Responses in energy balance to high-fat feeding in mice selectively bred for high wheel-running activity

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A novel animal model of hypothalamic obesity cinter-ventromedial nucleus lesions

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It is well recognized that hypothalamic obesity was produced not only by the destruction of bilateral ventromedial nuclei (VMH) but also by the destruction of several sites such as bilateral paraventricular nuclei(PVN), arcuatal nuclei(ARN), dorsalateral tegmental regions (DLH),area between VMH and lateral nuclei(LH) and hypothalamic island. We developed a novel hypothalamic obesity by the destruction of Inter-VMH(between VMH nuclei).The coordinates of Inter-VMH lesions, which destroyed the area between bilateral VMHs, were at 2.8mm posterior to bragma line, anteriorly, 0.5mm lateral to midsagital line, laterally and 0.5mm above the base of the skull, vertically. VMH lesions was produced by the destruction of the same coordinates except 0.7mm lateral to midsagital line, laterally. Two weeks after Inter-VMH and VMH lesions, both lesioned rats showed similar significant increased daily food intake, body weight gain and serum leptin concentration compared to control rats, but Inter-VMH lesioned rats showed less increased serum insulin concentration than VMH lesioned rats. Inter-VMH lesioned rats showed similar proliferating cell nuclear antigen (PCNA) positive cells in small intestine, stomach, pancreas to control rats, however, VMH lesioned rats showed more PCNA positive cells in these organs. In summary, Inter-VMH lesioned obesity is probably produced by cutting of the pathway of -MSH neuron between PVH and ARH, which leads to remarkable hyperphagia. VMH lesioned rats is produced by derangement of autonic nervous system which leads to remarkable hyperinsulinemia and cell proliferation in visceral organs mainly through vagal hyperactivity.

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Increased dietary fat intake in combination with a sedentary existence are precipitating factors for the development of obesity and the associated metabolic syndrome. Whereas most studies have investigated effects of exercise using 'forced' exercise protocols, in the present study we investigated the role of 'unforced' physical activity in the interaction between dietary fat and regulation of energy balance using selectively-bred mice which display a high level of voluntary wheel-running activity relative to control lines. Control and selected males and females were fed standard lab chow or an isocaloric 60% fat diet. All fat-fed mice rapidly increased in body mass and decreased food intake, with the exception of selected females. Selected females also were more glucose tolerant compared with the other groups on the standard diet, but became more glucose intolerant on the fat diet. The other groups did not developed glucose intolerance on the fat diet. Leptin (corrected for fat content) levels were not affected by diet or selection, but adiponectin levels were increased in selected mice on the fat diet. Insulin levels increased on the fat diet in control females and both groups of males, but not in selected females. Selected females fed a high-fat diet thus did not develop diet-induced obesity and became slightly glucose intolerant. These results will be discussed with relation to expected changes due to increased spontaneous activity. Mice selected for high spontaneous wheel-running activity are an attractive model for further investigating mechanisms involved in the metabolic syndrome and associated type 2 diabetes mellitus.

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Medgem hand-held indirect calorimeter is valid for resting energy expenditure measurement in Korean

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Aims: The purpose of this study is to assess validity of a hand-held indirect calorimeter in the determination of resting metabolic rate (RMR) in Korean.
Methods: Thirty-five healthy adults (13 men and 22 women) were included for this study (mean BMI: 31.4±3.4, mean age: 39.9 ±14.9). They arrived at hospital between 6:00 ~ 6:30 AM after overnight fast and rest in supine position for 30 minutes before testing. RMR was measured using both a conventional indirect calorimeter (Sensormedics Vmax229, Yoba, Linda, Cal, USA, Ventilated hood system) for 30-minute measurement period and a hand-held indirect calorimeter (MedGemTM, MG, HealthTech Inc, USA) for 10-minute measurement period.
Results: There was no difference in resting metabolic rate between the two methods (1711.4 ± 317.7 vs 1677.4 ± 430.9 kJ/d for Sensormedics Vmax 229 and MedGem, respectively). The resting metabolic rate measures by MedGem and Sensormedics Vmax229 did not show difference at any BMI classification.
Conclusions: The hand-held indirect calorimeter shows promise as a valid tool in the assessment of REE in Asian adults.

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Insulin resistance is associated with elevated resting energy expenditure in pre-pubertal children – a longitudinal study

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Background: Resting energy expenditure (REE) has been shown to be higher in adults with type 2 diabetes and impaired glucose tolerance, and has been found to be associated with insulin resistance (IR), independently of obesity. Little is known of these relationships in young children in whom obesity and diabetes are rising.
Aim: To investigate the relationships between REE, obesity and IR in young children.
Methods: REE by indirect calorimetry, fat-free mass (FFM) and fat mass (FM) by DEXA, and HOMA-IR measured in a cohort of 172 children at age 7 (± 0.3y), and repeated at 8y and 9y.
Results: 1. REE was associated with FFM and FM at all time-points (all $r > 0.32$, all $P < 0.002$). 2. At age 7y and 8y there were no statistically significant correlations between IR and REE independently of body composition (all $r < 0.2$, $P > 0.07$). 3. At age 9y a weak positive correlation emerged between IR and REE independent of body composition in boys but not in girls (boys: $r = 0.24$, $P = 0.01$, girls: $r = 0.02$, $P = 0.84$). REE was significantly higher in boys in the highest tertile of IR compared with the lowest tertile of IR, independently of body composition (1355 –v- 1456 kcal/day, $P = 0.01$).
Conclusion: By age 9y, in boys only, insulin resistance is associated with an elevated resting energy expenditure, which may indicate a higher risk for the development of type 2 diabetes.