

Online NBS Molecular Resources

2020 NBS Molecular Training Workshop

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Molecular Quality Improvement Program

Newborn Screening and Molecular Biology Branch,

Division of Laboratory Sciences

NCEH, CDC

NBS Molecular Resources Website

Resources Available

- ❑ Find liquid handling options by viewing detailed summaries of instruments used by other NBS programs
- ❑ Research Molecular Assays by reviewing detailed summaries of assays used by other NBS programs
- ❑ Access the Molecular Assessment Program (MAP) site visit checklist and request a MAP visit





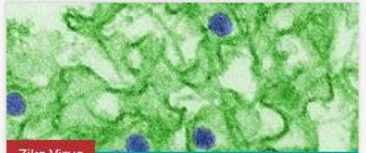
- Register for Training and Events
- Our Value**
About APHL & Our Membership
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Programs, Publications & Services
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Member, Funding, Emergency & Contact Information
- Your Development**
Training, Conferences & Careers
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APHL and EPA Formalize Environmental Partnership
MOU signed to support the environmental & public health lab community and more. [Learn more](#)

Analysis. **Answers.** **Action.**

The Association of Public Health Laboratories works to strengthen laboratory systems serving the public's health in the US and globally.




Zika Virus

Updates and Guidance for Response to Zika

Find information and resources for public health laboratory response to Zika.

[More >](#)




APHL in Action

Bioinformatics Fellowship Tackles Data Avalanche

2016 Bioinformatics in Public Health Fellows bring their expertise to CDC and the MN public health lab

Photo (L-R): Mahder Teka, Julie Shay, Dane Kania, Brian Mann, and Arunachalam Ramaiah

[More >](#)



STRENGTHENING LAB SYSTEMS UNDER

Lab Matters

Strengthening Lab Systems Under GHSA

APHL is using the lessons learned in-country through PEPFAR programs to support Global Health Security Agenda (GHSA) initiatives involving public health laboratories around the world.

www.aphl.org



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APHL Programs

- Environmental Health
- Food Safety
- Global Health
- Infectious Diseases
- Informatics
- Institutional Research
- Newborn Screening & Genetics**
- Public Health Preparedness & Response
- Quality Systems

Publications

- APHL Lab Blog
- Lab Matters
- APHL in Action
- eUpdate - weekly newsletter
- Bridges - Environmental Health newsletter

Reports & Briefs

- Guidance for State Medical Cannabis Testing Programs
- Next Generation Sequencing Implementation Guide
- Clinical Laboratory Preparedness and Response Guide
- Food and Feed Testing Data Best Practices
- Sierra Leone and Guinea: Strengthening Public Health Laboratories

Support APHL

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Consulting Services

- General Consulting
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- Global Health Consulting

APHL Our Work

APHL provides tools and resources to strengthen biosafety and biosecurity in US public health and clinical laboratories.



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APHL | APHL PROGRAMS | NEWBORN SCREENING & GENETICS

Newborn Screening & Genetics

Newborn Screening &
Genetics Training

APHL Newborn Screening
and Genetic Testing
Symposium

APHL Newborn Screening &
Genetics Program

Assuring Laboratory Quality

Legal & Legislative Issues in
Newborn Screening

**Molecular Resources for
Newborn Screening**

Newborn Screening
Resources

NewSTEPS: Supporting US
Newborn Screening
Programs

Partners in Newborn
Screening

Supporting Newborn
Screening Globally



Advancing through NewSTEPS
Providing data, technical assistance, quality improvement resources and training.
[More.](#)

Our Work

APHL strengthens the role of public health labs in newborn screening and genetic testing and designs strategies to address changes in the field.

Featured Resources

Parents

Healthcare Providers



Conferences & Trainings



Quality Assurance



Molecular Resources

Reports and Briefs

Newborn
Screening
Timeliness

HIT Survey,
Newborn
Screening

Newborn
Screening
Checklist for

Newborn
Screening for
Policymakers

Molecular Resources for Newborn Screening

NewSTEPS

Newborn Screening &
Genetics Program

Newborn Screening and
Genetic Testing Symposium

Hemoglobinopathies Project

Spinal Muscular Atrophy
Project

Health Information
Technology

Training

Quality Assurance

Legal & Legislative Issues

Global Newborn Screening

General Resources

Molecular Resources

Molecular screening brings new and different technologies into the newborn screening (NBS) laboratory, creating a need for related resources. APHL collaborates with CDC's [Newborn Screening and Molecular Biology Branch \(NSMBB\)](#) to provide state newborn screening programs with information on available molecular methods and quality improvement activities.

NBS Molecular Methods

The [state NBS laboratory assays list](#) (access restricted to NBS lab directors and their delegates) explains how newborn screening programs use their molecular assays and allows users to search for the molecular assay that best fits their needs.

Automation Methods

The links below offer information on the use of automation in newborn screening programs, types of automation instruments and considerations in purchasing a liquid handler:

- [Liquid Handling Instruments](#)
- [Automation Methods](#) (access restricted to NBS lab directors and their delegates)
- [Considerations in Selecting a Liquid Handler](#)
- [Liquid Pipetting Verification](#) (access restricted to NBS lab directors and their delegates)

Molecular Assessment Program Quality Improvement

The Molecular Assessment Program (MAP) is a non-regulatory site visit offered by CDC and APHL that is tailored to newborn screening laboratories that perform molecular tests. MAP was developed to assist newborn screening laboratories to determine how to best meet their molecular testing needs with available resources.

[View more information](#) on testimonials, checklists and to rate your MAP visit.

Other Molecular Training Resources

- [2017 Gene Sequencing Forum](#)
- [2017 Gene Sequencing in Public Health Newborn Screening Meeting](#)
- [2016 APHL Next Generation Sequencing Implementation Guide](#)
- [2016 APHL Molecular Training Workshop](#)
- [2013 APHL Molecular Resources Website Webinar](#)



State NBS Molecular Assays

APHL Newborn Screening & Genetics Program

Newborn Screening Conferences & Trainings

Assuring Laboratory Quality

Molecular Resources for Newborn Screening

Legal & Legislative Issues in Newborn Screening

NewSTEPS: Supporting US Newborn Screening Programs

Supporting Newborn Screening Globally

Newborn screening programs nationwide are adding molecular assays to their screening protocols.

Select a disorder to learn about the molecular methods in use in a particular newborn screening laboratory.

Please select disorder of interest:

Cystic Fibrosis

Galactosemia

Hemoglobinopathies

Krabbe

Medium Chain Acyl CoA Dehydrogenase (MCAD)

Maple Syrup Urine Disease (MSUD)

Severe Combined Immunodeficiency Disorder (SCID)

Thank you for helping APHL create an accurate summary of all NBS molecular assays currently in use.

[Add New Molecular Assay](#)

Contact

For assistance completing the form, please contact [Funke Akinsola](#), associate specialist, Newborn Screening & Genetics (240.485.2714) or [Laura Hancock](#), research scientist, Newborn Screening and Molecular Biology Branch, CDC.

Cystic Fibrosis

State	Contact Person	Laboratory Assay	Tier
California	Constantino Aznar	DNA Sequencing	Second
California	Constantino Aznar	Luminex xMAP	Second
Colorado	Gregory Bonn	Luminex xTAG 39	Second
Florida	Bonita Taffe PhD	Luminex xTAG 60	Second
Iowa	Mike Ramirez	GenMarkdx eSensor Cystic Fibrosis Genotyping Test	Second
Massachusetts	Ann Marie Comeau, PhD	Luminex xMAP	Second
Michigan	Kelly TenEyck, M.S.	Luminex xTAG 60	Second
Minnesota	Carrie Wolf, MBS	Luminex xTAG 39	Second
New York	Michele Caggana, ScD, FACMG	Luminex xTAG 39	Second
Ohio	Rosemary Hage PhD	Luminex xTAG 39	Second
Texas	D'Andra Luna	Hologic InPlex	Second
Virginia	Kim Turner, MSQA	Luminex xTAG 39	Second
Washington	Tim Davis	Fluorescent Probe Mutation Detection (i.e. TaqMan)	Second

Molecular Assay Description Form

State:	Massachusetts		
Program Website:	http://www.umassmed.edu/nbs/index.aspx		
Contact Person:	Anne Marie Comeau, PhD	Alt Contact:	jacalyn.thompson@umassmed.edu
Contact Email:	anne.comeau@umassmed.edu	Alt Email:	jacalyn.thompson@umassmed.edu
Contact Phone:	617-983-6300	Alt Phone:	617-983-6300
Condition:	Cystic Fibrosis		
Laboratory Assay:	Luminex xMAP		
Tier:	Second		
Please indicate the method of DNA extraction used in your laboratory:	Qiagen Generation method using in-house prepared wash solution as a substitute for Solution 1, and Solution :		

Extraction Duration (hrs):	1.25	Assay Duration Excluding Extraction (hrs):	5-6 hrs. Duration consists of 4 sets of ...
Mutations or Targets Screened:	<p>Exon3: G85E, 394delTT; Exon4 :Y122X, R117H; Intron4: 621+1G>T*; Intron5: 711+1G>T*; Exon7: R347H, R347P*, R334W*, 1078delT*; Exon9:A455E*,5/7/9T; Exon10: deltaI507*,deltaF508*,V520F,F508C,I507V,I506V; Intron 10: 1717-1G>A*; Exon11: A559T , G542X*,G551D* , R553X* , R560T* , S549N , S549R (T>G); Exon12: 1898+1G>A* , Intron12: 1898+5G>T; Exon13: 2307insA , 2183AA>G , 2184delA* ; Intron14b: 2789+5G>A* ; Intron16: 3120+1G>A* ; Exon17b: M1101K , Y1092X (C>A) , Y1092X (C>G); Exon19: R1162X* , S1255X (19) , 3659delC* ; Intron19: 3849+10kbC>T* ; Exon20: S1255X (20) , 3876delA , 3905insT , W1282X* ; Exon21: N1303K* . * indicates that mutation is on ACMG carrier screening panel.</p>		
Assay Description:	<p>The objective is to test a specific set of DNA sequences in the Cystic Fibrosis transmembrane conductance regulator (CFTR) gene simultaneously in order to detect and identify each as containing specific mutations, variants or wild-type sequence. The xTag[®] Cystic Fibrosis 39 v2 accomplishes this objective using multiplex Polymerase Chain Reaction (PCR) and multiplex Allele Specific Primer Extension (ASPE) with Luminex Molecular Diagnostic's (Luminex Corp) proprietary Universal Tag sorting system on the Luminex[®] analyzer</p>		
Assay Limitations:	<p>1. the assay will only identify the listed mutations and their respective wild-type sequences; it will not identify other mutations or deletions. 1a. Other mutations can be added, but only through a "laboratory developed test", which would be run independently. 2. the assay is dependent upon hybridization of primers and probes thus has the typical limitations related to such assays. 3 Though the technology has a wide range of flexibility in choice of alleles to be assayed, as an FDA-approved kit, there are limitations to this flexibility. Specifically, all mutations and polymorphisms are tested and software drives the reporting of the test results. Version 2 appears to be more limited than version 1 per FDA requirement (under investigation). As with all such assays, it's important to be familiar with these nuances.</p>		

<p>Instruments Used for this Assay</p>	<p>Assay Platform/Instrumentation and Manufacturer: Luminex 39+4 assay/Luminex 100/200 Reader System</p>
<p>Instruments Used for this Assay - Liquid Handling Robotics Instruments:</p>	<p>Liquid Handling Robotics Instrumentation and Manufacturer: Biomek 3000 for transfer of DNA eluate from 96-well plate to PCR tubes (optional)</p>
<p>Population Frequency for Disorder Within Your State:</p>	<p>The frequency of cystic fibrosis (excluding CRMS and CRD) in the Massachusetts population is about 1 in 380...</p>
<p>Important Assay Logistics /Hints Not Described Above (i.e. If multiple assays are used for this disorder, describe how each is used)</p>	<p>The Luminex TDAS software included in the kit is excellent for quality control monitoring. This is the same platform that we use for Laboratory-Developed tests for GALT and MCADD.</p>

Krabbe

Medium Chain Acyl CoA Dehydrogenase (MCAD)

Maple Syrup Urine Disease (MSUD)

Severe Combined Immunodeficiency Disorder (SCID)

Thank you for helping APHL create an accurate summary of all NBS molecular assays currently in use.

[Add New Molecular Assay](#)

Contact

For assistance completing the form, please contact [Funke Akinsola](#), associate specialist, Newborn Screening & Genetics (240.485.2714) or [Laura Hancock](#), research scientist, Newborn Screening and Molecular Biology Branch, CDC.

Variant Interpretation Materials

In 2017, The New England Newborn Screening Program developed materials to assist with variant interpretation based on the American College of Medical Genetics and Genomics (ACMG) guidelines. The following variant interpretation materials are restricted to state newborn screening program personnel:

- [MPS I Variant Interpretation Worksheet](#)
- [Pompe Variant Interpretation Worksheet](#)
- [X-ALD Variant Interpretation Worksheet](#)
- [Variant Interpretation Workflow](#)

View this [webinar](#) for more information on how to use the worksheets and workflow.

i Items on this list require content approval. Your submission will not appear in public views until approved by someone with proper rights. [More information on content approval.](#)

Molecular Assay Description Form	
CONTACT INFO	
State:	<input type="text"/>
Program Website:	<input type="text"/>
Contact Person:	<input type="text"/>
Contact Email:	<input type="text"/>
Contact Phone:	<input type="text"/>
Alt Contact:	<input type="text"/>
Alt Email:	<input type="text"/>
Alt Phone:	<input type="text"/>
ASSAY DETAILS	
Condition:	<input type="text"/>
<input type="button" value="Submit"/>	

Krabbe

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New England Newborn Screening Program University of Massachusetts Medical School

VARIANT HGVS NAME

Date of Evaluation:

Variant Assessment Worksheet

1. Condition: MPS-i Variant
2. Reviewed by NENSP before?
3. Other newborn screening program contribution

Name of program	
Listed?	
Clinical significance	
Date last reviewed	
Comment	

4. **MPS-1 database (DSdb)**

<http://mps1-database.org/mutants/>

this is NOT a great database – but it's a start.

- *Click on "list"*
- *Copy list each time into excel and sort to find variant or try Control F.*
- *Available database fields are listed in first set below (I would copy the record onto this sheet):*

id	
locus	
Mutation type	
genotype	
phenotype	
rsid	

NBS Molecular Methods

Use the [state NBS laboratory assays](#) list (access restricted to NBS lab directors and their delegates) to understand how other NBS programs are currently using their assays and search for the molecular assay that best fits your program's needs.

Automation Methods

Use the links below to discover the different types of automation instruments available, learn about how automation is currently being used in NBS programs and find questions to ask when purchasing a liquid handler:

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Molecular Assessment Program (MAP) Promotes Quality Improvement

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MAP teams are composed of CDC and state public health laboratory scientists, who work with laboratory personnel to assess all molecular testing procedures. Visits are tailored to the specific needs of the program and can provide guidance on evaluating ongoing or soon-to-be implemented molecular testing procedures.

Read the [MAP Testimonials](#) to learn how other labs have benefited from this program.

Interested in participating? [Request a MAP visit](#)

Before the visit:

- Review the [MAP Visit Timeline](#)
- Complete the
 - [Pre-Analytic Checklist](#),
 - [Analytic Checklist](#), and

Liquid Handling in Molecular Newborn Screening

APHL Newborn Screening & Genetics Program

Newborn Screening Conferences & Trainings

Assuring Laboratory Quality

Molecular Resources for Newborn Screening

Legal & Legislative Issues in Newborn Screening

NewSTEPS: Supporting US Newborn Screening Programs

Supporting Newborn Screening Globally

Two levels of automation are commonly used in handling liquids for molecular newborn screening: highly automated and semi-automated. Highly automated liquid handling requires little to no intervention until the method set up is complete. In semi-automated liquid handling, a combination of manual and automated levels, instruments are used on the front end of a method to add reagents but all other steps are completed manually.

Semi-Automated




[View examples of semi-automated instruments.](#)

- Used when processing a small (<500) to medium (>500) daily number of specimens
- Used for adding reagents directly into plate wells
- Does not work when mixing is required
- Instrument used to assist technician with addition of reagents, however other instruments are often used to complete the method
- No specialty positions on deck available (instrument cannot include barcode readers, heated peltier, plate shakers or plate hotels)
- Cannot be used for selective choosing of specimens (aspirating or dispensing to one specimen at a time, i.e. "cherry picking")
- Technician must be present while instrument(s) is running
- Small footprint
- Cheaper than highly-automated instruments

Highly-Automated

[View examples of highly-automated instruments.](#)

- Used when processing a medium to large daily number of specimens
- Used for adding reagents directly into plate, washing specimens, mixing specimens, and removing buffers from specimens
- Level of automation is flexible. Methods can be written to any level of user assistance; from zero user assistance needed, technician can walk away upon starting the method; or partial assistance with one or more step(s) completed with technician assistance
- Many specialty positions available. Common positions found in NBS labs include: barcode readers, heated peltier, plate shakers and plate/tip hotels
- Medium to large footprint
- More expensive than semi-automated instruments

Title	Robotic one 8 channel liquid handler	Robotic 96-channel Liquid Handler	Robotic one 8-channel and 96-channel Liquid Handler
Photo			
	<p><i>Picture Courtesy of the Michigan Department of Community Health</i></p>	<p><i>Picture Courtesy of the Georgia Department of Public Health</i></p>	<p><i>Picture Courtesy of New York State Department of Health - Wadsworth Center</i></p>
Mode Of Operation	<p>Aspirates & dispenses or multi-dispenses between 1 and 8 channels at a time.</p>	<p>Simultaneously aspirates & dispenses and multi-dispenses up to 96-channels at a time.</p>	<p>Instrument has two dispensing mechanisms. One that aspirates & dispenses between 1- and 8-channels at a time. The other arm simultaneously aspirates & dispenses and multi-dispenses up to 96-channels at a time.</p>
DNA Extraction	<p>Used when extracting one plate at a time.</p> <p>Used when method includes 1 wash of DBS punches. Please note that this can be used when multiple washes are needed. However many NBS labs currently use a vacuum apparatus to remove wash buffer and leave punches in well, therefore increasing the amount of time a laboratorian must interact with the method. Please note that vacuum is a separate instrument, and is not attached to liquid handler.</p> <p>Used for addition of elution solution.</p>	<p>Used when extracting 1 to 4 plates at a time.</p> <p>Used when method includes 1 or more washes of DBS punches. NBS labs currently have methods that effectively remove the wash buffer and leave the DBS punches in the wells.</p> <p>Used for addition of elution solution.</p>	<p>Used when extracting 1 to 8 plates at a time.</p> <p>Used with 96 head arm when method includes 1 or more washes of DBS punches. NBS labs currently have methods that effectively remove the wash buffer and leave the DBS punches in the wells.</p> <p>Used with 1- to 8-channel head for addition of elution solution.</p>
PCR Set-Up	<p>Used for addition of PCR master mix.</p> <p>Use for addition of DNA to PCR plate.</p>	<p>Used for addition of PCR master mix on instrument with the selective tip head.</p> <p>Used for addition of PCR master mix on instruments that only have the ability to simultaneously aspirate 96-wells at a time, however this is often an expensive reagent and a large excess volume must be added to the instrument to fill the 96-well reservoirs.</p>	<p>Used with 1 to 8 head for addition of PCR master mix on instrument with the selective tip head.</p> <p>Used with 96 head arm for addition of DNA to PCR plate.</p>

NBS Molecular Methods

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Automation Description Forms

APHL Newborn Screening & Genetics Program

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Molecular Resources for Newborn Screening

Legal & Legislative Issues in Newborn Screening

NewSTEPS: Supporting US Newborn Screening Programs

Supporting Newborn Screening Globally

Newborn screening programs across the country have implemented automation for molecular assays into their screening protocols. Select a method below to view automation techniques used in US laboratories or to upload your own.

DNA Extraction Method

PCR Set-Up Method

On-Card Assay Method

Thank you for helping APHL create an accurate summary of all NBS automation methods currently in use. Please fill out the form above for each automation method performed by your laboratory.

Contact

For assistance completing the form, please contact [Laura Russell](#), MPH, specialist, Newborn Screening & Genetics (240.485.2703) or [Laura Hancock](#), research scientist, Newborn Screening and Molecular Biology Branch, CDC.

Automation Description Forms



Newborn screening programs across the country have implemented automation for molecular assays into their screening protocols. Select a method below to view automation techniques used in US laboratories or to upload your own.







DNA Extraction Method

State	Contact	# Samples (Busiest Day)	Dispensing Instrument
Massachusetts	Jacalyn Thompson	1100	Manual
Michigan	Heather Wood, M.S.	1200	Robotic 1-8 channel liquid handler
Minnesota	Berta Warman	350	Non-robotic 8 channel reagent dispenser
New York	Jason Isabelle	~2,300	Robotic 1-8 and 96 channel liquid handler



[Add New DNA Extraction Method](#)

Complete the form below to submit your response

For drop down choices, select existing option or type in your answer.

State:	<input type="text" value="Minnesota"/>		
Contact:	<input type="text" value="Berta Warman"/>	Alt Contact:	<input type="text" value="Carrie Wolf"/>
Contact Email:	<input type="text" value="berta.warman@state.mn.us"/>	Alt Email:	<input type="text" value="carrie.wolf@state.mn.us"/>
Contact Phone:	<input type="text" value="651.201.4836"/>	Alt Phone:	<input type="text" value="651.201.5458"/>
Number of Samples on Busiest Day:	<input type="text" value="350"/>		
Number of Samples per Year:	<input type="text" value="70,000"/>		
Dispensing Instrument Used:	<input type="text" value="Non-robotic 8 channel reagent dispenser"/> 		
Instrument 1 Model (Manufacturer):	<input type="text" value="Viafill (Integra)"/> 		
Aspirating Instrument Used:	<input type="text" value="VP 177A-1 aspiration manifold (V7P Scientific, INC)"/> 		
Instrument 2 Model (Manufacturer):	<input type="text" value="N/A"/> 		
Type of DNA Extraction:	<input type="text"/> 		
Assay:	<input type="text" value="CF and SCID"/> 		

Manage	Close	
		CP and SCB
How Many Technicians are Needed to Run this Instrument Each Day?	1	
Plate Used for Extraction:	96 well, unskirted PCR plate, v bottom	
Size of Punch Extracted:	3.2 mm	
Number of Washes for Extraction:	3	
If Washes are Heated, What Temperature?:	N/A	
Extra Volume of Wash Added to Reservoir to Assure Accurate Pipetting:	N/A	
Describe Wash 1:	1. 150µl of Purification solution 1 (Qiagen) is added to each well containing a DBS using the Viafill. 2. Plate is	^ v
Describe Wash 2 (if applicable):	1. 150µl of Purification solution 1 is added to each well containing a DBS using the Viafill. 2. Plate is shake for 15 min. on the Vortemp 56 shaking-incubator at room	^ v
Describe Wash 3 (if applicable):	1. 150µl of Elution solution 2 (Qiagen) is added to each well containing a DBS using the Viafill. 2. Plate is shake for 15 min. on the Vortemp 56 shaking-incubator at room	^ v

Describe Wash 4 (if applicable):	N/A
Average Number of Spots Lost During Wash Removal:	0.01%
Detail How Liquid is Removed During Wash to Leave Spot:	with an 96 well aspiration manifold
Elution Volume:	25ul
Describe Elution:	Elution solution 2 (Qiagen) is added, plate is sealed with thermal sealing foil and placed in the Vortemp 56 shaking-incubator @ 900rpm for 30 minutes at 99.5oC.
Level of Automation:	Semi-automated 
Describe User Intervention Step(s) (if applicable):	Apply and remove adhesive film. Transfer plates from one instrument to the other. Press "start" on each instrument.
Smallest Volume Pipetted:	25 ul
Largest Volume Pipetted:	150 ul
List Speciality Positions Used:	N/A
Number of Plates Extracted at Same Time:	2-5 

Number of Plates Extracted in 1 Day:	<input type="text"/>
Is Sample Tracking Required?:	No <input type="button" value="v"/>
Number of Tips Used per Sample:	Non <input type="text"/>
Are Tips Re-used?:	N/A <input type="button" value="v"/>
Describe How Tips are Used? (One tip per sample, multiple tips per sample, tips used for multiple samples):	N/A <input type="text"/>
Are Speciality Tips Used?:	No <input type="button" value="v"/>
Time it Takes to Complete Method:	90 minutes (60 minutes in liquid handler, aspirator and RT incubation and 30 mi <input type="text"/>
How Many Positions on the Deck are Used During Method:	N/A <input type="text"/>
Important Method Logistics/Hints:	N/A <input type="text"/>

Important Method Logistics/Hints:	N/A	
Describe Other Instruments Used:	Shaker incubator (Vortemp 56)	
List Other Methods (Molecular and Non-molecular) that Use this Instrument:	N/A	
List of Labware that is Commonly Used with this Method:	Viafill: tubing cassettes (one per solution); vacuum pump, vacuum trap bottles, tubing	Aspirator Manifold:
Limitations of Instrument for this Method:		

NBS Molecular Methods

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Interested in participating? **Request a MAP visit**

Before the visit:

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Considerations in Selecting a Liquid Handling Platform



Click a heading below to view the related questions.

Instrument Hardware

Instrument Software

Instrument Maintenance

Instrument Support

Considerations in Selecting a Liquid Handling Platform

Instrument Hardware

1. How much space will this instrument take up? Will existing benches need to be modified (widened, pulled away from the wall, extended)?
2. What types of specialty additions can be incorporated?
 - i. Plate shaker
 - ii. Barcode reader
 - iii. Heating unit
3. How many plates/tips can I fit on the deck?
4. Can the instrument track samples?
5. Is the labware (plates, reservoirs, tips) I plan to use compatible? If not, are there adaptors that can be used?
6. What is the cost of the recommended labware? Are there other options for needed labware (other brands) or does it have to be from the same company as the instrument?
7. Can low reagent volumes be accurately pipetted? What are the accuracy and precision rates?
8. What is the dead volume when pipetting my lowest volume needed from my desired reservoir? Are there other reservoirs available that would decrease my dead volume that would also work for my needs?
9. Approximately how long does it take to dispense reagent to a 384 well plate? Into a 96 well plate? From different sources (reservoirs, plates, tubes)
10. Can the instrument be used for non-molecular cross purposes?
11. Can the instrument be connected to the intranet?

Questions to Ask When Purchasing a Liquid Handler

Instrument Hardware

1. How much space will this instrument take up? Will existing benches need to be modified (widened, pulled away from the wall, extended)?
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9. Approximately how long does it take to dispense reagent to a 384 well plate? Into a 96 well plate? From different sources (reservoirs, plates, tubes)
10. Can the instrument be used for non-molecular cross purposes?
11. Can the instrument be connected to the intranet?
12. Do I have a mechanism to purchase this instrument?
13. Do I have a mechanism to purchase consumables (tips, plates, reservoirs)?
14. Where can I see this instrument in action with a method similar to what I have planned?
15. Can I demo the instrument?
16. Does our specimen throughput or backup requirements necessitate instrument redundancy (purchase of more than one of the same instrument)?

Instrument Software

1. How much control does the user have over the labware descriptions, including plates and tips? (Example – if you need the tip to enter a plate at the side of a well, instead of the middle – can the end user adjust this?) Can the user define their own labware specifications or is that done by the manufacturer?
2. What level of programing is required?
3. Is the software user-friendly?
4. Do we have a person currently in our lab who can manage/maintain the more technical

Instrument Maintenance

1. What is covered by the warranty at time of purchase and what options there are when warranty need to be renewed?
2. Is this instrument maintenance covered under the contract agreement with my lab?
3. Recommendations on how often the instrument has to be shut down (daily, over the weekend, monthly).
4. What is the required instrument maintenance (daily, weekly, monthly, annually)?

NBS Molecular Methods

Use the [state NBS laboratory assays](#) list (access restricted to NBS lab directors and their delegates) to understand how other NBS programs are currently using their assays and search for the molecular assay that best fits your program's needs.

Automation Methods

Use the links below to discover the different types of automation instruments available, learn about how automation is currently being used in NBS programs and find questions to ask when purchasing a liquid handler:

- [Liquid Handling Instruments](#)
- [Automation Methods](#) (access restricted to NBS lab directors and their delegates)
- [Considerations in Selecting a Liquid Handler](#)
- [Liquid Pipetting Verification](#) (access restricted to NBS lab directors and their delegates)

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pipettingVerification

State	Contact	Method Used	Instrument
Michigan	Heather Wood	Artel MVS®	Eppendorf epMotion 5075
Minnesota	Berta Warman	Tools sent to Eppendorf for calibration.	epMotion 5075 TMX PC-Control
New England	Jackie Thompson	Bromocresol Green (BCG)	Biomek 3000
New York	Jason Isabelle	Artel MVS	Perkin Elmer JANUS
Virginia	Richard Haughton	Orange G (adopted from CDC method)	Biomek NXp Multichannel with Select Tips
Washington	Tim Lewis	Weight/Volume Calibration	Biomek 4000

Add Pipetting Verification

Pipetting Verification

Contact Information

State	<input type="text" value="Washington"/>		
Contact Name	<input type="text" value="Tim Davis"/>	Secondary Contact Name	<input type="text"/>
Contact Phone	<input type="text" value="425-275-7516"/>	Secondary Contact Phone	<input type="text"/>
Contact Email	<input type="text" value="Tim.Davis@doh.wa.gov"/>	Secondary Contact Email	<input type="text"/>

General Information

Method Used	<input type="text" value="Weight/Volume Calibration"/> (describe in 6 words or less)
Is SOP available upon request?	<input type="text" value="Yes"/>
Instrument(s) Model tested and pipetting mechanism	<input type="text" value="Biomek 4000"/>
Pipetting Mechanism	<input checked="" type="checkbox"/> 8 channel
How often are instruments calibrated?	<input type="text" value="Twice a year"/>

Verification Information

How long does the verification take (estimate based on # replicates described)?	<input type="text" value="about 2 hours"/> <small>If your answer is not included in the dropdown, please type it in the blank selection.</small>
---	---

Are pipetting volumes verified by an outside source, as well as verified by NBS lab? PMs?
How often is this done?

please check all that apply:

Can pipetting tool be removed from instrument for pipetting verification, or is it part of the instrument?

Pipette is part of instrument

What volumes are verified?

4ul

Instrument(s) Needed, other than liquid handler

analytical balance

Solutions Needed

deionized water

Are there any MSDS concerns with the chemicals/reagents listed?

No

What concerns are noted?

Detailed Description of Pipetting verification method (including number of replicates):

1. The density of water is 1g per ml or 1mg per ul. We will use this to calibrate the volume accuracy of the Biomek 40 by adding 352 aliquots of deionized water at 4ul per well (the template volume for the TREC assay) to a 384-well plate. The total volume should be 4ul x 352 wells, which equals 1,408ul. The weight of the added water should then be 1,408mg. Previous testing indicates that in 13 minutes (time of transfer) approximately 47mg of water will evaporate.

Is room temperature and humidity a consideration in this method?

No

Analysis Software (how is pipetting data analyzed?)

n/a

Acceptable Results

Acceptable range is 3.6 to 4.4ul per well.

Additional Information

Tips/Specifics on programming the verification run into the instrument

Hints/Logistics not otherwise noted

This method assumes that each pipette tips dispenses identically to the next. Therefore, all 8 tips are averaged. This method only addresses volume calibration and not variability between each dispense (CV).

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After the visit:

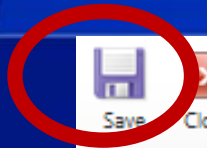
- [Rate your MAP visit.](#)
- The laboratory director will receive a summary report and any resources related to specific molecular testing issues that were discussed during the visit.

Contact

For more information or questions about MAP, please contact [Guisou Zarbalian](#), MS, MPH, senior specialist, Newborn Screening & Genetics, or [Christopher Greene](#), PhD, research scientist, CDC-NSMBB.

Other Molecular Training Resources

- [2017 Gene Sequencing Forum](#)
- [2017 Gene Sequencing in Public Health Newborn Screening Meeting](#)
- [2016 APHL Next Generation Sequencing Implementation Guide](#)



Save Close Paste Copy Cut
Commit Clipboard

Representative Name:	Laura Hancock
Phone Number:	770-488-4617
Email Address:	lfn2@cdc.gov
NBS Laboratory Name:	Centers for Disease Control and Prevention
NBS Laboratory Director:	Suzanne Cordovado
City:	Atlanta
State:	Georgia
Molecular Assays in Use by NBS Laboratory:	Cystic Fibrosis
Molecular Assays Expected in Next Six Months:	SCID
Reason for Visit Request (check all that apply)	<input type="checkbox"/> Preparation for CAP <input checked="" type="checkbox"/> Preparation for CLIA <input type="checkbox"/> New Molecular Lab <input checked="" type="checkbox"/> Expanding to Include New Assay <input type="checkbox"/> Performance Evaluation <input checked="" type="checkbox"/> Molecular Lab Design <input checked="" type="checkbox"/> <input type="text"/>



If your reason is not in this list please let us know in the blank box provided.

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3A: Unidirectional Workflow

3A.1: Does the laboratory have clearly defined pre-PCR and post-PCR laboratory spaces?

N/A YES NO

Comments:

3A.2: Are pre-PCR and post-PCR laboratory spaces physically separated in different rooms?

N/A YES NO

Comments:

3A.3: If pre-PCR and post-PCR areas are in the same room, does the laboratory utilize enclosed dead-air boxes to minimize contamination?

N/A YES NO

Comments:

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- [2016 APHL Molecular Training Workshop](#)
- [2013 APHL Molecular Resources Website Webinar](#)

Frequently Asked Questions

[NBS Molecular FAQs](#)

Contact

For more information about these molecular resources, contact [Funke Akinsola](#), associate specialist, Newborn Screening & Genetics (240.485.2714) or [Laura Hancock](#), Research Scientist, Newborn Screening and Molecular Biology Branch, CDC.

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Newborn Screening Molecular FAQ

The APHL Molecular Subcommittee provides guidance on Frequently Asked Questions related to molecular testing. Click on the questions listed under the headers below to view answers to the FAQ.

Considerations In Changing the Molecular Testing Platform or Assay for Cystic Fibrosis Screening (click questions to expand)

1. What are the expectations of CF NBS in your state?
2. What are the genotypes of people in your state with a diagnosis of CF (or CRMS or CFRD, dependent on your answers to question 1)?
3. Are there people with genotypes of CF (or CRMS or CFRD) who would NOT be identified by your current testing algorithm and panel?
4. Are there people with genotypes of CF (or CRMS or CFRD) who would NOT be identified by your newly proposed testing algorithm and panel?
5. Have you inquired with your NBS follow-up program regarding the algorithm used to follow infants who screen positive with the proposed laboratory algorithm changes?
6. What babies will you miss?
7. Laboratory factors to consider when selecting a new molecular testing platform/assay:

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- 1. What are the expectations of CF NBS in your state?**
 1. Do your state rules explicitly state the case definition?
 2. Have your CF clinicians had input on the case definition?
 3. Is the goal to identify mostly classical CF?
 4. Is the goal to identify CRMS while maximizing detection of classical CF?
 5. Is the goal to identify all CF related disease and syndromes?
- 2. What are the genotypes of people in your state with a diagnosis of CF (or CRMS or CFRD, dependent on your answers to question 1)?**
 1. Potential source: [CF Foundation](#) – you will need to file an application for these data; a CF Foundation Center Director may be able to request these data on your behalf.
 2. Potential source: CF Centers in your state/other CF care providers in your state
- 3. Are there people with genotypes of CF (or CRMS or CFRD) who would NOT be identified by your current testing algorithm and panel?**
- 4. Are there people with genotypes of CF (or CRMS or CFRD) who would NOT be identified by your newly proposed testing algorithm and panel?**
- 5. Have you inquired with your NBS follow-up program regarding the algorithm used to follow infants who screen positive with the proposed laboratory algorithm changes?**
- 6. What babies will you miss?**
- 7. Laboratory factors to consider when selecting a new molecular testing platform/assay:**

What Can You Do?

- ❑ **Request access to the NBS Molecular Resources Website from APHL**
- ❑ **Fill out Molecular Assay Description forms to describe your molecular assays**
- ❑ **Describe your liquid handling solutions for DNA Extraction, PCR Set up or the On-Card Assay Method**

NBS Molecular Subcommittee:

Rachel Lee (TX) – Chairperson

Michele Caggana (NY)

Richard Olney(CA)

Stan Berberich (IA)

Mark McCann (MN)

Rosemary Hage (OH)

Sherly Pardo-Reoyo (PR)

Anne Comeau (MA)

Miriam Schacter (NJ)

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Jelili Ojodu

Funke Akinsola

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Melissa Von Hatten

CDC:

Suzanne Cordovado

Christopher Greene

Laura Hancock

Carla Cuthbert

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333

Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348

E-mail: cdcinfo@cdc.gov Web: www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention, or the U.S. Department of Health and Human Services.

Use of trade names and commercial sources is for identification only and does not constitute endorsement by the U.S. Department of Health and Human Services, or the U.S. Centers for Disease Control and Prevention.

National Center for Environmental Health

U.S. Centers for Disease Control and Prevention

