

**LACTATE DEHYDROGENASE ACTIVITY IN DIFFERENT TISSUE OF *CROCOTHERMIS SERVILA* DURING PRE AND POST EMBRYONIC DEVELOPMENT**

**Kiran Kumari**

Gyatri Colony, Sant Kabir Road, Banuchhapar,  
Bettiah, West Champaran

**ABSTRACT**

LDH is key enzyme involved in The anaerobic oxidation of NADH to NAD under various stress conditions as well as in certain diseases and increase in LDH activity has been reported in human serum and muscle, similar increase in the LDH activity has been reported from the body of fish exposed to different chemicals. In the present work, the LDH activity in body haemolymph, fat bodies ovaries and testes has been investigated. It has been found that there is steady rise in the total body lactate dehydrogenase concentration with increase in body weight. Significant rise was observed in total body LDH concentration of 6<sup>th</sup> instar nymph maintaining a rising trend in the adult insect. The variation was discussed in the light of available literature.

**KEYWORDS:** Fat body, Haemolymph, LDH, Ovary, Testis.

**INTRODUCTION**

For aerobic oxidation of NADH<sub>2</sub> to NAD Lactate dehydrogenase (LDH) is the key enzyme. Pyruvate and NADH<sub>2</sub> which is formed during aerobic respiration of glucoses by glyceraldehyde 3-phosphate in both the plant and animal tissue The aerobic oxidation of pyruvate take place in mitochondria through Krebs cycle the reduced NADH<sub>2</sub> (Cofactor) also enters the mitochondrial membrane to get oxidized back to NAD by atmospheric Oxygen Via electron transport system. However, under anaerobic condition in actively contracting skeletal muscles, the NAD generated in glycolysis cannot be reoxidized by oxygen but must be oxidized to NAD by pyruvate itself converting pyruvate into lactate. The reduction of pyruvate by NADH<sub>2</sub> to form lactate is catalysed by lactate dehydrogenase.

A large number of literatures are available on biochemical investigation of lactate dehydrogenation in the tissue of different animals but biochemical investigation of lactate dehydrogenation in the pre and post embryonic state of insects are scanty the kinetic properties of lactate dehydrogenase depend upon the physiological diversity of different organs in man reveals its diagnosis importance. Markent in 1955, Kaplan 1963 and Bannister 1980, Radha 1989, Rekha *et al.* 2000, Kumar 2002 observed that LDH occurs in vertebrate tissue as at least five different isoenzymes separable by electrophoresis and it also exists in human serum. In insects, carbohydrate metabolism follows somewhat different pattern with regard to the different enzymes. Zebe and Mc Shan (1957) have measured in vitro the activity of a glycerophosphate dehydrogenase and lactate dehydrogenase prepared from various insect muscles. They found a high level of glycerophosphate dehydrogenase activity and relative low level of lactate dehydrogenase activity. So, a little information is available with regard to the concentration of these enzymes and its fluctuation under the various conditions in insects. The present study attempts to investigate the involvement of lactate dehydrogenase in pre and post embryonic conditions of insects.

**MATERIALS AND METHODS**

For Quantitative estimation of lactate dehydrogenase in haemolymph body homogenate was done by colorimetric method of king (1942) The reagent used for estimation of lactate dehydrogenase are glycine buffers, Buffer substrate solution, NAD solution 2'4' Dinitrophenyl Hydrozine reagent, sodium Hydroxide (OAN) Solution, Standard Solution pyruvate solution, Reduce Nicotinamide Adenine Dinucleotide solution. The haemo lymph from treated and control was collected. The whole procedure was down mentioned by king (1966).

**RESULTS AND DISCUSSION**

Lactate dehydrogenase activity in different Stage of *Crocothermis servila* was studied (Table 1, 2 and 3; figure 1, 2 and 3). It's activity in the haemolymph fat body, ovary and testis of mature and immature insects as revealed by calorimetrically were as follows:-

Total Body LDH concentration in different stages –

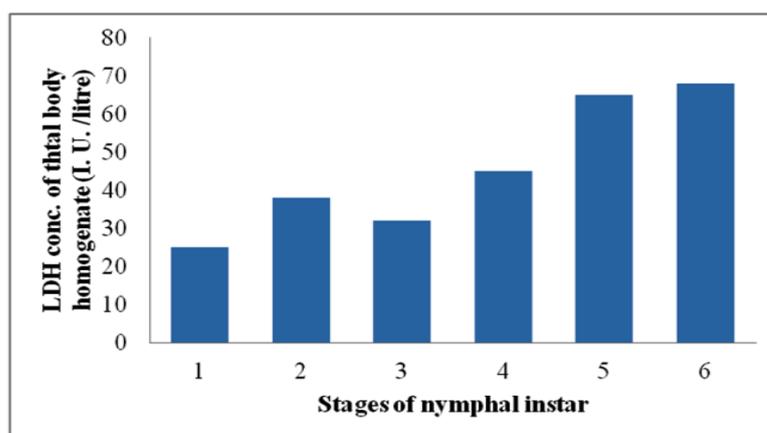
Lactate dehydrogenase activity in the homogenate of 1<sup>st</sup> nymphal instar and 2<sup>nd</sup> nymphal instar was 25+31 u/liter and 38+3.5 u/liter respectively.

The 2<sup>nd</sup> nymphal showed a significant rise in the concentration (P<.001).

The 3<sup>rd</sup> instar nymphal showed a decline in the total body LDH concentration 32+3.1 u/liter from the 2<sup>nd</sup> instar nymph. Total body LDH concentration from 4<sup>th</sup> nymphal instar to 6<sup>th</sup> nymphal instar showed a gradual rise. The LDH concentration of 4<sup>th</sup> nymphal instar 5<sup>th</sup> nymphal instar and 6<sup>th</sup> nymphal instar were 45+6.1 u/liter (P<.001) and 68+5.1 u/liter respectively. The 6<sup>th</sup> instar nymph showed a significant rise in concentration (P<.001) over the 5<sup>th</sup> nymphal instar.

**Table – 1. LDH concentration of body homogenate of different nymphal stages of *Crocothermis servilia* (Drury)**

Stages	LDH concentration of body homogenate (I. U./litre)
1 <sup>st</sup> nymphal instar	25 ± 3
2 <sup>nd</sup> nymphal instar	38 ± 3.5
3 <sup>rd</sup> nymphal instar	32 ± 0
4 <sup>th</sup> nymphal instar	45 ± 5
5 <sup>th</sup> nymphal instar	65 ± 6
6 <sup>th</sup> nymphal instar	68 ± 5



**Figure 1. Shows the LDH concentration of body homogenate of different nymphal stages of *Crocothermis servilia* (Drury)**

#### Adult Female

LDH Concentration activity in haenolymph of immature and mature female of 115±8 1.U/Liter and 35±8.5 IU/Liter respectively Adult female showed a significant rise in LDH concentration (P<0.001)

#### Fat Body

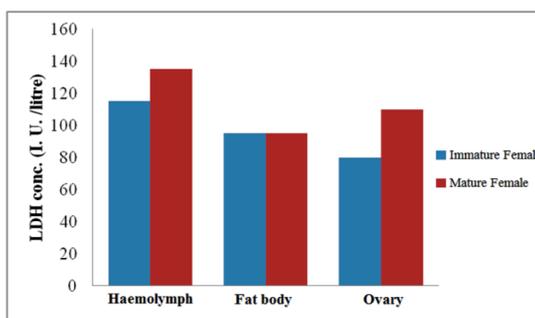
The fat body of immature and mature female was LDH Concentration of 95±6 1.U/Liter and 95±5 1.L/Liter respectively. Fat body LDH concentration showed mature and immature female.

#### Ovary

Ovarian LDH Concentration of immature female and mature female showed a different picture. There were a higher (P<.001) Concentration in mature ovary (110+6 1.U/Liter) then the immature ovary (80+5 1.U/Liter).

**Table 2. LDH concentration in haemolymph, fat body and ovary of adult female (Immature and Mature) of *Crocothermis servilia* (Drury)**

Tissue	Immature Female	Mature Female
Haemolymph (I. U./litre)	115 ± 8	135 ± 8.5
Fat body (I. U./litre)	95 ± 6	95 ± 5
Ovary (I. U./litre)	80 ± 5	110 ± 6



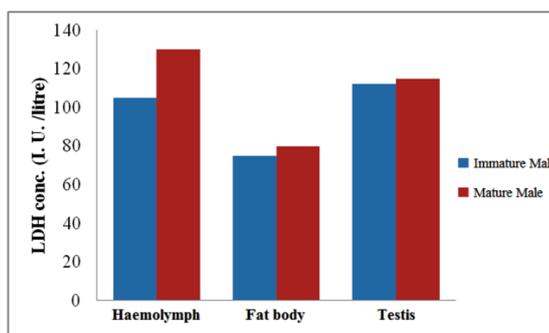
**Figure 2. shows the LDH concentration in haemolymph, fat body and ovary of adult female (Immature and Mature) of *Crocothermis servilia* (Drury)**

### Adult Male

The LDH activity in the haemolymph of immature and mature male was 105±5 1.U/Liter and 130±8 1.U/Liter respectively The LDH concentration in fat bodies of both immature and mature male of *C. servilia* was 75±5 1.U/Liter and 80±5 1.U/Liter respectively Fat body of immature male showed a lesser LDH concentration than The Fat Body of mature male. In the mature and mature testes LDH concentration were 112±8 1.U/Liter and 115±8 1.U/Liter respectively.

**Table 3. LDH concentration in haemolymph, fat body and testis of adult male (Immature and Mature) of *Crocothermis servilia* (Drury)**

	Immature Male	Mature Male
Haemolymph (I. U./litre)	105 ± 5	130 ± 8
Fat body (I. U./litre)	75 ± 5	80 ± 5
Testis (I. U./litre)	112 ± 8	115 ± 8



**Figure 3. Shows LDH concentration in haemolymph, fat body and testis of adult male (Immature and Mature) of *Crocothermis servilia* (Drury)**

## DISCUSSION

LDH is the key enzyme involved in the anaerobic oxidation of  $\text{NADH}_2$ , to NAD. The reaction occurs in the cytosol of the cells and the hydrogen atoms are received by pyruvate molecule which reduced lactate in turn. In the present study, *C. servillia* have nymphal instars in the life history. There was a steady rise in the total body lactate dehydrogenase concentration which gradual increase in the body weight was found. There was a sudden and significant rise in the total body LDH concentration of 6<sup>th</sup> instar nymph maintaining a rising trend in the adult insect. It was concluded that gradual rise in LDH activity confirmed that LDH was a rate limiting step in insect development. The lactate dehydrogenase activity in haemolymph of immature and mature female was  $115 \pm 8$  and  $115 \pm 8.5$  of haemolymph respectively. The mature and immature male had relatively low LDH activity of  $105 \pm 5$  and  $130 \pm 8$  respectively. Thus there was sex wise variation in LDH activity but lacking of the stage wise variation noted in *C. servillia*.

The fat body of adult female insect had a greater LDH concentration than that of the adult female. The mature ovary/testis had much greater LDH activity than that of immature ovary or testis. Overall rise in LDH activity in all stage of both male and female might be due to their great dependence upon energy produced by glycolytically. The relative activities of dehydrogenase may also be related to the function and energy yielding demand of tissues. The finding is in accordance with the works of Chefurka, 1965 Kilby 1965; King, *et al.* 1942; Kim, *et al.* 1981; Rekha, *et al.* 2000; Khan, *et al.* 1998; Kumar and Ehteshamuddin 2002; Srivastava, *et al.* 1991; Zabe, *et al.* 1957; Vogell *et al.* 1959; Zeba and Shan, 1951. Rising in LDH activity conforming the contention of Zeba and Shan (1953) that the lactate dehydrogenase was a rate limiting step in glycolysis in insects. Thus the activity of enzymes belonging to different metabolic route but competing for common substrate appears to be an important factor determining the metabolic rate of the substrate. This was also supported by Kubista, 1957 and Khan, 1996.

## REFERENCES

- Chefurka W. (1965).** Physio of insecta; academic press, New York and London.
- Kilby B. A. (1965).** Intermediately metabolism and the insect fat body. In Aspects of insect biochemistry, T.W. Door Win, ed.
- Kim Hak Ryal and Ful Wonsoe (1981).** Changes of heamolymph protein during metamorphosis of *Plenis rape*. *Korean. J. Entomol.*
- Rekha S. Misbahuddin and S Ehteshamuddin (2000).** Effects of Phosphamidol on the Alkaline phosphatase Activity in the Haemolymph of sap feeding insect pests *Aspongopus* and *Janus*, *crysocoris stollii* and *Dysdercus cingutus*. *Environ. Ecology.*
- SaiffuIa Khan N. Choudhary Chanda Kumari and Syad Ehteshamuddin (1998).** Effect of DDT on the haemolymph fat body and ovary protein and amino acid concentration in mature cybister confuses sharp.
- Shailesh Kumar and Syad Ehteshamuddin (2001).** Effect of corpus aiiatum hormone and brain on LDH activity in cybister confuses. *J. Natcon.*
- Srivastava R., Sharma S., Shah U. N. and Ehteshamuddin S. (1991).** Protein, free amino acids and glycogen in the haemolymph and fat body to *Hydrophilous olivaceous* in relation to starvations. *J. Fresh water Biol.*
- Zebe E. C. and McShan W. H. (1957).** Lactic and alpha-glycerophosphate dehydrogenases in insects. *J. Gen. Physiol.* 40. 779-790.