Localization, transport and uptake of D-aspartate in the rat adrenal and pituitary glands

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Abstract

Large amounts of D-aspartate (D-Asp) are present in the rat adrenal and pituitary glands. D-Asp is thought to be synthesized in the mammalian body and also accumulates in various tissues following intraperitoneal or intravenous administration. This report examines the origins of D-Asp in the adrenal and pituitary glands. We administered D-Asp to male rats intraperitoneally and immunolocalized this exogenous D-Asp in adrenal and pituitary tissue, using an anti-D-Asp antiserum which was previously developed in our laboratory. D-Asp levels in the rat adrenal gland have been shown to undergo a transient increase at 3 weeks of age and to decrease rapidly thereafter. We found that in the adrenal gland, exogenous D-Asp administered intraperitoneally was incorporated into the same region of the adrenal cortex in which endogenous D-Asp was present. By Northern and Western blot analysis and immunohistochemistry of glutamate (Glu) transporter, we also found that expression of the Glu transporter (GLAST), which has an affinity for D-Asp, transiently increased at 3 weeks of age and that localization patterns of the Glu transporter within the tissue were almost coincident with those of endogenous D-Asp. These observations suggest that D-Asp in the adrenal cortex of 3-week-old male rats is primarily acquired by uptake from the vascular system. We have previously shown that D-Asp is specifically localized in prolactin (PRL)-containing cells in the anterior lobe of the adult rat pituitary gland. Here we report that in the pituitary gland, exogenous D-Asp accumulated in endothelial cells, but not in PRL-containing cells. Northern and Western blot analysis and immunohistochemistry of Glu transporter revealed that developmental changes in the Glu transporter (GLAST) expression did not correlate with tissue levels of D-Asp and that the Glu transporter was not expressed in PRL-containing cells. These observations suggest that, in contrast to the adrenal gland, most of the D-Asp in the pituitary gland of adult male rats originates inside the gland itself.