

Evaluation of serum biochemical markers of skeletal muscle damage during hypobaric hypoxic stress

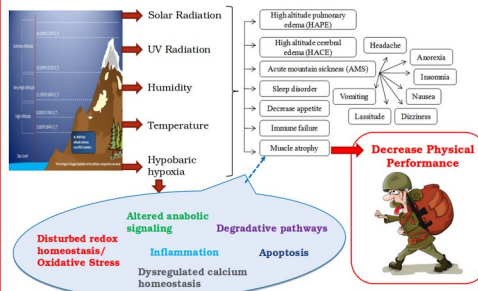
Richa Rathor and Geetha Suryakumar

Defence Institute of Physiology and Allied Sciences (DIPAS), DRDO, Ministry of Defence, New Delhi - 110054, India



***Corresponding author: Dr. Richa Rathor, Scientist 'F', e-mail: richa110in@gmail.com**

High Altitude Stress associated adverse environmental factors



Aim of the Study

The present study was planned to search out possible serum biomarkers which changed due to hypobaric hypoxia induced skeletal muscle damage.

Experimental Design

Male Sprague Dawley rats

**Normoxic control rats (n=5)
200 ± 20gm**



**Hypobaric hypoxia exposed rats
(25,000ft, 07 days) (n=5)**

• For hypobaric hypoxia exposure, rats were exposed to animal decompression chamber maintained at a low atmospheric pressure of 282 torr (equivalent to an altitude of 7620m, 8% oxygen).

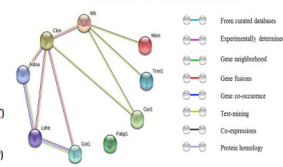
• Following exposure, the animals were sacrificed. Further, blood and muscle were excised for biochemical analysis.

Results.....

Biochemical markers of muscular damage

- ✓ Creatine phosphokinase (CPK)
- ✓ Lactate dehydrogenase (LDH)
- ✓ Aldolase
- ✓ Myoglobin
- ✓ Troponin
- ✓ Aspartate aminotransferase (AST)
- ✓ Carbonic anhydrase (CA)
- ✓ Fatty acid-binding protein (FABP)
- ✓ Myostatin

Bioinformatics networking by STRING v12.0 Software



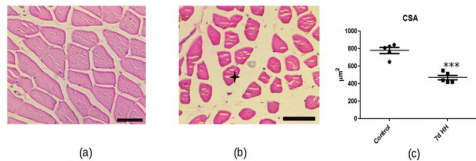
The score among the proteins. Highest confidence: 0.900

Node1	Node2	Node1 accession	Node2 accession	Score
Ldhb	Got1	ENSRNOP00000017965	ENSRNOP00000022309	0.982
Mb	Ckm	ENSRNOP000000006184	ENSRNOP00000022895	0.873
Ldhb	Aldoa	ENSRNOP00000017965	ENSRNOP00000032320	0.870

Hypobaric hypoxia induced muscle damage related marker???

Results.....

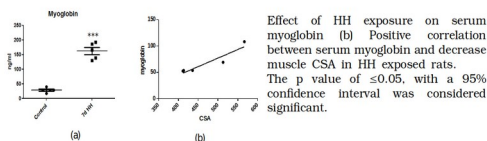
Effect of hypobaric hypoxia on skeletal muscle architecture



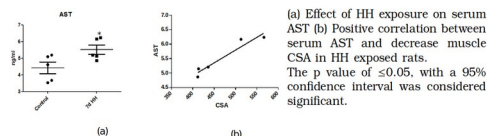
Effect of hypobaric hypoxia on skeletal muscle architecture (a-b) Photomicrograph of a transverse section (T.S.) of skeletal muscles (4 μm) from hind limb of rats, stained with Haematoxylin & Eosin. Control rats showed uniform muscle fibre size, thin endomysium, intact sarcoplasm with peripheral nuclei and 07d HH exposed rats showed significant decrease in muscle fibre size, centrally placed nuclei (indicated by *). (c) Quantification of histological images by Image J software. All values are Mean ± SEM (n = 5). Magnification-40X; Scale Bar-20 μm. ***p < 0.001 vs control.

Results.....

Myoglobin positively correlates with HH induced muscle atrophy



HH induced muscle atrophy correlates with aspartate aminotransferase (AST)

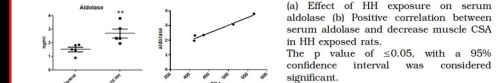


Results.....

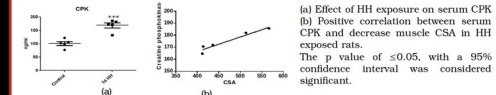
Lactate dehydrogenase (LDH) correlates with HH induced muscle atrophy



Aldolase significantly correlates HH exposed muscle atrophy



Creatine phosphokinase (CPK) significantly correlates HH exposed muscle atrophy



Conclusion.....

➤ The current study demonstrated that HH induced muscle damage was accompanied by increase in CPK, LDH, AST, aldolase and myoglobin on 07d HH exposure.

➤ These molecules present in muscle, considered as a key players of muscle activity and aerobic respiration. An increase level of these molecules in serum during hypobaric hypoxia (HH) could depict the muscle damage under compromised oxygen saturation level. Hence, these molecules might become markers for HH induced muscle damage.

Thank you