Abstract
In the light of studies suggesting that transcription of the gene coding for manganese superoxide dismutase (MnSOD) is induced by ACTH in the rat adrenal gland, northern blot analysis was used to determine its mRNA distribution. It was found that mRNA coding for MnSOD is primarily present in the inner zones of the rat adrenal cortex, and not the glomerulosa. To investigate the functional relationships between MnSOD activity and expression and adrenocortical function, adrenals and blood were taken from animals pretreated with corticotrophin or betamethasone (Betnesol), or subjected to a low-sodium diet. MnSOD activity in inner zone mitochondrial fractions was enhanced by corticotrophin and by a low-sodium diet, but suppressed by betamethasone. Apparent cytosolic MnSOD activity, total cytosolic MnSOD and CuZnMn-SOD, and glomerulosa mitochondrial MnSOD all were unaffected. Steroid assays showed a clear correlation between circulating corticosterone and inner zone mitochondrial MnSOD, but none between aldosterone and glomerulosa MnSOD. Immunoblot analysis of MnSOD showed two apparent isoforms, at approximately 25 kDa and 75 kDa. There was a partial relationship between expression of the 75 kDa isoform and MnSOD activity, in that it was induced by corticotrophin. However, there was also a slight induction with betamethasone, and a low-sodium diet had no effect. The 25 kDa MnSOD isoform was unaffected by the treatments. The results suggest that MnSOD may have a specific role in the steroidogenic function of the fasciculata/reticularis of the rat adrenal, but not in that of the glomerulosa.