TEST

PET scan

A PET scan uses a small amount of radioactive tracer to show activity inside the body.

WHAT IT MEASURES
Radioactive tracer uptake showing activity within tissues

SAMPLE
None; imaging after a radiotracer injection

FASTING NEEDED?
Sometimes, usually before an FDG PET scan

HOW LONG IT TAKES
Usually two to three hours

RESULTS IN
Usually days; varies by imaging centre and laboratory

USED FOR
Diagnosis, staging, treatment planning, and monitoring

MAIN LIMITATION
Infection and inflammation can resemble cancer

Overview

A positron emission tomography, or PET, scan creates pictures of activity inside your body. Before the scan, you receive a small amount of a radioactive substance called a radiotracer . A scanner detects where that tracer collects.

The most common tracer is fluorodeoxyglucose, or FDG . It behaves similarly to glucose, a type of sugar. Tissues that use more glucose may take up more FDG and appear brighter on the images.

PET is often combined with computed tomography, called PET/CT . The PET images show tissue activity, while CT shows the location and structure of organs. Some centres combine PET with magnetic resonance imaging, or MRI.

PET can help assess cancer, heart disease, brain disorders, infection, and inflammation. Different conditions may require different tracers and preparation.

Why the test is ordered

Your healthcare team may order a PET scan to:

A PET scan is not normally used by itself to confirm a diagnosis. Its findings are considered alongside your symptoms, examination, laboratory results, and other imaging.

- investigate an abnormality found on another scan
- help determine whether cancer has spread
- guide radiotherapy, surgery, or another treatment
- check how cancer is responding to treatment
- look for cancer that may have returned
- assess blood flow or living muscle in the heart
- examine patterns of brain activity
- investigate selected cases of infection or inflammation

Who should have the test

A PET scan may be appropriate when the result could clarify a diagnosis or affect treatment decisions. It is not a routine whole-body screening test for people without a specific medical reason.

Tell the imaging team before your appointment if you:

Pregnancy does not automatically mean the scan cannot be done. The team will weigh the expected benefit against radiation exposure and may consider another test.

- are pregnant or could be pregnant
- are breastfeeding
- have diabetes or difficulty controlling your blood glucose
- take insulin or other diabetes medicines
- recently had surgery, radiotherapy, chemotherapy, or an infection
- cannot lie flat or stay still
- have severe anxiety in enclosed spaces
- have an allergy to CT contrast dye
- have kidney problems, if contrast may be used

How to prepare

Follow the instructions from your imaging centre. Preparation differs according to the tracer, the body area being examined, and whether CT contrast is planned.

For a typical FDG PET scan, you may be asked to avoid food for several hours beforehand. Plain water is usually allowed and encouraged. Avoid sweets, chewing gum, and drinks containing sugar during the fasting period unless the centre tells you otherwise.

You may also be asked to avoid strenuous exercise for about a day. Exercise can increase tracer uptake in muscles and make the scan harder to interpret.

Keep taking prescribed medicines unless your imaging team gives different instructions. Diabetes medicines and insulin often need special timing so that blood glucose is safe while still allowing useful images. Do not change these medicines on your own.

Wear comfortable clothing without metal where possible. Leave jewellery at home. Tell the centre in advance if lying still may be difficult.

What happens during the test

When you arrive, staff will review your preparation and medical history. For an FDG scan, they usually check your blood glucose with a finger-prick test.

A small intravenous line is placed into a vein, usually in your arm or hand. The radiotracer is injected through it. The injection itself does not normally make you feel different.

You then rest quietly while the tracer moves around your body. This commonly takes about an hour. Talking, walking, reading, or using your phone may be limited because muscle and brain activity can affect some images.

For the scan, you lie on a narrow bed that moves slowly through a large, open-ended scanner. You must remain still. Imaging commonly takes 20 to 40 minutes, although the exact time depends on the test.

If your scan includes diagnostic CT, you may receive contrast dye through the intravenous line. This can briefly cause warmth, a metallic taste, or the feeling that you are passing urine.

Most people can go home soon afterwards.

Understanding your results

A specialist in nuclear medicine or radiology reviews the images. The report describes where the tracer collected and whether the pattern is expected.

Areas of increased uptake are sometimes called hot spots . Reduced uptake may be called a cold spot . Neither finding has one meaning. Cancer can cause increased uptake, but so can infection, inflammation, healing tissue, and normal activity in organs such as the brain, heart, kidneys, and bladder.

Reports may include a standardized uptake value, or SUV , which estimates how much tracer a tissue absorbed. There is no single SUV cutoff that reliably separates cancer from non-cancerous tissue. Scanner settings, timing, body size, blood glucose, and the type of tissue all affect the number.

Reference values and interpretation vary by imaging centre or laboratory, age, sex, pregnancy status, medicines, and clinical context. Comparison with earlier scans is often more useful than one measurement alone.

What affects the results

Several factors can change tracer uptake even when the scanner and tracer are working correctly.

Recent strenuous exercise can make muscles appear unusually active. Shivering, talking, chewing, or tension during the uptake period can also increase muscle uptake.

High blood glucose and recently injected insulin can alter FDG distribution. This may reduce the scan's ability to show some abnormalities. The imaging team may delay or reschedule the scan if glucose is outside the range required by its protocol.

Recent surgery, biopsy, radiotherapy, vaccination, infection, or inflammation can produce uptake that resembles disease. Healing tissue may remain active for some time.

Some medicines stimulate bone marrow or change metabolism. Chemotherapy, corticosteroids like prednisone or hydrocortisone , and medicines that affect blood cell production may alter appearances. Do not stop treatment unless instructed.

Movement can blur the pictures or cause the PET and CT images to line up poorly. Small amounts of brown fat, which produces heat, may also take up FDG, especially when you are cold or anxious.

Pregnancy and breastfeeding affect planning because the fetus or infant could be exposed to radiation. Kidney function has less effect on FDG PET than on some blood tests, but it matters if CT contrast is used and can affect how some tracers leave the body.

Accuracy and limitations

PET can find abnormal tissue activity before a structural change becomes obvious on CT or MRI. However, it does not detect every cancer or other disorder.

Very small abnormalities may be below the scanner's resolution. Some slow-growing cancers use little FDG and may be missed. High blood glucose, movement, nearby normal organ activity, or testing too soon after treatment can also hide a finding.

PET can also suggest disease when none is present. Infection, arthritis, healing wounds, recent procedures, and other inflammation may look similar to cancer. A positive area therefore does not automatically mean cancer.

The best test depends on the question. CT or MRI may show anatomy more clearly. Ultrasound may be better for certain superficial organs. A biopsy, which removes tissue for examination, may still be needed to determine exactly what an abnormal area represents.

Risks and complications

PET involves ionising radiation from the tracer and usually from the CT scan. The amount depends on the tracer and scanning protocol. The radioactive material loses activity and leaves the body, mainly in urine.

The intravenous line may cause brief pain, a small bruise, or light-headedness. Occasionally, tracer or contrast leaks into tissue around the vein, causing local pain or swelling.

Allergic reactions to PET tracers are uncommon. CT contrast has separate risks, including allergic reactions and kidney injury in susceptible people.

Seek emergency help for difficulty breathing, swelling of the face or throat, collapse, or a rapidly worsening reaction after contrast. Mild bruising at the injection site can usually be watched, but contact the imaging centre if pain or swelling is increasing.

What happens next

You can usually return to normal activities after the scan. Drinking fluids and passing urine regularly may help clear the tracer. Follow any specific instructions about close contact with pregnant people or young children.

A nuclear medicine specialist or radiologist sends a report to the healthcare professional who requested the test. Routine follow-up may involve discussing the report at a scheduled appointment, comparing it with previous scans, or arranging another test.

An uncertain result does not necessarily mean something serious was found. It may mean that imaging at a later date, a different type of scan, laboratory testing, or a biopsy is needed.

Common questions

Can I drink coffee before a PET scan?

Usually not during the fasting period. Coffee can contain sugar, milk, or caffeine, and caffeine is particularly important for some heart PET scans. Plain water is generally allowed, but follow your centre's instructions.

Does the time of day matter?

The clock time is less important than following the required fasting, medicine, and tracer schedule. People with diabetes may receive a carefully timed appointment.

Can I exercise beforehand?

Avoid strenuous activity if instructed, commonly from the day before an FDG scan. Exercise increases glucose use in muscles and can change the images.

Can I drive home afterwards?

Most people can drive after a routine PET scan. Arrange help if you receive a sedative or if your medical condition makes driving unsafe.

Can I be around children after the scan?

The tracer gives off radiation for a limited time. You may be told to limit prolonged close contact with young children or pregnant people for several hours. Follow the instructions for your specific tracer.

Will I feel claustrophobic?

The scanner is open at both ends and is shorter than many MRI scanners. Tell the centre beforehand if enclosed spaces cause significant anxiety.

Sources

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