Interactions of Neuronal Calcium Sensor DREAM with Zinc

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Downstream regulatory element antagonist modulator (DREAM) is an EF-hand protein that is highly expressed in the central nervous system in areas such as the hippocampus and the neural cortex and regulates kinetics of potassium channels, gene expression, calcium homeostasis and enzymatic activity of presenilin. Characterization of the metal-binding properties of DREAM and how it affects DEAM structure and DREAM interactions with effector proteins are crucial to understand its biological function under physiological and pathological conditions. Essential metals like Mg^{2+}, Zn^{2+} and Ca^{2+} play extremely important roles in biological processes through direct interactions with proteins. DREAM carry out two Ca^{2+} binding EF hands and one Mg^{2+} binding EF hand, however little is known about DREAM binding to other biologically significant metals. Here we have monitored interactions of DREAM with Zn^{2+} by using intrinsic and extrinsic fluorescent probes. Our data show that Zn^{2+} associates to DREAM with $K_d \sim 200\ \mu M$. Zn^{2+} does not compete for the same binding site as Ca^{2+} as the changes in the protein tertiary structure are distinct from those observed upon Ca^{2+}association. Considering increased concentration of Zn^{2+} in neuronal tissue (150 – 200 μM), these results point towards the potential role of Zn^{2+} in modulating DREAM interactions with other intracellular proteins.