TEST

Caloric stimulation

Caloric stimulation tests each inner ear's balance response using warm and cool air or water.

WHAT IT MEASURES
Each inner ear's balance response to warm and cool stimulation

SAMPLE
None; eye movements are recorded

FASTING NEEDED?
Sometimes, avoid food for several hours if instructed

HOW LONG IT TAKES
Usually 20 to 30 minutes

RESULTS IN
Same day to several days; laboratory timing differs

USED FOR
Diagnostic evaluation of dizziness and balance problems

MAIN LIMITATION
Tests only low-frequency function of one balance pathway

Overview

Caloric stimulation is a balance test that checks the inner ears separately. It is often one part of videonystagmography, or VNG, which records eye movements while your balance system is tested.

During the test, warm and cool water or air is placed into each ear canal. The temperature change moves fluid inside part of the inner ear called the horizontal semicircular canal. This normally causes a brief, automatic eye movement called nystagmus.

Special goggles or small electrodes record these eye movements. The strength and pattern of the response help show whether the balance signal from one ear is weaker than the other.

The test may feel unusual and can briefly cause spinning or nausea. These effects usually settle soon after each part of the test ends.

Why the test is ordered

Caloric stimulation may be used when symptoms suggest a problem involving the inner ear or the nerve carrying balance signals to the brain. These symptoms can include vertigo, unsteadiness, unexplained falls, or a feeling that your surroundings are moving.

The test can help identify:

Caloric stimulation does not usually identify the exact disease by itself. Results are interpreted with your symptoms, examination, hearing tests, and other balance tests.

- A weaker balance response from one ear
- Reduced balance responses from both ears
- Eye movement patterns that may need further neurological assessment

Who should have the test

A clinician may suggest caloric stimulation when dizziness or imbalance could come from the vestibular system. This is the group of inner-ear organs, nerves, and brain pathways involved in balance.

Not everyone with dizziness needs this test. Some conditions are better assessed with positional testing, hearing tests, imaging, or other vestibular tests.

Tell the clinic if you have an ear infection, drainage from an ear, previous ear surgery, or a known hole in the eardrum. Water may not be suitable in these situations. Air stimulation or a different test may be considered.

How to prepare

Follow the instructions from the testing centre, because preparation policies differ. You may be asked to avoid a heavy meal for several hours beforehand. This can reduce nausea, but you should not fast longer than instructed.

Some clinics ask you to avoid alcohol, caffeine, nicotine, or certain medicines before testing. Medicines that reduce dizziness, nausea, anxiety, or sleepiness can weaken the eye movement response.

Do not stop prescription medicine without specific instructions from the clinician who arranged the test. Bring a current medicine list, including non-prescription medicines and supplements.

Avoid eye makeup if you will wear video goggles, because it may interfere with eye tracking.

Glasses and contact lenses may need to be removed during recording.

Arrange help getting home if dizziness usually affects you strongly or if the clinic recommends it.

What happens during the test

A clinician first looks into your ears. Wax, infection, or eardrum problems may affect whether the test can proceed.

You then lie back while recording goggles or electrodes monitor your eyes. The room may be dark, or the goggles may block your view. Removing visual reference points makes the balance-related eye movements easier to measure.

Warm or cool air or water is placed into one ear canal. You may feel spinning, movement, or nausea as the inner ear responds. You may be asked simple questions or to perform a mental task so that you stay alert.

The eye movements are recorded until the response fades. Testing is usually repeated with warm and cool stimulation in both ears. There is a short recovery period between each part.

The caloric portion commonly takes about 20 to 30 minutes. A full VNG appointment may take longer because it includes other eye movement and balance tests.

Understanding your results

The laboratory compares the strength and direction of the eye movements produced by each ear. Your report may describe a normal response, unilateral weakness, bilateral weakness, or an unusual nystagmus pattern.

Unilateral weakness means one ear produced a lower response than the other. This may point to reduced function in that ear's horizontal canal or the connected balance nerve. It does not show the cause on its own.

Bilateral weakness means responses were reduced in both ears. This can reflect reduced function on both sides, but technical factors must first be considered.

Some reports mention directional preponderance , meaning eye movements were stronger in one direction. This finding is not specific to one condition and needs to be interpreted with the rest of the examination.

There is no single universal reference range for every laboratory or testing method. Ranges and interpretation vary by laboratory, age, sex, pregnancy status, medicines, and clinical

context.

What affects the results

A result can be misleading even when the equipment and laboratory work correctly. Important influences include:

Recent exercise, a recent blood transfusion, and kidney function do not usually have a meaningful direct effect on caloric responses. Pregnancy is not a usual cause of an abnormal result, although nausea and medicine choices may affect how the test is planned.

Tell the testing team about these factors before the test. This helps prevent a technically weak response from being mistaken for an inner-ear problem.

- Earwax blocking the ear canal
- A narrow ear canal or differences in ear anatomy
- An eardrum hole, middle-ear fluid, infection, or previous ear surgery
- Incorrect water or air temperature, volume, or delivery
- Medicines that suppress dizziness or make you sleepy
- Alcohol, cannabis, and some sedating substances
- Poor alertness during the test
- Difficulty keeping the eyes open or tracking them accurately
- Visual, eye movement, or neurological conditions
- Age-related reduction in vestibular responses

Accuracy and limitations

Caloric stimulation is useful because it can test the two ears separately. However, it examines mainly the horizontal semicircular canal and its nerve pathway at a very low frequency of movement. Everyday head movements are usually faster and involve more parts of the balance system.

A normal result does not rule out every vestibular disorder. The test can miss problems affecting other semicircular canals, the gravity-sensing organs of the inner ear, or balance problems that happen only during episodes.

The test may appear abnormal when inner-ear function is not truly reduced. Earwax,

middle-ear disease, medicine effects, poor alertness, or inadequate temperature transfer can produce weak responses.

Different tests answer different questions. A video head impulse test examines responses during quick head movements. Vestibular evoked myogenic potentials assess the gravity-sensing organs and related nerves. Rotational chair testing may be more useful when responses appear reduced in both ears.

Caloric testing alone cannot reliably determine the underlying cause or prove whether a problem is in the inner ear, balance nerve, or brain. The full pattern of results matters.

Risks and complications

The test commonly causes brief vertigo, nausea, sweating, or unsteadiness. These effects usually fade within minutes, although some people feel unsettled for longer.

Vomiting is possible but uncommon. Water stimulation may be unsuitable when the eardrum is not intact because fluid could enter the middle ear.

Serious complications are not expected. Contact the clinic if severe dizziness or repeated vomiting continues longer than they advised. New facial drooping, one-sided weakness, difficulty speaking, or a sudden severe headache requires emergency medical assessment rather than routine follow-up.

What happens next

You may receive an initial explanation immediately, or the recordings may be reviewed before a report is issued. Turnaround ranges from the same day to several days.

A normal test may lead to no further vestibular testing, or another test may be chosen if your symptoms suggest a part of the balance system that caloric stimulation does not assess.

An abnormal result is usually reviewed alongside your medical history, hearing results, examination, and other balance findings. Routine follow-up may include hearing assessment, vestibular rehabilitation, another vestibular test, or specialist review.

Common questions

Can I drink coffee before caloric stimulation?

Follow your clinic's instructions. Some centres ask you to avoid caffeine because it may affect

alertness or eye movement recordings. If caffeine withdrawal causes headaches, ask the clinic how to prepare.

Can I eat before the test?

You may be asked to avoid food for several hours or have only a light meal. This is mainly to reduce nausea. Do not fast unless instructed.

Does the time of day matter?

Usually not. Choose a time when you can remain alert and when any requested medicine restrictions can be followed safely.

Can I exercise beforehand?

Ordinary exercise is not known to change inner-ear caloric function. Avoid strenuous activity immediately beforehand if it tends to trigger your dizziness, nausea, or dehydration.

Can I drive home afterward?

Many people can, but temporary dizziness is possible. If you are prone to severe vertigo or the clinic advises against driving, arrange transport home.

Should I stop my dizziness medicine?

Only if the testing service and the clinician responsible for your medicine tell you to do so. Stopping some medicines suddenly can be unsafe, while taking them may reduce the test response.

Sources

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