TECHNICAL BULLETIN

Wizard® Magnetic DNA Purification System for Food

Instructions for Use of Products
FF3750 and FF3751

Revised 5/17
TB284

Wizard® Magnetic DNA Purification System for Food

All technical literature is available at: www.promega.com/protocols/
Visit the web site to verify that you are using the most current version of this Technical Bulletin.
E-mail Promega Technical Services if you have questions on use of this system: techserv@promega.com

1. Description

The isolation of DNA from food using traditional protocols can be a lengthy and potentially hazardous process. Further, many procedures yield relatively low amounts of DNA or have substantial carryover of inhibitors. The Wizard® Magnetic DNA Purification System for Food[a] avoids the use of lengthy incubations with Proteinase K, the use of hazardous organic solvents such as chloroform for most samples and eliminates multiple centrifugation steps required for many common food DNA isolation procedures. The system provides a single protocol that works with a wide variety of food items and purifies a representative sample of DNA from food.

The Wizard® Magnetic DNA Purification System for Food is designed for purification of DNA from a variety of food samples including corn seeds, cornmeal, soybeans, soy flour and soy milk. In addition, DNA can be purified from processed food such as corn chips, chocolate and chocolate-containing foods; lecithin and vegetable oils also may be used with the appropriate optimized protocols. The DNA purified from many of these samples can be used in PCR-based testing for Genetically Modified Organism (GMO) DNA sequences including quantitative analysis using the TaqMan® instrument.

Note: The protocols for lecithin and chocolate use hexanes and chloroform.

1. Description (continued)

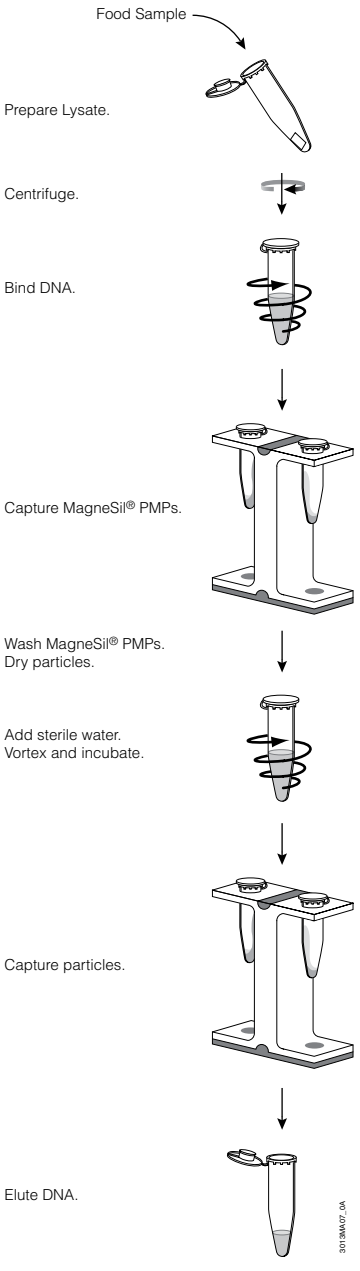

Figure 1. Schematic of DNA isolation using the Wizard® Magnetic DNA Purification System for Food.

The Wizard® Magnetic DNA Purification System for Food utilizes MagneSil® Paramagnetic Particles (PMPs). Paramagnetic particles can be considered a "mobile solid phase". Unlike column-based systems, the binding of nucleic acids to magnetic particles can occur in solution, resulting in increased binding kinetics and binding efficiency. Particles can also be completely resuspended during the wash steps of a purification protocol, thus enhancing the contact with and removal of contaminants, which increases nucleic acid purity.

Selected Citations Using the Wizard® Magnetic DNA Purification System for Food

- Bailey, A.M. *et al*. (2003) Robotic nucleic acid isolation using a magnetic bead resin and an automated liquid handler for biological agent simulants. *J. Assoc. Lab. Automation* **8(6)**, 113–20.

  This study describes the development of a system that can rapidly and accurately detect traces of biological agents from environmental samples. Using *Erwinia herbicola* and *Bacillus subtilis* var. niger as models for potential biological warfare agents, a method for DNA extraction using the Wizard® Magnetic DNA Purification System for Food, MagneSil® Blood Genomic, Max Yield System, and a combination of the two was automated on a Beckman Coulter Biomek® FX robotic liquid handling system.

For additional peer-reviewed articles that cite use of the Wizard® Magnetic DNA Purification System for Food, visit: **www.promega.com/citations/**

2. Product Components and Storage Conditions

PRODUCT	SIZE	CAT.#
Wizard® Magnetic DNA Purification System for Food	**200 preps**	**FF3750**
	400 preps	**FF3751**

Cat.# FF3750 contains sufficient reagents to perform approximately 200 × 200mg preparations.
Cat.# FF3751 contains sufficient reagents to perform approximately 400 × 200mg preparations.
Cat.# FF3750 includes:

- 100ml Lysis Buffer A, Food
- 100ml Lysis Buffer B, Food
- 1ml RNase A
- 150ml Precipitation Solution, Food
- 19ml MagneSil® Paramagnetic Particles

Note: 70% ethanol wash solution is not included. Directions for preparing solutions are provided in Section 4.

Storage Conditions: Store all components at room temperature (20–25°C).

Do not freeze MagneSil® Paramagnetic Particles.

3. Protocols

The Wizard® Magnetic DNA Purification System for Food assay procedures have been optimized for the purification of DNA from soy flour, soybeans, cornmeal, corn seeds and soymilk. Lysis Buffers, Precipitation Solution, MagneSil® PMPs and elution volumes may need to be optimized for other sample types depending on the characteristics of the starting material (DNA content, inhibitors, etc.). Some sample types may require a minimum of 1g of starting material per purification. Optimized protocols are included for lecithin, chocolate and oil. See Sections 3.C–E for protocol suggestions for these and other starting materials.

Fine particulate or liquid samples can be processed directly. Solid samples need to be finely ground for optimum yield. An economic choice for grinders may be a home coffee grinder. Other grinders, such as the Mixer Mill MM 200 (Retsch/Brinkmann) may be used if higher throughput is required. Be careful to clean the grinder with detergent and alcohol between samples to eliminate cross-contamination of samples.

The use of disposable rubber gloves is recommended to minimize potential contamination and as protection for the laboratory worker.

3.A. Sample Preparation Using 200mg of Starting Material

This protocol is intended to provide directions for isolating genomic DNA from up to 200mg (dry weight) of food material per isolation. Fifty microliters of MagneSil® PMPs (Step 8) allows the purification of up to 5µg of DNA eluted in 100µl of water (Step 14). For samples with low amounts of DNA (e.g., corn chips, cornflakes and soy milk) the procedure for 1g samples is recommended (Section 3.B). For oil samples, use the protocol provided in Section 3.C. For lecithin and chocolate samples, use the protocol provided in Section 3.D.

Materials to Be Supplied by the User
(Solution compositions are provided in Section 4.)

- 70% ethanol wash solution
- ethanol, 95% or 100%
- disposable rubber gloves
- pipette tips (ART®)
- tabletop centrifuge (capable of 13,000 × *g*)
- vortex mixer
- Nuclease-Free Water (Cat.# P1193)
- 2ml microcentrifuge tubes
- MagneSphere® Technology Magnetic Separation Stand (for 2 tubes, Cat.# Z5332; for 12 tubes, Cat.# Z5342)
- isopropanol

Before you begin, prepare wash solution (Section 4).

1. Weigh out 200mg of food material and transfer to a 2ml microcentrifuge tube.
2. With the tube tilted to one side and the dry material covering the side of the tube, add 500µl of Lysis Buffer A and 5µl of RNase A to the sample. Cap the tube and mix by vortexing vigorously.

   Note: Depending on the volume and characteristics of the starting material, the volume of lysis buffer may have to be adjusted. To promote ease of sample handling, we recommend that the sample remain at the side of the tube while adding the reagents. If the sample material clumps in the bottom of the tube and is not resuspended by vortexing, a pipette tip may be used to manually resuspend the sample.
3. Add 250µl of Lysis Buffer B and vortex for 10–15 seconds to mix. Lay the capped tube on its side so the material coats the side of the tube.
4. Incubate for 10 minutes at room temperature (22–25°C).
5. Add 750µl of Precipitation Solution, then vortex vigorously.

   Note: For most samples, the mixture will be green in color at this point. The sample should be evenly suspended in the mixture. If vortexing is not effective, the tube may be shaken vigorously to resuspend material. A clean small pipette tip may also be used to break up clumps.
6. Spin for 10 minutes in a microcentrifuge at high speed (13,000 × *g*).
7. Transfer the supernatant (liquid phase) to a fresh 2ml microcentrifuge tube.

   Note: If floating material is present on top of the liquid, carefully pipet under it, avoiding aspiration of floating material.
8. Vigorously mix the bottle of MagneSil® PMPs for 15–30 seconds to ensure that the particles are thoroughly resuspended. Add 50µl of resuspended MagneSil® PMPs to the supernatant. Vortex the tube vigorously. Note the volume of liquid in the tube.

   ! MagneSil® PMPs must be thoroughly resuspended before being dispensed from the bottle.
9. Add 0.8 volume of isopropanol (e.g., for 1,000µl of supernatant, add 800µl of isopropanol). Invert the tube 10–15 times to mix. Incubate for 5 minutes at room temperature (22–25°C) with occasional mixing, washing the inner surfaces of the tube as well as the particles. Insert tubes into the MagneSphere® Technology Magnetic Separation Stand and leave in place for 1 minute. Leaving the tubes in the stand, discard the liquid phase by decanting or pipetting.
10. Remove tube from the stand and add 250µl of Lysis Buffer B to the particles. Invert the tube 2–3 times to mix. Replace tube on the Magnetic Separation Stand, and allow particles to collect for 1 minute. Remove the liquid as in Step 9.

3.A. Sample Preparation Using 200mg of Starting Material (continued)

11. Resuspend particles in 1ml of 70% ethanol wash solution, and return the tubes to the magnetic stand for 1 minute. Remove and discard solution as in Step 9.
12. Repeat Step 11 twice for a total of 3 washes. Using a pipette, remove as much of the liquid phase as possible in the last wash. Discard.
13. Dry the particles at room temperature for 15–30 minutes (or at 65°C for 10 minutes). Drying times may be extended depending on ambient conditions. For more information about drying conditions see Section 3.E.
14. Add 100µl of TE buffer or Nuclease-Free Water, vortex to mix and incubate at 65°C for 5 minutes. Insert the tube into the Magnetic Separation Stand for 1 minute. Collect the DNA by leaving the tube in the stand and carefully transferring the liquid to a fresh tube. If the final volume is less than 100µl, bring the volume to 100µl by adding Nuclease-Free Water.

3.B. Sample Preparation Using 1g of Starting Material

This procedure is recommended for samples that contain low amounts of DNA, for example, corn and tortilla chips, cornflakes, cornstarch, tofu and soy milk.

The volume of material may be adjusted to accommodate different needs, applications and required DNA yield. Reagent volumes should be adjusted proportionally. For scaled-up preparations, we recommend using 50ml tubes (rather than 15ml). It is not necessary to adjust MagneSil® PMPs to volumes greater than 100µl unless more than 10µg of DNA is desired.

Materials to Be Supplied by the User
(Solution compositions are provided in Section 4.)

- 70% ethanol wash solution
- ethanol, 95% or 100%
- disposable rubber gloves
- vortex mixer
- disposable sterile pipettes (5ml)
- pipette aid
- Sorvall® tabletop centrifuge, or equivalent, capable of holding 50ml tubes and spinning at 3,000–5,000 × *g*.
- pipette tips (ART®)
- Nuclease-Free Water (Cat.# P1193)
- PolyATtract® System 1000 Magnetic Separation Stand (for 1 tube, Cat.# Z5410)
- 50ml conical tubes
- isopropanol

Note: Although either can be used, Corning® tubes fit into the Magnetic Separation Stand easier than Falcon® tubes.

Before you begin, prepare wash solution (Section 4).

1. Weigh 1g of material and place in a 50ml conical tube.
2. With the tube tilted to one side and the dry material covering the side of the tube, add 2.5ml of Lysis Buffer A and 25µl of RNase A to the sample. Cap the tube and mix by vortexing.

   Note: Depending on the volume and characteristics of the starting material, the volume of lysis buffer may have to be adjusted. To promote ease of sample handling, we recommend that the sample remain at the side of the tube. Should the sample material clump in the bottom of the tube and the material cannot be resuspended by vortexing, a pipette tip may be used to manually resuspend the sample.
3. Add 1.25ml of Lysis Buffer B and vortex for 10–15 seconds to mix. Lay the capped tube on its side so the material coats the side of the tube.
4. Incubate for 10 minutes at room temperature (22–25°C).
5. Add 3.75ml of Precipitation Solution, then vortex vigorously.

   Note: For most samples, the mixture will be green in color at this point. The sample should be evenly suspended in the mixture. If vortexing is not effective, the tube may be shaken vigorously to resuspend material. A clean small pipette tip may also be used to break up clumps.
6. Spin in a centrifuge for 10 minutes at 3,000–5,000 × *g*.

   Note: For 50ml tubes, centrifuge at highest possible speed in a Beckman or Sorvall® tabletop centrifuge. If separation is incomplete, extend centrifugation time to 20 minutes.
7. Transfer the supernatant (liquid phase) to a fresh 50ml tube.

   Note: If floating material is present on top of the liquid, carefully pipet under it, avoiding aspiration of floating material.
8. Vigorously mix the bottle of MagneSil® PMPs for 15–30 seconds. Add 100µl of resuspended MagneSil® PMPs to the supernatant. Vortex the tube vigorously. Note the volume of liquid in the tube.

   MagneSil® PMPs must be thoroughly resuspended before being dispensed from the bottle.

   Note: Unless more than 10µg of DNA is required, no more than 100µl of MagneSil® PMPs should be used.
9. Add 0.8 volume of isopropanol (e.g., for 4ml of supernatant, add 3.2ml of isopropanol) and invert the tube 10–15 times to mix. Incubate for 5 minutes at room temperature (22–25°C) with occasional mixing. Insert tubes into a PolyATtract® System 1000 Magnetic Separation Stand for 1 minute. Leaving the tube in the stand, discard the liquid phase by decanting into a waste container or by pipetting.
10. Remove tube from the stand and add 1.25ml of Lysis Solution B to the particles. Invert the tube 2–3 times to mix, washing the inner surfaces of the tube as well as the particles. Replace tube on the Magnetic Separation Stand, and allow the particles to separate 1 minute, then remove the liquid as in Step 9.

11 Resuspend the particles in 5.0ml of 70% ethanol wash solution, and place the tube back on the Magnetic Separation Stand for 1 minute. Remove and discard solution as in Step 9.

3.B. Sample Preparation Using 1g of Starting Material (continued)

12. Repeat Step 11 twice for a total of 3 washes. After the final wash, remove and discard as much of the liquid phase as possible using a pipette.

13. Dry the particles at room temperature for 15–30 minutes (or at 65°C for 10 minutes). Drying times may be extended depending on ambient conditions. For more information about drying conditions, see Section 3.E.

14. Add 100–400µl of TE buffer or Nuclease-Free Water, vortex to mix and incubate at 65°C for 5 minutes. Use a smaller amount of elution volume for samples containing smaller amounts of DNA. Insert the tube in the Magnetic Separation Stand for 1 minute. Collect the DNA by leaving the tube in the stand and carefully transferring the liquid phase to a fresh tube.

    Note: If more than 100µl of MagneSil® PMPs are used, the volume of Nuclease-Free Water may need to be adjusted.

3.C. Purification of DNA from Vegetable Oils (e.g., Corn, Canola and Soy Oils)

This protocol was developed using 160g samples of soy, corn or canola oils and yields sufficient DNA for 6 PCR amplifications using 5µl of template in a 50µl reaction. DNA purified from oil is of low molecular weight, and 10µl of the DNA run on an agarose gel may not be visible. However, PCR amplification using the proper controls for chloroplast or lectin targets will demonstrate the presence of DNA.

This protocol can also be performed using a 500g sample if more DNA is needed for archiving. The larger sample size will require bottles and a floor model centrifuge with rotors to accommodate them. To purify DNA from a 500g sample, the volumes of the Lysis A, Lysis B and Precipitation Solutions should be twice those listed for the 160g sample. The amount of MagneSil® PMPs does not need to be increased.

Depending on the application, different amounts of DNA may need to be added to PCR for quantitative amplification procedures. The amount of DNA should be determined experimentally. The recovered DNA is difficult to measure because of the low concentration, small size and the presence of single-stranded DNA. The DNA yield from 160g of oil is estimated at about 100–200ng based on performance in PCR amplifications.

Before you begin, prepare wash solution (Section 4).

1. Weigh out oil. Add 40g/tube to four 50ml polypropylene tubes.
2. Add 2ml of Lysis Buffer A to each tube, and mix well by shaking the tubes until the aqueous phase is well mixed with the oil. The sample will become opaque and lighter in color when mixed.
3. Add 1ml of Lysis Buffer B to each tube and mix well as in Step 2.
4. Incubate for 10 minutes at room temperature, mixing twice during this time.
5. Add 3ml of Precipitation Solution to each tube, and mix vigorously for 1 minute until evenly dispersed. The sample will have a greenish color.
6. Centrifuge at 4,000 × *g* for ≥20 minutes. It is important to separate the oil from the lysate by centrifugation until the aqueous phase is separated from the oil, with a compact white interface in between.
7. Remove the oil (top layer) with a 10ml pipette and discard. Leave 5cm remaining on top of the interface.

   Note: The lysate must be clear and free from oil and white interface material.
8. Using a pasteur or 1ml pipettor, pierce through the interface and collect the blue aqueous layer. Wipe the tip of the pipette with a Kimwipes® tissue so that oil and interface material is not carried over into the lysate. Pool the lysate from all four tubes in a clean 50ml tube. Note the final volume.
9. Vigorously mix the bottle of MagneSil® PMPs for 15–30 seconds. Add 50µl of resuspended MagneSil® PMPs to the lysate and vortex briefly.

   ! MagneSil® PMPs must be thoroughly resuspended before being dispensed from the bottle.
10. Add 0.9 volumes of isopropanol and mix well. Incubate for 1 hour with intermittent mixing to ensure binding of the small DNA fragments.

    Note: See Section 3.E for details about isopropanol volumes.
11. Place tube in a PolyATtract® System 1000 Magnetic Separation Stand and allow the particles to bind for 1 minute. Pour off supernatant to waste.
12. Wash the particles in 1–2ml of 70% ethanol. Remove the supernatant as in Step 10.
13. Repeat Step 12 for a total of 3 washes.
14. Allow the particles to dry in the uncapped tube for 15–20 minutes.
15. Add 30–40µl of TE buffer or water, vortex and place on a 65°C heat block for 5 minutes. Place the tube in the Magnetic Separation Stand. Collect the DNA by leaving the tube in the stand and carefully transferring the liquid phase to a fresh tube.

3.D. Purification of DNA from Lecithin and Chocolate

Isolation of DNA from lecithin is difficult due to the large amount of phospholipids and oils present. When mixed with aqueous lysis solutions, it forms an emulsion that is difficult to separate by centrifugation. This modified protocol uses hexane, a nonpolar solvent, to extract the lipid component of the lecithin, allowing the DNA to be released into the lysis buffers. A chloroform extraction is also used to aid in the phase separation.

Lecithin contains a small amount of DNA, which may not be visible on an agarose gel and is difficult to measure by standard methods. For liquid lecithin, a 5–10g sample may be used; for dry lecithin, use a 5g sample. When eluted with 100µl TE or water, there is sufficient DNA to perform up to 40 PCR amplifications using 2.5µl of template in a 50µl reaction volume. The amount of DNA used may need to be optimized for each protocol.

Chocolate is perhaps the most difficult sample from which to obtain clean amplifiable DNA. In addition to lecithin, cocoa, cocoa butter, sugar, vanilla and sometimes milk solids are used in the preparation of chocolate. Cocoa is difficult to remove and some carries over into the precipitation step. The Lysis Buffer B wash is very helpful in obtaining a clear eluate of amplifiable DNA. From a 5–10g sample, it is possible to perform up to 40 PCR amplifications using 1–2.5µl of eluate in a 50µl PCR amplification. The amount of DNA used may need to be optimized for each protocol.

Materials to Be Supplied by the User
(Solution compositions are provided in Section 4.)

- hexane
- chloroform

1. Weigh 10g of liquid lecithin, 5g of dry lecithin granules or 5–10g chocolate sample in a 50ml polypropylene tube.
2. For all pure lecithin samples, add 8ml of Lysis Buffer A, 4ml of Lysis Buffer B, and 20–25ml of hexane. Mix well until all of the sample has gone into solution. This may take a few minutes depending on the viscosity of the sample.

   For chocolate, add the two Lysis Buffers and place the tube in a beaker containing hot water until the chocolate is melted and completely mixed, then add 20–25ml of hexane.
3. Centrifuge at 3,000 × *g* for 5 minutes. There should be a clear separation of the hexane (top layer) and aqueous phase (bottom layer) with a varying amount of interface (see Step 5). Remove hexane and discard to waste.

   Note: For liquid lecithin samples, the aqueous phase is about 12ml, the total of the lysis buffer volumes. Most of the lecithin is extracted into the hexane.
4. Add another 20ml of hexane, mix and repeat centrifugation and removal of hexane layer.
5. For dry lecithin and chocolate samples, use a Pasteur pipette or pipettor to remove the aqueous phase, while avoiding the thick white interface (lecithin) or dark brown viscous material (chocolate). Transfer the lysate into a clean tube. Wipe the outside of the pipette tip between each transfer. For liquid lecithin, this step may be skipped.

6. Add 12ml of Precipitation Solution and mix well. Add 20ml chloroform and mix by shaking the tube for 1 minute.
7. Centrifuge at 3,000 × *g* for 5 minutes. Transfer the aqueous phase (top) to a clean tube, avoiding the interface material.
8. Vigorously mix the bottle of MagneSil® PMPs for 15–30 seconds. Add 50µl of MagneSil® PMPs and mix by vortexing briefly.

! MagneSil® PMPs must be thoroughly resuspended before being dispensed from the bottle.

9. Add 0.9 volume of isopropanol and mix well. Incubate for 20 minutes at room temperature.
10. Place tube on a PolyATtract® System 1000 Magnetic Separation Stand and allow particles to bind for 1 minute. Pour off supernatant to waste.
11. Remove the tube from the stand. Add 3ml of Lysis Buffer B, mix briefly and place the tube back on the stand. Pour off Lysis Buffer B wash to waste.
12. Wash the particles in 3ml 70% ethanol. Remove the solution as in Step 10.
13. Repeat Step 12 for a total of 3 washes.
14. Allow the particles to dry in an open tube for 20 minutes.
15. Add 100µl of TE or water, vortex and incubate for 5 minutes at 65°C. Place on the Magnetic Separation Stand and allow particles to settle. Remove eluate to a clean labeled tube.

3.E. Protocol Notes

1g Sample Preparation

Use 50ml tubes, rather than 15ml tubes, for large sample preparations. In 15ml tubes, lysates from many sample types tend to form an insoluble clump that is difficult to suspend in solution and mix by vortexing. This significantly decreases the yield of purified DNA.

Processing Highly Absorbent Foods

Cornflakes and cornstarch may require increased reagent volumes for efficient lysing and release of DNA. As DNA amounts are low in these samples, a 1g or greater sample size is recommended. Volumes of Lysis Buffer A, Lysis Buffer B and Protein Precipitation Solution all should be increased proportionally (i.e., 2X), but the volume of MagneSil® PMPs does not need to be increased.

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Washing MagneSil® PMPs with Lysis Buffer B (Section 3.A and B, Step 10)

For some sample types (e.g., cornflakes), washing with Lysis Buffer B in Step 10 removes a variety of impurities that might otherwise inhibit downstream applications such as PCR. Although some sample types do not require a wash with Lysis Buffer B for acceptable DNA purity, we recommend the Lysis Buffer B wash step for all samples to ensure the elimination of nucleases from the final DNA. It is important to wash the inside of the tube and cap, as well as the particles, with Lysis Buffer B to eliminate all potential nuclease contamination.

Drying MagneSil® PMPs (Section 3.A and B, Step 13)

After washing the MagneSil® PMPs with the 70% ethanol wash solution, the ethanol will evaporate, leaving some amount of water on the particles. It is not necessary to dry the MagneSil® PMPs to completion. Importantly, overdrying of the particles, particularly by extensive incubation at 65°C, will significantly decrease the yield of DNA obtained from this protocol. If the ethanol is not entirely evaporated prior to the elution step, leaving the cap off of the tube during the 65°C drying step (Section 3.A and B, Step 13), will help eliminate any residual ethanol.

DNA Elution Resulting in a Cloudy Solution

For some sample types, particularly liquids such as corn syrup, DNA purification is more difficult. With these samples, the DNA eluted may be in a cloudy solution. We recommend centrifuging the solution to separate the DNA from the impurities and removing the DNA-containing supernatant to a fresh tube. Additionally, the DNA isolation can be repeated with two washes with Lysis Buffer B at Step 10. Extraction of the DNA with organic solvents such as chloroform may remove the impurities; however, this may result in a lower DNA yield, as well as require removal of the residual organic solvent. If not removed, solvents may inhibit downstream applications such as PCR.

Note: Chloroform is used in the protocols for lecithin and chocolate; however, the solvent is removed before the ethanol step.

Processing Vegetable Oils

Because of the extensive processing of vegetable oils, the amount of DNA present may be quite variable and often extremely low. In addition, the DNA that is present is generally of low molecular weight. It is essential to use 0.9 volume of isopropanol in Section 3.C, Step 10, rather than the 0.8 volumes used with other sample types. This will ensure that these very low-molecular-weight DNAs are bound to the MagneSil® PMPs. However, using more than a 0.9 volume of isopropanol may result in an additional phase separation and should be avoided.

4. Composition of Buffers and Solutions

70% ethanol wash solution

Add 70ml of 100% ethanol to 30ml of Nuclease-Free Water, or add 74ml of 95% ethanol to 26ml of Nuclease-Free Water. Mix well. The total resulting volume should be 96ml.

5. Related Products

Product	Size	Cat.#
MagneSphere® Technology Magnetic Separation Stand (two-position)	1.5ml	Z5332
MagneSphere® Technology Magnetic Separation Stand (twelve-position)	1.5ml	Z5342
PolyATtract® System 1000 Magnetic Separation Stand	1 each	Z5410
Nuclease-Free Water	50ml (2 × 25ml)	P1193
Lysis Buffer A, Food	100ml	A8191
Lysis Buffer B, Food	100ml	Z3191
Precipitation Solution, Food	150ml	Z3201
RNase A Solution, 4mg/ml	1ml	A7973

6. Summary of Changes

The following changes were made to the 5/17 revision of this document:

1. Discontinued products were removed from Related Products.
2. The document design was updated.

[a]U.S. Pat. Nos. 6,027,945 and 6,368,800, Australian Pat. No. 732756, Japanese Pat. No. 3253638, Mexican Pat. No. 209436 and other patents pending.

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