

# Chronic Kidney Disease (CKD)

## ...and its hidden danger anemia

### Did you know that...

- 500 million people worldwide – approximately one in ten adults – have some form of kidney damage<sup>1</sup>
- CKD is an international public health problem affecting 5 – 10% of the world population<sup>2</sup>
- The most common causes of CKD is diabetes and high blood pressure, which together account for 66% of all cases of CKD<sup>3</sup>

### What are the kidneys?

The kidneys are a pair of bean-shaped organs. Along with the brain, heart, lungs and liver, they are one of the body's five most important organs. They are the filters that clear waste products and excess fluid from the blood.

### What do our kidneys do?

The kidneys' three main jobs are to filter blood, stimulate the production of red blood cells and to control blood pressure.

The kidneys are the body's primary blood filtration system, responsible for processing and removing waste. Hormonal sensors within the kidney determine which substances should be excreted as waste and which should be reabsorbed into the blood to nourish the body's cells, such as water, essential nutrients, salts and minerals. The kidneys maintain our body in fluid balance.

The kidneys also play an important role in maintaining the body's oxygen supply. Although it is the red blood cells that are ultimately responsible for delivering oxygen to the tissues, what is first required is the production by the kidney of a hormone, erythropoietin (EPO), that is released into the bloodstream to stimulate the red blood cell production in the bone marrow.

The kidneys are further involved in regulating blood pressure. The release of an enzyme called renin is finally causing the arteries and veins to narrow and making blood pressure to increase in the end. On the other hand are kidneys influencing blood pressure by affecting the circulating blood volume.

### What happens if the kidneys do not work properly?

Impaired kidney function carries serious implications and can lead to CKD defined as a permanent decline in kidney function below a particular filtration rate. The body fails here to produce enough urine to eliminate toxins and other waste from the bloodstream.

Damaged kidneys are also unable to release enough EPO to stimulate adequate red blood cell production. A low red blood cell count, called anemia, compounds CKD and threatens to starve tissues and organs of oxygen. Once this situation develops the heart does its best to compensate by pumping harder. This only raises the blood pressure and damages the delicate structure of the kidney even more.

Affected kidneys can furthermore produce too much renin. An excess of renin can cause blood pressure to rise above normal values which is accelerating kidney damage as well.

### What is the relationship between anemia and CKD?

Virtually 100%<sup>4</sup> of patients with CKD will develop anemia, since the diseased kidneys produce less of the vital EPO hormone. Why is EPO production so important? It is essential for stimulating the production of red blood cells and regulating blood oxygen levels.

In CKD kidney function declines and kidney cells die further impairing their crucial role in releasing enough EPO to maintain the red blood cell production.

### What are risk factors for CKD and anemia?

Anyone can develop kidney problems, but some are more prone to than others. You are at increased risk of kidney disease if you have:

- High blood pressure
- Diabetes
- Cardiovascular disease
- Family history of kidney failure

### What can be done?

Early detection can prevent CKD from becoming more severe. Unfortunately, onset is insidious, with signs and symptoms typically remaining silent for many years in early stages. Early detection and prevention are therefore crucial. How is early detection then possible?

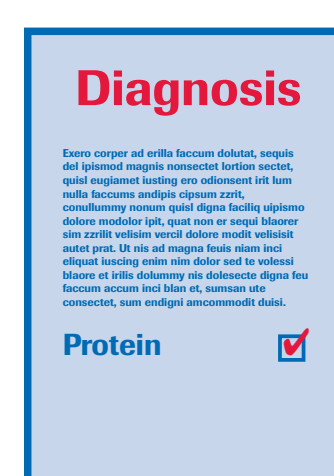
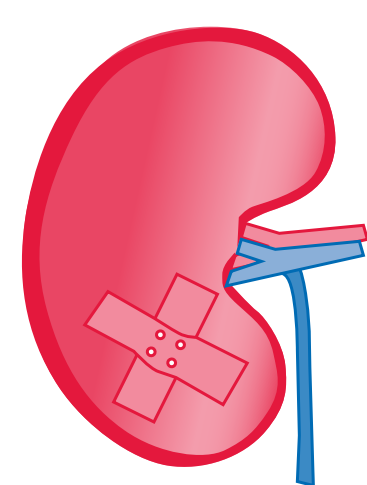
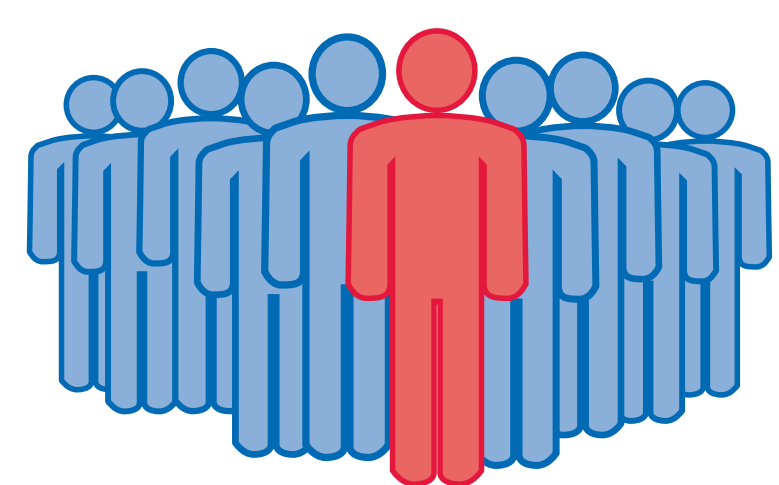
Damaged kidneys are unable to filter properly and as a consequence leak large amounts of protein into the urine. Increased urinary protein is one of the earliest signs of CKD and is easily detected with a simple urine test strip. Early detection minimizes additional kidney damage and is simple to perform at home or in the doctor's office.

### What are the treatment options?

Options depend on the disease stage at diagnosis. In the early stages of CKD, cutting back on dietary salt and protein helps to reduce the strain on kidney function. The earlier this measure is introduced the better, but it depends on early detection by urinalysis.

In the later stages the development of anemia is almost inevitable. This is why it is important to lessen the impact of anemia by preventing a reduction of EPO in the bloodstream. How? An artificial EPO substitute prevents this complication of CKD.

## What happens if our kidneys fail to work properly?



#### Who is affected?

The main risk factors for CKD include: diabetes, high blood pressure, cardiovascular disease, family history of CKD

▶ **These risk groups are more likely to develop CKD**

#### What does it lead to?

Impaired kidney function in CKD reduces filtration efficiency.

▶ **Early detection is important in preventing further damage**

#### How do you detect it?

One of the earliest signs of kidney damage is protein in the urine.

▶ **Detection of protein is possible with a simple urine test strip**

#### What is the consequence?

CKD causes anemia by decreasing blood EPO levels and depressing red blood cell production.

▶ **Oxygen transport by red blood cells is impaired**

#### How can further damage be prevented?

Adequate red blood cell production is essential for maintaining tissue oxygen levels.

▶ **Treatment with artificial EPO restores red blood cell production**