THE EFFECT OF HAND HEATING BY A WARM AIR BOX ON DEEP VENOUS OXYGEN SATURATION AND BLOOD FLOW OF THE CONTRALATERAL ARM BEFORE AND AFTER A GLUCOSE LOAD.

Blak E.E., van Baak M.A., Kempen P.G., Sargs W.H.M.

Artificial increases in forearm blood flow is often used in studying forearm metabolism. Astnup et al (1) showed that heating of the hand by a warming blanket caused a redistribution of blood flow in the contralateral arm and thus introduced errors in forearm skeletal muscle flux calculations. The present study was undertaken to investigate how hand heating by a warm air box (30°C) would affect metabolism and blood flow in the contralateral arm before and after a glucose load. Eleven healthy volunteers (BM:SP, age: 22-41 yrs) underwent an oral glucose tolerance test (67.5 g) on two different occasions, once with and once without heating of the contralateral hand in random order. In the heating experiment, the heating was started after 30 min of supine rest. In both experiments, glucose was given after the rest and rectal temperature (ST and RT), deep venous oxygen saturation of hemoglobin (SaO2), forearm blood flow (FBF) and oxygen consumption of the forearm (O2-flux) were followed, every 15 (ST and RT) or 30 min (other), for 1 h before and for 3 h after the glucose load. Heating the hand for 30 min before glucose load did not affect ST, RT, SaO2, FBF or O2-flux. Although, after the glucose load, hand heating increased FBF (p<0.05), the integrated response after glucose was not significantly different between control and heating experiments (mean ±SEM: 67±4 vs 117±4 ml/min/100 ml tissue). With both conditions, there was an increase in the integrated response of ST (control: 398±80 vs 96±001) and FBF (control: 095±0.01 and heating: 095±0.05) after glucose intake. These responses did not differ significantly between the conditions. Also, there were no significant differences in other variables after the glucose load between the control and heating experiment. In conclusion, heating by a warm air box has no effect on deep venous oxygen saturation and little effect on forearm blood flow of the contralateral arm. Therefore, it is a reliable method for obtaining arterialised blood in forearm muscle studies.


Adress: Department of Human Biology, University of Limburg, Postbus 616, 6200 MD Maastricht, The Netherlands.

THE READINESS POTENTIAL AND CURRENT SOURCE DENSITY PRECEIVING SELF-PAIRED MOVEMENTS.

K.B.L. Böcker and C.H.M. Brunia

Preceding a self-paced movement the Readiness Potential (RP) can be recorded, starting 1.5 sec before movement onset. After a bilateral symmetric phase the RP is known to be larger contralateral to the movement side than hand movements and ipsilaterally dominant for foot movements. In this experiment 19 subjects performed self-paced brisk movements with each of the upper-limb segments successively. Both smoothed potentials and current source densities (CSD: Hjorth’s method) were subjected to an ANOVA with Response-side (R), Hemisphere (H), Limb (L) and Electrode position (E) as repeated measures. From 500 ms before movement onset onwards the potentials show significant R±L±H interactions (p<0.05). For the CSD data the R±L±H interaction starts at ~900 ms. For both data the early bilaterally symmetric phase of the RP is absent from the grand average CSDs which show a sink at the vertex together with a uniquely contralateral sink at lateral electrodes (from 1500 ms onward). The individual CSDs are also more consistent in this respect than the dominance in individual potential data (shown by C±R±L and R±L±L, respectively). For foot movements the CSDs do not show any lateratization at all, while the potentials become larger ipsilaterally at ~300 ms.

Co-operation center Tilburg and Eindhoven Universities, Tilburg University (Room P612), PO Box 90151, 5000 LE Tilburg, The Netherlands.

ROLE OF ALPHA AND BETA ADRENERGIC RECEPTORS IN THE SYMPATHETICALLY MEDIATED THERMOGENESIS IN MEN.

Blak E.E., van Baak M.A., Kempen P.G., Sargs W.H.M.

The study was intended to investigate the role of α1- and β-adrenergic receptor populations in the sympathetically mediated thermogenesis. For determining the role of the β-receptors, 10 healthy male lean volunteers (mean±SEM; age:25±1.7 yrs) were measured twice with 3-7 days in between. In random order, the β1-blocker atenolol (AT, bolus: 0.07 mg/kg bw, infusion: 0.1 mg/kg bw/h) or saline was infused. After 30 min, a continuous infusion of increasing doses of the β1- and β2-agonist isoprenaline (ISO: 5,10,20,40 mg/kg/bw/h, each dose for 30 min) was added. Whole body energy expenditure (EE) was measured by an open circuit ventilated hood system. There was a significant increase in EE after infusion of ISO-AT (for the different doses: 8.10 and 14% respectively, p<0.01) and an almost twofold higher increase after infusion of ISO only (respectively: 7,13,16 and 25%, p<0.001). Also, the increase in heart rate (HR) with ISO+AT was half of the increase with ISO. The effect of stimulation of α2-adrenoceptors on EE was measured in six healthy male lean volunteers (age:24.02±1.2 yrs) by infusing increasing doses of the α1-agonist phenylephrine (0.5,1,2 μg/kg bw min, each dose for 30 min). EE did not change, while blood pressure (BP) increased (p<0.001) and HR decreased (p<0.01). In addition to this study, the role of the α-receptors was investigated in six healthy male volunteers (mean±SEM: age: 25±1.6 yrs) by continuous infusion of the α1-agonists phenylephrine (2.5,10 μg/kg bw min, each dose for 30 min) with simultaneous infusion of the β1- and β2-blocker prazosin (bolus: 150 μg/kg bw, infusion: 0.6 μg/kg bw/min). There was no effect on EE, while BP increased (p<0.01).

In conclusion, in healthy male lean volunteers both β1- and β2-adrenoceptors are involved in the sympathetically mediated thermogenesis, while the α1- and α2- adrenoceptors do not play a role.

Adress: Department of Human Biology, University of Limburg, Postbus 616, Maastricht, The Netherlands.

EFFECTS OF HEPTANOL, K+ AND TTX ON RECEPTANT VENTRICULAR TACHYCARDIA IN ANISOTROPHIC MYOCARDIUM.

Boersma J.V.A., Brugada J, Kirchhoff CJHH, Allessie MA.

In sheets Langendorff perfused anisotropic rabbit left ventricular mycardium, epicardial rings were created by a cryoprocedure. Reentrant ventricular tachycardia (VT) with a cycle length (CL) of 144±5 ms could be reproducibly induced by programmed electrical stimulation. In the ring, conduction parallel to the fiber orientation was fast (84±10 cm/s) in comparison to conduction perpendicular to the fiber orientation (8±1±3 cm/s) with a ratio of 3.3±0.3 (9±0.5). In 10 experiments the passive membrane properties were altered by increasing the intracellular coupling resistance with heptanol (80±0±5 mmol/l) to a CL of 357±84 ms. 80±0 was more decreased than 80±4 and 46±12 cm/s with an increase in ratio to 5.0±1.0 (p<0.001). In addition, at a 5.0±5 mm, transverse conduction block terminated VT in 8 of 10 experiments. Depression of the active membrane properties by increasing extracellular K+ from 4.0 to 10.0 mm, slowed VT to a CL of 259±96 ms. 80±4 was decreased more than 80±4 to 36±15 and 15±4 cm/s, decreasing the ratio to 2.6±0.8 (p<0.001). In 7 of 10 experiments longitudinal conduction block terminated VT at 11±6±1.8 mm of K+. In 5 experiments, administration of the selective sodium channel blocking agent TTX (25 μM) also terminated VT by longitudinal conduction block.

Conclusion: Depression of the fast sodium channels by K+ or TTX preferentially affects longitudinal conduction while increasing intercellular coupling resistance by heptanol preferentially depresses transverse conduction. This may have important implications for anti-arrhythmic therapy by drugs.

Physiology Department, University of Limburg, BMC, P.O.Box 515, 6200 MD, Maastricht, The Netherlands.