



## P-26

### A NEW PORTABLE DEVICE TO MEASURE SWEAT RATE IN HYPERTHERMIA FOR FIELD STUDIES

Yu Ogawa<sup>1</sup>, Yufuko Kataoka Y<sup>1</sup>, Kazumasa Manabe<sup>1</sup>, Takamichi Aida<sup>1</sup>, Koji Uchida<sup>1</sup>, Yoshi-ichiro Kamijo<sup>1,2</sup> and Hiroshi Nose<sup>1,2</sup>

<sup>1</sup>Dept. of Sports Med. Sci, Shinshu Univ. Grad. Sch. of Med. and <sup>2</sup>Inst. for Biomedical Sci., Shinshu Univ., 390-8621, Japan.

Sweat rate (SR) in hyperthermia has been measured by a ventilated capsule method. However, this technique is only limited to an experimental chamber.

Here, we have developed a portable capsule to measure SR for the field test. 4 males and 5 females (28-78yrs) performed cycling exercise for 20-30 min at ~65 % peak oxygen consumption rate [30 °C  $T_a$ ; 50 % RH]. SR was measured with a ventilated capsule traditionally used on the left chest which was perfused with dry air at 1.5 l/min ( $SR_{vent}$ ; 12.6 cm<sup>2</sup> area) and a portable capsule on the right chest in which 4.8 g of silica gel was contained to absorb water vapor from sweat and two small fans were installed to mix the air in the capsule ( $SR_{pd}$ ; 8.4 cm<sup>3</sup> volume), while monitoring esophageal temperature ( $T_{es}$ ).

$T_{es}$  at rest was ~36.6 °C and increased by 1.1 °C by the end of exercise when  $SR_{vent}$  and  $SR_{pd}$  increased to ~0.8 mg/min/cm<sup>2</sup> and ~1.7 mmHg, respectively. The profile of  $SR_{pd}$  ( $x$ ) every 5 sec during exercise was almost identical to that in  $SR_{vent}$  ( $y$ ) in each subject (all,  $r > 0.99$ ,  $P < 0.0001$ ) with the slope and the intercept of the regression equations were  $0.49 \pm 0.05$  mg/min/cm<sup>2</sup>/mmHg and  $0.01 \pm 0.00$  mg/min/cm<sup>2</sup>, respectively. In addition, when we determined the  $T_{es}$  threshold for increasing  $SR_{pd}$  ( $TH_{pd}$ ) and the sensitivity of  $SR_{pd}$  in response to increased  $T_{es}$  ( $\Delta SR_{pd}/\Delta T_{es}$ ) and those for  $SR_{vent}$  ( $TH_{vent}$  and  $\Delta SR_{vent}/\Delta T_{es}$ ) in individual subjects, they were highly correlated ( $y = 1.11x - 3.99$ ,  $r = 0.98$ ,  $P < 0.0001$ ). Similarly, the slopes of  $\Delta SR_{pd}/\Delta T_{es}$  ( $x$ ) and  $\Delta SR_{vent}/\Delta T_{es}$  ( $y$ ) were  $1.7 \pm 0.3$  mmHg/°C and  $0.9 \pm 0.2$  mg/min/cm<sup>2</sup>/°C, respectively, and they were highly correlated ( $y = 0.82x - 0.47$ ,  $r = 0.90$ ,  $P = 0.0008$ ).

Thus, the portable device can be used to measure SR in hyperthermia, suitable for the field test.

**Key words:** sweat rate, continuous measurement, portable device, field.