

Caution. Any urine which contains a large quantity of indican will give a blue or violet, and even green, color with nitric acid. This is a frequent occurrence in cases of melanotic cancers, when the urine often has a dark brown appearance.

The bile acids. Pettenkofer's Test. Some of the fluid containing the bile acids, is placed in a porcelain dish, and a drop of saturated solution of cane sugar added; strong sulphuric acid is then dropped into the mixture, taking care that this acid is clearly in excess of the amount of bile acid present, *i.e.* about the same volume as the fluid containing the bile acids. On applying heat (which must only be moderate) a beautiful cherry-red color is produced, passing into a deep purple. The purple color is the only reaction characteristic of the presence of bile acids.

Another, and perhaps a better, way of performing Pettenkofer's test is to pour the fluid containing the bile acids into a test tube; sulphuric acid being then added, at first in small quantity to precipitate the bile acids, but afterwards in amount sufficient to re-dissolve them, which renders the mixture perceptibly hot to the hand. A drop of syrup may now be let fall into the fluid, which then shows a play of colors passing from pink to cherry red, and from red to purple.

This test should never be applied directly to urine: setting aside the fact that the bile acids are never in sufficient quantity to give the reaction, the urine in jaundice frequently contains a small quantity of albumen which gives a reddish violet reaction with sugar and sulphuric acid, while the action of the acid upon the other constituents of the urine renders it impossible to be sure of the distinctive colors of Pettenkofer's test. If, therefore, it be very desirable to ascertain whether the bile acids be present in the urine, the method introduced by Hoppe must be employed for their separation; a long and somewhat complicated process, which can seldom be adopted by the clinical student.

With this object the urine must be rendered faintly ammoniacal with caustic ammonia, and then diaceate of lead added, so long as a precipitate occurs. The precipitate must be collected on a filter and washed with distilled water; then boiled with alcohol over a water bath, and filtered while hot; to the filtrate a few drops of potash or soda are to be added, and the solution evaporated to dryness over a water bath. The residue is again to be boiled with absolute alcohol over a water bath until but a small quantity is left. This must be then shaken with ether in a stoppered bottle, and after some time, the alkaline salts of the bile acids will crystallize out. In order to prove that these crystals are salts of the bile acids, they must be dissolved in a little distilled water, and tested with Pettenkofer's method, as directed above.

Clinical Import. The bile pigments and the bile acids are present in the urine in most cases of jaundice. In hot weather, the bile pigments may sometimes be detected by means of Gmelin's test, in the urine of persons who are not jaundiced. The quantity of bile acids present is usually not more than .02 per cent.; the smallness of the amount in the

urine being probably due to their oxidation after entering the blood.

UREA.—The clinical student may sometimes wish to know if the urine contain urea, or if a given fluid be really urine, or some other secretion. The fluid is first to be tested for albumen, which, if present, must be removed by acidulation with a few drops of acetic acid, raising the temperature of the fluid to the boiling point, and filtering. This filtrate is used for the subsequent operations of evaporation, etc., as stated below.

If the urine is free from albumen, some quantity, 2 or 3 fluid-ounces, must be evaporated in a Berlin dish over a water bath, until the fluid has the consistency of syrup. A water bath is essential, because an open flame would decompose the urea. After the syrupy fluid has completely cooled, nitric acid, as free as possible from nitrous acid, is added, drop by drop, so long as a precipitate is formed. An excess of nitric acid is desirable. Some of these crystals of nitrate of urea, removed with a glass rod and placed under the microscope, show flat rhombic or hexagonal plates closely united to one another.

Clinical Import. Urea is the most important constituent of the urine; a healthy man excretes from 300 to 500 grains in the 24 hours. In some acute diseases, as pneumonia, typhoid fever, and acute rheumatism, it is greatly increased owing to the excessive tissue-metamorphosis, and may be present in such quantity as to give a precipitate, without previous concentration, when the urine is acidulated with nitric acid. In other diseases, as uræmia and Bright's disease, the quantity of urea is below the average.

URIC ACID.—To ascertain if the urine contain uric acid, it is necessary to acidulate about a fluid-ounce of the urine with a fluid-drachm of hydrochloric acid, or strong acetic acid, in a suitable glass-vessel, an ordinary beaker being best, and to set it aside, covered with a glass plate, for 24 or 48 hours. At the end of that time, if uric acid be present, reddish brown crystals will be seen attached to the sides and bottom of the glass, or floating on the surface of the fluid. These crystals have the flat rhombic, oval, or hexagonal shape of uric acid; they are soluble in alkalies, and give with nitric acid and ammonia the murexid test.

A healthy man excretes, on an average, about 7 or 8 grains of uric acid in the 24 hours.

Clinical Import. The excretion of uric acid is usually increased *pari passu* with the urea, as in pyrexia, or acute rheumatism, and in chronic liver diseases. An excess of uric acid is observed after an attack of gout; it is often entirely absent from the urine immediately before the paroxysm, and may disappear for days when this disease has become chronic.

HIPPURIC ACID.—Hippuric acid exists in small quantity in the urine in health, but the amount is greatly increased in cases of corea. The method of preparing it from human urine is troublesome, and will rarely be required to be used by the clinical student. Two or more pints of perfectly fresh urine must be taken, and milk of lime added till the