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Pathological findings in anaemic pigs

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Abstract

Carcasses of 6 pigs were presented to Department of Veterinary Pathology, College of Veterinary Science, Tirupati for necropsy examination with a history of anorexia, bloody diarrhoea and weakness. External examination revealed poor body condition, pale mucus membranes, sunken eyeballs, cyanotic and haemorrhagic areas were noticed on dorsal and ventral aspects of the body of pigs. Serosanguineous fluid was observed in thoracic cavity and abdominal cavity. Post mortem examination was carried out in 6 pigs with severe anaemia, grossly severe parasitic infestation was observed in large intestine. In addition, hydropericardium, mild hepatomegaly and mild decrease in redness was noticed in bone marrow. Bone marrow aspirate revealed red cell aplasia, few early erythroid precursor cells, granulocytic precursors and lymphocyte precursors. Histopathologically, in intestine disruption of intestinal epithelium and mucosa, desquamation of epithelial cells, cut section of worms in the intestinal lumen, infiltration of lymphocytes and eosinophils in the lamina propria were observed. Engorgement of red pulp, deposition of haemosiderin pigment and infiltration of eosinophils, neutrophils and fibroblasts were noticed in red pulp in spleen of anemic pigs.

Keywords: Pale mucus membranes, serosanguineous fluid, hydropericardium, haemosiderin pigment

Introduction

In developing countries like India, majority of pigs were raised under free-ranging system where they fed with raw garbage and kitchen waste, therefore more prone to parasitic infections (Tiwari *et al.*, 2009) ^[12]. Around 90% of the pig population in India are in rural areas, where swine domestication is mainly concentrated to low-income group families having poor hygiene standards (Laha *et al.*, 2014) ^[7] lead to severe parasitic infestation and various vitamin and mineral deficiencies cause of anaemia in pigs. In pigs, piglet anaemia was most common. Anaemia in piglets in the neonatal period was caused by iron deficiency. When Sows and piglets were exclusively housed and not given iron supplementation this condition could arise.

Materials and Methods

Carcasses of 6 pigs were presented to Department of Veterinary Pathology, College of Veterinary Science, Tirupati for necropsy examination with the history of anorexia, bloody diarrhoea and weakness. A detailed post mortem examination was conducted and the gross findings were recorded. Representative tissue samples from various organs were collected in 10% neutral buffered formalin for histopathological examination. After fixation the tissues were processed and embedded in paraffin blocks. Sections were made at 5micron thickness and stained with haematoxylin and eosin (H&E) stain as per the conventional procedure (Culling, 1974)^[3].

Results and Discussion

Gross lesions: On external examination poor body condition, pale mucus membranes, sunken eyeballs, cyanotic and haemorrhagic areas were noticed on dorsal and ventral aspects of the body of pigs. Serosanguineous fluid was observed in thoracic cavity and abdominal cavity. Weakness because of less oxygen carrying capacity of blood, respiration becomes more rapid and eventually labored.

Pale mucus membranes in anemic pigs might be due to diminished haemoglobin and decreased red cell number. Variations in osmotic pressure resulted from reduced plasma protein levels in blood and failure to form plasma proteins resulted in malnutrition in the form of emaciation due to nonavailability of building blocks for proteins (Thomson, 1984)^[10]. Grossly lungs were pale in appearance, focal consolidated areas in dorsal and ventral surface, frothy exudate in trachea, bronchi and bronchioles, areas of mild emphysema, mild edema and moderate oozing of exudate was noticed. Pulmonary edema might be due to hypoproteinemia that resulted in increased accumulation of fluid in the organs. In intestines thickened wall of large intestine with severe congestion of mesenteric vessels, congested mucosa, contents were haemorrhagic and mixed with sand, catarrhal exudate and parasitic infestation in the large intestinal lumen (Fig.1) (Pittman et al., 2010)^[8] and enlarged Peyer's patches, swollen and edematous mesenteric lymphnodes were noticed in pigs with anaemia.



Fig 1: Photograph showing parasitic infestation in the lumen of large intestine

Infective eggs were ingested and localized in the intestine, liberating larvae penetrate the mucosa of the caecum and colon (Jones et al., 2012)^[6]. Severe parasitic infestation in the intestine resulted in hypoproteinemia, decreased haemoglobin activity and absorption of blood by the parasite which was observed in the present study. Mild hepatomegaly, congestion, hard in consistency, multiple focal gravish white areas on the dorsal surface few had diffuse yellowish white areas on the dorsal surface and distended gall bladder with thick bile. In heart hydropericardium, congested coronary vessels, few had gelatinization of epicardial fat, chambers contained current jelly clot and few had chicken fat clot. Gelatinization of epicardial fat occurs rapidly during anorexia, starvation or cachexia because fat is catabolized to maintain energy balance (Zachary and Mc Gavin, 2012) ^[14]. Stomach was pale with patchy areas of congestion and minute ulcers were noticed on mucosa. Focal haemorrhages in fundus region and stones were noticed in stomach. Kidneys were pale, dilated renal pelvis with congested cortex in few pigs and congested cortico medullary junction was observed. Mild splenomegaly was observed in pigs with anaemia. Splenomegaly due to presence of a greater number of erythrocytes and myelocytes and distributed throughout the spleen. Smears prepared from bone marrow red cell aplasia was observed. Few early erythroid precursor cells, but normal population of granulocytic precursors (Fig. 2) and lymphocyte precursors (Fig. 3) were noticed. Mitotic figures were also noticed. These results were in accordance with (Thrall *et al.*, 2012)^[11].



Fig 2: Cytological smear from bone marrow showing granulocytic precursors had irregular shape and eccentric nuclei, with fine to stippled chromatin pattern and basophilic cytoplasm in pig affected with anaemia. Leishman's stain: x 1000.



Fig 3: Photograph of cytological smear from bone marrow showing lymphocytic precursors with round indented nucleus, diffuse chromatin pattern without visible nucleoli and scanty basophilic cytoplasm in pig affected with anaemia. Leishman's stain: x 1000.

3.2 Histopathological lesions

3.2.1 Lungs

In lungs perivascular lymphoid infiltration, heavy neutrophil infiltration mild emphysema, edema, hemosiderin pigment deposition in bronchiole and bronchiectasis were noticed.

3.2. 2 Intestine

In intestine cut section of worms in the intestinal lumen (Fig. 4), infiltration of lymphocytes and eosinophils (Fig. 5) in the lamina propria, complete necrosis of villi with infiltration of mononuclear cells, enlargement of peyers patches and eosinophil infiltrationin the peyers patches were noticed. Anaemia resulted in necrosis which might be due to decreased amount of oxygen and nutrients and not sufficient to maintain cellular metabolism (Vegad, 1995)^[13]. Ova in epithelium were observed in large intestine especially in caecum. (Pittman *et al.*, 2010)^[8]. Heavy parasitic infestation resulted in catarrhal, hemorrhagic or necrotizing typhiltis and colitis. Larvae of

Trichiuris suis penetrate and ulcerate intestinal mucosal lining with subsequent erosion of capillary beds lead to hemorrhage and anaemia (Corwin *et al.*, 1999)^[2].



Fig 4: Histological section of intestine showing cut section of worms in the intestinal lumen. H&E:x100



Fig 5: Histological section of intestine showing infiltration of lymphocytes and eosinophils in the lamina propria. H&E:x100

3.2. 3 Liver

In liver individualization of hepatocytes, thickened central vein with fibroblasts (Fig. 6), proliferation of fibrous tissue in between hepatocytes (Fig. 7), proliferation of cholangiocytes and degenerative changes in hepatocytes were observed in pigs with anaemia. Degenerative changes might be due to parasitic infestation (Thomson, 1984)^[10].



Fig 6: Section of liver showing individualization of hepatocytes. H & E: x 400



Fig 7: Section of liver showing fibrous tissue proliferation in between hepatocytes. Vangieson's stain: x 100

3.2. 4 Heart

In heart degenerative changes in the epicardium, sarcolysis (Fig. 8) with individualization of cardiac muscle fibres in myocardium (Fig. 9) and pericarditis were observed in pigs affected with anaemia. Cloudy swelling might be due to accumulation of fluid within the cells (Vegad, 1995)^[13] due to hypoproteinemia that was observed in the present study.



Fig 8: Section of heart showing sarcolysis. H & E: x 400.



Fig 9: Histological section of heart showing individualization of cardiac muscle fibres in myocardium. H & E: x 400.

~ 128 ~

3.2. 5 Kidney

In kidney intertubular haemorrhages, loss of tubules with proliferation of fibroblasts and endothelial cells around the blood vessels with early extramedullary haemopoiesis was noticed (Fig. 10& Fig. 11), Similar type of results were noticed by (Alexander *et al.*, 2015) ^[1]. Extramedullary haematopoiesis due to haematologic disorders and also due to renal dysfunction or proteinuria.



Fig 10: Kidney showing loss of tubules with proliferation of fibroblasts and endothelial cells around the blood vessels with early extramedullaryhaemopoiesis. H & E: x 100



Fig 11: Note proliferation of endothelial cells early extra medullary haemopoiesis. H & E: x 400

3.2.6 Spleen

spleen In congestion, engorgement of red pulp, reticuloendothelial hyperplasia, lymphoid depletion, in white pulp deposition of haemosiderin pigment (Fig. 12) and infiltration of eosinophils (Fig. 13), neutrophils and fibroblasts were noticed in red pulp and in few cases giant cells were evident in red pulp of pigs affected with anaemia. Irwin et al., (1991)^[5] observed parasitized erythrocytes in all the tissues, marked increase in red pulp area and reticuloendothelial hyperplasia in spleen, mild and degenerative lesions of cytoplasm of proximal tubular epithelial cells, haemoglobin droplets in the proximal tubules of the kidney, mild interstitial pneumonia with thickening of the alveolar walls due to increased numbers of alveolar macrophages in dogs affected with Babesiosis. Haemosiderosis could be due to increased absorption of dietary iron, hemolytic anaemia and transfusions (Vegad, 1995)^[13].



Fig 12: Histological section of spleen showing deposition of haemosiderin pigment. H&E:x 100



Fig 13: Histological section of spleen showing infiltration of eosinophils. H&E:x 100

3.2.7 Stomach

In stomach degenerative changes in the parietal cells with infiltration of mononuclear cells, necrosis, ulcers and more number of goblet cells were observed in pigs affected with anaemia. These types of findings were noticed by (Doster, 2000)^[4].

3.2. 8 Uterus

In uterus subepithelial eosinophil infiltration (Fig. 14), fibrous tissue proliferation around blood vessels in myometrium was noticed in pigs with anaemia (Fig. 15). Eosinophil infiltration in intestine, spleen and uterus might be due to parasitic infestation (Soulsby, 2012)^[9].



Fig 14: Section of uterus showing subepithelial eosinophil infiltration. H & E: x 1000





Fig 15: Histological section of uterus showing fibrous tissue proliferation around blod vessels in myometrium. Vangeson stain:x 400

Conclusion

It was concluded that pigs affected with anaemia showing poor body condition, pale mucus membrane, serosanguineous fluid was observed in thoracic cavity and abdominal cavity, pulmonary edema and severe parasitic infestation in the intestine resulted in hypoproteinemia. *Trichiuris suis* penetrate and ulcerate intestinal mucosal lining with subsequent erosion of capillary beds lead to hemorrhage and anaemia. In kidney early extramedullary haemopoiesis was noticed. Eosinophil infiltration in the intestine, spleen and uterus due to parasitic infestation.

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