of cholesterol either in the concentration or daily output. Variations in the dietary fats and proteins had no effect on the biliary cholesterol excretion. The feeding of cholesterol, either alone or in combination with bile acids, had no effect whatsoever. No relation existed between the cholesterol content and the volume of bile excreted. In these studies no changes in the bile salt-cholesterol ratio of sufficient magnitude to approach the critical level for precipitation have been found. The responsibility for gall stone formation seems to lie in the gall bladder rather than in the liver.

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Is Cholesterol Excreted by the Gall Bladder Mucosa?

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(Introduced by Edmund Andrews.)

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This problem constantly recurs in gall stone studies and the following data may throw some light on it.

Pus cells contain a very high percentage of cholesterol and for that reason exudation into the gall bladder will of course increase the cholesterol content. Rous[1] and more recently Andrews[2] have called attention to the great tendency of the gall bladder of the dog under experimental manipulation to become infected.

The blood of the dog contains up to 300 mg. per 100 cc. of cholesterol and the bile 10-20 mg. In fistula dogs this may even be lower. It is obvious therefore that the leakage of a single drop of blood or serum into any experimental preparation (such as a needle hole) would completely vitiate the results of most experiments.

Numerous experiments made in our laboratory, mostly for other purposes, have been reviewed and the following data secured: In 36 dogs whose common duct had been tied for 24 hours or less the cholesterol content of the bladder bile was 57 mg. per 100 cc. In 42 dogs who had had common duct ligature for 3 to 80 days there was a cholesterol content of the bladder bile of 51 mg. per 100 cc.

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[1] Rous, P., and McMaster, P. D., *J. Exp. Med.*, 1923, **37**, 11.

[2] Andrews, E., and Hrdina, L. *Arch. Surg.*, 1931, **23**, 201.

This slight lowering may be taken as lying within the limits of experimental error. It appears, however, that in such a long series of experiments, if there were any appreciable excretion of cholesterol into the gall bladder one surely would have expected it to become evident.

In 6 human cases who had had common duct obstruction for varying periods, the cholesterol content of the bladder bile lay within normal limits.

In the cases of cystic duct obstruction reported recently by Phemister[3] in which calcium carbonate gall stones occurred, the secretion of the gall bladder, although it contained large amounts of calcium, had but a trace of cholesterol in one case and none in the others.

We have tried to reproduce this condition in dogs and it has proven very difficult on account of the tendency of such gall bladders to form large abscesses. In another series the cystic duct was ligated and a fistula established. These were kept open for several weeks and drained a purulent material. Finally they became cleaner and drained clear mucus and were then allowed to close. Most of them became infected again and when reopened were mere bags of pus, but one such experiment succeeded. In this dog the gall bladder when opened contained 6 cc. of milky fluid which contained practically no pus cells. The calcium content was 580 mg. per 100 cc. and the cholesterol was but 21 mg. per 100 cc. This is in accord with the recent work on human cases.

Conclusion. The normal gall bladder mucosa secretes calcium in large amounts and cholesterol in negligible amounts.

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Effect of Cyanide on Respiration of the Protozoan, Colpidium Campylum.

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The claim of Lund[1] that *Paramecium* is insensitive to KCN though questioned by Hyman[2] has been confirmed by Gerard and

[3] Phemister, D. B., Rewbridge, A. G., and Rudisill, H., *J. Am. Med. Asn.*, 1931, **97**, 1843.

* This work was carried out under the direction of Prof. R. W. Gerard.