



GenSolve™ **DNA COMPLETE**

GSC-50A & GSC-100A

User Guide

**DNA recovery and purification from
Ahlstrom GenSaver™ cards, FTA® paper,
Guthrie Cards, GenPlate® elements
and other papers**

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GenSolve DNA Recovery
Quick Guide
Simple Recovery Protocol

Step 1

Set incubator to 56°C

Step 2

Add 609 uL of Lysis solution, then add 11 uL of Proteinase K to each DBS sample tube

Step 3

Incubate at 56°C for 1½ hours with agitation at 1400 rpm

Step 4

Transfer solution plus paper to Spin Basket then centrifuge. Add Recovery Solution B

Step 5

Proceed with DNA purification



GenSolve DNA Purification

Quick Guide

Simple Purification Protocol

Step 1

Add 600 μ l of 100% Ethanol to the extracted DNA solution, add to the purification column

Step 2

**Mix Wash 1 and Wash 2 in equal volumes
Wash column with 500uL of this mixture**

Step 3

Wash column with 500uL of Wash Solution 3

Step 4

Elute DNA

Step 5

Concentrate DNA (Optional)



Overview

The GenSolve DNA Complete kit recovers double-stranded DNA from paper spotted with blood or other biological material, regardless of storage time, for subsequent purification. DNA can be efficiently recovered from treated paper (i.e. FTA, GenPlate elements, and GenSaver™ cards) and untreated paper (i.e. Guthrie cards, GenCollect™ cards). The FTA chemistry, available in a 384-well format as GenPlates, lyses blood cells upon contact and exposing the DNA, stabilizing it at room temperature.

The Protease component of GenSolve, coupled with lysis solution, enhances digestion of dried biological material when held at an elevated temperature, liberating bound DNA from the paper. The resulting lysate, which is a mixture of DNA, cellular debris, and FTA chemicals (if applicable) is then applied directly onto a purification column. Subsequent washing steps separate the DNA from cellular material. A final elution step results in purified DNA ready for most genetic analysis techniques.

Recovered DNA may be at a concentration too low to be measured by traditional spectrophotometry, i.e. NanoDrop. A fluorimeter method such as PicoGreen or quantitative PCR is recommended for quantitation.



Product specifications

GenSolve DNA Complete is designed to meet the following performance specifications when recovered from whole blood applied to 6 mm disks of paper.

Yield - The expected yield range is 50 to 350 ng/disk, depending on the white blood cell content of the original sample. The expected average yield is 130 ng/disk.

Concentration - The expected range is 0.5 to 2 ng/ μ L.

Size - The majority of fragments are at least 35 kb.

Reproducibility - <20% CV between triplicate samples and between assays.

Quantity - Expected range of purified DNA is 130 ng

PCR amplification - Successful amplification with primers used in both research and clinical laboratories.

Next Generation Sequencing—Successful whole genome

Safety information

The kit is intended for laboratory use only. Certain chemicals used in GenSolve reagents may be hazardous: lithium dodecyl sulfate, guanidinium-HCl.

Certain chemicals present in FTA paper may be hazardous and this kit: sodium dodecyl sulfate, uric acid, and EDTA, (ethylenediaminetetraacetic acid). GenSolve DNA contains Protease K which is a sensitizer and an irritant. Care should be taken when working with hazardous chemicals, such as minimizing contact and wearing appropriate personal protective equipment (safety glasses, gloves and a lab coat). Avoid contact with eyes and ingestion.



Kit contents GSC-50A

1. Lysis solution (LS); 62 mL, 1 bottles
2. Proteinase K solution; 0.6 mL, 1 vial, yellow cap
3. Recovery Solution B; 2.2 mL, 1 vial, white cap
4. Wash Solution 1 (WS1), 28 mL, 1 bottle ‡
5. Wash Solution 2 (WS2), 28 mL, 1 bottle ‡
6. Wash Solution 3 (WS3), 11 mL, 1 bottle ≡
7. Elution Buffer (EB), 25 mL, 1 bottle
8. Screw cap tubes & caps, 1.5 mL 50 ea.
9. Spin Basket/2 ml Dolphin-Tube Assembly, 50 ea.
10. Collection tubes, 2.0 mL, 150 ea.
11. DNA columns, 50 ea.
12. User Guide

‡ Add 12 ml of 100% Ethanol to complete WS1 and WS2

≡ Add 45 mL of 100% Ethanol to complete WS3

Note: See page nine for additional guidance

See page 22 for Trial Kit, GSCT-25, contents

An additional 30 mL of 100% Ethanol is required for addition to individual samples.



Kit contents GSC-100A

1. Lysis solution (LS); 62 mL, 1 bottles
2. Proteinase K solution; 0.6 mL, 2 vial, yellow cap
3. Recovery Solution B; 2.2 mL, 1 vial, white cap
4. Wash Solution 1 (WS1), 28 mL, 1 bottle ‡
5. Wash Solution 2 (WS2), 28 mL, 1 bottle ‡
6. Wash Solution 3 (WS3), 11 mL, 1 bottle ‡
7. Elution Buffer (EB), 25 mL, 1 bottle
8. Screw cap tubes, 1.5 mL 100 ea.
9. Spin Basket/2 ml Dolphin-Tube Assembly, 100 ea.
10. Collection tubes, 2.0 mL, 300 ea.
11. DNA columns, 100 ea.
12. User Guide

‡ Add 12 ml of 100% Ethanol to complete both WS1 and WS2

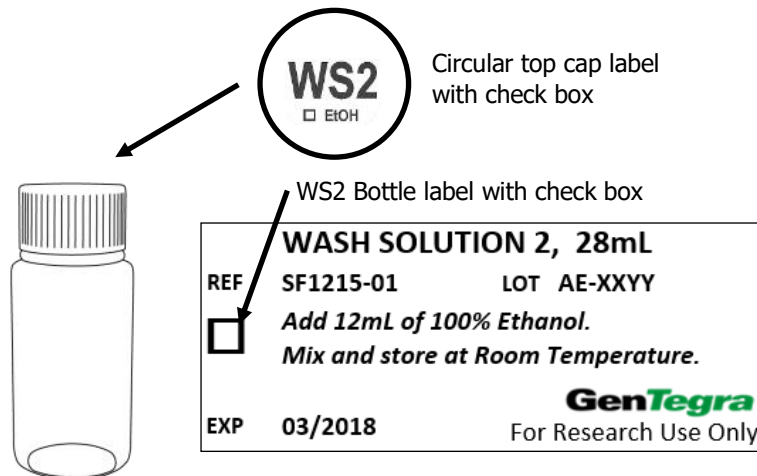
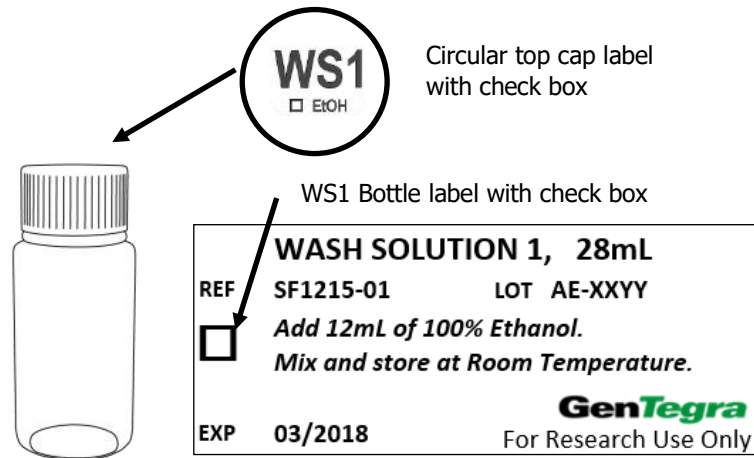
‡ Add 45 mL of 100% Ethanol to complete WS3

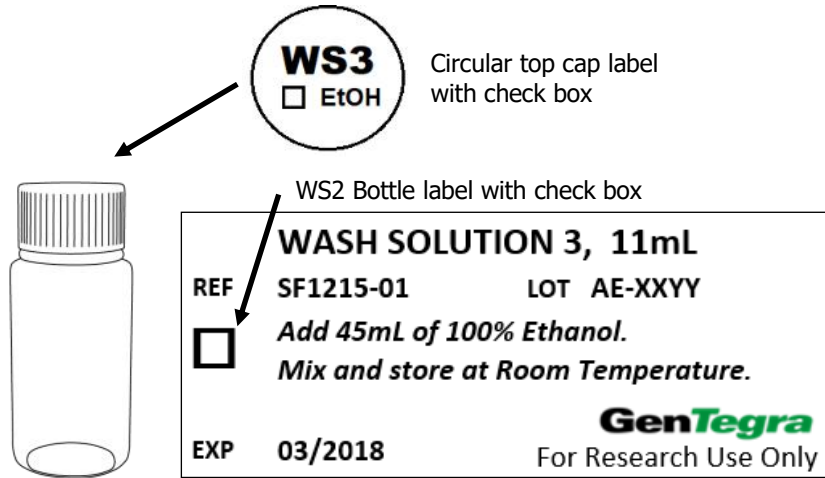
Note: See page nine for additional guidance

An additional 60 mL of 100% Ethanol is required for addition to individual samples.

Check boxes to prevent errors

Wash solutions WS1 , WS2, and WS3 are provided with check boxes on the bottles labels. Use the check box to confirm that the 100% Ethanol has been added and the wash solution is complete and ready to use. After adding the 100% Ethanol check either or both boxes. After Ethanol addition each wash solution is stable for one year at room temperature (i.e. 25°C).





For use with GenSolve GSC-50A and GSC-100A

GenPlates[®], other FTA-based storage papers, Ahlstrom-Munksjö GenSaver[™] cards and all other Dry Blood Spot (DBS) samples.



GenPlate GVN24P shown



Ahlstrom-Munksjö GenSaver[™] card for DNA



Storage

Proteinase K should be stored at 2-8°C upon arrival. It has a shelf life of 6-months from date of shipment.

All other components can be stored at either room temperature or 2-8 °C.

After addition of Protease K, Lysis Solution should be used within 2-3 hours for maximum DNA yield.

Additional equipment and materials required

- The **Thermomixer Compact** model thermal shaker is highly recommended to ensure proper vigorous shaking is provided. It is the one we use in our laboratory.
- Ethanol, 100% Molecular Biology Grade
- Microcentrifuge Tubes
- Millipore Microcon MRCF0R100 (optional)
- P20, P200 and P1000 pipettes, pipette tips
- Microcentrifuge

GenSolve protocols

DNA recovery

Notes: This protocol can efficiently process GenPlate elements and 6 mm punches from GenSaver, GenCollect, FTA or Guthrie cards. For maximum DNA yield, ensure that spotted paper has been cured for at least two weeks. If higher concentrations or more DNA is desired, up to three elements (6 mm disks) can be processed simultaneously without changing protocol. Do not use more than 3 punches, see page 22.

Note: Pre-heat Incubator/Shaker to 56°C.



1. For each reaction combine 609 μL of Lysis Solution with 11 μL of Proteinase K in 2 ml screw cap dolphin tube.
2. Close cap and vortex briefly to mix Solution. (Stable at RT for 2-3hrs)



Note: After addition of Protease, Lysis Solution should be used within 2-3 hours for maximum recovery.

4. Punch up to three 6 mm Died Blood Spot elements into a 1.5 mL screw top tube containing Lysis Solution + Proteinase K.



5. Close cap and place on Incubator/vortex Shaker and shake at 1400 rpm for 1.5 hr at 56°C.

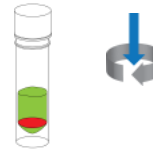




6. After removing the samples from shaker, preheat 140 μ L of elution buffer per sample in 56°C bath for later use in DNA purification at (Step 10, page 17).



7. Remove sample tubes from shaker, vortex samples for 5 sec then briefly centrifuge.



8. Place spin baskets in 2 mL snap cap dolphin tubes. (Hint: Transfer the majority of lysis supernatant to the dolphin tube before placing spin basket in dolphin tube.)



9. Use pipette to transfer the DBS and then pipette the remaining mixture into the spin basket.



10. Close cap and centrifuge at 16,300 x g or greater for two minutes. (Discard spin basket and element)



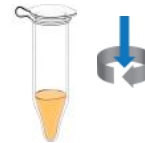
11. Add 20uL of Recovery Solution B to filtrate in each 2.0mL dolphin tube.



11. Add 600 μ L of 100% Ethanol to each sample.



12. Close cap and vortex for 5 sec then briefly centrifuge.



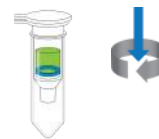
13. The DNA solution is now ready for the DNA purification protocol.



Proceed directly to DNA purification on next page.

DNA purification

1. Place DNA column in a fresh collection tube.
2. Transfer 600 μ L of DNA solution from step 13 on the previous page to the DNA column.
3. Close cap and spin down at 6000 x g for 30 sec , discard filtrate.
4. Repeat steps 2 & 3 until all sample has been loaded on the column.
5. Combine 250 μ L of WS1 and 250 μ L of WS2 per sample and mix.* Add 500 μ L of Wash 1+2 mixture to DNA column.**
6. Close cap and spin down at 6000 x g for 30 sec, discard filtrate and collection tube.



* **Note:** Make certain that 100% ethanol has already been added to both Wash Solution 1 and 2 prior to mixing.

** **Note:** Alternately, heat WS1 and WS2 to 56°C before mixing, as this improves the absorbance readings in the final solution.



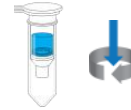
7. Place DNA column in new collection tube.



8. Add 500 μ L of WS3* to DNA column.

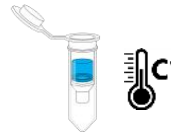


9. Close cap and spin tube and column at 6000 x g for 3 minutes, discard filtrate. Place tube and column in centrifuge again and spin 16,000 x g for 1 min. to dry column.



Note: Do not deviate from centrifuge times and speeds, over drying the column can lead to decreased DNA yield.

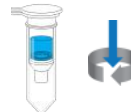
10. Place spin column in new 2mL collection tube and add 100 μ L of 56°C Elution buffer. Discard old tube.



11. Incubate for 1 min at Room Temperature (21-25°C).



12. Spin columns at 6,000 x g for 1 min, discard column.



13. Transfer eluent to an RNase/DNase free flip-cap or screw cap tube. The eluate is ready for quantitation and downstream analysis. To concentrate DNA, proceed to protocol on next page.



* **Note:** Make certain that 100% ethanol has been added to Wash Solution 3.




DNA concentration (Optional)

This addendum will assist in concentrating recovered DNA. Note: protocol requires Millipore Microcon YM- 100 (Millipore #42413) columns.

Do not allow Microcon membrane to dry with sample on it. Do not touch the membrane with pipet tip during sample addition or wash steps. When washing and concentrating gDNA samples, do not spin at more than 500 x g (2400 rpm).

1. Insert MICROCON-YM-100 sample reservoir into a microfuge tube.
2. Add 50 μ L of water and spin at 14,000 x g for 3 minutes.
3. Apply up to 500 μ L of SAMPLE onto MICROCON-YM-100.
4. Spin 500 x g for 15 minutes (LOW SPEED SPIN).
5. Decant microfuge tube and repeat steps 3 and 4 until the entire sample has been applied.
6. Transfer MICROCON-YM-100 to a new microtube.
7. Add 250 μ L of water to MICROCON-YM-100.
8. Spin at 500 x g for 15 minutes (LOW SPEED SPIN).
9. Optional: decant microcentrifuge tube and repeat steps 7-8.

- 
10. Continue to centrifuge until ~25µl remains on the column. For maximum recovery, do not spin to dryness. If processing multiple MICROCON-YM-100 units, independently monitor each unit, as they concentrate at different rates.
 11. Gently pipette mix the ~25 µL being careful not to touch the filter at the bottom of the filtration unit.
 12. Invert MICROCON-YM-100 and transfer into a new microcentrifuge tube.
 13. Spin at 1,100 x g for 3 minutes to collect the DNA.



Notes on the age of DBS samples

Overview

The age of a DBS has a marked affect on the recovery of DNA and how much agitation is required to provide optimum recovery of DNA. DBS samples that are less than 2-years old require much more vigorous mixing to provide the expected yield of DNA. As most DBS samples are archived for longer than two years before use our standard extraction protocol is for older (> 2-years old) samples.

DBS samples greater than 2-years old

The protocol details provide in step 8 of page 9 are those for older DBS. If fraying of the paper disks is noted then recoveries should be good.

DBS samples less than 2-years old

DBS samples that are less than 2-years old require more vigorous agitation and the paper matrix needs to be fully disrupted to ensure good yields of DNA. These fresher samples are harder to extract because the proteins in conjunction with the paper matrix act as a glue/shield to the GenSolve reagents and prevent access to the DNA. Strong mechanical agitation or vigorous vortexing every 5-minutes may be necessary to completely disrupt the paper matrix. Cutting the paper disk into very small pieces before extraction may also improve DNA extraction.

These extra mechanical efforts are not harmful to the quality of the DNA and are not required for older DBS samples. We do not recommend extra or prolonged heating to improve extraction as it will affect the quality of the DNA.



Frequently asked questions (FAQs)

How can I convert RPM to g (rcf)?

Use the correct centrifugation speeds in order to maximize yield and purity. Check your centrifuge setting using the following equation:

$g(\text{rcf}) = 1.12 * r * (\text{rpm}/1000)$, where r is the radius of the rotor in mm.

You recommend the Eppendorf Thermomixer Compact is this specific model important or will any thermal shaker work as well?

The application of vigorous shaking is important if freeing the DNA from the paper matrix. Without vigorous shaking the quantity of DNA extracted can be lower than what our reported values. The Thermomixer Compact is the model we use routinely in our testing as it provides the required level of vigorous shaking to ensure proper DNA extraction.

I left my Proteinase K out at room temperature. Can I still use it?

Yes, up to 24 hours. Store the proteinase at 4°C. Refer to page 9 for additional storage information.

How do I get a material safety data sheet (MSDS)?

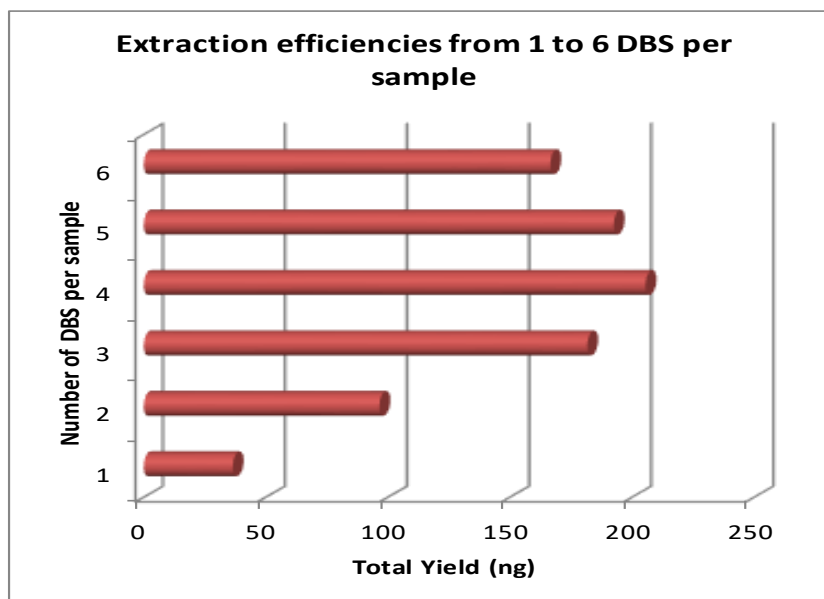
MSDS documents are available by contacting Technical Support at support@gentegra.com.

Where can I find further information about DNA quantitation and setting up a PicoGreen assay?

Refer to PicoGreen Assay Protocol provided by supplier.

My FTA Classic discs are not 6 mm, how many can I use?

A 6 mm disc is ($\pi \cdot r^2$) or 28.27 mm², whatever the size of your paper discs the total area of paper used should not exceed 85 mm² for maximum efficiency. Three 6 mm discs is optimum. See chart below.



Data in this figure is for extraction of DNA from FTA Classic paper or Whatman 903.

I am using GenSaver paper how much can I use for optimum DNA extraction?

Optimum yield is obtained by using $\frac{1}{4}$ of the circle for a single extraction. This is 123 mm² or four 6 mm discs.



Trial Kit contents GSCT-25

1. Lysis solution (LS); 16 mL, 1 bottles
2. Proteinase K solution; 0.3 mL, 1 vial, yellow cap
3. Recovery Solution B; 1 mL, 1 vial, white cap
4. Wash Solution 1 (WS1), 28 mL, 1 bottle ‡
5. Wash Solution 2 (WS2) 28 mL, 1 bottle‡
6. Wash Solution 3 (WS3), 11 mL, 1 bottle ‡
7. Elution Buffer (EB), 15 mL, 1 bottle
8. Screw cap tubes, 1.5 mL 25 ea.
9. Spin Basket/2 ml Dolphin-Tube Assembly, 25 ea.
10. Collection tubes, 2.0 mL, 75 ea.
11. DNA columns, 25 ea.
12. User Guide

‡ Add 12 mL of 100% Ethanol to WS1

‡Add 12 mL of 100% Ethanol to WS2

‡ Add 45 mL of 100% Ethanol to WS3

Note: See page nine for additional guidance

An additional 30 mL of 100% Ethanol is required for addition to individual samples.



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