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Effect of Oxytocin on Cytosolic Calcium Concentration of Alpha and Beta Cells in Pancreas

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Abstract : Oxytocin is a nine-amino acid peptide synthesized in the paraventricular nucleus (PVN) and supraoptic nucleus (SON) of the hypothalamus. Oxytocin promotes contraction of the uterus during birth and milk ejection during breast feeding. Although oxytocin receptors are found predominantly in the breasts and uterus of females, many tissues and organs express oxytocin receptors, including the pituitary, heart, kidney, thymus, vascular endothelium, adipocytes, osteoblasts, adrenal gland, pancreatic islets, and many cell lines. On the other hand, in pancreatic islets, oxytocin receptors are expressed in both α-cells and β-cells with stronger expression in α- cells. However, to our knowledge there are no reports yet about the effect of oxytocin on cytosolic calcium reaction on α and β-cell. This study aims to investigate the effect of oxytocin on α-cells and β-cells and its oscillation pattern. Islet of Langerhans from wild type mice were isolated by collagenase digestion. Isolated and dissociated single cells either α-cells or β-cells on coverslips were mounted in an open chamber and superfused in HKRB. Cytosolic concentration ([Ca2+]i) in single cells were measured by fura-2 microfluorimetry. After measurement of [Ca2+]i, α-cells were identified by subsequent immunocytochemical staining using an anti-glucagon antiserum. In β-cells, the [Ca2+]i increase in response to oxytocin was observed only under 8.3 mM glucose condition, whereas in α-cells, [Ca2+]i an increase induced by oxytocin was observed in both 2.8 mM and 8.3 mM glucose. The oscillation incidence was induced more frequently in β-cells compared to α-cells. In conclusion, the present study demonstrated that oxytocin directly interacts with both α-cells and β-cells and induces increase of [Ca2+]i and its specific patterns.

Keywords : α-cells, β-cells, cytosolic calcium concentration, oscillation, oxytocin
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