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ACTH stimulation affects rat adrenal mineralocorticoid receptor protein level and tissue distribution, but not subcellular localization

Behling Cheng, Inchirah N Iskandarani and Narayana Kilarkaje
Kuwait University, Health Science Center, Kuwait

Adrenal cortex is comprised of three distinctive zones: the outermost zona glomerulosa (ZG), the zona fasciculata (ZF), and the innermost zona reticularis (ZR). Repetitive stimulation of rats with ACTH for four consecutive days resulted in an elevated adrenal corticosterone synthesis. This glucocorticoidogenesis was accompanied not only by sustained adrenal aldosterone synthase and 24 hour urine aldosterone levels, but also by upregulation of the glandular mineralocorticoid receptor (MCR) protein level. Immunohistochemistry study revealed that, in the unstimulated state, MCR was expressed principally in ZG. Upon ACTH stimulation, expression of MCR became strikingly increased in ZF and ZR. Adrenal protein level of 11 β -hydroxysteroid dehydrogenase-2 (11 β HSD-2), the enzyme that protects MCR function from glucocorticoid interference, remained unchanged. After subcellular fractionation, both MCR and 11 β HSD-2 were localized in the microsomal fraction; only a small portion of MCR was found in the nuclear fraction. ACTH action did not result in translocation of MCR into the nucleus. Since ZF and ZR (but not ZG) reportedly express 11 β HSD-2, but 'gain' MCR to cope with ACTH stimulation, we hypothesize that aldosterone may be needed to influence ZF and ZR production of corticosterone, and the aldosterone autocrine/paracrine action may be involved in both non-genomic and genomic mechanisms.

Biography

Behling Cheng PhD is an academic staff member of the Biochemistry Department, Kuwait University Faculty of Medicine. He served as Chairman of the Department for 14 years (1998-2012) and was as a member of the central committee for medical curriculum reform from discipline-based courses to an integrated organ systems curriculum in 2005. He continues serving as a member in the endocrine system committee for course development and examination. He is currently involved in teaching and research in the areas of endocrine biochemistry, lipid metabolism, and cell biology of aging.

behling@HSC.EDU.KW

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