TEST

Joint fluid gram stain

A joint fluid Gram stain looks for bacteria in fluid removed from a joint.

WHAT IT MEASURES
Bacteria visible after staining joint fluid

SAMPLE
Joint fluid removed with a needle

FASTING NEEDED?
No

HOW LONG IT TAKES
Usually 10 to 30 minutes

RESULTS IN
Often same day; timing varies by laboratory

USED FOR
Diagnosing a possible joint infection

MAIN LIMITATION
A negative stain does not rule out infection

Overview

A joint fluid Gram stain is a laboratory test used when a joint infection is possible. It examines synovial fluid, the slippery liquid that cushions the inside of a joint.

The sample is collected through joint aspiration, also called arthrocentesis. A clinician passes a needle into the joint and removes a small amount of fluid.

In the laboratory, the fluid is spread onto a glass slide and treated with special dyes. Bacteria may appear purple or pink and may have shapes such as round cells or rods. These features can give an early clue about the type of bacteria present.

A Gram stain is faster than a culture, which attempts to grow bacteria from the sample. However, it is less able to rule out infection. A joint can be infected even when no bacteria are seen on the stain.

Why the test is ordered

The test is mainly ordered to investigate septic arthritis, meaning an infection inside a joint.

This can cause pain, swelling, warmth and reduced movement. Fever may occur, but some people with a joint infection do not have one.

A Gram stain may be ordered with other joint fluid tests, including:

The result can provide early information while the culture is still being processed. If bacteria are seen, their staining pattern and shape may help guide initial treatment. The stain cannot identify every organism or show which antibiotics will work.

- Bacterial culture and antibiotic like amoxicillin or doxycycline susceptibility testing
- White blood cell count
- Crystal analysis for gout or calcium pyrophosphate crystals
- Tests of the fluid's appearance and chemistry

Who should have the test

You may need joint aspiration and a Gram stain if you have a newly painful, swollen or unusually warm joint and infection is one possible cause. It may also be considered after joint surgery, a joint injection or an injury that could have introduced bacteria.

Testing can be especially important if you have an artificial joint, take medicines that suppress the immune system, or recently had an infection elsewhere. These details affect how your results are interpreted, but they do not prove that the joint is infected.

A Gram stain is not a routine screening test. It is ordered when symptoms, an examination or other test results raise concern about a specific joint.

A hot, swollen joint with severe pain needs prompt medical assessment, particularly if you also have fever, chills or feel very unwell. This usually warrants same-day urgent care rather than waiting for a routine appointment.

How to prepare

You do not need to fast. Unless your care team gives different instructions, you can eat, drink coffee and take your usual medicines.

Tell the clinician performing the aspiration if you:

Do not stop a blood thinner like warfarin or apixaban on your own. The clinician will weigh the bleeding risk against the need to test the joint promptly.

Wear clothing that allows easy access to the affected joint. You may want help getting home if

the joint is painful or difficult to use.

- Take anticoagulants or antiplatelet medicines that affect bleeding
- Have a bleeding disorder
- Have allergies to local anaesthetics, adhesives or antiseptics
- Have an artificial joint
- Have taken antibiotics recently
- Have broken or infected skin near the joint

What happens during the test

You will usually sit or lie in a position that keeps the joint steady. The skin is cleaned carefully. A local anaesthetic may be injected to numb the area.

A needle is then guided into the joint space. Ultrasound may be used for a deep or difficult-to-access joint. Fluid is drawn into a syringe and divided among suitable laboratory containers.

You may feel pressure, brief sharp discomfort or an ache as the needle enters. The appointment commonly takes 10 to 30 minutes, although the aspiration itself is often shorter.

A dressing is placed over the needle site. You may be advised to limit strenuous use of the joint for a short time. Follow the instructions given for the particular joint and procedure.

Understanding your results

The report may say that bacteria were seen or that no organisms were seen. If bacteria are visible, the report may describe them as Gram-positive or Gram-negative and note their shape and arrangement.

For example, round bacteria may be called cocci, while rod-shaped bacteria may be called bacilli. These are preliminary descriptions, not a final identification.

A positive result supports bacterial infection, especially when it matches your symptoms and other findings. Rarely, contamination or material mistaken for bacteria can produce a misleading positive result. Culture is usually needed to identify the organism and test which antibiotics are likely to work.

A negative result means no bacteria were seen on that slide. It does not mean infection has been excluded. There may be too few bacteria in the sample, or antibiotics may have reduced

the number present.

Results must be interpreted with the fluid culture, cell count, crystal analysis, blood tests, examination and imaging when needed. Interpretation also varies by laboratory, age, sex, pregnancy status, medicines and clinical context. There is no single Gram stain "reference range" that applies to everyone.

What affects the results

Several factors can make bacteria difficult to see even when the laboratory has processed the sample correctly.

Antibiotics taken before aspiration are especially important. They can reduce the number of bacteria in the fluid and may also make the culture negative. Tell your care team about recent antibiotic tablets, injections or hospital treatment.

Other factors include:

Blood entering the sample during aspiration can make the slide harder to read. Crystals do not usually prevent staining, but gout or calcium pyrophosphate disease can occur at the same time as an infection.

Food, coffee, exercise and time of day do not meaningfully change a joint fluid Gram stain. A recent blood transfusion does not affect it.

- A small number of bacteria in the joint
- A small or unevenly mixed fluid sample
- Infection with organisms that do not stain reliably
- Delay in transporting or processing the fluid
- Infection involving an artificial joint, where bacteria may attach to surfaces
- Sampling a joint area that does not contain much infected fluid

Accuracy and limitations

Gram staining is useful because it is quick and a clearly positive result is usually meaningful. However, it misses many genuine joint infections.

Across studies of native joints, bacteria have often been seen in only about one-quarter to one-half of culture-confirmed infections. The exact performance changes with the organism, prior antibiotics, sample quality and patient group. In practical terms, the stain can miss more

infections than it detects.

False-positive results are much less common, but they can occur through contamination, staining artefacts or a reading error. A positive result is therefore interpreted alongside the culture and the overall clinical picture.

Joint fluid culture is generally better for confirming the organism, although culture can also miss infection, particularly after antibiotics. Blood cultures may help when infection has spread through the bloodstream. Molecular tests that detect bacterial genetic material may be considered in selected cases, but they are not a replacement for routine culture in every situation.

No single joint fluid result can safely rule infection in or out by itself.

Risks and complications

Joint aspiration commonly causes brief pain. Mild soreness or a small bruise can occur afterward.

Bleeding is more likely if you have a bleeding disorder or take medicines that reduce clotting. Infection introduced by the needle is uncommon because the skin is cleaned and sterile equipment is used. Rare complications include injury to nearby tissue or a fainting reaction.

Seek urgent medical advice if pain, redness, warmth or swelling becomes clearly worse after the procedure, or if you develop fever or drainage from the needle site. Call emergency services if you become severely unwell, confused, faint or have difficulty breathing.

What happens next

A Gram stain result may be available the same day, but timing varies by laboratory. Cultures usually take longer because organisms need time to grow, and some require extended testing.

If the overall findings strongly suggest infection, treatment may begin before the final culture result. Management can include antibiotics and drainage of infected fluid. The exact approach is based on the affected joint, your health, any artificial joint and the suspected organism.

If infection appears less likely, other causes of joint inflammation may be investigated. These include gout, calcium pyrophosphate crystal arthritis, inflammatory arthritis, bleeding into the joint or injury.

Keep routine follow-up appointments to review the culture and other test results, even if the pain improves. Do not wait for routine follow-up if the joint rapidly worsens or you develop

fever and feel unwell.

Common questions

Can I drink coffee before the test?

Yes. Coffee does not affect a joint fluid Gram stain, and fasting is not usually required.

Does the time of day matter?

No. The test can be performed when needed. Prompt sampling may be more important than the time of day when infection is suspected.

Can I exercise beforehand?

Exercise does not alter the Gram stain result. However, activity may worsen pain in an inflamed joint, so avoid anything that feels uncomfortable.

Will the joint aspiration hurt?

You may feel a sting from the local anaesthetic and pressure or brief pain from the aspiration needle. Discomfort varies with the joint and the amount of inflammation.

Do antibiotics affect the result?

Yes. Antibiotics can reduce the number of bacteria seen and grown in culture. Do not delay prescribed treatment or stop antibiotics unless the clinician managing the test tells you to do so.

How long will I wait for the result?

The Gram stain is often reported within hours or the same day. Culture results take longer, and turnaround varies by laboratory and organism.

Sources

- Ravn C, Neyt J, Benito N, et al. Guideline for management of septic arthritis in native joints (SANJO). Journal of Bone and Joint Infection . 2023;8:29-37.
- Carpenter CR, Schuur JD, Everett WW, Pines JM. Evidence-based diagnostics: adult septic arthritis. Academic Emergency Medicine . 2011;18(8):781-796.
- Shirtliff ME, Mader JT. Acute septic arthritis. Clinical Microbiology Reviews . 2002;15(4):527-544.
- MedlinePlus. Synovial fluid analysis. U.S. National Library of Medicine.



- MedlinePlus Medical Encyclopedia. Gram stain. U.S. National Library of Medicine.