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Etiology of Gall Stones. III. Bile Salt-Cholesterol Ratio in Human Gall Stone Cases.*

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If, as has been suggested in a previous paper, cholesterol stones are formed in the human gall bladder because there were not enough bile salts present to hold the cholesterol in solution, one would expect to find in human gall bladders with cholesterol stones a lesser quantity of bile salts. The accompanying table amply confirms this expectation and corroborates the findings of Newman.[1]

TABLE I.
Human Gall Bladder Bile in Cholelithiasis.

Reg. No.	Cholesterol	Bile Salts	B.S./Chol. Ratio
34963	69	1130	16.4
32259	78	175	2.2
3971	138	1302	8.8
33293	114*	0	0.
35576	138	272	2.0
34904	188	1310	7.0
35861	96	735	7.6
37847	282*	0	0.
12869	360*	45	0.12
Average	162	556	3.4
Mixed bladder bile from 30 stone cases postmortem	400	247	0.6

Newman's studies were all upon autopsy material, and for that reason might have been questioned. The first series here given are all on fresh surgical specimens and hence not open to the criticism of agonal changes.

As controls in these studies it is of course impossible to obtain bile from normal human gall bladders, and the autopsy findings of Newman must serve. In his series the controls from normal human gall bladders gave a bile acid-cholesterol ratio of from 10 to 24, and his lowest figures of bile acid content of normal gall bladders were nearly double our highest one in a stone containing gall bladder. As a further control the figures cited by Hammarsten on 2 cases of

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[1] Newman, C. E., *Beitrage Z. Path. Anat. u. z. Allgem. Path.*, 1931, **186**, 187.

sudden accidental death are interesting. His analyses showed ratios of 10 and 40 respectively and the total bile acids were 8.2% and 8.7%, approximately 16 times as high as the average of our operative cases.

It is further very interesting to note that in several of our specimens the bile contained a large amount of cholesterol crystals and those cases had little or no bile acid in the bile. This was true not only in 2 cases with little or no pigment in the bile as a result of long cystic duct obstruction, but in another bile which appeared absolutely normal grossly except for the presence of cholesterol crystals and on chemical examination proved to contain but 42 mg.% of bile salts.

These figures are offered as further proof of the above annunciated theory that cholesterol stones are due to a faulty differential absorption of bile acids and cholesterol by the abnormal gall bladder mucosa.

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Intestinal Absorption of Viable Yeast.

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The fate of yeast ingested by mouth has been investigated in this laboratory for the past 2 years. The relative destruction within the lumen of the stomach, small intestine and large intestine has been reported (Montgomery, Boor, Bergeim and Arnold).[1] We wish to report upon the passage of yeast through the wall of the intestinal tract into the body. The procedures carried out by Nedzel[2] for absorption of bacteria have been followed in these investigations.

Fasting dogs were given one cake of compressed yeast (Fleischmann) in 100 cc. saline by a stomach tube and animals were killed at periods indicated in Table I. One gram masses of certain organs were removed and cultured in maltose acid broth. Subcultures

[1] Montgomery, Boor, Arnold and Bergeim, PROC. SOC. EXP. BIOL. AND MED., 1931, **28**, 589.

[2] Nedzel and Arnold, PROC. SOC. EXP. BIOL. AND MED., 1931, **28**, 358, 360, 361, 364, 366.