RNArchive

GTR5100-S and GTR5025-S

User Guide

* Due to plastic shortages that occurred during the COVID-19 pandemic you may receive RNArchive tube that have a grey or blue stripe cap. We will return to using only solid blue caps when they are available.

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FOR RESEARCH USE ONLY

RNArchive™

Part No: GTR5100-S

Overview

RNArchive stops RNA degradation at the source by stopping RNase activity as soon as it is added to the RNA solution. RNArchive also prevents hydrolysis and oxidation, while freezing merely slows these processes. Your RNA samples are stabilized in both the liquid form for safer handling, and after drying for shipping or long term storage. RNArchive is insurance against delays when shipping RNA samples.

(For more information on various formats of RNArchive, contact info@amsbio.com)

Product Specifications

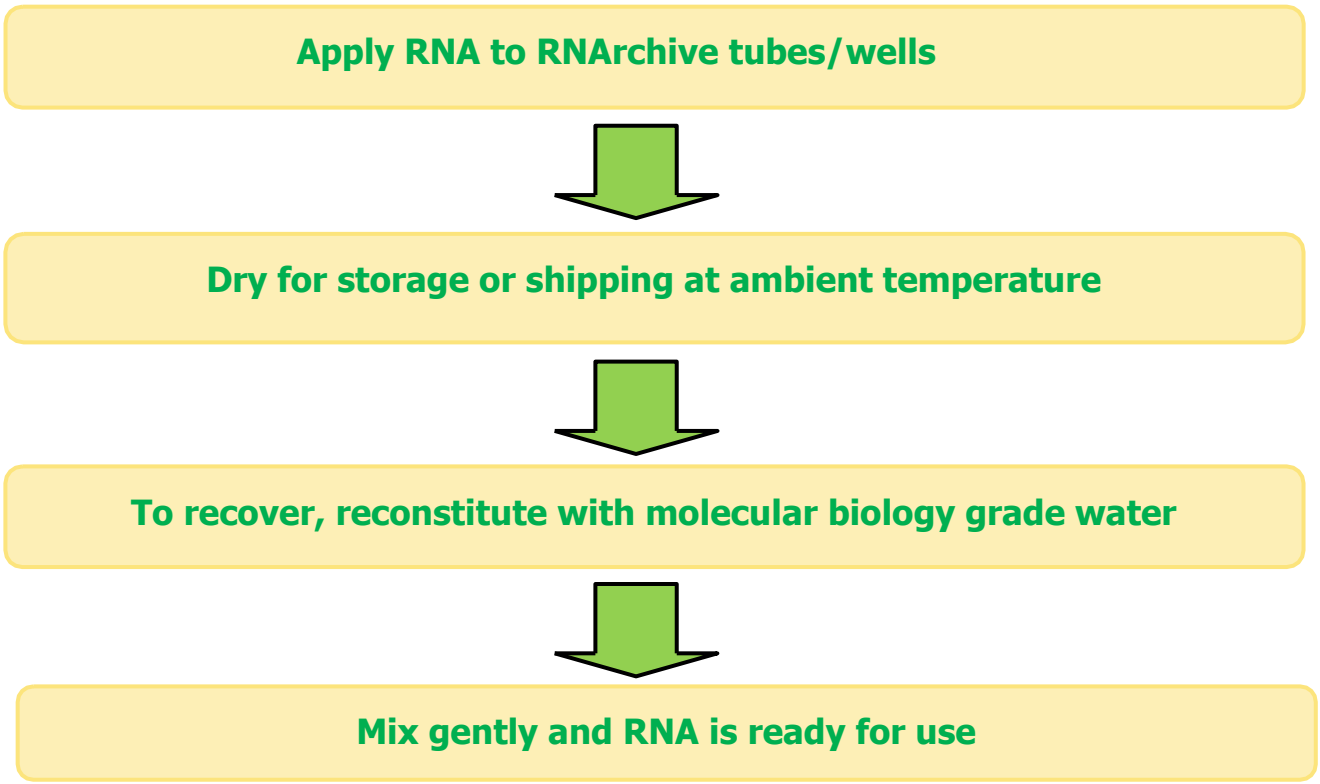
- Quantitative recovery of RNA comparable to input RNA
- Quality is comparable to input RNA
- Recovery in a volume of 20 - 50 µL, smaller volumes are acceptable but handling can be problematic
- Compatible with samples containing trace RNase
- Increased stability in liquid state for up to 100 hours at room temperature (21-25°C) upon application
- Increased stability in liquid state for up to 8 hours following rehydration of dried RNA, across up to 5 cycles
- Compatible with RNA from cell lines, blood, PAXgene, fresh and frozen tissue, FFPE tissue
- Compatible with RNA purified using all standard kits and protocols
- Compatible with all common storage buffers, including water, TE, EDTA and citrate (TE buffer is not recommended for samples which will be subjected to elevated temperature during transport)
- Use in downstream applications without further purification
- Does not inhibit RT-qPCR or expression profiling
- Thermal stability from -80°C to 76°C during transport
- Exceeds Military specifications for transport (-60°C to 71°C)
- Exceeds FedEx specifications for transport (-51°C to 60°C)

Storage and Transport

- Store at room temperature and transport at ambient temperature

RNArchive Quick Reference Workflow

Simplified Workflow



RNArchive Protocol

RNA Application

1. Add ≤ 20 µg of RNA in a volume of 20-50 µl. To ensure complete mixing of RNA and the RNArchive, apply a minimum volume of 20 µl. For concentrated samples, add water to a final volume of ≥20-50 µl
2. Incubate for 5 minutes at room temperature (21-25°C).
3. Mix by pipetting up and down 10 times to solubilize and mix in the RNArchive matrix. The RNArchive is supplied as a coating at the bottom of each tube.
4. For continued use of RNA in liquid form, proceed to protocol on page 6.
5. For transport or long-term storage of RNA, proceed to drying protocol on page 7.

Using Liquid RNA Stabilized with RNArchive

RNArchive is designed to stabilize RNA in the liquid state by inactivating trace nucleases and protecting against oxidation.

RNA stabilized in RNArchive may be used either at room temperature (~23°C), or on ice.

1. Apply RNA to RNArchive according to the protocol on page 5.
2. Use liquid RNA stabilized in RNArchive for RNA aliquots destined for prompt use (i.e. for quantitation, gel/ Bioanalyzer analysis or any downstream application).
    - RNA stored in RNArchive may be used for up to 100 hours in liquid form at room temperature (~23°C), or on ice, with increased stability.
3. Following the 100 hour period, dry the sample down or store RNA according to your typical protocol.

Drying RNArchive Samples

1. Dry tubes with caps off, according to either of the methods described in the table below.
    - The original caps may be saved and re-used when drying is complete.
    - Drying time for SpeedVac® is approximate.
    - Refer to page 8 for FastDryer operation instructions.
    - Refer to page 9 for instructions on drying RNA in a SpeedVac.
2. When drying is complete, cap tubes and store or transport RNArchive tubes at ambient temperature.

Application Volume	Drying Time		
	FastDryer	Vacuum Desiccator or SpeedVac	Biosafety Hood
20 µL	10 hours	~2 hours	~18 hours
21-50 µL	16 hours	~4 hours	~24 hours

Drying RNA Using a GVGT2001 FastDryer

A FastDryer may be used to dry up to 50 µL of RNA.

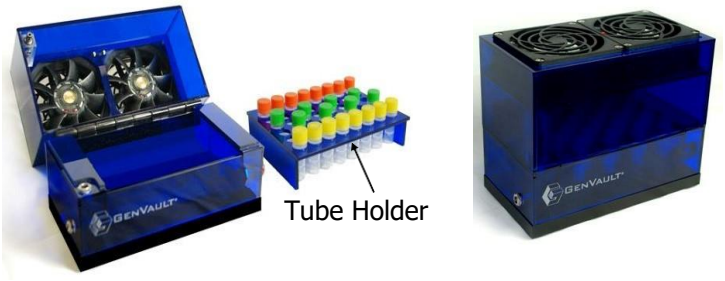
- Refer to page 20 for detailed instructions.
- A GVGT2001 FastDryer may also be used for drying one rack of 0.3ml duster tubes.

1. Ensure that the FastDryer is plugged in.
2. Place unsealed or uncapped tubes or rack in tube/rack holder.
3. Close the FastDryer lid.
4. Turn on the FastDryer by pressing the red ON/OFF switch.

Blue lights will illuminate when FastDryer is operating.

5. Dry overnight (16 hours).
6. Remove samples and cap or seal for storage/transport.

For details on operation and use of the FastDryer refer to the FastDryer User Guide.



FastDryer GVGT2001

Drying RNA using a SpeedVac

A SpeedVac may be used to dry up to 50 µL of RNA. Drying times are approximate and may need to be modified based on the specifications of your SpeedVac. On the first use, ensure that tubes are completely dry by visually inspecting or attempting to pipette liquid from the bottom of the tube.

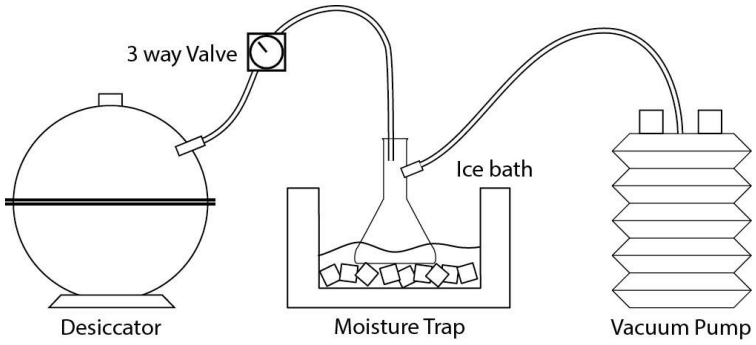
1. Place tubes with lids off in the SpeedVac.
2. Ensure that the temperature setting does not exceed 30°C.
3. Dry tubes for approximately 2-4 hours, according to guidelines in the table below.
4. Following drying, cap tubes and store or transport at ambient temperature.

Drying RNA using a Vacuum Desiccator

A Vacuum Desiccator may be used to dry up to 50 µL of RNA. Drying time is approximate and may need to be modified based on the system. The system consists of a vacuum desiccator, vacuum pump, a vapor trap, assorted tubing and a small ice bath. After the first use, ensure that tubes are completely dry by visually inspecting or attempting to pipette liquid from the bottom of the tube.

1. Place tubes in a convenient rack and place rack in desiccator.
2. Close desiccator and turn on vacuum pump.

3. Dry tubes for approximately 3-4 hours.
4. Following drying, cap tubes and store or transport at ambient temperature.



RNA Recovery at Sequencing Laboratory

1. Add a volume of molecular-biology grade water equal to the original sample volume.
2. Incubate the tubes at room temperature (~23°C) for a few minutes.

   Do not attempt to recover RNA on ice.
3. Pipette up and down 10 times to solubilize the RNA.
4. Alternately, tubes may be capped, vortexed for 10 seconds and centrifuged briefly.
5. The RNA is ready for use in QC or downstream applications.
6. RNA recovered from RNArchive may be used for up to **8 hours in liquid form** at room temperature (~23°C), or on ice, with increased stability.
7. Following the 8 hour period post recovery, dry down or store recovered RNA according to your typical protocol.

Product Information

RNArchive 0.5mL Screw-cap microtubes	
Catalog #	GTR5025-S(Trial kit); GTR5100-S; GTR5100-NL; GTR5003-S Evaluation Kit
Tube Volume	0.5 mL
Application Volume	20-50 µL
Application Volume	1-20 µl require special handling
Application Amount	Any
Concentration (RNA application)	Any
Recovery Volume	Equivalent to application volume
Concentration (RNA recovery)	Equivalent to original application
Drying Method	FastDryer, SpeedVac. MolBio Hood

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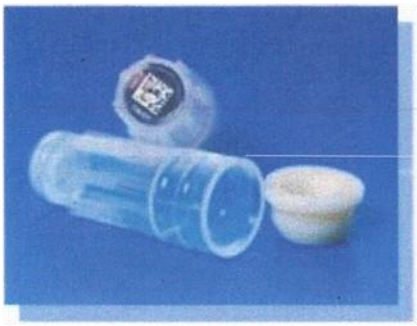
Product Information

RNArchive 0.5ml Cluster Tube Racks (Rack of 96 tubes)	
Catalog #	GTR3110; GTR3101; GTR3110-BC; GTR3101-BC
Tube Volume	0.5mL
Application Volume	20-50 µL
Application Volume	1-20 µl require special handling
Application Amount	Any
Concentration (RNA application)	Any
Recovery Volume	Equivalent to application volume
Concentration (RNA recovery)	Equivalent to original application
Drying Method	FastDryer, SpeedVac. MolBio Hood

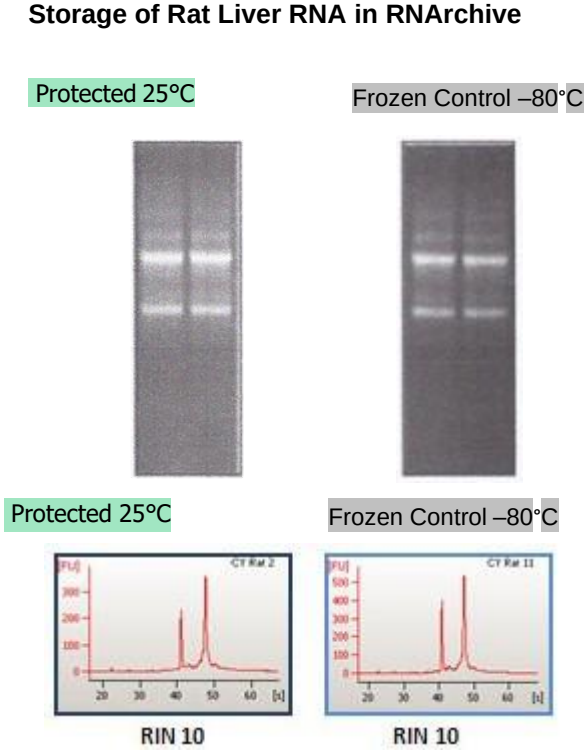


Product Information

RNArchive 96-well Microplate	
Catalog #	GTR4001-P; GTR4010-P; GTR4010-PBC
Application Volume	20-50 µl
Application Volume	1-20 µl require special handling
Application Amount	Any
Concentration (DNA application)	Any
Recovery Volume	Equivalent to application volume
Concentration (RNA recovery)	Equivalent to original application
Drying Method	FastDryer, SpeedVac. MolBio Hood

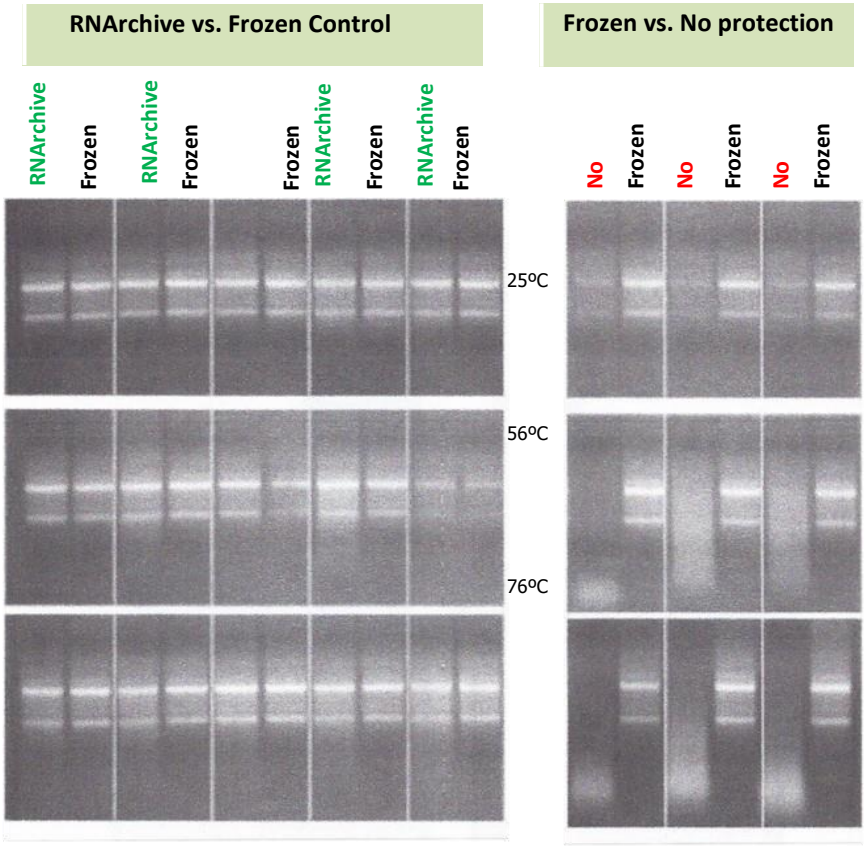
Technical Information

Storage of Rat Liver RNA in RNArchive



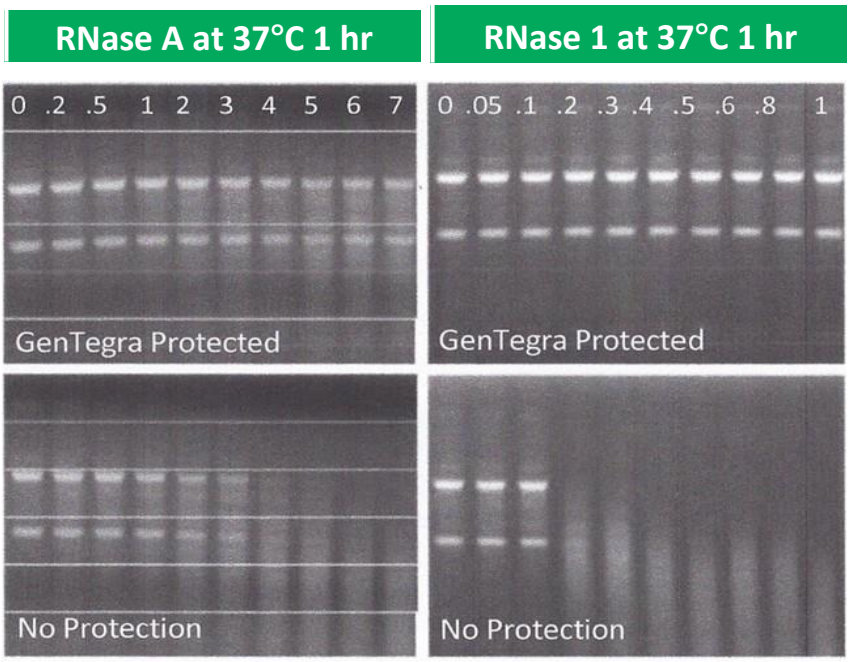
Quality and integrity of RNA stored in the presence of RNArchive is identical to RNA stored frozen. Total RNA (20 µg) purified from rat liver was stored in the dry state at 25°C for 30 days and compared with a control stored frozen at -80°C. RNA integrity was examined by running on a 0.8 agarose gel stained with ethidium bromide or using an Agilent Bioanalyzer.

Storage of PAXgene RNA in RNArchive



The integrity of PAXgene RNA stored in the presence of GenTegraRNA is equivalent to RNA stored frozen. RNA was purified from individual PAXgene tubes, and split into two aliquots. One aliquot of each sample was stored frozen at 80°C, while the other was stored in the dry state for 30 days at 25°C, 56°C or 76°C in the presence or absence of RNArchive.

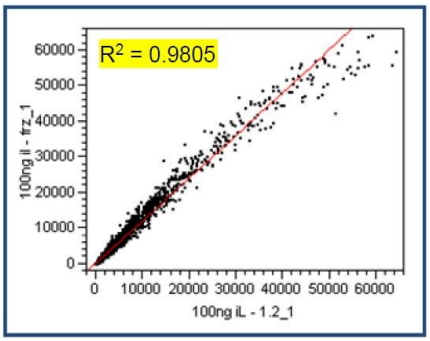
RNArchive Increases RNA stability in the liquid State in the Presence of Trace Nase



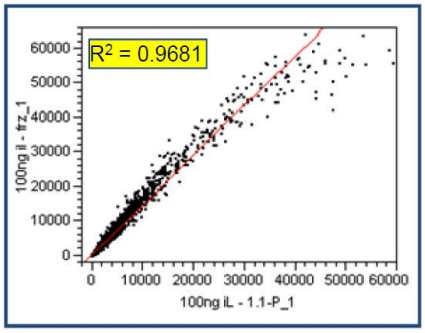
RNA integrity is maintained in the liquid state in the presence of increasing amounts of RNase A and RNase 1 only when protected with RNArchive. HeLa cell RNA (5 µg) was incubated with the indicated amounts of RNase (unit is $x10^9$ molecule) at 37ºC for one hour in the presence or absence of RNArchive.

Illumina Expression Profiling with RNA Recovered from RNArchive

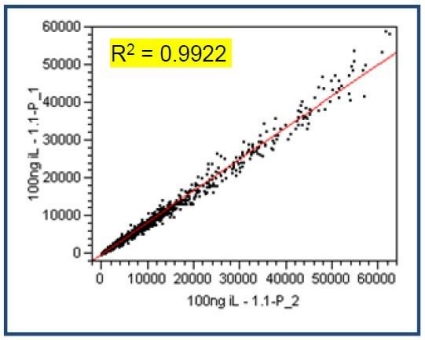
Replicate 1 Frozen vs. RNArchive



Replicate 2 Frozen vs. RNArchive



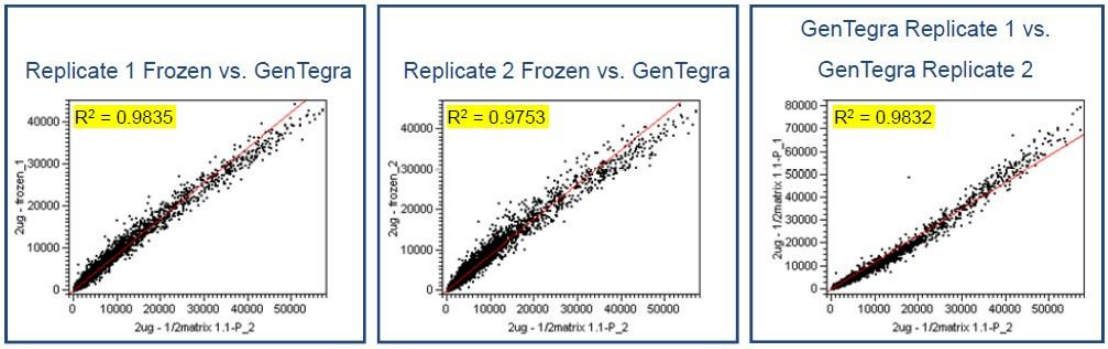
RNArchive Replicate 1 vs. RNArchive Replicate 2



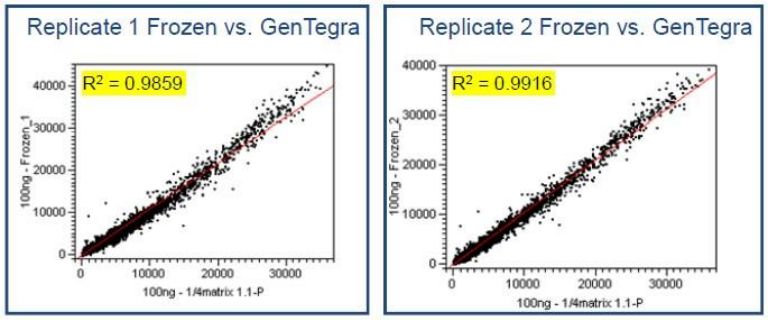
Successful expression profiling of RNA using Illumina HT-12 Expression Beadchips. Replicate RNA samples purified from HeLa cells (20 µg) were stored in the dry state for two weeks at 25°C with RNArchive and compared with a control stored at -80°C.

Affymetrix Expression Profiling with RNA Recovered from RNArchive

2 µg protocol



100ng (low mass) protocol



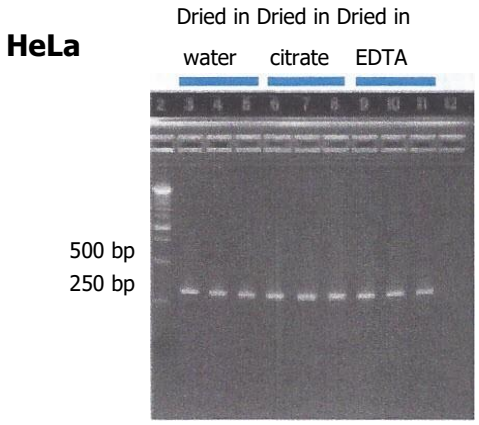
Successful expression profiling of RNA using the Affymetrix GeneChip Human Genome U133 Plus 2.0 Array. Replicate RNA samples purified from HeLa cells (20 µg) were stored in the dry state for two weeks at 25°C with RNArchive and compared with a control stored at -80°C.

MicroRNA Expression Profiling with RNA Recovered from RNArchive

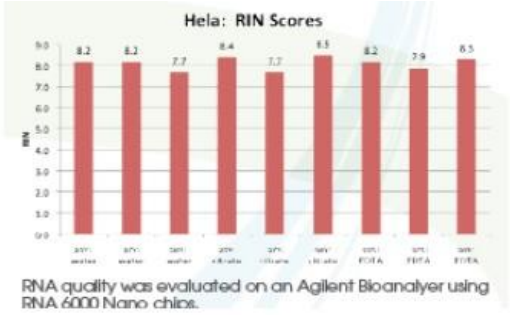
RNArchive Matrix			
	Replicate 1 (1/5x)	**Replicate 2 (1/5x)**	**1/10/x**
% False Negative	**0.63%**	**0.94%**	**3.13%**
% False Positive	**3.02%**	**3.85%**	**2.08%**
% Concordance to Frozen (960 probes interrogated, ~30% positive calls)	**96.35%**	**95.10%**	**94.70%**

Successful expression profiling of RNA using the Agilent miRNA microarray. Total RNA samples (20µg) containing miRNA were stored in the dry state for two weeks at 25°C with RNArchive and compared with a control stored at - 80°C.

Ongoing ambient temperature experiments show retention of qualify for 3.5 years



2% agarose gel corresponding to the RIN scores shown in chart below. Lanes 3, 6, 9 are 26ºC, lanes 4, 7, 10 are 37 ºC and lanes 6, 8, 11 are 56ºC.



RNA quantity was evaluated on an Agilent Bioanalyzer using RNA 6000 Nano chips.

Frequently Asked Questions

What are the two options for stabilizing RNA in RNArchive?

Option 1 Following application to RNArchive use RNA in liquid form for up to 100 hrs at room temperature (21-25°C) or on ice. RNArchive conveys additional stability to RNA in liquid form by inactivating trace RNase, simpli- fying sample handling. Following the 100 hour period, dry the sample down, or store RNA according to your typical pro- tocol.

Option 2 Following application to RNArchive dry RNA and store or transport at ambient temperature. Follow- ing rehydration, RNArchive conveys additional stability to RNA in liquid form for up to 8 hours at room tempera- ture (21-25°C) or on ice. Following the 8 hour post-recovery period, dry your sample down again for storage or store according to your typical protocol.

Where can I purchase new caps for RNArchive screw cap tubes? Are looped/tethered caps available?

New caps may be purchased from AMSBIO. Axygen microcentrifuge tube screw caps are also compatible with RNArchive tubes and are available through several distributors: Genesee Scientific offers the caps in a variety of colors and styles, including looped/tethered caps, at: www.geneseesci.com

Can RNA be rehydrated and dried multiple times?

Yes, RNA on RNArchive can be rehydrated and re-dried up to five times.

Is it safe to keep RNA at room temperature (21-25°C) during the 16 hour drying process?

Yes, the RNArchive protects RNA in the liquid state at room temperature during the drying process. This protection extends for up to 48 hours.

What is the composition of the storage solution after recovery?

After addition of molecular-grade water, your samples will be in the same buffer they were stored in at the time of application.

How should I store my recovered RNA?

Following recovery, RNA may be stored for up to 8 hours at room temperature (21-25°C), and then dry down or store according to your typical protocol.

Can I use the recovered RNA directly for downstream applications?

Additional purification is **not** required prior to performing downstream applications. Similar RNA quality is maintained before and after recovery.

What is RNArchive? Is RNArchive composed of a filter, beads or paper?

RNArchive is not a filter, beads, silica column or paper. RNArchive is a water soluble, chemical ma- trix.

When removing DNA contamination from my RNA preparation does the inhibitor in RNArchive interfere with digestion of gDNA using DNase I.?

Yes, the RNase inhibitor in RNArchive is an inhibitor of DNase I. However, because of the low concentra- tion of inhibitor it should be easy to swamp the inhibition by simply increasing the amount of DNase I used.

Frequently Asked Questions cont'd

Can RNArchive tubes be used to store DNA?

No, the chemical matrix used to store DNA is not the same as the chemical matrix used to store RNA.

Can I apply an RNA sample that is smaller than the recommended 20 µl?

Yes, but special care and handling is recommended. When applying the sample be especially careful to place it in the very bottom of the tube. When recovering the sample we recommend using a minimum of twice the original volume to ensure you rehydrate all the sample. Refer to our tutorial on handling small sample volumes for further details.

How can I avoid RNase contamination during the drying step? Is there a special protecting membrane available?

RNArchive has a strong inhibitor for RNases and is therefore protected against any possible contamina- tion by RNases during its drying period. However, if you are concerned about this contamination you can use Breathe Easier membranes for protection but they do slow drying and extend the drying time. Using vacuum to speed the drying time may be required when using a barrier such as the Breath Easier membrane.

Does the use of RNArchive interfere with library construction?

At its normal concentration range there is no effect on the polymerase reaction and we have done many library preps on RNArchive protected samples with no problems at all. Furthermore, as the sample moves thought the library construction the RNArchive is quickly diluted away.

Will RNArchive interfere with the removal of RNA template after the first strand reaction?

Yes, unless the RNArchive is diluted by >10-100 times compared to its normal concentration it will be a potent inhibitor of the RNase used to remove the starting RNA.

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