

UNDERSTANDING YOUR BLOOD TESTS!

INTRODUCTION

All patients with kidney failure have regular blood tests. These tests show how well your kidneys are working, or how well dialysis is working and if any changes are needed in your treatment.

Measurements are taken of different substances in the blood and the main ones related to your diet are explained here. These measurements can help you understand why your diet is important and help you to remain healthy while on dialysis.

BLOOD MEASUREMENTS

Substance	Normal level on dialysis
UREA (Ur)	25 - 30mmol/l
CREATININE (Cr)	600-1000mmol/l
POTASSIUM (K+)	3.5 - 6.0mmol/l
CORRECTED CALCIUM (CrCa)	2.1 - 2.6mmol/l
PHOSPHATE (PO4)	Less than 1.8mmol/l

For haemodialysis patients blood measurements are taken prior to starting a dialysis session. During haemodialysis the blood levels decrease and then build up again between dialysis sessions.

For CAPD patients the blood measurements can be taken at any time.

UREA (Ur)

	Normal level on dialysis
Urea	25-30mmol/l

Protein foods such as meat, fish, poultry, eggs, cheese and milk are used to build up muscles and repair body tissue. The waste product of protein is urea, which is normally removed by the kidneys. The level of urea builds up in the blood when the kidneys are not working properly. This can make you feel sick and cause an unpleasant taste.

Dialysis removes some of the urea. The level of urea in the blood after dialysis is low but gradually increases again between dialysis.

A low urea level when you are established on dialysis may indicate that you are not eating enough protein rich foods for example meat, chicken, fish, pulses, lentils.

Speak to your dietitian if you would like further advice on how to ensure you are eating enough protein foods.

CREATININE (Cr)

	Normal level on dialysis
Creatinine	600-1000mmol/l

Creatinine is a product from daily muscle turnover. This is normally filtered through the kidneys and removed in the urine. The level of creatinine rises in the blood when the kidneys are not working properly. Creatinine levels are individual depending on muscle size. Decreasing levels of creatinine when you are established on dialysis can indicate that you are losing muscle and body weight.

POTASSIUM (K+)

Substance	Normal level on dialysis
Potassium	3.5 - 6.0mmol/l

Potassium is a mineral found in certain foods; particularly fruit, vegetables, coffee and chocolate.

The heart and other muscles need potassium to function properly. It can be dangerous if the level becomes too high or too low. The kidneys normally control the level of potassium in the blood. Poorly functioning kidneys can no longer remove potassium from the blood efficiently and the amount of potassium in the blood increases. Dialysis removes potassium from the blood but it increases again between dialysis.

Reasons for high level

Medication
Constipation
Poor diabetic control
High intake of potassium foods.
Infection
Recent blood transfusion.
Inadequate dialysis

Reasons for low level

Poor food intake
Diarrhoea
Diuretics (water tablets)
Low intake of potassium foods.

How to help reduce your potassium level

Limit fruit intake to 2 portions a day, choose low potassium fruits eg apples, pears, tinned fruit in syrup
Boil potatoes or vegetables for 20 mins and discard water.
Reduce intake of chocolate.
Reduce intake of coffee.

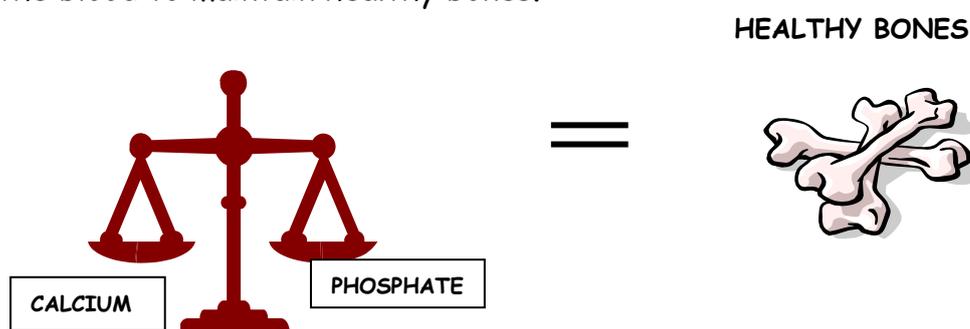
Speak to your dietitian if you would like further advice.

To increase potassium intake, please speak to your dietitian.

CALCIUM and PHOSPHATE

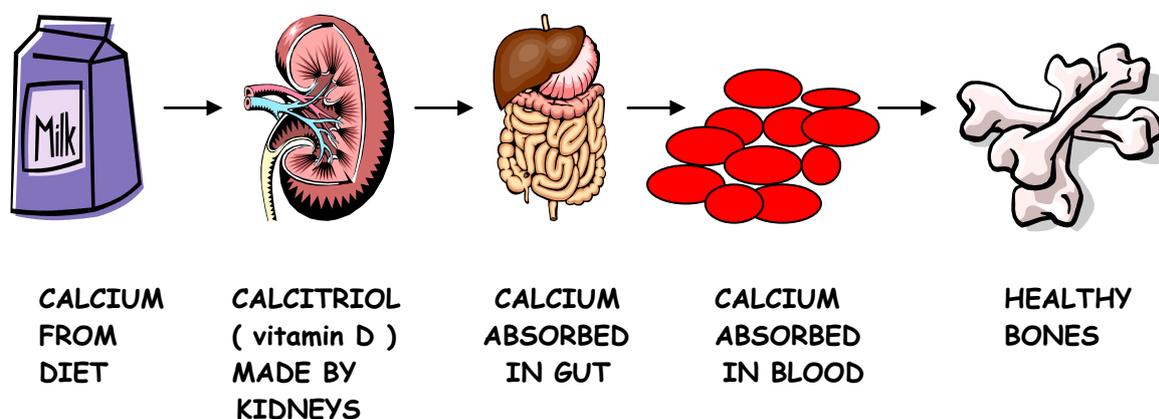
	Normal level on dialysis
CORRECTED CALCIUM (CrCa)	2.1 - 2.6 mmols/l
PHOSPHATE (PO4)	Less than 1.8 mmol/l

Calcium and phosphate are minerals stored in your bones to keep them strong. It is important to keep an equal balance of calcium and phosphate in the blood to maintain healthy bones.

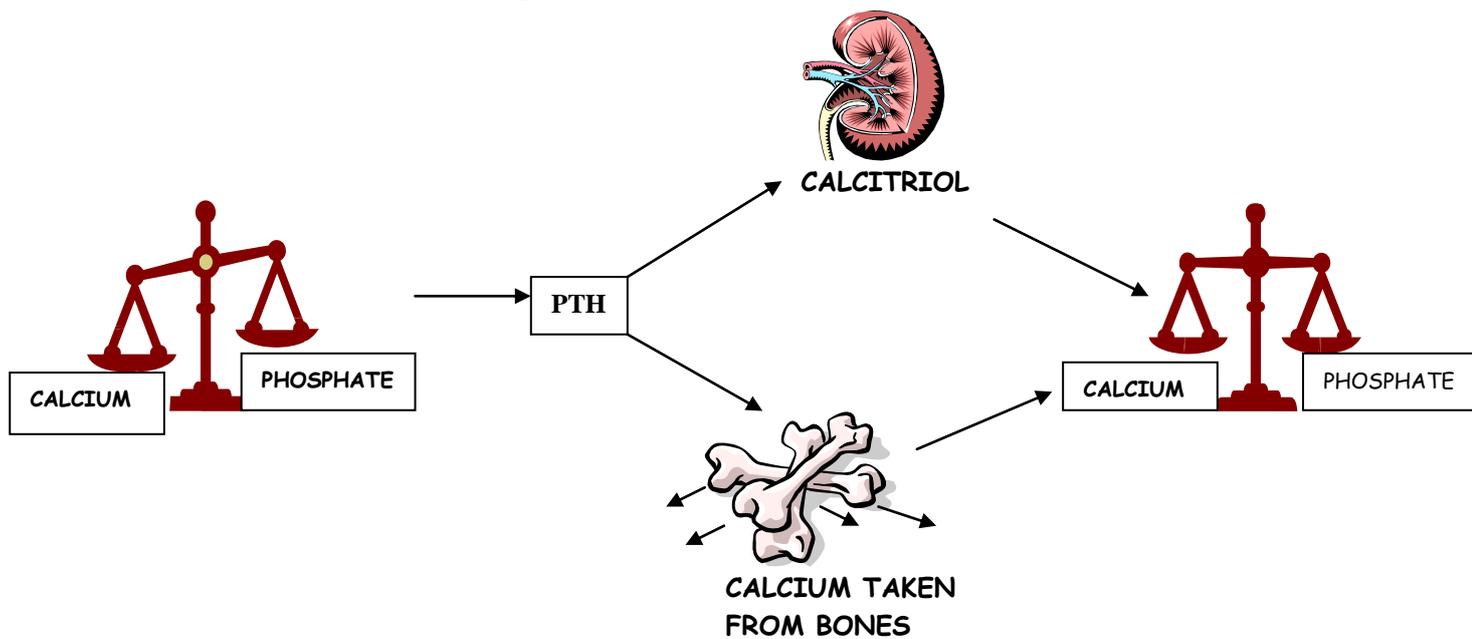


Phosphate is found in most foods, especially foods high in protein. The kidneys normally remove excess phosphate to maintain the calcium/phosphate balance in the blood.

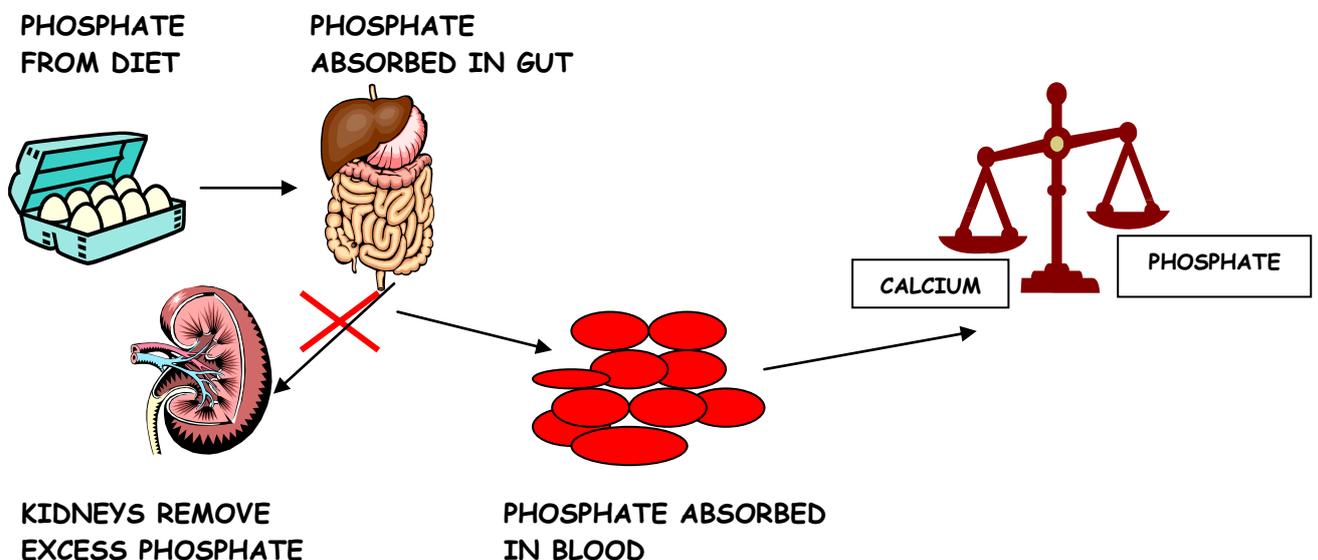
Calcium is a mineral found in many foods, especially milk and dairy foods. To absorb calcium from food we need a special form of vitamin D. The kidneys normally produce this special form of vitamin D (calcitriol). Calcitriol works by absorbing calcium from food through your intestines into your blood. Calcium is then taken and stored in your bones to keep them strong and healthy.



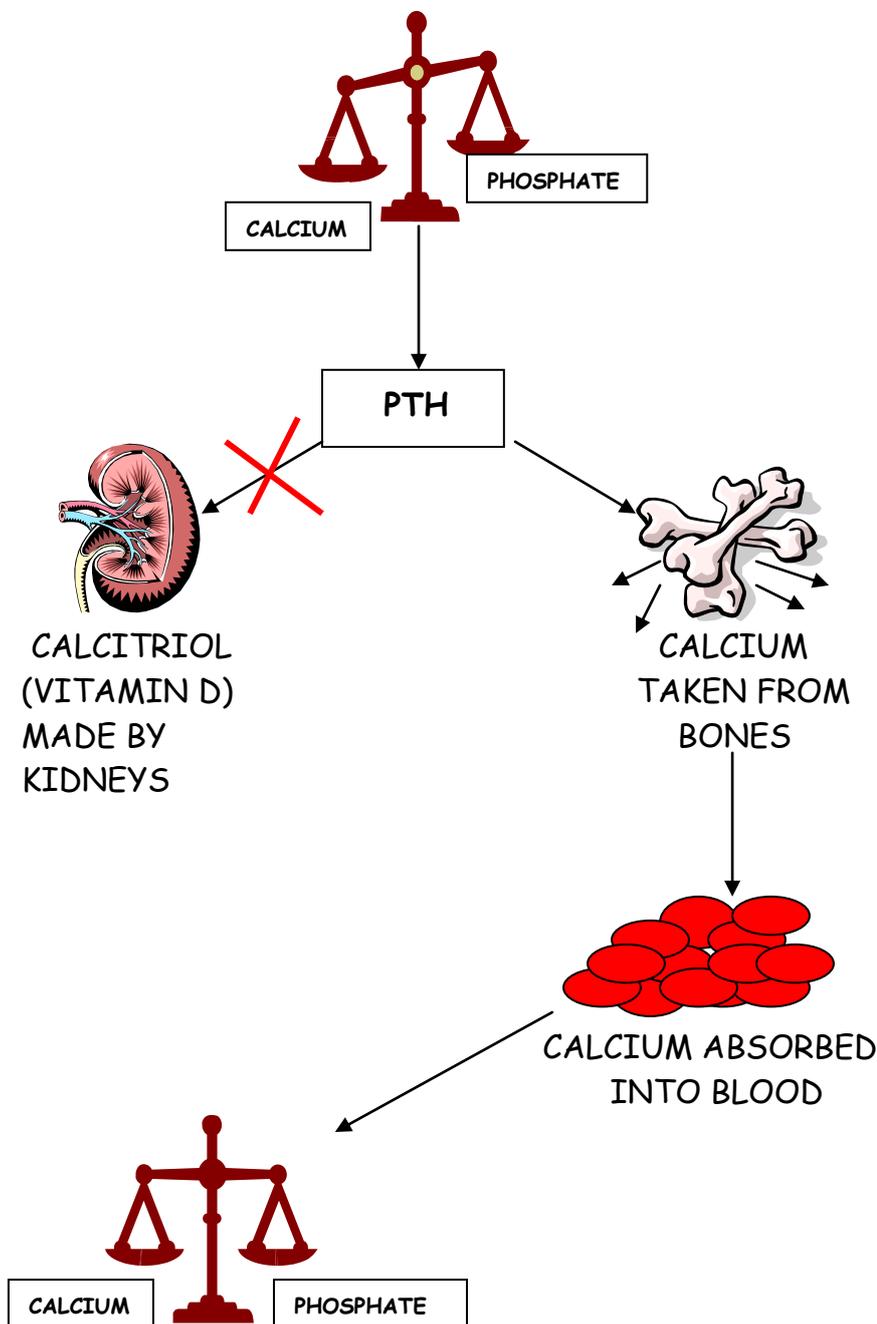
Calcitriol affects another part of your body called the parathyroid glands. These glands are found in your neck and produce the hormone parathyroid hormone (PTH). PTH is essential to control the balance of phosphate and calcium in the blood. When levels of phosphate run high, PTH releases calcium from your bones to correct the balance. When calcium levels run low, PTH tells the kidneys to make calcitriol to help absorb calcium from the gut. The calcium and phosphate levels in the blood are then balanced again.



In kidney failure this balance is upset, as your kidneys are no longer able to remove the excess phosphate from your blood. The amount of phosphate in the blood will therefore increase, causing the balance to be upset resulting in a reduced level of calcium.



In response to the raised phosphate and decreased calcium level, PTH is stimulated and responds by taking calcium from the bones to correct the balance and at the same time tells the kidneys to make calcitriol. The kidneys are not working properly and are therefore unable to make calcitriol. This means that we cannot absorb the calcium from food to increase the calcium level in the blood. In response, PTH continues to release calcium from the bones but at the same time continues to tell your kidneys to make calcitriol. This results in more and more calcium being taken from your bones making them weaker and weaker. When this happens you may complain of painful joints and this also increases your risk of fractures.



What can I do to control my calcium and phosphate levels?

There are two things that you can do to help keep the balance right in the blood.

1. Lower the amount of phosphate in the blood.

It may be necessary for you to restrict the amount of phosphate in your diet. You can decrease your phosphate intake by doing the following:

Include no more than $\frac{1}{2}$ pint milk/day.

Limit eggs to 3-4 times a week

Reduce intake of cheese.

Diet alone will rarely lower your phosphate level and you may have to take phosphate binders.

Phosphate binders help to bind excess phosphate from food so that it is not absorbed. Most binders contain calcium, which will help to keep your calcium level in balance as well as controlling phosphate level. These must be taken with food or they will not work effectively. The dietitian will advise you on how to distribute your tablets based on your normal food intake.

These are common phosphate binders which you may be prescribed:

Phosex

Calcichew

Alucaps

Renagel

2. Increase the amount of calcium in the blood.

A special vitamin D supplement (eg. alphacalcidol) may be given by the doctor to help calcium absorption from the gut.

This helps to maintain calcium levels in the blood and prevents your PTH from taking calcium from our bones.

Phosphate binders that are calcium based may also be advised, which helps to keep your calcium level in balance.

	Reasons for high levels	Reasons for low levels
PHOSPHATE	High intake of dietary phosphate Taking binders at the wrong time. Forgetting to take binders. Phosphate binder dosage needs adjusting	Low intake of dietary phosphate Too many binders given Poor / appetite
CALCIUM	Excess production of PTH Phosphate binders need adjusting Indigestion remedies	Vitamin D (calcitriol) deficiency Binders need adjustment Forgetting to take binders

What will happen if I don't control my levels?

As calcium and phosphate are linked it is important to keep levels in balance to prevent bone disease.

Itchy eyes and red eyes may be an early sign of high levels of phosphate and calcium in the blood. You may also complain of weak and painful bones and joints. This can increase your risk of fractures.

If your phosphate and calcium levels continue to run high over a long period of time, the phosphate and calcium join to form chalk-like deposits. These deposits can block the flow of blood in your heart, lungs and blood vessels.

This can result in serious problems and may increase your risk of having a heart attack. Your blood vessels might also become too chalk-like, which may affect the success of a kidney transplant.

If the phosphate and calcium levels are not controlled, an operation to take out your parathyroid glands may be necessary.

If you would like to discuss any of your blood results further, please ask to speak to your dietitian.

