

## Journal of the Hellenic Veterinary Medical Society

Vol 68, No 3 (2017)



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doi: [10.12681/jhvms.15545](https://doi.org/10.12681/jhvms.15545)

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#### To cite this article:

NOURANI, H., & JAFARI DEHKORDI, A. (2018). Pathological findings of severe pancreatolithiasis in a cow. *Journal of the Hellenic Veterinary Medical Society*, 68(3), 487-490. <https://doi.org/10.12681/jhvms.15545>

## **Pathological findings of severe pancreatolithiasis in a cow**

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**ABSTRACT.** The aim of this study was to describe macroscopic and microscopic characteristics of pancreatolithiasis in a cow. On post mortem examination, severe pancreatolithiasis or a large numbers of white stones with rough surfaces and the ectasis of pancreatic ducts were observed in a female dead cow. Histopathological examination of the affected pancreas revealed focal dilation of exocrine pancreatic acini, atrophy of the acini epithelial cells, infiltrations of lipocytes, mild cystic dilatation of the glands, squamous metaplasia and infiltration of chronic inflammatory cells in the pancreatic ducts wall. The histopathological results of this study showed that pancreatolithiasis can cause microscopic changes in the affected pancreas that some of these lesions have not previously been reported in pancreatolithiasis. Further studies are needed to find out the effects of these microscopic changes on the gland functions in cow.

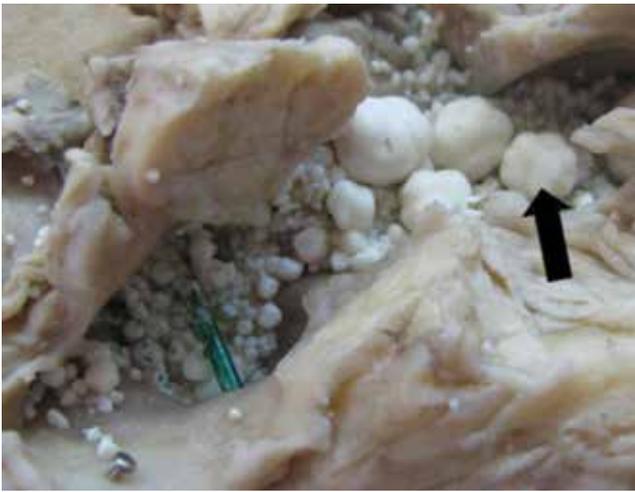
**Keywords:** pancreatolithiasis, pathological findings, cow

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*Date of initial submission: 4.7.2016*  
*Date of revised submission: 10.9.2016*  
*Date of acceptance: 17.9.2016*

**Figure 1.** A large numbers of white stones (arrow) with rough surfaces and different sizes are observed within the dilated pancreatic duct.



**Figure 2.** The pancreatic calculi are removed from the dilated ducts.



## INTRODUCTION

Pancreatolithiasis occurs naturally in humans and cattle (Bailiff et al., 2004). Pancreatic stones form within the ducts of the pancreas and sometimes in cattle are found during post slaughter examinations. This condition is slightly more common in cows over four years (Charles, 2007), but there are few reported studies on it in this animal species. Pancreatolithiasis is rare in other animal species. At necropsy, pancreatic calculi are incidental findings but not an important cause for obstruction (Charles, 2007).

In humans, there are many studies on the diagnosis and treatment of pancreatic stones (Furukawa et al., 1996; Suzuki et al., 2010) but in animals, there are few naturally occurring case reports about pancreatolithiasis and some experimentally induced pancreatic stones in dogs (Konishi et al., 1981; Okumura et al., 1982; Sakakibara et al., 1982; Hayakawa et al., 1993). Two cases of pancreatolithiasis with concurrent chronic pancreatitis have been reported in cats (Bailiff et al., 2004; Madany et al., 2014).

To the authors' knowledge, there is no study on the pathological aspects of pancreatolithiasis in cattle. The aim of this study was to describe macroscopic and microscopic characteristics of pancreatolithiasis in a cow that some of these histopathological features have not already been reported in human or other animal species.

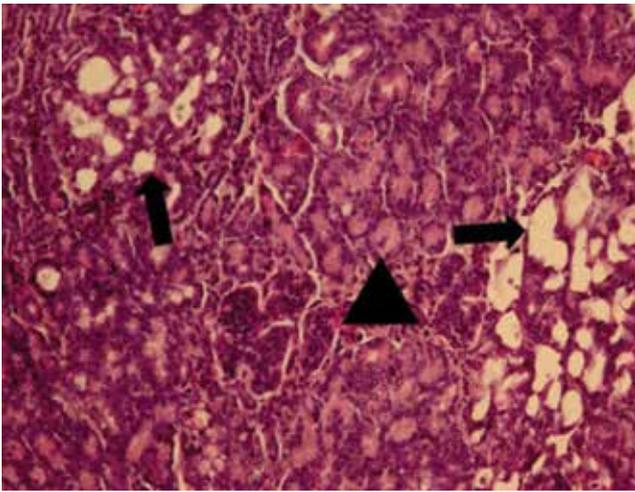
## CASE DESCRIPTION

A female 4-year-old, dead Holstein cow with 35 kg mean daily milk production was necropsied at a dairy farm in Shahrekord, Iran. There were the clinical signs of colic in the case history and the disease progressed despite treatment with anti-analgesic drugs. At necropsy, the cause of death was not diagnosed and pancreatolithiasis and the ectasis of pancreatic ducts were incidentally observed. The affected pancreas and associated ducts were referred to Department of Pathology, Faculty of Veterinary Medicine, Shahrekord University, Shahrekord, Iran for pathological studies. After recording of gross characteristics, for histopathological study, tissue samples were taken from the lesions, fixed in 10% buffered formalin and processed through routine paraffin embedding technique. They were cut at 5  $\mu$ m and stained by hematoxylin and eosin.

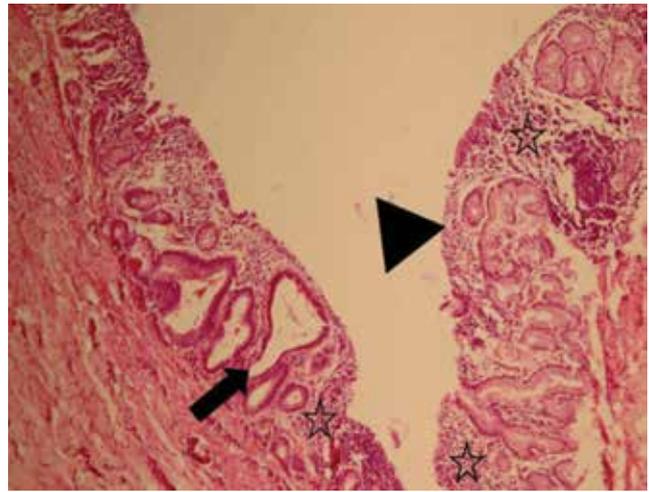
On macroscopic examination, the pancreatic ducts were cystic (duct ectasia) and a large numbers of white stones with rough surfaces and different sizes were observed within the ducts (Fig. 1 and 2).

Histopathological examination of the affected pancreas revealed focal dilation of exocrine pancreatic acini and atrophy of the acini epithelial cells in some tissue sections (Fig. 3). Additionally, there were infiltrations of lipocytes in the pancreas tissue as focal regions. Desquamation of the epithelial cells of the

**Figure 3.** There are two focal dilation of exocrine pancreatic acini (arrows) and the atrophy of the epithelial cells. The most acini (arrowhead) have normal structure (H and E,  $\times 20$ ).



**Figure 4.** Note desquamation of the epithelial cells (arrowhead) of the pancreatic duct, mild cystic dilatation of the glands (arrow) and infiltration of inflammatory cells (asterisks) (H and E,  $\times 10$ ).



pancreatic ducts, mild cystic dilatation of the glands, squamous metaplasia and infiltration of inflammatory cells especially lymphocytes and plasma cells were seen in the pancreatic ducts wall (Fig. 4).

## DISCUSSION

In the present study, chronic inflammation of the pancreatic duct is suggested as a potential cause or the result of pancreatolithiasis in the affected cow. In a study, subclinical chronic pancreatitis associated with hepatitis and peritonitis has been reported as a potential cause of pancreatolithiasis in a cat (Madany et al., 2014). In human pancreatic stone formation mechanisms are complicated and many factors are involved in its formation. These stones are associated with inflammation of the pancreatic ducts and may be the consequences of the inflammation (Koizumi and Takashi, 2005; Charles, 2007). Experimental pancreatolithiasis has been induced in dogs with the partial ligation of the major pancreatic ducts. The endocrine insufficiency of pancreas can be the consequences of pancreatic stone formation in dogs but is less severe when compared with the human stones (Konishi et al., 1981; Okumura et al., 1982).

Pancreatic stones are usually hard, white, multiple, and often resemble small grains of sand (Charles,

2007) that are in agreements with macroscopic findings of our study. Pancreatic calculi are mainly composed of carbonates and phosphates of calcium and magnesium. The affected pancreatic ducts by stones may be irregularly stenotic or dilated and have cystic dysplasia of mucosal glands (Charles, 2007). In the present study, the pancreatic duct dilatation and formation of stone were severe, but the cystic glandular changes and squamous metaplasia were evaluated as mild. There is no pathological study on the pancreatolithiasis of cow to compare the results of this study. Our histopathological findings were different from those that have been reported by Bailiff et al., 2004 in a cat. They found severe multifocal amyloidosis of the islets of pancreas, diffuse chronic and suppurative pancreatitis with interstitial fibrosis, and peripancreatic fat necrosis (Bailiff et al., 2004) that were not observed in this study.

The histopathological results of this study showed that pancreatolithiasis can cause microscopic changes in the affected pancreas that some of these lesions such as infiltrations of lipocytes in the pancreas tissue, dilation of exocrine pancreatic acini and the atrophy of the epithelial cells have not previously been reported in the pancreatolithiasis. Further studies are needed to find out the effects of these microscopic changes on the gland functions in cow. ■

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