



The State of CIDTs in Minnesota

Dave Boxrud

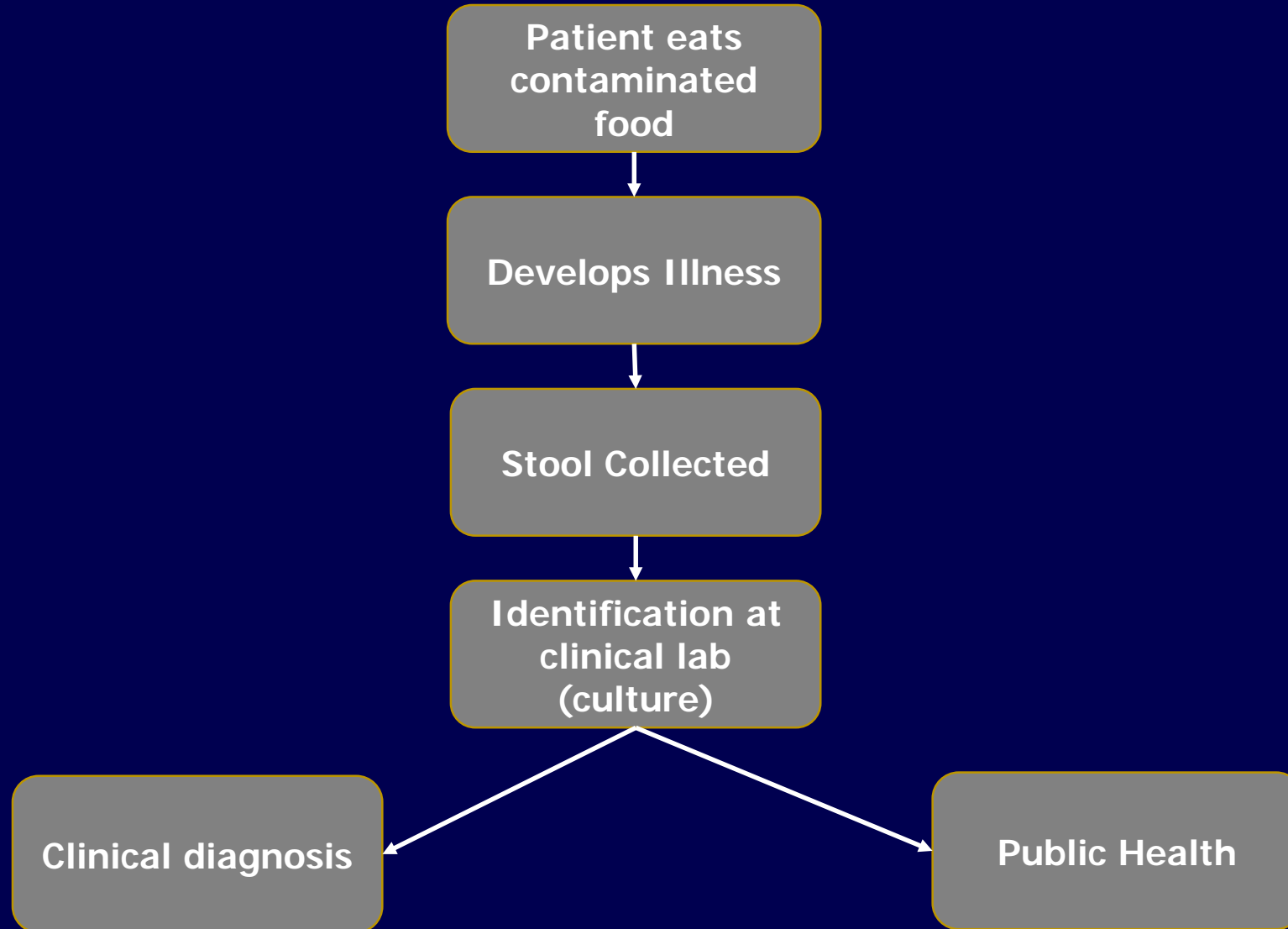
Molecular Epidemiology Supervisor



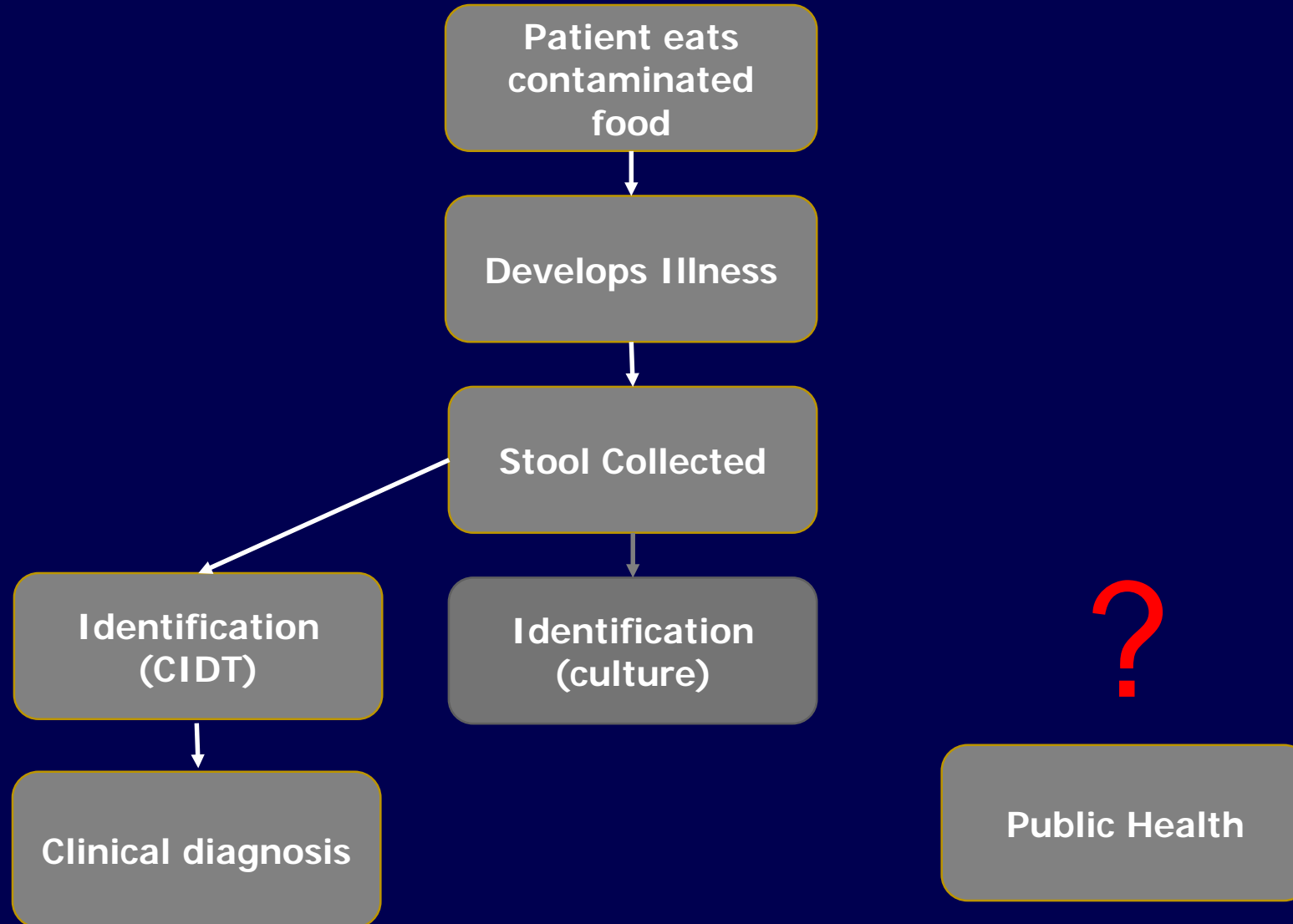
Second Generation GI CIDT (molecular multiplex)

	BD MAX Enteric Bacterial Panel (BD)	FilmArray (BioFire)	Prodiess ProGastro SSCS (Hologic)	Verigene Enteric Pathogens (Nanosphere)	xTAG GPP (Luminex)
Bacteria	6	13	5	7	7
Viruses	0	5	0	0	2
Parasites	0	4	0	3	2
Test Time	Same Day	Same Day	Same Day	Same Day	Same Day

Past GI Testing



Testing with GI CIDT



Diseases Reportable to the Minnesota Department of Health

612-676-5414 or 1-877-676-5414 24 hours a day, 7 days a week

Report Immediately by Telephone

Anthrax (*Bacillus anthracis*)^a
Botulism (*Clostridium botulinum*)
Brucellosis (*Brucella* spp.)^a
Cholera (*Vibrio cholerae*)^a
Diphtheria (*Corynebacterium diphtheriae*)^a
Hemolytic uremic syndrome^a
Measles (rubeola)^a
Meningococcal disease (*Neisseria meningitidis*)
(all invasive disease)^{a, b}
Orthopox virus^a
Plague (*Yersinia pestis*)^a
Poliomyelitis^a
Q fever (*Coxiella burnetii*)^a
Rabies
(animal and human cases and suspected cases)
Rubella and congenital rubella syndrome^a
Severe Acute Respiratory Syndrome (SARS)
(1. Suspect and probable cases of SARS. 2. Cases of health care workers hospitalized for pneumonia or acute respiratory distress syndrome.)^a
Smallpox (variola)^a
Tularemia (*Francisella tularensis*)^a
Unusual or increased case incidence of any illness^a

Report Within One Working Day

Amebiasis (*Entamoeba histolytica/dispar*)
Anaplasmosis (*Anaplasma phagocytophilum*)
Arboviral disease (including but not limited to: LaCrosse encephalitis, eastern equine encephalitis, western equine encephalitis, St. Louis encephalitis, and West Nile virus)
Babesiosis (*Babesia* spp.)
Blastomycosis (*Blastomyces dermatitidis*)
Campylobacteriosis (*Campylobacter* spp.)^a
Cat scratch disease (infection caused by *Bartonella* spp.)
Chancroid (*Haemophilus ducreyi*)^c
Chlamydia trachomatis infection^c
Coccidioidomycosis
Cryptosporidiosis (*Cryptosporidium parvum*)^a
Cyclosporiasis (*Cyclospora* spp.)^a
Dengue virus infection
Diphyllobothrium latum infection
Ehrlichiosis (*Ehrlichia* spp.)
Encephalitis (caused by viral agents)
Enteric *E. coli* infection (*E. coli* O157:H7, other enterohemorrhagic [Shiga toxin-producing] *E. coli*, enteropathogenic *E. coli*, enteroinvasive *E. coli*, enterotoxigenic *E. coli*)^a
Enterobacter sakazakii (infants under 1 year of age)^a
Giardiasis (*Giardia lamblia*)
Gonorrhea (*Neisseria gonorrhoeae*)^c
Haemophilus influenzae disease
(all invasive disease)^{a, c}
Hantavirus infection
Hepatitis (all primary viral types including A, B, C, D, and E)
Histoplasmosis (*Histoplasma capsulatum*)
Human immunodeficiency virus (HIV) infection, including Acquired Immunodeficiency Syndrome (AIDS)^{a, d}
Influenza
(unusual case incidence, critical illness, or laboratory confirmed cases)^{a, e}
Kawasaki disease
Kryptosporidiosis (invasive only)
Legionellosis (*Legionella* spp.)^a
Leptospirosis (Hansen's disease) (*Mycobacterium leprae*)
Leptospirosis (*Leptospira interrogans*)
Listeriosis (*Listeria monocytogenes*)^a
Lyme disease (*Borrelia burgdorferi*)
Malaria (*Plasmodium* spp.)
Meningitis (caused by viral agents)
Mumps
Neonatal sepsis, less than 7 days after birth (bacteria isolated from a sterile site, excluding coagulase-negative *Staphylococcus*)^{a, b}
Pertussis (*Bordetella pertussis*)^a
Pittacosis (*Chlamydia philipii*)
Retrovirus infection
Reye syndrome
Rheumatic fever (cases meeting the Jones Criteria only)
Rocky Mountain spotted fever (*Rickettsia rickettsii*, *R. canada*)
Salmonellosis, including typhoid (*Salmonella* spp.)^a
Shigellosis (*Shigella* spp.)^a
Staphylococcus aureus (vancomycin-intermediate *S. aureus* [VISA], vancomycin-resistant *S. aureus* [VRSA], and death or critical illness due to community-associated *S. aureus* in a previously healthy individual.)^a
Streptococcal disease (all invasive disease caused by Groups A and B streptococci and *S. pneumoniae*)^{a, b}
Syphilis (*Treponema pallidum*)^c
Tetanus (*Clostridium tetani*)
Toxic shock syndrome^a
Toxoplasmosis (*Toxoplasma gondii*)
Transmissible spongiform encephalopathy
Trichinosis (*Trichinella spiralis*)
Tuberculosis (*Mycobacterium tuberculosis* complex)
(pulmonary or extrapulmonary sites of disease, including laboratory confirmed or clinically diagnosed disease. Latent tuberculosis infection is not reportable.)^a
Typhus (*Rickettsia* spp.)
Unexplained deaths and unexplained critical illness
(possibly due to infectious cause)^a
Vaccinia-zoster disease (1. Primary [chickenpox]: unusual case incidence, critical illness, or laboratory-confirmed cases. 2. Recurrent [shingles]: unusual case incidence, or critical illness.)^a
Vibrio spp.^a
Yellow fever
Yersiniosis, enteric (*Yersinia* spp.)^a

Footnotes

- Submission of clinical materials required. If a rapid, non-culture assay is used for diagnosis, we request that positives be cultured, and isolates submitted. If this is not possible, send specimens, enrichment broths, or other appropriate material. Call the MDH Public Health Laboratory at 612-676-5396 for instructions.
- Isolates are considered to be from invasive disease if they are isolated from a normally sterile site, e.g. blood, CSF, joint fluid, etc.
- Report on separate Sexually Transmitted Disease Report Card.
- Report on separate HIV Report Card.
- See www.health.state.mn.us/divs/idepo/topics/reportable/index.html for criteria for reporting laboratory confirmed cases of influenza.

Clinical Materials

To send clinical materials to MDH:
If you are sending clinical materials by U.S. mail, use regulatory compliant transport packaging and send to: PO Box 9441, Minneapolis, MN 55440-9441.
If you are using a courier, use transport packaging appropriate for the specific courier and send to: PO Box 9441, Minneapolis, MN 55440-9441.
To request pre-paid transport labels (both mail and courier) and packaging, or for other assistance, call the Public Health Laboratory Specimen Handling Unit at: 612-676-5396.

To Report A Case

For diseases that require immediate reporting call the Infectious Disease Epidemiology, Prevention and Control Division at: 612-676-5414 or 1-877-676-5414.

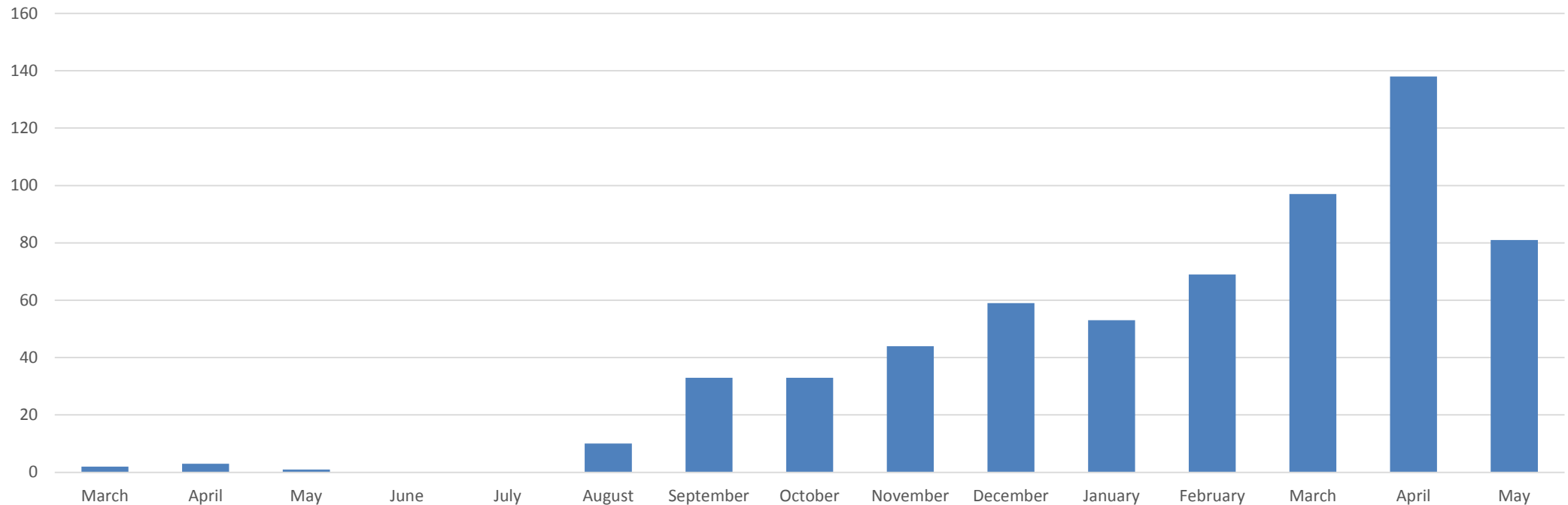
To report by mail or fax, fill out a Minnesota Department of Health case report form (available at www.health.state.mn.us/divs/idepo/topics/reportable/index.html) and mail to: PO Box 9441, Minneapolis, MN 55440-9441 or fax the form to 612-676-5743.

Minnesota Department of Health
Infectious Disease Epidemiology, Prevention and Control
717 Delaware Street SE, Minneapolis, MN 55414
or PO Box 9441, Minneapolis, MN 55440-9441
612-676-5414, 1-877-676-5414, TTY 612-676-5663
www.health.state.mn.us

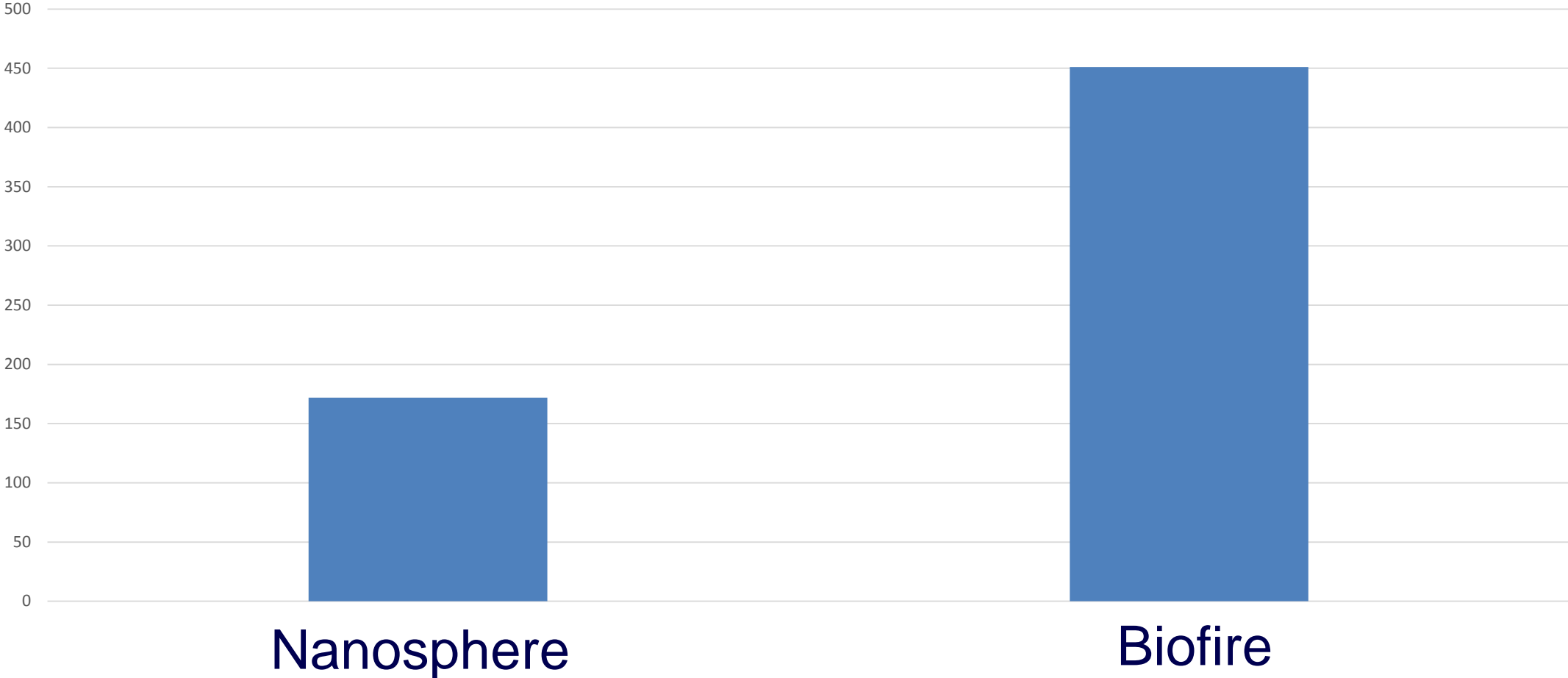
**Mandatory submission:
Campylobacter, Cryptosporidium,
Cyclospora, Enteric E. coli (STEC,
ETEC, EIEC, EPEC), Salmonella,
Shigella, Vibrio sp., Yersinia sp.**

**Submission of clinical materials
required. If a rapid, non-culture assay is
used for diagnosis, we request an
isolate, if that is not possible then a
specimen, if that is not possible then
nucleic acid**

Molecular CIDT Specimens Received at MDH (last updated May 24, 2016)



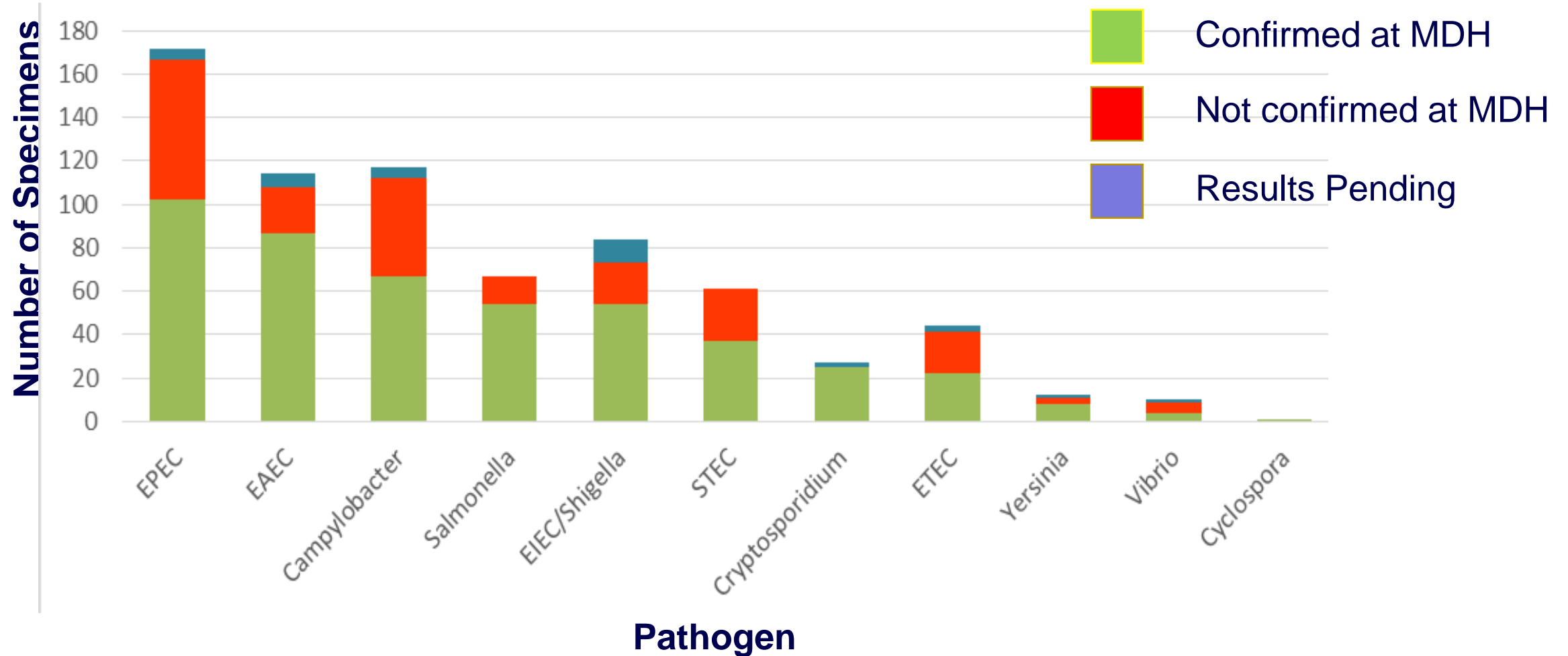
CIDT Assays on Specimens Received at MDH



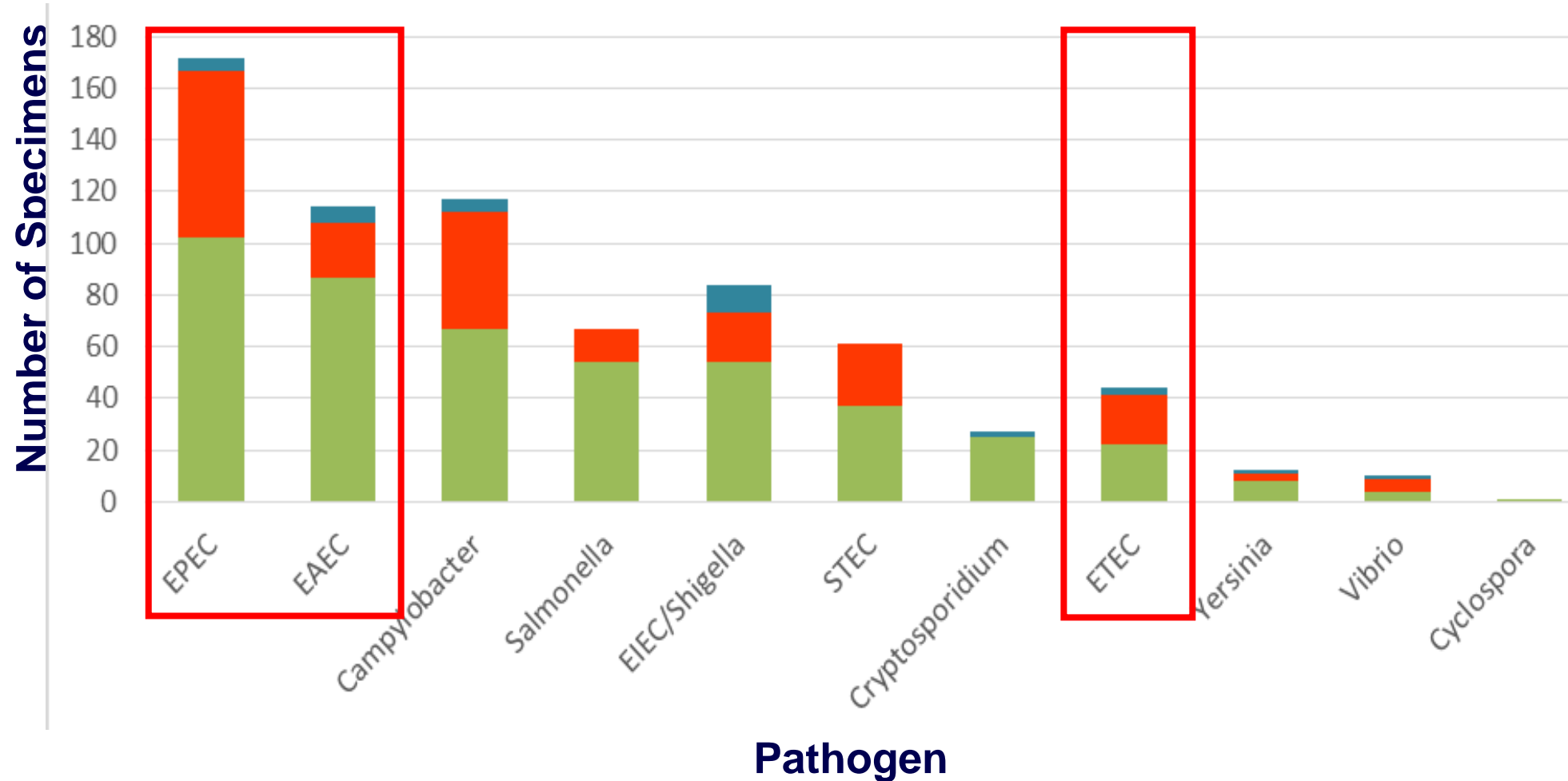
Clinical Labs Performing CIDTs in MN (n=14)

Organism	# Performing Reflex Culture
Campylobacter	2
Salmonella	5
Shigella	7
STEC/0157	2
Vibrio	2

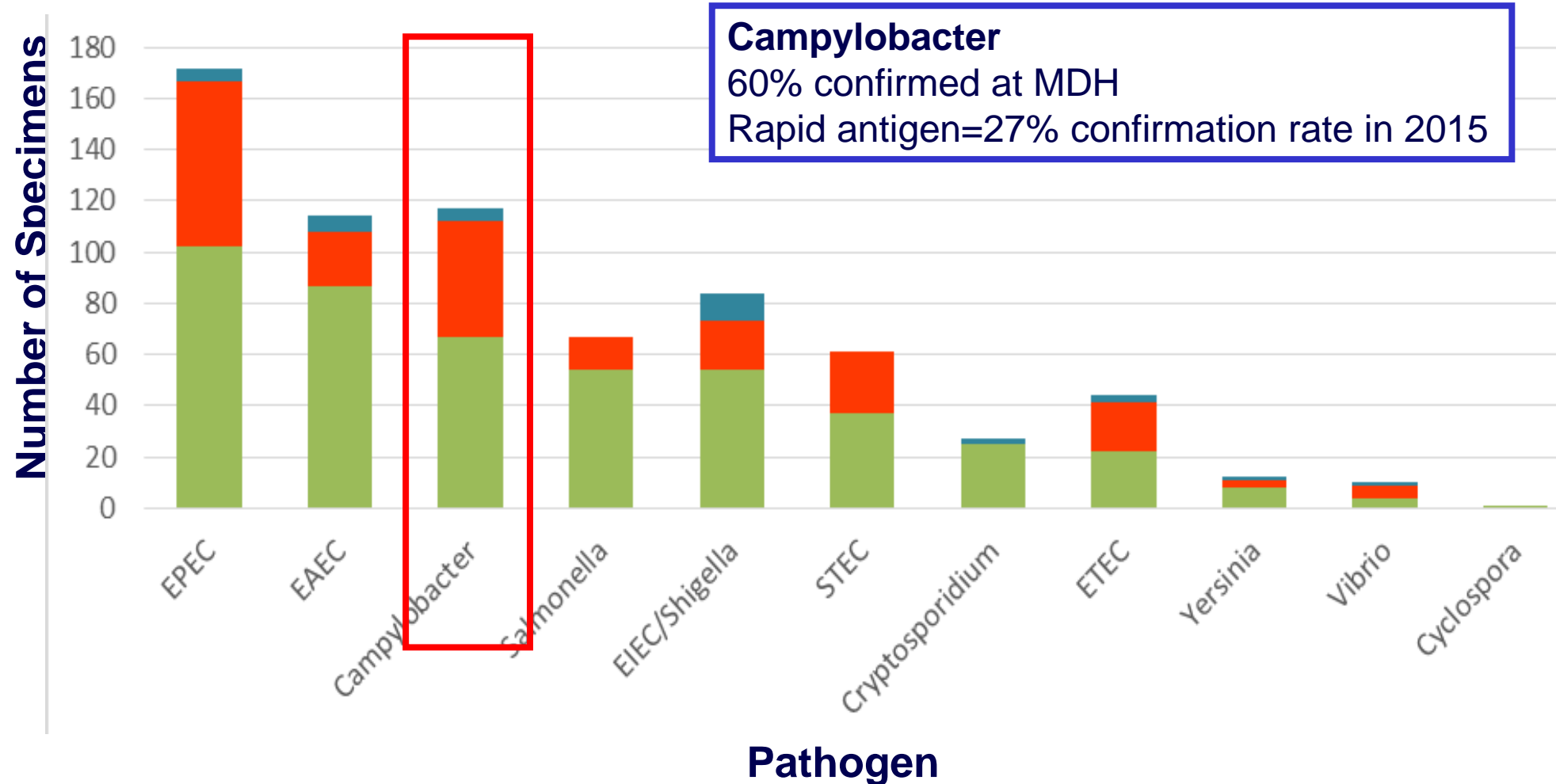
Molecular CIDT Specimens Received at MDH Since March 2013



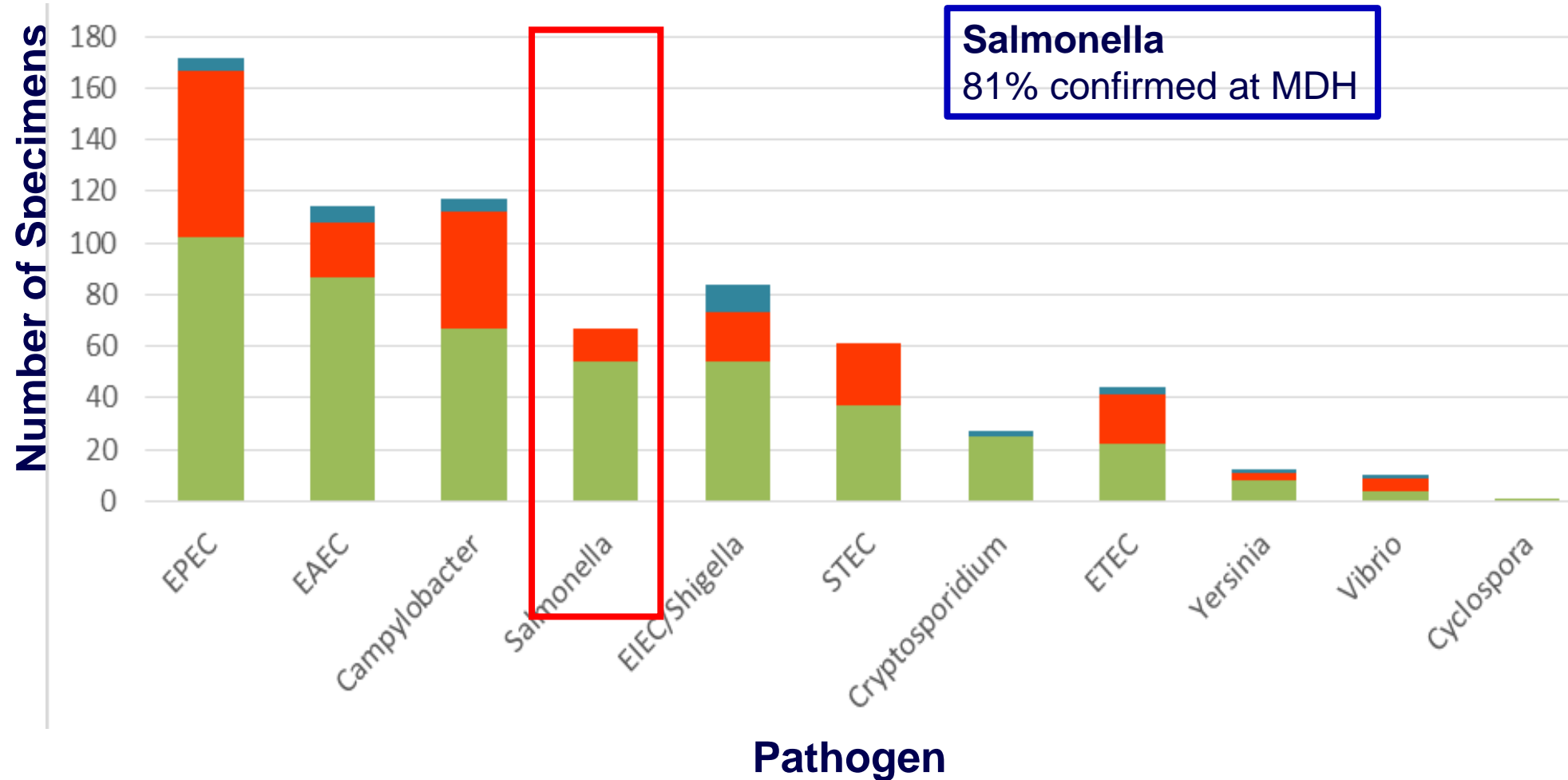
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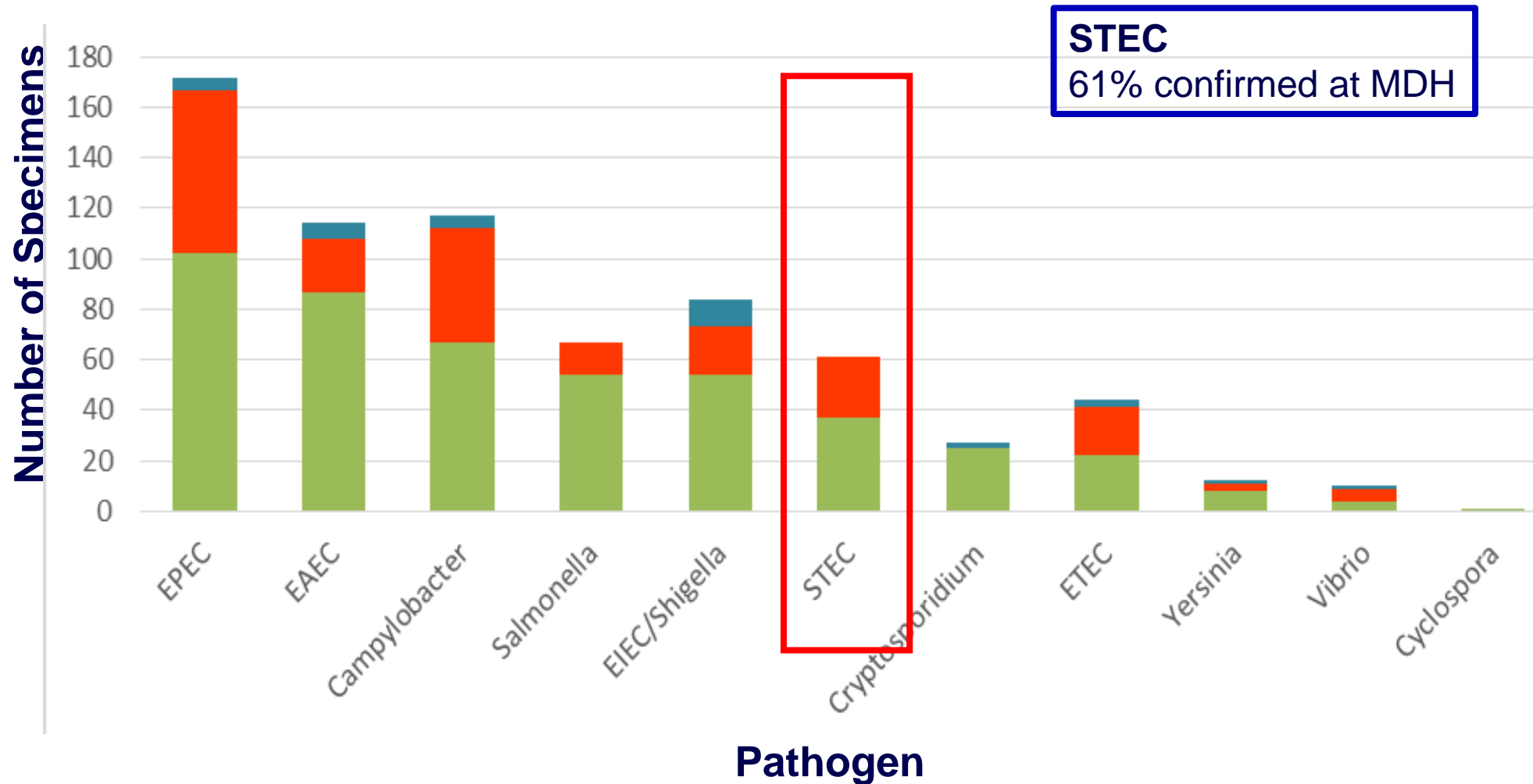
Molecular CIDT Specimens Received at MDH Since March 2013



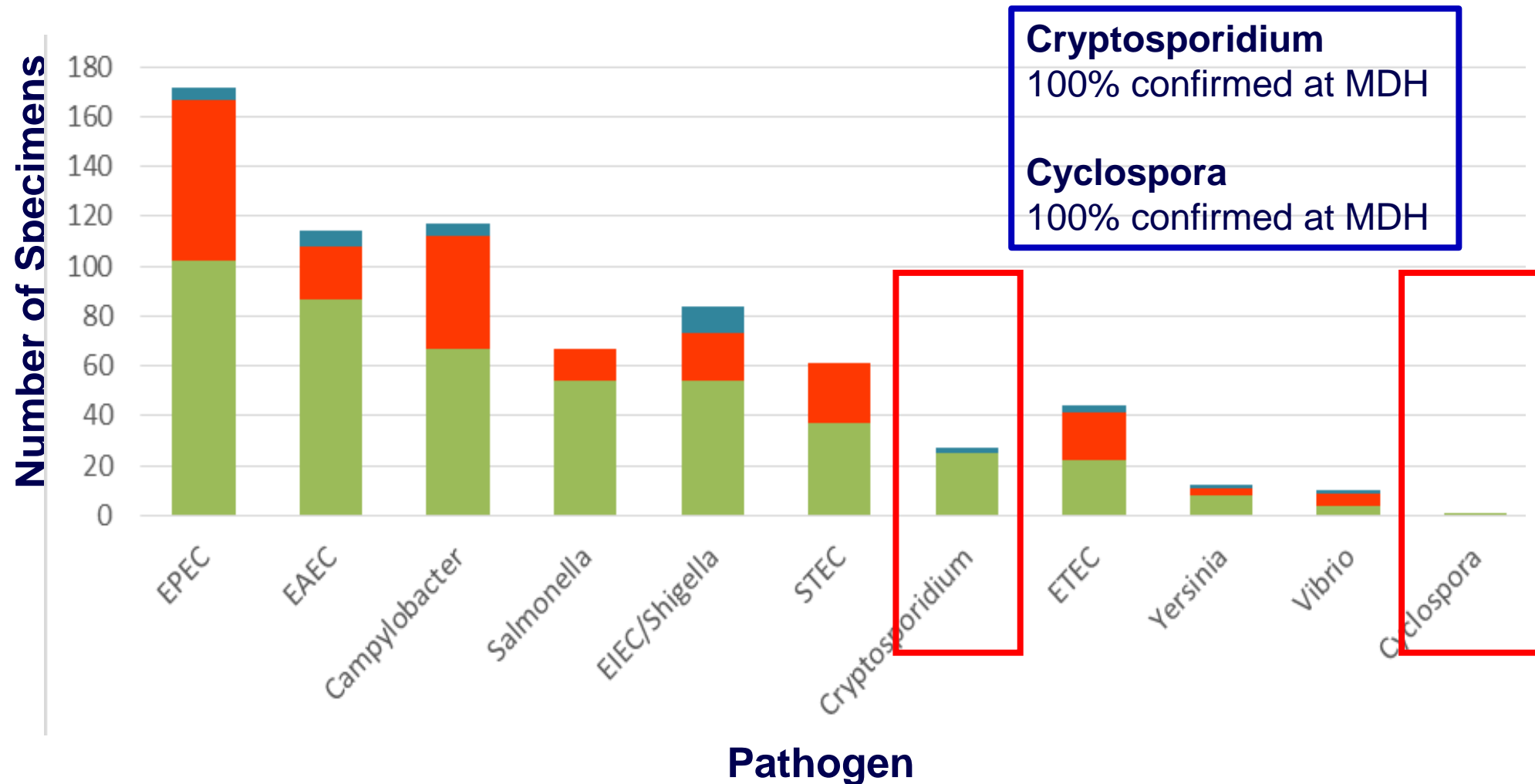
Molecular CIDT Specimens Received at MDH Since March 2013



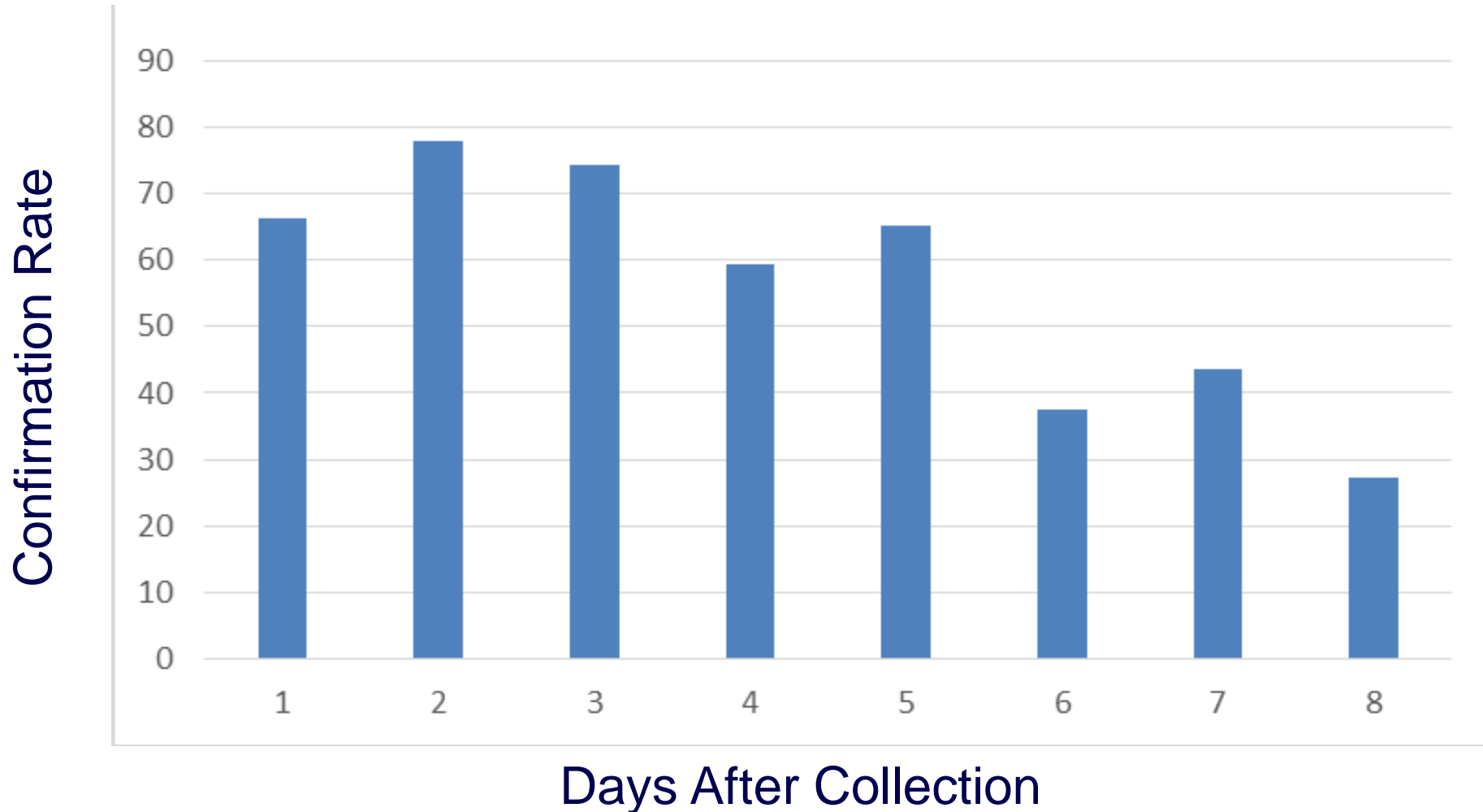
Molecular CIDT Specimens Received at MDH Since March 2013



Molecular CIDT Specimens Received at MDH Since March 2013



Confirmation Rate vs Days After Collection for CIDT Positive Specimens at MDH



EPEC

- **Symptoms-diarrheae, fever, vomiting**
- **Important pathogen for children and cause of persistant diarrheae worldwide**
- **Is it really a pathogen? What is EPEC?**

EPEC Characterization

	<i>eae</i>	<i>stx</i>	Sorbitol	<i>bfp</i>
STEC	+	+	N/F	-
EPEC (typical)	+	-	F	+
EPEC (atypical)	+	-	F	-

What is EPEC (Biofire)

- Typical EPEC
- Atypical EPEC
- *E. coli* 0157 (without stx)
- *E. albertii*
- *S. boydii*
- *Citrobacter sp.*
- Others??

MDH Project 1935 – What have we learned about EPEC?

- 166 EPEC's submitted
 - 91 single detections (60% confirmed)
 - 75 polymicrobial detections (50.7% confirmed)
 - EPEC + virus = 11 (7 confirmed)
 - EPEC + EAEC + ETEC = 8 (2 confirmed)
 - EPEC + EAEC + ETEC + EIEC = 3 (3 confirmed)
- Unexpected findings (6%)
 - 2 typical EPEC's
 - 1 EPEC/ETEC
 - 1 STEC (eae + stx2f)
 - 5 *E. albertii* (1 + for stx2f) (3% of all EPECs)
 - 2 possible STECs that lost their shiga-toxin phage (O145, hly+)



***E. albertii* – a newly emerging enteric pathogen**

- **First identified in 2003**
- **Outbreak in Japan**
- **Found in wild and domestic birds**
- **USDA-study looking for EA in chicken rinsates in 2009**
- **MDH has identified *E. albertii* from isolates sent to MDH by clinical lab-identified by automated instruments as Salmonella or other enteric pathogens**

Recent MN EPEC Outbreak

- Restaurant associated outbreak with catering (22 cases)
- Diarrhea: 22/22 (100%)
- Cramps: 17/21 (81%)
- Fever: 4/18 (22%)
- One reported temp at 99F
- Vomiting: 2/22 (9%)
- Bloody Stools: 1/21 (5%)
- Lack of temp abuse

Outbreak Continued

- 0/12 Noro neg
- Ran 1 on the Biofire-EPEC positive
- 11/12 aEPEC positive (stx-, bfp-, eae+)
- 3/4 *C. perfringens* toxin positive, unable to culture
- Isolated eae positive colonies-O167
- Same/similar PFGE patterns

Conclusions

- Use of molecular CIDTs increasing in MN
- Concern about resources to respond
- Several pathogens with poor isolate recovery
- High amount of EPEC-some CIDT identified
EPECs may be O157, *E. albertii* or STEC
- ‘EPECs’ may be clinically significant and warrant additional investigation
- CIDTs offer PHLs challenges but some opportunities to better understand and identify foodborne illness pathogens

Acknowledgements

- Elizabeth Cebelinski, MDH
- MDH enteric and PFGE lab
- MDH foodborne epidemiologists