TEST

Acid loading test (ph)

An acid loading test checks whether your kidneys can make urine acidic when your body receives an acid-forming substance.

WHAT IT MEASURES
How well the kidneys make urine acidic after an acid load

SAMPLE
Urine and usually blood

FASTING NEEDED?
Sometimes, usually overnight under the testing centre's instructions

HOW LONG IT TAKES
Several hours; longer protocols may continue for days

RESULTS IN
Same day to several days, depending on laboratory processing

USED FOR
Diagnosing impaired urine acidification, especially distal renal tubular acidosis

MAIN LIMITATION
Inadequate acid loading can make the result uninterpretable

Overview

An acid loading test measures how well your kidneys remove acid from the body. It is also called a urinary acidification test or ammonium chloride loading test.

The kidneys keep the blood's acid level stable by removing acid into urine and returning bicarbonate to the blood. During this specialist test, you receive an acid-forming substance, usually ammonium chloride. Blood and urine samples are then collected.

The laboratory measures urine pH, which shows how acidic or alkaline the urine is. Blood tests confirm whether the acid load produced enough change for the urine response to be interpreted.

Why the test is ordered

The test may be ordered when a kidney specialist suspects distal renal tubular acidosis, or distal RTA. In this condition, the final part of the kidney's filtering system does not remove acid

into urine as expected.

A milder form, called incomplete distal RTA, may be harder to identify because blood bicarbonate can be normal between tests.

Reasons for considering the test include:

It is not used for general screening, and one abnormal urine pH result is not enough on its own to justify the test.

- Repeated kidney stones, especially calcium phosphate stones
- Calcium deposits in the kidneys, called nephrocalcinosis
- Urine that remains less acidic than expected
- Unexplained changes in blood bicarbonate or potassium
- Suspected inherited problems with kidney acid handling
- Inconclusive results from simpler tests

Who should have the test

You may be offered the test if your history and earlier results suggest a problem with kidney acid handling. A kidney specialist usually decides whether it is needed.

The test is not suitable for everyone. The team will review your kidney and liver function, electrolyte levels, pregnancy status, medicines and other health conditions. If routine tests already show a clear acid-base disorder, another test may be safer or more useful.

How to prepare

Follow your testing centre's instructions because protocols differ. You may need to fast overnight. Ask whether you may drink plain water.

Tell the team about all medicines and supplements you use. Bicarbonate, citrate, diuretics like furosemide or hydrochlorothiazide , acetazolamide, topiramate and other medicines that affect kidney acid handling can alter the result. Do not stop any medicine unless the clinician arranging the test tells you to.

Also tell the team about:

Do not arrive dehydrated, but avoid drinking unusually large amounts because this can dilute your urine. Follow instructions about fluids, food, coffee and exercise.

- Recent vomiting or diarrhoea
- A current urinary infection
- Pregnancy or possible pregnancy
- Kidney, liver or heart conditions
- Difficulty swallowing tablets or capsules

What happens during the test

A baseline urine sample is collected, and you will usually have a blood test for bicarbonate, potassium and other electrolytes.

You then take ammonium chloride, an acid-forming salt, as capsules or another oral preparation. The dose depends on the local protocol. It may taste unpleasant and can cause nausea.

Further urine samples are collected at set times. Blood tests may be repeated to confirm that bicarbonate fell enough for the urine response to be judged fairly.

Most protocols take several hours, although some continue for more than one day. You may remain in the testing area for observation.

Some centres first use a challenge involving furosemide and fludrocortisone. An ammonium chloride test may still be needed if that result is unclear or abnormal.

Understanding your results

A lower pH means urine is more acidic. Healthy kidneys usually lower urine pH after a sufficient acid load.

Many protocols use a urine pH near 5.3 as a decision point, but targets and timing vary between laboratories. Results must be considered with the blood tests.

If the acid load did not produce the expected fall in blood bicarbonate, the kidneys were not fully challenged. The result may be inconclusive rather than normal or abnormal.

If urine pH remains higher than expected despite a confirmed blood response, this supports impaired distal urine acidification. It does not diagnose distal RTA by itself. Electrolytes, kidney function, urine chemistry, medicines and medical history must also be considered.

What affects the results

Vomiting or being unable to take the full preparation can prevent an adequate acid load. Without a sufficient change in the blood, the urine result cannot be interpreted reliably.

A urinary infection caused by bacteria that break down urea can raise urine pH and mimic impaired acidification.

Other influences include:

Urine dipsticks may not be precise enough. A calibrated pH meter provides a more accurate measurement. Age and pregnancy can also affect acid-base physiology and whether a protocol is suitable.

- Bicarbonate, citrate and other alkali treatments
- Diuretics and medicines that alter acid handling
- Dehydration or reduced kidney function
- Recent vomiting, diarrhoea or major dietary changes
- Incorrectly timed or contaminated samples
- Delayed or imprecise urine pH measurement

Accuracy and limitations

There is no single accuracy figure because protocols, measurement methods and patient groups differ. The ammonium chloride test is also used as a reference for evaluating alternative tests.

Urinary infection, dehydration, certain medicines, inadequate acid loading, poor sample timing or inaccurate pH measurement can falsely suggest impaired acidification.

The test may miss a mild or intermittent problem, particularly if sampling ends too early. An appropriate fall in urine pH also does not assess every part of kidney acid removal.

Other investigations may include blood bicarbonate and potassium, urine chemistry, kidney imaging, stone analysis or genetic testing.

Risks and complications

Blood sampling can cause brief discomfort, bruising or light-headedness.

Ammonium chloride commonly causes an unpleasant taste, nausea or vomiting. Because the

test intentionally changes the body's acid balance, it is performed using a controlled protocol with blood testing and observation.

Tell staff immediately if you feel increasingly unwell. After leaving, contact the testing centre promptly if vomiting continues or you cannot keep fluids down.

Severe weakness, confusion, collapse, chest pain, marked breathing difficulty or a sustained irregular heartbeat require urgent medical assessment. Call emergency services for severe or rapidly worsening symptoms.

What happens next

If your urine became acidic as expected and blood tests confirm an adequate challenge, impaired distal acidification is less likely. Your clinician may investigate other causes of your symptoms, stones or earlier results.

An abnormal result is reviewed with your electrolytes, kidney function and urine measurements. Testing may need to be repeated if the acid load was inadequate or a sample problem affected the result.

Further assessment may include kidney imaging, stone analysis or genetic testing. Follow-up is usually routine unless blood tests show a significant electrolyte or acid-base disturbance requiring faster review.

Common questions

Can I drink coffee before an acid loading test?

Not if you have been told to fast. Follow the centre's instructions; plain water may be allowed.

Does the time of day matter?

Yes. Urine pH varies with meals and daily rhythms, so samples must be collected at the specified times.

Can I exercise beforehand?

Avoid unusually intense exercise unless told otherwise. Exercise, sweating and dehydration can affect acid-base balance and urine concentration.

Should I take my usual medicines?

Ask the team. Some medicines affect the result, but stopping them without medical advice may be unsafe.

Will the test hurt?

The acid preparation may taste unpleasant or cause nausea. Blood draws can briefly sting and leave a small bruise.

Can I go home straight afterwards?

Usually, once sampling is complete and you feel well. Some protocols require longer observation, so ask whether someone should accompany you.

Sources

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