**Physiology of the Gallbladder**

The gallbladder is a hollow, muscular organ below the liver that stores, concentrates, and releases bile into the duodenum of the gastrointestinal (GI) tract. The gallbladder is the storage component of the biliary system, which includes all organs, ducts, and structures that are involved in synthesizing, storing, and releasing bile into the GI tract. Bile, which is a yellowish green liquid that emulsifies fat in the chyme that enters the small intestine, is synthesized in the liver and released through the common hepatic duct, which leads into the common bile duct. The cystic duct, a branch off of the common hepatic duct, conveys bile into and out of the gallbladder. The common bile duct joins with the pancreatic duct to drain its contents into the duodenum at the duodenal papilla. The sphincter of Oddi controls the release of hepatic and pancreatic secretions into the small intestine.

![Biliary System](http://www.yalemedicalgroup.org/stw/Page.asp?PageID=STW028971)

The liver synthesizes around 700mL of bile each day. Bile is composed of bile acids, which are formed from cholesterol in the liver, lecithin (an emulsifier), bilirubin-glucuronide (a pigment), water, electrolytes, immunoglobulin A (IgA), and some steroid hormones. Even though the gallbladder can only hold between 35 and 60mL of bile, one of its main functions is to heavily concentrate bile up to 20 times its hepatic concentration. The mechanism by which the gallbladder concentrates bile is through water and electrolyte absorption. Through secondary active transport, sodium and chloride ions are transported out of the luminal bile in the gallbladder and across the gallbladder epithelium. Following
the osmotic gradient, water molecules in the bile follow these solutes out of the lumen, thereby increasing the concentration of the remaining bile.

Gallbladder contraction begins even before food enters the small intestine. The smell, sight, and taste of food signal the vagus nerve to stimulate the gallbladder to contract and release the stored bile. Once food enters the duodenum, the presence of fatty acids causes the cells lining the duodenum to release cholecystokinin (CCK) into the bloodstream. CCK binds to receptors in the smooth muscle cells of the gallbladder, leading to more contractions that release the bile into the cystic duct. CCK is also most likely responsible for relaxing the sphincter of Oddi, which allows bile to enter the duodenum through the common bile duct. Between meals, the sphincter of Oddi is closed to prevent bile from entering into the duodenum. As a result, the bile produced by the liver backflows into the gallbladder through the cystic duct, which remains open at all times, for storage and concentration.

The gallbladder is key to the proper release of a bolus of bile when fat-containing foods are present in the GI tract, but it is not essential to proper bile secretion or normal digestion of food. It is common for bile acids, lecithin, and cholesterol to solidify into gallstones, which can cause acute or chronic inflammation of the gallbladder and necessitate removal of the gallbladder. If the gallbladder is not functioning properly or has been surgically removed, the liver will release a continuous flow of unconcentrated bile into the duodenum at a slow rate throughout the day.

References

