

GROSS AND MICROSCOPIC HEPATIC LESIONS OF DROMEDARY CAMELS SLAUGHTERED IN EASTERN PROVINCE OF KINGDOM OF SAUDI ARABIA

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ABSTRACT

This study was carried out to describe the gross and microscopic hepatic lesions of dromedary camels slaughtered at Al omran abattoir in the Eastern Province of Saudi Arabia. The grossly affected livers from 120 camels with different ages, sexes, and unknown history were collected from freshly slaughtered animals, and examined grossly and microscopically. The total number of liver lesions recorded in this study were 43 (36.66%) cases out of 120 samples of camel livers collected. The pathological changes observed in this study, were degenerative changes and focal hepatic necrosis (10, 8.33%), partial liver cirrhosis (8, 6.66 %), diffuse liver cirrhosis (6, 5 %), liver abscesses (5, 4.16 %), hydatid cysts (4, 3.33 %), haemorrhages and congestion (4, 3.33%), chronic suppurative hepatitis (3, 2.5%) and pigmentation (3, 2.5%). In the present study, degenerative changes, necrosis and liver cirrhosis were the most common hepatic lesions affecting the collected liver samples of camels during the study period. In some liver sections, partially degenerated parasitic ova and hydatid cysts were identified as cause of focal necrosis and calcification.

Key words: Camel, hydatid cyst liver lesions, liver cirrhosis

The camel suffers from many disease conditions including those that affect the kidneys (Taha *et al*, 2007, Barakat *et al*, 2021). Recently there is continued interest concerning incidence of liver diseases in dromedary camels, and various liver diseases have been reported during necropsy examination (Van Saun *et al*, 2000). As in all domestic animals, the liver of camels is considered the most important organ because most of the metabolic activities of the body take place in the liver (Siddig, 2002; Watkins and Seef, 2006; Radostits *et al*, 2007). In general, hepatic dysfunction may be diagnosed by the evaluation of clinical history, physical examination, biochemical tests, hepatic imaging, gross and histopathological examinations (Al-Sobayil, 2008). In many previous studies, researchers have explained several hepatic disorders associated with the liver of camels in many countries, including hepatitis and cirrhosis (El-Mahdi *et al*, 2013; Tharwat, 2020), hydatid cysts (Ahmadi, 2005, Al-Hadi and Saad, 2012), *Fasciola hepatica* (Eslami *et al*, 2003), linguatulososis (Haddadzadeh *et al*, 2009; Oryan *et al*, 2011) and abscesses of *Corynebacterium pseudotuberculosis*, (Hawari, 2008). In addition, neoplasms arising from genetic mutations or environmental carcinogens were reported in different camels tissues (Weiss and Walz, 2009; Simmons

and Fitzgerald, 2005). The present study was aimed to clarify the main gross and microscopic hepatic lesions of dromedary camels slaughtered at Al Omran abattoir in the Eastern region of Saudi Arabia.

Materials and Methods

The grossly affected livers from 120 dromedary camels with different ages and unknown history were collected from freshly slaughtered animals at Al omran abattoir in the Eastern Province of Saudi Arabia and examined carefully for macroscopic lesions. For histopathological study, tissue samples were taken from the hepatic lesions and fixed in 10% neutral buffered formalin. These were processed and embedded in paraffin. Sections of 5 µm thickness were cut and stained with haematoxylin and eosin.

Results

Various gross and microscopic lesions observed in the liver of 120 examined camels are summarised in table 1.

Pathological manifestations

1. Patterns of Focal hepatic Necrosis

Hepatocellular degeneration and focal necrosis and calcification were the most common hepatic lesions seen in this study. The lesions were in the

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form of round white or gray spots or areas 4-6 cm in diameter, distributed under the liver capsule or within the liver tissue (Figs 1a, 1b).

Microscopically, these appeared as a coagulative type of necrosis at the centre of the lesion surrounded by cellular infiltrations composed of macrophages, tissue cells, lymphocytes, plasma cells, and then granulation tissue (blood capillaries and fibroblasts) (Fig 2).

Table 1. Pathological changes observed in the liver of 120 examined camels.

Pathological changes	Number of samples	Percentage
Focal hepatic necrosis	10	8.33
Partial liver cirrhosis	8	6.66
Diffuse liver cirrhosis	6	5.00
Liver abscesses	5	4.16
Hydatid cysts	4	3.33
Haemorrhages and congestion	4	3.33
Chronic suppurative hepatitis	3	2.50
Pigmentation	3	2.50
Total	43	36.66

2. Partial and diffuse liver cirrhosis

Liver cirrhosis appeared on partial or diffuse liver fibrosis. The affected parts were hardened and white in colour. Some cases were associated with peritoneal ascites. However, parasitological examination of these camels was negative. Microscopic examination revealed fibrosis characterised by proliferation of fibroblasts and collagen fibres in the liver capsule, around the liver lobules, or around the hepatocytes (Fig 3). In advanced cases, fibrosis involved many liver lobules (diffuse fibrosis) or large parts of the liver, where the affected parts were composed of connective tissue containing remnants of atrophic hepatocytes (Figs 4 and 5).

3. Liver abscesses

Grossly, the lesions were characterised by the presence of a purulent material surrounded by fibrous tissue, usually protruding from the liver surface. The cross-section revealed a purulent material that was white or greenish in colour and found calcified (Figs 6 and 7). Microscopically, the lesion showed a liquefied necrosis surrounded by numerous neutrophils and a fibrous capsule (Fig 8).

4. Hydatid cysts

The lesions were characterised by the presence of variable numbers of prominent vesicles

on the surface or within the liver tissue (Fig 9). Microscopically, the lesion showed the presence of a fibrous outer membrane, hepatocyte atrophy, and cellular infiltration (Fig 10).

5. Liver haemorrhages and congestion

The affected liver was characterised by its enlargement and change in colour to crimson or dark red, with the presence of haemorrhagic spots, clear liver lobules (Figs 15) and blood flow when the liver was cut. Microscopic examination showed that there was congestion in the blood sinuses in the centres of the lobules (Fig 16), although in some cases it included most of the lobules, as it was accompanied by atrophy and necrosis of the hepatic cells, and the lobules were transformed into blood fields containing some atrophied hepatic cells

6. Chronic suppurative hepatitis

This lesion was characterised by hepatomegaly and the presence of multiple, large, irregular purulent spaces with a fibrous capsule dividing the lesions into what looked like honeycombs. The lesions were usually calcified and accompanied by peritoneal oedema. (Figs 13 and 14).

7. Pigmentation

Irregular black spots were observed on the surface of the liver and were found to be spread within the visceral tissue on cut sections (Fig 11). Microscopically, melanocytes were seen in the liver capsule in the connective tissue surrounding the liver lobules (Fig 12).

Discussion

An overall occurrence of pathological lesions affecting the liver of camels examined in the present study was recorded as 36.66%. However, other researchers found higher occurrence in dromedary camels in other countries i.e., Al-Hadi and Saad (2012) and Hamza *et al* (2017) in Sudan, Nourani and Salimi (2013) in Iran and Asopa *et al* (2022) in India.

Histopathological examination performed in fresh animal tissues is an extremely useful diagnostic method and can often detect various hepatic diseases as infectious, toxic, or obstructive (Al-Sobayil, 2008). In the present study, hepatocellular degeneration and necrosis, were seen in (8.33%) 10, liver samples. However, higher incidence of degenerations and necrotic changes were reported by Salem and Azza (2011), Borai *et al* (2013), Zakian *et al* (2016) and Tavella *et al* (2018). The occurrence of partial and diffuse liver cirrhosis, was reported in the present

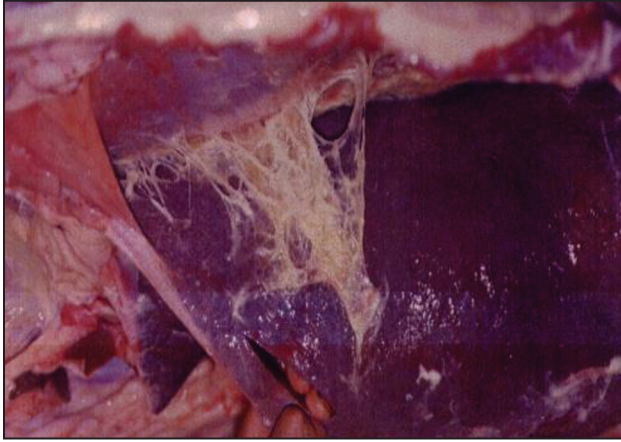


Fig 1a. Fibrinous adhesions on the liver capsule. Notice marked fibrin deposition along the capsule surface.

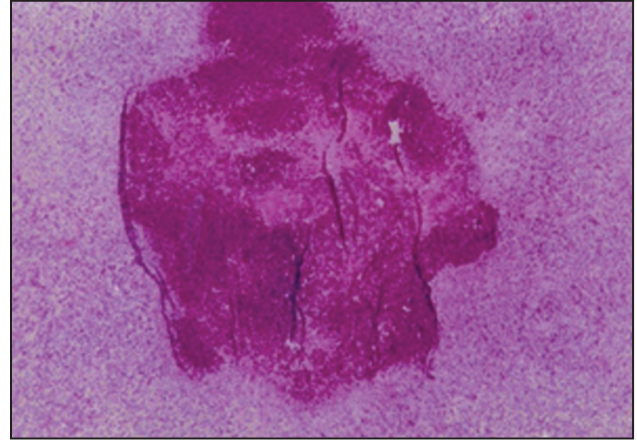


Fig 1b. Note the areas of coagulative necrosis of the hepatic cells surrounded by granulation tissue.

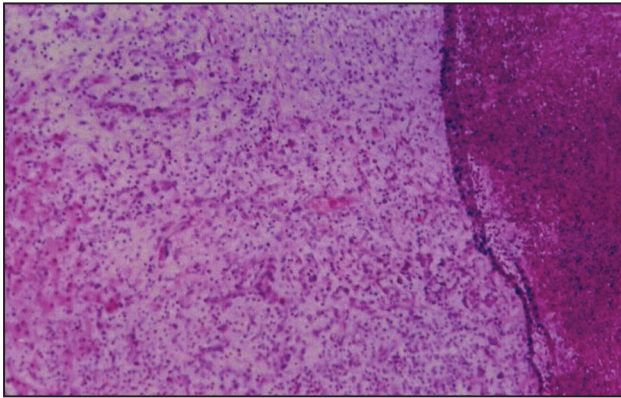


Fig 2. Localised liver coagulative necrosis 100 x.

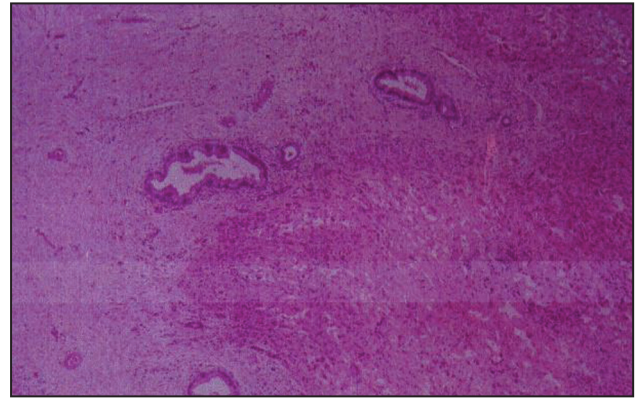


Fig 3. Partial liver cirrhosis proliferation of fibrous tissue around the hepatic lobules with the continued presence of bile ducts 100 x.

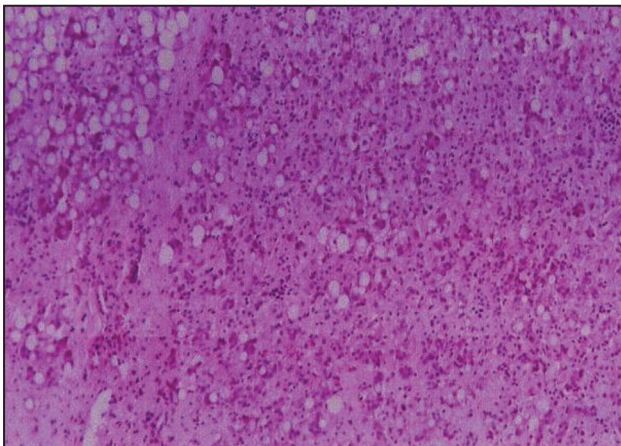


Fig 4. Diffuse liver cirrhosis: Fibrous tissue proliferation with hepatocellular atrophy 100 x.

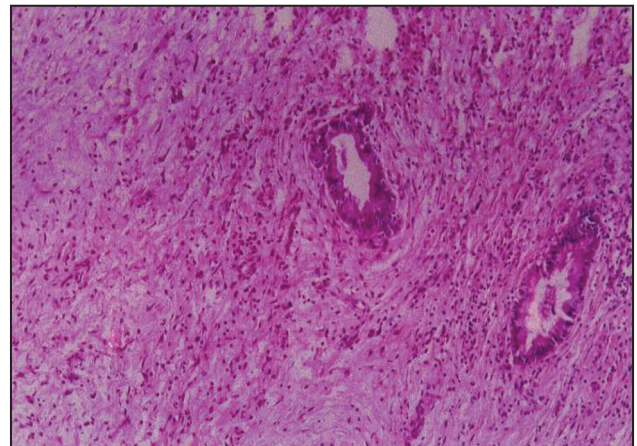


Fig 5. Proliferation of fibrous tissue and the disappearance of hepatic cells, with the presence of the bile ducts 200 x.

study. However, higher incidence was observed by Jamshidi and Zahedi (2014). The occurrence of liver fibrosis is frequently associated with parasitic infestations (Singh, 1998 and Ibrahim *et al*, 2021) and it may occur as a result of certain environmental

pollutants, such as copper, (Jung and Thornburg, 1989), arsenic and selenium, (Groom *et al*, 1995) and diazinon (Agab, 2003).

Previous reports conducted in Sudan, Egypt and Kenya have shown that some microbes have been

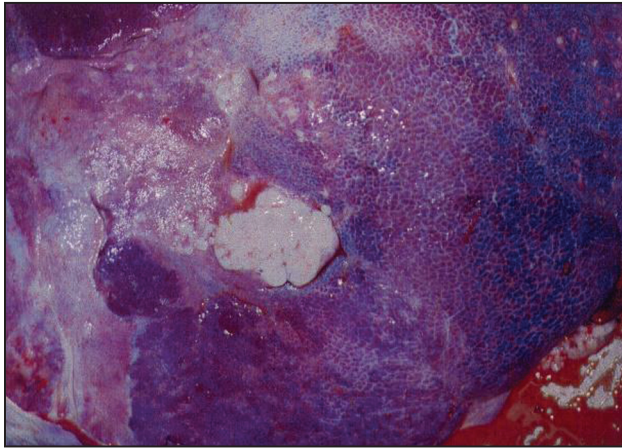


Fig 6. Liver abscesses. Note the presence of a liver abscess protruding on the surface of the liver.

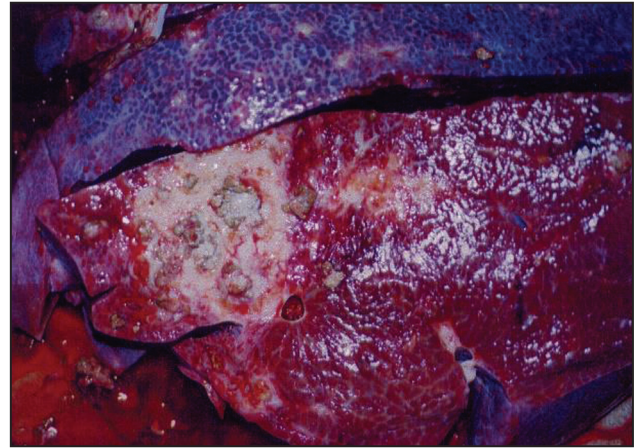


Fig 7. Cross section of an abscess consisting of purulent fluid surrounded by fibrous tissue.

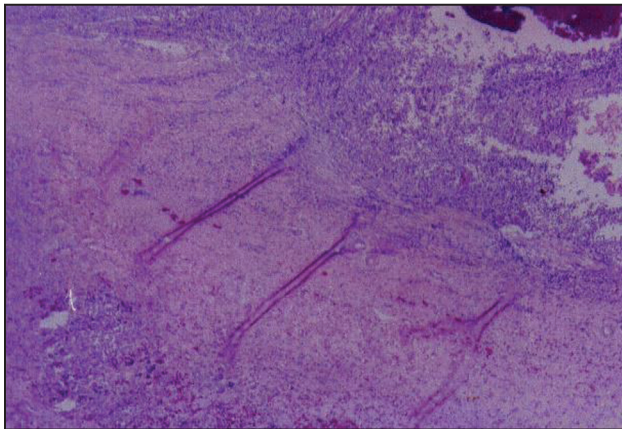


Fig 8. Liver abscess. Liquefied necrosis surrounded by inflammatory cells and fibrous tissue 40 ×.

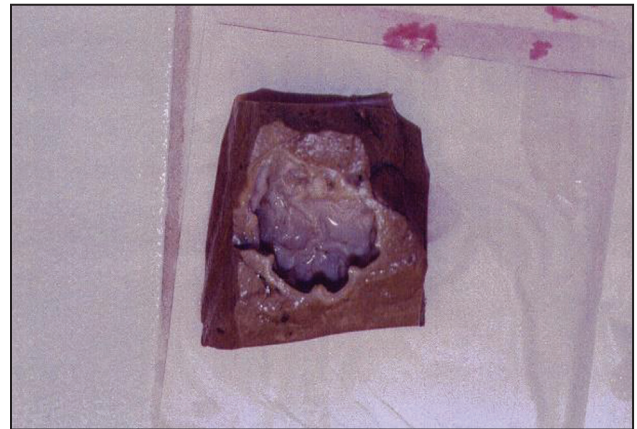


Fig 9. Hydatid cysts. Note the presence of a thick fibrous outer membrane and cysts imbedded in the liver tissue.

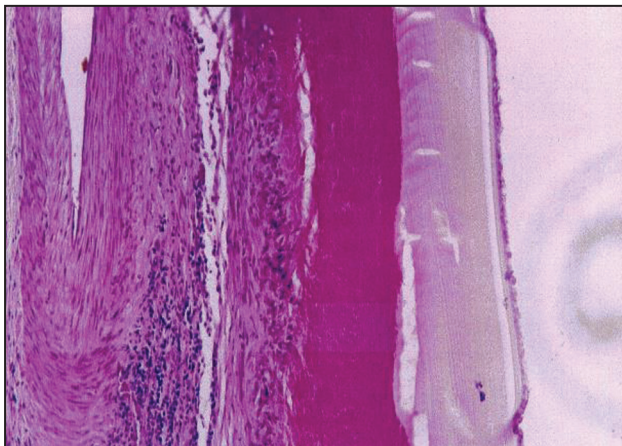


Fig 10. Hydatid vesicles. Note the presence of a fibrous outer membrane, hepatocyte atrophy, and cellular infiltration 100 X.



Fig 11. Liver melanosis. Note the presence of black areas on the surface of the liver.

associated with liver necrosis, cirrhosis and hepatitis in dromedary camels (Hennessy and Porth, 2004, Thapa and Walia, 2007; Ayman, 2008).

The occurrence of liver abscesses was found low in animals of present study. A higher incidence

was reported by Elhadi and Saad (2012), (9%), and Aljameel *et al* (2014) (13.5%) in Sudan. Whereas a lower incidence was recorded in Jordan (1.2%) (Al-Ani *et al*, 1998) and in Iran (0.64%) (Nourani and Salimi, 2013). The occurrence of liver hydatid

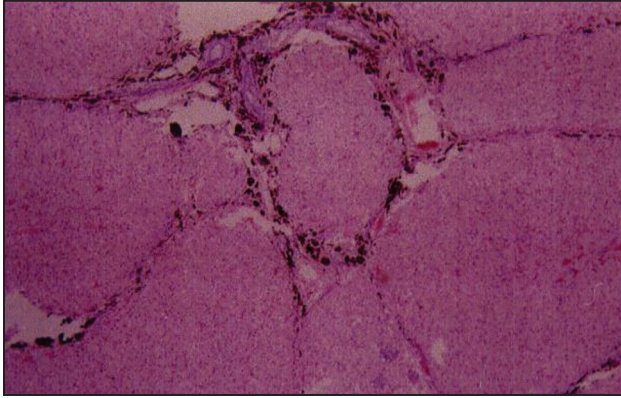


Fig 12. Liver melanosis. the presence of black areas on the surface of the liver.



Fig 13. Chronic purulent hepatitis, Cross section of the liver showing the appearance of the lesion as multiple purulent lesions surrounded by fibrous tissue.

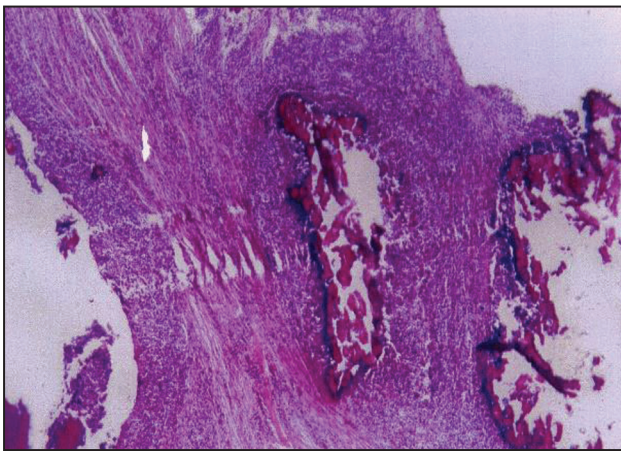


Fig 14. Chronic purulent inflammation. Note the calcification of the purulent lesions, surrounded by inflammatory cells and a fibrous capsule. 40 X.

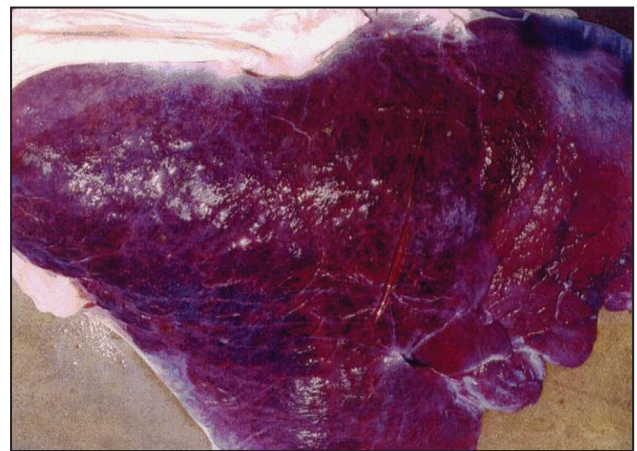


Fig 15. Liver Congestion Note the enlarged liver with dark spots under the surface of the liver capsule.

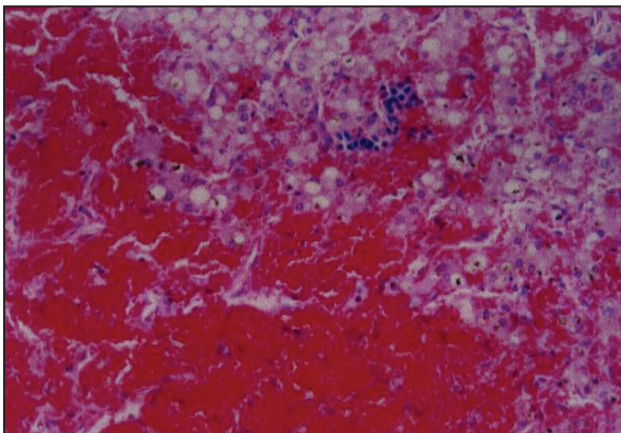


Fig 16. Liver congestion. Note the presence of partial haemorrhage with hepatic cell necrosis.

cysts as noted in present study was also reported in camels by Mirazaei *et al* (2016) in Iran. However, higher incidence of liver hydatidosis was reported in Sudan (Omer *et al*, 2010). The incidence of hydatid liver disease in man and animal is very common

worldwide and frequently associated with the *E. granulosus* infection (Belina *et al*, 2011).

The occurrence of liver haemorrhages and congestion as observed in present study was in partial agreement with the observations of Singh (1998) and Ibrahim (2021). Chronic suppurative hepatitis lower than those reported by previous investigators in Jordan (Al-Ani *et al*, 1998) and in Iran (Nourani and Salimi, 2013). Purulent inflammatory conditions in camel liver could be attributed to a number of etiologies, the most important of which are bacterial infections, environmental changes and husbandry practices. (Hawari, 2008; Hegazy *et al*, 2010).

Irregular black spots of melanin noted on the surface of the liver is generally considered a benign condition, often found incidentally during slaughter. Naturally occurring black pigmentation of the camel liver, often with concurrent lung and kidney discolouration was previously reported in Iran (Gholam *et al*, 2014) and in Australia (Meat and Livestock Australia, 2018). Affected camels of present

study appeared healthy and it was considered is observed as an incidental finding at slaughter.

In conclusion, losses of camel livers in slaughterhouse are economically significant. Therefore, routine examination of camels and early diagnosis, of hepatic disorders, using modern diagnostic techniques should be considered on priority as it affect health of human and camel both.

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