

A novel membrane steroid binding protein in the neurosecretory cells is reduced by salt loading

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Summary

Steroid hormones, which possess lipid soluble properties, act on several tissues through intracellular receptors that regulate the transcription of specific genes. In addition, it was known that some steroids interact with membrane receptors and evoke acute actions. Recently, it has been demonstrated that in mammals a membrane steroid binding protein, MSBP, might be a putative progesterone membrane receptor. Based on our studies concerning neurosteroids, we attempted to identify MSBP in the quail brain. We found that MSBP was expressed in neurosecretory cells that produced an antidiuretic hormone, arginine vasotocin (AVT), and its expression was affected by osmotic stress such as salt loading. In the present study, we investigated the physiological changes on the expression of MSBP by immunohistochemistry using an antiserum against mammalian MSBP.

To assess the acute osmotic stress on the expression of MSBP, 9% NaCl was intraperitoneally injected into quails and analyzed the expressions at 1, 3, 6, 10 hours of post-injection. The results showed no significant changes compared with 0.9% NaCl injected control birds. On the other hand, a chronic osmotic stress of 2% NaCl loading for 4 days was examined. The effect of 2% NaCl drinking significantly reduced the number of MSBP-like immunostained neurosecretory cells. In addition to the salt loading, the treatment of water deprivation for 4 days caused the similar result. Furthermore, the effect of rehydration followed by the 4 days-water deprivation was also investigated. Although the immunoreactivity in the quails that were rehydrated for 12 hours showed the same results as that of water deprived birds for 4 days, the immunoreactivity recovered in the 24 hours-rehydrated birds when compared with control birds. It was observed that when the reduction of MSBP-like immunoreactivity occurred under the chronic osmotic stress, then the AVT plasma level increased. In contrast with the osmotic stress, the food deprivation stress for 4 days did not produce any significant change on the immunoreactivity. In addition, the subcutaneous injection of aldosterone for 7 days did not effect on the expression of MSBP.

Taken together, our observations suggest that MSBP is a chronic osmotic stress-responsible protein and its expression may be involved in the production of AVT in the avian brain.