Standard Operating Procedure for:

Purification of Filtered Samples Using the Qiagen DNeasy PowerSoil® Pro Kit



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1. SCOPE AND APPLICATION

1.1. This method is based on the Qiagen DNeasy PowerSoil® Pro kit user manual and describes a procedure for recovering genomic DNA (gDNA) from samples that contain PCR inhibitors. This method is used to purify samples treated with propidium monoazide (PMA) and to re-analyze samples when inhibition is detected after performing the crude lysate method (as described in SOP PCR-4.1).

2. SUMMARY OF METHOD

2.1. Environmental samples (water filters) are added to bead tubes and homogenized on a bead beater for rapid and thorough homogenization. Cell lysis occurs by mechanical shearing and chemical interactions. Total gDNA is bound on a silica membrane in a spin column. DNA is washed and eluted from the spin column to yield purified DNA.

2.2. Interferences

2.2.1. Purification removes PCR inhibitors but may result in a low yield of DNA. Ethanol in Solution C5 can interfere with qPCR. It is important to ensure that the Spin Filter is thoroughly centrifuged to remove any traces of Solution C5 and that the Spin Filter is removed carefully to avoid splashing any Solution C5 onto the Spin Filter.

2.3. Definitions

2.3.1. qPCR: Quantitative Polymerase Chain Reaction is a procedure in which the amount of DNA amplified in each PCR cycle is measured using fluorescent dyes to determine the original amount of DNA in the sample.

2.3.2. Target sequence: The DNA sequence in the Gene of Interest (GOI) that is amplified by the primers/probe in each PCR cycle. The primers/probe series is designed to attach specifically to this sequence.

3. EQUIPMENT AND SUPPLIES

3.1. Gloves, nitriles

3.2. Tube racks

3.3. Forceps

3.4. Micropipettes with sterile PCR grade filter tips

3.5. CBS Optimizer PCR Workstation #2 (S/N 007632)

3.6. Fisher Mini Vortex

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3.7. Centrifuge

3.8. Fisher Scientific Bead Mill 24 (S/N 24G2336)

3.9. Qiagen DNeasy PowerSoil® Pro Kit (Catalog#47014)

3.9.1. PowerBead Pro Tubes

3.9.2. MB Spin Columns

3.9.3. 2 mL Collection Tubes

3.9.4. 1.5 mL Elution Tubes

3.9.5. 2 mL Microcentrifuge Tubes

Note: Solution CD2 should be stored at 2-8°C upon arrival. All other kit reagents and components should be stored at room temperature (15-30°C).

3.10. PCR#5, Thermo Fridge/Freezer (S/N 0121174701121218), maintained at 4ºC ± 2ºC and -20ºC ± 10ºC, Room B246

3.11. PowerVac® Manifold Cat#11991 (optional)

4. REAGENTS AND STANDARDS

4.1. Qiagen DNeasy PowerLyzer® Pro Kit (Catalog#47014)

4.1.1. Solution CD1

4.1.2. Solution CD2

4.1.3. Solution CD3

4.1.4. Solution EA

4.1.5. Solution C5

4.1.6. Solution C6

4.2. 1E4 SKETA Standard (Salmon DNA) – Prepare per SOP PCR-3.1

4.3. E5 *B. dorei* DNA spike- Prepare per SOP PCR-3.2

4.4. E7 BRD3GD spike – Prepare per SOP PCR-3.4

4.5. E6 Gull2 spike – Prepare per SOP PCR-3.3

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4.6. E7 C2H2 spike – Prepare per SOP PCR-3.7

4.7. Sterile Deionized (DI) Water

4.8. Bleach solution, 10% (v/v)

4.9. 80% Ethanol – Prepare per SOP IZ-09.

5. CALIBRATION AND STANDARDIZATION

5.1. See DEP Laboratory Quality Manual, Section 5.5.

5.2. Clean work area before and after use. Wipe down all surfaces with 10% bleach and wait 15 minutes before rinsing with sterile water.

6. SAMPLE PURIFICATION

6.1. Place forceps in PCR Workstation #2 and turn on UV lights. Sterilize forceps for at least 2 minutes.

6.2. Use sterile forceps to transfer a filter to a PowerBead Pro Tube labeled for each sample or for controls (see section 7).

Note: Keep forceps in a small beaker of ethanol during the purification process. Dip in the ethanol and shake off excess before grasping each filter. If forceps are accidentally dropped or placed on counter, re-sterilize in PCR Workstation #2. Make sure no ethanol residue from the forceps touches the filter.

6.3. Count the number of tubes. In a 50 mL conical tube, add 800 µL of Solution CD1 X total number of tubes plus one, and 2 µL of 1E4 SKETA standard X total number of tubes plus one. Invert several times to mix well. With a 1000 µL micropipette, dispense 802 µL of Solution CD1 to each PowerBead Pro Tube. Vortex briefly on speed 7 to mix.

6.4. Place the tubes in the bead beater and shake for 45 seconds at a speed setting of 4. Make sure the tubes are sealed tightly and are balanced in the bead beater.

6.5. Centrifuge at 15000 x g for 1 min to pellet the debris.

6.6. With a 1000 µL micropipette, carefully transfer the supernatant to a new 2 mL microcentrifuge tube for each sample. The supernatant should have a volume of 500-600 µL.

6.7. With a 200 µL micropipette, add 200 µL of Solution CD2 (stored in fridge) into each tube and vortex at speed 7 for 5 seconds.

6.8. Centrifuge at 15000 x g for 1 min to pellet the debris.

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6.9. Carefully, without disturbing the pellet, transfer up to 700 µL of the supernatant to a new 2 mL microcentrifuge tube for each sample. Expect 500-600 µL.

6.10. With a 1000 µL micropipette, add 600 µL of Solution CD3 into each tube and vortex at speed 7 for 5 seconds.

Note: If Solution CD3 has precipitated, heat at 60°C until precipitate dissolves.

6.11. With a 1000 µL micropipette, transfer 650 µL of the lysate to an MB Spin Column for each sample and centrifuge at 15000 x g for 1 min. Discard the flow through. Repeat until all the solution is centrifuged through the MB Spin Column.

6.12. Carefully transfer the MB Spin Column into a clean 2 mL Collection Tube. Avoid splashing any flow-through onto the MB Spin Column.

6.13. With a 1000 µL micropipette, add 500 µL of Solution EA into each MB Spin Column.

6.14. Centrifuge at 15000 x g for 1 min. Discard the flow-through and place the MB Spin Column back into the same 2 mL Collection Tube.

6.15. With a 1000 µL micropipette, add 500 µL of Solution C5 into each MB Spin Column. Centrifuge at 15000 x g for 1 min. Discard the flow-through and place the MB Spin Column into a new 2 mL Collection Tube. Centrifuge at up to 16000 x g for 2 min.

6.16. Carefully transfer the MB Spin Column into a new 1.5 mL Elution Tube. Avoid splashing any of Solution C5 onto the Spin Filter.

Note: Solution C5 is an ethanol-based solution. Any trace of this solution can interfere with qPCR.

6.17. With a 200 µL micropipette, add 100 µL of Solution C6 onto the center of each white filter membrane.

6.18. Centrifuge at 15000 x g for 1 min and discard the MB Spin Column. Store purified DNA in the freezer. Use -20°C for short term storage and -80° C for long term storage.

7. QUALITY CONTROL

7.1. Negative Controls

7.1.1. Analyze a Method Blank (MB) control for each set of samples filtered (maximum of 13 per batch). Filter 50 mL of sterile PBS with each batch and analyze with samples.

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7.1.2. Analyze an Extraction Blank (EB) control for each set of samples extracted (maximum of 13 per batch). Place a sterile filter into a PowerBead Pro tube and extract along with samples in the batch.

7.2. Extraction Control (EC)

7.2.1. Include an EC for each assay to be analyzed for the batch (maximum of 13 samples per batch). Place a sterile filter into a PowerBead Pro tube and spike with 5 µL of E5 *B. dorei* spike, E7 BRD3GD spike, E6 Gull2 spike, or E7 C2H2 spike. Make separate ECs for each assay needed. Extract along with samples in the batch.

7.3. Sample Processing Control (SPC)

7.3.1. Add 2 µL of 1E4 SKETA standard to each PowerBead Pro Tube after adding the sample/control filter in Step 6.2. The SKETA standard is added along with Solution CD1.

7.4. Refer to SOP PCR-5.1 for further details on uploading quality control data into LIMS, including calculations and control limits.

8. SAFETY/HAZARDOUS WASTE MANAGEMENT

8.1. Wear gloves and avoid all skin contact with kit reagents.

8.2. All media/bacteria/plates/tubes must be autoclaved for 45 minutes before disposal.

8.3. Refer to the Health and Safety Plan. Read MSDS information for reagent handling and disposal.

9. REFERENCES

9.1. Qiagen DNeasy PowerSoil® Pro Kit Instruction Manual (Catalog#47014)

9.2. FDEP Laboratory Quality Assurance Manual

9.3. Health and Safety Plan

9.4. DEP SOP IZ-09, *Preparation of 80% Ethanol*

9.5. DEP SOP PCR-3.1, *Preparation of SKETA assay standards and reagents for qPCR analysis*

9.6. DEP SOP PCR-3.2, *Preparation of Bacteroides dorei (B. dorei) Assay Reagents and Standards for qPCR analysis*

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9.7. DEP SOP PCR-3.3, *Preparation of Gull2 Assay Reagents and Standards for qPCR analysis*

9.8. DEP SOP PCR-3.4, *Preparation of GFD Assay Reagents and Standards for qPCR analysis*

9.9. DEP SOP PCR-3.7, *Preparation of CowM2 Assay Reagents and Standards for qPCR analysis*

9.10. DEP SOP PCR-4.1, *Crude Lysate Extraction Method for qPCR Analysis*

9.11. DEP SOP PCR-5.1, *LIMS QC Manager Data Upload, Verification, and Sample Authorization Instructions for qPCR samples*

Appendix of Changes

05/11/2016 – Added optional method of purification that includes the use of vacuum manifold.

06/05/2017 – Added extraction controls for additional markers. Replaced bead beater and added instructions specific to new bead beater.

06/05/2018 – Updated the equipment, supplies and reagents list. Update the Health and Safety plan link.

05/28/2019 – Added extraction controls for DG3, CowM2 and HumM2 markers.

02/11/2020 – Updated the procedure with new specifications for Qiagen DNeasy PowerSoil® Pro Kit.

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