POTENTIATING EFFECT OF VIP ON THE SECRETORY RESPONSE AND CALCIUM SIGNALING IN THE PANCREATIC ACINI OF GUINEA PIG

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The present study was carried out to examine the effect of guinea pig VIP (vasoactive intestinal polypeptide) on CCK–8–induced amylase release, and to record dynamic changes in the cytosolic concentration of Ca^{2+} ($[Ca^{2+}]_c$) in isolated perifused pancreatic acini of the guinea pig.

Continuous stimulation with 100 pM CCK–8 alone caused a gradual increase in amylase release, which reached a plateau level five times as high as the resting level. Continuous stimulation with 100 pM guinea pig VIP alone caused a small gradual increase in amylase release, which reached a level two to three times as high as the resting level. The amylase release in response to 100 pM guinea pig VIP was significantly greater than the resting level.

Stimulation with 100 pM CCK–8 in combination with 100 pM guinea pig VIP caused an increase in amylase release, which was greater than the sum of the individual responses to 100 pM CCK–8 alone and to 100 pM VIP alone.

Stimulation with 30 pM guinea pig VIP alone caused little, if any, amylase release. Stimulation with 100 pM CCK–8 in combination with 30 pM guinea pig VIP induced an increase in amylase release, which was significantly greater than that induced with 100 pM CCK–8 alone. From these results, analysis of statistical significance was made to establish the potentiating effect of VIP on CCK–8–induced amylase release.

Continuous stimulation with 100 pM CCK–8 alone caused oscillatory $[Ca^{2+}]_c$ dynamics, which damped down gradually. Stimulation with 100 pM CCK–8 in combination with 100 pM guinea pig VIP induced sustained oscillatory $[Ca^{2+}]_c$ dynamics without damping. The frequency of $[Ca^{2+}]_c$ oscillation in the final 15 minutes of continuous stimulation with both CCK–8 and VIP was significantly greater than that with CCK–8 alone.

The present study showed that the potentiating effect of VIP was demonstrated over the entire period of amylase release caused by continuous CCK–8 stimulation, whereas the VIP effect on $[Ca^{2+}]_c$ dynamics was confirmed only in the latter period of CCK stimulation. These results suggest that, in addition to Ca^{2+} signal alone, crosstalk between Ca^{2+} and cAMP signals may amplify the final processes that trigger exocytosis in the pancreatic acini of the guinea pig.