DEPARTMENT OF HEALTH

Temperature Monitoring at Specimen Receipt

Bonita Bryant, Infectious Disease Lab | August 28, 2025

Overview

- Background/history
- Tiered study approach
  - Tier 1
  - Tier 2
  - Tier 3
- Where are we at now? What's next?

Background/history

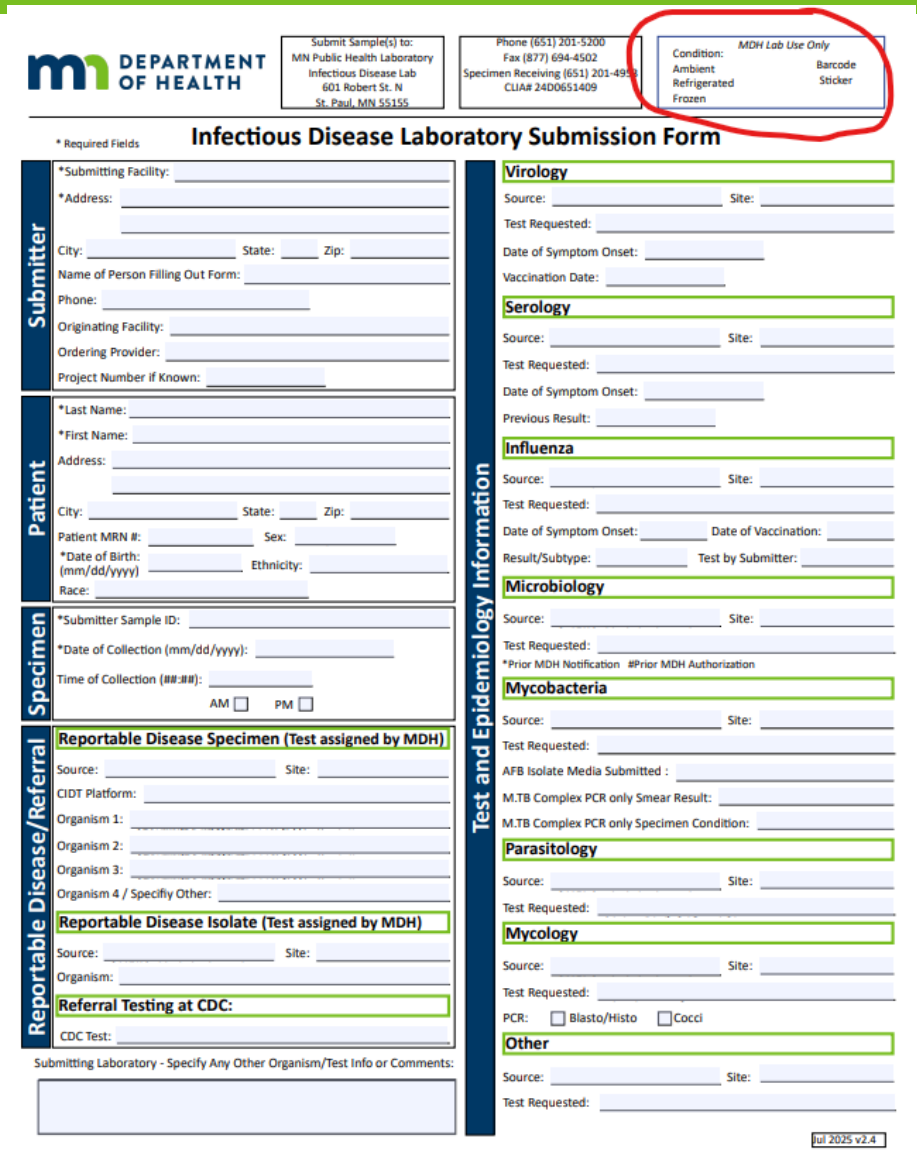
- “Gloved touch” and physical appearance
- Document on submission form

Background/history con’t

MDH Lab Use Only

Condition:
Ambient
Refrigerated
Frozen

Barcode
Sticker



DEPARTMENT OF HEALTH

Submit Sample(s) to:
MN Public Health Laboratory
Infectious Disease Lab
601 Robert St. N
St. Paul, MN 55155

Phone (651) 201-5200
Fax (877) 694-4502
Specimen Receiving (651) 201-4959
CLIA# 24D0651409

MDH Lab Use Only
Condition:
Ambient
Refrigerated
Frozen
Barcode Sticker

* Required Fields

Infectious Disease Laboratory Submission Form

Submitter
*Submitting Facility:
*Address:
City: State: Zip:
Name of Person Filling Out Form:
Phone:
Originating Facility:
Ordering Provider:
Project Number if Known:

Patient
*Last Name:
*First Name:
Address:
City: State: Zip:
Patient MRN #: Sex:
*Date of Birth: (mm/dd/yyyy) Ethnicity:
Race:

Specimen
*Submitter Sample ID:
*Date of Collection (mm/dd/yyyy):
Time of Collection (##:##):
AM ☐ PM ☐

Reportable Disease/Referral
Reportable Disease Specimen (Test assigned by MDH)
Source: Site:
CIDT Platform:
Organism 1:
Organism 2:
Organism 3:
Organism 4 / Specifiy Other:
Reportable Disease Isolate (Test assigned by MDH)
Source: Site:
Organism:
Referral Testing at CDC:
CDC Test:

Submitting Laboratory - Specify Any Other Organism/Test Info or Comments:

Test and Epidemiology Information
Virology
Source: Site:
Test Requested:
Date of Symptom Onset:
Vaccination Date:
Serology
Source: Site:
Test Requested:
Date of Symptom Onset:
Previous Result:
Influenza
Source: Site:
Test Requested:
Date of Symptom Onset: Date of Vaccination:
Result/Subtype: Test by Submitter:
Microbiology
Source: Site:
Test Requested:
*Prior MDH Notification #Prior MDH Authorization
Mycobacteria
Source: Site:
Test Requested:
AFB Isolate Media Submitted :
M.TB Complex PCR only Smear Result:
M.TB Complex PCR only Specimen Condition:
Parasitology
Source: Site:
Test Requested:
Mycology
Source: Site:
Test Requested:
PCR: ☐ Blasto/Histo ☐ Cocci
Other
Source: Site:
Test Requested:

Jul 2025 v2.4

What did we know?

- Wanted actual temperature of specimen
- Avoid rejecting large % at onset
- Needed to determine appropriate ranges

Planning

GOAL:
Incorporate specimen temperature monitoring using NIST thermometers at time of receipt to best assess the integrity of the specimen.

Considerations?

- No idea what to expect
- Seasonal affects
- Time/distance
- Impact on lab

How bad (or good) is it?

- How are specimens currently arriving?
- Establish “baseline”
  Metric for QI

Phased approach

Adopted “Phased” approach

- Tier 1 – how are specimens currently arriving?
- Tier 2 – Where are the issues?
- Tier 3 – What can we do to improve?

Tier 1 -Planning

Tier 1 – how are specimens currently arriving?

- Monitor shipments for “x” period
- Apply Levi Jennings charting and Westgard rules
  - Determine statistically significant ranges for ambient, refrigerated, and frozen
  - Desire 95% “IN” range

Tier 1 -Preparation

Ordered a couple NIST thermometers:

*Both ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001 compliant

*POC studies showed they read within 0.2 degrees of each other on same target

Fisherbrand™ Traceable™ Infrared Thermometer with Trigger Grip

Temperature Range: -60°C to +500 °C

Accuracy: ±1°C

Fisherbrand ™ Traceable Circle Laser Infrared Thermometer with Type K and Calibration

- Temperature: -60°C to +550 °C
- Accuracy: ±2°C

Tier 1

Specimen Receipt Time/Temperature Log

DEPARTMENT OF HEALTH IDL OPERATIONS

UPS – ○
FedEx – ☆

Specimen Receipt Time/Temperature Log

DATE	FACILITY	RECEIPT TEMP	RECEIPT TIME STAMP
		AMB REF FRZ	
		AMB REF FRZ	

Specimen Receipt Time/Temperature Log

DATE	FACILITY	RECEIVE TEMP	RECEIVE TIME STAMP
2-8	Fed Ex	AMB REF FRZ	☆ RCVD FEB 08 2024 AM10:24
		AMB (REF) FRZ	☆
		AMB (REF) FRZ	☆
		(AMB) REF FRZ	RCVD FEB 08 2024 AM10:35
		AMB (REF) FRZ	☆
		AMB (REF) FRZ	☆
		AMB (REF) FRZ	☆
		AMB (REF) FRZ	RCVD FEB 08 2024 AM11:03
		AMB (REF) FRZ	☆
		AMB (REF) FRZ	☆
		AMB (REF) FRZ	☆
		(AMB) REF FRZ	☆
	Mayo	(AMB) (REF) FRZ	☆

Tier 1 -Summary

- May 30th –August 7th, 2024
- “Average” temperature of shipments
  - Hold trigger, scan several spots throughout shipment
  - Release trigger, record weighted average below intended shipping temp
- Data points n= 1,835 (225 facilities)
  - Ambient n= 952
  - Frozen n= 122
  - Refrigerated n= 761

Tier 1 -Data

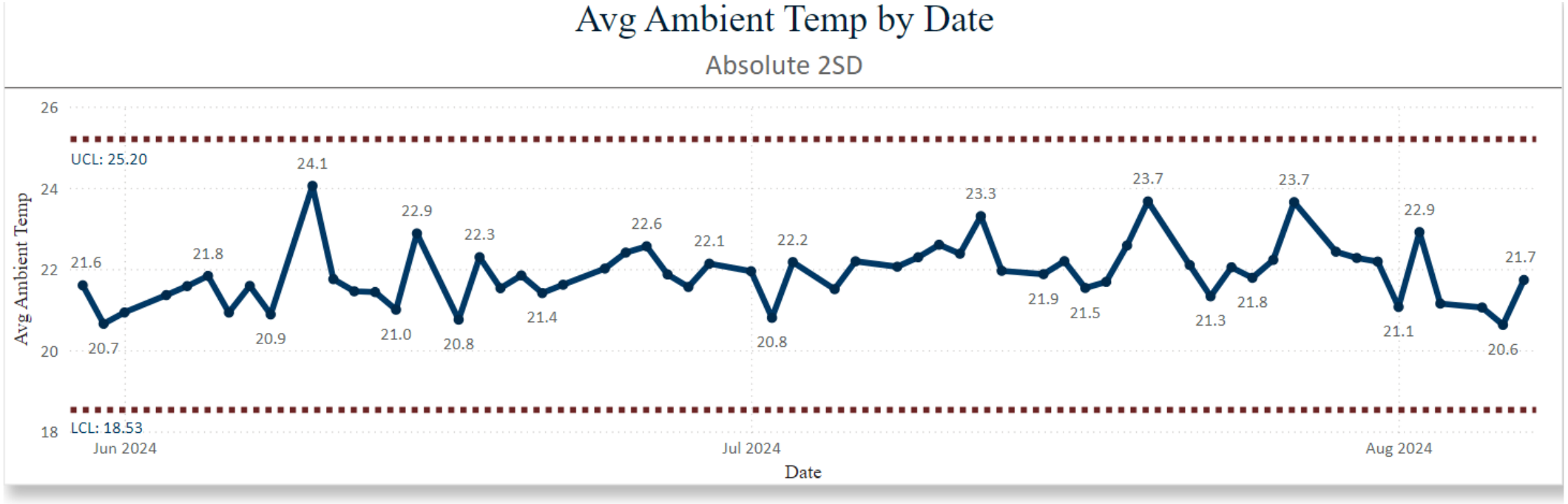
Then we looked at the data……

Tier 1 -Data

Applied Westgard QC rules to Levi Jennings graphing for:

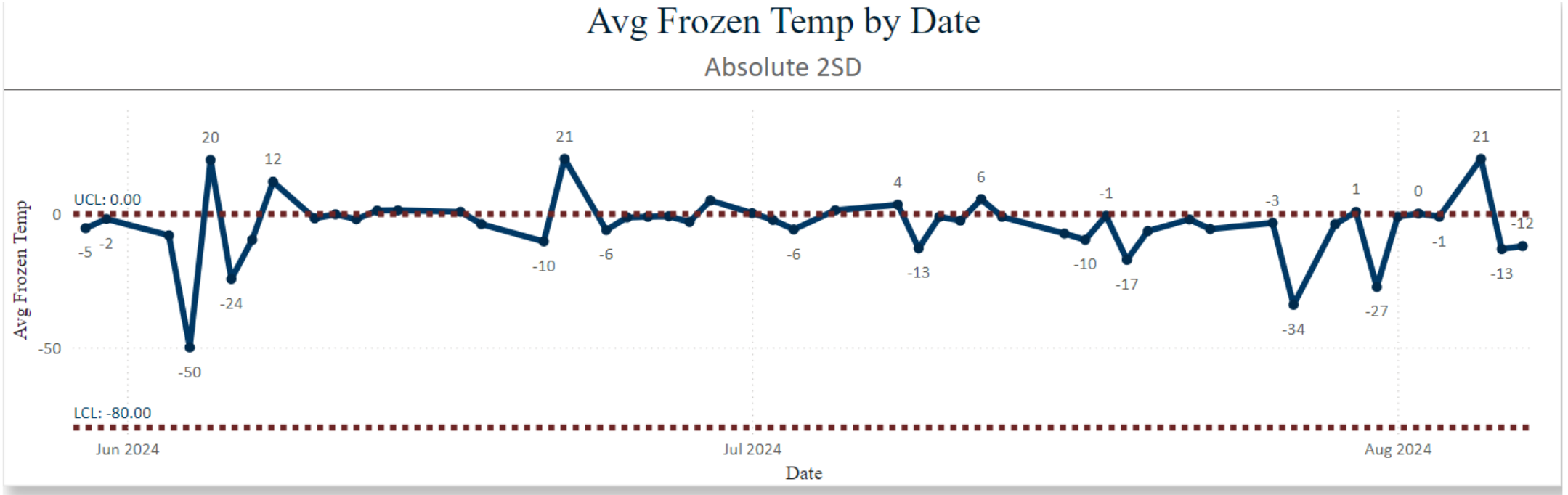
- Average, Min, and Max Temperatures at each range
- Upper and Lower limit 2SD

Ambient



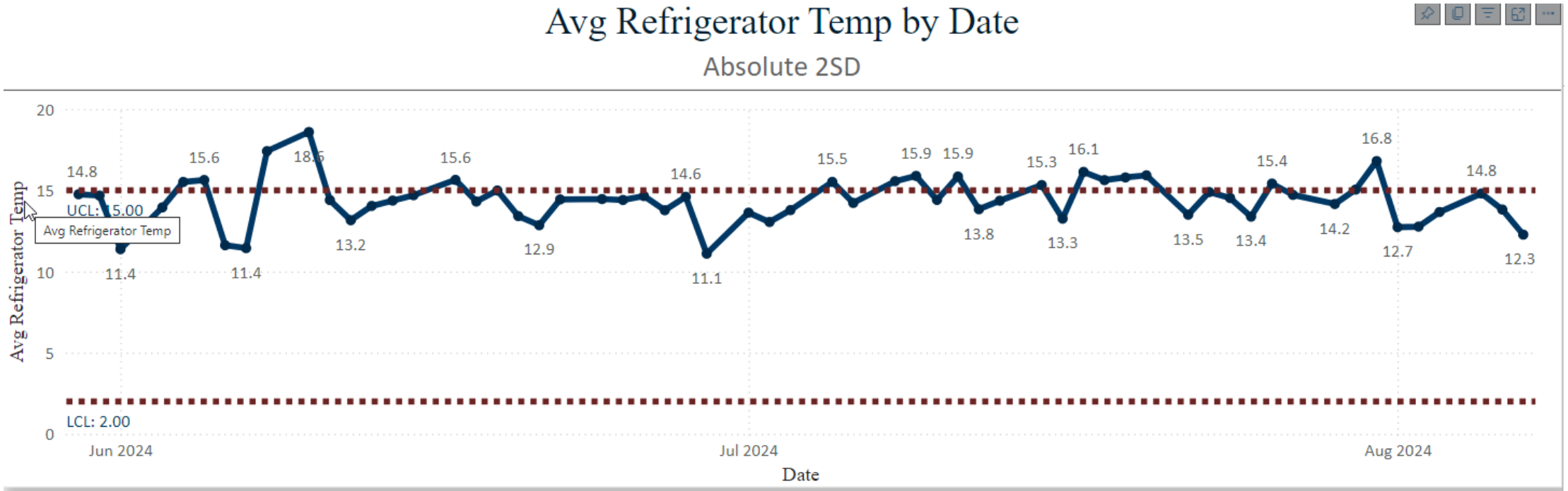
21.86	1.67	18.53	25.20	33.90	11.90
Avg Ambient Temp	STD (Ambient)	LCL(2SD) Ambient	UCL(2SD) Ambient	MAX Temp (Ambient)	MIN Temp (Ambient)

Frozen



-4.90	16.27	-37.45	27.65	24.40	-60.00
Avg Frozen Temp	STD (Frozen)	LCL(2SD) Frozen	UCL(2SD) Frozen	MAX Temp (Frozen)	MIN Temp (Frozen)

Refrigerated

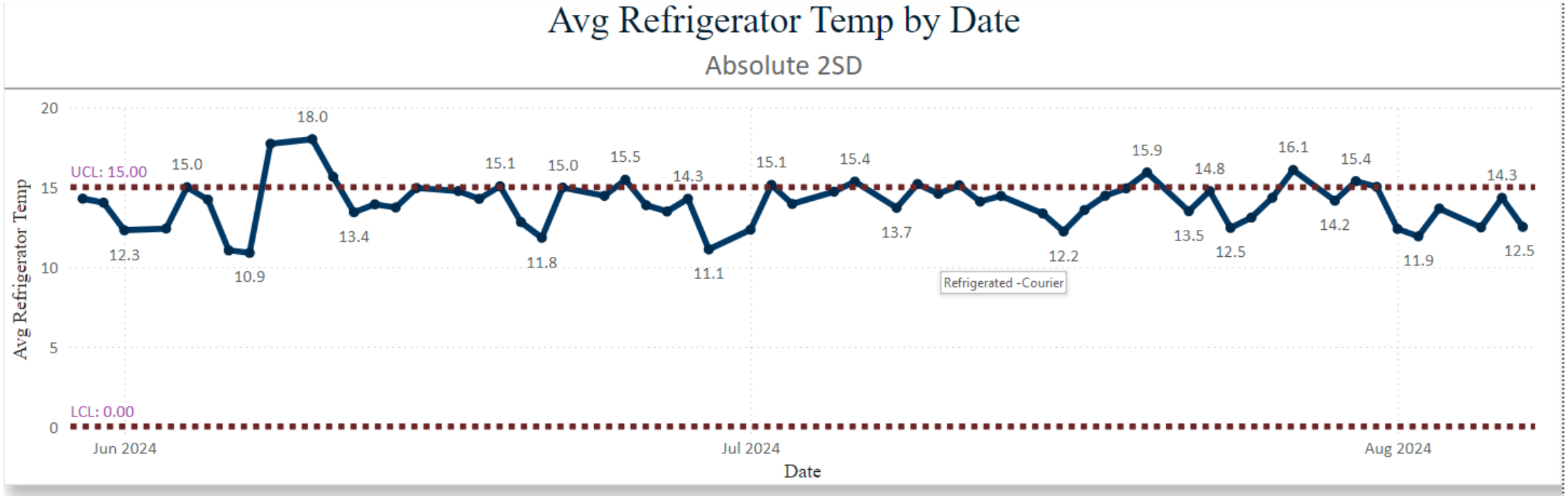


14.44	4.94	4.56	24.32	26.80	0.70
Avg Refrigerator Temp	STD (Refrigerated)	LCL(2SD) Refrigerated	UCL(2SD) Refrigerated	MAX Temp (Refrigerat...	MIN Temp (Refrigerated)

Refrigerated – Deep dive

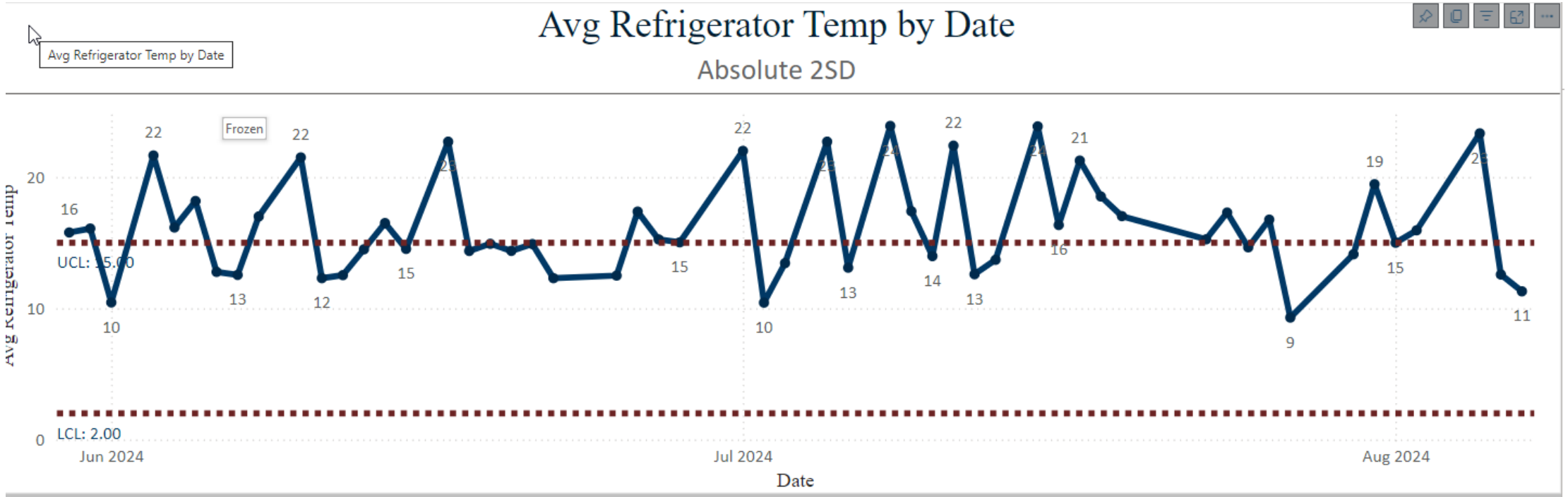
- Facilities denoted as “Courier” or “Shipper”
- Generally:
  - Couriers are used to transport specimens within metro area
  - Shippers are sending samples from out state areas

Refrigerated -Courier



13.94	4.30	5.35	22.53	0.70	26.80
Avg Refrigerator Temp	STD (Refrigerated)	LCL(2SD) Calculated	UCL(2SD) Calculated	MIN Temp	MAX Temp

Refrigerated -Shipper



15.77	6.14	3.48	28.05	25.80	2.70
Avg Refrigerator Temp	STD (Refrigerated)	LCL(2SD) Refrigerated	UCL(2SD) Refrigerated	MAX Temp (Refrigerat...	MIN Temp (Refrigerated)

Tier 1 -Conclusion

Packages intended to be shipped at “refrigerated” temperature was our challenge!

Tier 1 -Limitations

- “Average” temperature (not actual)
- Specimen types unknown
- Tests/Order Choices unknown
- Limited study - May through August
- Multiple staff involved
- Noted challenges for reading <1 mL volume (i.e., cryovials)

Tier 2 – Where are the issues?

- Lab Test(s)
- Specimen type(s)
- Sending facilities
- Day(s) received

Tier 2 -Planning

Needs:

- Standardize temperature process--variety of specimen types/containers/packaging
- Incorporate temperatures in LIS
- Revise SOPs

Tier 2 -Planning con’t

Large shipments + Actual temps **= Problem**

Consulted lab director:

- ≤10 specimens, actual specimen temp
- >10 specimens, average shipment temp

Account for “preferred” versus “alternative” shipping temps

- Many test shipping requirements allow ambient OR refrigerated
  - Tier 1 data only looked at intended vs. average
    - Inform submitters shipments may not be arriving as intended
    - Collection to receipt time- may not have time to “chill”
  - Identify tests and specimen types this applied to in data set

Tier 2 -Planning con’t

Extend temp ranges in data set

- For instance, ambient or refrigerate can use 0.1-25°C range

Workflow refinements

- Loading dock → drop off on cart in lab
- Drop cart → accessioning bench
- Accessioning

Tier 2 - Planning

Under counter fridge

Tier 2 - Planning

Tier 2 -Study

Tier 2 -Summary

November 2024 through March 2025

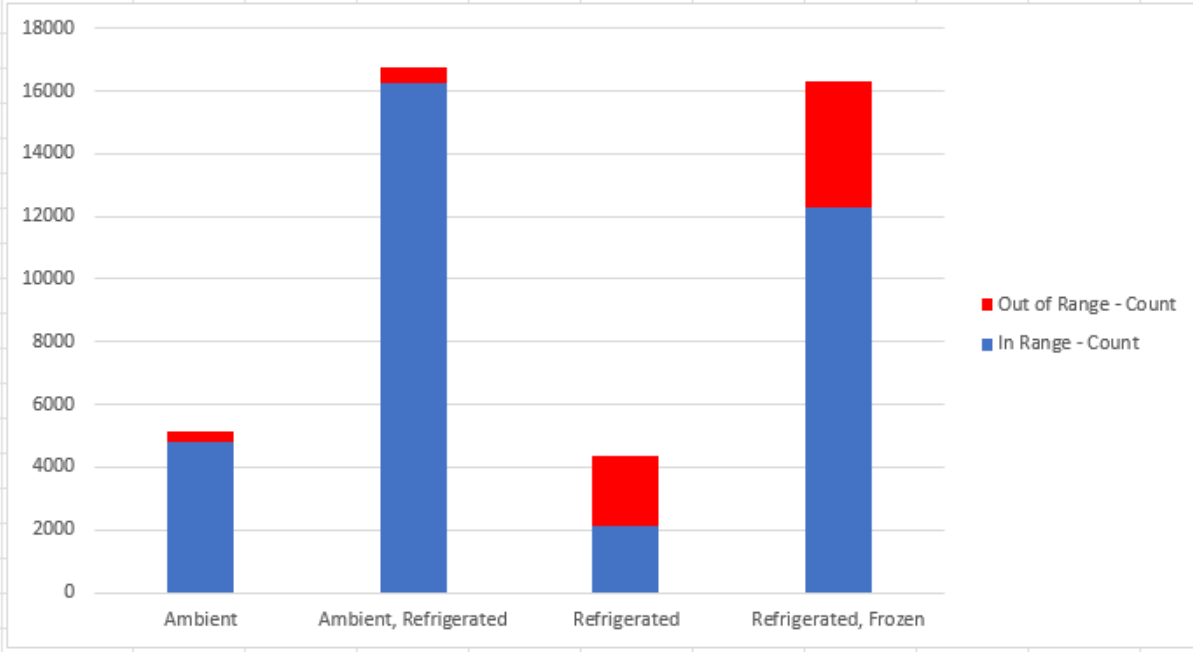
- Browsers pulled from LIS weekly
- Ongoing data review
  - Direct comparison to established ranges
    - Ambient 18-28
    - Fridge 1-15
    - Frozen <0

Pulling all the data together…

Submitting Facility	Order Date	Collection Dat	Order ID	Sample ID	Order Choice Name	Order Choice Abbreviation	Sample Type	Intended Ship Temp	Received Temp (C)	Temp range	Temp appr	Temp min	Temp max	TAT
MAYO CLINIC - MICRO CORE LAB	11/7/2024	11/5/2024			Bordetella PCR	BORDPCR_VTM	Nasopharyngeal swab	Frozen	-51	Ambient, Refrigerated	Out of Range	0.1	25	2.0
	11/7/2024	11/6/2024			Influenza SARS-CoV-2 (FluSC2) Multiplex PCR	FluSC2PCR	Nasopharyngeal swab	Refrigerated	15.9	Refrigerated, Frozen	Out of Range	-99	12.9	1.0
	11/7/2024	11/3/2024			Arbovirus IgM IFA - Serum	FluSC2PCR	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	4.0
	11/7/2024	11/6/2024			M. tuberculosis Complex and M. avium Complex PCR	MTBCPCR	Sputum	Refrigerated	14.4	Refrigerated	Out of Range	0.1	12.9	1.0
	11/7/2024	11/6/2024			Measles Virus PCR	MEVPCR	Nasopharyngeal swab	Refrigerated	13.8	Refrigerated, Frozen	Out of Range	-99	12.9	1.0
	11/7/2024	10/31/2024			Respiratory Syncytial Virus Sequencing Surveillance Rec	RSVSEQ	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	7.0
	11/7/2024	11/2/2024			Respiratory Syncytial Virus Sequencing Surveillance Rec	RSVSEQ	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	5.0
	11/7/2024	11/1/2024			Respiratory Syncytial Virus Sequencing Surveillance Rec	RSVSEQ	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	6.0
	11/7/2024	11/3/2024			Respiratory Syncytial Virus Sequencing Surveillance Rec	RSVSEQ	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	4.0
	11/7/2024	11/5/2024			Respiratory Syncytial Virus Sequencing Surveillance Rec	RSVSEQ	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	2.0
	11/7/2024	11/5/2024			Respiratory Syncytial Virus Sequencing Surveillance Rec	RSVSEQ	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	2.0
	11/7/2024	11/5/2024			Respiratory Syncytial Virus Sequencing Surveillance Rec	RSVSEQ	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	2.0
	11/7/2024	11/4/2024			Respiratory Syncytial Virus Sequencing Surveillance Rec	RSVSEQ	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	3.0
	11/7/2024	11/6/2024			Respiratory Syncytial Virus Sequencing Surveillance Rec	RSVSEQ	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	1.0
	11/7/2024	10/31/2024			SARS-CoV-2 Sequencing Surveillance [i]	2621GENO	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	7.0
	11/7/2024	10/31/2024			SARS-CoV-2 Sequencing Surveillance [i]	2621GENO	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	7.0
	11/7/2024	11/1/2024			SARS-CoV-2 Sequencing Surveillance [i]	2621GENO	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	6.0
	11/7/2024	11/2/2024			SARS-CoV-2 Sequencing Surveillance [i]	2621GENO	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	5.0
	11/7/2024	11/2/2024			SARS-CoV-2 Sequencing Surveillance [i]	2621GENO	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	5.0
	11/7/2024	11/3/2024			SARS-CoV-2 Sequencing Surveillance [i]	2621GENO	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	4.0
	11/7/2024	11/5/2024			SARS-CoV-2 Sequencing Surveillance [i]	2621GENO	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	2.0
	11/7/2024	11/7/2024			SARS-CoV-2 Sequencing Surveillance [i]	2621GENO	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	0.0
	11/7/2024	11/6/2024			SARS-CoV-2 Sequencing Surveillance [i]	2621GENO	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	1.0
	11/7/2024	10/31/2024			SARS-CoV-2 Sequencing Surveillance [i]	2621GENO	Nasopharyngeal swab	Refrigerated	14.1	Refrigerated, Frozen	Out of Range	-99	12.9	7.0
	11/7/2024	11/5/2024			Syphilis Confirmation by TPPA - Serum	SYPHTPPA	Serum	Refrigerated	16.8	Refrigerated, Frozen	Out of Range	-99	12.9	2.0
	11/7/2024	11/5/2024			Syphilis Confirmation by TPPA - Serum	SYPHTPPA	Serum	Refrigerated	17.9	Refrigerated, Frozen	Out of Range	-99	12.9	2.0
	11/7/2024	11/6/2024			Syphilis Screen by RPR - Serum	SYPHRPR	Serum	Refrigerated	13.3	Refrigerated, Frozen	Out of Range	-99	12.9	1.0
	11/7/2024	11/6/2024			Syphilis Screen by RPR - Serum	SYPHRPR	Serum	Refrigerated	14.3	Refrigerated, Frozen	Out of Range	-99	12.9	1.0
	11/7/2024	11/5/2024			Syphilis Screen by RPR - Serum	SYPHRPR	Serum	Refrigerated	16.7	Refrigerated, Frozen	Out of Range	-99	12.9	2.0
	11/7/2024	11/1/2024			Syphilis Screen by RPR - Serum	SYPHRPR	Serum	Refrigerated	15.9	Refrigerated, Frozen	Out of Range	-99	12.9	6.0
	11/7/2024	11/6/2024			Syphilis Screen by RPR - Serum	SYPHRPR	Serum	Refrigerated	17.6	Refrigerated, Frozen	Out of Range	-99	12.9	1.0
	11/7/2024	11/3/2024			Escherichia coli (invasive) - Isolate	ECOLIID	Isolate	Ambient	14.1	Ambient, Refrigerated	In Range	0.1	25	4.0
	11/7/2024	11/3/2024			Escherichia coli (invasive) - Isolate	ECOLIID	Isolate	Ambient	13.8	Ambient, Refrigerated	In Range	0.1	25	4.0
	11/7/2024	11/4/2024			Specimen-Reportable Disease Rule Submission[i]	RDRSPEC	Stool	Refrigerated	10.5	Ambient, Refrigerated	In Range	0.1	25	3.0
	11/7/2024	11/5/2024			Specimen-Reportable Disease Rule Submission[i]	RDRSPEC	Stool	Refrigerated	11.3	Ambient, Refrigerated	In Range	0.1	25	2.0
	11/7/2024	11/4/2024			Specimen-Reportable Disease Rule Submission[i]	RDRSPEC	Stool	Refrigerated	13.1	Ambient, Refrigerated	In Range	0.1	25	3.0
	11/7/2024	11/5/2024			Specimen-Reportable Disease Rule Submission[i]	RDRSPEC	Stool	Refrigerated	11.6	Ambient, Refrigerated	In Range	0.1	25	2.0
	11/7/2024	11/6/2024			EpiOB [i]	EpiOB	Stool	Ambient	20.1	Ambient, Refrigerated	In Range	0.1	25	1.0
	11/7/2024	11/5/2024			Carbapenemase-producing Organism Culture	CPOCX	Axilla and groin swab	Refrigerated	12.4	Ambient, Refrigerated	In Range	0.1	25	2.0
	11/7/2024	11/5/2024			Carbapenemase-producing Organism Culture	CPOCX	Axilla and groin swab	Refrigerated	12.4	Ambient, Refrigerated	In Range	0.1	25	2.0
	11/7/2024	11/5/2024			Carbapenemase-producing Organism Culture	CPOCX	Axilla and groin swab	Refrigerated	12.4	Ambient, Refrigerated	In Range	0.1	25	2.0
	11/7/2024	11/5/2024			Carbapenemase-producing Organism Culture	CPOCX	Axilla and groin swab	Refrigerated	12.4	Ambient, Refrigerated	In Range	0.1	25	2.0
	11/7/2024	11/5/2024			Carbapenemase-producing Organism Culture	CPOCX	Axilla and groin swab	Refrigerated	12.4	Ambient, Refrigerated	In Range	0.1	25	2.0
	11/7/2024	11/6/2024			Mycobacterium Culture and Acid Fast Smear	AFBCU	Biopsy	Refrigerated	11.4	Ambient, Refrigerated	In Range	0.1	25	1.0
	11/7/2024	11/5/2024			Carbapenemase-producing Organism Culture	CPOCX	Axilla and groin swab	Refrigerated	12.4	Ambient, Refrigerated	In Range	0.1	25	2.0

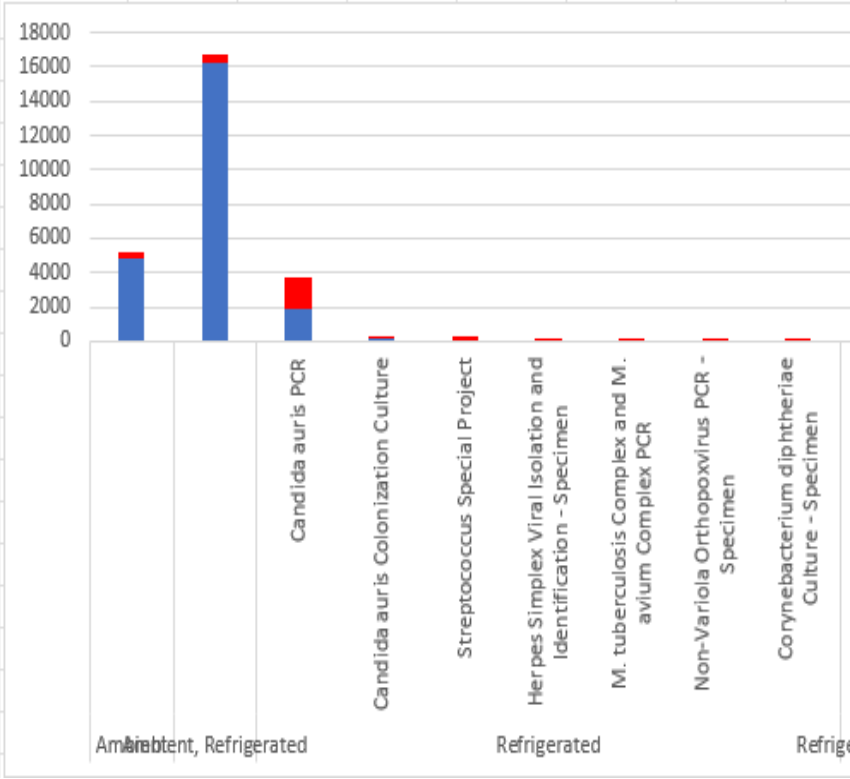
Tier 2 Data

Row Labels	In Range Count	In Range Percent	Out of Range Count	Out of Range Percent	Total Count	Total Percent
Ambient	4811	93.40%	340	6.60%	5151	100.00%
Ambient, Refrigerated	16235	96.90%	519	3.10%	16754	100.00%
Refrigerated	2130	48.61%	2252	51.39%	4382	100.00%
Refrigerated, Frozen	12264	75.18%	4049	24.82%	16313	100.00%
Grand Total	35440	83.19%	7160	16.81%	42600	100.00%



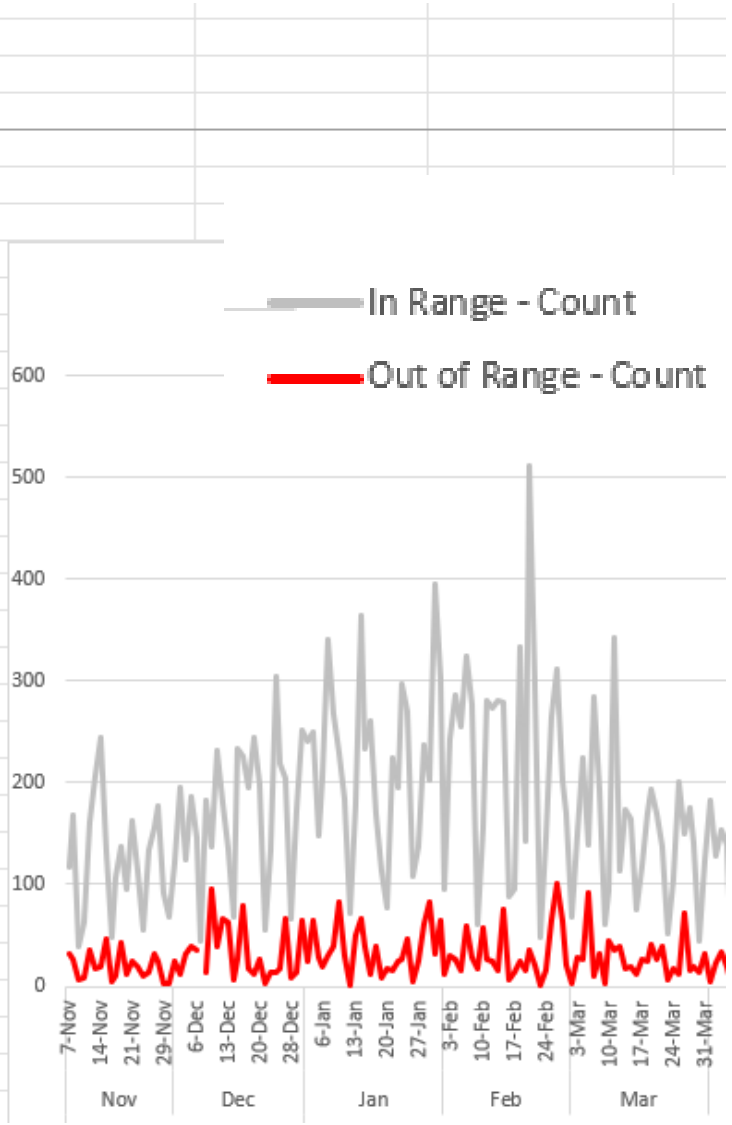
Tier 2

Row Labels	In Range Count	In Range Percent	Out of Range Count	Out of Range Percent	Total Count	Total Percent
Ambient	**4811**	**93.40%**	**340**	**6.60%**	**5151**	**100.00%**
Ambient, Refrigerated	**16235**	**96.90%**	**519**	**3.10%**	**16754**	**100.00%**
Refrigerated	**2130**	**48.61%**	**2252**	**51.39%**	**4382**	**100.00%**
Candida auris PCR	1880	51.05%	1803	48.95%	3683	100.00%
Candida auris Colonization Culture	104	60.82%	67	39.18%	171	100.00%
Streptococcus Special Project	76	24.05%	240	75.95%	316	100.00%
Herpes Simplex Viral Isolation and Identification - Specimen	33	50.00%	33	50.00%	66	100.00%
M. tuberculosis Complex and M. avium Complex PCR	20	27.78%	52	72.22%	72	100.00%
Non-Variola Orthopoxvirus PCR - Specimen	15	22.39%	52	77.61%	67	100.00%
Corynebacterium diphtheriae Culture - Specimen	2	28.57%	5	71.43%	7	100.00%
Refrigerated, Frozen	**12264**	**75.18%**	**4049**	**24.82%**	**16313**	**100.00%**
Grand Total	**35440**	**83.19%**	**7160**	**16.81%**	**42600**	**100.00%**



Tier 2

Column Labels					
In Range		Out of Range		Total Count	Total Percent
Count	Percent	Count	Percent		
133	60.73%	86	39.27%	219	100.00%
193	80.08%	48	19.92%	241	100.00%
127	67.91%	60	32.09%	187	100.00%
1286	**75.07%**	**427**	**24.93%**	**1713**	**100.00%**
141	80.11%	35	19.89%	176	100.00%
33	64.71%	18	35.29%	51	100.00%
90	75.00%	30	25.00%	120	100.00%
200	89.69%	23	10.31%	223	100.00%
128	78.53%	35	21.47%	163	100.00%
125	67.93%	59	32.07%	184	100.00%
130	56.28%	101	43.72%	231	100.00%
45	68.18%	21	31.82%	66	100.00%
100	82.64%	21	17.36%	121	100.00%
185	84.86%	33	15.14%	218	100.00%
109	68.13%	51	31.88%	160	100.00%
35440	**83.19%**	**7160**	**16.81%**	**42600**	**100.00%**



Tier 2

Row Labels	Column Labels: In Range Percent	In Range Count	Out of Range Percent	Out of Range Count	Total Percent	Total Count
Acid Fast Bacillus Identification - Isolate	98.61%	566	1.39%	8	100.00%	574
Aerobic Bacteria Identification	100.00%	90	0.00%		100.00%	90
Antimicrobial Susceptibility - Expanded AST Panel	100.00%	3	0.00%		100.00%	3
Arbovirus IgM IFA - Serum	45.69%	53	54.31%	63	100.00%	116
Bacillus anthracis Culture	100.00%	1	0.00%		100.00%	1
Bacillus anthracis PCR - Isolate	100.00%	20	0.00%		100.00%	20
Bacterial Meningitis PCR Panel	85.71%	6	14.29%	1	100.00%	7
Blastomyces & Histoplasma PCR - Isolate	97.92%	47	2.08%	1	100.00%	48
Blood Parasite Smear, Giemsa Stain	90.00%	9	10.00%	1	100.00%	10
Bordetella PCR	93.08%	632	6.92%	47	100.00%	679
Bordetella pertussis Anti-PT IgG - Serum	33.33%	1	66.67%	2	100.00%	3
Brucella PCR - Isolate	96.55%	28	3.45%	1	100.00%	29
Burkholderia mallei/pseudomallei PCR - Isolate	94.44%	17	5.56%	1	100.00%	18
Campylobacter Culture - Stool	98.10%	1033	1.90%	20	100.00%	1053
Campylobacter Identification - Isolate	99.13%	114	0.87%	1	100.00%	115
Candida auris Colonization Culture	60.82%	104	39.18%	67	100.00%	171
Candida auris PCR	51.05%	1880	48.95%	1803	100.00%	3683
Carbapenemase Detection in Acinetobacter - Isolate	96.46%	218	3.54%	8	100.00%	226
Carbapenemase Detection in Enterobacterales - Isolate	98.04%	601	1.96%	12	100.00%	613
Carbapenemase Detection in Pseudomonas - Isolate	98.16%	479	1.84%	9	100.00%	488
Carbapenemase PCR Panel - Isolate	100.00%	54	0.00%		100.00%	54
Carbapenemase PCR, CarbaR - Specimen	98.14%	2115	1.86%	40	100.00%	2155
Carbapenemase-producing Organism Culture	98.42%	1931	1.58%	31	100.00%	1962

Tier 2

Submitting Facility	(All)					
	Column Labels					
	Out of Range		In Range		Total Percent	Total Count
Row Labels	Percent	Count	Percent	Count		
⊞Blood Parasite Smear, Giemsa Stain	10.00%	1	90.00%	9	100.00%	10
⊞Bordetella PCR	6.92%	47	93.08%	632	100.00%	679
⊞Bordetella pertussis Anti-PT IgG - Serum	66.67%	2	33.33%	1	100.00%	3
⊞Brucella PCR - Isolate	3.45%	1	96.55%	28	100.00%	29
⊞Burkholderia mallei/pseudomallei PCR - Isolate	5.56%	1	94.44%	17	100.00%	18
⊞Campylobacter Culture - Stool	1.90%	20	98.10%	1033	100.00%	1053
⊞Campylobacter Identification - Isolate	0.87%	1	99.13%	114	100.00%	115
⊞Candida auris Colonization Culture	39.18%	67	60.82%	104	100.00%	171
⊟Candida auris PCR	48.95%	1803	51.05%	1880	100.00%	3683
Axilla and groin swab	48.69%	1772	51.31%	1867	100.00%	3639
Swab	64.71%	22	35.29%	12	100.00%	34
Groin swab	90.00%	9	10.00%	1	100.00%	10
⊞Carbapenemase Detection in Acinetobacter - Isolate	3.54%	8	96.46%	218	100.00%	226
⊞Carbapenemase Detection in Enterobacterales - Isolate	1.96%	12	98.04%	601	100.00%	613
⊞Carbapenemase Detection in Pseudomonas - Isolate	1.84%	9	98.16%	479	100.00%	488
⊞Carbapenemase PCR Panel - Isolate	0.00%		100.00%	54	100.00%	54
⊞Carbapenemase PCR, CarbaR - Specimen	1.86%	40	98.14%	2115	100.00%	2155
⊞Carbapenemase-producing Organism Culture	1.58%	31	98.42%	1931	100.00%	1962

Tier 2

Row Labels	Column Labels In Range Count	In Range Percent	Out of Range Count	Out of Range Percent	Total Count	Total Percent
Axilla and groin swab	3274	63.88%	1851	36.12%	5125	100.00%
Nasopharyngeal swab	9043	83.51%	1785	16.49%	10828	100.00%
Serum	1525	56.25%	1186	43.75%	2711	100.00%
Nasal swab	1222	72.05%	474	27.95%	1696	100.00%
Throat swab	1009	69.11%	451	30.89%	1460	100.00%
Urine	983	78.08%	276	21.92%	1259	100.00%
Cerebrospinal fluid (CSF)	180	43.37%	235	56.63%	415	100.00%
Isolate	6022	96.26%	234	3.74%	6256	100.00%
Stool	6098	97.27%	171	2.73%	6269	100.00%
Swab	132	57.89%	96	42.11%	228	100.00%
Urethral swab	16	16.84%	79	83.16%	95	100.00%
Sputum	898	93.74%	60	6.26%	958	100.00%
Rectal swab	2655	98.30%	46	1.70%	2701	100.00%
Source, Other	235	85.77%	39	14.23%	274	100.00%
Buccal swab	20	33.90%	39	66.10%	59	100.00%
Genital swab	26	50.98%	25	49.02%	51	100.00%
Skin lesions/scabs	119	86.86%	18	13.14%	137	100.00%
Lavage, bronchial	224	92.95%	17	7.05%	241	100.00%
Blood, Whole	417	97.20%	12	2.80%	429	100.00%
Groin swab	2	18.18%	9	81.82%	11	100.00%
Respiratory source	22	73.33%	8	26.67%	30	100.00%
Wound	245	96.84%	8	3.16%	253	100.00%
Wound Swab	125	93.98%	8	6.02%	133	100.00%
Vesicular fluid	84	93.33%	6	6.67%	90	100.00%
LRN Water	2	28.57%	5	71.43%	7	100.00%
Bronchial wash	187	97.40%	5	2.60%	192	100.00%
Lung swab		0.00%	4	100.00%	4	100.00%
Aspirate, nasal	1	25.00%	3	75.00%	4	100.00%
Tissue	165	98.80%	2	1.20%	167	100.00%
Aspirate, Tracheal	98	98.99%	1	1.01%	99	100.00%
Bone	16	94.12%	1	5.88%	17	100.00%
Vesicular swab	9	90.00%	1	10.00%	10	100.00%

Tier 2

Urine	**983**	**78.08%**	**276**	**21.92%**	**1259**	**100.00%**
Cerebrospinal fluid (CSF)	**180**	**43.37%**	**235**	**56.63%**	**415**	**100.00%**
Isolate	**6022**	**96.26%**	**234**	**3.74%**	**6256**	**100.00%**
Stool	**6098**	**97.27%**	**171**	**2.73%**	**6269**	**100.00%**
MDH Surveillance Request	32	31.68%	69	68.32%	101	100.00%
Specimen-Reportable Disease Rule Submission[i]	3278	98.38%	54	1.62%	3332	100.00%
Campylobacter Culture - Stool	1033	98.10%	20	1.90%	1053	100.00%
Salmonella Culture - Stool	727	99.05%	7	0.95%	734	100.00%
Shiga toxin-producing E. coli (STEC) Culture - Stool	422	98.60%	6	1.40%	428	100.00%
Clostridium botulinum Rule-out	2	33.33%	4	66.67%	6	100.00%
EpiOB [i]	125	97.66%	3	2.34%	128	100.00%
Rhinovirus and Enterovirus Multiplex PCR	1	25.00%	3	75.00%	4	100.00%
Vibrio Culture - Stool	47	95.92%	2	4.08%	49	100.00%
Norovirus GI/GII PCR - Stool	108	98.18%	2	1.82%	110	100.00%
Shigella Culture - Stool	185	99.46%	1	0.54%	186	100.00%
Gastrointestinal Pathogen Panel - Stool	11	100.00%		0.00%	11	100.00%
Enteric Pathogen Culture - Specimen	19	100.00%		0.00%	19	100.00%
Carbapenemase-producing Organism Culture	4	100.00%		0.00%	4	100.00%
Cryptosporidium Identification - Stool	7	100.00%		0.00%	7	100.00%
Microbiology Bacteria Sequencing	1	100.00%		0.00%	1	100.00%
Shiga-like toxin PCR - Isolate	93	100.00%		0.00%	93	100.00%
Mycobacterium Culture and Acid Fast Smear	3	100.00%		0.00%	3	100.00%
Swab	**132**	**57.89%**	**96**	**42.11%**	**228**	**100.00%**

Tier 2 -Review

- Documented weekly reviews
- Tightened ranges to determine % out
  - Strive for 95% acceptable
- Updated acceptable ranges to close the gap

Tier 2 -Conclusions

We could comfortably tighten our range

- Data review
    - Ambient 18-28
    - Fridge 1-15 changed to: 1°C - 12.9 °C
    - Frozen <0
- Data supplied info to follow up externally with submitters and internally with testing team

Temp Range Timeline

Timeline	AMB	FRIDGE	FROZEN
Applied @ Tier 1	18 to 25	1 to 15	0 to -80
Established (Tier 1)	18 to 28	0 to 15	<0
Established (Tier 2)	15 to 30	0.1 to 12.9	<0
IDEAL (Tier 3)	**8 to 25**	**2 to 10**	**<0**

Ideal ranges

- Outward facing “ship at 2°-8°C”
- Internally accept up to 12.9°C
  - Requires lab director approval!
  - End goal accept 1-10°C
- Active follow-up with submitters

Update Test Catalog

July 2025 - update shipping requirements

- Transport section of the MDH-IDL Test Catalog updated to state a temperature range(s) in parenthesis behind the words “ambient”, “refrigerated”, and “frozen” that is specific for that test. …Specimens that do not meet acceptance criteria will be rejected, and the submitter will be notified.
    - Ambient 8°C to 25°C
    - Refrigerated 2°C to 8°C
    - Frozen <0°C

Tier 3 – What can we do to improve?

- Externally
  - Educate submitters - share data and findings
  - Provide resources and guidance on shipping
  - Understand their challenges
- Internally
  - Assess integrity readily before testing
  - Perform stability studies where needed

Presently Starting Tier 3

Time to act on data! Ensure access to all staff…

- Internally determine if we should be testing (acceptance/rejection process) and consider specific stability studies needed to be done based on themes we see for certain tests and specimen types
- Externally follow up with facilities/submitters that are repeatedly not meeting the established acceptable range(s)
  - Educate, train, and provide data and resources (i.e., shipping material suggestions) to our submitters.
- Track and trend on-going

Tier 4?

Program LIS --acceptance/rejection criteria:

- Laboratory test(s) requested and acceptable specimen type/collection device
- Collection date to receipt date
- Receipt temperature and storage history
- Minimum volume

Tier 4 con’t

LIS build would need each test code to have:

- Test specific specimen type drop down list that only contains validated specimen types unique to test requested
- Collection date to received date calculations – how old is specimen?
- Receipt temperature and storage history
- Specimen volume requirements by test

Acknowledgments

- Ashley Barington, Specimen Receiving
- Emily Goman, Specimen Receiving
- Vicki Lappi, Specimen Receiving Supervisor
- Ginny Dobbins, Health Informatics Supervisor
- Anna Strain, Laboratory Manager
- Sara Vetter, Laboratory Director

Thank You!

Bonita Bryant, MT (ASCP)

Quality Improvement Specialist

Best Practices for Sample Transport

ELIZABETH BERLIN

08/28/2025

Florida Bureau of Public Health Laboratories

Locations

- **Jacksonville**
  - 4 connected buildings with 3-4 floors
- **Miami**
  - 1 building with 3 floors
- **Tampa**
  - 1 building with 1 floor

Jacksonville

Triage Team and Direct Deliveries to Departments

- Triage sorts packages that are not addressed to specific departments
  - Specimen window receives courier deliveries
- Departments receive packages addressed to them

Miami

Triage Team and Direct Deliveries to Departments

- Triage sorts packages that are not addressed to specific departments
  - Specimen window receives courier deliveries
- Departments receive packages addressed to them

Tampa

Direct Deliveries to Departments

- Departments receive packages addressed to them
- Each department opens the packages, takes the temperature, and keeps a log

Documentation in the Laboratory

- Triage SOPs for Each Laboratory
- Preanalytical Specimen Condition Form
- Specimen Delivery Log
- Calibration Certificates

Temperature Study

Date Receiv	Package Temperature	Indicat	Cooler, FedE Bag, etc.?	How many i packs?	Are the ice packs still frozen? Describe if not	Saturday delive checked?	Comments	Picture of strip? (If possib
6/26/2024	7.1°C	Clear	Cooler	2	Yes	No	N/A	
7/18/2024	1.5°C	Clear	Cooler	2	Yes	No	N/A	
7/19/2024	6.1°C	Clear	Cooler	6	Yes	No	N/A	
7/19/2024	14.9°C	Red	Cooler	4	Melted	No	N/A	

Cooler Packaging

"SANDWICH" THE SPECIMEN BETWEEN THE FROZEN ICE PACKS

Specimen Collection Training

BPHL now offers self-paced specimen collection trainings that also highlight best practices for packaging specimens in coolers for transport to help maintain the temperature until the specimens arrive at the lab.

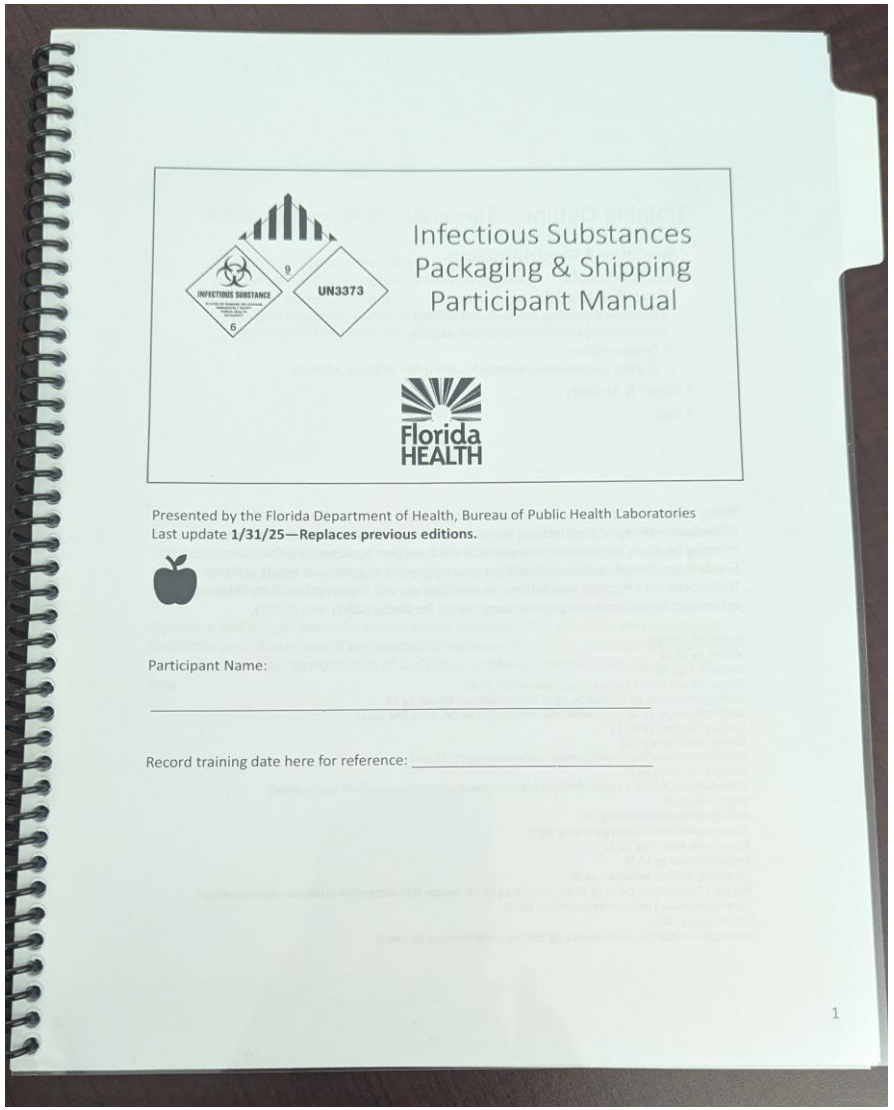
Revamped the Website

Overhaul of the website to make it easier to locate information.

The test menu was recreated to make finding specimen requirements easier.

Monitor Rejection Reasons

Every month a report is built to assist with communication to clients about best practices for collecting and shipping specimen.



Packaging and Shipping Training

The Bureau of Public Health Laboratories sponsors Infectious Substances Packaging and Shipping Training for hospital and county health department personnel and non-sentinel laboratory personnel through the CDC Cooperative Agreement Grant.

Participants learn how to properly package and ship Category A and Category B infectious substances and other dangerous goods, such as dry ice, by air and ground in accordance with prescribed guidelines.

Courier Deliveries

Specimen Window and Courier Deliveries

- The staff will log all deliveries and take the temperature for all specimen or groups of specimens that arrive before they are placed in storage, ex: refrigerator, even in boxes and coolers. A form is completed to make sure the technical staff knows what temperature the specimen arrived at.

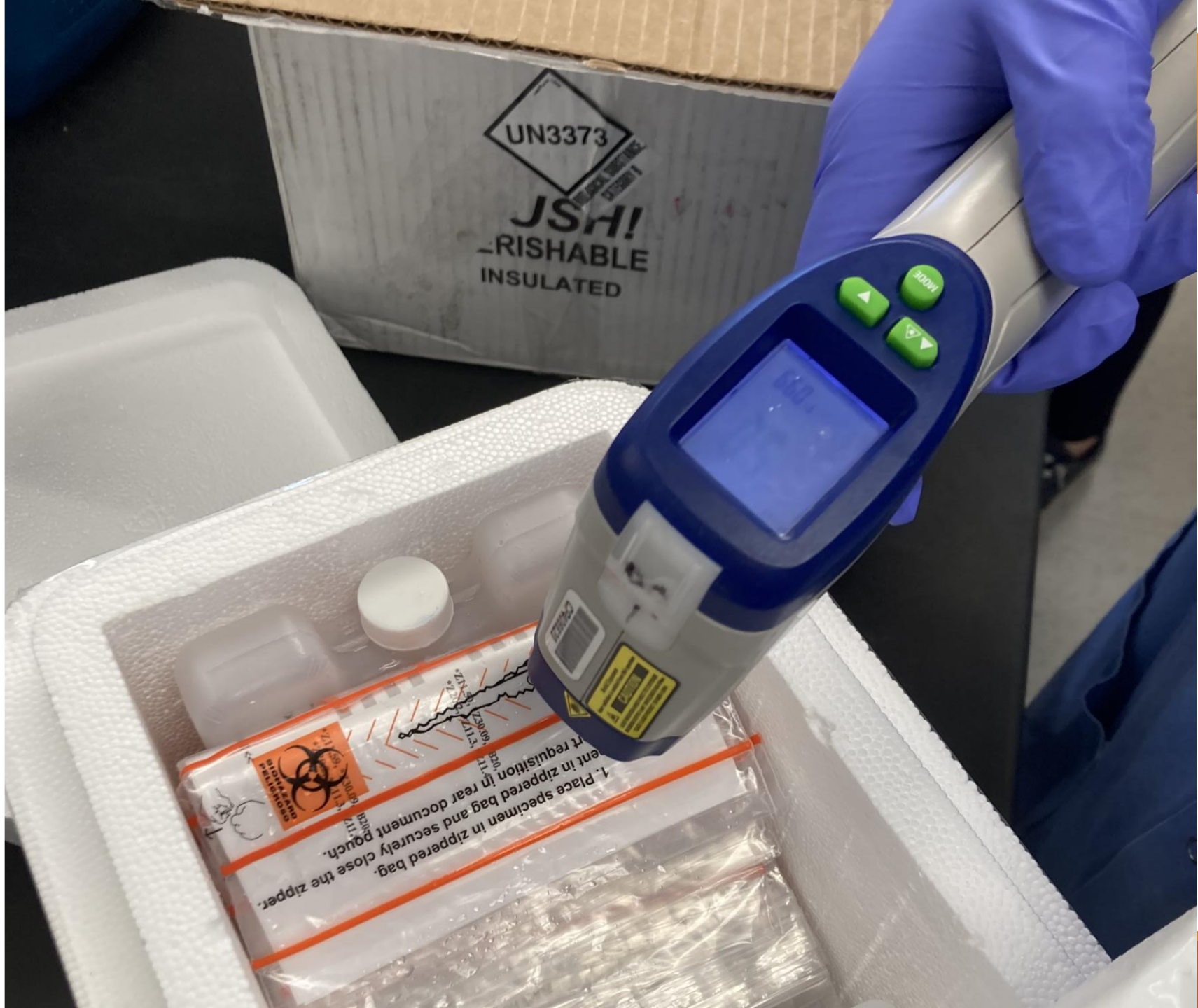
Commercial Shipping

- Main method for specimens arriving at the laboratory.
- Troubleshooting with vendor.
- Had to ensure clinic staff know to include Saturday delivery is checked otherwise packages are stored in a warehouse until Monday.

Checking the Temperature

Using a Calibrated Temperature Gun

When checking the temperature of the specimens and packages, the ice packs on top are removed and the thermometer is placed **1 inch from the top specimens**.



Sorting the Specimen for Delivery to Departments

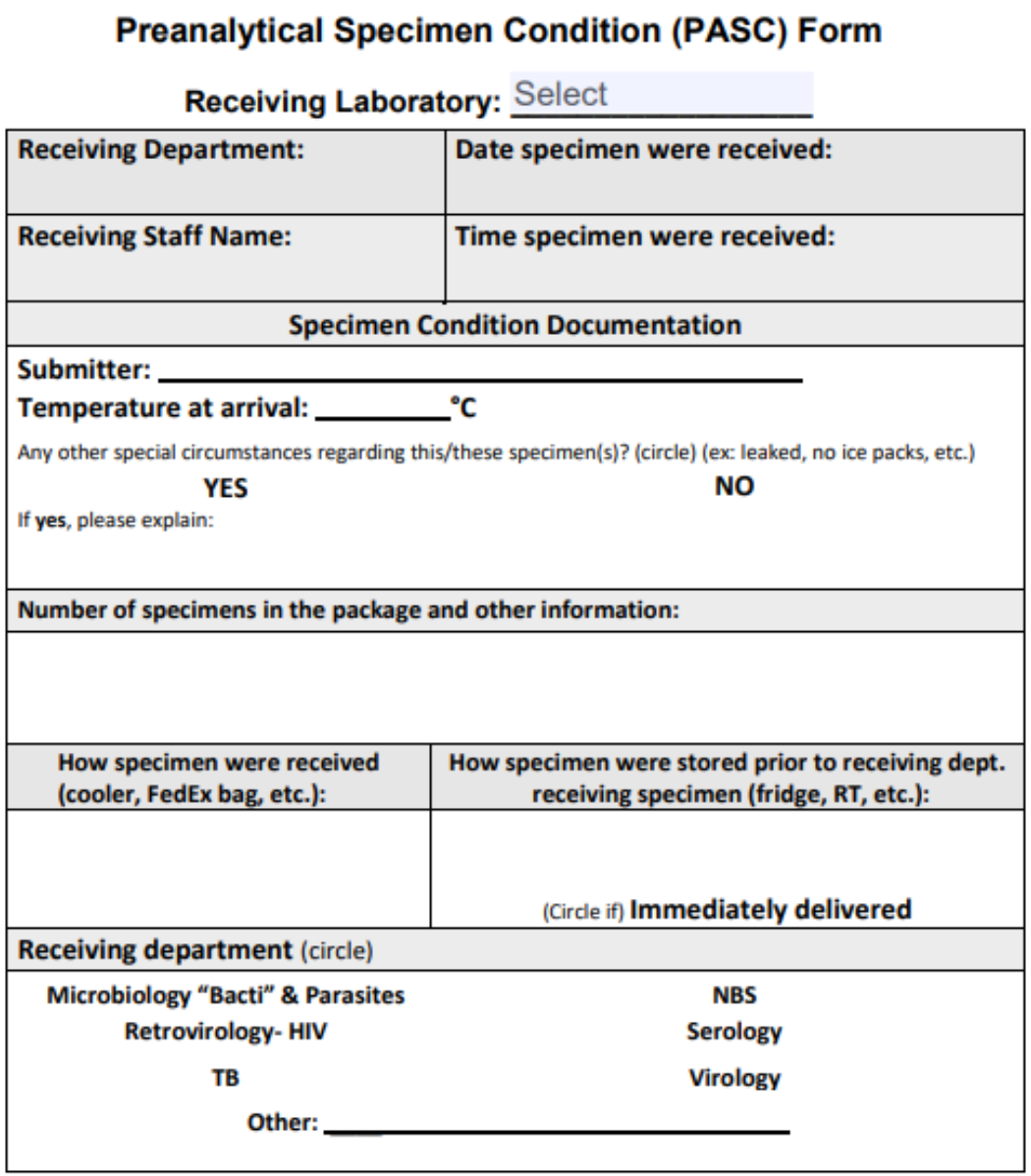
Triage Cheat Sheet

This is used to assist with determining if further documentation is needed

SPECIMEN TEMPERATURE REQUIREMENTS BY DEPARTMENT

Section/Test	Temperature (°C) Ranges Required for Specimen Integrity	Is a *PASC Form Required?
Virology (All)	≤ 8 °C	Y if greater than 8
TB		
Sputum	2-28°C	Y if out of range
TB urine samples	2-8°C	Y if out of range
HIV		
Ag/Ab serum separated	2-37°C	Y if out of range
HIV Viral Load	≤ 8 °C	Y if greater than 8
Serology		
Gen Probe Hologic Aptima Media	2-30°C	Y if greater than 30
RPR	≤ 8°C	Y if greater than 8
QFT-TB	Li-Hep: 2-8°C QFT Tubes: 17-25 °C	Y if out of range
Hepatitis, Rubella Screening	2-8°C	Y if out of range
Newborn Screening	Ambient	No
Bacteriology-Micro samples	2-28°C	Y if out of range
Blood Cultures	2-28°C	Y if out of range
EDTA Blood tubes micro	2-28°C	Y if out of range

* Pre-Analytical Specimen Condition Form



Preanalytical Specimen Condition (PASC) Form

Receiving Laboratory: Select

Receiving Department:	**Date specimen were received:**
Receiving Staff Name:	**Time specimen were received:**

Specimen Condition Documentation

Submitter: _____

Temperature at arrival: _____ **°C**

Any other special circumstances regarding this/these specimen(s)? (circle) (ex: leaked, no ice packs, etc.)

YES **NO**

If **yes**, please explain:

Number of specimens in the package and other information:

How specimen were received (cooler, FedEx bag, etc.):	**How specimen were stored prior to receiving dept. receiving specimen (fridge, RT, etc.):**
	(Circle if) **Immediately delivered**

Receiving department (circle)

Microbiology "Bacti" & Parasites **NBS**

Retrovirology- HIV **Serology**

TB **Virology**

Other: _____

Documentation - Preanalytical Specimen Condition Form

Specimen Delivery Log

SPECIMEN DELIVERY LOG

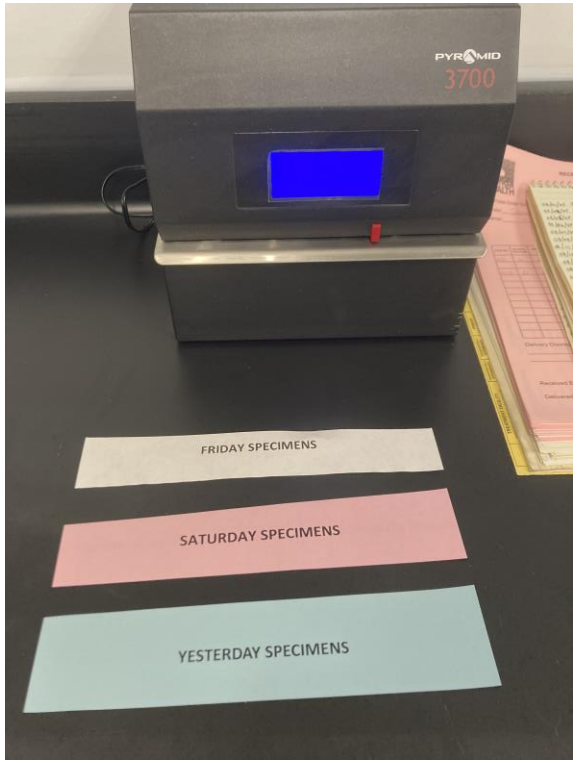
Lab Location: Select **Department:**

Temperature Gun Serial Number: **Expiration Date:** (mm/dd/yyyy)

Date mm/dd/yy	Provider	Description of Sample(s)	Temp	Within Range	Checked by (Initials)	Comments

Comments:

Reveiwed by: **Date:** mm/dd/yyyy



Opening Packages in Triage

a. Appropriate PPE will be donned before opening packages and handling specimens. Specimens will be delivered to the lab departments throughout the day according to the specimen cut-off time below.

Bacteriology	All day as received
Retrovirology	All day as received
Virology	All day as received
Serology	2:00 pm
TB	12:00 pm
Newborn Screening	12:00 pm

After Hours Specimens

Courier Service

Courier

BPHL utilized a courier service for priority specimens sent from select county health departments for a few years.

CLIA questioned how the specimens were maintained temperature during the long commutes.

- How the labs adapted:
  - Coolers with and without ice packs were implemented in the cars
  - An official letter from the company stating that the cars have A/C and specimens are not left in the vehicle with the car turned off.
  - Check the temp of the coolers prior to removing the specimens.

Specimen Acceptability Stability Studies

- Ensure the stability study extends all the way through all reflex tests
- Make sure it is a full range (ex: 2-30°C)
- Test many different conditions to ensure you choose the best options
- Consider your laboratories receiving process and what temperatures work best for your workflow