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ABSTRACT

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Training at moderate altitude (~1800m) is often used by athletes to stimulate muscle hypoxia. However, limited date is available on peripheral muscle oxidative metabolism at this altitude (1800AL). The purpose of this study was to determine whether acute exposure to 1800AL alters muscle oxygenation in the vastus lateralis muscle during resistance exercise. Twenty young active male subjects (aged 16 - 21 yr) performed up to 50 repetitions of the parallel squat at 1800AL and near sea level (SL). They performed the exercise protocol within 3 h after arrival at 1800 AL. During the exercise, the changes in oxygenated hemoglobin (OxyHb) in the vastus lateralis muscle, arterial oxygen saturation (SpO₂), and heart rate were measured using near infrared continuous wave spectroscopy (NIRcws) and pulse oximetry, respectively. Changes in OxyHb were expressed by Deff defined as the relative index of the maximum change ratio (%) from the resting level. OxyHb in the vastus lateralis muscle decreased dramatically from the resting level immediately after the start of exercise at both altitudes. The D_{eff} during exercise was significantly (p < 0.001) lower at 1800AL (60.4 \pm 6.2 %) than at near SL (74.4 \pm 7.6 %). SpO₂ during exercise was significantly (p < 0.001) lower at 1800AL (92.0 ± 1.7 %) than at near SL (96.7 \pm 1.2 %). Differences (SL - 1800AL) in D_{eff} during exercise correlated fairly strongly with differences in SpO₂ during exercise (r = 0.660). These results suggested that acute exposure to moderate

Effect of Moderate Altitude on Peripheral Muscle Oxygenation

altitude caused a more dramatical decrease in peripheral muscle oxygenation during leg resistance exercise. It is salient to note, therefore, that peripheral muscle oxygenation status at moderate altitude could be evaluated using NIRcws and that moderate altitudes might be effectively used to apply hypoxic stress on peripheral muscles.

Key words: NIRcws, muscle oxygenation, moderate altitude, parallel squat, SpO

Key Points

- The change in muscle oxygenation during the parallel squat at 1800 altitude and near sea level was investigated using near infrared continuous wave spectroscopy (NIRcws)
- The muscle oxygenation during exercise at 1800 altitude decreased more dramatically compared to sea level.
- NIRcws could help to provide a better understanding of exercising muscle metabolism at moderate altitude.

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