

by a few drops of weak acetic acid, and the urine then boiled, and nitric acid added. If alkaline urine be boiled without previous acidulations, a deposit of phosphate of lime is almost sure to occur, which is immediately dissolved on the addition of an acid.

If nitric acid be added, before boiling, to an albuminous urine, the albumen will often not be precipitated on the application of heat. Care must therefore be taken that it is acetic acid which is used in the preparatory acidification of the urine.

(d.) If the urine be permanently turbid, from any cause, and it is desired to know accurately whether albumen be present, the urine must be filtered before boiling; in this way very minute quantities may be discovered.

The method of testing for albumen, proposed by Heller, which consists of pouring nitric acid into a test tube, and allowing the urine to flow down upon the acid, so that the two fluids touch, but do not mix, and observing the layer of coagulated albumen thus produced, is open to many notorious fallacies, and does not detect minute quantities; it cannot, therefore, be recommended.

A rough way of estimating the amount of albumen present in the urine, is to pour some of the urine into a test tube, until it is about half full, and to boil the whole of the urine in the tube, until the albumen is completely coagulated. One or two drops of nitric acid are then added, and the test tube is set aside for 24 hours: at the end of that time, the proportion of the coagulated albumen, which has collected at the bottom of the tube, to the rest of the fluid, is noticed; if the albumen occupy one-third of the height of the fluid, there is said to be one-third of albumen in the urine; or one-sixth, or one-eighth, as may be. If, however, at the end of 24 hours scarcely any albumen has collected at the bottom, there is said to be a trace. If the urates have been deposited, the urine must be filtered before boiling, or a considerable error will creep in, by their increasing the apparent amount of albumen.*

Clinical Import. The presence of albumen in the urine is an important objective sign of disease.

Any state, which produces a mechanical impediment to the return of blood from the kidneys, will be accompanied by albumen to the urine; and the albumen will be persistent so long as the congestion of the kidney continues; the longer the albumen remains in the urine, the greater danger is there, of permanent textural injury to the kidney. In many acute febrile diseases, albumen is frequently present, which, as a rule disappears with the termination of the illness; but, if persistent, it affords evidence of organic disease of the kidney. In a chronic, non-febrile disorder, without obvious impediment to the return of blood from the kidneys to the heart, the discovery of albumen in a clear urine would indicate structural change in the kidney.

The search for renal casts must always follow the

detection of albumen in the urine. The discovery of these structures renders it certain that the albumen, or, least, part of it, is derived from the kidney.

A frequent cause of the presence of albumen is pus, in proportion to its quantity; in the urine of woman, a small quantity of albumen is frequently due to leucorrhæal discharge, which is composed chiefly of pus. Gleet, in the male, similarly causes albumen to be present in the urine.

The presence of blood in the urine necessitates the presence of albumen as well from the escape of the serum through the divided vessels.

EXAMINATION FOR SUGAR

If the specific gravity rise above 1,030, sugar may be suspected, and should be looked for.

Many methods of testing for sugar have been proposed; but only the most prominent and trustworthy will be mentioned, although it must be confessed that a rapid, and yet trustworthy, test, suited to practitioners, is still a desideratum.

Moore's Test. Equal parts of urine, and liquor potassæ or liquor sodæ, are poured into a test tube, and the upper stratum of this mixture is heated to boiling in the manner described in the section on examination for albumen. The heated portion becomes brown-red, dark-brown, or black, according to the quantity of sugar present. The least alteration of colour may be perceived by comparing the upper and the lower portions of the liquid.

Cautions. (a.) High coloured urines, and urines containing excess of phosphates, darken perceptibly on boiling with caustic alkalies, and, if the urine be albuminous, the colour will be greatly deepened, though no sugar be present. Before, therefore, applying Moore's test to an albuminous urine, the albumen must be removed by filtration after boiling with a drop of two of acetic acid.

(b.) It has been noticed that liquor potassæ which has been kept for a few weeks only in white glass bottles, takes up lead from the glass, and that a black precipitate of sulphide of lead is formed, when the alkali is boiled with certain urines which contain much sulphur. Care must be therefore taken that the liquor potassæ is free from lead.

The value of Moore's test is chiefly negative; if the urine on boiling with liquor potassæ does not perceptibly darken, it may be assumed to be free from a hurtful quantity of sugar; if, however, darkening occur, a further observation must be made with the tests, described below.

The Copper Test depends on the property which grape sugar possesses, of reducing the higher oxide of copper to a suboxide. There are two methods of conducting this reaction, identical in principle, named respectively Trommer's Test, and Fehling's Test.

Trommer's Test. About a drachm of the suspected urine is poured into a test tube, and liquor potassæ, or liquor sodæ added in about half the quantity, a weak solution of sulphate of copper (about 19 grs. to the fluid-ounce) is dropped into the mixture. The precipitate which first forms is redis-

* The plan for estimating the albumen, by the difference in the specific gravity, before and after coagulation, is not yet based upon sufficiently numerous observations, to be trustworthy.