

fish to 6 mg. in one weighing 2 kilograms, result in the total elimination of the dye within 15 hours as follows: 1. Agglomerular kidney weighing from 50 to 80 mg.; amount injected 0.6 mg. to 1.2 mg.; 30% elimination by the kidney and 70% in the bile. 2. Almost agglomerular kidney of a 2 to 3 kg. fish; amount injected, 10 mg. intravascularly; amount excreted by kidney within 30 minutes after injection, —20%; bile, none. Further statement to be published elsewhere. 3. Predominantly glomerular kidney; intraperitoneal injection of 6 mg.; weight of fish 2 kg.; amount eliminated by the kidney, —70%; in bile, —30%.

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**Stone Formation in the Non-Contracting Gall Bladder.**

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(Introduced by W. J. M. Scott.)

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It has been reported previously that stones could be produced experimentally by interference with the normal mechanism for filling and emptying the gallbladder, resulting in stasis and over-concentration of bile.<sup>1</sup> The observations here presented tend to confirm that finding and add further evidence as to the mode of formation of gall stones.

In one cat while the gallbladder was being filled with iodized oil it was accidentally stripped away from the liver bed nearly down to the cystic duct. The gallbladder containing iodized oil was then replaced in its fossa and the abdomen closed. The next day the viscus had expelled most of the oil and partly refilled with bile, as evidenced by a shadow form with flecks of oil about the sides. The expulsion of the oil was perhaps due to rapid congestion and edema from the injury, which later subsided, allowing partial refilling of the viscus. This shadow form of the gallbladder produced by the radio-opaque oil adherent to its wall remained constant for 11 days, except that it decreased slowly in size to about two-thirds its original volume. A fat meal on the second day produced no change in the shadow. At necropsy the gallbladder was found to be filled with a very hard black cast made up undoubtedly of inspissated bile. The cystic duct, where there had probably been

less stasis, was filled with a black putty-like mass which hardened like the other upon being dried. The vesicle was thin and pale and tense over the stone. Microscopic examination showed a good deal of organizing tissue between the gallbladder and the liver. The wall of the viscus and the mucosa, however, were fairly normal, indicating that concentration of bile could have taken place. The whole sequence of events leaves the impression that induced stasis associated with concentration over a period of several days produced a pigment (or mixed pigment) stone.

In another cat the gallbladder was filled with iodized oil in the usual way and the animal fasted for 8 days. For 5 days there was little apparent change in the vesicle. At the ampulla there was a persistent negative shadow indicating incomplete filling with oil, the presumption being that this negative shadow was due to bile. Between the fifth and the eighth day the gallbladder spontaneously emptied its iodized oil into the intestine. Necropsy revealed a somewhat thickened gallbladder containing muco-purulent material and a brownish putty-like ovoid stone packing the ampulla in the exact location of the negative shadow before mentioned. The inference is that stasis of bile in the ampulla of the gallbladder allowed concentration to proceed to stone formation. Why the gallbladder spontaneously emptied after 5 days, during fasting, is unexplained, though it may possibly be accounted for as follows: Denton<sup>2</sup> has apparently shown that impaction of a stone in the ampulla blocks the venous and lymphatic channels, producing hemorrhage and edema in the gallbladder. Possibly this newly formed stone acted in this manner and the resulting thickening of the wall of the viscus with narrowing of the lumen forced the oil out, even past the stone. The process may have been aided by purulent exudation displacing the oil. Microscopic examination revealed pus in the lumen of the vesicle. The mucosa showed normal epithelium with moderate infiltration of poly- and mono-nuclear leucocytes. The muscularis was normal but the subserosa showed mono-nuclear infiltration.

We have never seen this type of stone form in a gallbladder where the epithelium was destroyed, and we do not believe it results primarily from an inflammatory process, unless this inhibits the emptying of the gallbladder by interference with the action of its musculature.<sup>1</sup>

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<sup>1</sup> Whitaker, L. R., *J. Am. Med. Assn.*, 1927, lxxxviii, 1542.

<sup>2</sup> Denton, J., *Arch. Surg.*, 1927, xiv, 1.