Necator americanus
genesig® Easy Kit
for use on the genesig® q16

50 reaction

For general laboratory and research use only
genesig® Easy: at a glance guide

For each DNA test

<table>
<thead>
<tr>
<th>Component</th>
<th>Volume</th>
<th>Lab-in-a-box pipette</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. americanus reaction mix</td>
<td>10 µl</td>
<td></td>
</tr>
<tr>
<td>Your DNA sample</td>
<td>10 µl</td>
<td></td>
</tr>
</tbody>
</table>

For each positive control

<table>
<thead>
<tr>
<th>Component</th>
<th>Volume</th>
<th>Lab-in-a-box pipette</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. americanus reaction mix</td>
<td>10 µl</td>
<td></td>
</tr>
<tr>
<td>Positive control template</td>
<td>10 µl</td>
<td></td>
</tr>
</tbody>
</table>

For each negative control

<table>
<thead>
<tr>
<th>Component</th>
<th>Volume</th>
<th>Lab-in-a-box pipette</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. americanus reaction mix</td>
<td>10 µl</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>10 µl</td>
<td></td>
</tr>
</tbody>
</table>
Kit Contents

• N.americanus specific primer/probe mix (BROWN)
  Once resuspended the kits should remain at -20ºC until ready to use.

• Lyophilised oasig™ Master Mix

• Lyophilised oasig™ Master Mix resuspension buffer (BLUE lid)

• N.americanus positive control template (RED lid)

• Internal extraction control DNA (BLUE lid)

• RNase/DNase free water (WHITE lid)

• Template preparation buffer (YELLOW lid)

• 54 x genesig® q16 reaction tubes

Reagents and equipment to be supplied by the user

genesig® q16 instrument

genesig® Easy DNA/RNA Extraction Kit
  This kit is designed to work well with all processes that yield high quality DNA but the genesig Easy extraction method is recommended for ease of use.

genesig® Lab-In-A-Box
  The genesig Lab-In-A-Box contains all of the pipettes, tips and racks that you will need to use a genesig Easy kit. Alternatively if you already have these components and equipment these can be used instead.
Step-by-step guide

1. Create your reaction mix

Use the blue pipette to transfer 500µl* of the oasis Master Mix resuspension buffer into the tube of lyophilised oasis Master Mix and mix well by gently swirling. Then transfer all of that master mix into the brown tube labelled N.americanus primers/probe.

*Transfering 525µl of the oasis Master Mix resuspension buffer to your oasis Master Mix (instead of the 500µl recommended above) will enable you to take full advantage of the 50 reactions by accounting for volume losses during pipetting. In order to do so with the genesig Easy fixed volume pipettes use 1x blue, 2x red and 1x grey pipettes to make the total volume. Please be assured that this will not adversely affect the efficiency of the test.

Cap and shake tube to mix. A thorough shake is essential to ensure that all components are resuspended. **Failure to mix well can produce poor kit performance.**

Leave to stand for 5 minutes. Now your reaction mix is ready to use.

Store the reaction mix in the freezer from hereon.

**Top tip**

- Ensure that the reaction mix is mixed thoroughly before each use by shaking.
- Once resuspended do not expose genesig Easy kit to temperatures above -20°C for longer than 30 minutes at a time.
2. Internal extraction control

Use the blue pipette to transfer 1000µl (2 x 500µl) of template preparation buffer into the Internal Extraction Control DNA tube. Cap and shake tube to mix.

Your kit contains Internal Extraction Control DNA. This is added to your biological sample at the beginning of the DNA extraction process. It is extracted along with the DNA from your target of interest. The q16 will detect the presence of this Internal Extraction Control DNA at the same time as your target. This is the ideal way to show that your DNA extraction process has been successful.

**If you are using an alternative extraction kit:**
Use the red pipette to transfer 10µl of Internal Extraction Control DNA to your sample *after* the lysis buffer has been added then follow the rest of the extraction protocol.

**If you are using samples that have already been extracted:**
Use the grey pipette to transfer 5µl of Internal Extraction Control DNA to your extracted sample.

3. Add reaction mix to all reaction tubes

For every reaction to be run, use the red pipette to add 10µl of your N.americanus reaction mix to every tube.

**Top tip**

- Always pipette the reaction mix directly into the bottom of the tube.
- You can label the tube lids to aid your reaction setup but avoid labelling tube sides.
4. Negative control

For each test you will require a negative control. Instead of DNA, water is used. This sample should typically prove negative thus proving that all of your positive samples really are positive.

To create a negative control reaction simply use the red pipette to add 10µl of the water to the required reaction tubes. Close these tubes after adding the water.

Because some genesig kit targets are common in the environment you may occasionally see a “late” signal in the negative control. The q16 software will take this into account accordingly.

Top tip

- Always add the water to the side of the tube to reduce the introduction of bubbles.

5. Set up a test

For each sample you wish to analyse, use the red pipette to add 10µl of your DNA sample to the required reaction tubes. Close these tubes after adding the sample. Always change pipette tips between samples.

Top tip

- Always add the DNA sample to the side of the tube to reduce the introduction of bubbles.
6. Positive control

Use the blue pipette to transfer 1000µl (2 x 500µl) of template preparation buffer into the positive control template tube. Cap and shake tube to mix.

Each time you run a test you will require a positive control. This is a small portion of DNA from your target of interest. It serves two purposes:

1. It will always test positive so it shows that everything is working as it should be.
2. The q16 software knows how much DNA is present in the positive control. So it can automatically compare your sample of interest with the positive control to calculate the amount of target DNA in your sample.

To create a positive control reaction, simply use 10µl of the positive control instead of your DNA sample.

Take great care when setting up your positive control. The positive control template has the potential to give you a false positive signal in your other samples. Set positive controls up last after all other sample tubes are closed. Always change pipette tips between samples. You may even choose to set up positive controls in a separate room.

Top tip

- Always add the positive control to the side of the tube to reduce the introduction of bubbles.
7. Running the test

Place the tubes into the correct positions in your q16 as defined by the software, this may include positioning of empty tubes to ensure that the q16 lid is balanced. The run can then be started.

Top tip

• Before loading tubes into the q16, check for bubbles! Flick the bottom of the tubes to remove any bubbles that may have formed during the test setup.
• Apply centrifugal force with a sharp wrist action to ensure all solution is at the bottom of the reaction tube.
• When repeating a test you can use a previous file as a template by clicking ‘open’ then selecting File name > Files of Type > Experiment file as template.
What do my results mean?

Analysis of your data is carried out automatically by the genesig q16. The following information is designed to help you fully understand a result or to troubleshoot:

“Positive”

Explanation
Your sample has produced a positive result. Your target of interest is present and you can use the reported quantity.

“Negative”

Explanation
Your sample has produced a negative result. The target is not present in your sample.

“Test contaminated”

Explanation
The Negative Control should be completely free of any DNA. If you see this error message it means that at some point during the setup, the Negative Control has been contaminated with DNA and has given a positive signal. This contamination has invalidated the test. The Positive Control and your test samples are both possible sources of contaminating DNA. The genesig q16 reaction tubes from previous runs will also contain very high amounts of DNA so it is important that these are carefully disposed of after the run is completed and NEVER OPENED. It may be the case that your kits have become contaminated which will lead to the same problem occurring repeatedly.

Solutions
1. Clean your working area using a commercial DNA remover solution to ensure the area is DNA free at the start of your run and re-run the test
2. If the problem persists then the kit has become contaminated and it will have to be discarded and replaced with a new kit. When you open the new kit, run a simple test to show that changing the kit has solved the problem. Prepare a test which includes only the Positive Control, the Negative Control and one ‘mock sample’. For the ‘mock sample’ add water instead of any sample DNA. The result for the Negative Control and the mock sample should be negative indicating that contamination is no longer present.

Preventive action
An ideal lab set-up has a ‘Clean area’ where the test reagents are prepared and a ‘sample area’ where DNA samples and the Positive Control template are handled. The best workflow involves setting up all the test components (excluding the positive control template) in the clean area and then moving the tests to the sample area for sample and Positive Control addition. If this method is followed then the kit components are always kept away from possible sources of contamination. For extra security the Negative Control can be completely prepared and sealed in the clean area. All work areas should be decontaminated regularly with DNA remover.
“Sample preparation failed”

**Explanation**
The test has failed because the quality of the sample was not high enough. The Internal Extraction Control component identifies whether the sample has been prepared correctly and is of suitable quality. This error message means that this quality control test has failed and the sample quality is not high enough for analysis.

**Solutions**
1. Check the sample preparation protocol for any user errors then repeat.
2. Poor quality samples can result from overloading the sample preparation protocol with too much starting material. Try reducing the amount of starting material then repeat.
3. Failing to add the Internal extraction Control DNA to your sample during the sample preparation protocol can also lead to a reported result of “sample preparation failed”. Ensure that this step has not been overlooked or forgotten. If your samples are derived from an archive store or from a process separate from your genesig Easy extraction kit; you must add 5µl of Internal Extraction Control DNA into each 0.5ml of your sample to make it suitable for use on the q16.

“Positive result, poor quality sample”

**Explanation**
The test is positive so if you are only interested in obtaining a ‘present or absent’ answer for your sample then your result is reliable. However, the test contains an Internal Extraction Control component that identifies if the sample is of high quality. This quality control test has failed and the sample is not therefore of high enough quality to accurately calculate the exact copy number of DNA present. If you require quantitative information for your sample then proceed with the solutions below.

**Solution**
For appropriate solutions, read the “Sample preparation failed” section of this handbook.
“Test failed”

**Explanation**
The test has failed because the Positive Control has not worked. The Positive Control is present to show that all aspects of the test are working correctly together. When this control test fails, the test as a whole is invalidated. This finding indicates that a problem has occurred in the reaction set-up part of the experiment and has nothing to do with sample preparation.

**Solutions**
1. Check the entire workflow and test set-up to look for any user errors, then repeat the test e.g. have the right colour pipettes and solutions been used with the correct tubes?
2. Ensure the positive and negative controls are inserted into the correct wells of your q16.
3. A component of the test may have ‘gone off’ due to handing errors, incorrect storage or exceeding the shelf life. When you open a new kit, run a simple test to show that changing the kit has solved the problem. Prepare a test which includes only the Positive Control, the Negative Control and one ‘mock sample’. For the ‘mock sample’ add internal control template instead of any sample DNA. If the Positive Control works, the mock sample will now be called as a negative result.

“Test failed and is contaminated”

**Explanation**
The Positive Control is indicating test failure, and the Negative Control is indicating test contamination. Please read the “Test Failed” and “Test contamination” sections of this technical support handbook for a further explanation.

**Solution**
For appropriate solutions, read both the “Test failed” and “Test contaminated” sections of this handbook.
Necator americanus

Necator americanus is a species of nematode worm of the Ancylostomatidae family. This species is known to infect humans predominately in Sub-Saharan Africa, South-East Asia, and the Americas causing Ankylostomiasis, a progressive anaemia. This species, more commonly known as hookworm, range in length from 5-9mm for males and 10mm for females. The anterior end accommodates a buccal capsule with a pair of cutting plates used for attaching to the host cells.

In ideal conditions, moist soil above 18°C, the eggs of this species can hatch revealing an infective larva which can remain viable in the soil for several weeks. These larvae penetrate the skin of humans, mainly on the foot when walking through contaminated soil. Once inside the body, they migrate through the circulatory system to the lungs, up the trachea and down the oesophagus through the stomach ending in the small intestine. The larvae mature into adults here and cause a prolonged infection over several years by using nutrients from the host blood. In the intestine the adults mate and new eggs are passed in the faeces.

An allergic reaction at the entry site is often seen in infected individuals as is an inflammation of the lungs as the larvae penetrate the alveoli. Diarrhoea and stomach pains are the result of the hookworm in the intestine. High parasitic levels can result in anaemia due to blood loss and in children this can result in growth retardation.

Before the larvae migrate away from the skin, it can be treated with cryotherapy. Once it is moving through the body Benzimidazole based therapies can be used to target the infection and act by preventing microtuble polymerisation within the parasite. If anaemia occurs then patients are also treated with furrous sulphate.
Specificity

The Primerdesign genesig Kit for Necator americanus (N.americanus) genomes is designed for the in vitro quantification of N.americanus genomes. The kit is designed to have the broadest detection profile possible whilst remaining specific to the N.americanus genome.

The primers and probe sequences in this kit have 100% homology with a broad range of N. americanus sequences based on a comprehensive bioinformatics analysis.

Our kit for Necator americanus has been designed for the specific and exclusive in vitro quantification of this species. The primers and probe sequences in this kit have 100% homology with a broad range of clinically relevant reference sequences based on a comprehensive bioinformatics analysis.

If you require further information, or have a specific question about the detection profile of this kit then please send an e.mail to enquiry@primerdesign.co.uk and our bioinformatics team will answer your question.
Kit storage and stability
This lyophilised kit is stable at room temperature but should be stored at -20°C on arrival. Once the lyophilised components have been resuspended they should not be exposed to temperatures above -20°C for longer than 30 minutes at a time and unnecessary repeated freeze/thawing should be avoided. The kit is stable for six months from the date of resuspension under these circumstances. Primerdesign does not recommend using the kit after the expiry date stated on the pack.

Suitable sample material
All kinds of sample material suited for PCR amplification can be used. Please ensure the samples are suitable in terms of purity, concentration, and RNA/DNA integrity.

Dynamic range of test
Under optimal PCR conditions genesig N.americanus detection kits have very high priming efficiencies of >95% and can detect less than 100 copies of target template.

Notices and disclaimers
This product is developed, designed and sold for research purposes only. It is not intended for human diagnostic or drug purposes or to be administered to humans unless clearly expressed for that purpose by the Food and Drug Administration in the USA or the appropriate regulatory authorities in the country of use. During the warranty period Primerdesign genesig detection kits allow precise and reproducible data recovery combined with excellent sensitivity. For data obtained by violation to the general GLP guidelines and the manufacturer’s recommendations the right to claim under guarantee is expired. PCR is a proprietary technology covered by several US and foreign patents. These patents are owned by Roche Molecular Systems Inc. and have been sub-licensed by PE Corporation in certain fields. Depending on your specific application you may need a license from Roche or PE to practice PCR. Additional information on purchasing licenses to practice the PCR process may be obtained by contacting the Director of Licensing at Roche Molecular Systems, 1145 Atlantic Avenue, Alameda, CA 94501 or Applied Biosystems business group of the Applera Corporation, 850 Lincoln Centre Drive, Foster City, CA 94404. In addition, the 5’ nuclease assay and other homogeneous amplification methods used in connection with the PCR process may be covered by U. S. Patents 5,210,015 and 5,487,972, owned by Roche Molecular Systems, Inc, and by U.S. Patent 5,538,848, owned by The Perkin-Elmer Corporation.

Trademarks
Primerdesign™ is a trademark of Primerdesign Ltd.
genesig® is a registered trademark of Primerdesign Ltd.