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Ultrastructural studies on the sinusoids of sheep

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Abstract
The present ultrastructural study was conducted in nine apparently healthy sheep irrespective of sex. The collected samples were preserved in 2.5% glutaraldehyde solution (PBS based EM grade) in 0.1 M phosphate buffer (pH 7.2) and were processed by standard protocol of Ruska Labs, College of Veterinary Science, Hyderabad. The present study revealed that the hepatocytes were arranged in the form of anastomosing cords which were surrounded by sinusoids with mean diameter of 6.5 to 8 µm and lined by pleomorphic kupffer cells with irregular surfaces due to the presence of filopodia and lamelliapodia was characteristic feature of the sinusoids of sheep.

Keywords: Sheep, Ultrastructural study, Sinusoids

Introduction
The liver is the largest gland that performs various functions essential for the life. It has a direct influence on the digestive process. The dual blood supply of the liver is a unique feature and it receives a generous blood supply through the hepatic artery and portal vein (Dyce *et al*., 2010) [2]. The portal vein contributes to the liver blood supply with 2/3rd of its total inflow and the remaining 1/3rd is delivered by the hepatic artery (Dyce *et al*., 2010) [2]. The hepatic artery carries oxygen-rich blood from the aorta where as the portal vein carries blood rich in digested nutrients and certain toxic substances from the entire gastrointestinal tract and also from the spleen and pancreas, which were absorbed by the hepatocytes (Getty, 1975, Nickel *et al*., 1973, Konig *et al*., 2004) [4, 7, 5]. The sinusoidal endothelial cells are the gateway to the liver, their transcellular fenestrations allow the unimpeded transfer of small and dissolved substances from the blood into the liver parenchyma for metabolism and processing. Blood from sinusoids exit the liver through central and hepatic veins draining into the posterior vena cava. An understanding of sinusoids morphology is influenced by various disease, toxic, and physiological states and how these changes impact on liver function. However, the great capacity of regeneration and compensation of hepatic tissues for increased metabolic demands was noticed in previous investigation (Perkins, James D., 2006) [8].
The Present study elucidates the ultrastructural details in sheep. Keeping in view the above factors the current research has been planned with the hope that the results of these observations will helpful for future investigation.

Materials and methods
The present ultrastructural study was conducted in nine apparently healthy sheep irrespective of sex. One cubic mm fresh tissue pieces of each liver will be collected and preserved in 2.5% glutaraldehyde solution (PBS based EM grade) in 0.1 M phosphate buffer (pH 7.2) for 24 hrs at 4 °C and post fixed in 2 % aqueous osmium tetroxide for 4 hrs. Post fixation samples were dehydrated in series of graded alcohols and dried to critical point drying. Samples were mounted over stubs with ouble sided carbon conductivity tape and thin layer of gold was coated in automatedsputter coater (Model – JEOL JFC-1600) for three minutes and scanned under Scanning electron microscope (Model – JOEL JSM-5600) at required magnifications as per the standard protocol of Ruska Labs, College of Veterinary Science, Hyderabad. Necessary SEM photographs of required magnification of hepatic sinusoidal images of sheep was taken by digital camera and documented.

Results and discussion
Scanning electron microscopic studies revealed that the hepatocytes were arranged in the form of anastomosing cords which were surrounded by sinusoids with mean diameter of 6.5 to 8 µm

(Fig.1). The sinusoids were narrow and cylindrical without cell boundaries and radiated into the hepatic lobules (Fig.2). The nature of epithelium in the present study was not evident as reported by who reported in postnatal liver of sheep that the sinusoids were lined by squamous cells which were similar to regular endothelium. The supporting tissue of the liver parenchyma in the present study was a network of various size collagen fibers (Fig. 3) between hepatocytes and the hepatic sinusoidal blood capillaries. The Pleomorphic kupffer cells were found lining the sinusoids walls. This cell has irregular surfaces due to the presence of filopodia and lamelliapodia with phagocytosed blood cells (Fig.4) which is in total confirmation with the observations of Nafady *et al*., (2017) [6] whose ultrastructural studies revealed that the Kupffer cells were found protruding from the luminal surface of the endothelium extending the microvilli and filopodia through the fenistrae of endothelial cells.

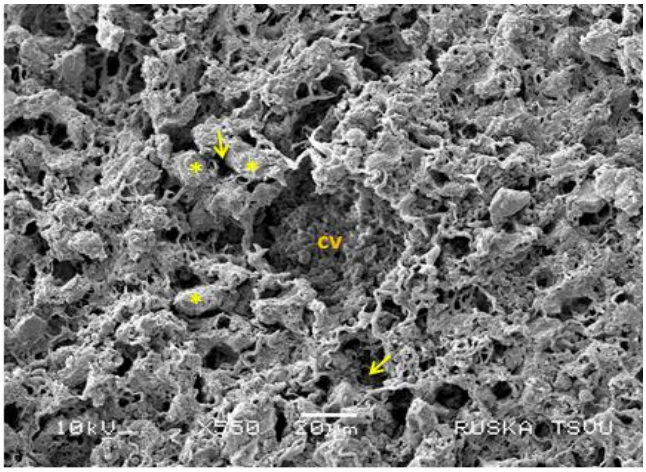

Fig 1: Scanning electron micrograph showing the central vein, hepatic cords & scinusoids. Central vein (CV), Hepatic cords (*), scinusoids (→)

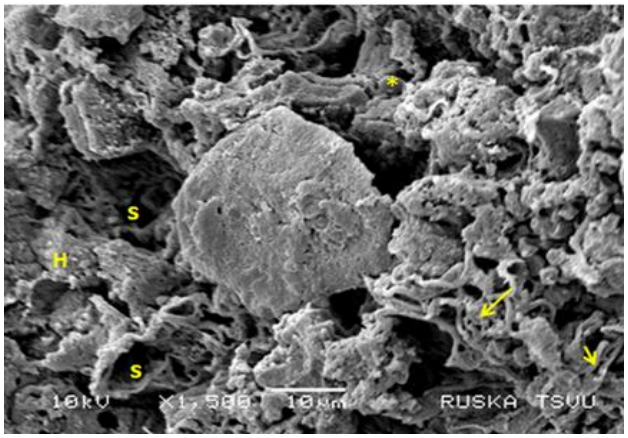

Fig 2: Scanning electron micrograph showing collagen fibers. Scinusoids (S), Hepatic cords (H), Blood cell, (*), Collagen fibers (→)

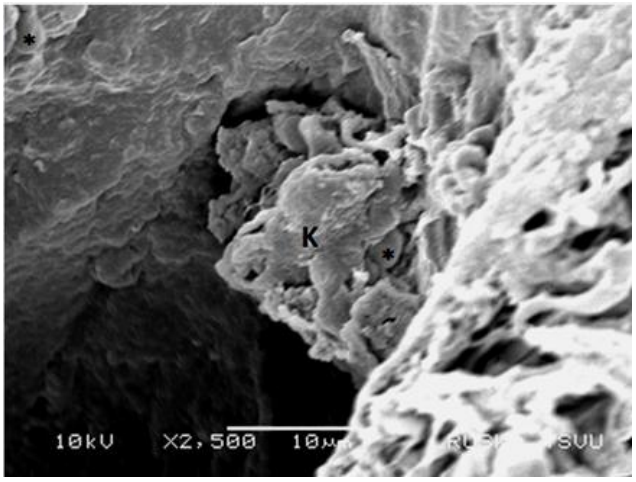

Fig 3: Scanning electron micrograph showing kupffer cell. Kupffer cell (k), blood cells (*)

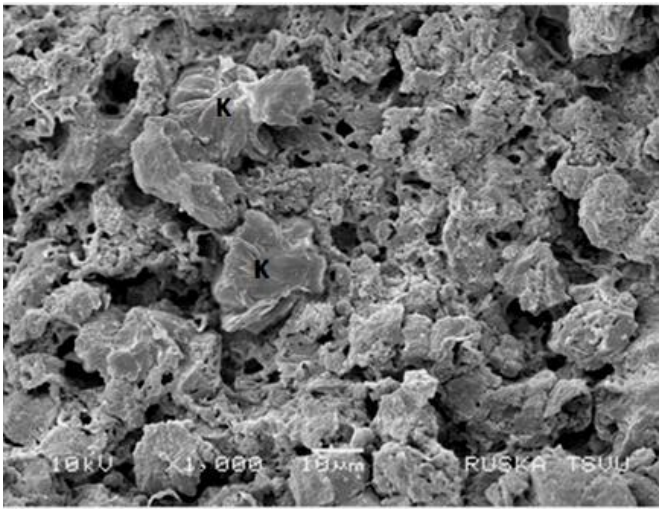

Fig 4: Scanning electron micrograph of cross section showing kupffer cell. (k) indicating the Kupffer cell.

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