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Analysis of Urea in the Blood of Male and Female Megachiropteran bat Rousettus Leschnaultii (Desmerest) during Reproductive Cycle

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Abstract—*In the present study the serum urea levels were found to be variable when compared for the complete reproductive cycle. Thus in the male Rousettus the blood urea value ranged from 20–32mg%. The highest values were 32mg% during July. The values showed an insignificant slop from September, October, August, January, April, November, February and March, May, June and December. Thus the values being greater during inactive period. In the female Rousettus the blood urea values ranged from 16-28 mg%. The highest values were recorded during late pregnancy and lactation(phase-I) but the values were significantly lower in phase-II pregnancy and lactation. An insignificant fall was recorded during pregnancy (January, February and March). Constant values were recorded from August, September, October, November and December–proestrous, estrous and anestrous (non-gravid) females.*

1. INTRODUCTION

Since there is no information so far concerning the blood and its formed elements and serum chemistry in any Indian bat excepting a small note on the haematology of the Indian false vampire, *Megaderma lyra lyra* (Gopalkrishna and Chitle, 1973) only in adult male and female and juvenile bats, but not during the reproductive cycle, during different phases of male maturity and oestrous cycle, pregnancy and lactation period. Thus the present work is an attempt to correlate the profile of blood and reproduction. The fact that many physiological conditions are accompanied by a variation in the blood composition has led us to investigate the composition of blood study in the *Rousettus leschenaulti* during the reproductive cycle. Our study from July 2003 to June 2004 is an attempt to investigate the blood chemistry of *Rousettus leschenaulti* during reproductive cycle. Such data can be used as a basis for comparison during the reproductive cycle of the Indian bat and to stimulate others to further define hematological and serum chemistry characteristics, in the Indian bats. Apart from changes in the reproductive status of the animal hematological data can be used to make comparisons between populations for purposes of taxonomy and phylogeny and for determining population differences in nutritional status. These data are also necessary to determine the influences of handling stress, immobilization and nutrition. Estimation of serum urea indicates status of blood circulation.

Ammonia is produced as a result of deamination of amino acids in liver and kidney tissues. It is very toxic, hence its detoxification is absolutely essential. It is detoxified by its conversion to urea solely in the liver. Ammonia combines with CO_2 and forms urea. The synthesis of urea begins with a condensation of ammonia and carbon dioxide with phosphate to form carbonyl phosphate, which enters a synthetic pathway to form citrulline. A second ammonia is added from the amino acid aspartic acid, leading to the formation of the amino acid arginine. In the presence of the enzyme arginase, arginine is decomposed into urea and ornthine. This frees the ornithine for renewed synthesis of citrulline, repeating the entire cycle, the total pathway is therefore known as the ornithine cycle for urea synthesis. As the blood urea level rises–the haemoglobin progressively falls. Insignificant sex difference was noted. The high values noted in *Rousettuss* during July in both the sexes suggests slowed renal function. There are certain opinions regarding the elevations of urea in blood, Cohn, et al. 1956 have also shown that blood urea fluctuates with the ingestion of food, reaching a peak about 8 hours after a meal. According to them slowed renal function during the spring indicated by increased creatinine levels coupled with the reinstatement of a varied diet produces observed elevation in the blood urea values. The increased levels of urea also suggest a shift from fat metabolism to a varied regimen of fat, protein and carbohydrate diet and therefore more functional renal system.

The objective of this present study is to investigate the relationship between the reproductive status of the male and female and the haemotology and serum chemistry characteristic throughout the reproductive cycle. We also intend to explore differences attributable to sex. Comparative hematological data and serum chemistry on natural populations like *Rousettus leschenaulti* might serve as taxonomic, phylogenetic and physiological purposes, not available for the order Chiroptera. However, it is hoped that

the results of this study will eventually be related to populations in other geographical areas and ecotypes and not only be restricted to India.

2. MATERIAL AND METHODS

This old world Indian fruit bat, *Rousettus leschenaulti* (Desmerest) is selected for the present study because of its easy availability in the vicinity of Nagpur city. The specimens of *Rousettus leschenaulti* were collected with the help of mist net placed at the entrance of Mansar / Kandri mines near Nagpur once every calendar month throughout the complete reproductive cycle.

Blood sample (2 ml) were collected in Eppendorf tubes and into 6 to 8 heparinised capillary tubes after puncturing a wing vein. After blood sampling each bat was released. Urea analysis was performed using a Technicom semi auto analyzer (RA50 Technicom, Germany) (Saini and Kaur, 1996; Sood, 1996; Ramakrishnan, et al. 1998; Choudhari, 2002 and Godkar and Godkar, 2003).

3. OBSERVATION

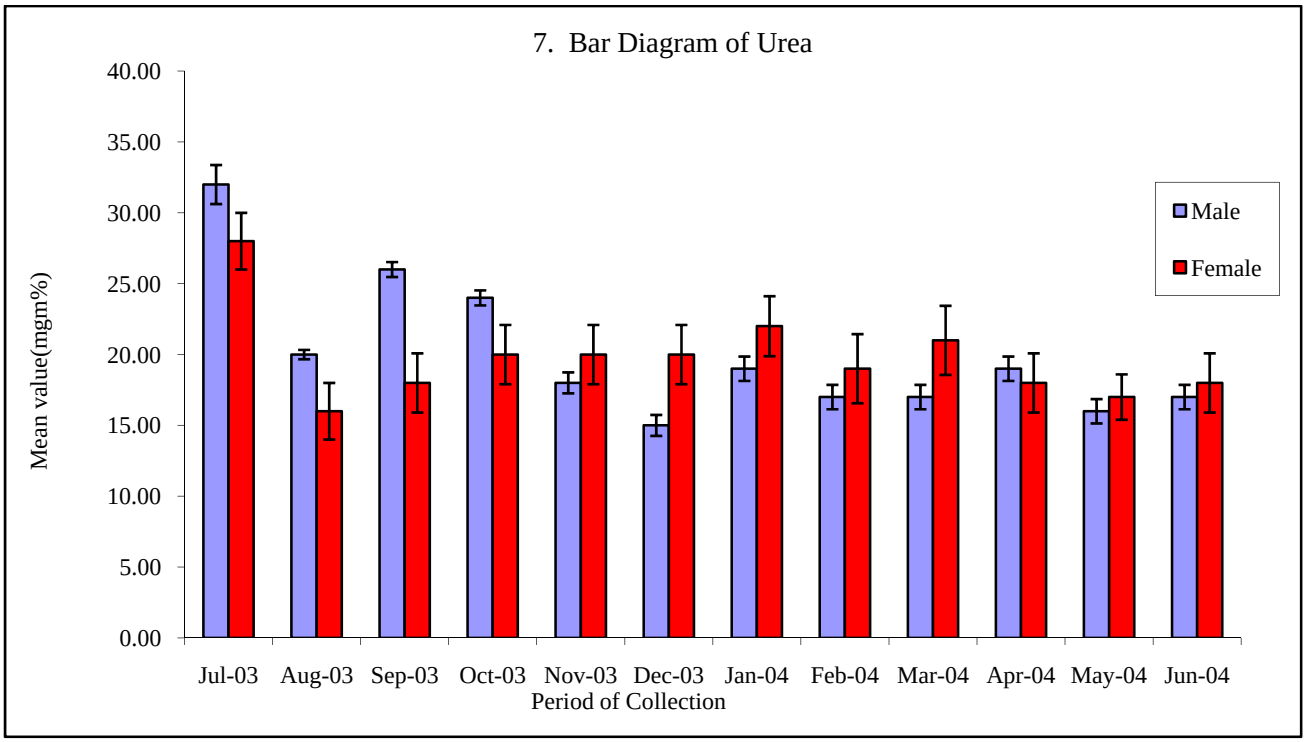
As shown in Table 1 & 2 and Graph for month wise values of Urea in Male and Female bat Rousettus leschnaultii (Desmerest) during reproductive cycle (2003 to 2004).

Table 1: Values of Urea for male *Rousettus leschenaulti* during reproductive cycle (2003–2004)

Date of Collection	Reproductive Status	Urea (mgm%)
31/07/03	Male Inactive	32.0±1.38
29/08/03	Male Inactive	20.0±0.33
29/09/03	Male approaching maturity	26.0±0.53
21/10/03	Male approaching maturity	24.0±0.53
20/11/03	Male active	18.0±0.74
29/12/03	Male active	15.0±0.74
25/01/03	Male active	19.0±0.86
28/02/03	Male active	17.0±0.86
25/03/04	Male active	17.0±0.86
25/04/04	Male active	19.0±0.86
27/05/04	Male regressed	16.0±0.86
24/06/04	Male regressed	17.0±0.86

Table 2: Values of Urea for female *Rousettus leschenaulti* during reproductive cycle (2003–2004)

Date of Collection	Reproductive Status	Urea (mgm%)
31/07/03	Late pregnancy/just delivered	28.0±2.00
29/08/03	Lactating female	16.0±2.00
29/09/03	Anaestrous female	18.0±2.09
21/10/03	Proestrus female	20.0±2.09
20/11/03	Female at Oestrous	20.0±2.09
29/12/03	Ovulation / Early pregnancy	20.0±2.09
25/01/03	Mid pregnancy	22.0±2.12
28/02/03	Advanced pregnancy	19.0±2.44
25/03/04	Just delivered / post portum oestrous	21.0±2.44
25/04/04	Lactation / early pregnancy/ abortion	18.0±2.09
27/05/04	Mid pregnancy	17.0±1.60
24/06/04	Advanced pregnancy / abortion	18.0±2.09



4. RESULT AND DISCUSSION

In the present study the serum urea levels were found to be variable when compared for the complete reproductive cycle. Thus in the male *Rousettus* the blood urea value ranged from 20–32mg%. The highest values were 32mg% during July. The values showed a insignificant slop from September, October, August, January, November, February and March. Thus the values being greater during inactive period. Further insignificant decline was observed April / May / June / December.

In the female *Rousettus* the blood urea values ranged from 16-28 mg%. The highest values were recorded during late pregnancy and lactation. An insignificant fall was recorded during, pregnancy (January, February and March). Constant values were recorded from August, September, October, November and December–proestrous, estrous and anestrous (non gravid) females. A slight but constant decline during August / April / May / June. Insignificant sex difference was noted. (Bar diagram).

Another explanation for the high blood urea in *Rousettus*, is the high tolerance of bats for ammonium ions and high blood urea values in other hibernators may eventually lead to additional evidence for the role of protein catabolism as an energy source for mammalian hibernators including bats as stated by (Kristoffersson, 1963). Horst, 1969, have interpreted that the long loops of Henle are not only responsible for the concentration of urine but bat's kidney have 'cells' which concentrate urine without the long loops of Henle.

Some authors have emphasized for the high urea in the blood serum to the high protein diet (Mc Farland and Wimsatt, 1969). According to them the vampire bats, feeding on blood, represents the mammals with the diet richest in protein, 85.5% combined with lowest fat, 1% and carbohydrate, 1.7% content. Following feeding the authors observed a significant rise in the urea concentration from 27–57 millimoles per litter. This is not true for *Rousettus*, since it is a fruit eating bat but our reading tallies with the earlier reading (27mg% in *Desmodus*) representing the high values.

Finally it can be concluded that slowed renal function elevates blood urea values. And as the other serum constituents blood urea values are fluctuable according to age, sex, breed, season, stress, reproductive state, general health of the animal, captivity, the method of capture, water conservation capacity of the kidney, diet and of course the amount of protein consumption.

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