Anatomical and Histological study of the Pancreas of Pigeon

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Abstract

Ten Adult Pigeon male and female obtained from AL-Nassiriya market species *(Columbia livia*). Histological and histochemical study on the pancreas of pigeon were carried out using special staining and light microscope. The pancreas had four lobes ,Three pancreatic ducts were recognized as they join the proximal end of ascending duodenum . The Exocrine portion consist of intercalated duct, intralobular duct , interlobular duct and main duct. In the present study the serous tubuloacinar gland having Exocrine and Endocrine portion .The Endocrine portion were found to be Langerhans Islets which were composed of Alpha islets and Beta islets . Alpha islet were composed of two types of cells: Alpha cell and Beta cell .Beta islets containing Beta cell and Delta cell. The Endocrine Portion was consisted of various shapes and size of Alpha and Beta islets .The structure of Pigeon Pancreas was similar to that of other avian species with minor differences.

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KeyWord:Pancreas,Anatomy,Histology,Alphacells,Betacells,Endocrine,Exocrine.

Introduction

The avian pancreas differs from other Animals in being composed of two or more lobes and in containing two islets types , there are many species differences in structure of avian

Pancreas ,division of lobes distribution of the islets in lobes ,the form and frequency of Endocrine cells in islets and structure of ducts are the most important differences.(Gulmez,2003).The Pancreas in common quail is located on the right side of the abdominal cavity ,It is tightly bound by mesentery and blood vessel positioned between the Descending and the Ascending Duodenal loops (AL-hathry 2000).The pancreas is considered to have four lobes :ventral lobe ,dorsal lobe, third lobe and splenic lobe, ventral duct , dorsal duct and third duct, as described in chicken and quail (Baumel,1993). In the duck ,the bulk of the Pancreas consists of dorsal , ventral and small splenic lobe with three pancreatic ducts (Liu,*et al*.1998).The Endocrine Pancreas of birds contains three islets types release glucagon , insulin, somatostatin and Avian Pancreatic Polypeptid (APP),interaction between these hormones ,and Pancreatic hormone – plasma metabolite feedback mechanisms ,are the main regulators of these secretions.(Das,et al.,2003). The Pancreas in birds is the largest gland connected with alimentary tract ,it is consist of an Exocrine Portion and Endocrine Portion , in such Portion the function are both carried out by the some cells ,the Pancreas Exocrine and Endocrine function that are performed by different groups of cells (Gussekloo,2006).The Exocrine Portion in the Brazilian Sparrow species is a composed acinus glands whose lobules are bound together by loose vessels , neural fibers , lymphatic and Excretory ducts ,the acini drain their product into Exocrine ducts which cluster in rounded and short tubules scattered cells throughout the Endocrine Portion of the Pancreas constitute richly vascularized small mass of Endocrine cells which represent the islets of Langerhans(Nascimento,*et al*.2007). The present study was conducted to investigate the structure of Pigeon pancreas to provide base line information.

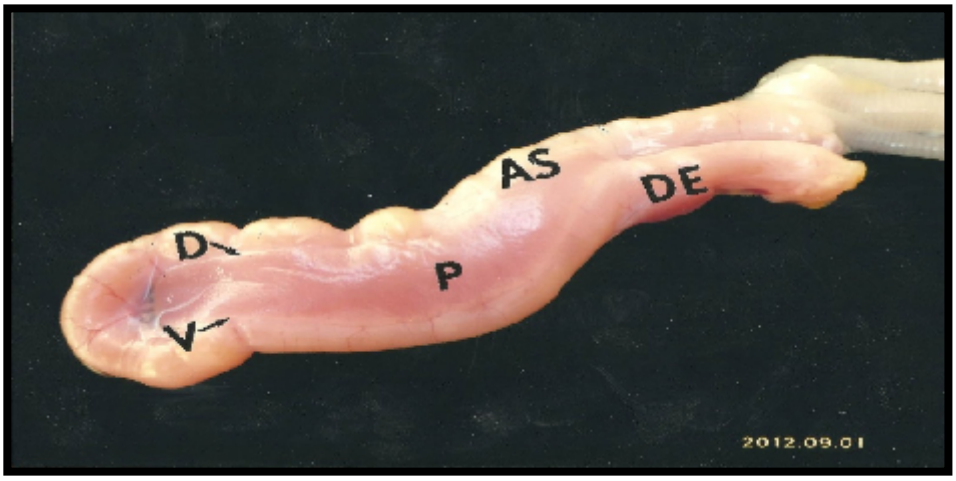
Material and methods

Ten Adult Pigeon male and female obtained from AL-Nassiriya market ,after anesthesia the Pancreas was removed from each one and cut in smaller fragment for fixing in Bouins solution for (48) hours (Shindala,1999) .After postfixation the tissue pieces were dissected from the lobes of Pancreas and then routinely processes of Ethanol 70% 80% 90%, 95%,100% (Vacca, 1985). Embedding in Paraffin ,tissue block were cut into 6-micrometer thick section using a microtome .The section were stained ,the histological and histochemical method of staining were employed as follows : Harris-Heamatoxylin and Eosin stain(H&E) , phosphotengestic acid(PTAH) , weigerts stain (Bancroft and Gammble,2002).Photographs of the examined slides were carried out with a Motic microscope which is supplied with a digital Camera with resolution Power of two mega pixel ,digital caliper , digital balance .

Results and Discussion

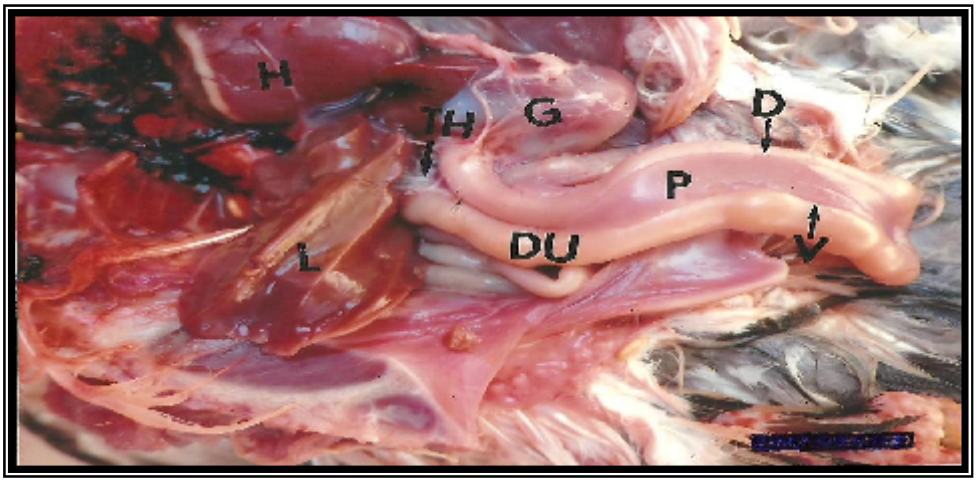
In the present study ,the pigeon pancreas as

pale pinkish and ribbon-like organ located between the ascending and descending limbs of the duodenum and enclosed with the pancreatic duodenal ligament .It is covered by a thin layer of loose connective tissue capsule (figer. 1)



Figure(1) .The pancreas(P)fills the gap between (AS)ascending and (DE)descending duodenum ,(V) ventral loop,(D) dorsal loop.

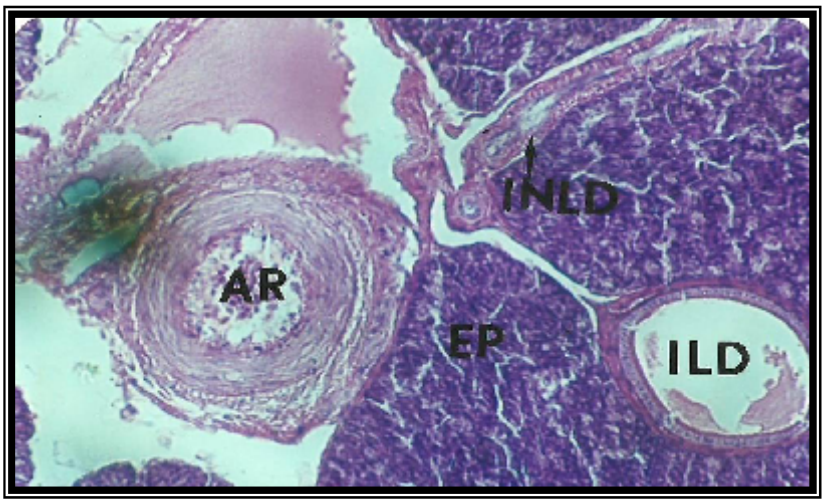
This finding is in agreement with the result (AL Hathry,2000) and (Khalid, *et al*.2010). The pancreas in this study had four lobes : dorsal lobe , ventral lobe, third lobe and splenic lobe (figer .2).



Figure(2).A pigeon pancreas(P).The pancreas is attached in (DU) duodenal loop ,(V)Ventral lobe,(D)Dorsale lobe,(TH)Third lobe,(L) Liver ,(G)Gizzard(H)Heart .

Our results was found to be similar to that described in previous studies (Baumel,1993) and (AL- Hathry ,2012), when they described the Pancreas of birds have four lobes .All the

Pancreatic lobes had their own Intercalated duct,Intralobular duct Interlobular duc and Main duct. .In addition ,there were only two main ducts (dorsal and ventral pancreatic ducts) extending from the pancreas to the point where it emptied its contents into duodenum .Figure(3,4).



figure(3). Cross section in pancreas,The Exocrine portion(EP) , (ILD) Intralobular duct,(INLD)Interlobular duct.(AR),Artery. H&E stain (40x).

These results showed difference with the finding (Liu, *et al*.1998). (AL-Hathry,2000) demonstrated Pancreas common Quail (*coturnix c coturnix L*.)that it has ductal system : Intercalated duct, Intralobular duct,Interlobular duct and Main duct, these Intercalated duct and Intralobular duct are lined by simple cuboidal epithelium which changed to simple columnar epithelium in the Interlobular duct ,this fact agreed with our study . Topographical distribution of Pancreatic ducts in this study have been in agreement with reports (Sawad,1997), when showed that Pancreas*(seteppe buzzard)* has the Exocrine parts consist of many lobes . In the present work Intercalated ducts lined with a simple flattened epithelium reach Inrtalobular duct lined with tall columnar epithelium ,Intralobular and Interlobular ducts are composed of two main tissues ,a columnar epithelium which lines up inside the ducts and connective tissue surrounding the connective tissue and main duct lines with simple columnar epithelium tissue.(figer.4) .

Figure(4).Cross section in main duct (MD),simple columnar epithelium (SCE),splenic lobe(SL),(SMF)smooth muscle fibers,(PTAH) stain(40x).

Our data no agreed with(motta ,1997)who reported that there are three different pancreatic ducts in the fowl ,two of which arise from the ventral and one from the dorsal lobe .These ducts inter the proximal loop of the Ascending Duodenum ,there are only ducts in goose (Gulmez,2003) .In addition to the first pancreatic duct from the dorsal Pancreatic lobe ,which inters the Duodenal loop between its Descending and Ascending limb (Liu,*et al* .1998).In the histological study the Pancreas had two Portions ,Exocrine and Endocrine Portion and was located in the meshwork of reticular fibers.The Exocrine Portion was arranged in form of serous tubuloacinar glands and occupied a large area of Pancreas and had cells called acini cotaining centroacinar cell (figer.5.6)

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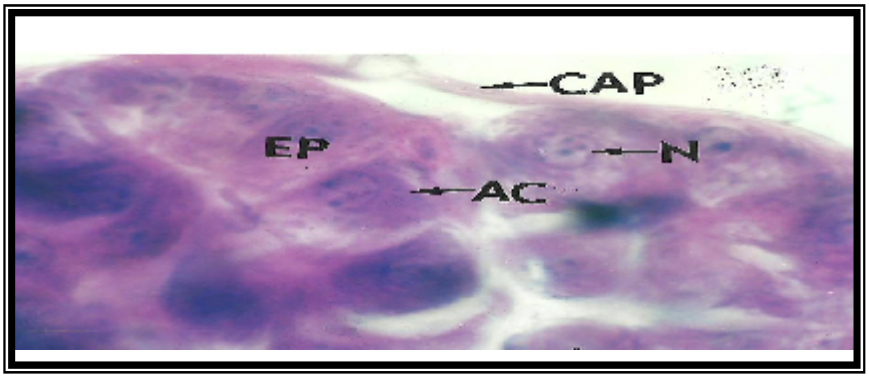
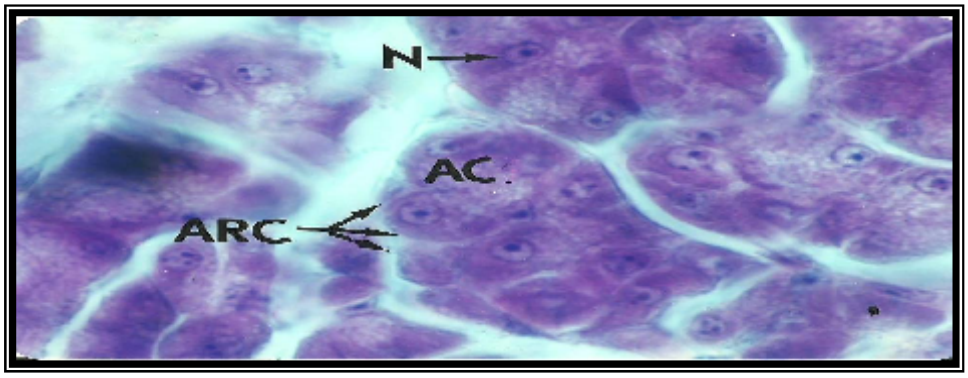


Figure(5).Cross section in dorsal lobe showed (CAP) capsule ,(EP) Exocrine portion(AC) Acinar cell ,(N) Nucleus .H&E stain(1000x).

These data is similar to results (Gencer,2007). We are found that the Exocrine Portion was composed of acini and ducts, the acini were round to oval in shape with large granules ,they had centroacinar cells, their duct were of different size with simple epithelium ,the ducts especially the large ones had muscular layer which were arranged more in circular layers around them .

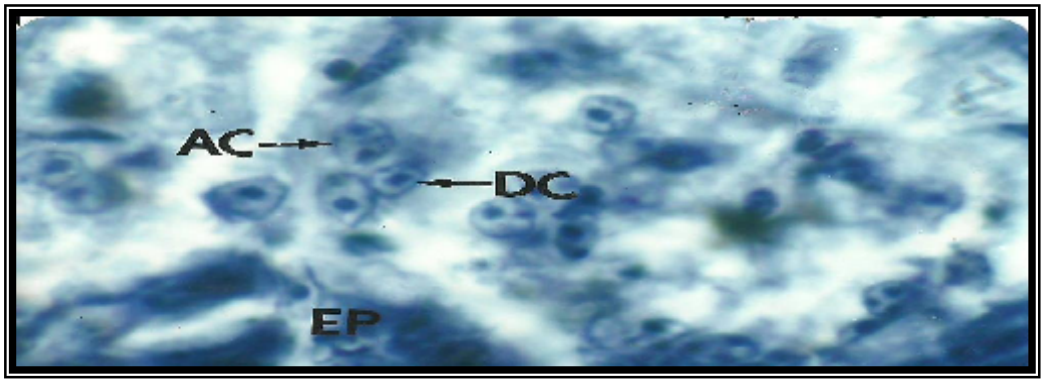


Figure(6).Cros section in dorsal lobe note the Exocrineportion.(AC) Acini

,(ARC)Acinar cells ,(N)Nucleus.H&E stain.(1000 x). .

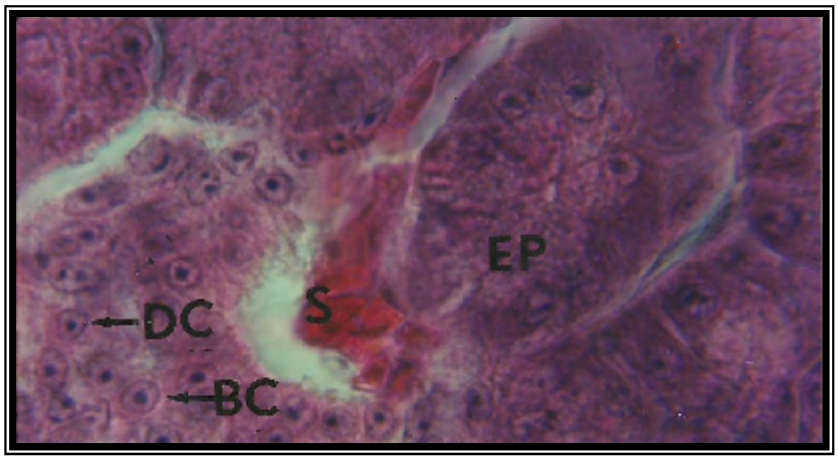
The Endocrine Portion had two islets called Langerhans islets consist of Alpha islets composed of Alpha and Delta cells and

the other was a Beta islets made of Beta and Delta cells .According to these data we agreed with results (Mensha,*et al.*2004) and (Tarakcy et al.2005) were demonstrated in the center of the Pancreatic islets containing Alpha,Beta and Delta cells . Delta cells in Mynah were also seen in both Alpha and Beta islets (Saadatfar ,*et al*.2009),the duct in Mynah were similar to that observed in previous studies .(AL-Hathry,2006)reported that the pancreas of columbidae cotaining islets of Langerhans consist of Alpha ,Beta and Mixed Islets. The structure of the Pancreas of Pigeon was found to be similar to that described in previous study (AL-Samarrae,*et al*.1999) and (Sawad,1996), reported the Endocrine Portion is composed of aggregated cells surrounded by reticular fibers and by network of sinusoid like blood capillaries which lined by endothelial cells. Our results were showed that the Endocrine Portion constitute the islets of Langerhans , which is Alpha cells : are found usually at the peripheral ,Beta cells :



Figure(7).Cross section in ventral lobe showed:Langerhans islet ,(AC) Alpha cell,(DC)Delta cell, (EP) Exocrine portion. Weigerts stain(1000x).

these cells are arranged in the form of cords or in irregular rows of polygonal cells and have round nuclei ,and Delta cells : these are numerous and are scattered between the peripheral Alpha and the central Beta cells ,these cells are irregular in shape and posses large spherical nuclei(Figure.7).



Figure(8).Cross section in splinic lobe showed Lagnerhans islet.(BC)Beta cell,(DC),Delta cell,(EP)Exocrine portion(S)sinusoid's.H&E stain(1000x) .

The Endocrine Portion were as islets of various sizes and shapes scattered in small group of cells .Alpha islets were more and larger than Beta islets .They had no distinct borders with the Endocrine Portion and were more densely populated than Beta islets (figer.8), while (Mobini,2011) described the Pancreas of Goose had three islets of Langerhans and the secretary acini in the Exocrine Parts consisted of variable number of pyramidal cells having basophilic zymogene granules and the intralobular ducts were lined with a simple cuboidal epithelium reach interlobular ducts lined with low columnar epithelium.

References

AL-Hathry ,S .A. (2000) . Topografical ,histological ,and histochemical study of the pancreas of Common Quil (*Coturnix C. Coturnix L* .) . M.Sc.Thesis Univertity of Baghdad – Baghdad . Iraq. Pp:47-48 .

AL-Hathry ,S .A.(2012).Histological study of Alpha cells,Beta cells and Delta cells on pancreas of Abu- gura.J.Coll.Edu. .Univ.Thi-Qar.,2(2):16-21.

AL-Hathry,S. A. (2006) . Histological study of the Langerhans Islets of columbidae . J. Univ.Thi-qar., 2(2): 151-154.

AL-Samarae , N.S. ,Thayer ,A. and Sawad,A.A.(1999) . Topografical and histological study of the pancreas of the moorhen (*Galinula C.coropus*) .Veterinarian., 9:1-6.

Bancroft, J.D. and Gamble, M. (2002). Theory and practice of histological . techniques.5th ed. Churchill Livingstone, Philadelphia.

Baumel,J.(1993). Hand book of avian Anatomy.Nomina Anatomica.Avium.2nd.Ed.Cambridge,Am .USA:Nuttal Ornithological club.

Das. A, Das. R.K, and Parida. S, (2003) . Histomorphological study on pancreas of duck (*Anas boscas*). Indian J. Anim. Sci.; 73 (6): 598-599.

-Gencer, B . T . Yaman, M. and Bayrakdar, A. (2007). Immunohistochemical study on the endocrine cells in the Pancreas of the Ostrich (*strohtio camellus*).J.Anim.Vet. Adu.,6:693-696 .

Gulmez,N .(2003). Are gland present in Goose pancreatic Ducts? Alight microscope study.Jop.J.pancreas (Online),4(3): 125_128.

Gussekloo, S.W.S. (2006). Feeding structures in birds.In,feeding

in domestic vertebrates: from structure to behaviour. Edn V.Bels. Wallingford, UK, Combridge

Khalid, K., Kadhim,I., Zuki A. B. Z. ,. Noordin, M. M., Babjee,M.A. and Zamri-Saad, M. (2010) .Morphological study of pancreatic duct in red jungle Fowl. African Journal. of Biotechnology Vol. 9(42), pp: 7209-7215

Liu, J.W., Evans. H, Larsen P., Pan, D., Xu ,S.Z., Dong, H.C., Deng,X.B., Wan, B. and GR, T. 1998) . Gross anatomy of the pancreatic lobes and ducts in six breeds of domestic ducks and six species of wild ducks in china. Anat. Histol. Embryol. 27: 413-417.

Mensah-Brown, E.P.K., Bailey, T.A., Pallot, D.J. and Garner,

A. (2004). Pepdidergic hormones and neuropeptides

and aminergic neurotransmitters of the pancreatic

islets of the Houbara bustar *(Chlamydotis undulate).*

J. Anat., 196: 233-241.

Mobini,B.(2011).histological study on pancreas of Goose (*anser albifrons)* .vetrinary reseach forum.2(1):25-29.

Motta, P., Macchiarelli, G.,and Nottola ,S.A. (1997).

.

Histology of the Exocrine Pancreas. Micros. Res. Tech. 37: 384-398.

Nascimento,A.A.,Sales,A.,Cardo,T.R,D.,Penhe ro,N.L.and Mendes,R.M.M.(2007). Immunocytochemical study of the distribution of endocrine cells in the Pancreas of the Barazilian sparrow species.Braz.J.Biol.,67(4):735-740.

Saadatfar,Z.and Asadian,M.(2009). Anatomy of pancreas in Mynah *(Acridothere tristis*).J.Appl.Anim.Res,36:191-193.

Sawad, A.A.(1997). Some topographical and histoarchetectural study on the pancreas of *Seteppe buzzard* (*Buteo b. vulpins* Gloger).Veterinarian., 6: 114-146.

.

Sawad,A.A.(1996). Anatomical and histological study of the Pancreas in Turkey (*Maeagaris gallopavo*) . M.Sc.Thesis.University of Baghdad .Baghdad. Iraq. PP:35-36.

Shindala, M. K. **(1999**). Anaesthetic effect of ketamine and ketamine with diazepam in chicken. Iraq. J. Vet. Sci., 12: 261-265.

Tarakcy, G.B., Yaman, M., Bayrakdar A. and Atlar, O.

(2005). Immunohistochemical detection of Gonadotropin

-releasing hormone (GnRH) in porcupine*(Hystri cristatax)*

pancreas. J. Anim. Vet., 8: 747-74

Vacca,L.L.(1985). Laboratory manual of histochemistry. 1st ed. Raven press. New York. U.S.A. PP: 182.

دراسة تشريحية ونسجية لبنكرياس طائر الحمام

ستار عبود فارس

قسم البايلوجي –كلية التربية للعوم الصرفة-جامعة ذ ي قار

الخلاصة

تم الحصول على ذكور واناث بالغة للحمام العراقي نوع(*Columbia livia*)

من سوق الناصرية المحلي. اجريت الدراسة النسجية والكيمياء النسجية لبنكرياس الحمام باستخدام الصبغات الخاصة والمجهر الضوئي . تمتلك البنكرياس أربعة فصوص وثلاثة قنوات بنكرياسية ميزت بارتباطها بالجزء القاصي للاثني عشر . يتكون جزء الإفراز الخارجي من القناة البينية ،القناة داخل الفصيص ، القناة بين الفصيص والقناة الرئيسة.الغدد النبيبية في الدراسة الحالية تمتلك جزء إفراز خارجي وداخلي ،الجزء داخلي الإفراز يمتلك جزيرات لانكرهانس التي تتكون من جزيرات ألفا وجزيرات بيتا.جزيرات الفا مكونه من نوعين من الخلايا ،خلايا الفا وخلايا دلتا وجزيرات بيتا تحتوي خلايا بيتا وخلايا دلتا . كما يحتوي الجزء داخلي الإفراز على أشكال وأحجام مختلفة من جزيرات ألفا وجزيرات بيتا . تركيب بنكرياس الحمام مشابه لبنكرياس الأنواع الأخرى من الطيور مع بعض الاختلافات الطفيفة.

الكلمات المفتاحية:بنكرياس،تشريح،أنسجة،خلايا ألفا،خلايا بيتا،جزء الإفراز الداخلي،جزء الإفراز الخارجي