Effects of the Lectin Concanavalin-A on the Regulation of Second Messengers and Parathyroid Hormone Release by Extracellular Ca\(^{2+}\) in Bovine Parathyroid Cells

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Abstract

The lectin Concanavalin-A (Con-A) binds to cell surface carbohydrate-containing moieties and modulates the function of a variety of glycoprotein receptors. Since extracellular calcium (Ca\(^{2+}\)) may regulate parathyroid function by a receptor-like process, we examined the effects of Con-A on various aspects of Ca\(^{2+}\)-regulated parathyroid function. We recently showed that Con-A significantly reduces the inhibitory effects of high Ca\(^{2+}\) on dopamine as well as isoproterenol- and forskolin-stimulated cAMP accumulation. In our present studies Con-A similarly reduced the inhibitory effect of 2.0 mM Ca\(^{2+}\) on PTH release from 60 ± 6% to 40 ± 6% and increased the setpoint for Ca\(^{2+}\)-regulated PTH release from 1.25 to 1.8 mM. This effect was dose dependent. Con-A also inhibited the Ca\(^{2+}\)-stimulated accumulation of inositol phosphates by 50–60% in association with a marked reduction in the high Mg\(^{2+}\)-evoked spike in cytosolic Ca\(^{2+}\) as well as a significant decrease in the sustained rise in cytosolic Ca\(^{2+}\) at 2–3 mM extracellular Ca\(^{2+}\). These data provide further evidence for a key role for cell surface carbohydrate-containing moieties in the mechanism through which parathyroid cells “sense” Ca\(^{2+}\) and, in turn, regulate PTH release, phosphoinositide turnover, and the release of intracellular Ca\(^{2+}\) stores. It is possible that the putative Ca\(^{2+}\) receptor is a glycoprotein or is closely associated with glycoproteins or other moieties containing \(\alpha\)-methyl-D-glucoside or \(\alpha\)-methyl-D-mannoside residues. (Endocrinology 128: 2931–2936, 1991)

Footnotes

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