

by the presence of the large round wood-cells which characterise the order Coniferae.

Casts may be conveniently divided, according to their appearance under the microscope, into three kinds, the epithelial cast, the granular cast, and the hyaline cast.

The epithelial cast. This cylinder consists of a mass of epithelial cells derived from the tubules of the kidney; the cells may become granular and acquire a dark appearance by transmitted light. The cast is usually wide, never very narrow.

The granular cast. This is a solid cylinder having a granular appearance, which may be limited to a few dark points in the substance of the cast, or be so intense as to give the cast an almost black appearance. In this kind of cast may often be found epithelial cells, blood corpuscles, red or white, pus corpuscles, crystals of uric acid, urates, and especially oxalate of lime. The fatty cast is a variety of the granular, produced by the running together into globules of fat of the granules of olein.

The hyaline cast. This cast is usually very transparent, and the outline is often so indistinct that a little iodine or magenta must be added to the urine before it can be detected, or a diaphragm with a narrow opening must be used. They show indistinct markings on their surface, or a few granules and nuclei. There are two kinds, the wide and the narrow; the latter are sometimes of great length.

In observing casts, notice must be taken of the action of acids upon them, or their contents. It is thought that when the cylinders resist the solvent action of hydrochloric acid to any great degree, that the inflammation of the kidney is correspondingly intense. The granules on the cast, if formed of protein, will disappear, when acted on by acetic acid; but if of olein, they are rendered more distinct. The width of the cylinder is of some importance, as it is supposed that very broad casts are formed in tubules completely stripped of their epithelium, and that the prognosis is more grave when these wide casts show on their sides no nuclei, or attempt at reformation of epithelium. From the recent observations on the varying diameters of the uriniferous tubes, the importance of the breadth of the cast becomes less.

Clinical Import. The presence of casts in the urine is a sure sign of disease of the kidney, but not, however, necessarily of permanent disease of the kidney. They are present in many acute diseases, accompanied by albumen in the urine. But if they are found for several weeks together, after all pyrexia has subsided, permanent disease of the kidney may be inferred. Casts are constantly present in the urine in all cases of congestion of the kidney, and of acute or chronic Bright's disease. But no certain information as to the nature of the disease existing in the kidney, *e. g.* whether lardaceous or fatty, can be obtained from the character of the casts, since all forms of Bright's disease terminate in fatty changes. Some assistance may, however, be derived from the appearance of the casts in forming a judgment of the acute or chronic character, or a prognosis, of the disease. If, for example, there be found in the urine

epithelial casts which have undergone little, or no, granular change, and casts studded with red blood corpuscles, together with a large quantity of epithelium from the tubules of the kidney, having a natural or only slightly cloudy appearance, there can be little doubt that the patient is suffering from an acute attack of Bright's disease: while if the casts be chiefly fatty, or intensely granular, and the epithelium be small in amount, and the cells withered and contracted, or containing globules of olein, it will be more than probable that the case is one of chronic Bright's disease.

Since little reliance can be placed on the characters of the casts as an aid to special diagnosis, some of the leading characters of the renal derivatives in the chief forms of kidney affection have been subjoined.

Congestion of the kidney. The casts are chiefly hyaline, seldom showing any marks of fatty change. Very rarely are blood or epithelial casts discovered.

Acute Bright's Disease. At the commencement, the urine deposits a sediment which consists of blood-corpuscles, narrow hyaline casts, and casts covered with blood-corpuscles, the 'bloodcasts' of some authors. In the next stage, the amount of blood present is not so great, but, a great desquamation of the renal tubules taking place, renal epithelium and epithelial casts are found in great numbers; the epithelium has undergone very little, if any, granular change; hyaline casts are observed together with epithelial. In the next stage, the changes in the epithelium may be almost daily observed; at first they become granular, cloudy in appearance, which alteration, the sequel of the catarrh, often proceeds to fatty degeneration, and the epithelial cells then contain large fat drops, while the epithelial casts undergo similar change, and become distinctly granular and even fatty.

If the patient recover, the casts and epithelium gradually disappear from the urine, but if the case become chronic, the renal derivatives show the characters described in the next paragraph.

Chronic Bright's Disease. Numerous forms of casts are met with; the hyaline, both narrow and wide forms; the larger are often beset with granules dissolved on addition of acetic acid; the granular, whose surface is often covered with fatty or shrivelled-up epithelium cells; fat drops may stud the cylinder. Epithelial casts are rare, except in febrile exacerbations, when the renal derivatives found in acute Bright's disease are present, together with granular and fatty casts, evidence of the previous alteration of the kidney.

Lardaceous or Albuminoid Kidney. The urinary deposit contains hyaline casts, which are often accompanied by pus corpuscles. Atrophied epithelial cells, becoming fatty in the later stages of the disease, are almost invariably present.

FUNGI.

Many kinds of fungi grow in the urine after it has been voided for some time, and when the ammoniacal decomposition has begun are (*a*) *vibriones*, which may be seen in almost every albuminous urine which