

URINARY CATECHOLAMINE EXCRETION IN EXPOSURES TO HEAT STRESS

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It is known that pilots are exposed to significant heat stress during flight operations. The reason for the heat stress is mostly the use of a constant-wear over-water flight suit. The aim of the present study was to investigate the amount of heat stress in pilots in terms of body temperature changes and urinary catecholamine excretions during aerobatics and simulation work in a climatic chamber.

Five healthy subjects volunteered for the measurements during aerobatics. Two of the pilots and four healthy male subjects volunteered for the simulation test in a climatic chamber. The control group consisted of 6 pilots. Each subject was tested wearing a standard flight garment during every trial. The sorties consisted of series of aerobatics at 300-3000 m above ground level. The total flight time varied from 36 to 45 minutes. The pilots carried out two test flights, one as pilot, the other as co-pilot. Rectal temperature and heart rate were recorded continuously during the flights. The simulation in the climatic chamber consisted of a 90-min sitting and a 45-min bicycle ergometer work (50 W) period at 30 °C T_o and 40 % rh. Continuous monitoring included ECG, HR, rectal temperature and skin temperatures at nine sites. The urine samples were collected after aerobatics and simulations tests and adrenaline and noradrenaline were measured by a fluorometric method.

The mean urinary adrenaline excretion during aerobatics was 98.1 pmol/min (± 9.4 SE), and during simulation tests 59.0 pmol/min (± 4.9 SE). In the control group the mean urinary excretion was lower (46.2 pmol/min ± 10.6 SE). During aerobatics the mean urinary noradrenaline excretion was 320 pmol/min (± 39.0 SE) and during the simulation test 229 pmol/min (± 19.0 SE). In the control group the mean urinary excretion was also at a lower level (185 pmol/min ± 7.5 SE). No significant correlations between urinary hormone levels, rectal temperature and heart rate were observed.

It can be concluded that urinary catecholamine excretion increases significantly more during aerobatics than during the simulation test. In spite of the fact that a greater increase in mean noradrenaline excretion was found during the aerobatics compared to the simulation test, the change in rectal temperature was greater during the simulation test. The increase in urinary adrenaline excretion during aerobatics probably reflects high mental tension, since the increase during simulation test was much smaller.