References


129. Volume regulation of human lymphocytes by aldosterone in isotonic media

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In vitro binding of aldosterone to mineralocorticoid receptors on human mononuclear leukocytes (HML) and its effects on the intracellular sodium and potassium concentrations of HML have already been described [1, 2]. In the present paper this easily accessible human cell model was investigated with regard to the regulation of the cell volume by aldosterone since the concordant changes of sodium and potassium were expected to be accompanied by water and volume shifts.

As determined by measurement of the cell diameter and planimetric estimation of the cell area in photographs, the cell volume decreased by about 15% when the cells were incubated in RPMI-medium without addition of aldosterone for 1 h at 37 °C. In freshly isolated, nonincubated HML the mean diameter was 7.79 ± 0.07 μm, the mean area 45.45 μm². After incubation for 1 h at 37 °C in RPMI-1640 without aldosterone, mean ± SD for the diameter was 7.4 ± 0.09 μm, for area 39 ± 4 μm². These means were significantly lower than those for nonincubated cells (p < 0.001; 0.05). Aldosterone (1.4 nM) in the incubation medium almost completely prevented the shrinkage of HML.

The means were significantly higher than those obtained after incubation without aldosterone: the diameter was 7.70 ± 0.14 μm, and the area 45.3 ± μm² (p < 0.01 for diameter and area). The values for cells before and after incubation with aldosterone were not different, the effect was half maximal at a concentration between 0.07 and 0.14 nM. 140 nM canrenone antagonized the action of aldosterone. Cortisol was ineffective. The results indicate concordant changes in intracellular sodium and potassium and cell volume if studied under the same conditions. The agreement of data obtained for the aldosterone effects on cell volume and electrolytes underlines the significance of aldosterone for the physiological regulation of HML volume and electrolyte content. To our knowledge, aldosterone is the first human hormone shown to be involved in the volume regulation of HML at physiological concentrations in isotonic media. This observation is the basis for a simple method of studying mineralocorticoid effects in vitro. Its simplicity should stimulate research about the basic and clinical effects of an “old” hormone and its antagonist therapy.

References
