ACUTE EFFECT OF AN INCREASED FRACTION OF INSPIRED OXYGEN ON ACID-BASE BALANCE DURING EXHAUSTIVE CONSTANT LOAD TESTS IN HIGHLY TRAINED ATHLETES.

Lemieux Laurence L.¹, Norris Stephen R.², Kolb Jon C.², Smith David J.²

(Faculty of Kinesiology, University of Calgary ¹, University of Calgary ², Canada)

It has been demonstrated that an increase of the fraction of inspired O₂ (FIO₂) increases PO₂ and SO₂. At exhaustion, there is evidence that HCO₃⁻ and pH are unchanged by an increased FIO₂ (Ekblom et al., 1975) and that the blood lactate (BLA) response is not as clear. It has been reported that BLA is similar (Linossier et al., 2000) in hyperoxia (HYPER) and normoxia (NORM) although BLA may have a tendency to be lower at exhaustion in HYPER (Nielsen et al., 1998). The purpose of this study is to examine the influence of an elevated FIO₂ (0.45) on blood gas measurements during exhaustive constant load tests (ET) in highly trained males. 12 subjects (Age: 28±8yrs, Wt: 72.4±5.3kg, Ht: 177.3±5.2cm, VO₂peak: 4.42±0.30L·min⁻¹, MAP: 381±22W) performed one maximal incremental cycle test (Gxt) and 12 ET: three times a series of four ET corresponding to 144, 113, 91 and 84% of maximal aerobic power (MAP). Series 1 (PRE) was performed in NORM, series 2 was in HYPER (0.45) and series 3 (POST) was again in NORM. The order of tests within each series was randomized. For each of the ET, 3 125uL arterIALIZED blood samples were taken at the ear during rest, prior and post wash-in period (pre test), as well as immediately post exercise (Impo). Blood lactate, pHcorr (corrected for tympanic temperature), PO₂corr, PCO₂corr, SO₂, HCO₃⁻, pulse oximetry (temporal sensor) and heart rate (Hr) were measured. Time to exhaustion was significantly increase by HYPER compared to PRE (PRE: ET1: 64±9s, ET2.5: 139±20s, ET6: 346±51s, ET10: 580±82s vs HYPER: ET1: 75±8s, ET2.5: 182±35s, ET6: 630±179s, ET10: 1061±229s) corresponding to an improvement of 17, 31, 82 and 83% respectively. PO₂ and SO₂ were significantly higher in HYPER when compared to PRE and POST both in pre test and Impo for all ET. Impo PO₂ was significantly higher in PRE and POST when compared to pre test for all ET except PRE ET6. Impo pH and HCO₃⁻ was significantly higher in HYPER when compared to PRE and POST during the ET6 and ET10. Impo BLA was significantly lower in HYPER when compared to Pre and POST for ET10. Impo BLA was significantly lower in POST ET6 when compared to PRE. All other Impo BLA were not affected by condition. Hr was not affected by condition, but all Hr were significantly lower than Hrmax measured during the Gxt. No training affect was found when ventilation measurements during ET2.5 PRE and POST were compared. These findings differ somewhat from previous literature stating that no differences exist in acid-base balance between NORM and HYPER at exhaustion. That is, although no differences between the NORM and HYPER were found for the ET1 and 2.5, our findings suggest that there may be other factors that would cause termination of high intensity exercise in the longer tests.

References

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