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Short Communication

GAMMA-GLUTAMYL TRANSFERASE (GGT), A POTENTIAL MARKER FOR THE EVALUATION OF HEAT TREATMENT OF DROMEDARY MILK

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The purpose of milk heat inactivation is the protection of the consumer from pathogenic micro-organisms. The process partially destroys the micro-organisms or completely sterilises the milk so as to prolong its storage life. Several methods are used world wide. If one day camel milk and its products are allowed into foreign markets, a milk enzyme must be found that clearly conforms the proper heat inactivation. In cow milk, this enzyme is alkaline phosphatase (ALP), which is destroyed at 72°C, but not in camel milk. Gamma-glutamyl transferase (GGT) seems to be a good candidate for camel milk (Wernery *et al,* 2006).

This paper compares the results of both milk enzymes GGT and ALP after camel milk was inactivated at different temperatures and times.

Materials and Methods

Two hundred dromedary milk samples from the Dubai Camel Dairy Farm (DCDF) were aseptically collected from each quarter into 50 ml sterile plastic bottles and 10 ml of each quarter pooled from each animal. The 50 pooled samples were then analysed for GGT and ALP in the Hitachi Automatic Analyser 912 after heat inactivation in a water bath at different temperatures and times. The test kits were from Roche Diagnostics GmbH, D-68298, Mannheim, Germany, and the method used was a quantitative wet test. The dromedary milk samples were centrifuged at 16,000 rpm for 20 minutes. The clear intermediate fluid was tested after the fat layer was removed from the top of the fluid column (Wernery *et al,* 2006).

Results and Discussion

GGT and ALP results are summarised in Table 1. As has been proven by several researchers, ALP cannot be used as proof that camel milk has been properly heat inactivated or not (Loiseau *et al,* 2001). In an earlier publication, Wernery *et al* (2006) showed a complete inactivation of ALP in camel milk only at 90°C after 5 minutes, whereas GGT was destroyed at 72°C between 30 seconds and 20 minutes. Our current investigations showed a similar outcome. GGT is very high in raw milk and is gradually destroyed at 72°C with increasing times. It is undetactable between 10 and 20 minutes at 72°C, whereas ALP is much lower in raw milk and not completely destroyed at 72°C for 20 minutes.

It is concluded that GGT is a potential marker of proof whether camel milk is properly heat inactivated or not.

Table 1. Effect of heat treatment on GGT and ALP of 50 dromedary milk samples at various temperatures and times.

Temperature and Time	GGT (U/L)	ALP (U/L)
Raw	308 ± 58	13 ± 8
72°C – 15 sec	95 ± 33	5 ± 4
72°C - 30 sec	80 ± 32	5 ± 4
72°C – 10 mins	0.4 ± 0.6	5 ± 3
72°C – 20 mins	0.00	5 ± 3

Conclusion

ALP cannot be used as proof that camel milk has been properly heat inactivated or not. This enzyme is not destroyed by pasteurisation. GGT, which is high in raw camel milk, was undetectable when the milk was heated at 72°C for 20 minutes. We therefore believe that GGT is a potential marker for the evaluation of heat treatment of dromedary milk.

References

Loiseau G, Faye B, Serikbaeva A and Montet D (2001). Enzymes ability to serve as markers of pasteurised camel milk. Conference on New Horizons in Biotechnology 18-21 April, Trivandrum, India.

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