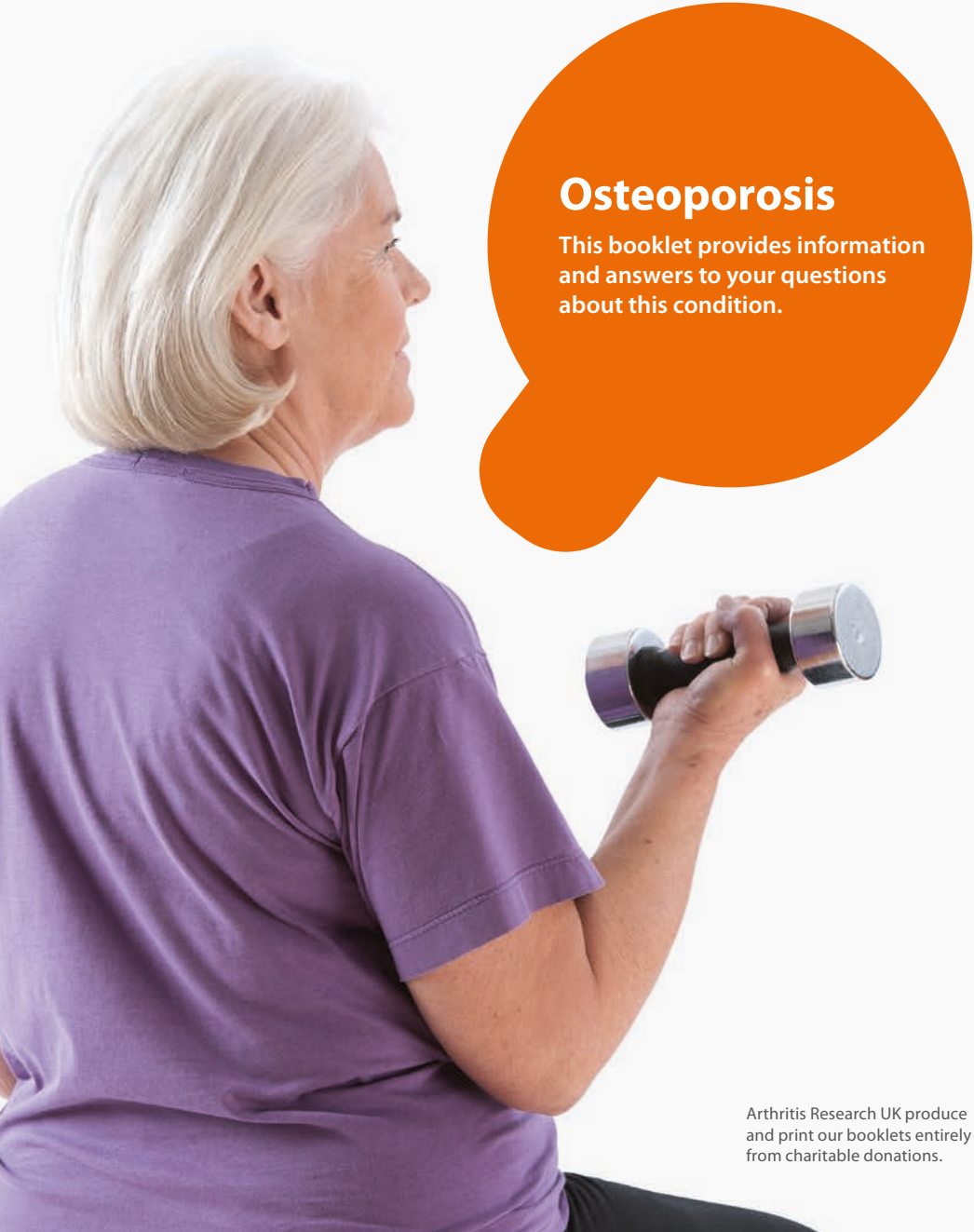
Arthritis Research UK

Condition
Osteoporosis



Osteoporosis

This booklet provides information and answers to your questions about this condition.

Arthritis Research UK produce and print our booklets entirely from charitable donations.

What is osteoporosis?

Osteoporosis is a condition that causes the bones to become fragile, so they break more easily. In this booklet we'll explain what causes osteoporosis and how it's treated. We'll also look at what you can do to reduce your risk of developing osteoporosis and suggest where you can find out more.

At the back of this booklet you'll find a brief glossary of medical words – we've underlined these when they're first used.

What's inside?

Osteoporosis is a condition which makes the bones fragile. There are usually no symptoms, and it's often only discovered when you break a bone in a minor accident or fall.

At a glance
Osteoporosis

If you develop osteoporosis, there are a number of treatments that can help.

What is osteoporosis?

Bone is a living tissue, but as we get older it's not able to renew itself as well and our bones start to weaken. This happens to everybody to some degree, but when the bones become fragile it's called osteoporosis.

Who gets it?

Osteoporosis is quite common in the UK. It mainly affects women, particularly after the menopause, but it's not uncommon in men. You're at greater risk of developing osteoporosis if you:

- have needed steroid treatment for more than three months
- have a family history of osteoporosis
- don't do much weight-bearing exercise
- are a heavy drinker or smoker.

If you're female, your risk may also be increased if you've:

- been through the menopause, especially if it was before the age of 45 (early menopause)
- had your ovaries removed.

How can I help myself?

The following will help to reduce your risk of developing osteoporosis:

- Get plenty of calcium and vitamin D as part of a well-balanced diet.
- Exercise regularly, especially activities that involve running or jogging.
- Stop smoking.
- Don't drink too much alcohol.

What treatments are there?

There are a number of treatments available, including:

- calcium and vitamin D
- bisphosphonates (for example alendronate, risedronate)
- teriparatide
- raloxifene
- denosumab.

What is osteoporosis?

The word osteoporosis means spongy (porous) bone. Bone is made up of minerals, mainly calcium salts, bound together by strong collagen fibres. Our bones have a thick, hard outer shell (called the cortex, cortical bone or sometimes compact bone) which is easily seen on x-rays. Inside this, there's a softer mesh of bone (trabecular bone) which has a honeycomb-like structure.

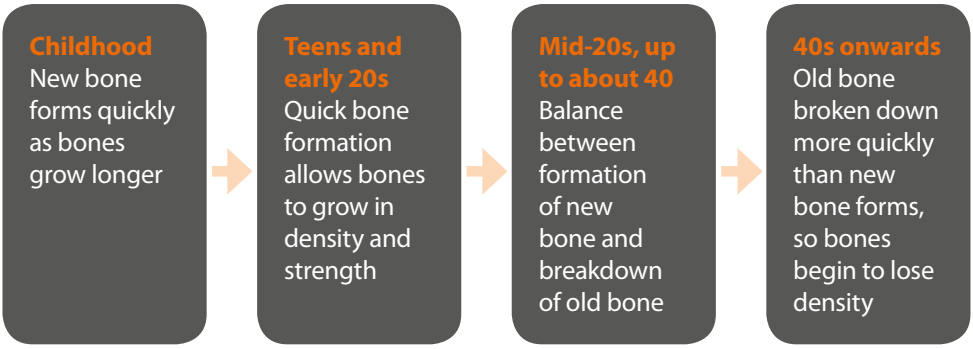
Bone is a living, active tissue that's constantly renewing itself. Old bone tissue is broken down by cells called osteoclasts and is replaced by new bone material produced by cells called osteoblasts.

The balance between the breakdown of old bone and the formation of new bone changes at different stages of our lives (see Figure 1).

1. In childhood, new bone is formed very quickly. This allows our bones to grow longer. Later, in our teens and early 20s, the bones stop growing longer but continue to grow in density and strength. Bone density reaches its peak by our mid to late-20s.
2. After this, new bone continues to be produced at about the same rate as older bone is broken down. This means that the adult skeleton is completely renewed over a period of 7–10 years.
3. Eventually, bone starts to be broken down more quickly than it's replaced, so our bones slowly begin to lose their density. This phase usually starts at about the age of 40 and continues for the rest of our lives.

Everybody will have some degree of bone loss as they get older, but the term osteoporosis is used only when the bones become quite fragile. When bone is affected by osteoporosis, the holes in the honeycomb structure become larger and the overall density is lower – which is why the bone is more likely to fracture (see Figure 2).

Figure 1 Stages of bone development and renewal



What are the symptoms of osteoporosis?

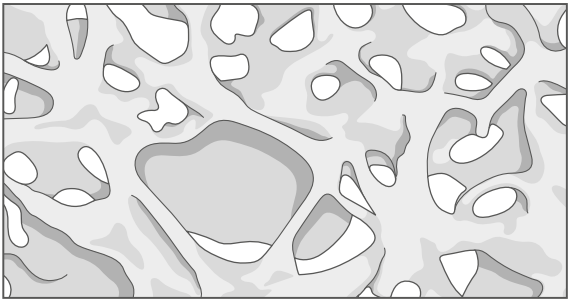
Quite often the first sign of osteoporosis is breaking a bone in a fairly minor fall or accident. Fractures are most likely to happen at the hip, spine or wrist.

! Each year in the UK there are around 70,000 hip, 120,000 spine and 50,000 wrist fractures that are linked to osteoporosis.

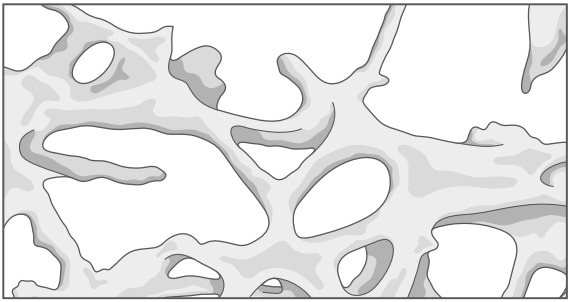
Spinal problems occur if the bones in your spine (vertebrae) become weak and lose height (described as a vertebral crush fracture). This usually happens around the middle/lower back. If several vertebrae lose height, your spine will start to curve and you may become shorter. This can sometimes cause back pain and some people may have difficulty breathing simply because there's less space under their ribs.

People who have spinal fractures will also have a greater risk of hip and wrist fractures.

Figure 2
The effect of osteoporosis on bone



Normal bone



Bone affected by osteoporosis

Who gets osteoporosis?

Osteoporosis is quite common in the UK, and the risk of developing it increases with age. Anyone can get osteoporosis but women are about four times more likely than men to develop it. There are two main reasons for this:

1. The process of bone loss speeds up for several years after the menopause, when the ovaries stop producing the female sex hormone oestrogen.
2. Men generally reach a higher level of bone density before the process of bone loss begins (see Figure 3). Bone loss still occurs in men but it has to be more severe before osteoporosis occurs.

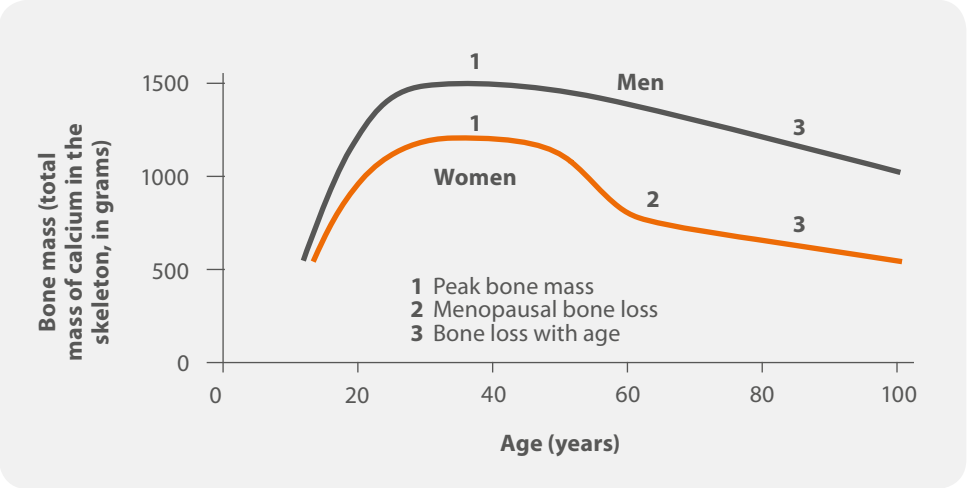
A number of other risk factors can increase your chances of developing osteoporosis.

Risk factors

Steroids – Steroids are drugs which are used for a range of inflammatory conditions, for example rheumatoid arthritis. They can affect bone production partly by reducing the amount of calcium absorbed from the gut and increasing calcium loss through the kidneys. If you're likely to need steroids for more than three months, your doctor will probably recommend calcium and vitamin D tablets and possibly other treatment to help prevent against osteoporosis.

See Arthritis Research UK drug leaflet *Steroid tablets.*

Figure 3 **Graph showing typical total bone mass in men and women**



A lack of oestrogen in the body (oestrogen deficiency) – If you've had an early menopause (before the age of 45) or a hysterectomy where one or both ovaries were removed, this increases your risk of developing osteoporosis. This is because they cause your body to stop producing oestrogen, so the process of bone loss will speed up. Removal of the ovaries only (ovariectomy or oophorectomy) is fairly rare but is also linked with an increased risk of osteoporosis.

Lack of weight-bearing exercise – Exercise encourages bone development. If you don't exercise, or you have an illness or disability that makes exercising difficult, you'll be more at risk of losing calcium from your bones and so are more likely to be diagnosed with osteoporosis. Muscle and bone health have been shown to be linked so keeping up your muscle strength with exercise is important. This may also reduce the risk of falling. However, women who exercise so much that their periods stop have a higher risk of developing osteoporosis because it causes a lack of oestrogen.

Poor diet – If your diet doesn't include enough calcium or vitamin D, or you're very underweight, you're at greater risk of osteoporosis (see section 'Diet and nutrition').

Heavy smoking – Tobacco is directly toxic to bones, and smoking reduces the cells' ability to make bone. It also lowers the oestrogen level in women and may cause early menopause. In men, smoking lowers testosterone activity and this can weaken the bones.

Heavy drinking – Drinking a lot of alcohol reduces your body's ability to make bone. It also increases your risk of breaking a bone as a result of a fall.

Family history – Osteoporosis does run in families. This is probably because there are inherited factors that affect bone development. If a close relative has suffered a fracture linked to osteoporosis your own risk of a fracture is likely to be greater than normal. It's not yet known if there's a particular genetic defect that causes osteoporosis, although we do know that people with a very rare genetic disorder called osteogenesis imperfecta are more likely to develop fractures.

Other factors that affect your risk include:

- race
- low body weight
- previous fractures
- medical conditions or treatments which affect absorption of food, for example if you've had a gastrectomy (removal of part of the stomach) to treat stomach cancer.

It's important that your diet includes enough calcium and vitamin D to prevent osteoporosis.

How is osteoporosis diagnosed?

There are no clear physical signs of osteoporosis, so it may not cause any problems straight away. If your doctor thinks you have osteoporosis, they may suggest you have a DEXA (dual-energy x-ray absorptiometry) scan to measure the density of your bones and assess your risk of fractures.

Your scan is available at many hospitals and involves lying on a couch, fully clothed, for about 15 minutes while your bones are x-rayed (see Figure 4). The dose of x-rays is very small – about the same as spending a day out in the sun. The possible results are:

Normal – Your risk of a low-impact fracture is low.

Osteopenia – Your bone is weaker but your risk of a low-impact fracture is still quite small. You may not need treatment but you should discuss this with your doctor and think about how you can reduce your risk factors (see section 'Self-help and daily living').

Osteoporosis – You have a greater risk of low-impact fractures and it's likely that you'll need treatment.

Who should have a scan?

There's no good evidence that screening the whole population for osteoporosis would be helpful. However, you should speak with your doctor about having a scan if:

- you've already had a low-impact fracture
- you need steroid treatments for three months or more
- you had your menopause before the age of 45
- either of your parents has had a hip fracture
- you have another disease which can affect the bones – for example, coeliac disease, inflammatory bowel disease (Crohn's disease or ulcerative colitis), rheumatoid arthritis, diabetes and hyperthyroidism (overactive thyroid)
- your body mass index (BMI) is less than 19.

Working out your body mass index:

1. Multiply your height in metres (m) by itself.
2. Divide your weight in kilograms (kg) by the number you got in stage 1. The result is your BMI. For example:
   1.7 (m) x 1.7 = 2.89
   53 (kg) ÷ 2.89 = 18.3
   Your BMI is 18.3.

For most people a healthy BMI is in the range 18.5–25.

Your doctor may use an online scoring tool called FRAX®, developed by the World Health Organisation (WHO), to assess your risk of fracture and to help decide whether you should have a DEXA scan or treatment for osteoporosis.

Your doctor can ask for a bone density (DEXA) scan to be carried out to test the strength of the bones.

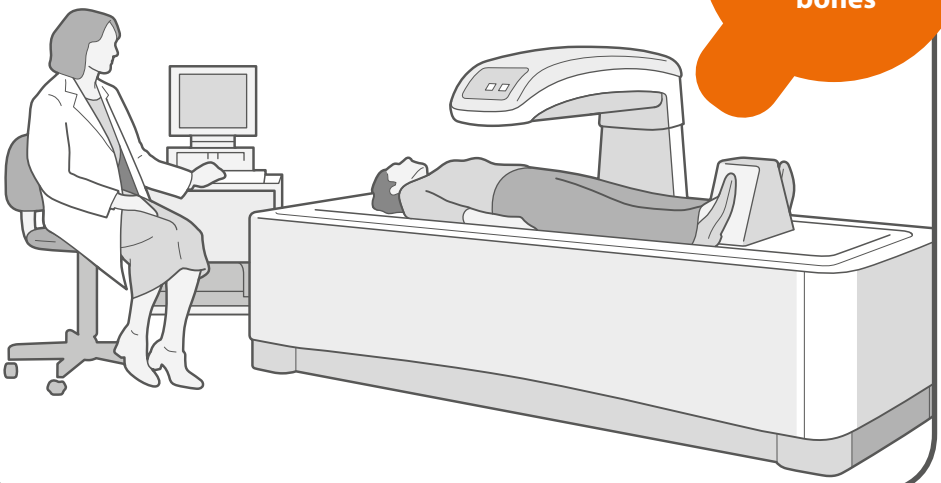


Figure 4 Testing the density of bones

What treatments are there for osteoporosis?

If you're diagnosed with osteoporosis following a low-impact fracture, the fracture will need to be treated first. The next step is to begin treatment to reduce the risk of further fractures.

Treatment of fractures

Most fractures are first treated in A+E, and you'll usually see an orthopaedic surgeon at a fracture clinic as an outpatient later on to see how things are going.

Unless you have a vertebral compression fracture, the fractured area will usually be put in a cast for several weeks so you can't move it to allow the fracture to heal. In some cases the fracture may need manipulation by a specialist before this is done. This may be carried out in A+E, but you may need to be admitted to hospital. You're also likely to be admitted if the fracture needs fixing with an operation.

It's important to make sure any pain is controlled. Treatments can include:

- painkillers (analgesics) such as paracetamol, codeine and occasionally morphine
- non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen or naproxen.

See Arthritis Research UK drug leaflets *Non-steroidal anti-inflammatory drugs (NSAIDs); Painkillers (analgesics).*

Prevention of fractures

Self-help measures such as diet and weight-bearing exercise can help to reduce the risk of fractures, but a number of specific treatments are also available.

Calcium and vitamin D

Many people don't have enough calcium in their diet and will benefit from calcium and vitamin D supplements. Vitamin D is needed for the body to absorb and process calcium.

Bisphosphonates

Bisphosphonates are a group of drugs that work by slowing bone loss; in many people, an increase in bone density can be measured over five years of treatment. They reduce the risk of hip and spine fractures.

Some bisphosphonates come in tablet form and are taken by mouth (for example alendronate, risedronate and ibandronate). The tablets can irritate your gullet (oesophagus), so you should take them on an empty stomach and wash them down with one to two glasses of tap water (other drinks can prevent the drug being properly absorbed by the body). You shouldn't eat anything or take any other medication or supplements for at least 30 minutes afterwards. You also shouldn't lie down afterwards as this might lead to the medication flowing back up into your gullet from your stomach, which can irritate the gullet and cause heartburn.

If you can't tolerate bisphosphonates by mouth, it's possible to have them by intravenous infusion (a drip into a vein). Pamidronate is given every three months and zoledronate is given once a year. Ibandronate can be given by mouth monthly or intravenously every three months.

Teriparatide and parathyroid hormone

Parathyroid hormone is naturally produced by your body and helps regulate calcium levels in your blood. Teriparatide is very similar to the naturally-occurring hormone. It helps new bone formation and so reduces the risk of fractures. It's taken by daily injection into the thigh or abdomen (your healthcare team will give you training on how to do this yourself) and is usually used for up to 18 months. At present it's used mainly for people with vertebral fractures or who've had fractures despite using other treatments or side-effects from other treatments. Side-effects of teriparatide include nausea, limb pain, headaches and dizziness.

A synthetic form of parathyroid hormone itself is also available. Like teriparatide, it's also ready to use in a 'pen' syringe to be self-administered subcutaneously once a day.

Hormone replacement therapy (HRT)

HRT is useful for the bones while it's being used, but it's not recommended as the first-choice treatment for women over 60 because it's linked with an increased risk of breast cancer, blood clots and heart attacks.

Raloxifene

Raloxifene is given as a tablet and mimics the useful effects of oestrogen on bone strength, reducing the risk of spinal fractures. It may cause side-effects like hot flushes and may increase the risk of developing blood clots, for example DVT, and isn't usually suitable for older women. It does, however, reduce the risk of breast cancer.

Denosumab

Denosumab works by blocking a protein called RANK ligand. This is important for the production, function and survival

of osteoclasts, the cells that break down bone. By stopping osteoclasts, it increases bone mass and strength.

Denosumab is recommended for postmenopausal women who can't take bisphosphonates and is given as an injection under the skin twice a year. It can help prevent a first fracture and further fractures in women who've already had them. Common side-effects of denosumab can include back, arm and leg pain, urinary tract infections and high cholesterol levels. In rare cases, side-effects can include low blood calcium, infections and skin reactions.

Strontium ranelate

Strontium ranelate works by both speeding up the formation of new bone tissue and slowing the breakdown of old bone material. Trials have shown that strontium ranelate reduces the risk of spine and hip fractures in people who've already had a fracture, as well as those with low bone density.

Strontium ranelate is only available to people who can't use other osteoporosis treatments, and isn't suitable for people who have a history of heart disease or circulatory problems such as stroke, heart attack, obstruction of the blood flow in the arteries or uncontrolled high blood pressure.

See Arthritis Research UK drug leaflet *Drugs for osteoporosis.*

Weight-bearing exercises such as walking or running are good for bone strength.

Self-help and daily living

There's a great deal you can do at different stages in your life to help protect yourself against osteoporosis.

Exercise

We should all take part in sports or other types of exercise throughout our lives to help strengthen our bones. Weight-bearing exercises (any activity that involves walking or running) are better for bone strength than non-weight-bearing exercises such as swimming and cycling, but all forms of exercise will help to improve co-ordination and keep up muscle strength. This is important because muscle loss as we get older (sarcopaenia) is increasingly recognised as a risk factor for fractures in older people due to the greater chances of falling. T'ai chi in particular can be effective in reducing the risk of falls.

See Arthritis Research UK booklets *Keep moving; Looking after your joints when you have arthritis; Physiotherapy and arthritis.*

Diet and nutrition

Calcium

We all need a diet that contains the right amount of calcium. The best sources of this are:

- dairy products such as milk, cheese and yogurt – low-fat ones are best
- calcium-enriched types of milk made from soya, rice or oats
- fish that are eaten with the bones (such as tinned sardines).

Other sources of calcium include leafy green vegetables (for example cabbage, kale, broccoli), watercress, beans and chickpeas, and some nuts, seeds and dried fruits. See Figure 5 for more information on the calcium content of some common foods.

People on osteoporosis drug treatment may find a daily calcium intake of 1,000–1,200 mg useful. A pint of milk a day, together with a reasonable amount of other foods that contain calcium, should be enough. Skimmed and semi-skimmed milk contain more calcium than full-fat milk. If you don't eat many dairy products or calcium-enriched substitutes, then you may need a calcium supplement. We recommend that you discuss this with your doctor or a dietitian. Recently there have been worries that taking calcium supplements might have a negative effect on heart health. There have been no similar concerns regarding calcium intake from food.

Vitamin D, the sunshine vitamin, is produced when the skin is exposed to sunlight.

Vitamin D

Vitamin D is needed for the body to absorb and process calcium and there's some evidence that arthritis progresses more quickly in people who don't have enough vitamin D. Vitamin D is sometimes called the sunshine vitamin because it's produced by the body when the skin is exposed to sunlight. A slight lack (deficiency) of vitamin D is quite common in winter.

Vitamin D can also be obtained from the diet (especially from oily fish) or from supplements such as fish liver oil. However, it's important not to take too much fish liver oil.

If you're over 60, dark-skinned or don't expose your skin to the sun very often and are worried about a lack of vitamin D, you should discuss with your doctor whether a vitamin D supplement would be right for you. It's sometimes necessary to take a daily supplement containing 10–20 micrograms (µg), or 400–800 international units (IU), of vitamin D, especially for people over 60.

See Arthritis Research UK booklet *Diet and arthritis.*

Figure 5 Approximate calcium content of some common foods

Food	Calcium content
115 g (4 oz) whitebait (fried in flour)	980 mg
60 g (2 oz) sardines (including bones)	260 mg
0.2 litre (⅓ pint) semi-skimmed milk	230 mg
0.2 litre (⅓ pint) whole milk	220 mg
3 large slices brown or white bread	215 mg
125 g (4½ oz) low-fat yogurt	205 mg
30 g (1 oz) hard cheese	190 mg
0.2 litre (⅓ pint) calcium-enriched soya milk	180 mg
125 g (4½ oz) calcium-enriched soya yogurt	150 mg
115 g (4 oz) cottage cheese	145 mg
3 large slices wholemeal bread	125 mg
115 g (4 oz) baked beans	60 mg
115 g (4 oz) boiled cabbage	40 mg

Note: measures shown in ounces or pints are approximate conversions only.

What else might help?

It's important to try to prevent falls. There are a few simple things you can do at home to help you avoid falls there. This includes mopping up spills and making sure walkways are free from clutter and trailing wires. The tips in our *Everyday living and arthritis* booklet might also be useful. Some hospitals also offer falls preventions clinics or support groups – ask your doctor if there's one in your local area.

Smoking can affect your hormones and may therefore increase your risk of osteoporosis. We strongly recommend you stop smoking or seek help to try to do so.

Drinking a lot of alcohol can also affect the production of new bone, so we recommend keeping within the maximum amounts suggested by the government: 2–3 units a day for women and 3–4 units for men.

See Arthritis Research UK booklet *Everyday living and arthritis.*

Research and new developments

Important research has led to the production of the FRAX® assessment tool, which is now being used by doctors to measure a patient's risk of having an osteoporotic fracture. And the SCOOP study is testing a method of community-based screening to find out whether early identification of risk, followed up with preventative treatment, leads to a reduction in the number of fractures in women aged 70–85.

A key focus is also being placed on the development of systems to identify people who have already fractured in order to try to prevent further fractures. 'Capture the Fracture' is a new scheme from the International Osteoporosis Foundation (IOF) which aims to reduce the number of secondary fractures by coordinating healthcare more effectively. You can find out more at www.iofbonehealth.org/capture-fracture

The National Osteoporosis Society (NOS) has launched the 'Stop at one' campaign, which aims to make the symptoms of osteoporosis more widely known and encourage people to seek early diagnosis and treatment. Visit stopatone.nos.org.uk for more information.

Research is also investigating new drugs which should further improve the treatment options available.

Glossary

Analgesics – painkillers. As well as dulling pain they lower raised body temperature, and most of them reduce inflammation.

Bisphosphonates – drugs used to prevent the loss of bone mass and treat bone disorders such as osteoporosis and Paget's disease. They work by slowing down bone metabolism.

Body mass index (BMI) – a measurement used to estimate a healthy body weight based on how tall a person is. BMI is calculated by using the following equation: BMI = w ÷ (h x h), where w = weight in kilograms and h = height in metres. A BMI of between 18.5 and 25 is considered to be an ideal weight.

Coeliac disease – a condition where an extreme sensitivity to gluten (found in wheat, rye and other cereals) damages the lining of the small intestine, preventing the digestion and absorption of food. Coeliac disease is a permanent condition that can be treated by a strict gluten-free diet.

Collagen – the main substance in the white, fibrous connective tissue that's found in tendons, ligaments and cartilage. This very important protein is also found in skin and bone.

Deep vein thrombosis – a blood clot that forms in the deep-lying veins (usually in the leg or pelvis).

Density – how compact a substance is. Bone density refers to the amount of mineral per square centimetre of bone. It's measured using a DEXA scan.

Diabetes – a medical condition that affects the body's ability to use glucose (sugar) for energy. The body needs insulin, normally produced in the pancreas, in order to use glucose. In diabetes the body may produce no insulin or not enough insulin or may become resistant to insulin. When the body is unable to use glucose obtained from foods, the level of sugar in the blood increases. If untreated, raised blood sugar can cause a wide variety of symptoms.

Hyperthyroidism – overactivity of the thyroid gland which means that too much thyroid hormone is produced. The excess of thyroid hormones overstimulates metabolism, which speeds up various body systems, causing symptoms such as an increased heart rate, nervousness, weight loss, sweating, fatigue and sensitivity to heat. It's also a cause of osteoporosis.

Inflammatory bowel disease (IBD) – a group of inflammatory conditions that affect the small and/or large intestine. The symptoms can include abdominal pain, bleeding, weight loss, fatigue and diarrhoea. The two main types of IBD are Crohn's disease and ulcerative colitis.

Menopause – the time when menstruation ends, usually when a woman is in her 50s. This means the ovaries stop releasing eggs every four weeks, and it's no longer possible to have children. If this happens before the age of 45, it's known as premature menopause.

Non-steroidal anti-inflammatory drugs (NSAIDs) – a large family of drugs, prescribed for different kinds of arthritis, that reduce inflammation and control pain, swelling and stiffness. Common examples include ibuprofen, naproxen and diclofenac.

Oestrogen – one of a group of hormones in the body that control female sexual development and the reproductive cycle.

Orthopaedics – a branch of surgery dealing with bone and joint problems, including treatments such as joint replacements and setting of broken bones.

Osteogenesis imperfecta – a genetic condition existing at birth (congenital) resulting in fragile bones that fracture easily. The whites of the eyes of affected individuals often appear blue.

Pulmonary embolism – the blockage of the pulmonary artery or one of its branches in the lungs, usually caused by detached fragments from a blood clot in a leg or pelvic vein.

Rheumatoid arthritis – an inflammatory disease affecting the joints, particularly the lining of the joint. It most commonly starts in the smaller joints in a symmetrical pattern – that is, for example, in both hands or both wrists at once.

Testosterone – one of a group of hormones in the body that control male sexual and reproductive development.

Where can I find out more?

If you've found this information useful you might be interested in these other titles from our range:

Self-help and daily living

- *Diet and arthritis*
- *Everyday living and arthritis*
- *Keep moving*
- *Looking after your joints when you have arthritis*

Therapies

- *Physiotherapy and arthritis*

Drug leaflets

- *Drugs for osteoporosis*
- *Non-steroidal anti-inflammatory drugs (NSAIDs)*
- *Painkillers (analgesics)*
- *Steroid tablets*

You can download all of our booklets and leaflets from our website or order them by contacting:

Arthritis Research UK
Copeman House
St Mary's Court
St Mary's Gate, Chesterfield
Derbyshire S41 7TD
Phone: 0300 790 0400
www.arthritisresearchuk.org

Related organisations

The following organisations may be able to provide additional advice and information:

Arthritis Care
Floor 4, Linen Court
10 East Road
London N1 6AD
Phone: 020 7380 6500
Helpline: 0808 800 4050
Email: info@arthritiscare.org.uk
www.arthritiscare.org.uk

Food Standards Agency
Aviation House
125 Kingsway
London WC2B 6NH
Helpline: 020 7276 8829
Email: helpline@foodstandards.gsi.gov.uk
www.food.gov.uk

National Osteoporosis Society
Camerton
Bath BA2 0PJ
Phone: 01761 471771
Helpline: 0845 450 0230
Helpline email: nurses@nos.org.uk
www.nos.org.uk
stopatone.nos.org.uk

NHS Choices
The NHS Choices website has useful information on falls and falls prevention
www.nhs.uk/Conditions/Falls/Pages/Introduction

Links to sites and resources provided by third parties are provided for your general information only. We have no control over the contents of those sites or resources and we give no warranty about their accuracy or suitability. You should always consult with you GP or other medical professional.

Please note: We've made every effort to make sure that this content is correct at time of publication. If you would like further information, or if you have any concerns about your treatment, you should discuss this with your doctor, rheumatology nurse or pharmacist.

Notes

We're here to help

Arthritis Research UK is the charity leading the fight against arthritis.

We're the UK's fourth largest medical research charity and fund scientific and medical research into all types of arthritis and musculoskeletal conditions.

We're working to take the pain away for sufferers with all forms of arthritis and helping people to remain active. We'll do this by funding high-quality research, providing information and campaigning.

Everything we do is underpinned by research.

We publish over 60 information booklets which help people affected by arthritis to understand more about the condition, its treatment, therapies and how to help themselves.

We also produce a range of separate leaflets on many of the drugs used for arthritis and related conditions. We recommend that you read the relevant leaflet for more detailed information about your medication.

Please also let us know if you'd like to receive our quarterly magazine, *Arthritis Today*, which keeps you up to date with current research and education news, highlighting key projects that we're funding and giving insight into the latest treatment and self-help available.

We often feature case studies and have regular columns for questions and answers, as well as readers' hints and tips for managing arthritis.

Tell us what you think

Please send your views to:
feedback@arthritisresearchuk.org
or write to us at:
Arthritis Research UK, Copeman House, St Mary's Court, St Mary's Gate, Chesterfield, Derbyshire S41 7TD

A team of people contributed to this booklet. The original text was written by director of the epidemiology resource centre Prof. Cyrus Cooper, who has expertise in the subject. It was reviewed at draft stage by rheumatology nurse specialist Alison Bayliss, clinical research fellow Dr Mark Edwards, senior lecturer and honorary consultant rheumatologist Dr Nick Harvey and musculoskeletal specialist Dr Theo Peters. An **Arthritis Research UK** editor revised the text to make it easy to read, and a non-medical panel, including interested societies, checked it for understanding. An **Arthritis Research UK** medical advisor, Dr Luke Gompels, is responsible for the content overall.

Arthritis Research UK

Get involved

You can help to take the pain away from millions of people in the UK by:

- volunteering
- supporting our campaigns
- taking part in a fundraising event
- making a donation
- asking your company to support us
- buying products from our online and high-street shops.

To get more **actively involved,** please call us on **0300 790 0400**, email us at **enquiries@arthritisresearchuk.org** or go to **www.arthritisresearchuk.org**

Arthritis Research UK

Arthritis Research UK
Copeman House
St Mary's Court
St Mary's Gate, Chesterfield
Derbyshire S41 7TD

Tel **0300 790 0400**
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Registered Charity England and Wales No. 207711, Scotland No. SC041156

Published March 2014 2028/OP/14-1