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Morphofunctional Characteristics of Insulin-Synthesizing Cells of Different Localization in the Pancreas of Intact Rats

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The study is devoted to the comparison of morphofunctional features, the ratio of the processes of apoptosis and proliferation of insulin-synthesizing cells (ISC) population of the pancreas of different localization (pancreatic islets (PIs), single ISC and their agglomerates) in physiological conditions. On histological preparations of the pancreas, the quantitative analyses of ISCs of different localization, the intensity of insulin fluorescence, the ratio of the processes of their proliferation and apoptosis were determined. Single ISCs of the acinar epithelium, in comparison with ISCs of other localization, have the highest synthetic potential, expressed in the maximum values of the intensity of insulin fluorescence and the area of the cytoplasm. The study of the ratio of the processes of proliferation (Ki-67) of the ISC indicates that Ki-67$^+$ ISCs are present only in the PIs, while they are not detected outside the PIs. The largest ratio of TUNEL$^+$ ISCs from the total number of ISCs is determined in agglomerates and is absent in single ISCs. A direct relationship was revealed between the intensity of insulin fluorescence of β-cells of the islets and the amount of Ki-67 + ISCs in them. Islets with a high intensity of insulin fluorescence also have the highest amount of TUNEL + ISCs in comparison with other PIs, which indicates a significant level of their self-renewal. At the same time, PIs with a low insulin content are characterized by a significant predominance of apoptosis over proliferation. Our data indicate that the structure and functional activity of ISCs depend on the peculiarities of their localization, and their heterogeneity creates the basis for plasticity in pathological conditions.

Keywords: insulin, pancreatic islet, extraisletal insulin-synthesizing cells