MACHEREY-NAGEL

# NucleoMag® DNA Microbiome

## Automated DNA purification from biofilm, soil and stool samples on the Hamilton NIMBUS® Presto workstation

## Introduction

Microbes are the most ancient, abundant and diverse forms of life on earth. Microorganisms colonize, impact, and proliferate every surface or organism – mostly in the form of complex communities. The goal of microbiome studies is to systematically understand their role, functions and communities and how they interact with their environment and hosts.

One of the most important procedures in microbiome and metagenomics research is the extraction of high-quality DNA, representative of all species present in a sample. The MACHEREY-NAGEL NucleoMag® DNA Microbiome kit enables high-throughput, automation-friendly isolation of microbial DNA from samples typically used for microbiome analysis, including soil, stool and biofilm. Its patented inhibitor removal technology ensures efficient removal of contaminants from even challenging soil or fecal samples for superior downstream performance.

In this Application Note, we demonstrate the advantages of automated DNA purification from microbial communities using the NucleoMag® DNA Microbiome on the Hamilton NIMBUS Presto platform. The procedure combines mechanical ceramic bead-based sample homogenization (MN Bead Tubes Type A or MN 96 Bead Plate Type A) with the fully automated DNA isolation to conveniently achieve unbiased lysis and highest DNA yields.

| NucleoMag® DNA Microbiome | |
|---|---|
| Technology | Magnetic beads |
| Sample material | 50–200 mg soil, stool, biofilm (including swabs) |
| Elution volume | 50–200 µL |
| Typical DNA yield | 1–30 µg DNA (depending on sample type and quality) |
| Preparation time | Approx. 70 min (excl. lysis) / 96 samples |

The NIMBUS Presto workstation combines liquid handling and magnetic rod processing for fully automated, high-throughput nucleic acid extractions.

| NIMBUS Presto workstation | |
|---|---|
| Technology | Automated liquid handling platform (Hamilton NIMBUS) with integrated magnetic rod processing unit (KingFisher™ Presto) |
| Capacity | 1–96 samples |
| Processable volume | 50–5000 µL |
| Footprint | L 1359 mm \| W 709 mm \| H 889 mm |

## Material and Methods

To obtain a complete and unbiased picture of the microbes contained in a sample, we always recommend mechanical homogenization of the sample specimen when performing microbiome studies. Therefore, 100–200 mg of various soil samples or a spatula tip of human stool samples were transferred to MN Bead Tubes Type A (ceramic beads) and mixed with lysis buffer and optional RNase. For soil samples, the addition of Enhancer SX ensures optimal conditions to release the DNA. Sample disruption was performed on MN Bead Tube Holder, in combination with a Vortex-Genie® 2 for 4–5 minutes operating at full speed. A subsequent precipitation step ensures that contaminants and inhibitors are removed very efficiently from the samples. All subsequent DNA purification steps were performed on the Hamilton NIMBUS Presto with no need for further user intervention.

## Options for sample homogenization

**MN Bead Tubes Type A**

- 2 mL screw cap tubes
- Prefilled with 0.6–0.8 mm ceramic beads
- Compatible with common bead-beating devices

**MN 96 Bead Plate Type A**

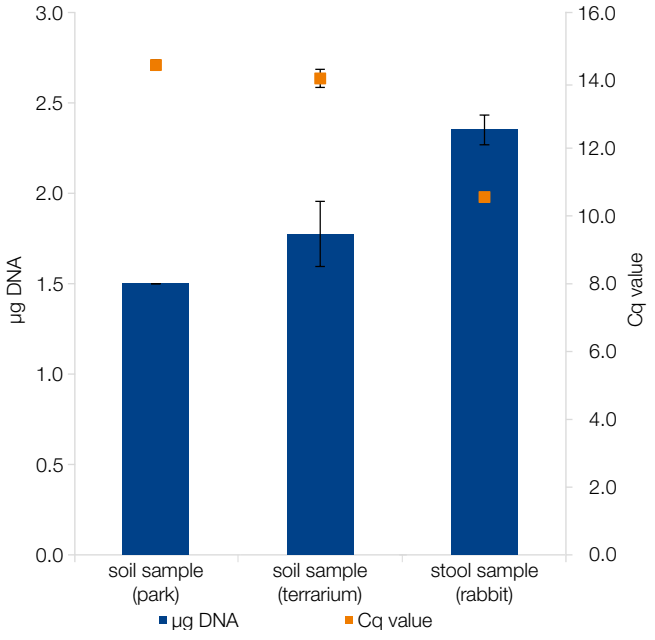
- Rack of prefilled tube strips (8 × 12)
- Prefilled with 0.6–0.8 mm ceramic beads
- Compatible with common plate disruption device

Single bead tubes or bead plates

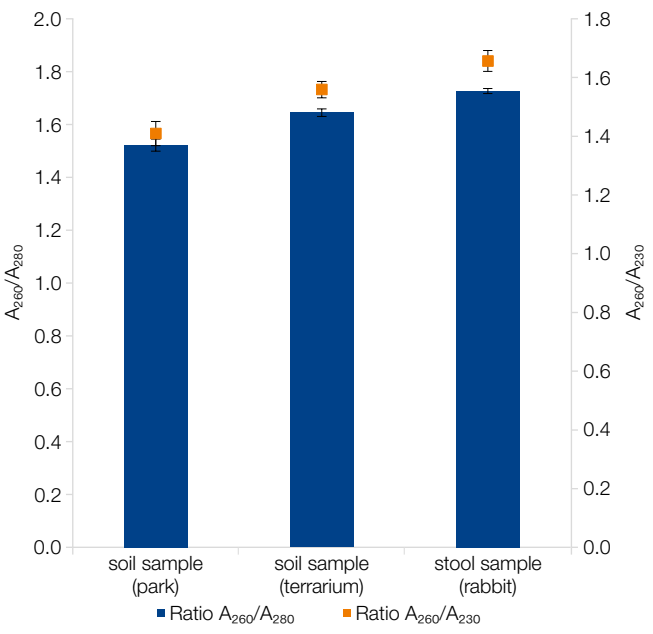
For optimal DNA yields, a complete disruption of sample material is necessary and can be performed with e.g., MN Bead Tubes Type A or MN 96 Bead Plates Type A. These accessories contain ceramic beads, resulting in the efficient disruption of microbial cells in soil, stool and other materials used for microbiome analysis.

## Application data – soil samples

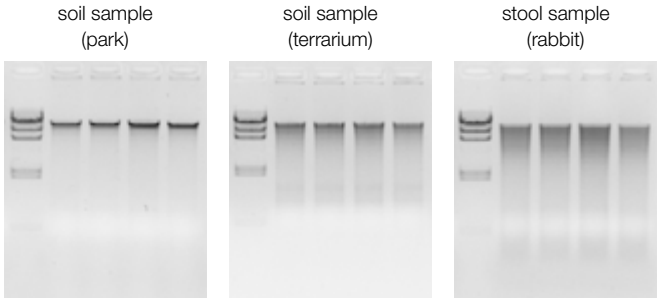
A)




C)



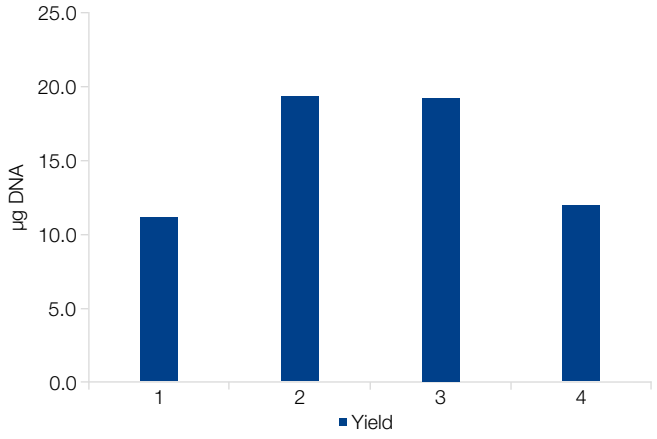

B)

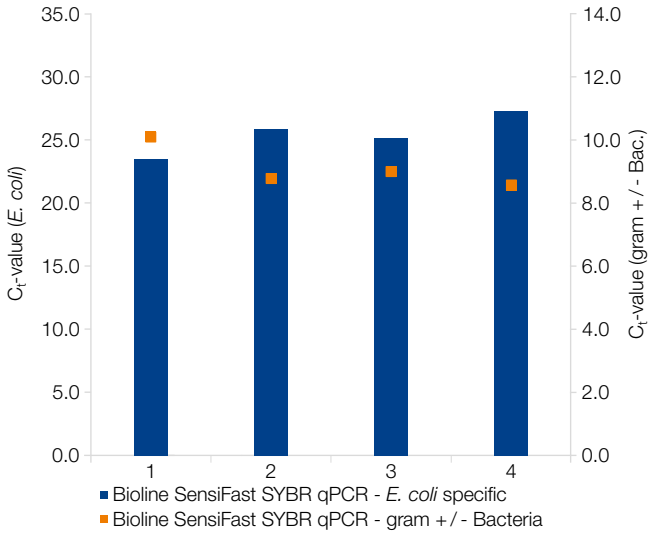



Automated purification of DNA from soil and stool samples on the Hamilton NIMBUS Presto platform

The NucleoMag® DNA Microbiome kit was used on the Hamilton NIMBUS Presto platform to isolate high-quality DNA from soil and stool samples. The soil samples were either collected from a city park (100 mg; predominantly mineralic soil and low content of organic components) or from a terrarium (200 mg; consisting of coco humus, forest soil, decomposed moss; high content of organic and humic components). The stool samples were collected from rabbit feces.
(A) DNA was isolated from different sample matrices (n = 4 for each sample type) and quantified photometrically. DNA was further used as input for a subsequent qPCR targeting the bacterial 16s rRNA gene. The qPCR was conducted using the SensiFast™ SYBR Lo-ROX kit from BioLine on an Applied Biosystems® 7500 Real-Time PCR System. Results indicate a consistent extraction and amplification of DNA, even from challenging material.
(B) Integrity of genomic DNA was visualized via gel electrophoresis (10 µL per lane; 1 % TAE gel; M: GeneRuler™ 1 Kb DNA Ladder - Thermo Scientific).
(C) DNA purity was determined photometrically by measuring the OD ratios at 260/280 nm and 260/230 nm. All eluates exhibit values of >1.5 both for the 260/280 nm and 260/230 nm value.

## Application data – human stool sample




### Automated purification of DNA from human stool samples on the Hamilton NIMBUS Presto

DNA was purified from a spatula tip from four individual human stool samples using the NucleoMag® DNA Microbiome kit on the Hamilton NIMBUS Presto platform. After automated extraction, the DNA yield recovered from stool samples was determined photometrically.

### Reliable qPCR performance of purified DNA from human stool samples

qPCR analysis was performed with equal volumes of purified DNA detecting either gram +/- Bacteria or *E.coli* using the SensiFast™ SYBR Lo-Rox qPCR assays from Bioline on an Applied Biosystems® 7500 Real-Time PCR System. The results demonstrate a reliable qPCR-performance. The combined data indicate the NucleoMag® DNA Microbiome kit on the Hamilton NIMBUS Presto quickly and reliably purifies high-quality DNA from stool samples.

## A rapid, fully automated solution for DNA isolation from soil, stool and biofilm samples

MACHEREY-NAGEL and Hamilton deliver a tailored solution for your high-throughput DNA extraction from soil, stool and biofilm samples. We have adapted the NucleoMag® DNA Microbiome procedure on the NIMBUS Presto workstation to meet the expectations of applied microbiomic research. No matter if you're working with environmental soil, biofilm or fecal samples, our solution perfectly combines mechanical sample homogenization with the patented inhibitor removal technology of the NucleoMag® DNA Microbiome kit and with the fully automated NIMBUS Presto workstation.

- Save hands-on time by using automated plate-prefilling and plate-handling performed by the NIMBUS workstation
- Benefit from the high-speed extraction procedure of the integrated KingFisher™ Presto unit
- Patented inhibitor removal technology
- Minimized downstream inhibition for reliable results and downstream assay performance

## Ordering information

| Product | Specifications | Pack of | REF |
|---|---|---|---|
| NucleoMag® DNA Microbiome | Magnetic bead-based kit for the purification of microbial DNA from soil, biofilm and fecal samples contains NucleoMag® B-Beads, buffers. | 1 × 96 preps<br>4 × 96 preps | 744330.1<br>744330.4 |
| MN Bead Tubes Type A | 2 mL screw cap microtubes prefilled with 0.6–0.8 mm ceramic beads; recommended for soil, stool, and biofilm samples. | 50 | 740786.50 |
| MN 96 Bead Plate Type A | Rack of prefilled tube strips (12 strips with 8 tubes each) containing 0.6–0.8 mm ceramic beads; suitable in conjunction with mixer mill; recommended for soil, stool, and biofilm samples. | 1 × 96 preps<br>4 × 96 preps | 740850.4<br>744350.24 |
| MN Bead Tube Holder | Rubber-foam adapter for processing MN Bead Tubes with Vortex-Genie 2. | 1 piece | 740469 |
| NIMBUS Presto | Automated liquid handling platform with 4 pipetting channels, a CO-RE Gripper, Barcode Scanner, and many additional features. | | Hamilton* |

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* For more detailed information, please visit www.hamiltoncompany.com/robotics. To find a Hamilton subsidiary or distributor in your area, please visit http://www.hamiltoncompany.com/contacts.