Microscopic Studies on Islets of Langerhans of Pancreas of Adult Albino Rat

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ABSTRACT

The pancreas of rat was an encapsulated, lobulated compound tubuloacinar gland consisting of exocrine and endocrine parts. The endocrine part contained islets of different sizes and they were embedded within the exocrine tissue of pancreas. Three different types of islets viz., small, medium and large sized were noted. The islets were consisted of alpha, beta, delta, and pancreatic polypeptide cells. The alpha and pancreatic polypeptide cells occupied peripheral region in the islet, whereas beta cells were placed deeply in the islets. But delta cells were distributed randomly throughout the islets and they were long, flattened, and irregular in shape and characterized by the presence of small granules.

Key words: Islets of Langerhans, Pancreas, Rat

The pancreas is an encapsulated, lobulated compound, tubuloacinar gland containing both exocrine and endocrine parts. The pancreatic islet produces mainly insulin, glucagon hormones which play role in glucose metabolism. Bani and Bani (1985) and Fattah (2008) have studied pancreas of rat. But detailed information on microscopic structure of pancreas of rat is scarce. Hence, the present study has been undertaken.

MATERIALS AND METHODS

A total of twelve adult albino rats irrespective of the sex were utilised for the present study. The rats were obtained from Department of Veterinary Parasitology, College of Veterinary Science, Tirupati. The tissue samples were collected from gastric, splenic and duodenal parts of pancreas and were fixed in 10% neutral buffered formalin and Bouin’s fluid. The fixed tissues were processed for paraffin sections by acetone benzene schedule (Luna, 1968). The sections of 4-5 µ were subjected to routine as well as special histological staining methods (Bancroft and Gamble, 2008).

RESULTS AND DISCUSSION

The exocrine part of pancreas was consisted of acini and ducts. The endocrine part contained islets of different sizes being embedded within the exocrine portion (Fig. 1) and appeared as pale stained rounded or oval areas between the darkly stained acini. The islets of Langerhans were consisted of group of cells arranged in irregular branching and anastamosing cords separated by blood capillaries and delicate collagen fibres (Fig. 1) as reported by Fattah (2008) in albino rat. The large islets were usually ovoid found close to the large blood vessels. These were richly vascularised and appeared as compact structures and were supplied by one or two afferent arterioles depending on the size. Each pancreatic islet was divided into two regions i.e central and peripheral regions as reported by Sae-Kwang et al. (2002) in BALBc mouse.

Small, medium and large islets were observed. The average diameter of the small islets was measured between 45 to 50 µ, medium sized islets was 75-85 µ, whereas, larger islets were measured between 130-160 µ. The average number of endocrine cells were 15-20, 60-80 and 120 and above in small, medium and large islets, respectively in rat. Whereas Redecker et al. (1992) have noted poly cellular and mono cellular types of islets in dogs.

The pancreatic islets of the rat consisted of alpha (A), beta (B), delta (D) and pancreatic polypeptide (PP) cells (Fig. 2). The alpha and pancreatic polypeptide cells occupied peripheral region of the islet, whereas beta cells were placed deeply in the islets. The delta cells were distributed randomly throughout the islets (Fig. 2) as reported earlier (Mostafa et al., 1993). Contrary to this, Bani and Bani (1985) identified five different islet cell types in pancreas of rat viz., insulin, glucagon, somatostatin, pancreatic polypeptide cells and enterochromomoffin like cells in pancreas of rat. In the pancreas of albino rat some individual isolated endocrine cells were also noted.

Alpha cells were characterized by a pale cytoplasm, dense round granules and a pale nucleus. They appeared as isolated individual granular cells arranged at the periphery of the islets (Fig. 3). They encircled the beta cells as a cellular band of one or more cells thickness. Caramia (1963)
noted two types of alpha cells in the adult rat pancreas viz., the clear alpha cells and dark alpha cells with few granules and compact ergastoplasm.

The average size of the alpha cell was 10-12 µ. These cells were slightly larger than the beta cells and they were spherical or ovoid in shape (Fig. 3). These comprised only a small portion of the total islet cell population. Beta cells constituted approximately 80 per cent of the total islets cells population (Fig. 2) as reported by Baetens et al. (1979). The beta cells were spherical or oval in shape and were slightly smaller than the alpha cells (Fig. 3). The average size of the beta cells was 8-10 µ. The nucleus of these cells was oval or rounded in shape. The granules of the beta cells were smaller in size.

Delta cells were long, flattened or irregularly shaped. They constituted about 2-3 per cent of the total islet cell population. These cells were characterized by the presence of small granules as reported earlier (Baetens et al., 1979). These cells were arranged close to the capillaries. Most of the delta cells were situated peripherally, only a few cells were found at intermediate portion (Fig. 2). Caramia (1963) stated that the delta cells were found randomly throught the islets in rat pancreas as noted in the present study. The granules of these cells were relatively smaller than alpha and beta cells.

The pancreatic polypeptide cells were found singly or in clusters at the periphery of the islet (Fig. 2) and were not recorded in the exocrine pancreas. The pancreatic polypeptide cells were large and flattened elongated type but at some locations they appeared spherical shape (Fig. 2). The pancreatic polypeptide cells were variable in size and shape. They constituted 2 per cent of total islet cell population in splenic and gastric parts of pancreas in albino rat, whereas in duodenal part they were more in number and constituted 15-20 per cent. According to Baetens et al. (1979) the per cent volume of pancreatic poly peptide cells in dorsal pancreatic islets was 0.5 per cent whereas in the ventral pancreas their per cent volume was 14.3 per cent.

The alpha cells showed orange coloured granules in the cytoplasm, beta cells showed dark purple granules, whereas, delta cells showed green granules and pancreatic polypeptide cells showed light purple granules in cytoplasm with Halamis’s aldehyde fuchsin method (Fig. 2) as reported in pancreas of cat (Jagapathi Ramayya et al., 2012).

**REFERENCES**


