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CHEST MECHANICS AND RESPIRATORY CONTROL DURING 5-DAYS DRY IMMERSION

Abstract

It is well known that microgravity affects on lung and chest wall mechanical properties (Paiva et al., 1989; Wantier et al., 1998, Prisk, 2000). We had observed the increased contribution of abdomen to tidal volume as well as the shifts in sensitivity of respiratory control during long-term spaceflights (Baranov et al., 2009). However there were no sufficient data about the chest mechanics and respiratory control of ventilation in dry immersion as a ground-based model of microgravity. The aim of the study was to investigate the effect of 5-days dry immersion on respiratory function, chest mechanics and respiratory control parameters in humans (Prof. I.B. Kozlovskaya was the PI of the immersion experiment). We observed seven volunteers before (in sitting position), on the 2nd and 4th days of dry immersion and after the end of exposure (in 7-8 hours in sitting position). The lung volumes and flows, including vital capacity (VC), inspiratory and expiratory reserve volumes (IRV and ERV respectively), minute ventilation, breathing rate, forced vital capacity (FVC), breath-hold time (BHT) were measured by spirometric system "Respiration-1". We also estimated the ability for voluntary control of breathing movements by the spirokinography method (Minyaev, 1994, 2010). The contribution of thorax and abdomen to lung volumes was measured by special belts, included in the equipment. The technique we've used was constructed especially for use on ISS board. The breathing pattern didn't alter during the exposure in comparison with baseline data: there were no changes in volumes and flows, breathing rate at tidal breathing. VC had no changes too, but IRV increased (on average 36Thus the dry immersion causes the changes in reserve volumes, the increase the abdomen contribution in lung volume and improvement in voluntary control of breathing movements. These results are similar to those observed in spaceflight studies.