



ARLN Central Region Lab: *Streptococcus pneumoniae*

Paula M. Snippes Vagnone (MT,ASCP)
Coordinator, AR Lab Network Central Region
Laboratory/Microbiology Unit Supervisor

Supplemental Testing – *S. pneumoniae*

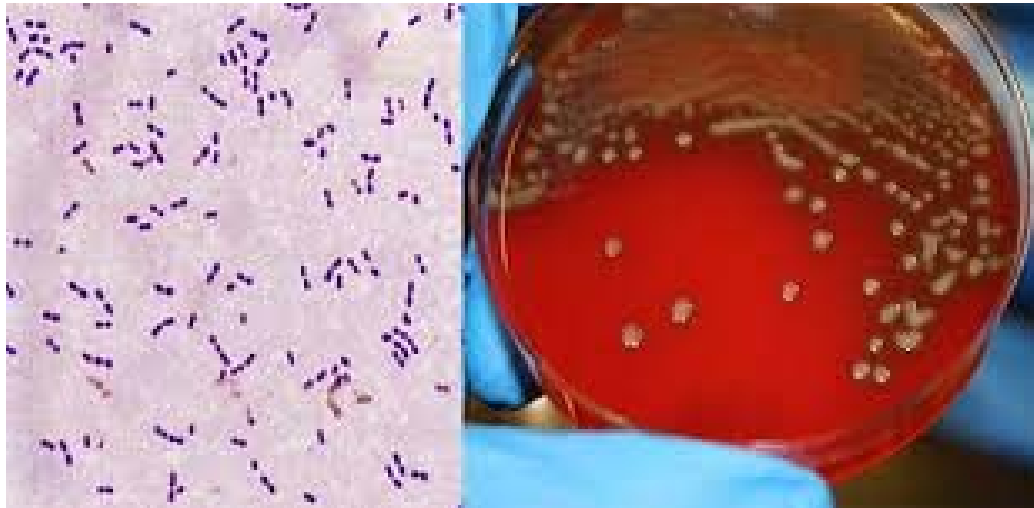
Program Highlights:



- **2 regional labs** – Minnesota and Wisconsin
- **Goal:** 1,000 isolates/year
- **Testing:**
 - Serotyping – real-time and conventional PCR
 - MIC testing – TREK panel
- **Purpose:** Identify antimicrobial resistance and emerging resistance traits – correlate with serotypes

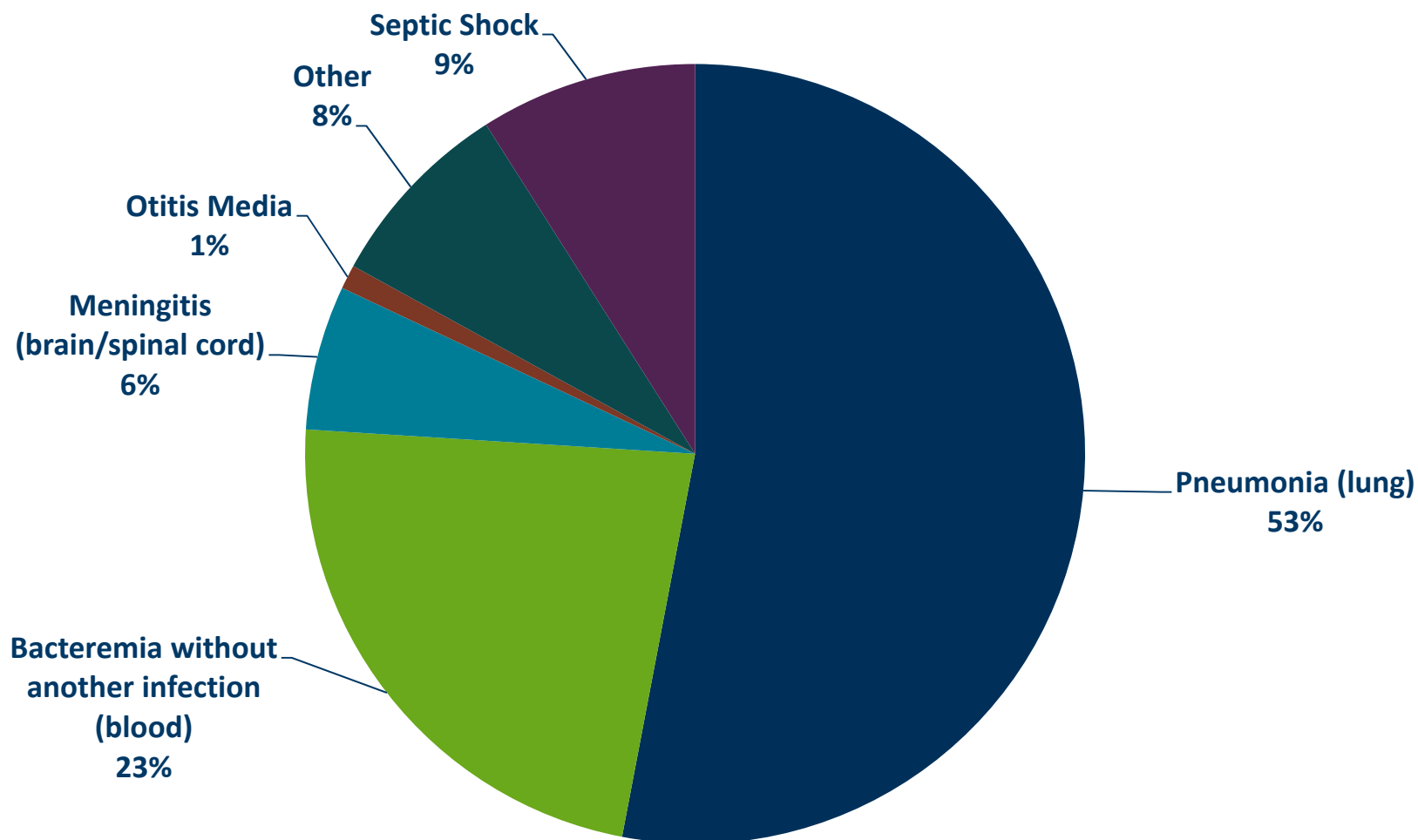
Importance of *S. pneumoniae*

- Currently, drug-resistant *S. pneumoniae* cause over 1 million infections per year and over 7,000 deaths.
- Main cause of community-acquired pneumonia and meningitis in children and the elderly. Can cause a host of other infections ranging from mild to severe.



Streptococcus pneumoniae

Invasive Pneumococcal Disease by Type of Infection/Syndrome, Minnesota 2017*



*This chart represents 558 infections among **481 cases** (some cases had > 1 infection), MDH Emerging Infections (EIP) program.

Corinne Holtzman, Epidemiologist, Emerging Infections Unit, MDH

ARLN *S. pneumoniae* Project Goals

- Identify antimicrobial resistance and emerging resistance traits.
- Associate serotypes with antibiotic resistance.
- Identify and monitor drug-resistant trends.
- Detect and understand vaccine escape strains.
- Inform treatment guidelines and vaccine formulations in hopes of providing new, more effective ways to treat and prevent infections.

ARLN *Streptococcus pneumoniae* Initiative

Antibiotic Resistance Laboratory Network (ARLN)

- *S. pneumoniae* is one of the ARLN pathogens.
- Two ARLN regional laboratories: Wisconsin State Laboratory of Hygiene (East) and Minnesota Department of Health (generally West).



- Each lab will test ~500 *S. pneumoniae* isolates annually collected from sterile body sites.
- Isolates are collected at hospitals, jurisdictional healthcare facilities, and state public health laboratories.

Isolate submission criteria

Submission criteria in order of priority

(from ARLN Overview, Sept. 2017)

- Isolates collected from sterile body sites from persons <12 years old.
- Invasive isolates from sterile body sites (all ages) that are resistant to any of the antibiotics in Table 1 (next slide).
- Any other isolates of concern – failed therapy, vaccine failure, or outbreak.
- We make exceptions. Not sure? Give us a call 😊!

Antibiotics that generate concern when *S. pneumoniae* resistance is detected

Table 1: Antibiotic Resistance
Rifampin
Ampicillin and/or Penicillin
Ceftriaxone and/or Cefotaxime
Meropenem
Cefepime
Ceftaroline
Vancomycin
Synercid
Linezolid

Submit invasive isolates collected from sterile sites that are non-susceptible to at least one of the antibiotics listed in the table.

Antimicrobial Susceptibility Testing (AST)

Performed using a custom TREK broth microdilution panel
Designed through strategic collaboration between CDC, WSLH, and MDH-PHL

	1	2	3	4	5	6	7	8	9	10	11	12
A	ERY 0.06	ERY 0.12	ERY 0.25	ERY 0.5	ERY 1	ERY 2	ERY 4	ERY 8	CPT 0.12	CPT 0.25	CPT 0.5	CPT 1
B	CLI 0.06	CLI 0.12	CLI 0.25	CLI 0.5	CLI 1	CLI 2	MERO 0.06	MERO 0.12	MERO 0.25	MERO 0.5	MERO 1	MERO 2
C	SXT 0.12/2.38	SXT 0.25/4.75	SXT 0.5/9.5	SXT 1/19	SXT 2/38	SXT 4/76	DOX 0.12	DOX 0.25	DOX 0.5	DOX 1	DOX 2	SYN 0.5
D	PEN 0.03	PEN 0.06	PEN 0.12	PEN 0.25	PEN 0.5	PEN 1	PEN 2	PEN 4	PEN 8	PEN 16	DTS	SYN 1
E	AMP 0.03	AMP 0.06	AMP 0.12	AMP 0.25	AMP 0.5	DAP 0.5	DAP 1	DAP 2	LZD 1	LZD 2	LZD 4	SYN 2
F	TIZ 0.12	TIZ 0.25	TIZ 0.5	TIZ 1	TIZ 2	TIZ 4	LEVO 0.5	LEVO 1	LEVO 2	LEVO 4	LEVO 8	SYN 4
G	AXO 0.06	AXO 0.12	AXO 0.25	AXO 0.5	AXO 1	AXO 2	AXO 4	AXO 8	RIF 0.5	RIF 1	RIF 2	RIF 4
H	CHL 2	CHL 4	CHL 8	FOX 0.5	FOX 1	FOX 2	FOX 4	FOX 8	VAN 0.25	VAN 0.5	VAN 1	POS

Identification and Serotyping of *S. pneumoniae*

Conventional PCR and RT-PCR

- Identification:
 - *lytA* is the marker for *S. pneumoniae*
 - Allows for identification of *S. pneumoniae* independent of culture
 - Presence of *lytA* confirms ID
- Serotyping:
 - >90 documented serotypes
 - MDH-PHL types for 39 serotypes using conventional PCR and 21 serotypes using RT-PCR

The forecast is for use of Whole Genome Sequencing (WGS) for ID and serotyping in the near future

- WGS will be able to predict antibiotic resistance

Isolate recruitment from healthcare facility labs

- All labs (PHL and clinical) are encouraged to send *S. pneumoniae* isolates that meet the criteria to MDH-PHL for testing.
 - Isolates can be submitted through SPHL or directly to MN PHL
- Turnaround time for ID and serotyping is 5-7 days.
- AST is performed periodically in batches.
- Submitting institutions will receive a report containing identification and serotyping results via secure fax.
- AST results will not be reported to the submitter.



Antibiotic Resistance Laboratory Network (ARLN)

Public Health Laboratory * 601 Robert St N * St. Paul MN 55155 * 651-201-5200

Project #

Fee
sticker

N/A

Bar Code
Sticker

MDH Use Only

Clinical Testing and Submission Form

PATIENT INFO

Last name: _____
First name: _____ MI: _____
Address: _____
City: _____ State: _____ Zip: _____
Patient ID #: _____ County: _____
DOB (mm/dd/yyyy): ____/____/____ Sex: ☐ M ☐ F ☐ U

SUBMITTING FACILITY INFO

Facility name: _____
Address: _____
City: _____ State: _____ Zip: _____
Submitter #: _____ Phone: _____
Clinician: _____ Phone: _____
Name of person filling out form: _____ Phone: _____

Patient location at time culture collected (facility name): _____ State: _____ Zip: _____

Clinical laboratory info (facility name): _____ State: _____ Zip: _____

Specimen or Isolate Source Information

☐ Specimen ☐ Isolate

Lab sample #: _____

Collection date: (mm/dd/yyyy) ____/____/____

Collection time: _____ ☐ a.m. ☐ p.m.

☐ Blood
☐ Abscess: site: _____
☐ Body fluid: _____
☐ Bone: _____
☐ Bronchial: _____
☐ CSF

☐ Sputum
☐ induced ☐ expectorated
☐ Stool
☐ Swab site: _____
☐ Tissue ☐ Biopsy site: _____
☐ Urine

☐ Wash ☐ Aspirate site: _____
☐ Wound site: _____
☐ Other: _____

Organism: _____

Test Requested

- ☐ Project 2176* Carbapenem-resistant Enterobacteriaceae (CRE)
*Please include phenotypic carbapenemase test result (mCIM, etc), PCR result and AST results.
- ☐ Project 2177* Carbapenem-resistant Pseudomonas aeruginosa (CRPA)
*Please include phenotypic carbapenemase test result (mCIM, etc), PCR result and AST results.
- ☐ Project 2178* Carbapenem-resistant Acinetobacter or 3rd generation cephalosporin-resistant E. coli or Klebsiella spp.
*Please include AST results from clinical lab and results of any other testing (eg: mCIM, ESB, etc.)
- ☐ Project 2179* Carbapenem Resistant Organism colonization screening
*Testing requires prior approval from regional lab.
- ☐ Project 2180 Candida AST/identification
- ☐ Project 2181 S. pneumoniae serotyping/AST

Submitting laboratory's comments:

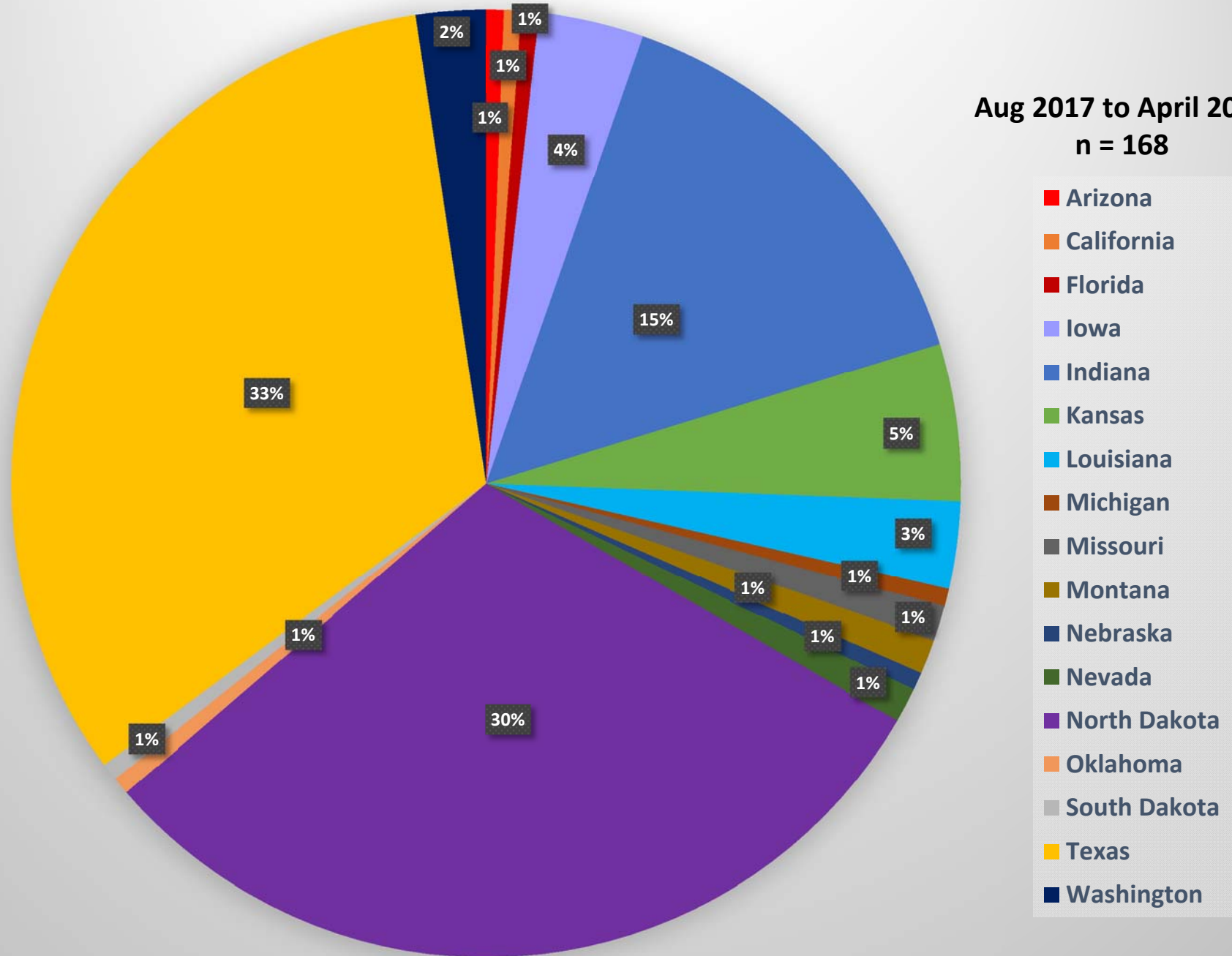
Supplemental Testing – *S. pneumoniae*



Snapshot of data...

Isolates received by state

Aug 2017 to April 2018
n = 168



S. pneumoniae serotypes and pneumococcal vaccines

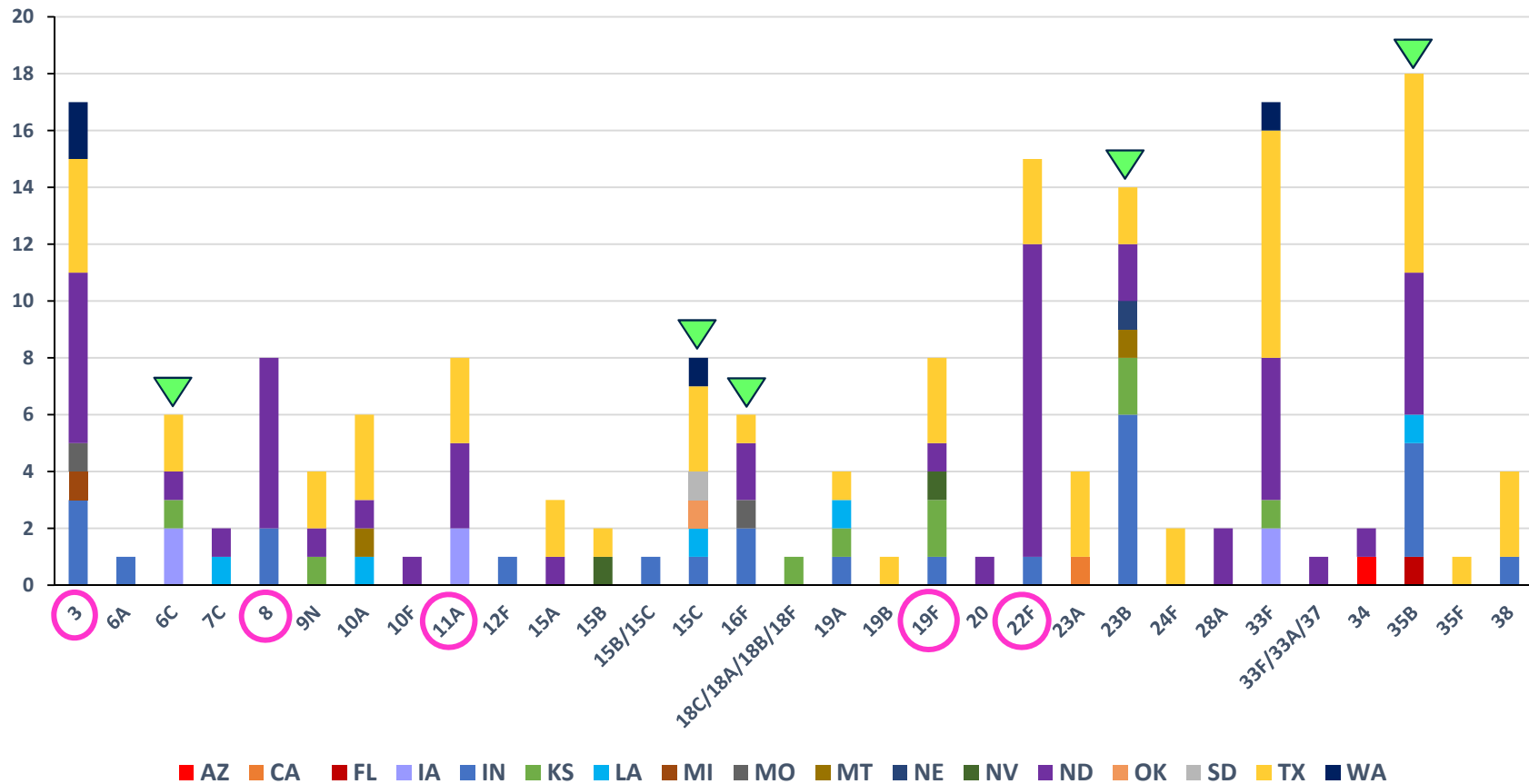
- Pneumococcal conjugate vaccine (PCV13 or Prevnar13®) protects against 13 serotypes: 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 19A, 19F, 18C, and 23F. CDC recommends PCV13 for use in infants and young children and adults 65 years or older.
- The pneumococcal polysaccharide vaccine (PPSV23 or Pneumovax®) protects against 23 serotypes: 1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19F, 19A, 20, 22F, 23F, and 33F. CDC recommends this vaccine for all adults 65 years or older and for those 2 years or older at increased risk for disease.

<https://www.cdc.gov/pneumococcal/about/risk-transmission.html>.

<https://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM257088.pdf>

Serotypes by State

Serotypes by State
Aug 2017 to April 2018
n=168



Final Reminder - Soliciting Isolates

Provide awareness to partners

- Infectious Disease Docs
- Laboratorians
- Public Health colleagues in other states in the expanded western region

Submission criteria refresher:

- Sterile body sites, <12 years old
- Resistant isolates
- “Other” isolates of concern
- arlnmn@state.mn.org



QUESTIONS...





THANK YOU!

Paula Snippes Vagnone (MT, ASCP)

Paula.snippes@state.mn.us