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Assessing the Osmotic fragility of Erythrocytes of rural and semiurban Camels (*Camelus dromedarius*)

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Abstract

Dromedary camel, despite subjected to harsh environmental condition, has been adapted to arid and dry climate. Camel has shown exceptional ability to withstand considerable period of dehydration and camel erythrocytes have the ability to expand twice their volume without rupturing in hypotonic solution. Osmotic fragility of camel erythrocyte of rural and semi urban area was compared especially in relation to exposure to pollutants. Camel erythrocyte did not show any hemolysis when suspended to descending concentration of NaCl solution. The greater resistance of camel erythrocyte to osmotic fragility was attributed to their morphological characteristics and its membrane protein, "Spectrin".

Keywords: Dromedary camel, Osmotic fragility, Erythrocytes, NaCl, Spectrin

Introduction

The dromedary camel (*Camelus dromedarius*) has adapted to the arid and dry ecosystem and although always being subjected to harsh environmental conditions. The camel owing to certain physiological, biochemical and pharmacological characteristics differ from other related ruminants. It has an exceptional ability to withstand considerable periods of dehydration (Perk, 1963) and to rapidly replace lost water once ,it has access to drinking water (Schmidt-Nielsen, *et al.,* 1956).

Erythrocytes of camels are highly resistant to osmotic hemolysis being able to expand to 240% of their original volume without rupture in hypotonic solutions (Perk *et al.,* 1964). Camel erythrocytes are more resistant to

osmotic hemolysis than cattle, sheep, goat, pig and human erythrocytes (Livine and Kuiper, 1973). This may be partly due to the oval shape of erythrocytes (Turner *et al.*, 1958) and composition of the erythrocyte membrane (Livine and Kuiper, 1973).

The camel plays an important role in rural and semi urban transportations. Male camels are predominantly used for transportation purpose attached to carts. They regularly travel to the cities through highways and therefore are constantly exposed to pollution from automobile fumes besides feeding and grazing on the plants collected around roadsides camels are thus exposed to fall out of heavy metal particles from nearby industries making them vulnerable to suffer from ill effect of pollution.

Materials and Methods

The present study was undertaken to compare osmotic fragility of erythrocytes of rural and semi urban camel in relation to exposure to pollutants. The rural based organized camel farms and camels attached to camel carts and regularly visiting cities through highways were selected for the comparison. A total of 50 blood samples: 10 from rural camel and 40 from camels attached to cart were collected in a heparinized sterile vials and transported in an ice packed cooler to the laboratory. Osmotic fragility of erythrocytes was carried out as per peviously described prodcedures(Daice and Lewis, 1968) and results were expressed in percentage (Table 1). Osmotic fragility of erythrocytes was measured using descending concentration of Sodium Chloride

Table 1: Measurement of Osmotic fragility of Erythrocytes.

TT No.	1% Nacl (ml)	Distilled Water (ml)	0.85% Nacl (ml)	Total Vo. (ml)	Total Strength
I*	-	-	5.0	5	0.85%
H*	5.0	-	-	5	1.0%
1	2.9	2.1	-	5	0.58%
2	2.7	2.3	-	5	0.54%
3	2.5	2.5	-	5	0.50%
4	2.3	2.7	-	5	0.46%
5	2.1	2.9	-	5	0.42%
6	1.9	3.1	-	5	0.38%
7	1.7	3.3	-	5	0.34%
8	1.5	3.5	-	5	0.30%
9	1.3	3.7	-	5	0.26%
W	-	5.0	-	5	1.0%

(NaCl) solution (0.1-0.9%).

Results

Camel erythrocytes did not show hemolysis when suspended in hypotonic NaCl solutions up to 0.34% in both samples from rural and semi urban camels (Figure 1A). Partial hemolysis of erythrocytes was observed at and above 0.34% NaCl solutions (Figure 1B). The observed value did not differ considerably in rural as well as semi urban camel as the camel erythrocytes are normally fragile at 0.34 % NaCl solution.

Discussion

The present study revealed that camel erythrocytes,(irrespective of whether camels were exposed or unexposed to pollutants) are resistant to hemolysis (or osmotically less fragile). Between the species, camel erythrocytes are resistanced to hemolysis when compared to that of cattle, sheep, goats, pigs, man (Livine and Kuiper, 1973). This has been attributed to morphological characteristics of the red cell as well as its ability to swell twice to its volume in hypotonic solutions and resistance to sonic hemolysis (Turner *et al* 1958), which is unique property of the camel erythrocytes membrane.

Ralston (1975) showed that the major proteins of camel erythrocyte membranes were similar to those of cattle and human, with major difference in the membrane protein, "spectrin", which appears to be very tightly bound to the camel erythrocytes membrane. Concurrent with the total release of spectrin, camel erythrocytes undergo a change in shape, from flat ellipsoids to spheres, suggesting an important shape maintaining role for spectrin in the erythrocytes of camels.

The osmotic fragility of erythrocytes of rural and pollutant exposed urban camel did not show significant difference. The greater natural resistance of camel

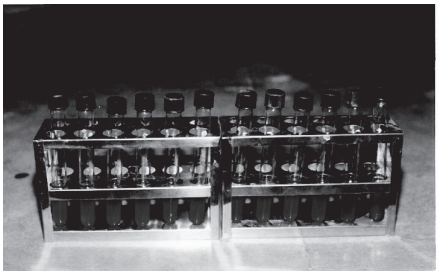

Fig. 1A

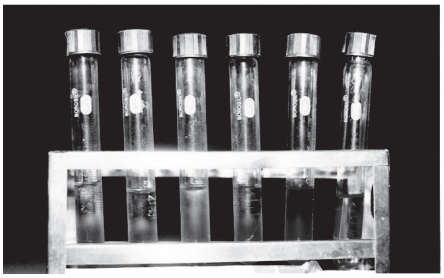

Fig. 1B

Fig. 1A and 1B: Erythrocytes fragility tubes with starting of hemolysis in Tube 7.

erythrocytes to osmotic fragility was mainly attributed to morphological characteristics and its membrane protein. The present study further confirmed the fact that camel erythrocytes were less fragile compared to other mammalian species.

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