

The Nursing of Children's Diseases.

By J. PORTER PARKINSON, M.D., M.R.C.P.,
*Physician to the North-Eastern Hospital for Children ;
and to the London Temperance Hospital, etc.*

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LECTURE X.

THE KIDNEYS AND URINE.

The human body is frequently compared to a steam engine in which coal is burnt or oxidized, producing heat which involves force to make the engine work. The burning of the coal produces ash which clogs the fire, preventing draught, and must be removed if the fire is to continue to burn freely. The body fuel is the food which is burnt up or oxidized in the tissues after digestion and absorption, and produces heat and force, whilst the ash produced by this oxidization is poured off into the blood and is removed from thence by the kidneys. A portion of food is not digested, and is passed on down the intestinal tract, and finally thrown off from the bowel as *fæces*. A certain portion of waste products is thrown off by the lungs as carbonic acid gas ; this is chiefly produced from sugar, starch and fat which have been oxidized in the body, producing heat, and are thrown off in this form by the lungs. It is chiefly the albuminous parts of the food which are thrown off by the kidneys in the form of urea, uric acid and other bodies which represent those albumins of the food and the tissues in the urine.

The kidneys are two in number, situated in the upper and back part of the abdominal cavity, one on each side of the spine. Each kidney has a large artery which carries the blood to it to be purified by removal of waste products. This artery divides rapidly into smaller vessels and capillaries, which are arranged in tufts from which the blood is carried to the veins, and thence back to the heart. From the tufts and other capillaries of the kidney the water salts, urea and uric acid, are removed from the blood into the very minute tubes of which the kidney is composed, through which they flow till the fluid is poured into a larger tube proceeding from the kidney to the bladder, called the ureter, from which the urine is evacuated through the urethra.

The amount of urine varies much according as much or little fluid is taken, hence in infants fed on milk it is more in proportion to the size

than in children who are fed upon more solid food. The amount varies also with the amount of fluid passed through the skin as perspiration, and with the frequency of action of the bowels. Hence if a child have diarrhoea, the amount of urine is diminished, and in cold weather, when the skin acts less, the urine is greater in amount than in the summer. Retention of urine means that urine is being secreted by the kidneys, but is not passed from the bladder, which therefore, if unrelieved, becomes distended and painful. Suppression of urine means that urine is not secreted by the kidneys, and is a very serious condition.

The examination of the urine.—The first point is the quantity ; this is relatively greater in children than in adults ; between 2 and 5 years between 15-25 oz. are passed each twenty-four hours, between 5 and 9 years between 25-35 oz. are passed each twenty-four hours, between 9 and 14 years between 35-40 oz. are passed each twenty-four hours. When a child passes all its urine into a napkin of course the amount cannot be estimated. The colour varies even in health, but is usually paler than during adult life. If it is dark and greenish, and on shaking a green froth can be seen, it denotes that the urine contains bile. If the urine be smoky and turbid, or of a reddish or reddish-brown colour, it may contain blood ; this must not be confused with a turbidity due to the deposit of urates in a cooling urine containing an excess of this ingredient. This sediment is of a brick-red colour, and soon falls to the bottom of the vessel as a granular deposit, which dissolves again on warming. The urine may contain clots which probably come from the bladder or urethra. On standing a red deposit like red pepper may appear at the bottom of the urine glass ; this is uric acid. Sometimes a white deposit of phosphates may appear ; if a little of this be put into a test-tube, and acetic acid added, it will dissolve, proving that it is a phosphatic deposit. Pus makes the urine turbid, and gradually settles as a heavy deposit to the bottom of the urine glass. Some of this deposit mixed with liquor potassæ forms a ropy, semi-gelatinous fluid. The specific gravity of the urine must be taken if possible ; this means the weight of urine compared with that of an equal quantity of water. The specific gravity of water is 1,000 and that of urine varies in health between 1,012 and 1,015 in an infant, and the specific gravity increases with

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