Ward's Liver Histology Model

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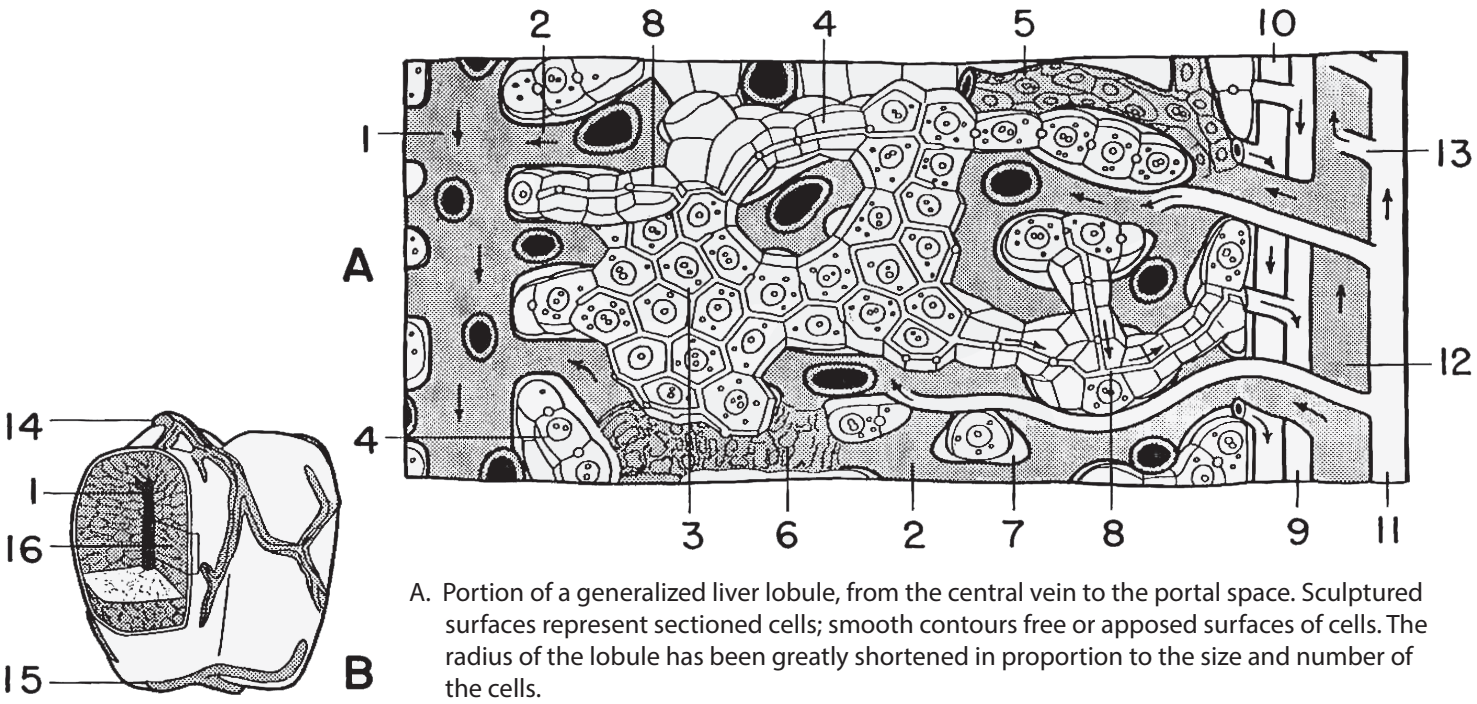

A. Portion of a generalized liver lobule, from the central vein to the portal space. Sculptured surfaces represent sectioned cells; smooth contours free or apposed surfaces of cells. The radius of the lobule has been greatly shortened in proportion to the size and number of the cells.

B. Three lobules of pig's liver, showing form, connective tissue borders, and circulatory relationships. Approximately 50X.

1. Central vein.
2. Sinusoids.
3. Plate of hepatic cells with upper hall of cells removed.
4. Plate of hepatic cells seen on edge.
5. Kupffer cells.
6. Reticular tissue.
7. Perisinusoidal space.
8. Bile canaliculi.
9. Twig of intrahepatic bile duct.
10. Lymphatic. Its connections with the lobule are diagrammatic.
11. Interlobular hepatic arteriole.
12. Interlobular portal venule. The arrangement of 9 to12 on the model is entirely schematic.
13. Arterio-portal anastomosis (not present in all forms).
14. Interlobular vessels in portal canal, consisting of 9, 10, 11, 12.
15. Central veins emerging from lobules.
16. General location of area enlarged in A. A, however, is a diagram of liver in general, and is not based on the pig.

The liver is composed primarily of lobules. In the pig's liver the lobules are well defined by intervening connective tissue, but this is poorly developed in most animals. Blood is distributed to the periphery of the lobule by branches of both portal vein and hepatic artery. Twigs of the hepatic artery penetrate the lobule to different levels. In amphibians the arterial twigs enter the sinusoids in their outer quarter. In mammals, at least some, if not all, of the arterial twigs enter the sinusoids at mid-zone. Arterial blood may also, in amphibians at least, be shunted directly from hepatic arteriole to portal venule (13). Since the sinusoids and all other blood vessels of the liver are contractile, the character and quantity of blood flowing through the lobule are subject to constant local regulation. The blood leaves the lobules through the central veins, which unite by stages to form the hepatic veins. The central vein may emerge from the lobule at various points, as indicated in B.

The lobule is composed of anastomosing sheets or plates of cells, the hepatic laminae, which define small chambers or lacunae, intercommunicating through pores or stomata. The sinusoids lie in the lacunae. The walls of liver cells separating the lacunae are always exactly one cell thick. The space between the sinusoids and the walls of the lacunae contains reticular tissue, and is a potential lymph space. Little is known of the origin of lymphatics within the lobule, although blindly ending tubes, not shown on the model, have been described. In any case, from one third to one half of all the lymph is formed in the liver. The bile canaliculi also drain toward the periphery of the lobule.

The interlobular vessels (14) are accompanied by nerves, not shown, and are embedded in connective tissue, which is continuous with that of the main vessels and with the capsule of the liver. As indicated by changes in certain types of disease, there appears to be some qualitative difference between the cells forming the central and peripheral parts of the lobule.

In certain animals (horse, rabbit) the lacunae are cylindrical, radiating from the central vein. This is the *tubular* type of liver. In other cases (man, cat, etc.) the lacunae are irregular, as in the model. This is the *saccular* type of liver. In some animals (dog) the two forms intergrade.

For further information consult the papers of Hans Elias, Amer. J. Anat., vol. 84, 1949; and Knisely, Bloch, and Warner, Det Kongelige Danske Videnskabernes Selskab, Biologiske Skrifter, Bind 14, Nr. 7, 1948.

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