

general. Their pathogenesis cannot be explained upon a purely chemical basis. An increase of the constituents of the bile, their greatest concentrations, the absence of those substances holding them in solution, the addition of calcium, the presence of foreign bodies, have all failed to explain satisfactorily the precipitation of the stone-forming elements. The cause, then, must be sought elsewhere. The bile of persons afflicted with gall-stones was found upon several occasions to contain pathogenic bacteria. Among those that had been found prior to Naunyn's publication, the bacterium coli commune were the most frequent. This led to their consideration as a probable factor in the pathogenesis of these calculi, and started research along the right path. Inasmuch as the bile has been deprived of much of the antiseptic power formerly attributed to it, it is now well known that infections of the mucous membrane of the gall-bladder may occur in other ways than through the lymph channels. It may result from the presence of pathogenic bacteria in the bile itself. How these intruders gain entrance to the bile in every case is still a disputed point. It is maintained by some that they gain entrance through the ductus communis choledochus from the duodenum, while others claim that this rarely, if ever, occurs, and that these infections take place through the portal system from the intestines. No doubt both are, in a measure, correct. While the infection is most often a hematogenic one, an ascending infection from the duodenum is in all probability possible. Futterer demonstrated through a series of very interesting experiments that bacteria which gain entrance to the portal circulation from the intestinal tract are soon excreted by the liver and kidneys, and are found in the bile and urine. Cultures of the typhoid bacilli, the bacterium coli commune, and the bacillus prodigiosus, and others, were cultivated from the bile of animals into whose portal veins cultures had been injected. He found, too, that micro-organisms may find their way through the intestinal walls into the circulation, even in the absence of great pathologic lesions. That these may retain their vitality in the bile and produce an inflammation of the mucous membrane of the gall-bladder, where stagnation exists, has been frequently seen clinically and experimentally. In fact, no one now doubts the possibility of the blood route of such an infection.

I am led to believe that an ascending infection from the duodenum is also possible, because of an interesting observation that I had occasion to make recently in the microscopic examination of a set of gall-stones. These stones, averaging about the size of a grain of wheat, were cleansed thoroughly externally, crushed and dissolved in ether. The