THE STABILITY OF THE PACKED CELL VOLUME OF ANTICOAGULATED BOVINE BLOOD STORED AT REFRIGERATION TEMPERATURE.

I. O. IGBÖKWE, and N. M. SANU.

Department of Veterinary Pathology, Faculty of Veterinary Medicine,
University of Maiduguri, P. M. B. 1069, Maiduguri, Nigeria.

(Received 26 Nov. 1991, accepted 11 Feb. 1992)

ABSTRACT

Bovine blood samples with ethylene diamine tetra-acetate (EDTA) or oxalate as anticoagulant were stored at refrigeration temperature of 4°C. The packed cell volume (PCV) was determined daily. During storage, the PCV did not vary significantly. Complete haemolysis, suggested by failure of blood samples to separate into cellular and plasma fractions, started occurring in samples on days 28 and 17, and was observed to have occurred in all samples on days 41 and 24 in blood with EDTA and oxalate respectively.

INTRODUCTION

Blood samples are anticoagulated and stored for the purpose of laboratory analysis or blood transfusion.

For haematology, ethylene diamine tetra-acetate (EDTA), oxalate and heparin are the anticoagulants that can be used (Coles, 1980). EDTA is the most preferred anticoagulant because it preserves better the stainability and morphological characteristics of the blood cells (Coles, 1980).

For haematological data to be reliable, blood samples for haematology are stored at refrigeration temperature (4°C) for a limited length of time in case there is need for delay in the laboratory analysis. In over-stored blood, there is tendency for the red blood cells (RBC) to swell and haemolyse and for the white blood cells (WBC) to undergo alterations in morphology and lyse (Schalm *et al.*, 1975). Storage of blood with EDTA in a refrigerator at 4°C produced little effects on the packed cell volume of bovine blood for 24 hours (Fisher, 1962) and blood of dog, cat and horse for 48-72 hours (Penny *et al.*, 1970). It was reported that in the stored blood, there was a tendency for the RBC to swell slowly

Nigeria Journal of Animal Production 18 (1991)

ly after 48 hours; and by 6 days of storage, the PCV had increased by about 7-10% and there was an increased tendency to haemolyses (Penny *et al.*, 1970). These reports did not mention how long the blood could be stored before complete haemolysis occurred. The purpose of this study was to find out how long the anticoagulated bovine blood could be stored at refrigeration temperature before complete haemolysis occurred.

MATERIALS AND METHODS

Out of 20 blood samples (10ml) collected from adult white Fulani cattle, 15 were anticoagulated in dipotassium EDTA at 1.0mg/ml of blood, and 5 were anticoagulated in balanced oxalate prepared as described by Coles (1980). The packed cell volume (PCV) of the samples was determined daily by microhaematocrit method until complete haemolysis occurred; that is, when the blood samples could no longer be separated.

RESULTS AND DISCUSSION:

The daily variation in the mean PCV of the stored bovine blood presented in Table 1 was not significant when tested with one-way analysis of variance. Thus, the PCV did not gradually increase or decrease during storage. Complete haemolysis started occurring in samples on days 28 and 17 and had occurred in all samples on days 41 and 24 in blood with EDTA and oxalate anticoagulants respectively. Complete haemolysis occurred earlier in blood with oxalate than in blood with EDTA.

The bovine RBC has about the longest life span (160 days) among the domestic animals (Kaneko, 1963; Coles, 1980). Mature RBC cannot replenish its enzymes and other proteins, but

TABLE 1. PACKED CELL VOLUME OF BOVINE BLOOD ANTICOAGULATED WITH EDTA AND OXALATE AND STORED AT 4°C.

DAYS	Blood with EDTA	Blood with Oxalate
0	34.0 ± 4.6 (15)	35.0 ± 3.2 (5)
1	35.8 ± 3.3 (15)	34.6 ± 3.0 (5)
2	35.6 ± 3.3 (15)	34.8 ± 3.2 (5)
3	35.6 ± 2.3 (15)	35.2 ± 3.5 (5)
5	35.5 ± 3.5 (15)	38.4 ± 3.8 (5)
8	36.7 ± 4.0 (15)	36.0 ± 4.2 (5)
10	37.0 ± 3.3 (15)	36.2 ± 3.9 (5)
17	35.6 ± 3.8 (15)	36.7 ± 2.8 (4)
23	35.4 ± 3.7 (15)	34.0 ± 1.4 (2)
28	36.8 ± 3.5 (14)	-
40	39.0 ± 4.6 (3)	-

* Mean ± standard deviation

() number of samples.

depends on preformed enzyme to maintain its metabolic needs by glucose utilization (Kaneko, 1974). When the blood is stored at 4°C, the metabolism of the RBC is slowed down and the exhaustion of its enzymes and metabolites is delayed thereby increasing the duration of storage.

The bovine RBC did not seem to swell remarkably during storage as was suggested by insignificant variation of the PCV of the stored blood in contrast to reported swelling of RBC in canine, feline and equine blood samples

during storage (Penny *et al.*, 1970). The swelling of the RBC depends on the cell membrane permeability and elasticity, and the failure of bovine RBC to swell may probably be due to its peculiar cell membrane properties.

REFERENCES

- COLES, E. H., 1980. *Veterinary Clinical Pathology*, 3rd edn., W. B. Saunders, London.
- FISHER, F. W. 1962. Observations on the bovine haemotocrit. *Brit. Vet. J.* 118: 513 - 521.
- KANEKO, J. J. 1963. Erythrokinetics and iron metabolism in bovine porphyria erythropoietica. *Ann. N. Y. Acad. Sci.* 104: 689.
- KANEKO, J. J. 1974. Comparative erythrocyte metabolism. *Advances in Veterinary Science and Comparative Medicine* 18: 117 - 153.
- PENNY, R. H. C., CARLISLE, C. H., DAVIDSON, H. A. and GRAY, E. M. 1970. Some observations on the effect of the concentration of ethylene diamine tetra-acetic acid on the packed cell volume of domesticated animals. *Brit. Vet. J.* 126: 383 - 388.
- SCHALM, O. W., JAIN, N. C. and CARROLL, E. J. 1975. *Veterinary Hematology*. 3rd edn., Lea and Febiger, Philadelphia.