sition has taken place within the body, and a blue color has been noticed immediately after the urine was voided. Sometimes, too, in alkaline urine on exposure there is a bluish film on the surface.

To test for indican, place four or five c. c. of nitric or hydrochloric acid in a test-tube; boil, and add an equal quantity of urine. A bluish ring develops at the point of contact. Add ten c. c. of chloroform and shake the test-tube, and on separation the chloroform has a violet or bluish color due to the presence of indican.

XI. Melanuria.

In melanotic cancer the urine, either at the time of voiding or after exposure to the air, may present a dark color. This pigment is known as melanin, and it may occur in solution or in the form of small granules. The urine may be voided clear, and subsequently, on exposure to the air or on the addition of oxidizing substances, becomes dark. In these cases it contains a chromogen called melanogen which turns dark by oxidation. Von Jaksch has found that "in urine containing melanin or its precursor, melanogen, Prussian blue is formed by adding a nitroprusside, aqueous potash, and an acid. This reaction, however, does not seem to depend on the presence of melanin, as it is not given by that substance when separated from the urine, but apparently by some other at present unknown substance, which is present in traces in normal urine and is increased in cases of melanuria, and also in those conditions where excess of indigo occurs in the urine." (Halliburton.)

XII. Other Substances.

Fat in the urine, or *lipuria*, occurs, according to Halliburton, first, without disease of the kidneys, as in excess of fat in the food, after the administration of cod-liver oil, in fat embolism occurring after fractures, in the fatty degeneration in phosphorus poisoning, in prolonged suppuration as in phthisis and pyæmia, in the lipæmia of diabetes mellitus; secondly, with disease of the kidneys, as in the fatty stage of chronic Bright's disease, in which fat casts are sometimes present, and, according to Ebstein, in pyonephrosis; and, thirdly, in the affection known as chyluria. The urine is usually turbid, but there may be fat drops as well, and fatty crystals have been found.

Lipaciduria is a term applied by von Jaksch to the condition in which there are volatile fatty acids in the urine, such as acetic, butyric, formic, and propionic.

Acetonuria.—Von Jaksch distinguishes the following forms of pathological acetonuria: The febrile, the diabetic, the acetonuria with certain forms of cancer, the form associated with inanition, acetonuria in psychoses, and the acetonuria which results from auto-intoxication. It is doubtful, however, whether the symptoms in these are really due to the acetone. It may be the substances from which this is formed, particularly the diacetic acid or the oxybutyric acid. The odor of the acetone may be marked in the breath and evident in the urine. Le Nobel's test has been given in the section on diabetes.

Diacetic acid is probably never present in the urine in health. With a solution of ferric chloride it gives a Burgundy-red color. A similar reaction is given by acetic, formic, oxybutyric acids, and it may be present in the urine of patients who are taking antipyrin, thallin, and the salicylates. "If, however, the urine is previously boiled, diacetic acid, if present, still gives the ferric-chloride reaction, but these other substances do not. Fleischer found that the substance which gives the ferric-chloride reaction in diabetic urine is not taken up by ether after the urine has been acidulated with sulphuric acid, whereas ethyl-diacetic acid is soluble in ether." (Halliburton.)

Alcaptonuria.—Aromatic compounds occur in the urine after the administration of carbolic acid or gallic acid, and on exposure to air becomes dark. In carboluria the substance causing the black color is known as hydrochinon. Many years ago Boedeker met with cases in which the urine became dark, owing to the presence of an aromatic compound which he called alcapton. It has been found in cases of consumption, and in other instances in which there are no local lesions or no general disease. The urine may be clear on passing, and then darken on exposure to the air, or on the addition of liquor potassæ. The substance is apparently without clinical significance except in so far as it, with the other aromatic substances, is capable of reducing the Fehling solution, and may be mistaken for sugar.

Choluria and glycosuria have already been considered under jaundice and diabetes.*

IV. URÆMIA.

Under this term is grouped a series of manifestations, chiefly nervous, developing in the course of Bright's disease, and due to the retention within the blood of poisonous materials which should be eliminated in the urine.

Uræmia is usually seen in nephritis, but may occur when the ureters are obstructed, or when the circulation of blood in the kidneys is impeded, as in conditions of extreme engorgement following compression of the renal vessels or in the profound alterations of the blood in cholera.

Two opposite views are held with reference to the production of uræmia: (*a*) That it is due to the accumulation in the blood of excrementitious material—body poisons—which should be thrown off by the

* For further details concerning the urine the student is referred to von Jaksch's Clinical Diagnosis, Tyson on the Urine, and to Halliburton's Text-Book of Chemical Physiology and Pathology.

kidneys. "If, however, from any cause, these organs make default, or if there be any prolonged obstruction to the outflow of urine, accumulation of some or of all the poisons takes place, and the characteristic symptoms are manifested, but the accumulation may be very slow and the earlier symptoms, corresponding to the comparatively small dose of poison, may be very slight; yet they are in kind, though not in degree, as indicative of uræmia as are the more alarming, which appear towards the end, and to which alone the name uræmia is often given." (Carter.) Several poisons having distinct actions have been separated from the urine by Bouchard, two of which produce convulsions, and one of which is narcotic. Bouchard's observations tend strongly to confirm the view now generally held, that the symptoms are caused by the retention of the excretory products. The nature of these poisonous ingredients is not yet known. It was formerly thought that the urea was the offending substance, and it has been found increased in the blood in uræmia. Others hold that it is the accumulation of carbonate of ammonia. It is more probable, however, that there are several toxic agents at work.

(*b*) Traube suggested that the chief symptoms of uræmia, particularly the coma and convulsions, were due to localized œdema of the brain. In favor of this view is the fact that obstruction of the ureters, as by stone, does not necessarily produce uræmia, even if long continued, and in this obstructive suppression neither convulsions nor coma occur. Then, too, uræmia may supervene in a case of chronic Bright's disease in which a large amount of urine is being passed with a fair proportion of solids. Œdema of the brain certainly does occur in some fatal cases—it may be diffuse or localized, but it is not a constant lesion, and cannot explain all the symptoms of uræmia.

Symptoms.—Clinically, acute and chronic uræmia may be recognized, but, for convenience of description, it is perhaps best to follow the division of French writers into *cerebral*, *dyspnœic*, and *gastro-intestinal* forms.

Among the *cerebral* manifestations of uræmia may be described:

(*a*) *Mania.*—This may come on abruptly in an individual who has shown no previous indications of mental trouble, and who may not be known to have Bright's disease. In a remarkable case of this kind which came under my observation the patient became suddenly maniacal and died in six days. More commonly the delirium is less violent, but the patient is noisy, talkative, restless, and sleepless.

(*b*) *Delusional Insanity* (*Folie Brightique*).—Cases are by no means uncommon, and excellent clinical reports have been issued on the subject from several of the asylums of this country, particularly by Bremer, Christian, and Alice Bennett. Delusions of persecution are common. One of my cases committed suicide by jumping out of a window. The condition is of interest medico-legally because of its bearing on testamentary capacity. Profound melancholia may also supervene.

(*c*) *Convulsions.*—These may come on unexpectedly or be preceded by pain in the head and restlessness. The attacks may be general and identical with those of ordinary epilepsy, though the initial cry may not be present. The fits may recur rapidly, and in the interval the patient is usually unconscious. Sometimes the temperature is elevated, but more frequently it is depressed, and may sink rapidly after the attack. Local or Jacksonian epilepsy may occur in most characteristic form in uræmia. A remarkable sequence of the convulsions is blindness—*uræmic amaurosis*—which may persist for several days. This, however, may occur apart from the convulsions. It usually passes off in a day or two. There are no ophthalmoscopic changes. Sometimes uræmic deafness supervenes, and is probably also a cerebral manifestation. It may also occur in connection with persistent headache, nausea, and other gastric symptoms.

(*d*) *Coma.*—Unconsciousness invariably accompanies the general convulsions, but a coma may develop gradually without any convulsive seizures. Frequently it is preceded by headache, and the patient gradually becomes dull and apathetic. In these cases there may have been no previous indications of renal disease, and unless the urine is examined the nature of the case may be overlooked. Twitchings of the muscles occur, particularly in the face and hands, but there are many cases of coma in which the muscles are not involved. In some of these cases a condition of torpor persists for weeks or even months. The tongue is usually furred and the breath very foul and heavy.

(*e*) *Local Palsies.*—In the course of chronic Bright's disease hemiplegia or monoplegia may come on spontaneously or follow a convulsion, and post mortem no gross lesions of the brain be found, but only a localized or diffused œdema. These cases, which are not very uncommon, may simulate almost every form of organic paralysis of cerebral origin.

(*f*) Of other cerebral symptoms, headache is important. It is most often occipital and extends to the neck. It may be an early feature and associated with giddiness. Other nervous symptoms of uræmia are intense itching of the skin, numbness and tingling in the fingers, and cramps in the muscles of the calves, particularly at night.

Uræmic dyspnœa is classified by Palmer Howard as follows: (1) Continuous dyspnœa; (2) paroxysmal dyspnœa; (3) both types alternating; and (4) Cheyne-Stokes breathing. The attacks of dyspnœa are most commonly nocturnal; the patient may sit up, gasp for breath, and evince as much distress as in true asthma. Occasionally the breathing is noisy and stridulous. The Cheyne-Stokes type may persist for weeks, and is not necessarily associated with coma. I have seen it in a man who travelled over a hundred miles to consult a physician. In another instance a patient, up and about, could only when at meals feed himself in the apnœa period. Though usually of serious omen and occurring with coma and

other symptoms, recovery may follow even after persistence for weeks or even months.

The *gastro-intestinal* manifestations of uræmia often set in with abruptness. Uncontrollable vomiting may come on and its cause be quite unrecognizable. A young married woman was admitted to my wards in the Montreal General Hospital with persistent vomiting of four or five days' duration. The urine was slightly albuminous, but she had none of the usual signs of uræmia, and the case was not regarded as one of Bright's disease. The vomiting persisted and caused death. The post-mortem showed extensive sclerosis of both kidneys. The attacks may be preceded by nausea and may be associated with diarrhœa. In some instances the diarrhœa may come on without the vomiting; sometimes it is profuse and associated with an intense catarrhal or even diphtheritic inflammation of the colon.

A special uræmic stomatitis has been described (Barie) in which the mucosa of the lips, gums, and tongue is swollen and erythematous. The saliva may be increased, and there is difficulty in swallowing and in mastication. The tongue is usually very foul and the breath heavy and fetid.

Diagnosis.—Uræmia may be confounded with:

(*a*) Cerebral lesions, such as hæmorrhage, meningitis, or even tumor. In apoplexy, which is so commonly associated with kidney disease and stiff arteries, the sudden loss of consciousness, particularly if with convulsions, may simulate a uræmic attack; but the mode of onset, the existence of complete hemiplegia, with conjugate deviation of the eyes, suggest hæmorrhage. As already noted, there are cases of uræmic hemiplegia or monoplegia which cannot be separated from those of organic lesion and which post mortem show no trace of coarse disease of the brain. I know of an instance in which a consultation was held upon the propriety of operation in a case of hemiplegia believed to be due to subdural hæmorrhage which post mortem was shown to be uræmic. Indeed, in some of these cases it is quite impossible to distinguish between the two conditions. So, too, cases of meningitis, in a condition of deep coma, with perhaps slight fever, furred tongue, and without localizing symptoms, may readily be confounded with uræmia.

(*b*) With certain infectious diseases. Uræmia may persist for weeks or months and the patient lies in a condition of torpor or even unconsciousness, with a heavily coated, perhaps dry, tongue, muscular twitchings, a rapid feeble pulse, with slight fever. This state not unnaturally suggests the existence of one of the infectious diseases. Cases of the kind are not uncommon, and I have known them to be mistaken for typhoid fever and for miliary tuberculosis.

(*c*) Uræmic coma may be confounded with poisoning by alcohol or opium. In opium poisoning the pupils are contracted; in alcoholism they are more commonly dilated. In uræmia they are not constant; they may be either widely dilated or of medium size. The examination of the eye-ground should be made to determine the presence or absence of albuminuric retinitis. The urine should be drawn off and examined. The odor of the breath sometimes gives an important hint.

The condition of the heart and arteries should also be taken into account. Sudden uræmic coma is more common in the chronic interstitial nephritis. The character of the delirium in alcoholism is sometimes important, and the coma is not so deep as in uræmia or opium poisoning. It may for a time be impossible to determine whether the condition is due to uræmia, profound alcoholism, or hæmorrhage into the pons Varolii. The treatment will be considered under chronic Bright's disease.

V. ACUTE BRIGHT'S DISEASE.

Definition.—Acute diffuse nephritis, due to the action of cold or of toxic agents upon the kidneys.

In all instances changes exist in the epithelial, vascular, and intertubular tissues, which vary in intensity in different forms; hence writers have described a tubular, a glomerular, and an acute interstitial nephritis. Delafield recognizes *acute exudative* and *acute productive* forms, the latter characterized by proliferation of the connective-tissue stroma and of the cells of the Malpighian tufts.

Etiology.—The following are the principal causes of acute nephritis:

(1) Cold. Exposure to cold and wet is one of the most common causes. It is particularly prone to follow exposure after a drinking-bout.

(2) The poisons of the specific fevers, particularly scarlet fever, less commonly typhoid fever, measles, diphtheria, small-pox, chicken-pox, cholera, yellow fever, meningitis, and, very rarely, dysentery. Acute nephritis is not often associated with syphilis. In acute tuberculosis nephritis is not uncommon. It may also occur in septicæmia.

(3) Toxic agents, such as turpentine, cantharides, chlorate of potash, and carbolic acid may cause an acute congestion which sometimes terminates in nephritis. Alcohol probably never excites an acute nephritis.

(4) Pregnancy, in which the condition is thought by some to result from compression of the renal veins, although this is not yet finally settled. The condition may in reality be due to toxic products as yet undetermined.

(5) Acute nephritis occurs occasionally in connection with extensive lesions of the skin, as in burns or in chronic skin-diseases.

Morbid Anatomy.—The kidneys may present to the naked eye in mild cases no evident alterations. When seen early in more severe forms the organs are congested, swollen, dark, and the section may drip blood. In other instances the surface is pale and mottled, the capsule strips off readily, and the cortex is swollen, turbid, and of a grayish-red color, while the pyramids have an intense beefy-red tint. The glomeruli in some in-