Analysis of indirect calorimetry with wild-type mice and Tbc1d4-deficient mice by using TSE metabolic cages

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Abstract

The TSE metabolic cages (TSE System) is a fully computerized and electronically controlled system to investigate indirect calorimetry in mice. The mice are enclosed by an air-tight case that can be connected to a fully automatized indirect gas calorimetry system. During the measurement (usually for 3 days) the calorimetric parameters, such as oxygen consumption (VO2), carbon dioxide production (VCO2), respiratory exchange ratio (RER) were measured at fixed intervals. In this experiment, with the aid of this TSE metabolic cages, it was investigated to define the difference between wild-type (WT) mice and Tbc1d4 knockout (D4KO) mice and between sedentary group and exercised group. Totally 35 mice were on high-fat diet (60 cal% fat), the exercised group (WT and D4KO) were subjected to 4-week regular exercise training on treadmills. In the second last week of exercise period, the indirect calorimetry was performed. As a result, RER value in WT and D4KO mice was reduced during the authentic measurement period (24 hours after adaptation period: Light phase 2 and dark phase 2). Interestingly, the RER value in D4KO mice was higher than WT mice. During the measurement period, it was shown that each exercised group has lower RER value in light phase but higher RER value in dark phase than each sedentary group. Regarding spontaneous physical activity (SPA), it is shown that all mice show generally higher activity in dark phase than light phase. Interestingly, WT exercised mice were more active than sedentary mice, whereas D4KO exercised and sedentary mice did not show a notable difference. Regarding VO2 max value, WT exercised mice show the higher value than sedentary mice, whereas there is a little increase between D4KO exercised mice and sedentary mice. In regards to food intake, it is shown that D4KO mice consumed more feed than WT mice during the measurement period. Additionally it is also shown that the exercised group shows that they consumed more food compared to sedentary group.

Keywords: *Calorimetry,Tbc1d4, VO2, VCO2, RER, food intake, Mice exercise training, spontaneous physical activity*