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Localization of Fructose 1, 6-Biphosphate in Nucleus of Smooth Muscle Cell

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In the presence of divalent metal ions (Mg^{2+}, Mn^{2+}, Co^{2+}, and Zn^{2+}), fructose 1,6-bisphosphatase catalyses the hydrolysis of fructose 1,6-bisphosphate to fructose 6-phosphate and inorganic phosphate. Gomori was the first to discover the enzyme (1943). Approximately 2000 articles on the kinetics and tissue distribution of FBPase were published during the next 60 years. Only a few of these studies, however, deal with the enzyme's subcellular distribution. FBPase was discovered in the perinuclear area of hepatic and renal cells by Saez et al. in 1996, and nuclear localization of FBPase in these cells was discovered by Yanez et al. in 2003. FBPase is found on both sides of the Z-line in skeletal muscle and significantly interacts with a-actinin, while FBPase is detected in the nuclei of cardiac muscle cells, according to a recent study of the enzyme's subcellular distribution in mammalian muscle tissue. In this study, we show that the subcellular distribution of FBPase in smooth muscle cells is similar to that of cardiomyocytes, and that the enzyme's presence inside the cells' nuclei is restricted to the heterochromatin area. Two FBPase isozymes have been discovered in vertebrate tissues. FBPase from the liver is a gluconeogenesis regulating enzyme.

The muscle isozyme is involved in glycogen production from lactate as well as glycolysis control. None of these actions are dependent on the enzyme being present in the cell nucleus. We generated the structures of all known muscle FBPase sequences in search of a molecular basis for FBPase's nuclear localization, and utilising in silico analysis of the tertiary structures, we discovered a number of functional sites indicative of a wide variety of proteins susceptible to nuclear transport. This finding's physiological significance is examined.

DAKO provided the antibody diluent and DAB chromogen; Fluka provided the paraformaldehyde, glutaraldehyde, Coomassie Brilliant Blue R-250, and paraffin wax; and ICN provided the anti-Rabbit IgG gold-conjugated (10 nm) antibody. Sigma provided the Biotin Conjugated Mouse Monoclonal Anti-Rabbit Immunoglobulins, ExtrAvidin Horseradish Peroxidase, Normal Sera, Nitrocellulose Membranes, and other reagents. The reagents were all of the highest commercially available purity. Muscle-specific antiserum FBPase was raised in a rabbit by injecting the electrophoretically pure enzyme and Freund's complete adjuvant into the rabbit's skin. The experiment was carried out in accordance with The Scientific Research Ethical Committee's standards. Using acetone powder, the immunoserum was partially purified. The twofold diffusion method was used to determine the anti-FBPase serum's reactivity. The antiserum and the purified enzyme had a robust response after immunodiffusion.