# Oregon Reportable Diseases & Notable Outbreaks, 2015

### June E Bancroft, Epidemiologist, Oregon Public Health Division



Local health department information For a list of local health department phone numbers go to www.healthoregon.org/diseasereporting.

See new definition in footnote 1 Free-living Naegleria gruberi

#### **OREGON PUBLIC HEALTH DIVISION REPORTING FOR**

2. http://arcweb.sos.state.or.u

www.healthorenon.org/disessereporting

5. http://arcweb.sos.state.or.us/pages/rul

or 333/333 026 html

3 056 html ORS 409 050, 433 004: 0AR 333-

s/oars 300/

018-0000 to OAR 333-018-0015 (http://arcweb.sos.stat

pdf/45cfr164.512.pdf; see 45 CFR 164.512(b)(1)(i).

s/rules/cars 300/car 333/333 018.html)

Syringe (i.e., Sharps)

y law,<sup>2</sup> Oregon clinicians must report diagnoses of the specified infections diseases and conditions listed on this poster. Both lab-confirmed and clinically suspect cases are reportable. The parallel system of lab reporting does not obviate the clinician's obligation to report Some conditions (e.g., uncommon illness of public health significance, animal bites, HUS, PID, pesticide poisoning, disease outbreaks) are rarely, if ever, identified by labs. We depend on clinicians to report

Reports should be made to the patient's local health department<sup>3</sup> and include at least the patient's name, home address, phone number, date of birth sex, diagnosis and date of symptom onset. Most reports should be made within one working day of the diagnosis, but there are several important exceptions - please refer to the list on this poster

Disease reporting enables appropriate public health follow-up for your patients, helps identify outbreaks, provides a better understanding of morbidity patterns, and may even save lives. Remember that HIPAA does not prohibit you from reporting protected health information to public health authorities for the purpose of preventing or controlling diseases, including public health surveillance and investigations.

#### CIVIL PENALTIES FOR VIOLATIONS OF **OREGON REPORTING LAW**

A civil penalty may be imposed against a person or entity for a violation of any provision in OAR chapter 333, division 18 or 19.5 These regulations include the requirements to report the diseases listed on this poster, along with related data; and to cooperate with local and state public health authorities in their investigation and control of reportable diseases. Civil penalties shall be imposed as follows:

- First violation \$100, second violation \$200. third or subsequent violation \$500;
- Each day out of compliance will be considered a new violation.

Ebola treatment training





### **CLINICIANS**

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(central nervous system only)	He
Animal bites (of humans)	H
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equine encephalitis, ehrlichiosis,	de
Heartland virus infection, Kyasanur	Le
West Nile fever, Western equine	Le
encephalitis, etc.)	Le
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	WORKING DAY Amedic infections <sup>7</sup> (central nervous system only) Animal bites (of humans) Arthropod vector-borne disease (babesiosis, California encephalitis, Colorado tick fever, dengue, Eastern equine encephalitis, ehrlichiosis, Heartland virus infection, Kyasanur Forest disease, St. Louis encephalitis, West Nile fever, Western equine encephalitis, etc.) Brucellosis (Brucella) Campylobacteriosis (Campylobacteriosis (Campylobacteri) Chancroid (Haemophilus ducreyi) Coecidiaidomycosis (Coecidiaides) Creutzfeldt-Jakob disease (CJD) and other transmissible sponfform encephalopathies Cryptococcosis (Copptococcus) Cyclosporosis (Cyclosporo cayetanensis) Entrobacteriaceae family isolates that are resistant to any cartapenem antibicits by current CLSI breakpoints <sup>a</sup> Escherichia coli (Siga-toxigenic, including E. coli 0157 and other serogroups) Giardiasis (Giardia) Goncoccca Infections (Meisseria gonorthoeae)

enatitis C cute or chronic infection) epatitis D (delta) epatitis E IV infection (does not apply anonymous testing) nd AIDS fluenza (laboratory-confirmed) eath of a person <18 years of age ead poisoning<sup>9</sup> egionellosis (Legionella) entospirosis (Leptospira) steriosis vme disease

sittacosis

isteria monocytogenes Borrelia burgdorferi) lalaria (*Plasmodium*) Ion-tuberculous mycobacterial fection (non-respiratory)10 elvic inflammatory disease PID), acute, non-gonococcal ertussis (*Bordetella pertussis*) Chlamydophila psittaci) fever (Coxiella burnetii) elapsing fever (Borrelia) ickettsia (all species: Rocky lountain spotted fever, phus, others)

Pulmonary fibrosis in a case

of coccidioidomycosis

almonellosis (Salmonella cluding typhoid) higellosis (Shigella) yphilis (Treponema pallidum) anis infection ncluding cysticercosis and peworm infections) etanus (Clostridium tetani) ichinosis (Trichinella) uberculosis (Mvcobacterium iberculosis and M. bovis) 10

briosis (other than cholera) ersiniosis (other than plague)

"Syringe means an instrument for the injection of medicine or 6. Influenza A virus that cannot be subtyped by commercially distributed assays the withdrawal of body fluids that consists of a hollow barrel fitted with a plunger and a hollow needle."

For example, infection by Naegleria or Balamuthia spp. CLSI. Performance Standards for Antimicrobial Susceptibility Testing; Twenty-Fifth Informational Supplement. CLSI document M100-S25. Wayne, PA: Clinical and Laboratory Standards Institute; January 2015. "Lead poisoning" means a confirmed blood lead level of at least 5 µg/ dL for children <18 years of age, or a confirmed blood lead level of at</li> least 10 µg/dL for persons ≥18 years of age. 10. Infection at any site with M. tuberculosis or M. bovis is reportable. Only non-respiratory infections with other mycobacteria are reportable





Naegleria in brain tissue

#### **OREGON PUBLIC HEALTH DIVISION REPORTING FOR**

influenza H1N1 isola

y law,<sup>1</sup> Oregon laboratories must report all human B test results "indicative of and specific for" the following diseases, infections, microorganisms and conditions listed in the accompanying table. These results include microbiological culture, isolation or identification: assays for specific antibodies; and identification of specific antigens, toxins or nucleic acid sequences.

In general, reports must be made to the patient's local public health department within one working day of the initial test report<sup>2</sup>

Laboratories should also familiarize themselves with select biological agents and toxins that have potential to pose severe threats.3 Reports must include the patient's name, date of birth, county of residence, specimen type and specimen source site, collection date, lab test. result, and contact information for the ordering

clinician and the lab.4 If possible, patient gender and street address should also be submitted

The laboratory reporting the result to the clinician is responsible for reporting to public health, regardless of which lab actually performs the test. Reports on out-ofstate residents should be made directly to that state's health department, or to the Public Health Division of the Oregon Health Authority. Document these reports in a log.

Oregon law requires laboratories that send an average of >30 records per month to the local public health authority to submit the data electronically according to the standards in the Oregon Health Authority's Manual for Mandatory Electronic Laboratory Reporting (ELR).5

- Please contact us at 971-673-1111 for ELR initiation. assistance and approval.
- Laboratories required to report via ELR shall have a state-approved continuity of operations plan to maintain reporting in emergency situations. At least two alternate methodologies should be incorporated, such as facsimile, mail or courier service
- A licensed laboratory required to report data electronically shall participate fully in Oregon's Data Quality Control program, as specified in the Oregon Health Authority's Manual for Mandatory Electronic Laboratory Reporting.<sup>5</sup>
- · Electronically submitted reports shall meet relevant reporting timelines<sup>1</sup>

Filamentous Ebola virus particles budding from the surface of a VERO cell







### LABORATORIES

#### CIVIL PENALTIES FOR VIOLATIONS OF OREGON REPORTING LAW

A civil penalty may be imposed against a qualifying laboratory that fails to seek or obtain ELR approval, or against a clinical laboratory for failing to report a reportable disease according to Oregon Administrative Rules.6

Report within 24 hours.

Bacillus anthracis 3 💽 🕒

Bordetella pertussis

Chlamydia trachomatis

Chlamvdophila psittaci

Clostridium tetani

Coxiella burnetii 3

Fhdichia

Clostridium botulinum 3 💽

Corynebacterium diphtheriae 💽 🕄

Enterobacteriaceae family isolates

that are non-susceptible to

carbapenem antibiotics by

current CLSI breakpoints7.8

Francisella tularensis 3 🕢 🚺

Haemophilus influenzae® 🧐 🕚

Mycobacterium tuberculosis

Listeria monocytogenes 🕚

Mycobacterium bovis

Mycobacterium, other

(non-respiratory only)

Neisseria gonorrhoeae

Grimontia hollisae 🔿

Haemophilus ducreyi

Legionella

Leptospira

(formerly Vibrio hollisae)

Escherichia coli (Shiga-toxigenic)<sup>8</sup> (19

BACTERIA

Anaplasma

Borrelia

Brucella<sup>3</sup>

Campylobacter

Civil penalties shall be imposed as follows: First violation \$100, second violation \$200, third or subsequent violation \$500; · Each day out of compliance will be considered a new violation

Coccidioides immiti

Report by phone immediately, day or night. New reportables are highlighted. Isolates must be forwarded NOTE: Those items below without a symbol next to them require reporting to Oregon State within one local public health authority working day. **Public Health** Forward isolate (aliquot or subculture) to the Oregon State Public Health Laboratory. Laboratory: 503-693-4100 Neisseria meningitidis º 😂 🕚 Hantavirus Hepatitis A Rickettsia 3 Salmonella 💦 Hepatitis B Hepatitis C Shigella 💽 Hepatitis D (delta) Treponema pallidum Hepatitis E Vibrio cholerae 🕢 🙌 Hemorrhagic fever viruses 13 🕤 Vibrio, non-cholerae HIV infection and AIDS Yersinia pestis 3 💽 🙆

Influenza, novel strain 14 🕃 🕄 Yersinia, non-pestis 🙆 Measles (rubeola) 🕢 FUNGI Mumps Polio 💿 Coccidioides (3) Cryptococcus 🕚 Rabies 💿 Rubella 💽 PARASITES SARS-coronavirus 💽 Amebic infections<sup>10</sup> Variola maior (smallpox) 🕢 (central nervous system only) West Nile Babesia Yellow fever 🕢 Cryptosporidium Cyclospora Giardia

Trichinella

**OTHER IMPORTANT** REPORTABLES Plasmodium Any "uncommon illness of potential Taenia solium<sup>1</sup> public health significance" i 🤤 Anv outbreak of disease 1 💽 Results on all blood lead testing PRION DISEASES Creutzfeldt-Jakob disease should be reported within seven days unless they indicate lead (CJD), other prion diseases poisoning, which must be reported within one local health department

bleDisease/ReportingCommunicableDisease/Documents/ sters/poster-cre.pdf (OHA 8578) for further information. CLSL a Standards for Antimicrobial Supportibility Testino-Twarty Fi

nce Standards for Antimicrobial Susceptibility Testing: Twenty-Fifth vnal Supplement. CLSI document M100-S25. Wayne, PA: Clinical

11. Report cysticercosis and all undifferentiated Taenia spp. (eggs in stool O & P).

Any other arthropod-borne viruses, including, but not limited to California encephalitis, Colorado tick fever, Dengue, Eastern equine encephalitis, Heartland virus, Kyasanur Forest, SL Louis encephalitis.

Hemorrhagic fever caused by viruses of the filovirus (Ebola, Marburg) or arenavirus (Lassa, Machupo) families are reportable.

and Laboratory Standards Institute: January 2015

9. Report only isolates from normally sterile specimen types

10. For example, infection by Naeoleria or Balamuthia spo.

VIRUSES working day.15 Arboviruses 12 Arenaviruses 13 💽 All CD4 counts and HIV viral loads Filoviruses 13 💽

nezeki, etc., see www.selectagents.gov/Select/gentsandToxinsList.htm www.selectagents.gov/regulations.html www.selectagents.gov/regulations.html (7 CFR Part 331, 9 CFR Part 12 d www.selecta CER Part 73)

Control transformer and the precise material of the specimen and Specimen Source Site describes the source from which the specimen was obtained. Examples of the Specimen Type/Specimen-Source-Site pairings could be (Haid, Spenvia/Minely, (Ilosau/Carrid), (Blood/Hencus), Please relat to

sone for more details ORS 433.004 and OAR 333-018-0013 (http://aroweb.sos.state.or.us/per rules/cars\_300/car\_333/333\_018.html; Manual for Mandatory Electron Laboratory Reporting (v

14. Influenza A virus that cannot be subtyped by commercially distributed assays "Lead poisoning" means a confirmed blood lead level of at least 5 µg/dL for children <18 years of age, or a confirmed blood lead level of at least 10 µg/dL for persons >18 years of age. ORS 431.262; OAR 333-018 (http://arcweb.sos.state.or.us/pages/nil/ oars\_300/bar\_333/333\_018.html; OAR 333-026-0030 http://arcweb



FOOTNOTES Oregon Revised Statute 433.004; Oregon Administrative Rule 333-018 (http://arcweb.sos.state.or.us/rapas/rules/pars. 300/par. 333/333.018.html) 7. See CRE poster https://public.health.oregon.gov/Dis 2. Refer to www.heal porting for a list of local health s, reporting FAQs, and more details about what to report. Whe For a list of select agents, e.g., Burkholderis mallei (melinidosis), Rickettsi All confirmed or suspect isolates of E. coli 0157, and all non-0157 Shiga-toxin-positive stools or broths, must be forwarded to the Oregon State Public Health Laboratory (phone: 503-693-4100).

# Low Incident Notifiable Diseases by Year

Orpheus data, May 20, 2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total	
Babesiosis	0	0	0	1	0	1	0	0	2	2	6	
Botulism	0	1	2	0	1	3	6	4	2	3	22	
Brucellosis	0	2	1	3	1	1	0	2	2	0	12	
Chikungunya	0	0	0	0	0	0	0	0	14	4	18	
Colorado Tick Fever	0	0	3	1	0	1	1	0	1	0	7	
Cryptococcus	0	0	0	0	0	0	0	2	59	73	134	
Cyclosporiasis	2	0	0	0	0	0	1	0	2	0	5	
Dengue Fever	2	4	6	4	8	2	4	4	6	0	40	
Ehrlichiosis	1	1	1	3	0	6	0	1	0	4	17	
Hantavirus pulmonary	1	1	0	2	3	2	2	1	2	0	14	
Leprosy	0	1	1	2	0	0	0	0	0	0	4	
Leptospirosis	1	0	1	0	0	1	0	0	4	0	7	
Mumps	22	2	1	2	3	4	6	3	2	3	48	
Non Mycobacterium TB	0	0	1	0	0	0	1	11	82	41	136	
Plague	0	0	0	0	2	1	2	0	0	2	7	
Psittacosis	3	1	1	0	0	0	0	2	0	0	7	
Q fever	0	2	1	4	3	1	4	3	18	2	38	
Relapsing Fever	2	0	4	3	0	0	3	1	8	3	24	
Rocky Mtn Spotted fev	2	2	3	0	1	0	1	2	2	0	13	
Rubella	0	0	0	0	0	0	0	1	0	0	1	
Taeniasis	3	3	11	50	3	5	5	2	6	3	91	
Tetanus	0	0	0	0	0	0	0	1	0	0	1	
Tularemia	3	3	4	1	3	5	0	3	8	7	37	
Typhus (murine)	0	0	0	0	0	0	0	3	1	0	4	
Total	42	23	41	76	28	33	36	46	221	147	693	

### Recently Reportable

# Shigellosis



### Incidence of *Shigella* infections Oregon and the US, 2001-2015



Cases/100,000

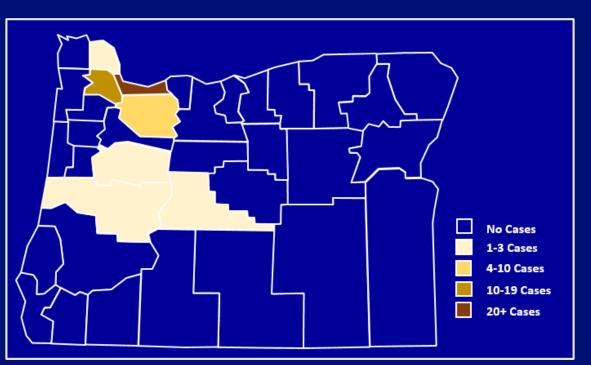
### **Overview**

- Multistate *Shigella sonnei* outbreak
  - June 2015
  - 175 infections
    - **102 (58%) in Oregon**
  - Men who have sex with men (MSM)
  - People experiencing homelessness

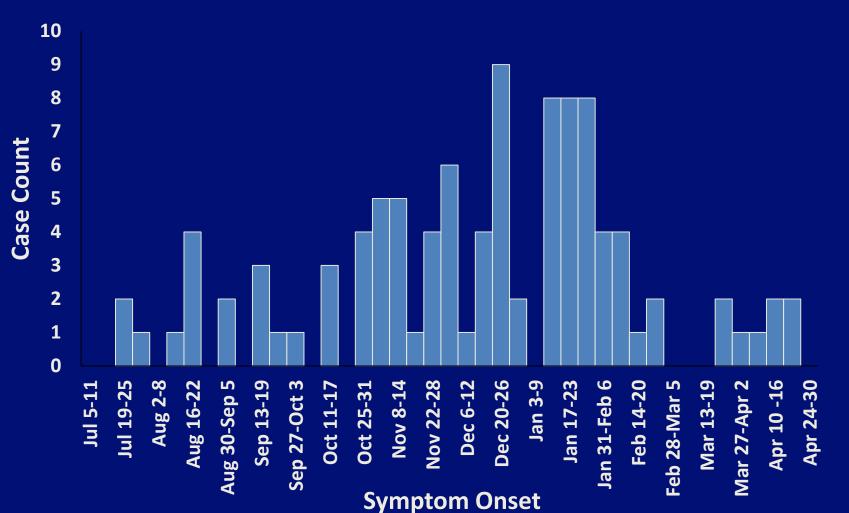


### Shigella Outbreak

- 102 confirmed cases as of 5/16/16
- 7 Oregon counties
- Median age: 43 years old (range 18-90)
- Onsets: 7/21/15 4/22/16
  - 38\* (40%) with bloody diarrhea
  - 46 (45%) hospitalized
  - 0 deaths



\*Among persons whose symptoms are known



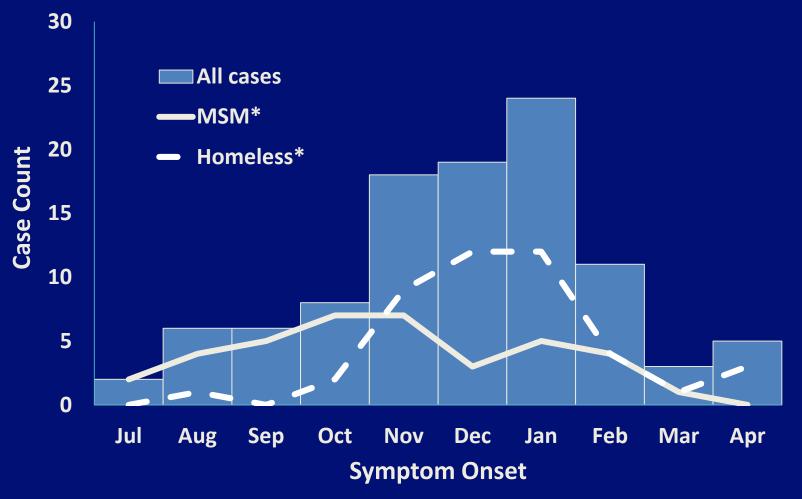
### S. sonnei Infections — July 2015–April 2016

### **Patient Characteristics**

	Ν	%*
Women	25	25
Men	77	75
MSM	38**	68
Homeless	44	44
Contact with homeless	12	40
HIV-positive	24	37
Drug or alcohol use	42	62
*Among persons with known values		

**\*\*Women excluded** 

### **Epidemiologic Shift**



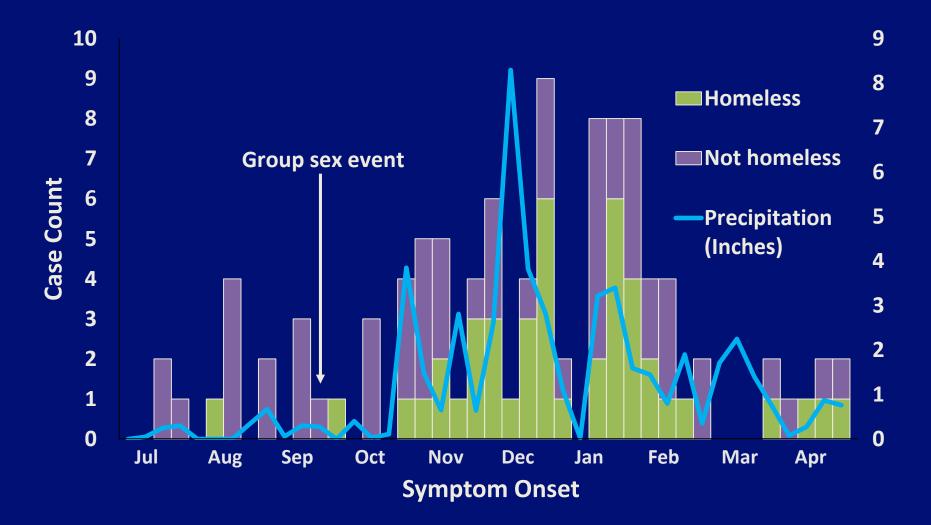
\*Three cases were MSM and homeless

### **Epidemiologic Shift**

	Before Nov 1 N (%)	After Nov 1 N (%)	Prevalence Ratio (95% CI)
MSM	18 (82%)	20 (25%)	3.3 (2.1–5.0)
Homelessness	3 (14%)	41 (51%)	0.3 (0.1–0.8)

MSM: Men who have sex with men 95% CI: Ninety-five percent confidence interval

### **Theories for the Transition**



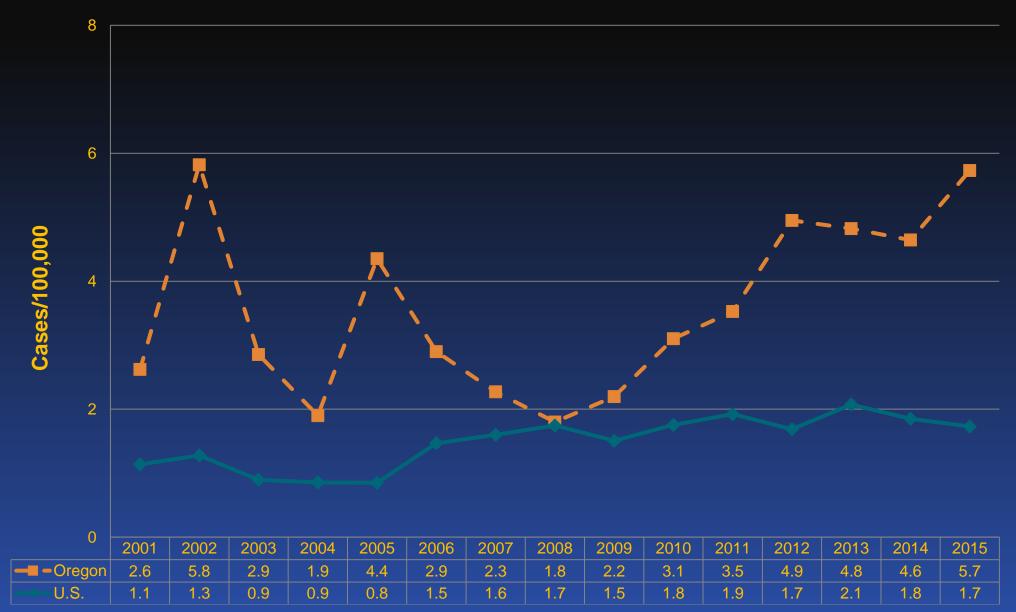
### Summary

- Largest *Shigella* outbreak in Oregon
- Began among MSM, shifted into homeless people
- Unsure why the epidemiologic shift occurred
- Infections continue to occur

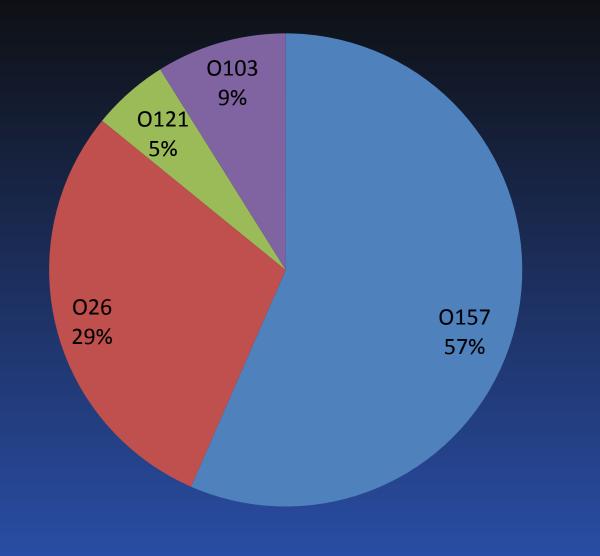


# Shiga toxin-producing E. coli (STEC)

# Incidence of Shiga toxin-producing *E. coli* infections Oregon and the US, 2001-2015



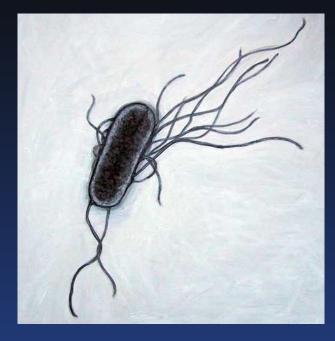
# STEC cases by Serotype, Oregon, 2015





# *E. coli* 026

- Produces Shiga toxin
- Foodborne and person-to-person
- Most common non-O157 STEC
  - Spectrum of illness
  - Less severe disease
- Outbreaks
  - Day care centers
  - Raw clover sprouts





## It started with a neighborly call

- 10-27-15, Clark County reported 5 STEC cases, onsets 10/21-10/24
  - Epi-linked, but no info on serotypes or PFGE patterns
  - Multiple locations suggested a contaminated food item in the supply chain rather vs. an ill food handler
  - No lab confirmed cases in Multnomah County





# **Environmental Health Inspection**

- 10/29: Clark Co. closed Hazel Dell: (4/8 cases linked) probable source of contamination.
- 10/29 Cascade Station Inspection (3/8 cases linked)
   Inquired about ill food workers
  - Food samples
    - Produce (e.g. cilantro, jalapeños, lime juice, tomatoes, salsa, corn)
    - Cheese
  - Inspection mostly unremarkable

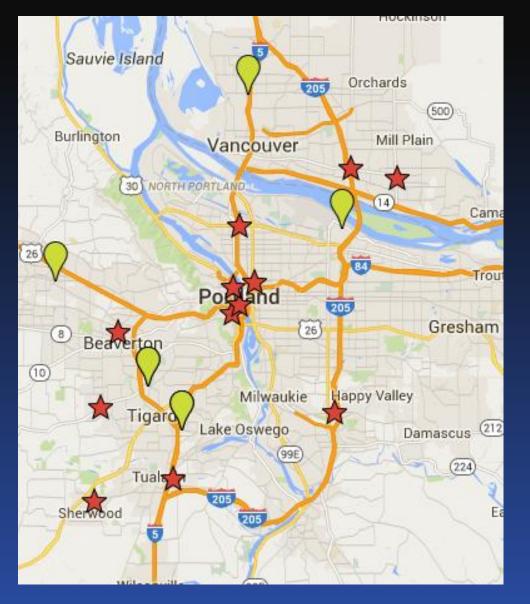


# **Justification for Closure**

- Severe illness (bloody diarrhea, ~30% hospitalized, ~85% visited ED)
- Potential to affect a lot of people
- Clear epi-link to Chipotle
- Ultimately multi-state
- Agreement among Health Officers in multiple counties



# Chipotle Stores in Metro Area







# **Chipotle 101**

- Corporation that had influence from McDonald's
- Opened in 1993 'fresh fast food'
- Dramatic success through the 2000s

   Customers looking for healthy fast-food alternative



# **Food with Integrity**



CONFORMENT CONFORMENT

We're committed because we understand the connection between how food is raised and prepared, and how it tastes.

We do it for farmers animals the environment dentists crane operators ribbon dancers magicians cartographers and you.



# **Chipotle Outbreaks**

History of outbreaks

- Hazel Dell norovirus September 2015
- MN Salmonella Newport August 2015
- CA norovirus August 2015
- Boston norovirus September 2015
- E coli 2009, Ohio norovirus 2008, CA- Hep A 2008



## What was known

- Cases were STEC O26
  - Second most common serotype
- People were hospitalized
- Washington state had the lions share of cases with earlier onset dates
- All cases had eaten food from Chipotle
- An unusually high number of shiga toxin positive specimens had arrived at OSPHL to be subtyped
- Most items served at Chipotle have cilantro, lime juice and red onion
- There are a lot of Chipotle locations
- The media were interested



### What was not known

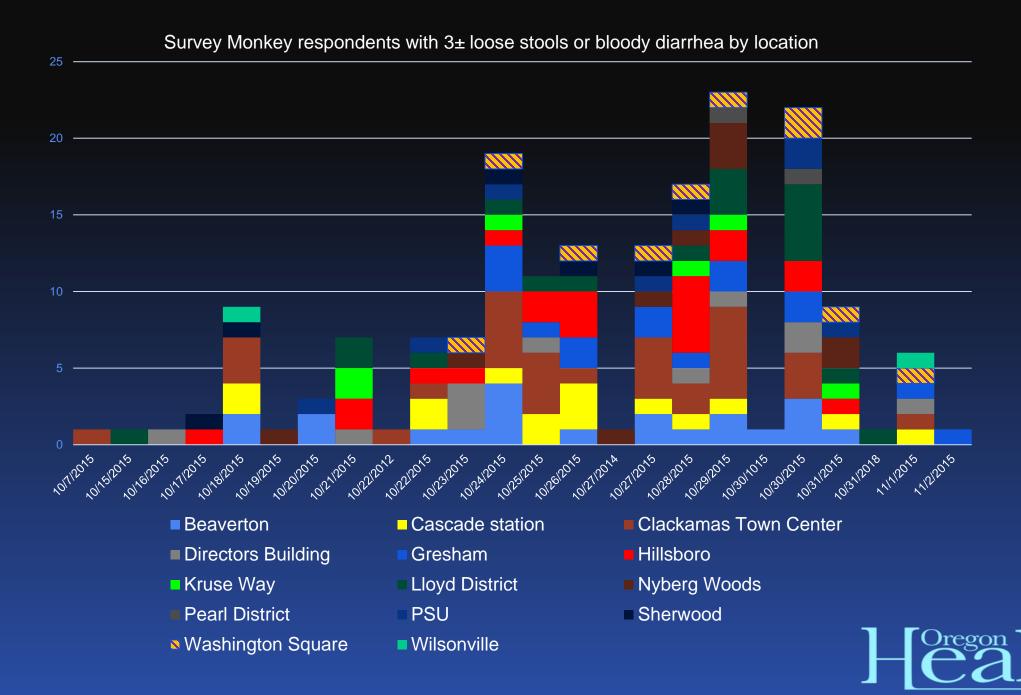
- Extent of illnesses
- If there were additional risk factors among cases
- Whether the PFGE's matched each other and the best case definition to use
- What the vehicle was that was causing illness
- What Chipotle ingredients only went to Oregon and Washington



# Epidemiologist's toolkit

- Created a questionnaire & database for case interviews
- Used Survey Monkey with online orders
- Provider alert
- Case control study matched on meal date and location
- Queried our syndromic surveillance system
- Request that OSPHL prioritize STEC specimens





Authority





Register Log in

Chipotle illness outbreak showcases improved surveillance, lagging solutions Nov 11, 2015



# **Case definition**

- Any Oregon resident with symptoms consistent with STEC, onset on or after Oct 7th and:
  - Confirmed :Positive culture for *E.coli* O26 with match PFGE pattern for outbreak strain (Xba1 EVCX01.1180)
  - Presumptive : Positive culture for *E.coli* O26 with pending PFGE



# **Exposure and onset dates**

- Washington state
  - meal dates 10/15-10/24
  - onset dates 10/19-10/31
- Oregon cases
  - meal dates 10/18-10/24
  - onset dates 10/21-10/29
- November 4<sup>th</sup> first PFGE results; still no cases outside of Oregon and Washington
- November 6<sup>th</sup> PFGE match in Minnesota

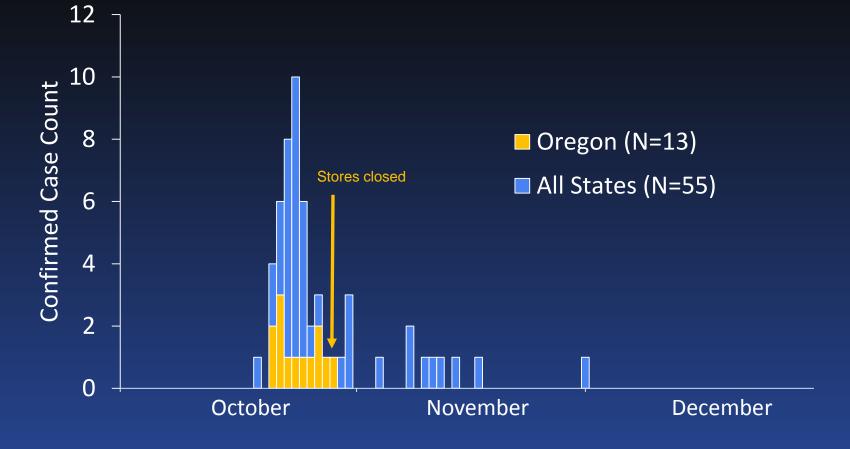


# **Outbreak expands**

- Nov 9<sup>th</sup> MN case has no Chipotle exposure
- Use whole genome sequencing
- Nov 20<sup>th</sup> Cases in CA, MN, OH, NY



# E. coli O26 Cases, All States and Oregon, 2015



Symptom Onset

# **Descriptive Epidemiology**

	Oregon (N=13)	All States (N=55)
Median age (range)	18 (11-61)	21 (1-94)
Women <i>,</i> N (%)	8 (61%)	31 (56%)
Bloody diarrhea, N (%)	11 (85%)	NA
Hospitalized, N (%)	4 (31%)	21 (38%)
HUS, N (%)	0 (0%)	0 (0%)
Deaths, N (%)	0 (0%)	0 (0%)



# **States With Confirmed Cases**

- California 3
- Delaware 1
- Illinois 1
- Kentucky 1
- Maryland 1
- Minnesota 2

- New York 1
- Ohio 3
- Oregon 13
- Pennsylvania 2
- Washington 27



# **Reopening Criteria**

1. Food(s) implicated as the potential source(s) of illnesses by epidemiologic data or food testing results is obtained from a new source.

2. All food contact surfaces are thoroughly cleaned and sanitized. \*

3. All fresh or frozen produce items that were in the facility on or before Friday, Oct 31, 2015 are removed from the premises. \*

4. All food employees complete the Chipotle "Employee Symptom Survey". Food employees will be cleared to work when they indicate no symptoms (vomiting, nausea, diarrhea, abdominal cramps, or fever). Any food employees with symptoms are excluded. Symptomatic food employees will be reviewed and reinstated on a case by case basis.

5. Produce rinsing procedures are revised to ensure all produce is rinsed under cold, running water before any preparation occurs (such as cutting, chopping, or soaking).
\*Verified by health department officials prior to reopening.



### Challenges

- Case definitions —Issues with being ahead of laboratory test results
  - Analysis issues with changing definitions
- Active case finding 108 suspect cases interviewed
- Multiple meal dates and locations complicate analysis
- Initial focus on regional food distribution due to geographic clustering
  - Laboratory time lags changing the scope of the investigation required reconsideration of the hypotheses



### Challenges

- Shiga toxin-producing tests not specific for O type
- Shiga toxin profiles varied at local labs
- Other O26 cases distributed statewide with no Chipotle connection
  - At one point there were 19 Oregon "cases"
- Shiga toxin positive, symptomatic persons later culture negative



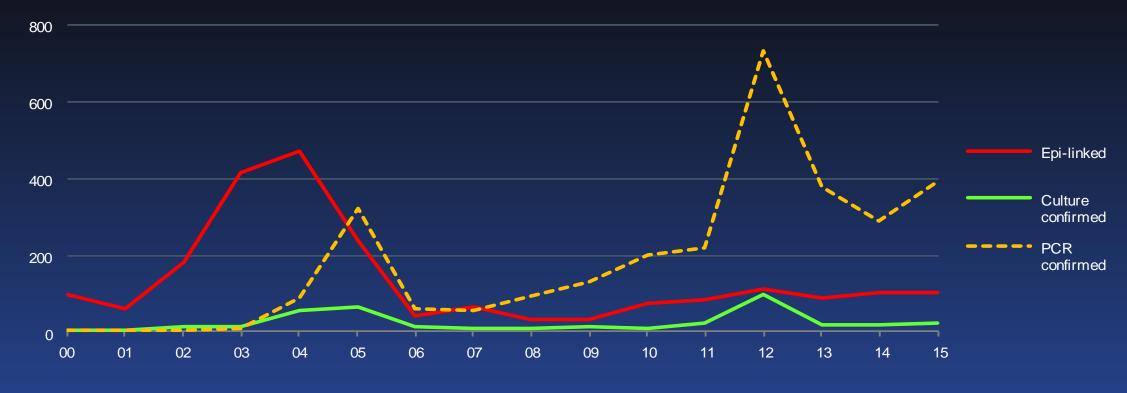
### Pertussis



#### **Incidence of Pertussis infections, Oregon and US, 2001-2015**



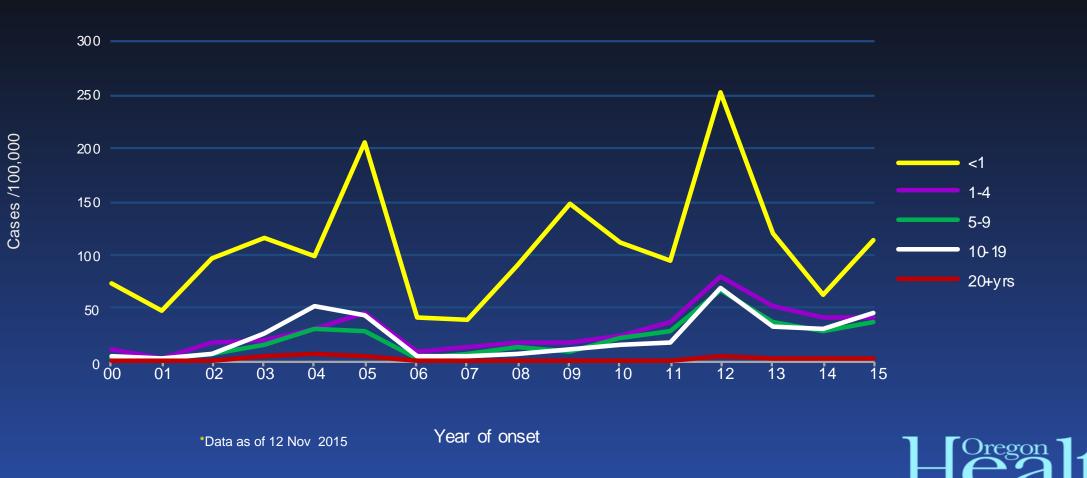
#### Pertussis cases by epi linkage and test type, Oregon, 2000–2015\*



Year

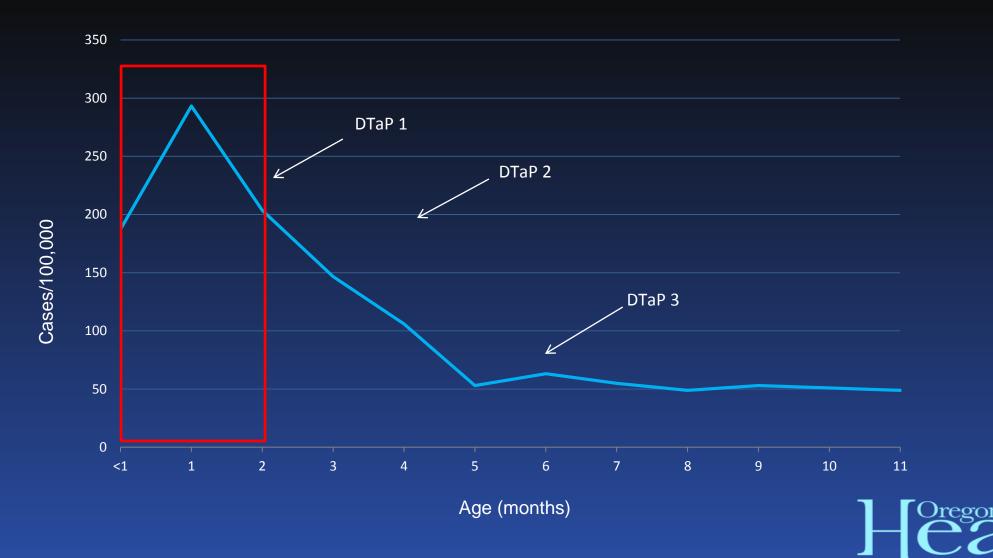


### Pertussis Incidence by Age Group, Oregon, 2000–2015\*



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## Pertussis incidence among infants, Oregon, 2003–2014



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#### **Suffer the Infants**

 Most of the suffering from pertussis is experienced by infants too young to be vaccinated

The focus of Oregon's pertussis prevention and control efforts is the protection of infants, who are at greatest risk for hospitalization and death.



Photo courtesy of CDC



#### **Vaccination During Pregnancy**

- Believed to be the most effective means of protecting young infants
- Provides earlier benefit to mother, thereby protecting infant at birth
- High levels of transplacental maternal antibodies in infants of mothers vaccinated during pregnancy
  - Likely provides direct immunity to infant
- Women should receive a dose of Tdap with every pregnancy
  - Optimal timing between 27 and 36 weeks gestation to maximize maternal antibody response and passive antibody transfer to infant



# Agreement of high effectiveness of maternal pertussis vaccination -- United Kingdom

#### **Observational study**

- Vaccine screening method
- For infants <3 months of age at onset of pertussis

Vaccine effectiveness	Timing of maternal vaccination
91% (83-95)	At least 28 days before birth
38% (-95-80)	0-6 days before or 1-13 days after birth

#### **Case-Control study**

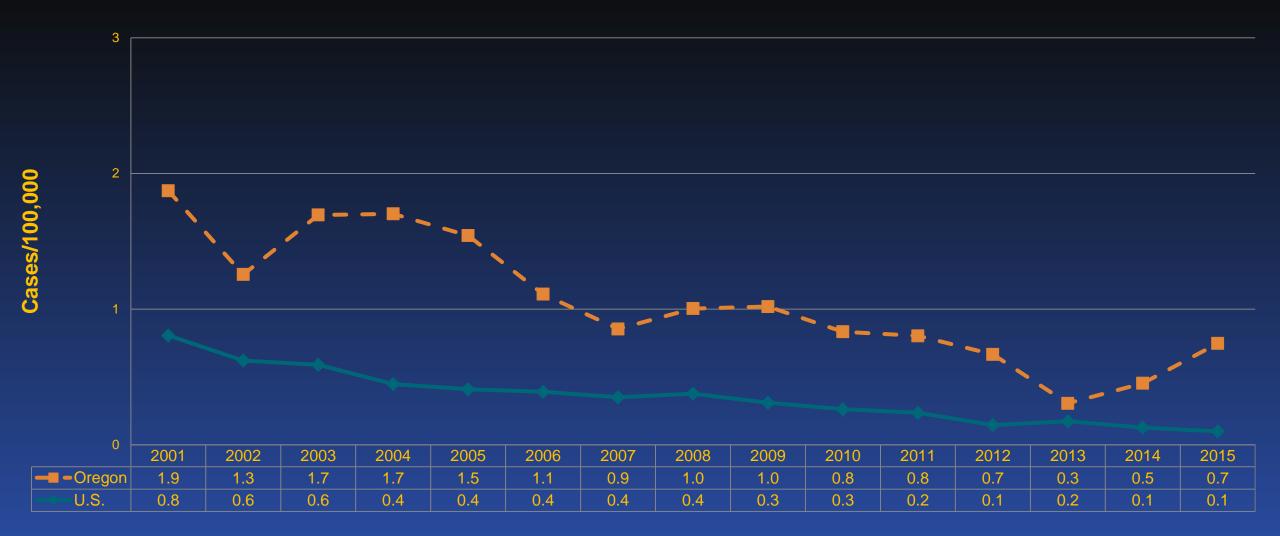
- Cases: infants <2 months of age at onset pertussis infection
- 58 cases, 55 controls
  - Mothers vaccinated during pregnancy: 10 cases (17%) and 39 controls (71%)
- Unadjusted VE = 91% (77%-97%)
- Adjusted VE = 93% (81%-97%)

Lancet. 2014 Oct 25;384(9953):1521-8. Clin Infect Dis. 2015 Feb 1;60(3):333-7.

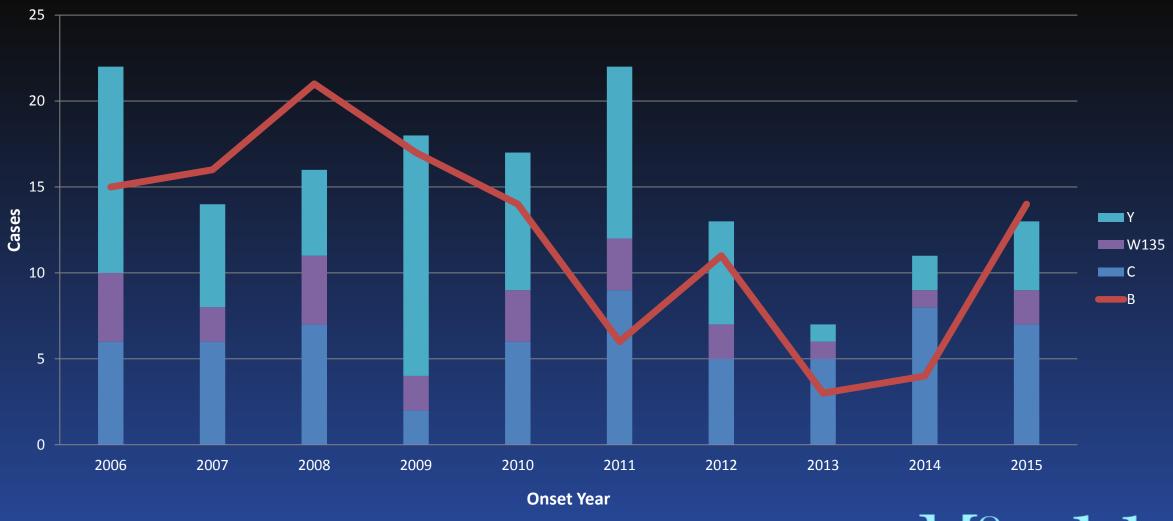
### Meningococcal Disease



# Incidence of Meningococcal Disease Oregon and the US, 2001-2015

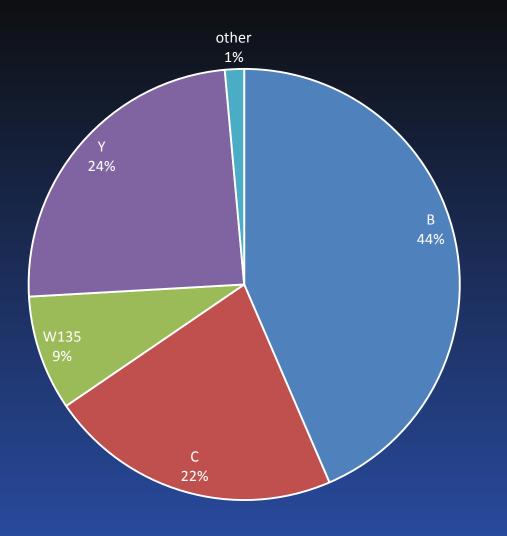


#### Meningococcal disease by Serogroup: Oregon, 2006–2015



]-[Oregon lth

# Meningococcal Disease by Serogroup, Oregon, 2006-2015







### regon Meningococca





### **Infection and Transmission**

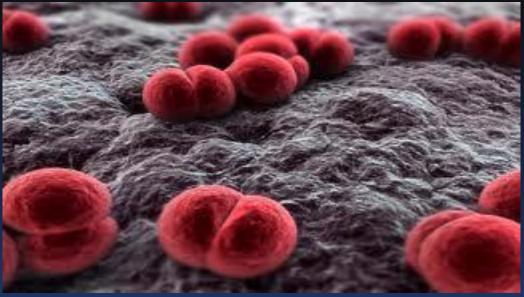
Humans are the only natural reservoir for *N. meningitidis* Infection

- Bacterium attaches to the surface of mucosal cells of the nasopharynx
- Can penetrate the mucosa and gain access to the bloodstream, resulting in systemic disease
- Up to 10% of population are colonized

Transmission

Human to human through direct contact with large droplet respiratory secretions

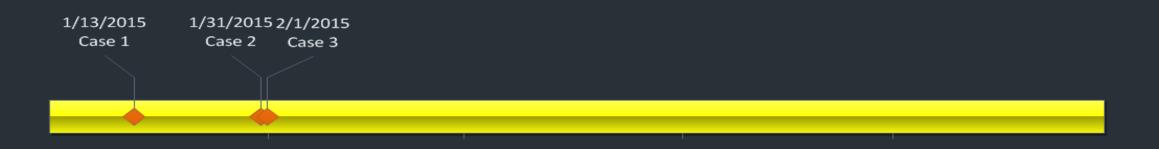
Incubation period is usually 3-4 days



#### Neisseria meningitidis



University of Oregon Meningococcal Outbreak Timeline Case #3 19 y/o freshman at U of O





### **Control Measures**

- Antibiotic prophylaxis was recommended to all close contacts of each case
- ► Vaccination?
  - For serogroup C outbreaks...
  - Vaccination of the population at risk should be considered if the attack rate is >10 cases/100,000 persons.
    - Attack rate for U of O campus population is 2.4/100,000





### *Interim* Serogroup B Guidance...

1 case	<ul> <li>Serogrouping of isolate or clinical specimen performed</li> <li>Isolate typed or stored for future molecular typing, or sent to CDC</li> <li>Case investigation</li> <li>Chemoprophylaxis of close contacts</li> </ul>
2 cases in 6 months	<ul> <li>Same response as after 1 case with the following additions:</li> <li>If both cases have serogroup B disease, the state health department should contact CDC</li> <li>Send isolates to CDC for molecular typing for both cases</li> </ul>
3 or more cases in 6 months	<ul> <li>Same response as after 1 case with the following additions:</li> <li>If all cases have serogroup B disease, the state health department should contact CDC</li> <li>Send isolates from additional cases to CDC for molecular typing and testing to predict strain coverage of vaccine</li> <li>If all cases have serogroup B disease and available information supports use of MenB vaccine, consult CDC regarding the use of MenB vaccine using a CDC-sponsored expanded access IND</li> </ul>
	Oregon

-

Authority

#### University of Oregon Meningococcal Outbreak Timeline Case #4 18 y/o freshman at U of O – fatal case





### Serogroup B Meningococcal Vaccines

- October 29, 2014, the FDA licensed the first serogroup B meningococcal vaccine (Trumenba<sup>®</sup>).
   FDA approved this vaccine for use in people 10-25 years of age as a 3-dose series.
- January 23, 2015, FDA licensed a second serogroup B meningococcal vaccine (Bexsero<sup>®</sup>).
   FDA approved this vaccine for use in people 10-25 years of age as a 2-dose series.





### Case Demographics

- 75% female
- 75% 19 year olds
- 100% freshman
- 50% lived off-campus
- 50% Greek





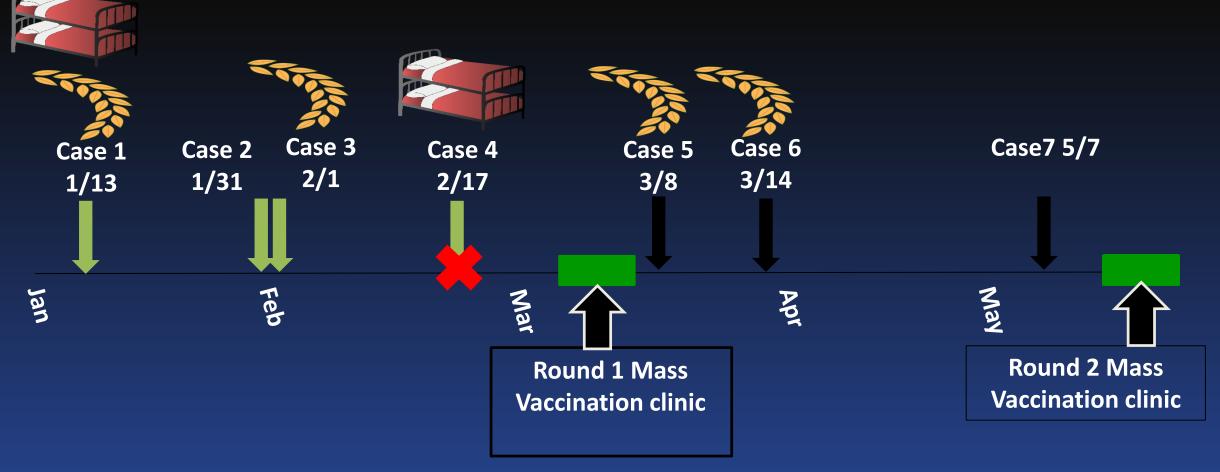
#### **University of Oregon At-Risk Population**

<b>Population</b>	<u>Cases</u>	<b>Denominator</b>	Attack Rate
Undergraduates	4	19,250	21/100,000
Dorm Dwellers	2	3,505	57/100,000
Greek society members	2	3,158	63/100,000
Freshman	4	3,780	106/100,000

All University of Oregon undergraduates were included



#### University of Oregon Meningococcal Outbreak – 2015

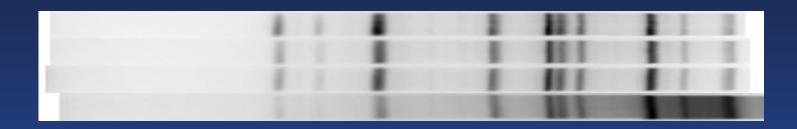




#### University of Oregon Cases

- All serogroup B
- All match by PFGE
  - Match by WGS







#### Likelihood Ratio of Attending a Vaccination Clinic by Risk Category

<u>Risk Group</u>	Vaccination Clinic <u>Attendance Rates</u>	Likelihood Ratio of Attending Vaccination Clinic <u>(95% CI)</u>
Greek	18%	1.3 (1.2-1.4)
Freshman	26%	2.3 (2.2-2.9)
Dorm Dwellers	29%	2.4 (2.4-2.6)



#### Cost

	<u>Cost per</u> <u>Dose</u>	<u>Cost per</u> <u>Series</u>	<u>Total Cost</u>	<u>Number (%)</u> <u>Fully</u> <u>Vaccinated</u>
Estimated Cost Theoretical	\$134	\$402	\$7.7 million	19,250 (100%)
Actual Cost	\$194.05	\$1,576	\$1.8 million	1,122 (6%)



### Summary

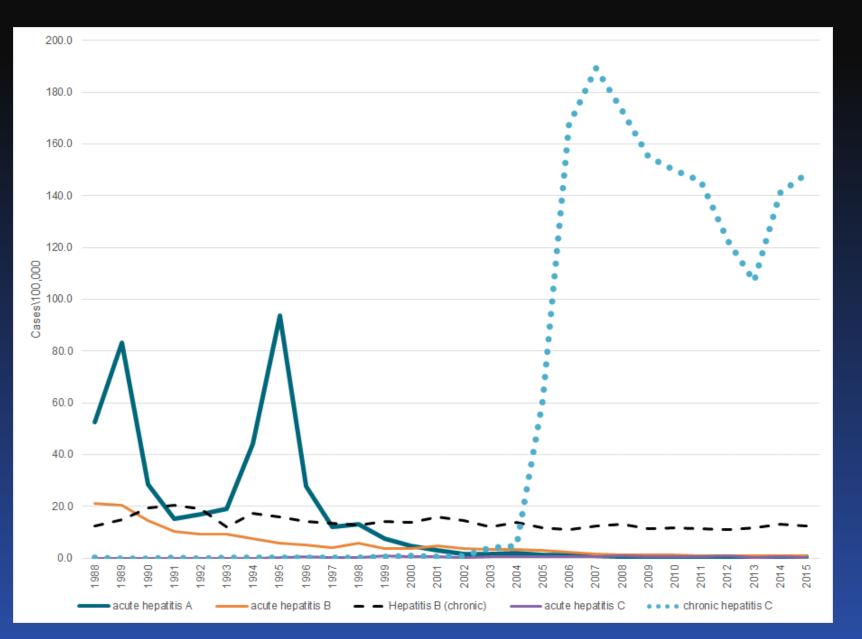
- 7 cases of serogroup B meningococcal disease associated with University of Oregon undergraduates
  - 1 fatal
- Control measures:
  - Prophylaxis of close contacts
  - Vaccination campaign
- Ongoing efforts to maximize vaccination rates
- Learning from this...
  - Who gets vaccinated
  - Communications
  - Carriage & Herd Immunity?



### Hepatitides

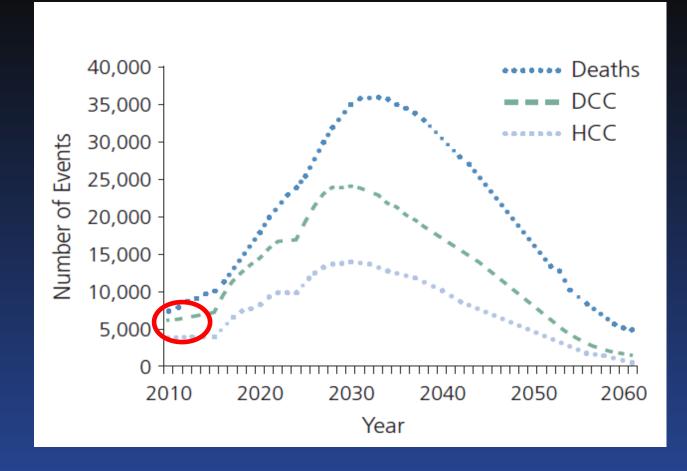


### Incidence of Hepatitides, Oregon, 1988-2015



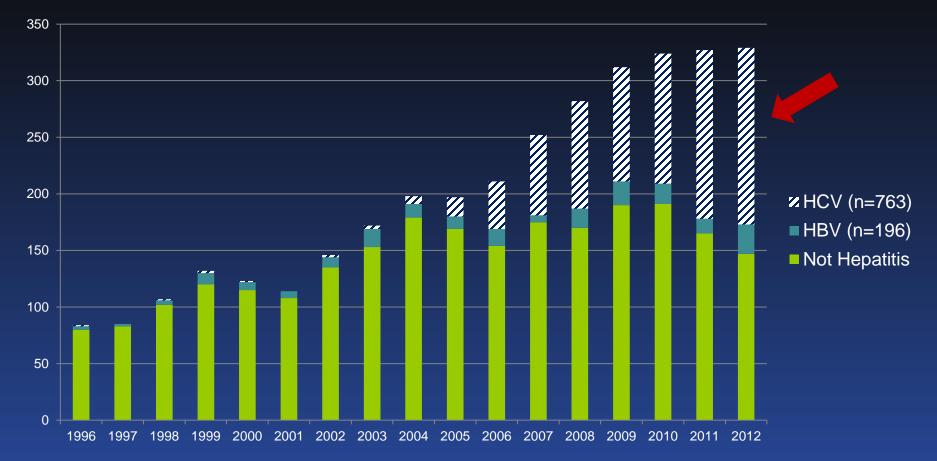


Projected burden of HCV related mortality, decompensated cirrhosis (DCC), and hepatocellular carcinoma (HCC)





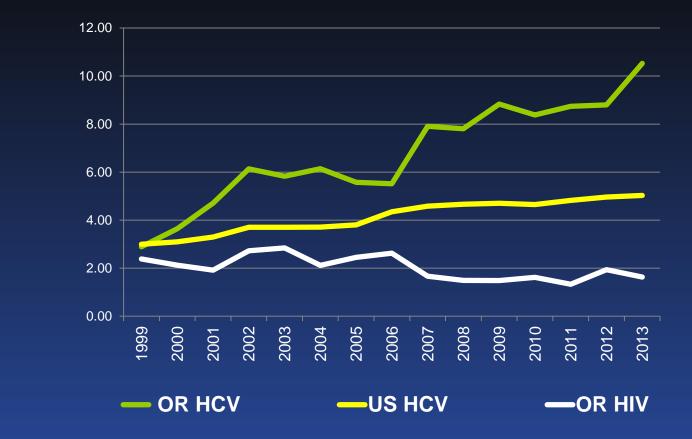
# Chronic viral hepatitis cases by year of liver cancer diagnosis, Oregon, 1996-2012





# Age-adjusted mortality from HCV and HIV in Oregon and from HCV nationally, 1999-2013

Age-adjusted mortality rates



Age-adjusted Rates per 100,000

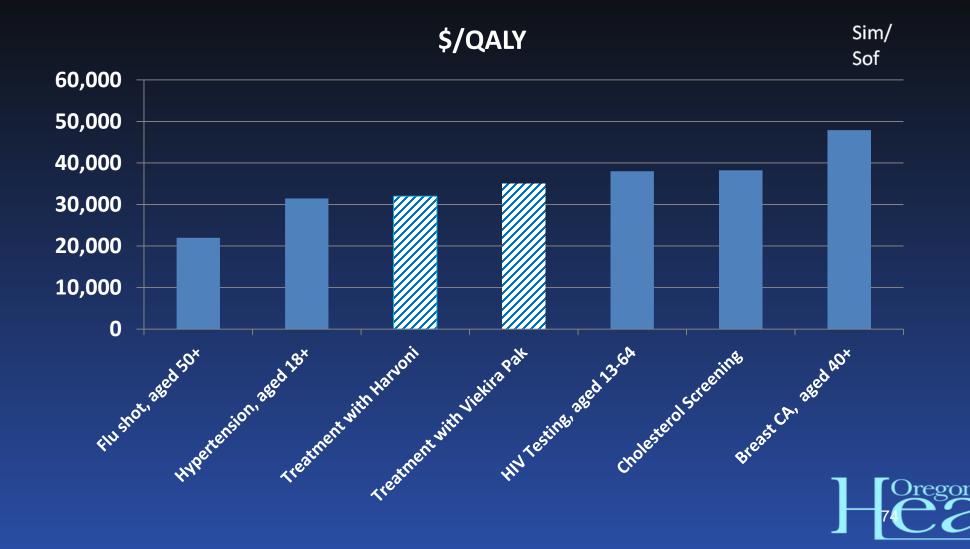


#### New HCV regimens and their cost

Generic Name	Brand Name	Manufacturer	Approximate Cost for 12-week Therapy	Date of FDA approval
Sofosbuvir	Sovaldi	Gilead Sciences	\$84,000	12/2013
Ledipasvir + sofosbuvir	Harvoni	Gilead Sciences	\$94,500	10/2014
Simeprevir	Olysio	Janssen Theraputics	\$66,360	11/2013
dasabuvir/ ombitasvir paritprevir/ ritonavir	Viekira Pak	AbbVie	\$83,319	12/2014
Ombitasvir/ paritprevir/ ritonavir	Technivie	AbbVie	\$76,653	7/2015
Declatasvir	Daklinza	Bristol-Meyers Squibb	\$63,000	7/2015



# Comparison of HCV cost effectiveness with other preventive services



uthority

Age Distribution in HCV-related hospitalizations, cases of liver cancer, and deaths in Oregon, 2009-2013

HCV-related	<b>Baby Boomers</b>	> 65
Hospitalizations	83%	8%
Liver Cancer	77%	16%
Deaths	80%	16%



#### Federal Medicaid Program communications

#### CMS Issues Notice Regarding **Barriers to HCV Treatment**

#### By Dalia Deak

Yesterday, the Centers for Medicare & Medicaid Services (CMS) issued a notice that affirmed CMS's commitment to provide prescription drugs to beneficiaries, specifically highlighting beneficiaries suffering from hepatitis C virus (HCV). The notice comes at a moment of heightened interest in the cost of prescription drugs (particularly on the federal level as an inquiry in the Senate has been initiated regarding rising drug prices).

#### In the statement, CMS:

and regulations.

 Reminded the states of their obligation, under the terms of the Social Security. that Medicaid programs must cover prescription drugs for medically accep

 Discussed the concern regarding costs of direct-acting antiviral (DAA) HCV drug. emphasizing the role of competition and negotiation in bringing down the drugs

 Expressed concern regarding some states' policies to restrict access to the DAA HCV drugs that may be contrary to their obligations under the Social Security Act; Encouraged states to ensure that their policies do not unreasonably restrict

Reminded states that drugs available under the states' fee-for-service programs

must also be available to beneficiaries of Medicaid managed care organizations;

 Indicated that CMS will monitor state Medicaid policies for DAA HCV drug coverage to ensure that they are compliant with approved state plans, statutes,

CMS also followed up its notice with a letter to the CEO of Abb√ie asking for additional information regarding the types of value-based purchasing arrangements offered to

payers and to state Medicaid agencies by December 31, 2015.



Regulatory

medicine Medscape Medical News > Conference News

Medicaid Denial for Hep C Drugs Nearing 50% in Some

States

by Emily Wasserman | Nov 6, 2015 9:34am

Medicaid calls on Gilead, AbbVie to answer hep C drug





#### What can you do about hepatitis C?



### Legionellosis



#### Incidence of Legionellosis, Oregon and the US, 2006-2015



#### **Incidence of Legionnaire's Disease by age and sex, Oregon 2006-2015**



#### Legionella outbreak at Oregon resort

Characteristics	Case A	Case B	Case C	Case D
Report date	10/7/14	1/16/14	2/26/13	9/27/11
Age	62	73	57	54
Gender	Male	Female	Male	Female
County of residence	Marion	Clatsop	Linn	Lane
Travel dates	9/21 - 9/28	12/27-12/30	2/14-2/15	9/15-9/16
Sx Onset	9/24/14	1/11/14	2/19/13	9/19/11
Stayed at	Condo - 04	Condo - 04	Condo - 03	Single Fam
Risk factors	Age>60;AC; shower; <b>used</b> <b>tub</b>	Age; COPD; immunocomp humidifier; <b>did</b> <b>not use tub</b>	Smoker; used tub	Smoker; HC worker; <b>used</b> <b>tub</b> ; other exp.



### Outbreak Investigation - Methods

Conducted environmental assessment - physical testing - collected samples Performed lab testing Increased awareness of Legionella - provided resources



# Field Trip to the Site



# Outbreak Investigation - Results

#### **Raw water sample chemistry:**

- Free chlorine 0.0
- Combined Chlorine 0.0
- pH 8.2
- Alkalinity 40 ppm
- Ca Hardness 50ppm
- Temperature 104 F (?)

#### Lab test results – positive for

- all three samples from shower head
- one from kitchen sink faucet



# Outbreak Investigation - Results

Type of facility – private, members only; not licensed or inspected by local PH

- Water supply supplied by well water; these were pretty deep @ 736 ft. and 800 ft.; water not chlorinated
- Occupancy high --more than 90% occupied at any given time
- Cleaning procedures met standard guidelines, there was no recent maintenance in the building implicated, and no recent reports of people calling sick



### Implement Control & Prevention Measures

- Immediate steps
  - Close implicated units
  - Remediate

#### Long terms steps

- Recommend expert advice
- Identify and implement control measures, including thermal disinfection & hyper-chlorination
- Identify & report new cases
- Report progress on eradication of pathogen



#### Environmental Protection Agency & Legionella

Technologies for Legionella Control: Scientific Literature Review, November, 2015

- Major public health concern high morbidity and mortality
- Natural in environment, colonizes biofilms in premise plumbing\*
  - 62% of waterborne disease outbreaks Legionella
  - 80% caused by environmental conditions within water systems of buildings
- Surface Water Treatment Rule (SWTR) 1989
  - Presumes that compliance with treatment requirements will control for *Legionella*
- \*premise plumbing after service connection to the tap. Conditions can lead to Legionella proliferation water heating, long residence time, low disinfectant residuals, cross connections, installation and repairs



# Rules pertaining to public water systems

Low concentrations of Legionella entering buildings from these sources may colonize and regrow in hot water systems

Large buildings with lots of plumbing and recirculating hot water systems (for example: hospitals, hotels, casinos) may be most susceptible

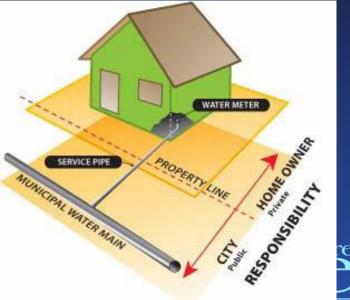
Hospitals particularly concerned due to increased susceptibility of patients





### Rules pertaining to public water systems

- Large building owners are considering treatment or other practices to reduce risk
- OHA-DWS regulates the Safe Drinking Water Act up to the user's meter – beyond that is the responsibility of the property owner and Plumbing Code
- Building owners that add treatment need to be regulated as a public water system
  - Plan review and approval
  - Monitoring requirements
  - Operator certification



PUBLIC HEALTH DIVISION Drinking Water Services

#### **Control Technologies**

- •Chlorine effective but residual maintenance is important, efficacy  $\uparrow$  with  $\uparrow$  temperature
  - -Biofilms and *Legionella* in the amoeba shields it from chlorine
  - -Potential water quality issues with byproducts, taste, odor and corrosion
- Monochloramine wide range of inactivation, efficacy ↑ with ↑ temperature
   Several studies showed > penetration of biofilms than chlorine
   Potential water quality issues with byproducts, nitrification. Corrosion
- •Chlorine Dioxide effectiveness at low doses, can penetrate biofilms and amoebae, efficacy  $\uparrow$  with  $\uparrow$  temperature
  - -Potential water quality issues formation of chlorite/chlorate, taste, odors and corrosion



### **Control Technologies**

•Copper-Silver ionization(CSI) – can reduce cultivability of Legionella

- Biofilms and Legionella in the amoeba shields it from CSI
- Potential water quality issues high copper concentrations and corrosion
- Legionella strains appear to develop resistance
- •Ultraviolet disinfection shown effective at decreasing/eliminating at low doses
  - Only effective on water flowing through reactor requires supplemental tx if Legionella is in premise plumbing
  - Some reactors ? Tolerance of high temp or disinfectants
  - Iron, manganese, calcium, and magnesium may decrease UV output
- •Ozone– effectiveness wide range of conditions
  - effects on biofilms and amoebae, efficacy not well characterized
  - Decomposes quickly hard to maintain residual, especially at high temps.
  - Potential water quality issues formation byproducts and corrosion



### **Control Technologies**

- Point-of-use filtration
  - Shown to be effective
  - Dependent on pore size ( $\leq 0.2$  um)
  - Depth filtration, use of silver incorporated BAC filtration not effective
  - Filters may clog
- Preventative and Remediation multi barrier approach





### **Emergency Disinfection**

#### **Shock Chlorination**

•Inject elevated Chlorine 20-50 ppm for specific time

- •Mixed success
- Legionella can be protected within amoeba which can survive chlorine [50ppm]





Emergency Measure: Thermal Disinfection ("super heat and flush")

Increase water temperature to 71-77° C (160-171°F)

While flushing outlet for at least 30 min

Regrowth is an issue
 may not provide long-term control

Has been effective in hospital outbreak scenarios



### Continuous Treatment: Regulatory Considerations

- If treatment for a regulated contaminant is applied, they become a public water system
- Monitoring & reporting requirements
  - Chlorine residual levels
  - MCLs, MRDL, TTs must be met
- Operator of the treatment must be certified to properly operate & maintain equipment
- Plan review approval of equipment & chemicals used



PUBLIC HEALTH DIVISION Drinking Water Services

### Challenges

- Thorough evaluation of WS facilities & plumbing is needed to determine appropriate treatment
- Some methods have not always proven completely successful or provide permanent protection from recolonization
- A combination of treatment options may be needed
- Consult with professionals experienced with Legionella & pathogen control measures is advised
- Monitoring effectiveness of treatment is critical!



#### Conclusion

- Water treatment processes & regulations have reduced transmission of illnesses in public DW supplies
- Outbreaks have led to increased interest in preventing Legionella occurrence & minimize exposure
- Research is needed to understand factors promoting biofilm growth, pathogen survival & proliferation
- EPA guidance to be released in 2015 on treatment technologies for facilities installing secondary disinfection to address Legionella

