

Fig. 3a. Group III. Swelling of the mitochondria (M), dilatation of the bile canaliculi (bc), and degeneration with disappearance of the microvilli can be noted (x6200).

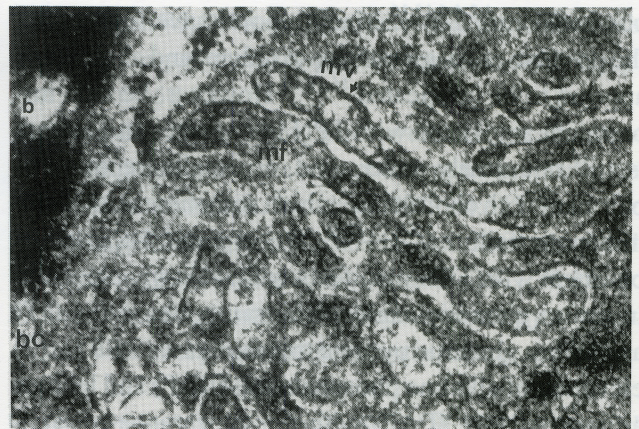


Fig. 3b. Group III, high magnification of the bile canaliculi (bc) (x100,300). Marked swelling of the microvilli (mv) is evident. Bile canaliculi were completely obstructed by the swollen microvilli; the normal microfilaments were completely destroyed and vacuolated degeneration can be noted within the microvilli.

continuous cross-section of the bile canaliculi with scattered mitochondria evident. Bile crystals (crystalline) can be recognized in the bile canaliculi (black arrow), which represents bile stagnation; in addition, swollen mitochondria can also be noted in the hepatocytes. All of these findings indicate that hepatic impairment had occurred.

Fig. 3a and b is from group III, which received the higher concentration of L-form amino acids. In Fig.

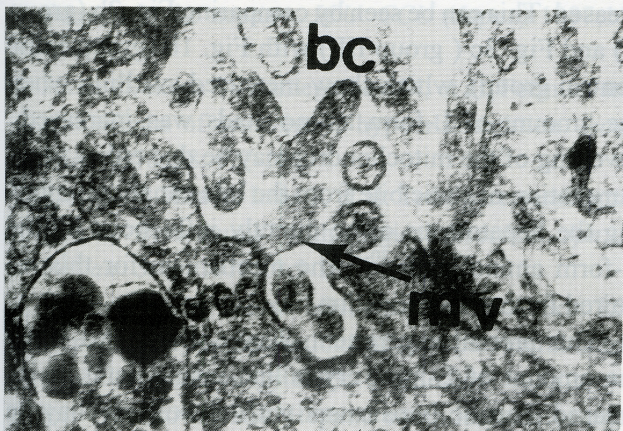


Fig. 4. Group IV, high magnification picture of the bile canaliculi (bc) of a 1-d-old rat (x100,300). The microvilli are shorter than those of the mature rat, and the microfilaments are not well developed.

3a, swollen mitochondria and dilated bile canaliculi appeared the same as seen in group II. Fig. 3b is a magnified picture of the bile canaliculi and showing that the microvilli are swollen and completely occupy the bile canaliculi. Moreover, the microfilaments in the microvilli have almost been destroyed and replaced with vacuolization. These changes could influence the function of bile excretion and are suggested to be one of the reasons for cholestasis. This marked degeneration of the microvilli is highly suspected to have been induced by the higher concentration of L-form crystalline amino acids.

Fig. 4 is a magnified picture of a liver cell of a 1-d-old rat. It shows that the microvilli is very short, and the microfilaments have a very underdeveloped appearance. The structure of the microvilli in the bile canaliculi can be seen to be very fragile and immature.

DISCUSSION

Clinically, total parenteral nutrition (TPN) is an important treatment modality, being widely used currently. Numerous studies have reported on TPN-associated complications since the beginning of its use; among these, hepatic impairment is the most seri-