MODULATION OF SKIN THERMOAFFERENTS BY CALCIUM AND VARIOUS EFFECTOR PROCESSES IN THE COLD: THERMOREGULATION, IMMUNE RESPONSE, BLOOD LIPOPROTEINS

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Background- One of the fundamental is the question about regulatory mechanisms of the formation of effector responses on the effect of temperature. Studies of the interaction of various physiological systems in conditions of directed modulation of skin thermoreceptors is in a special interest, from the point of view of the analysis of a role of temperature afferent signal in formation of effector functions. It is known that calcium ions are important for many processes initiating by cold exposure. In the present work, we studied the effect of iontophoretic application of calcium to the skin, where thermoreceptors are concentrated, on the formation of different effector responses to cold.

Procedure- The thresholds and values of thermoregulatory responses (total oxygen consumption, electrical muscle activity, skin blood vessel constriction), immune parameters (number of antigen binding and antibody forming spleen cells) and blood lipoproteins (the small-angle X-ray scattering) were studied in rats at cooling in conditions of modulating action of Ca(2+) ions. Results- Application of Ca(2+) causes changes in all investigated systems. 1) Temperature thresholds for all cold defense responses decrease. There is also increase of values of heat loss and shivering, but decrease of nonshivering thermogenesis. 2) Ca(2+) ions change the effect of cooling on the fractional composition of plasma lipoproteins. In thermoneutral conditions Ca(2+) causes decrease in the level of high density lipoproteins and increase of the atherogenic coefficient. Cooling on the background of Ca(2+) recovers these parameters. 3) Ca(2+) prevents the suppressive influence of deep cooling on the immune response. It is relevant to both antigen binding and antibody forming processes in spleen. Conclusion- Obtained data give the basis to believe, that Ca (2+) - dependent thermoregulatory processes developing in an organism at cooling, compete in Ca (2+) ions with other processes, it can be one of mechanisms for involving of various systems in formation of the general response of an organism to cold. Distinctive aspects of Ca(2+) influence on the formation of effector responses to cold in hypertensive animals will be discussed.