

# The kidneys

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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 ribcage. Although most people have two kidneys, having one healthy kidney is enough to ensure that you remain well. Some treatments used in people with HIV have been associated with kidney problems and sometimes, HIV can cause a form of kidney disease.

## What the kidneys do

The kidneys filter the blood and remove 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 can be caused 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 side-effect of some anti-HIV drugs, particularly 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. *Seprin*) or from some recreational drugs such as cocaine. The protease inhibitor Indinavir (*Crixivan*, now rarely used) can cause kidney stones. Stones are much more likely to form if you don't drink enough liquid.

Tenofovir (*Viread*, also in the combination pills *Truvada* and *Atripla*) has been associated with a small number of cases of kidney problems.

## Symptoms of kidney problems

Your kidney function and blood sugar should be monitored in your routine blood tests. Some kidney problems cause brown/red discolouration or frothy urine respectively. 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, itchy and, later, darkening of the skin. People with kidney stones caused by indinavir may notice severe pain in the flank (one side of the body), or a burning pain in the urethra when urinating. Urine infections can cause pain when urinating, frequency of urination, and especially if affecting the kidneys, also loin pain, fever and malaise.

## Tests

Your kidney function will be checked as part of your routine HIV care .

Blood or protein in the urine can be detected by simple 'stick' tests; more detailed analysis can be done in a 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.

## Treatment

Changing treatment or reducing doses after talking to your doctor may be needed . 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, and good outcomes have been seen in people with HIV.