

SUMMARY

Pancreatic regeneration after partial pancreatectomy was used as model systems to study pancreatic β -cell proliferation in rats.

1. Primary cultures of pancreatic islets were used as the *in vitro* system to study pancreatic islet cell proliferation
2. [3 H]thymidine incorporation was used as an index for pancreatic DNA synthesis. DNA synthesis was peaked at 72 hrs after partial pancreatectomy and reversed to control level by 7 days.
3. 5-HT content was analysed using HPLC. It increased in the brain regions during active islet cell proliferation
4. EPI and NE contents were analysed using HPLC. It decreased in the adrenals during active pancreatic islet regeneration. Plasma EPI and NE level also decreased during pancreatic regeneration.
5. 5-HT receptor functional status was analysed by Scatchard and displacement analysis using [3 H] ligands. Receptor analysis was confirmed by studying the mRNA status of the corresponding receptor using RT-PCR. 5-HT_{1A} and 5-HT_{2C} receptors were down regulated in brain regions during active islet cell proliferation.
6. Pancreatic islet 5-HT content decreased in 72 hrs pancreatectomised rats. Pancreatic islet 5-HT_{1A} receptor up regulation was observed during islet DNA synthesis. 5-HT_{2C} receptor up regulation was also found during pancreatic regeneration.
7. *In vitro* insulin secretion study showed that low concentration of 5-HT and 5-HT_{1A} agonist, 8-OH DPAT, induced glucose stimulated insulin secretion from pancreatic islets. 5-HT_{2C} antagonist, mesulergine, inhibited glucose induced insulin secretion.

9. *In vitro* DNA synthesis studies showed that activation of 5-HT_{1A} receptor by adding 8-OH DPAT, a specific agonist, induced islet DNA synthesis. Also, the addition of mesulergine, a specific antagonist of 5-HT_{2C} receptor resulted in the inhibition of DNA synthesis.

Thus, the regulation of 5-HT_{1A} and 5-HT_{2C} receptors in the brain and pancreatic islets plays an important role in insulin secretion and islet cell proliferation during pancreatic regeneration