

Lung Function Studies: Methacholine Challenge Test

Challenge tests or challenge studies, are types of tests that measure changes in your lung function after you breathe specific agents. In the U.S., the most common agent used in this test is methacholine. Histamine is another agent that may also be used in the test.



A challenge study may be done to see if you have asthma or how well your asthma medicine is working.

Are there other names for challenge studies?

Challenge studies may be referred to by several different names: methacholine challenge test (MCT), methacholine inhalation test, bronchoprovocation test, histamine challenge test and histamine inhalation test.

Why have I been asked to get a challenge study?

Your health care provider may have ordered a methacholine challenge test (MCT) to find out if your breathing problem is from asthma. If you have asthma, your provider may order the test to check if your asthma is under control.

What can I expect during a Methacholine Challenge Test (MCT)?

If you have asthma, your airways will tighten when you breathe in methacholine which is detected as a drop in lung function with breathing tests (spirometry). During the MCT, you will inhale a very small dosage of methacholine. Before and after each dose of methacholine, you will be asked to perform the breathing test. If your breathing does not change with the first dosage, you will be asked to inhale progressively larger dosages of methacholine until you have a significant drop in lung function or symptoms (see step 7). If your airways tighten at any point, you will be given an inhaled bronchodilator medicine to open your airways. Often, the staff person doing the test will know that your airways are tightening before you feel it, by seeing a drop in the breathing test. For more information on the spirometry test, see ATS Patient Information Series: Pulmonary Function Tests at www.thoracic.org/patients.

The basic steps for a methacholine (or histamine) challenge test are as follows:

1. You will do a spirometry test to see what your baseline lung function is. If your lung function is not too low, you will move to the next step of the challenge test.

2. In this step, you may or may not be asked to breathe a saline (salt water) solution before repeating the spirometry test.
3. If your lung function does not change, you will be asked to breathe in a very low dose of methacholine.
4. You will repeat the spirometry test immediately after inhaling the methacholine and again a few minutes later.
5. If your lung function does not change after the lowest used dose of methacholine, you will inhale the next higher dose of methacholine that is a little stronger than the first dose. You will then do spirometry again.
6. As long as you do not react to the methacholine, you will continue the test, inhaling stronger doses of the chemical (usually between 5-10 doses total) followed by spirometry testing.
7. As soon as your lungs show a significant worsening in lung function, with a drop in forced expiratory volume at 1 second (FEV₁) of 20% or more, the test is considered complete. You will be given an inhaled bronchodilator treatment (usually albuterol or levalbuterol) to help reopen your airways. You will then repeat the spirometry test to make sure your lungs have returned to normal. The concentration of the methacholine given at this point will be your test result. If you do not have a drop in function or symptoms, the last dose given is the result.
8. You will not leave the test area until your breathing has returned to normal. You may therefore be asked to wait for an hour or more, before being allowed to go home.

What should I do or not do before a Methacholine Challenge Test?

- Do not eat or drink any caffeine containing products such as coffee, tea, cola drinks, energy drinks, Mountain Dew™ products or chocolate on the day of the test. The caffeine in these products can act as a weak bronchodilator and result in inaccurate test results.

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- Do not exercise for at least 6 hours before the test and do not smoke at least 6 hours before the test. Tell your health care provider if you have had a cold or upper respiratory infection in the 4 weeks before the test. These can also affect the test results.

You may need to stop certain medicines before taking the challenge test. Different medicines have to be stopped at different times based on how long they stay in your body. Ask your health care provider which medicines you should stop taking and when you should stop them.

Medicines which may need to be stopped before a Methacholine or Histamine Challenge Test	
If you are taking this medicine...	Stop taking it this long before the test....
Quick-acting bronchodilators such as <i>albuterol</i> (Proventil®, Ventolin®, ProAir®), <i>levalbuterol</i> (Xopenex®) or <i>pirbuterol</i> (Maxair®)	8 hours
Long-acting bronchodilators such as <i>formoterol</i> (Foradil®), <i>salmeterol</i> (Serevent®) or <i>tiotropium</i> (Spiriva®)	48 hours (some centers may ask you to be off of tiotropium for 1 week prior to testing)
Combination products such as <i>budesonide/formoterol</i> (Symbicort®) or <i>fluticasone/salmeterol</i> (Advair®)	48 hours
Antihistamines (such as <i>certirizine</i> (Zyrtec®), <i>fexofenadine</i> (Allegra®) or <i>loratadine</i> (Claritin®))	12 to 24 hours. Check with your health care provider or testing center to find out when you should stop these medications prior to testing.
<i>Cromolyn sodium</i> (Intal®)	8 hours
<i>Nedocromil</i> (Tilade®)	48 hours
Leukotriene modifiers such as <i>montelukast</i> (Singulair®) or <i>ziflurkast</i> (Accolate®)	24 hours
<i>Ipratropium bromide</i> (Atrovent®) or <i>ipratropium/albuterol</i> (Combivent®)	24 hours
Theophylline medicines (There are many brands such as Theo-Dur®, Theolair®, Theo-24®, Uniphyll® etc.)	12 to 24 hours. Check with your health care provider or testing center to find out when you should stop these medications prior to testing.
Inhaled corticosteroids such as <i>beclomethasone</i> (QVAR®), <i>budesonide</i> (Pulmicort®), <i>fluticasone</i> (Flovent®), <i>mometasone furoate</i> (Asmanex®) or <i>triamcinolone</i> (Azmacort®)	These do not always need to be stopped. Check with your health care provider or the testing center.

Also make a list of any over the counter medications you are taking for your breathing or for sinus congestion or allergies. Check with your health care provider or testing center if these will affect the test results.

What can I expect to feel when taking a Methacholine Challenge Test?

The challenge study is designed to see if your airways tighten, so if your airways do not tighten, you may have no symptoms at all. If your airways do tighten during the test,

you may have symptoms of an asthma worsening. You may cough, wheeze, feel chest tightness or be short of breath. If the test results show that your airways are tightening, you will be given a bronchodilator that will relieve the symptoms. The test is done in a testing center with trained staff and a health care provider available during the study.

Is there a chance that I may not be able to have the Methacholine Challenge Test?

There are several reasons you may not be able to undergo the MCT. You should not have the test for the following reasons:

- your lung function is too low after the first spirometry test
- heart attack or stroke in the last 3 months
- uncontrolled blood pressure
- certain types of blood vessels problems (e.g. aortic or cerebral aneurysm)
- pregnant or nursing

In order to ensure your safety, the testing center staff will review with you other potential reasons not to do the test or to have it done later. When in doubt about whether or not you should have this test, ask your health care provider and discuss your concerns with the testing center.

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Rx Action Steps

- ✓ If you have a cold, increased coughing, or are feeling ill the day of the test, check with the testing center about postponing your test.
- ✓ Check with the testing center to find out if any medicines need to be stopped before your challenge test and for how long.
- ✓ Ask your health care provider to explain the results of your test.

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Other Resources:

American Thoracic Society

- ATS Official Documents
www.thoracic.org/statements/pulmonary-function.php
- Patient Information Series
<http://www.thoracic.org/patients/>

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