) and lamb (up to 75.00 IU/L) (Kraft and Duerr, 1999).

The mean of ALT activity in the serum of Ettawa crossbreed is at the level of 24.12±5.66 IU/L. Alanine aminotransferase activity on Ettawa crossbreed with clinically healthy is at the level of 11.45-37.32 IU/L. Alanine aminotransferase activity on Ettawa crossbreed at ALT levels reported by Mitruka and Rawsley (1981) equal to 0.50 to 47.00 IU/L and 4.50-6.10 IU/L in West African Dwarf goats (WAD) in Owerri, South East Nigeria (Opara et al., 2010). Furthermore, ALT activity in Ettawa crossbreed also corresponds to the findings of Juma et al. (2009) that the activity of ALT at the local goat of Iraq was at the level ranged from 22.22 to 32.75 IU/L. Compared to another species, it can be assumed that the ALT activity was in the range of physiological activities of ALT values in various species of animals such as cows (up to 50.00 IU/L) and pigs (up to 68.00 IU/L), but were above physiological values for sheep (up to 14.00 IU/L) and horses (15.00 IU/L) (Kraft and Duerr, 1999). Compared to other species, it can be stated that ALT activity of Ettawa crossbreed was in the range of physiological activities of ALT values in various species of animals, such as cows (up to 50.00 IU/L) and pigs (up to 68.00 IU/L), but were above physiological values for sheep (up to 14.00 IU/L) and horses (15.00 IU/L) (Kraft and Duerr, 1999). Based on the data, it can be calculated that the ALP activity in goat are in the range of values 38.90-2689.40 IU/L. This result consistent with Wosnik (1991) that reported the high individual deviation for the value of

ALP enzyme activity in goats and can even reach to 700.00 IU/L. Furthermore, most of the data in this study demonstrates the value is proportional to the mean value of ALP activity found in local goats of Iraq 86.15 to 100.80 IU/L (Juma et al., 2009). Variety of literature suggests that some factors were suspected to influence the ALP value, such as age and pregnancy (Kraft and Duerr, 1999; Merks, 1992; Juma et al., 2009).

Activity of creatine kinase in goat serum was in the range of 4.35-350.40 IU/L with the mean value was 135.62±75.41 IU/L. The range of enzyme activity level in healthy Ettawa crossbreed is higher than in sheep (up to 25.00 IU/L), goat of Europe (to 65.00 IU/L), horses (up to 130.00 IU/L), cows (to 250.00 IU/L), but lower level than pigs (up to 2000.00 IU/L) (Kraft and Duerr, 1999). Similarly, young buck shows a tendency of higher availability of CK activity than adult male Ettawa crossbreed. This may indicate a possible interaction between factor of breed, age, and activities. Race, age, and physical activity significantly affect the level of enzyme activity in serum CK in pigs (Kraft and Duerr, 1999).

## CONCLUSION

Activities of AST, ALT, and ALP in serum have a level that comparable to that of other ruminants. Meanwhile, CK activity is higher than the value stated in the literature for other small ruminants.

## ACKNOWLEDGEMENTS

This research was supported by Hibah Kompetensi from the Ministry of National Education, Republic of Indonesia, Contract number: Nomor: 346/SP2H/PL/Dit. Litabmas/IV/2011, April 14, 2011. For that we thank the Directorate of Research and Community Service, the Directorate General of Higher Education, Ministry of Education and Culture, Republic of Indonesia.

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