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HEAT DEBT DURING WORK **IN** COLD CONDITIONS

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The purpose of this study was to find out the body heat debt of clothed man and to estimate the significance of sweating to the heat balance during work in cold condition.

The study considered the interaction of ergometer tests (N=45) for 60 minutes in a climatic chamber in combination with work loads (55 and 110 W), ambient temperatures (-5°C and -15°C) and clothing (**1.3**, 1.5, 2.2 and 2.4 clo). Skin temperatures were measured by **YSI** 400 probes and non-evaporative heat flow at ten sites on the skin by heat flow transducers (Termonetics HFT-A).

The limit of recommended'body heat debt of 40 Wh/m^2 was exceeded in the following conditions:
a) in light work (55 W)
Ta = -5°C and clothing < 1.6 clo.
Ta = -15°C and clothing < 2.3 clo.
b) in moderate work (110 W)
Ta = -5°C and clothing < 1.45 clo.
Ta = -15°C and clothing < 2.05 clo.

Mean skin temperature (Tsk) correlated significantly with the heat debt (Q) (r=0.9, p<0.0001). The relations were:
a) in light work Tsk = -0.106*Q + **33.7.**
b) in moderate work Tsk = -0.109*Q + **34.1.**
There were no significant differences between light and moderate work. The results show that it is possible to estimate reliable heat debt by measuring the mean skin temperature.

The flow of evaporative heat was not important in light work and non-evaporative heat flow through the skin correlated significantly with the heat debt (r=0.85, p<0.0001). The relation between sweating and non-evaporative heat flow correlated significantly with the heat debt (r=0.86, p<0.0001). The relation was **0.4-3.0** in moderate work. The recommended limit of body heat debt ($40 Wh/m^2$) was exceeded when the relation was less than one. When it was over two, there were problems due to wet clothing.

The correlation between sweating and the flow of non-evaporative heat demonstrates how thermal regulation works during moderate exercise. The results **could** be useful when planning and making decisions concerning clothing for use in cold conditions.