

# the kidneys

The kidneys are bean-shaped organs, about the size of an adult fist, located one on each side, around the middle of the back, just below the rib cage. Although most people have two kidneys, having one healthy kidney is enough to ensure that you remain well. Some therapies used in people with HIV have been associated with kidney problems and uncommonly, HIV can cause a form of kidney disease.

## What the kidneys do

The kidneys filter the blood and removing waste products from the normal breakdown of body tissue and from food. They regulate the body's balance of minerals and water, waste, excess minerals and water form urine, which flows to the bladder through tubes called ureters. The kidneys also release important hormones, notably one that stimulates the production of red blood cells (erythropoietin), and another that regulates blood pressure (renin). The kidneys also convert vitamin D into its active form, which is essential for healthy bones.

## Kidney problems

Common causes of kidney disease are inflammation in the filter, diabetes and high blood pressure. These may cause excessive loss of protein from the blood, blood in the urine, and/or chronic kidney failure. Infection in the urine can be limited to bladder (cystitis) or may affect the kidneys (pyelonephritis); some bacterial infections can reach the kidneys via the blood, (tuberculosis). In acute kidney failure, the filtering process stops altogether; this may happen if the blood supply to the kidneys is inadequate, with severe bacterial infections or with some substances that are toxic to the kidney. In diabetes, the excess glucose in the blood can damage the kidney blood vessels, causing a condition known as diabetic nephropathy. High blood pressure can damage the blood vessels. Drug toxicities most commonly damage the tubules.

## Kidney problems in HIV infection

HIV itself can (uncommonly) cause a form of glomerulonephritis (HIV nephropathy). This inflammation of the kidneys is more often seen in black people and also in drug users. HIV nephropathy is probably less common with widespread use of anti-HIV drugs. Diabetes is a possible complication of treatment with protease inhibitors. Drug toxicities, in people with HIV, may result from use of anti-HIV drugs or from drugs used to treat opportunistic infections (e.g. *Septrin*) or from some recreational drugs such as cocaine. Indinavir can cause stones to form in the urine. Stones are much more likely to form if you drink too little. Tenofovir (*Viread*) has been associated with a handful of cases of kidney problems.

## Symptoms of kidney problems

Your kidney function and blood sugar should be monitored in your routine blood tests. Large amounts may cause brown/red discolouration or frothy urine. Excessive protein loss may cause fluid accumulation in the legs and elsewhere. An early sign that the kidneys are not working can be passing a lot of urine at night (also a symptom of diabetes). The symptoms of more severe kidney failure may include a general feeling of malaise, tiredness, nausea, headaches, muscle cramps, reduced urine flow, drowsiness, itchiness and, later, darkening of the skin. People with kidney stones caused by indinavir may notice severe pain in the flank or a burning pain in the urethra when urinating. Urine infections can cause pain when urinating, and especially if affecting the kidneys, also loin pain, fever and malaise. They can also affect the frequency of urination.

## Tests

Blood or protein in the urine can be detected by simple "stick" tests; more detailed analysis can be done in the laboratory. Blood samples can be checked for mineral and protein levels, and for creatinine, which is a very sensitive and specific marker of kidney function, or urea, which is a less specific marker, being more affected by hydration and diet. Ultrasound, CT (computerised tomography) or MRI (magnetic resonance imaging) or functional scans can be used to image the kidneys. Some people may require renal biopsy, which involves taking a small sample of kidney tissue for examination under a microscope.

## Treatments

Stopping drugs or reducing their doses may be needed, where these are implicated in kidney problems. If you are taking indinavir, drink at least two litres of water a day, more in hot weather or when exercising. Urinary infection should be treated promptly with appropriate antibiotics. Some forms of nephritis (inflammation of the kidneys) can be treated. If there is much protein loss and oedema (swelling), diuretics and a high protein diet may be used. Raised blood sugar and blood pressure should be controlled carefully, the approach depending on the cause and severity of the problem. In moderate kidney failure, a low protein diet may help reduce symptoms and protect the kidneys; salt and potassium intake may need modification. If your kidneys stop working completely, you would need dialysis (haemodialysis, which puts blood through an external filtering machine; or peritoneal dialysis, where fluid is put in and taken out of the abdominal cavity) to remove waste products and balance water and mineral levels; a kidney transplant, with immunosuppressive treatment to prevent it being rejected, may be needed if the kidneys have failed permanently, but this is obviously not straightforward in people with HIV.

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