

dark concretion, around which, in the gall-bladder, there is soon deposited layer upon layer of cholesterin, which substance forms much the larger bulk of most gall-stones. The practical question, therefore, is, "What first leads to the precipitation of the calcium and the bile pigment? and then, How does cholesterin form around this nucleus in such abundance, out of all proportion to its quantity in normal bile?"

Normally the calcium and the bilirubin, or bile pigment, are kept in solution in the bile by the presence of the bile salts, especially the glycocholate of sodium. A deficiency of this salt, therefore, may have some effect in promoting the precipitation, but an observation of Naunyn's makes it certain that the commonest cause of the formation of calcium-bilirubin concretions is the addition to the bile of an albuminous constituent. He found that the addition of egg albumin at once led to the precipitation of calcium-bilirubin from bile, and hence, in every catarrh of the mucous membrane of the bile-ducts and of the gall-bladder, we have just the source of an abundant supply of an albuminous ingredient, which would cause the throwing down of such a precipitate. These small, hard concretions, therefore, are often found in the bile-ducts within the liver itself, and it is easy to see how some thus formed might afterward flow with the bile into the gall-bladder and become the nuclei there of gall-stones. It is important to note, however, that when such a concretion gets impacted in the common duct it then grows *in situ* by the precipitation of more bilirubin-calcium so as ultimately to become a large calculus with relatively little cholesterin. As it grows, it produces wide distention of the duct, with a continuing process of inflammation about it which further promotes the addition of bilirubin to the original calculus. In the gall-bladder itself the concretions grow mainly by accretion of cholesterin, and the source of this ingredient is not far to seek.

Cholesterin is found in abundance wherever degeneration of cells is going on. It is, therefore, present in every catarrhal discharge from a mucous membrane, as in the sputum of bronchitis and of phthisis. It constitutes about 7 per cent. of the solid constituents of pus, and in the cavities of dilated bronchi in bronchiectasis it sometimes accumulates in a fashion resembling its collections in the gall-bladder. While it is always present in small amount in normal bile, so soon as a catarrhal condition of the gall-bladder sets in, the cholesterin can be seen in discrete drops in the degenerated epithelial cells of the mucous membrane, which set it free to adhere to other similar drops, and if any acid is present it quickly solidifies into cholesterin crystals. Naunyn, therefore, is of opinion that sometimes soft gall-stones, composed