RESEARCH
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HISTOLOGICAL COMPARATIVE STUDY OF PANCREAS GLAND BETWEEN INDIGENOUS RABBIT *(ORYCTOLAGUS CUNICULUS)* AND CAT *(FELIS CATUS DOMESTICUS)*

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Abstract: The aim of study to investigate the some histological differences of pancreatic tissue between mature males of indigenous rabbit and cat, the study carry out twenty mature healthy indigenous rabbit and cat of male sexes were euthanized and later dissected in order to collect the selected organs, the samples of the selected organs were processed routinely to prepare histological sections and stained by general and special stains. Histologically, The pancreas were covered by a connective tissue capsule which appear thicker in rabbit than in cat. The connective tissue capsules extended into parenchyma of pancreas forming septa which dividing pancreas parenchyma in to many lobules. In both species the pancreas is composed of both endocrine and exocrine Portions. There were multiple acini (serous tubuloacinar form) and a duct system in the exocrine section, which characterized by Islets of Langerhans. In the two species were found similar branched ducts but with some histological differences. In both, it was started with centroacinar cells, which connected with intercalated ducts that were lined with a flattened cuboidal epithelium (were circular, narrow lumen but it look more regular in rabbit than cat). The latter converged to form interlobular ducts lined with columnar epithelium, in guinea pig, ducts showed goblet cells and subepithelial mucous glands. intralobular ducts were lined by simple squamous to cuboidal epithelium, while in rabbit were surrounded by secretory acini, in cat it is surrounded by connective tissue septa and have thin muscle layers surrounding the connective tissue. In both species the endocrine part consisted of islets of Langerhans that is scattered in various shapes and sizes in the exocrine part throughout the acini, these islets were composed from alpha (α) and beta (β) cells Delta (δ) cells.

Keywords: Pancreas, Islet's of Langerhans, Rabbit, Cat, Histology.

Introduction:

As a laboratory animal, rabbits are utilized for producing vaccines and antibodies, evaluating different surgical methods, and investigating new chemicals and pharmaceuticals substances (Yanni, 2004) and (Gupta, et al., 2017). In biological research, rabbits are commonly used as laboratory animals since they are phylogenetically more similar to primates than rodents (Elsheikh, et al., 2023). While the Cat *(Felis catus domesticus)*, was employed as a research subject that concern with studies of the nervous system, vision, and hearing, as well as immunodeficiency disorders, toxicology, and other human and animal safety evaluations (Maher, et al., 2020).

The digestive system is a long, hollow tube made up of the buccopharynx, esophagus, stomach, and intestines, as well as some associated glands (salivary glands, liver, and pancreas). These organs are responsible for ingesting and digesting food as well as moving unabsorbed substances through the body and nutrient absorption (Davies R. and Davies J., 2003).

The pancreas gland is studied because of it medical significance since it is related with two life threatening diseases comprising diabetes mellitus and pancreatic cancer. The pancreas is regarded as an organ linked with digestive system. It is in charge of synthesizing the enzymes that the duodenum's lumen receives to aid in digestion. Because it secretes some hormones that aid in metabolism, the organ is additionally known as

an endocrine organ. This gland is classified as a mixed gland because it can produce hormones and enzymes that aid in digestion. Therefore, both neural and hormonal regulators control and coordinate the function of the pancreatic exocrine and endocrine sections (Junqueira, 2005) and (Al-Saffar, 2016).

Material and Methods:

Twenty indigenous cats and rabbits were used to conduct the current study. They were distributed into two groups each group comprises of 10 male species. The two different species were used mature male indigenous rabbit *(Oryctolagus cuniculus)* and cat *(Felis catus domesticus)* aged (1-2) years as a herbivorous and carnivores species respectively. These species were collected from common markets at AlMuthanna Province.

Both species weighed before sacrificed, then they were euthanized prior to its dissection with an total anesthesia by Ketamine and Xylazin, after that. The specimens were obtained from all parts of pancreas for both species and fixed in 10% neutral buffered formalin for 48 hours (Appendix 1) (Luna, 1968). Then the specimens passed into series of ethanol treatments, beginning from the 70 up to 100%, then clearing were done in xylene, embedded in paraffin, and finally by a rotary microtome serial sectioned at 5-6 µm. The histological sections were stained with Hematoxylin-Eosin stain (H&E) for general morphological features, Masson trichrome stain for identifying connective tissue, PAS for identifying carbohydrates and Gomori's stain to identify endocrine cells. The histological sections were observed with an Olympus microscope (Leica Galen III) and were photographed with a digital camera mounted to a microscope (Leica with Dinocapture 2).

Results and discussions:

The histological results of each pancreas showed that it was covered by a connective tissue capsule, which consist of collagenous and elastic fibroblast cells that had flattened shape cell with oval nuclei in Masson stain, the connective tissue capsule in rabbit appear thicker than in cat. The mean thickness of pancreas capsule in rabbit and cat were (527.0 ± 31.0) µm, (117.0 ± 9.1) µm, respectively. This result agreed with reports of (Mohammed, 2019) in rabbit and (Ayat and Bassim, 2017) in Indigenous Rabbit, not compatible with observations previously made by (Mostafa and Mohammed, 2022) in local dogs.

The capsules connective tissue extended into parenchyma of pancreas forming septa dividing it in to many lobules. These septa varied in size some of them were very thin and some of them carried blood vessels which were distributed all over the pancreas. This finding was agreed with reports of (Rasheed, et al.,2021), (Mohammed, 2019) in rabbit, (Ayat and Bassim 2017) in Indigenous Rabbit, (Mostafa and Mohammed, 2022) in local dogs and (Saffar and Zuhairy, 2017) in the domestic cat.

The pancreas parenchyma of both studied species composed mainly from exocrine portion which characterized by serous acini and endocrine portion which characterized by islets of Langerhans which were interspersed among acini Fig. (1,2). In both species the exocrine portion was organized in serous tubuloacinar form. It occupied a large portion of pancreas and had oval to spherical shape. It is composed of multiple number of pyramidal or tall columnar shape acinar cells. These cells' nuclei were primarily spherical, basally located, and had light or condensed chromatin. The basal portion of the cytoplasm looked basophilic, while the apical portion had an acidophilic color. A thin sheath of reticular fibers supports the basal lamina that envelops the acin. These results enhanced with (Mostafa and Mohammed, 2022) who founded in local dogs, in the domestic cat (Saffar and Zuhairy, 2017), (Dhoolappa, et al.,2004) in donkey, also agree with (Mohammed, 2019).

In both species the ductal system of the exocrine portion comprised of intercalated, intralobular and interlobular ducts. Intercalated ducts in both species were circular, narrow lumen but it look more regular in rabbit than cat and are lined with a flattened cuboidal epithelium that extends into the acinus lumen to form centroacinar cells. Its average diameters in rabbit (217.0 ± 16.0), and in cat (108.0 ± 7.4) respectively. These results agree with (Dhoolappa, et al., 2004) in donkey.

Through the parenchyma of pancreas of the two species the intralobular ducts were scattered without a defined arrangement, these ducts in both species were generally circular to oval in shape and were lined by simple squamous to cuboidal epithelium. In rabbit they are surrounded by secretory acini, while in cat it is surrounded by connective tissue septa and have thin muscle layers surrounding the connective tissue as in Fig.(3,4). its average diameter in rabbit (2695 ± 55) and in feline (1435 ± 40). The interlobular ducts were irregular oval shape and its average diameter in rabbit (306.0 ± 14.0) and in feline (223.0 ± 11.0). columnar epithelium lines these ducts and secretory acinus surrounding outside these ducts. The structure of the ducts in the two species found to be similar to that described in previous studies (Abdulkhalek, 2021) in rabbits, (Mohammed, 2019) in native rabbits.

In both species the endocrine part consisted of islets (islets of Langerhans) that is scattered in various shapes and sizes in the exocrine part throughout the acini, these islets were composed from alpha (α) and beta (β) cells Delta (δ) cells show with Gomeris stain. In both species these islets didn't have distinctive margins with

the exocrine part Fig.(5,6). The microscopic result revealed that the α-cells were larger than the β-cells they are spindle in shape with central oval nuclei that is slightly smaller than the nuclei of beta cells, and it is situated around the edges of the Langerhans islets. While β-cells were irregular polygonal in shape with central spherical nuclei and it is situated in the center of islets. This results agreement with (Ayat, 2017) in indigenous rabbit, (Kim, et al.,2009) in mice and other rodents but disagree in human and monkey islets were the α-cells are distributed throughout the islet. While in dogs and pigs the α- and β-cells organization is an intermediate between that in rodents and monkeys and occasionally α-cells found in the central core.

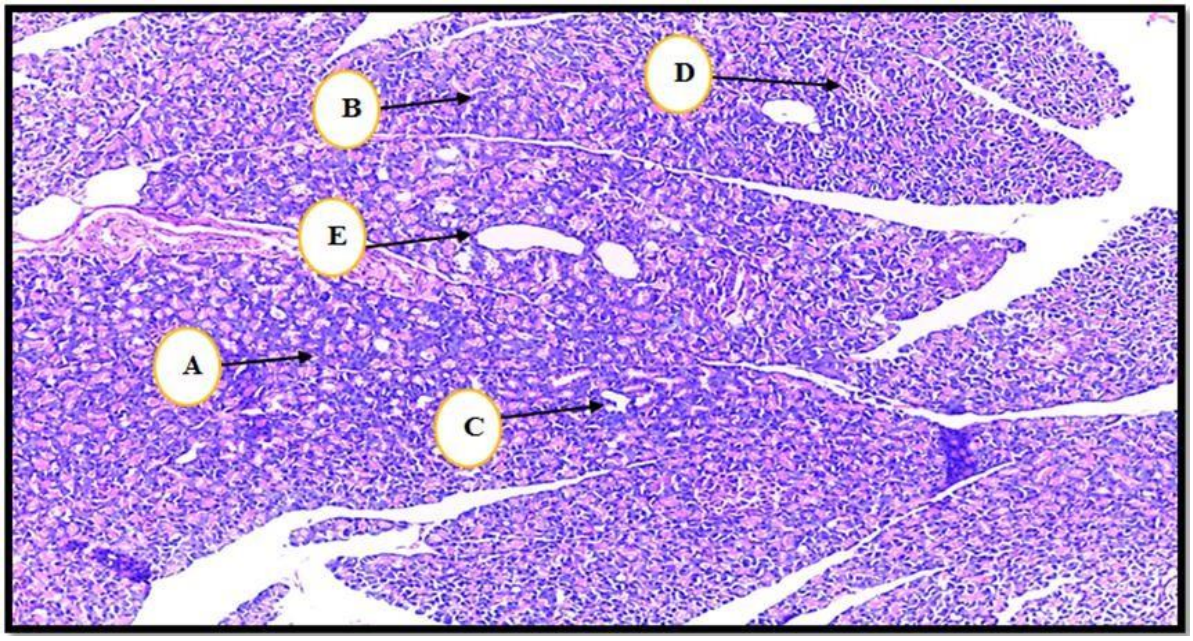

Fig. 1. Photographic of the pancreas in rabbit show the: **A**. acinus, **B**. centroacinar cell, **C**. Interlobular duct, **D**. Islet of Langerhans, **E**. Intralobular duct. **X 40 H & E.**

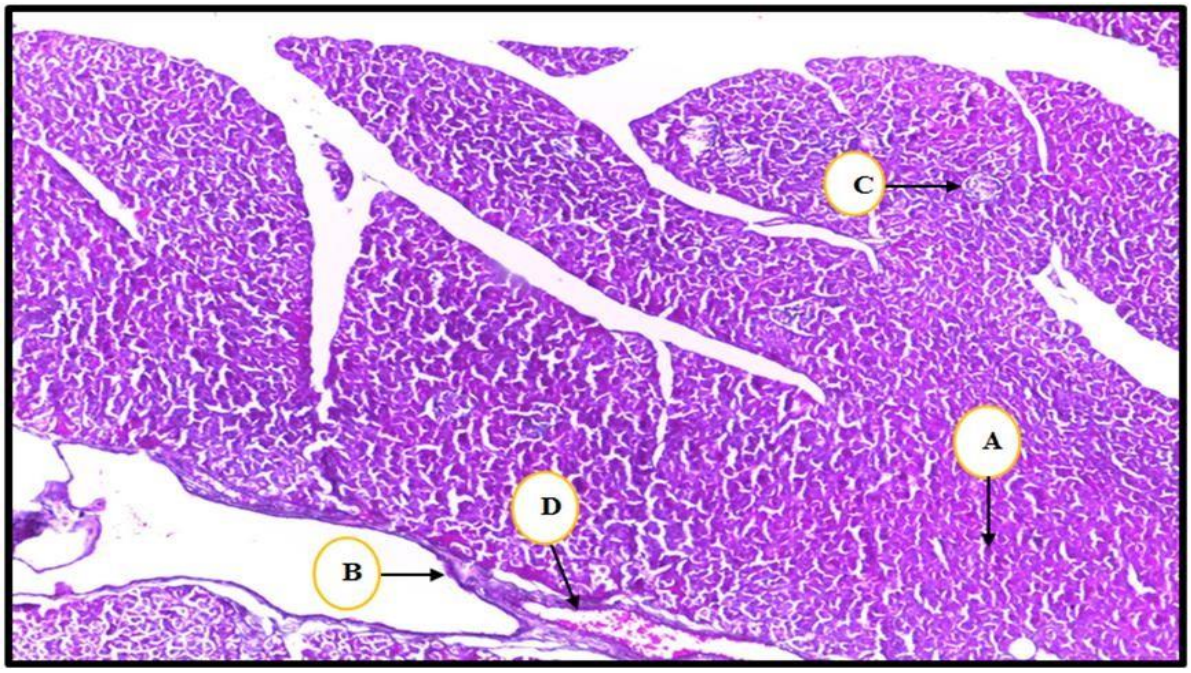

Fig. 2. Photographic of the pancreas in cat show the: **A**. acinus, **B**. Septa, **C**. Islet of Langerhans, **D**. Blood vessel. **X 40 H & E.**

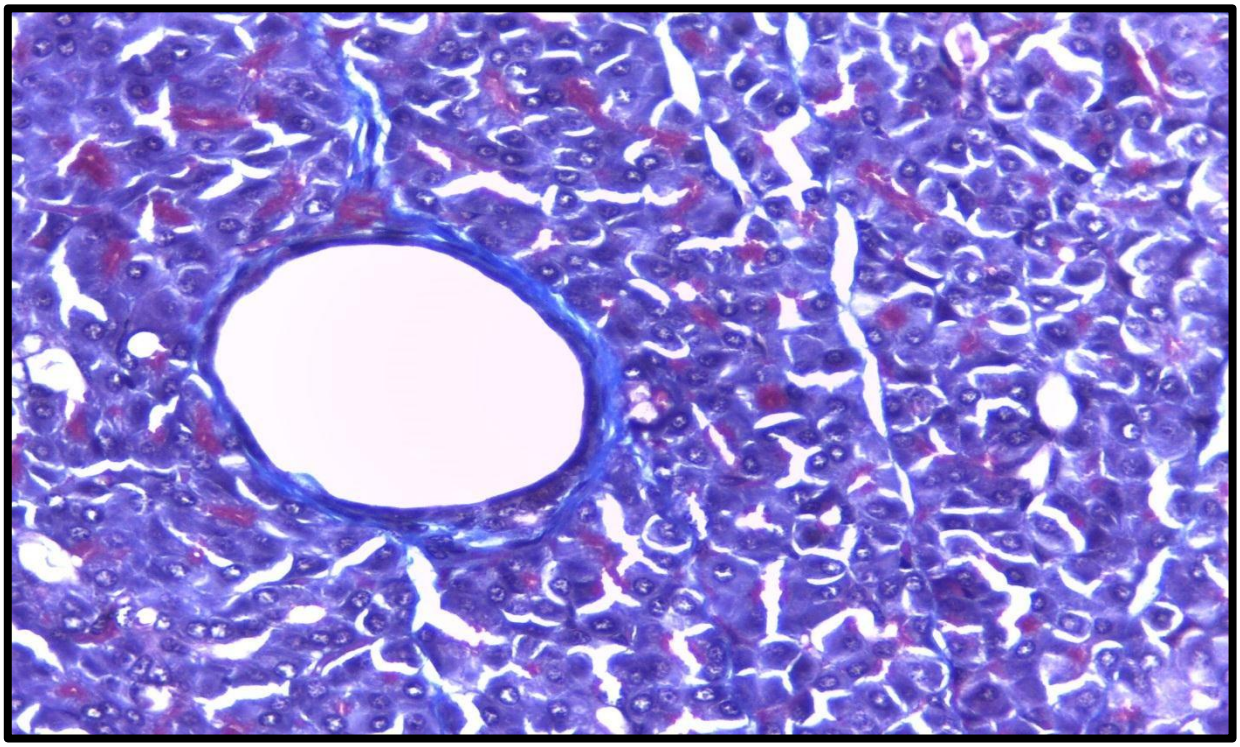

Fig.3. Photographic of the pancreas in rabbit show the: **A**. acinus, **B**. Intralobular duct. **X 400 Masson Trichrome stain.**

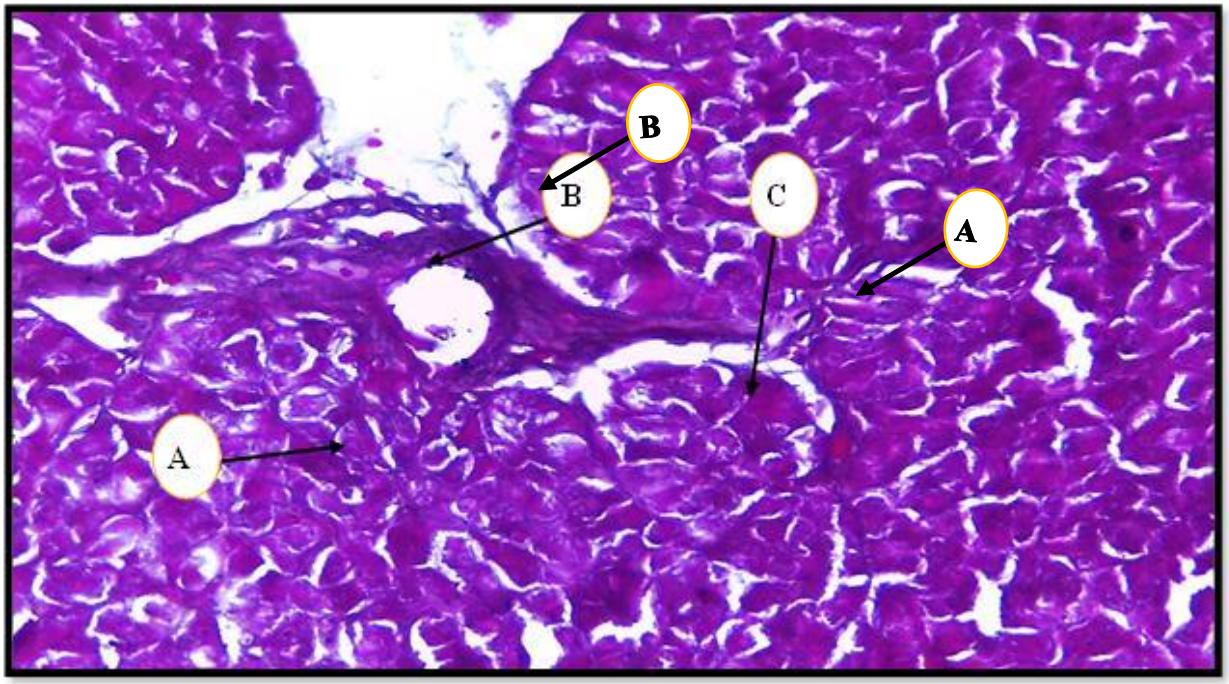

Fig.4. Photographic of the pancreas in cat show the: **A**. acinus, **B**. Intralobular duct, **C**. Islet of Langerhans. **X 400 Masson Trichrome stain.**

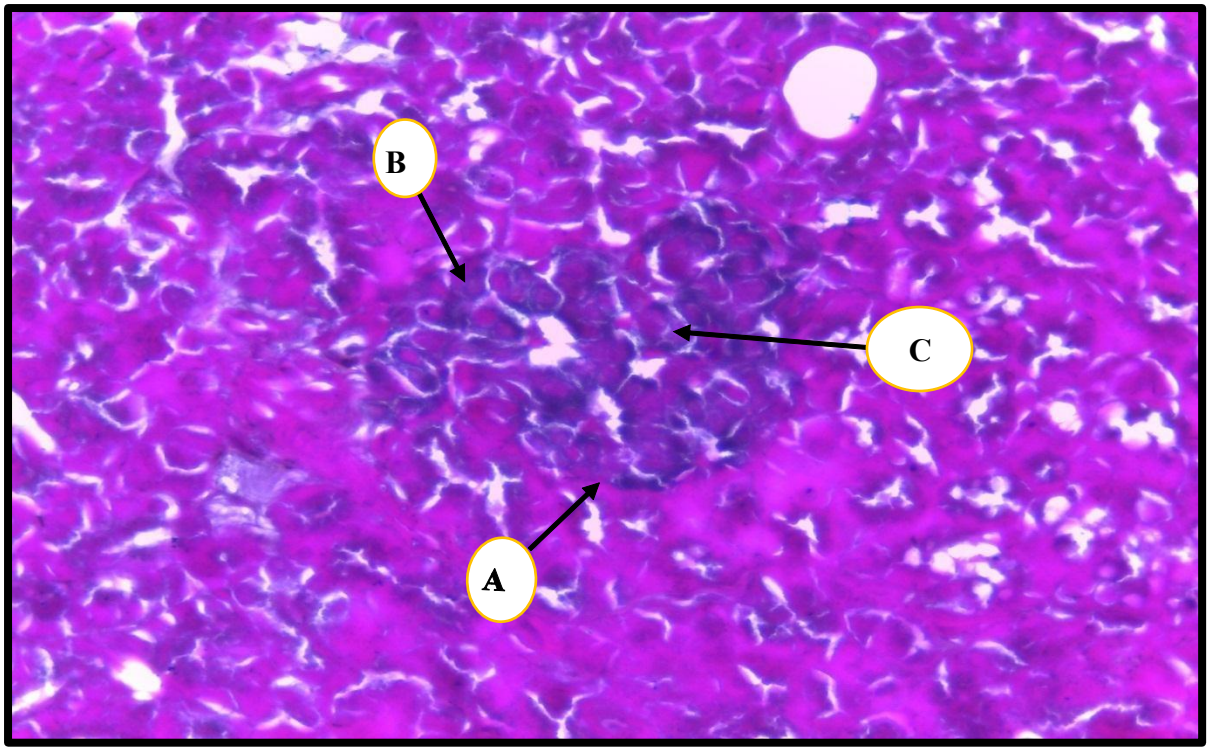

Fig.5. Photographic of the pancreas in rabbit show the: **A**. Islet of Langerhans, **B.** alpha cells, **C**. Beta cells. **X400 Gomers stain.**

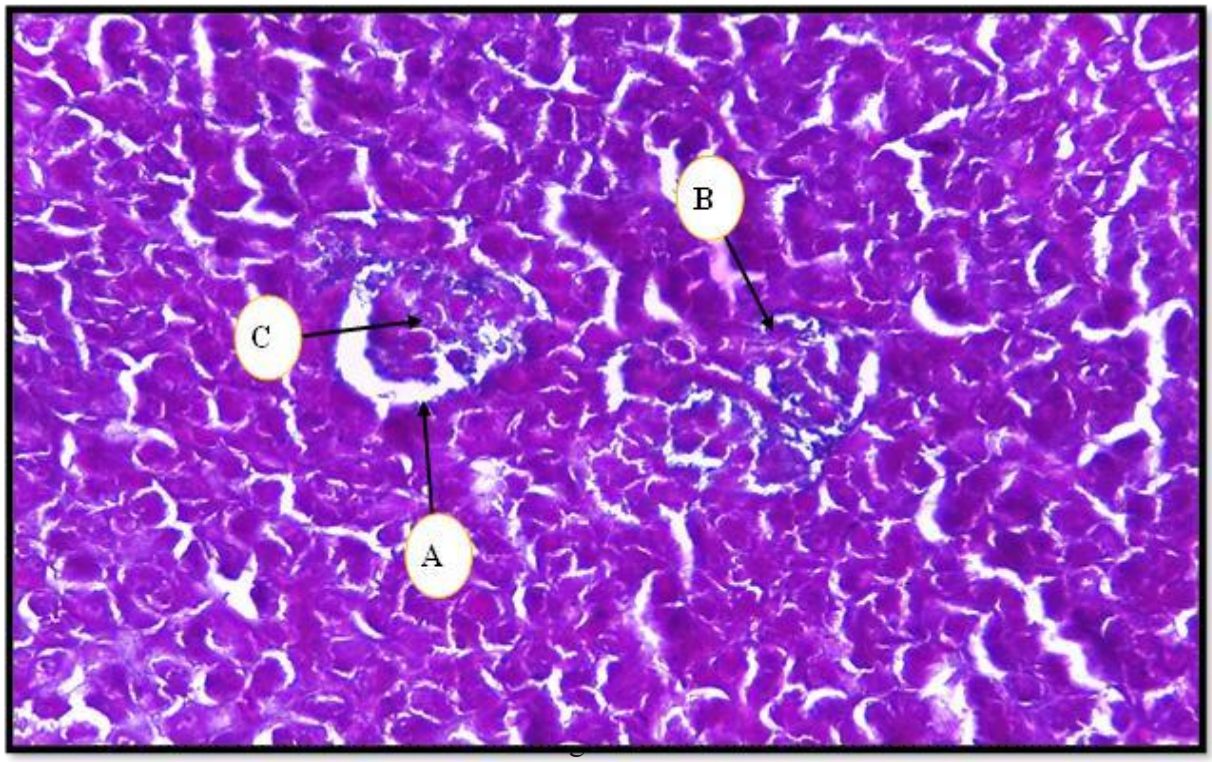

Fig.6. Photographic of the pancreas in cat show the: **A**. Islet of Langerhans, **B.** alpha cells, **C**. Beta cells.**X400 Gomers stain.**

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