ORIGINAL ARTICLE

EFFECT OF EXPERIMENTAL VARIATION OF TEMPERATURE ON SERUM TRIGLYCERIDES IN *UROMASTYX HARDWICKII*

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Background: The study has been performed on *Uromastyx hardwickii*, a local lacertilian species. This male Poikilotherm vertebrate mainly inhabits the arid regions of the Indo-Pakistan subcontinent. The objective of this study was to see whether artificially created high temperature in winter can increase triglycerides level in this species, as it is normally seen in summers. **Material and Methods:** This study was conducted in Oct 2005 and Jan 2006 in Physiology Lab, University of Health Sciences, Lahore. Male *Uromastyx hardwickii* (n=20) were kept for this study carried out in autumn and winter within 48 hours of their arrival in the laboratory. Blood samples were collected by anterior abdominal venepuncture from conscious animals using a heparinised syringe and serum Triglyceride was measured by GPO-PAP method (Human, Weisbaden, Germany). **Results:** Mean serum Triacylglycerol levels were found to be significantly higher in summer and with an increase in temperature observed during winter and autumn season. **Conclusion:** There is significant increase in serum triglycerides in *Uromastyx hardwickii* on artificial increase in temperature even during winter season.

Keywords: Temperature, *Uromastyx hardwickii*, Triglycerides, Poikilotherm Vertebrate

INTRODUCTION

In many lizards and generally for many terrestrial ectotherms body temperature tends to vary with environment and thus affect, performance of physiologically important tasks.[1] It is possible that after a change in ambient temperature, membrane fluidity maintenance could be associated with adaptation involving change in membrane lipid characteristics.[2] A study on oviparous lizard *Phrynocephalus przewalski*, has demonstrated that lipid characteristics of tissues are influenced by ambient temperature. Significant differences were observed in the contents of lipids in the heart, liver, muscle and brain at different temperatures (4 °C, 25 °C, 38 °C). Serum TAG (Triglycerides) was also found to be increased at high temperature.[3]

Studies on temperature induced alteration in the liver of wall lizard show that reptiles are good models for studying temperature in biological systems. Since reptiles are poikilothermic animals, they are incapable of maintaining a constant body temperature. The hepatocytes of animals (lizards) exposed to higher temperature produce lipid inclusions than animals exposed to low temperatures. This data shows the morphological and functional plasticity of hepatocytes to temperature adaptation of *Hemidactylus frenatus* lizard.[4]

Studies in the lizard found in the tropical parts of Australia, show changes due to acclimatization response to environmental temperatures, which is due to decreased food or seasonal hormonal cycles.[5] Hamsters which resemble with *Uromastyx* due to their common physiological properties (cold blooded and brown fat tissue) when kept at increased ambient increase their preference for saturated fats.[6] Daily and seasonal activity of sleepy lizard, *Tiliqua Rugosa*, shows that these lizards are more active in winter and spring seasons. In summer they are active in early mornings but in all other seasons they are almost inactive.[7]

The objective of this study was to assess whether artificially created high temperature in winter can increase triglyceride level in this species, as it is normally seen in summer.

MATERIAL AND METHODS

This experimental study was conducted on *Uromastyx hardwickii* in Oct 2005 (pre-hibernation period) and Jan 2006 (hibernation period) in Physiology Lab, University of Health Sciences, Lahore. A total of 20 male animals with snout vent length >15 Cm and body weight (263.4±16.6 Gm) were used. In October (room temp 24 °C), 5 animals were kept at room temperature and another 5 were kept in a temp regulated cabinet at 35 °C. In January (room tem 11 °C) another 5 animals were kept at room tem and the remaining 5 were kept in temp regulated cabinet at 35 °C. All animals were sacrificed after 7 days for standardisation of environmental conditions. They were fed on corn seeds and bits of cucumbers. Water was provided *ad libitum*.

Two ml of blood samples were obtained by abdominal venepuncture from conscious animals and immediately centrifuged at 10,000 rpm and serum was stored at -4 °C until analysed. The samples were taken only once from each animal.

Serum triglycerides were measured by GPO-PAP Method, Human, Weisbaden, Germany. Triglycerides were determined after enzymatic hydrolysis with lipases. The indicator used was quinoeimine formed from hydrogen peroxide, 4´amino-antipyrine and 4´chlorophenol under the catalytic influence of peroxidase 88. Reagents were warmed and

cuvetted to 37 °C. Temperature was kept constant during the test. The reagents were then mixed and incubated for 5 minutes at 37 °C and measured the absorbance of standard and the sample against the reagent blank.

The data were analysed using SPSS-16. Mean±SEM was determined for triglyceride. The mean difference for the two groups was determined by Student's *t*-test. Tukey test was applied to study that which group mean differs and $p<0.05$ was considered statistically significant.

RESULTS

Table-1 shows variations in mean serum triglycerides concentration with an increase in temperature during winter season (11 °C) compared to the values at ambient temperature. However, increased temperature showed no effect on serum triglyceride level in autumn.

Table-1: Effect of temperature on serum triglycerides in *Uromastyx hardwickii* (mg/dL, Mean±SEM)

	Groups		
Temperature	**Experimental**	**Control**	***p***
January (11 ºC)	89.7±4.6	66.8±3.9	<0.05
October (24 ºC)	85.3±4.1	85.5±5.7	>0.05

DISCUSSION

Serum Triacylglycerol (TAG) levels show significant ($p<0.05$) changes throughout the year. Serum TAG levels are higher in summer and minimal values are seen in winter months. Decline in TAG levels in winter season has been reported in other reptilian species.[8] It has previously been shown that in cold acclimatised hamsters, approximately 50% lipids from the brown fat tissue are depleted during arousal. It is surmised that the heat produced by the combustion of the lipid during arousal process could be the major factor of the heat needed to re-warm the animal following hibernation.[8] There are significant ($p<0.05$) changes seen in serum TAG levels in winter season when animals are exposed to high and low temperature. Serum TAG increased at high temperature in winter as compared to serum TAG at low temperature. Highest TAG value has been recorded from the muscle at high temperature. High TAG may supply energy when lizard crawl and contract strongly their muscle during high temperature.[9]

So at low temperature, lipids decrease and it is correlated with lizard *Hemidactylus frenatus*, where these animals showed a decrease in lipid level. These lipids decreased in winter due to increased utilisation for reproduction and production of heat to re-warm the animals during hibernation.[4]

CONCLUSION

Serum triglycerides concentration increases significantly with an increase in temperature during winter season in temperature controlled cabinets compared to values at ambient temperatures. In autumn, increased temperature shows no effect on serum TAG levels.

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