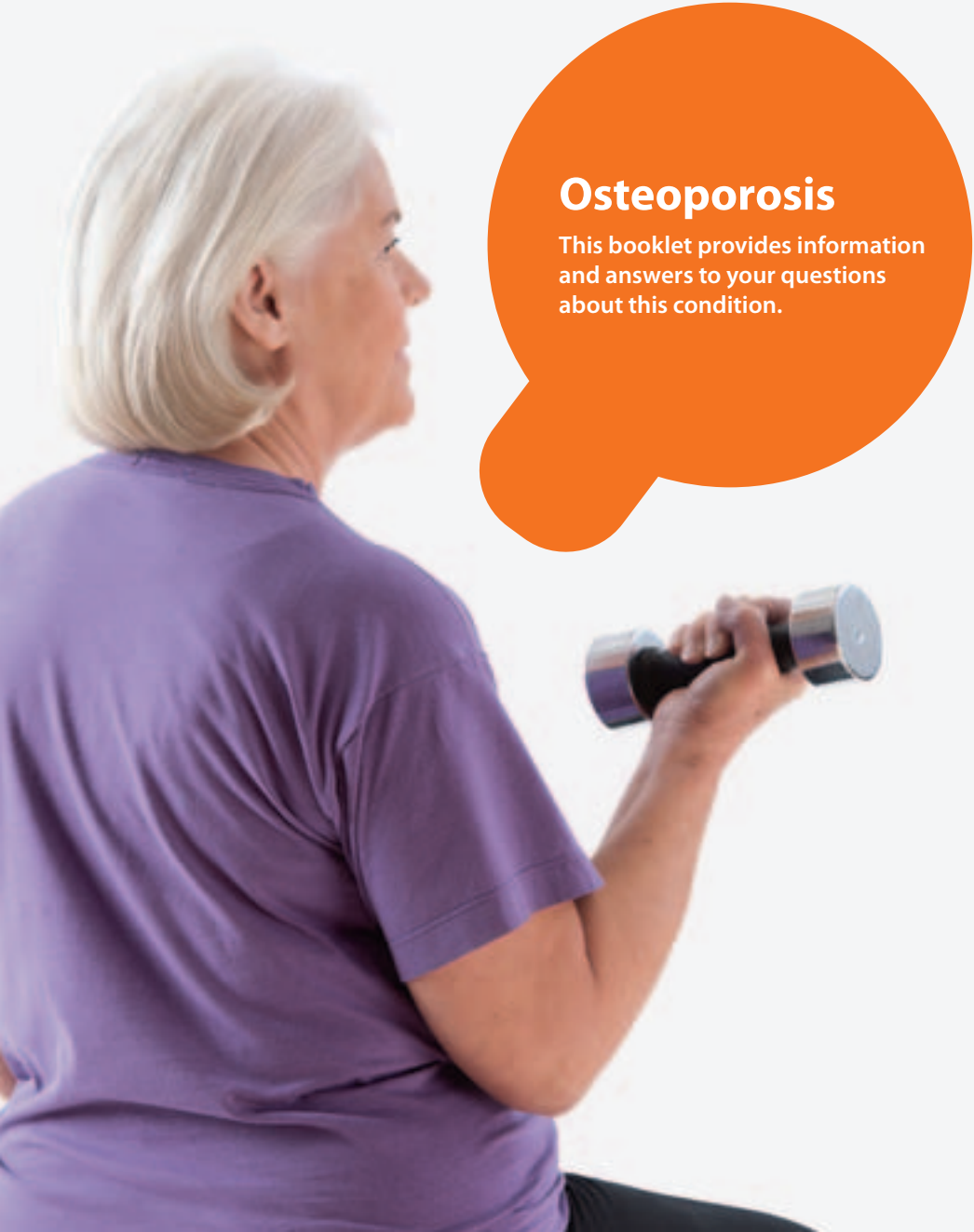
Arthritis Research UK

Condition
Osteoporosis



Osteoporosis

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

What is osteoporosis?

Osteoporosis is a condition that causes the bones to become fragile, so that 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 in the booklet.

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 – so our bones start to weaken. This happens to everybody to some extent, but when the bones become quite fragile it's called osteoporosis.

Who gets it?

Osteoporosis is quite common in the UK. It mainly affects women, particularly after the menopause, but can also affect men. People at greater risk of developing osteoporosis include:

- people who have needed steroid treatment for more than 3 months
- women who have been through the menopause, especially those who had an early menopause (before the age of 45)
- women who have had their ovaries removed
- people with a family history of osteoporosis
- people who don't get much exercise
- heavy smokers or heavy drinkers.

How can I help myself?

The following will help to guard against osteoporosis:

- getting plenty of calcium and vitamin D as part of a well-balanced diet
- exercise – especially activities that involve running or jogging
- not smoking
- not drinking too much alcohol.

What treatments are there?

There are a number of treatments available, including:

- calcium and vitamin D
- bisphosphonates (e.g. alendronate, risedronate)
- strontium ranelate
- teriparatide
- hormone replacement therapy (HRT)
- raloxifene
- calcitonin.

Introduction to osteoporosis

Osteoporosis is quite common in the UK. It mainly affects women, especially after the menopause, although men can also develop it. People who need long-term treatment with steroids for another condition are also at risk of osteoporosis.

As we get older our bones start to lose some of their density and strength. There are usually no visible signs that this is happening. However, the right combination of diet and exercise will help to build and maintain bone strength, and minimise your risk of developing osteoporosis later in life. And for those who do develop osteoporosis, there are a number of different treatments that can help to reduce the risk of fractures.

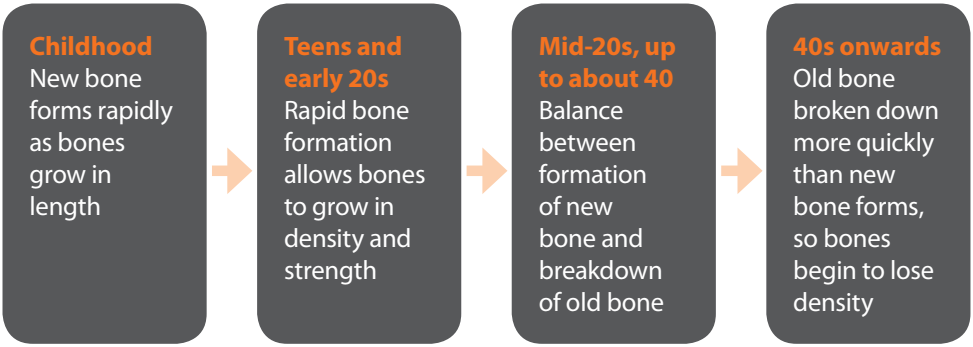
What is osteoporosis?

The word osteoporosis means porous (spongy) 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 softer, spongy bone (or 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).

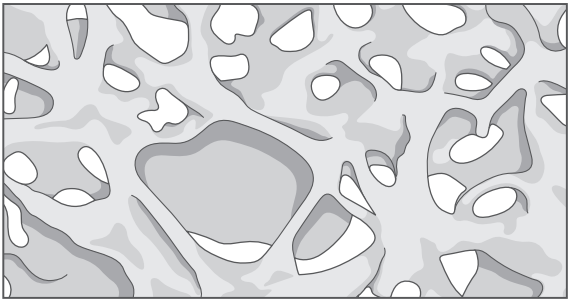
Figure 1 Stages of bone development and renewal



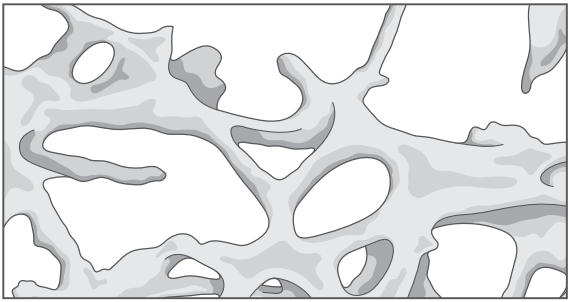
1. In childhood, new bone is formed very rapidly. This allows our bones to grow in length. Later, in our teens and early 20s, the bones stop growing in length but continue to grow in density and strength. Bone density reaches its peak by our mid to late-20s.
2. After this, new bone continues to be produced 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 gradually 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 significantly more fragile. When bone is affected by osteoporosis the holes in the honeycomb structure of the spongy bone become larger – which is why the bone is more prone to fracture (see Figure 2).

Figure 2
The effect of osteoporosis on bone



Normal bone



Bone affected by osteoporosis

What are the symptoms of osteoporosis?

Quite often the first sign of osteoporosis is when somebody breaks a bone in a relatively minor fall or accident. Fractures are most likely to happen to 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 the spine (vertebrae) become weak and lose height (described as a vertebral crush fracture). This typically occurs at the level of the chest (or thoracic spine). If several vertebrae lose height, the spine will start to curve and you may look shorter. This can sometimes cause back pain and some people may have difficulty breathing simply because there's less space under their ribs.

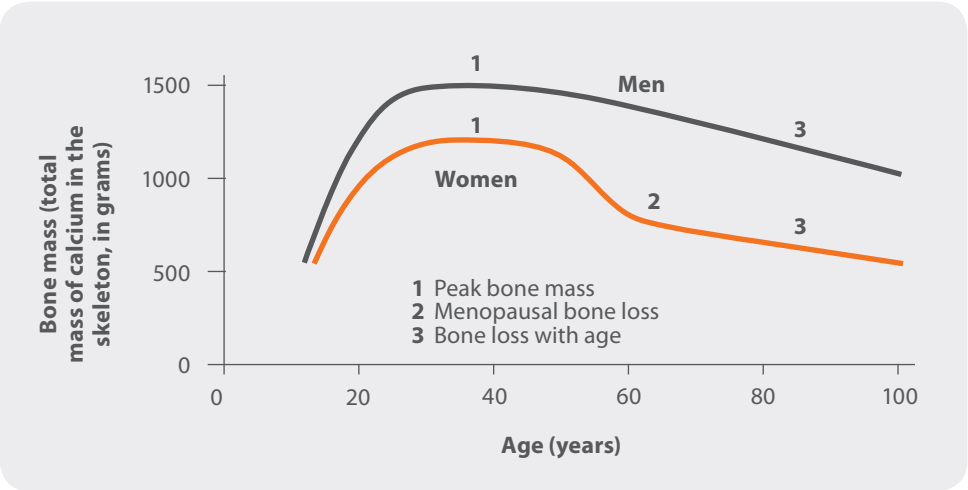
People who have spinal problems also have a greater risk of hip and wrist fractures.

Who gets osteoporosis?

The risk of osteoporosis 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:

- The process of bone loss speeds up for several years after the menopause, when the ovaries stop producing the female sex hormone oestrogen.

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



- 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 may never reach a point where the bone is significantly weakened.

A number of other risk factors can affect our individual chances of developing osteoporosis and of breaking a bone in a relatively minor accident.

Risk factors

Corticosteroids – Sometimes known just as steroids, these drugs can affect the production of bone 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 3 months, your doctor will probably recommend increasing your calcium and vitamin D intake and possibly other preventive treatment to guard against osteoporosis.

See Arthritis Research UK drug leaflet *Steroid tablets.*

Oestrogen deficiency – Women who have had an early menopause (before the age of 45) or a hysterectomy where one or both ovaries have been removed are at greater risk. Removal of the ovaries only (ovariectomy or oophorectomy) is relatively rare but is also associated with an increased risk of osteoporosis.

Lack of exercise – Moderate exercise during childhood and throughout adult life encourages bone development.

Women who exercise so intensively that their periods stop do have a higher risk of developing osteoporosis.

However, anyone who doesn't exercise, or has an illness or disability that makes exercise difficult, will be more prone to losing calcium from the bones and thus more likely to be diagnosed with osteoporosis.

Poor diet – People whose diet doesn't include enough calcium or vitamin D or who are significantly underweight are at greater risk of osteoporosis. (See the section 'Diet and nutrition'.)

Heavy smoking – Tobacco lowers the oestrogen level in women and may cause early menopause. In men, smoking lowers testosterone activity and this can also weaken the bones.

Heavy drinking – A high alcohol intake reduces the ability of the body's cells to make bone. It also increases the 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 the development of bone. If a close relative has suffered a fracture linked to osteoporosis then 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 osteoporosis.

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

How is osteoporosis diagnosed?

There are no obvious physical signs of osteoporosis so the condition may go undetected for years. If your doctor suspects osteoporosis, they may suggest a DEXA scan (dual energy x-ray absorptiometry) to measure the density of the bones and assess the risk of fractures.

The 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 – The risk of a low-impact fracture is low.

Osteopenia – The bone is becoming weaker but the risk of a low-impact fracture is still quite small. You may not require specific treatment but you should think about how you can reduce the risk factors.

Osteoporosis – There's a greater risk of low-impact fractures and treatment is likely to be needed.

Who should have a scan?

There's no good evidence that screening the population as a whole for osteoporosis would be helpful. However, you should discuss with your doctor whether you should have a scan if any of the following apply to you:

- you need corticosteroid treatments (e.g. prednisolone) for 3 months or more
- you've already had a low-impact fracture
- your menopause occurred 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)
- you have a body mass index (BMI) of less than 19.

Calculating your body mass index:

1. Multiply your height in metres by itself. e.g. 1.7 (m) x 1.7 = 2.89
2. Divide your weight in kilograms (kg) by the number you got in stage 1. e.g. 53 (kg) ÷ 2.89 = 18.3
3. The result is your BMI. e.g. 18

For most people a healthy BMI is in the range 20–25.

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

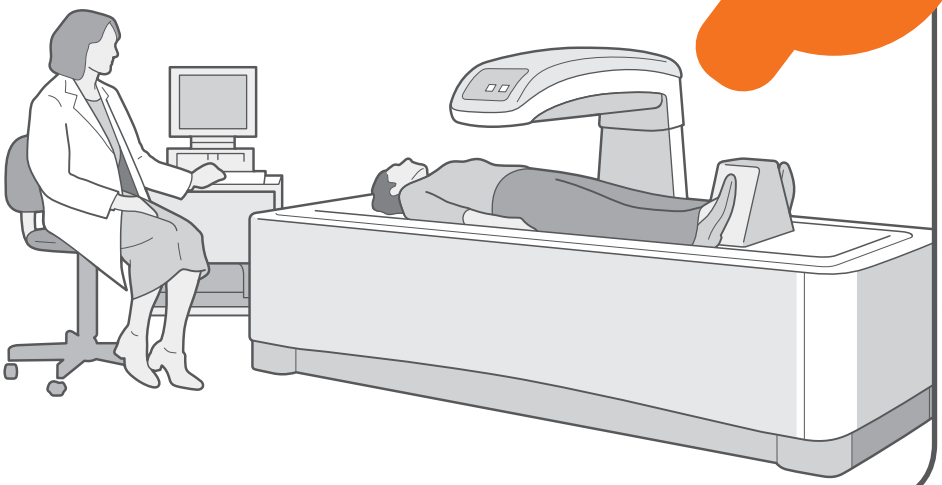


Figure 4 Testing the density of bones

What treatments are there for osteoporosis?

If osteoporosis is diagnosed following a low-impact fracture, the first priority will be to treat the fracture. The next step is to begin treatment to reduce the risk of further fractures.

Treatment of fractures

Unless you have a vertebral fracture (a fracture of the backbone), you'll usually need an orthopaedic assessment because it may need fixing. Pain relief may also be needed, especially if the fracture involves one of the backbones. This can include:

- analgesics (painkillers) – such as paracetamol, codeine and occasionally morphine
- non-steroidal anti-inflammatory drugs (NSAIDs) – such as ibuprofen, or naproxen
- calcitonin, which has been shown to reduce pain from fractures of the pelvis and vertebrae.

Prevention of fractures

Self-help measures such as diet and exercise can help to reduce the risk of fractures, but a number of specific treatments are also available for people with osteoporosis. The choice of treatment will depend on your individual circumstances and you should discuss this with your doctor.

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

This group of drugs works by slowing bone loss; in many people, an increase in bone density can be measured over 5 years of treatment. There are a number of drugs in this group, including alendronate, risedronate, ibandronate and etidronate. They reduce the risk of hip and spine fractures in patients with osteoporosis. These drugs can be taken by mouth but not with food. Specific instructions are provided for taking the tablets as they can cause irritation of the gullet (oesophagus). More recently, intravenous injections and infusions of bisphosphonates have been developed (ibandronate and zolendronate), which are useful if you can't take the tablets. Ibandronate can be given by a 3-monthly injection and zoledronate by annual infusion.

Strontium ranelate

This 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 patients who have already had a fracture, as well as those with low bone density. Strontium ranelate is particularly helpful in reducing fracture risk in people over the age of 80 and is also useful for people who can't take bisphosphonates. There's a slightly increased risk of developing blood clots with this medicine.

Teriparatide

Teriparatide helps new bone formation and therefore reduces the risk of fractures. It's taken by daily injection into the thigh or stomach (patients are shown how to do this themselves) and is used for up to 24 months, during which time the bones are strengthened. At present it's used mainly for people who have had fractures despite using other treatments or who have had side-effects from other treatments. Side-effects of teriparatide include nausea, limb pain, headaches and dizziness.

Hormone replacement therapy (HRT)

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

Raloxifene

Raloxifene is given as a tablet and mimics the beneficial effects of oestrogen on bone strength, reducing the risk of spinal fractures. It may cause side-effects like menopausal flushing and may increase the risk of developing blood clots, for example deep vein thrombosis (DVT). It does, however, reduce the risk of breast cancer.

Calcitonin

Calcitonin is a substance that the body produces naturally and which helps keep the bones healthy. If you have osteoporosis, it can be used as a treatment and has been shown to increase bone strength. It's given as an injection or as a nasal spray. Injections of calcitonin are normally only given as a short-term treatment for painful

vertebral fractures, but the nasal spray may be used as a long-term treatment for osteoporosis. Possible side-effects include hot flushes, nausea, an unpleasant taste in the mouth, tingling in the hands and, rarely, an allergic reaction. The nasal spray may also cause a blocked or runny nose, sneezing and headaches.

Denosumab

A drug called denosumab (brand name Prolia) has recently been approved by NICE (the National Institute for Health and Clinical Excellence). Unlike bisphosphonates, it works by restricting 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 have already had them. Common side-effects can include pain in the back, arms and legs, urinary tract infections and high cholesterol levels. In rare cases, side-effects can include low blood calcium, infections and skin reactions.

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

Children should take part in sports or other types of exercise to help strengthen their bones. For the same reason, adults should keep physically active all the way into retirement.

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. However, all forms of exercise will help to maintain muscle strength and to improve co-ordination, reducing the risk of falling and thus the risk of fractures.

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

Diet and nutrition

Children and adults need a diet that contains the right amount of calcium. The best sources of this are milk, cheese, yogurt and certain types of fish which are eaten with the bones (see Figure 5). Other sources of calcium include leafy green vegetables (e.g. cabbage, kale, broccoli), watercress, beans and chick peas, and some nuts, seeds and dried fruits. Calcium is often added to white bread and to some soya milks.

People on osteoporosis drug treatment may benefit from a daily calcium intake of 1,000–1,200 mg. A pint of milk a day, together with a reasonable amount of other foods that contain calcium, should be sufficient.

Vitamin D is sometimes called the 'sunshine vitamin' because it's produced by the body when the skin is exposed to sunlight. It's also obtained from some foods, especially oily fish, and is added to some soya milks and vegetable margarines. It's sometimes necessary to take a daily supplement containing 10–20 micrograms (µg) (this is the same as 400 to 800 international units (IU)) of vitamin D, especially for people over 60.

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.

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

What else might help?

Smoking can affect the hormones in men and women and may therefore increase the risk of osteoporosis. We strongly recommend you stop smoking – especially if you're at risk for other reasons.

Drinking a lot of alcohol can also affect the production of new bone, so we recommend keeping to 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 *Diet and arthritis.*

Research and new developments

Research has recently produced the FRAX assessment tool, developed by the World Health Organisation, 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. 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 reducing high levels of calcium in the blood and 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 20 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.

Corticosteroids – drugs that have a very powerful effect on inflammation. They're often called steroids for short and are similar to cortisone, which is produced naturally in the adrenal glands. They're quite different from the anabolic steroids sometimes used by athletes to build up their bodies. Prednisolone is the most commonly used corticosteroid.

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.

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.

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.

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.

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*
- *Keep moving*
- *Looking after your joints when you have arthritis*

Drug leaflets

- *Drugs for osteoporosis*
- *Steroid tablets*

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

Arthritis Research UK
PO Box 177
Chesterfield
Derbyshire S41 7TQ
Phone: 0300 790 0400
www.arthritisresearchuk.org

Related organisations

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

Arthritis Care
18 Stephenson Way
London NW1 2HD
Phone: 020 7380 6500
Helpline: 0808 800 4050
www.arthritiscare.org.uk

Food Standards Agency
Aviation House
125 Kingsway
London WC2B 6NH
Phone: 020 7276 8000
Emergencies only: 020 7270 8960
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

Notes

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 of our booklet

Please send your views to:
feedback@arthritisresearchuk.org
or write to us at:
Arthritis Research UK, PO Box 177, Chesterfield, Derbyshire S41 7TQ.

A team of people contributed to this booklet. The original text was written by director of the epidemiology resource centre Prof. Cyrus Cooper with expertise in the subject. 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 Ben Thompson, 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 gifts from our catalogue

To get more **actively involved,** please call us **0300 790 0400** or e-mail us at enquiries@arthritisresearchuk.org

Or go to:
www.arthritisresearchuk.org

Providing answers today and tomorrow

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