Indiana State Department of Health
Indiana Epidemiology Newsletter

Volume 18, Issue 6 November/December 2010

Enteroviral Laboratory Surveillance

Dana Hazen, RN, MPH
Invasive Disease Epidemiologist

Dave Dotson
Director, Virology and Emergency Preparedness

Mark Glazier
Microbiologist Supervisor, LRN/Rabies/Molecular Virology

Katie Masterson
Microbiologist Supervisor, Virology Laboratory

Enteroviruses are common viruses which cause a variety of conditions ranging from mild illness, such as fever, rash, and cold-like symptoms, to more severe conditions, such as viral meningitis or encephalitis. Enterovirus infections are also suspected to play a role in the development of juvenile-onset diabetes[1]. Enteroviruses are spread through contact with the respiratory secretions or stool of an infected person and through contact with surfaces contaminated with the virus.

Enteroviruses include Coxsackie, Echovirus, numbered Enteroviruses and Poliovirus. Almost 100 serotypes of nonpolio enteroviruses have been recognized in the current International Taxonomy of Viruses classification[1.] Individual serotypes are associated with different clinical manifestations and have different patterns of circulation. For example, Echovirus 9 and Echovirus 30 are associated most commonly with sporadic cases and large outbreaks of viral meningitis, whereas Coxsackie group A and B viruses are more often associated with myocarditis and hand, foot and mouth disease[3]. Enterovirus infections, with the exception of polioviruses, are not nationally notifiable in the United States.

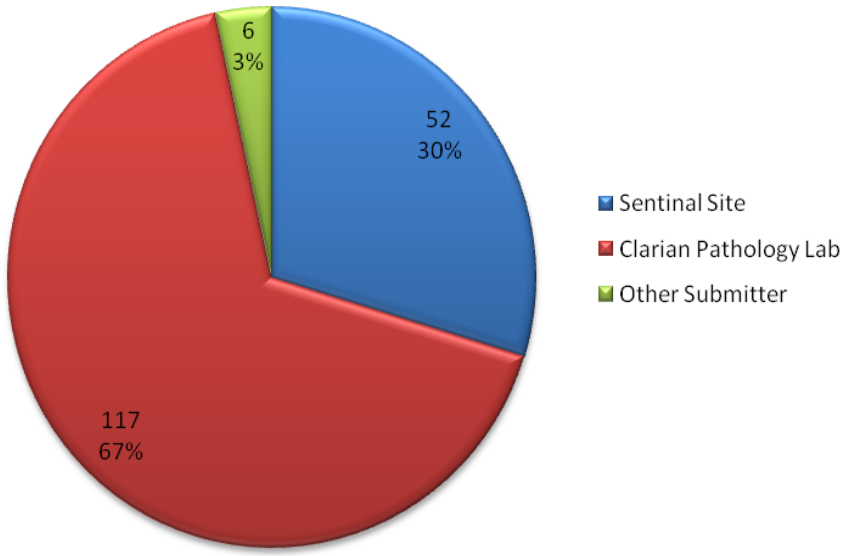
Beginning in the summer of 2009, Indiana implemented a voluntary passive system for the submission and testing of potential enterovirus specimens. Specimens are routinely submitted and tested from providers enrolled in the influenza sentinel site program, as well as the Clarian Pathology Laboratory, which provides laboratory services for 16 hospitals and several outpatient clinics across the state. Testing at the Indiana State

Department of Health (ISDH) virology laboratory includes real-time reverse transcriptase PCR (RT-PCR) for the detection of enteroviruses, viral culture, and antigenic characterization through molecular sequencing. All results obtained from enterovirus testing are reported to the National Enterovirus Surveillance System (NESS) as well as the National Respiratory and Enteric Virus Surveillance System (NREVSS) at the Centers for Disease Control and Prevention (CDC). This report is a descriptive analysis of enteroviral isolates in Indiana submitted during the enterovirus surveillance project from April 28, 2009 to May 15, 2010. This report also includes specimens received for both influenza and mumps testing.

Description of Specimens

A total of 175 specimens were submitted from 23 different facilities to the ISDH Laboratory for virology testing. Over half of the specimens were submitted for enteroviral confirmation by the Clarian Pathology Laboratory (CPL). Figure 1 depicts the number of specimens which tested positive for enterovirus by submitting site.

Figure 1: Number of Enterovirus Specimens Submitted by Site Classification



Sixty-nine percent (121/175) of the specimens were submitted for enteroviral testing. Other indications for testing included influenza (46) and mumps viruses (8). Of the specimens submitted for enteroviral testing, 96.6% (117/121) were submitted by the Clarian Pathology Laboratory. Table 1 details the indication for testing and number of specimens submitted to the ISDH Virology Laboratory.

Table 1: Number of Specimens Submitted by Indication for Testing

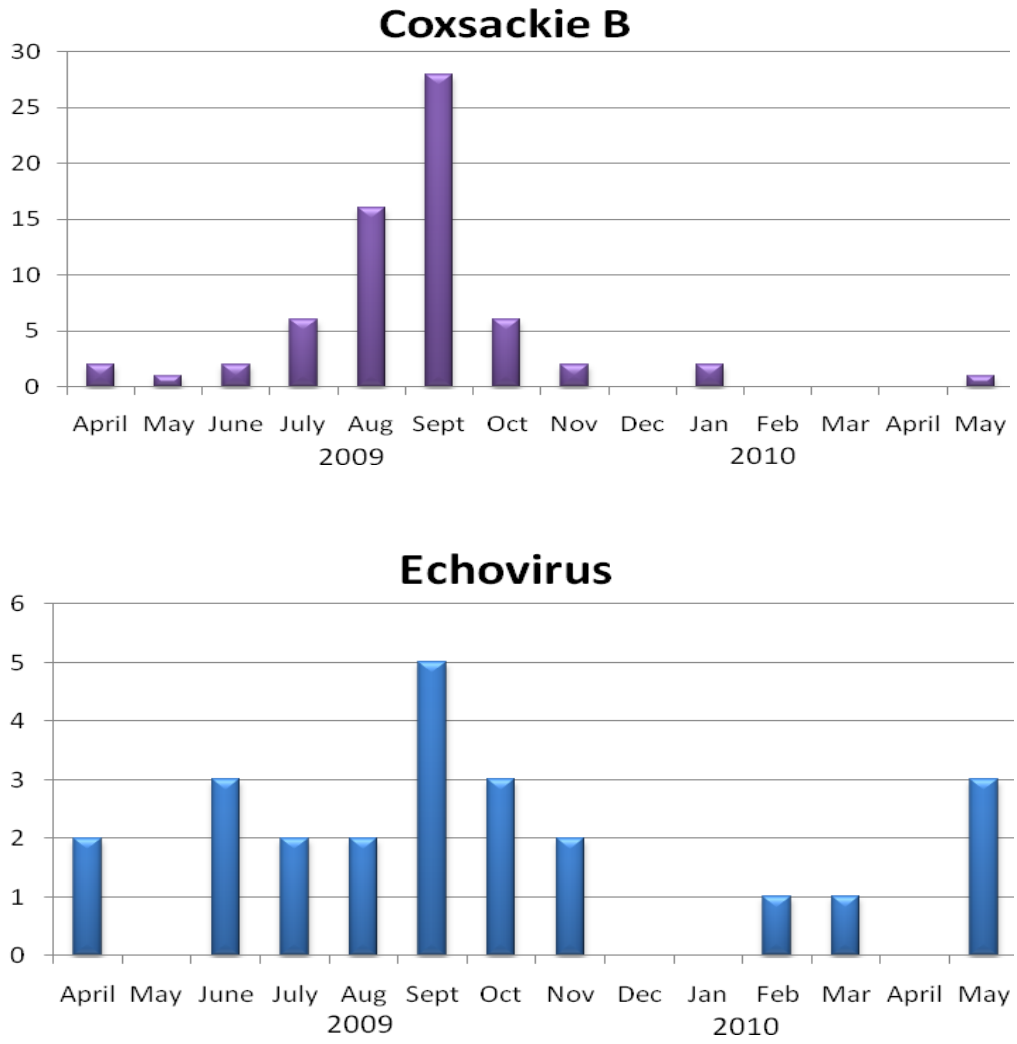
Indication for Testing	Frequency	Percentage of Specimens
Mumps	8	4.6
Influenza	46	26.2
Enterovirus	121	68

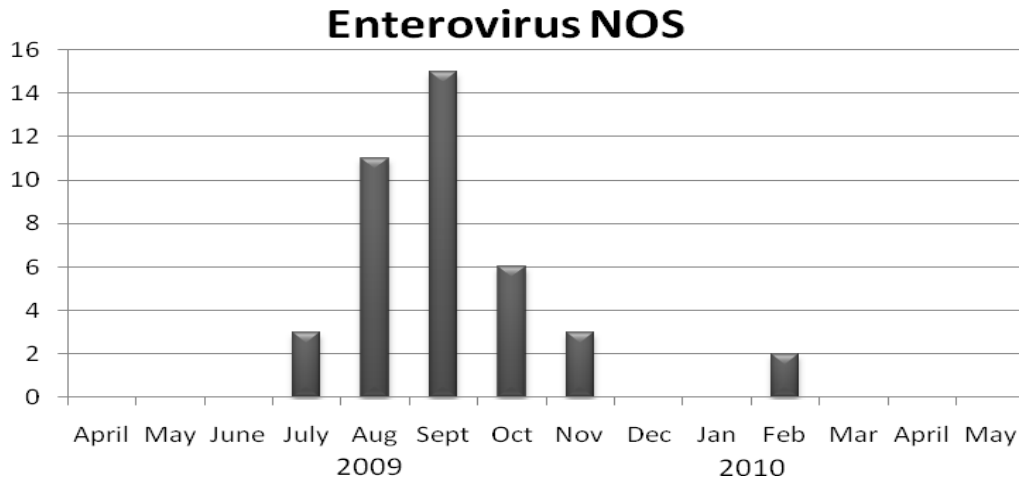
The symptoms and clinical diagnosis were not available from the enteroviral sentinel surveillance program (virology submission forms); however, information on the source of the specimen was available for 64% (111/175) of all cases. Of these, 96 submissions

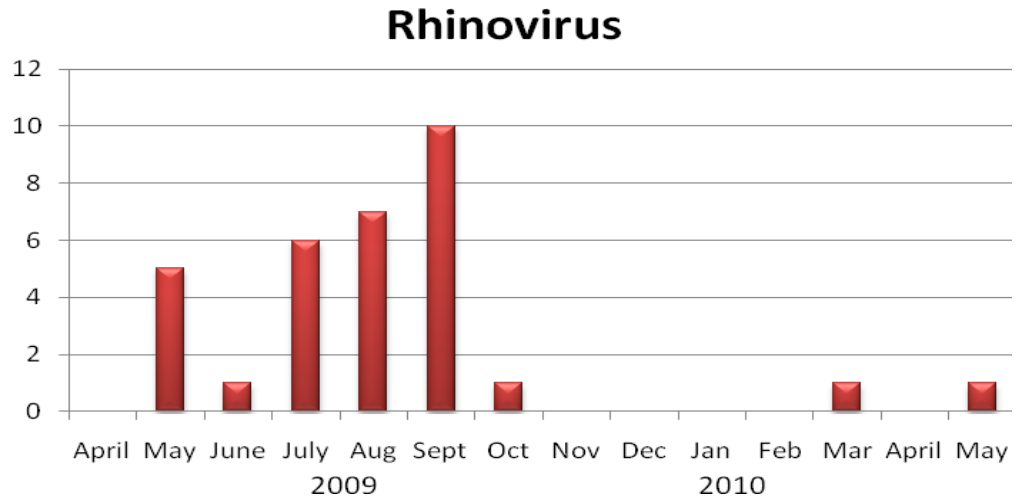
(86.4%) were specimens from the upper respiratory tract (nasopharyngeal or throat swabs, or sputum samples). Other specimen sources included bronchial specimens or stool.

The majority of the specimens 118 (67%) were collected between July and September, which is consistent with the enterovirus season; none of the cases were linked to an outbreak. Figure 2 depicts the viral strain type by month of collection.

Figure 2: Enterovirus Cases by Month and Culture Result April 2009 – May 2010







Viral culture results were available for all but nine isolates, although it's presumed these were cases of enterovirus or other viruses that could not be isolated using culture techniques. Of these, coxsackie B (37.7%), non-specific enterovirus (22.9%), echovirus (13.7%), and growth consistent with rhinovirus (18.3%), were the most common findings. Table 2 displays the culture results for all specimens.

Table 2: Enteroviral Culture Results

Rank	Culture Result	Frequency	Percentage
1	Coxsackie B	66	37.7
2	Enterovirus NOS (untyped)	40	22.9
3	Consistent with Rhinovirus	32	18.3
4	Echovirus	24	13.7
5	Enterovirus 70/71	3	1.7
6	Coxsackie A16	1	0.5
N/A	No Virus Isolated	9	5.1

Viral culture results were available for all but nine isolates, although it's presumed these were cases of enterovirus or other viruses that could not be isolated using culture techniques. Of these, coxsackie B (37.7%), non-specific enterovirus (22.9%), echovirus (13.7%), and growth consistent with rhinovirus (18.3%), were the most common findings. Table 2 displays the culture results for all specimens.

Table 3: Enteroviral Sequencing Results

Rank	Sequencing Results	Frequency	Percentage
1	Enterovirus 68	38	35.5
2	Echovirus 9	8	7.5
3	Echovirus 6	7	6.5
4	Coxsackie B4	4	3.7
	Rhinovirus	4	3.7
5	Echovirus 11	3	2.8
	Coxsackie B2	3	2.8
	Coxsackie A16	3	2.8
6	Other Coxsackie B	2	1.9
	Other Echovirus	2	1.9
	Other Enterovirus	1	0.9
	Rhinovirus spp	4	3.7
	Untyped	28	26.2

Age and gender data was not available for 42% of the cases. Of the cases with this information, the average age of the cases was 15.25 years (range: 3 months to 80 years). Forty-six percent of the cases were female.

Please contact Dana Hazen, invasive disease epidemiologist, if your laboratory has interest in submitting isolates for enteroviral typing.

References

1. Pallansch MA, Roos RP. Enteroviruses: polioviruses, coxsackieviruses, echoviruses, and newer enteroviruses. In: Knipe DM, Howley PM, Griffin DE, et al, eds. Fields Virology, 4th ed. Philadelphia, PA: Lippincott, Williams, & Wilkins; 2001:723--75.
2. CDC. Nonpolio Enterovirus and Human Parechovirus Surveillance ---United States, 2006-2008. MMWR 2010: 59(48): 1577-1580.
3. CDC. Enterovirus Surveillance---United States, 1970-2005. MMWR 2006: 55(SS08): 1-20.

Trends in Antimicrobial Resistance and Serotypes among Invasive *Streptococcus Pneumoniae* isolates in Indiana, 1999-2008

Teresa Jue, MPH
Epidemiology Intern, Surveillance and Investigation Division

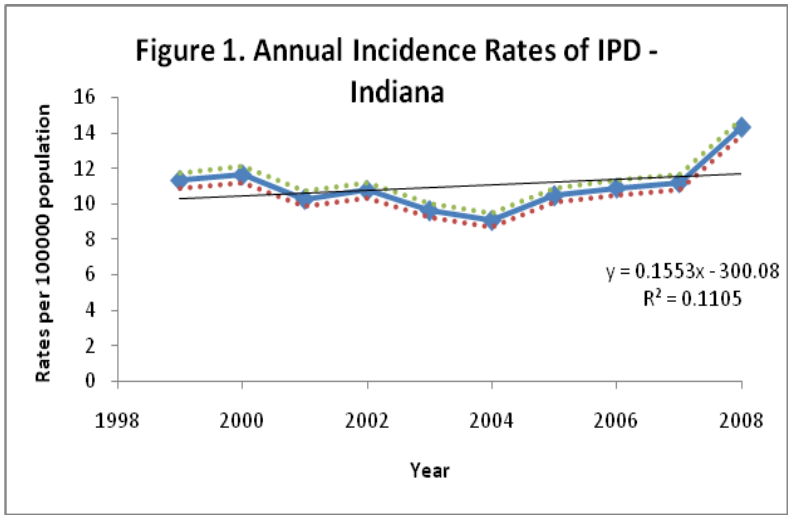
Background

As the most common cause of community-acquired pneumonia, meningitis, and bacteremia, *Streptococcus pneumoniae* (pneumococcus) has greatly impacted society on global and local levels. Naturally found within the nasopharyngeal tract of approximately 70% of healthy individuals, invasive or sterile site cases of invasive pneumococcal disease (IPD) causes nearly 1.6 million deaths per year globally, with 1 million of those deaths being children under the age of 5 years. Within the United States, the Centers for Disease Control and Prevention (CDC) has reported that incidence of sterile-site infections have shown geographic variation from 21 to 33 cases per 100,000 population.

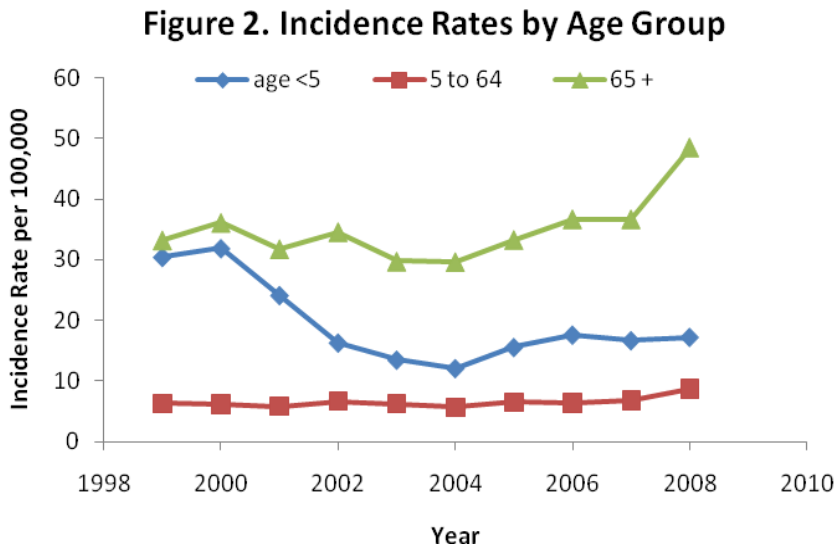
Currently, vaccines are available and recommended for high risk individuals, such as children under 5 years, adults older than 65, and immunocompromised individuals, to help decrease the burden caused by IPD; however incidence within Indiana has still increased in recent years. Indiana has been participating in data collection and reporting of IPD for several years, however analysis of this data has been lacking. This study aimed to analyze the overall incidence of IPD within the state, detect trends in antimicrobial resistance among isolates, identify trends in the incidence of multi-drug resistant cases of IPD, and to discuss the changes in serotype distribution since the introduction of the conjugate vaccine, PCV7. All analyses were conducted using SAS version 9.1.

Incidence Rates

A total of 6,804 cases of IPD were identified between the years of 1999 and 2008. In order to meet the case definition of IPD, the organism must be isolated from a normally sterile site within the body (i.e. blood, CSF, pleural fluid, etc.) Childhood cases (age < 5 years) accounted for approximately 10% of cases per year.



Overall, Indiana has experienced a slight increase in incidence of IPD since 1999 (Figure 1). However, when broken down further by age group, there has actually been a decrease in incidence of IPD in those under 5 years (Figure 2). Using an average incidence rate from 1999-2001 and 2006-2008 representing the time of the PCV7 vaccine licensure and five years later, respectively, the rate of IPD incidence dropped from 28.82 to 16.92 cases per 100,000 population ($p < 0.0001$).



In contrast, both the 5-64 and 65+ age groups experienced an increase in incidence since 1999. The 5-64 age group showed a slight, yet statistically significant, increase from 6.08 to 7.28 cases per 100,000. ($p < 0.0001$) The 65+ age group showed the most drastic change

among all groups with a statistically significant increase from 33.72 cases per 100,000 at the time of PCV7 licensure to 40.74 cases per 100,000 five years after ($p < 0.0001$). This represents a 20.8% increase in the incidence of IPD among older individuals.

Table 1 shows Indiana's progress in meeting the Healthy People 2010 goals for incidence of invasive pneumococcal infections.

Table 1. Indiana Incidence Rates per 100,000 persons Compared to HP 2010 Goals

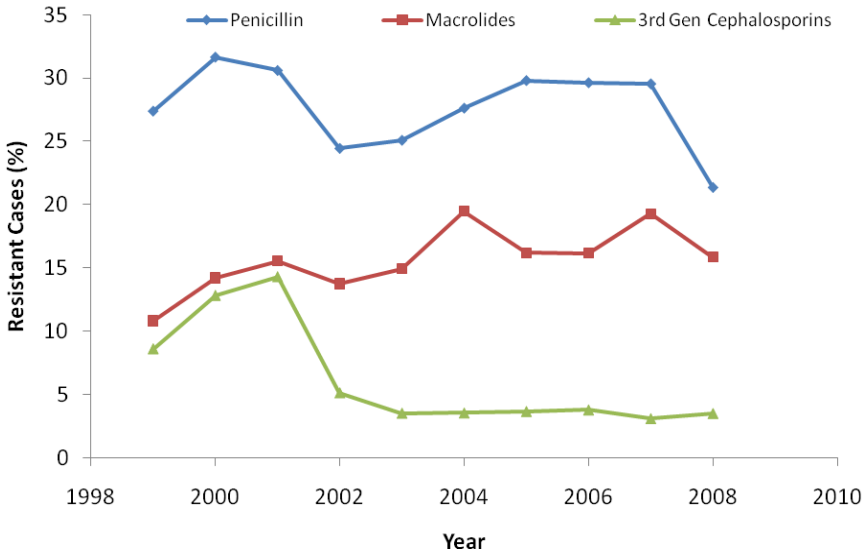
Age Group		1999 (National)	2010 Goal	2008 (Indiana)	Goal Reached?
Age < 5	IPD	76	46	17.3	Yes
	Penicillin Resistant IPD*	16	6	5.2	Yes
65 +	IPD	62	42	52.5**	No
	Penicillin Resistant IPD*	16.4	7	10.44**	No

*Rates for national penicillin resistant IPD were from 1997
**Incidence has increased during the ten-year time period

Antimicrobial Resistance Patterns

This particular analysis focused on penicillin, cephalosporins and macrolides. Resistance to penicillin was first noted in the 1970's, and has dramatically increased. However, Indiana has shown stabilization in resistance during the years of this analysis. Figure 3 shows how trends in each of these drug classes have changed from 1999 to 2008.

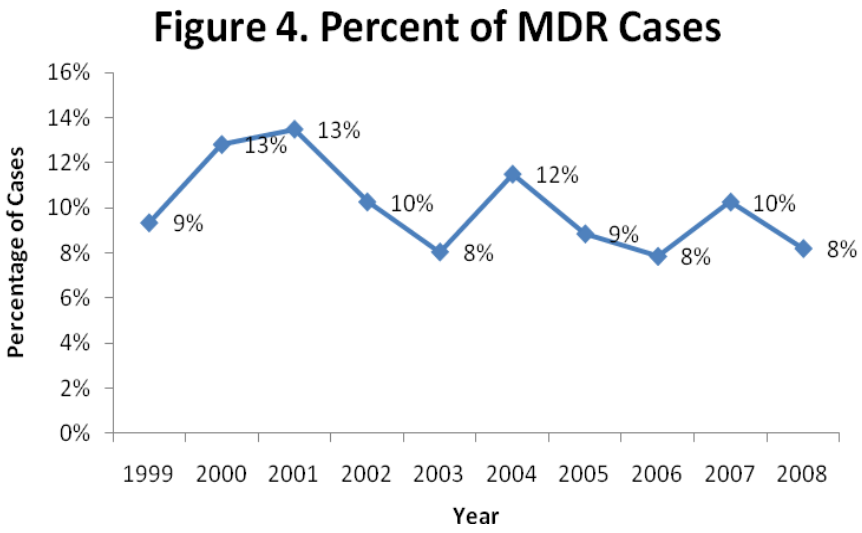
Figure 3. Antimicrobial Resistance Trends



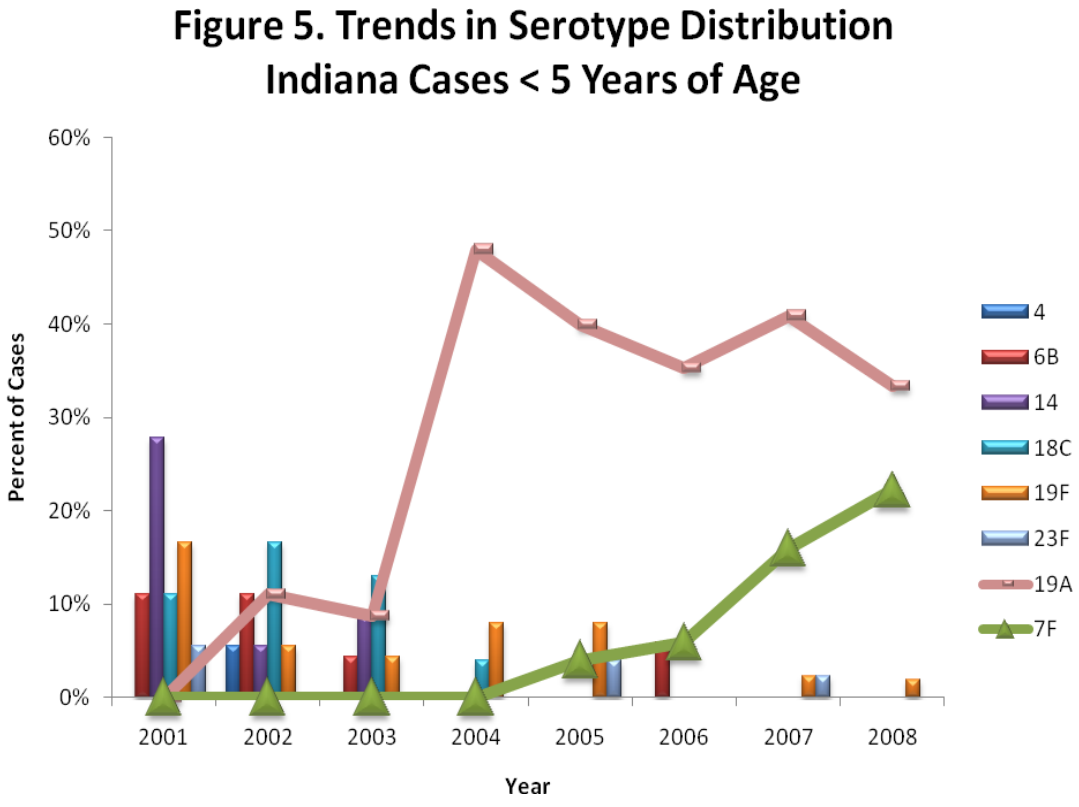
There was a statistically significant decrease in incidence of penicillin resistant cases between the years of 1999-2001 and 2006-2008. ($p = 0.0113$) The Clinical & Laboratory Standards Institute (CLSI) increased the minimum inhibitory concentration (MIC) interpretive levels for penicillin in 2008, therefore it is difficult to attribute this trend to actual decreasing resistance or to policy change. However, if 2008 data is taken out of the analysis, the data suggest stability among penicillin resistance.

Similarly, the percentage of cases resistant to third-generation cephalosporins (ceftriaxone and cefotaxime) also showed a decrease between the years of 1999-2001 and 2006-2008. ($p < 0.0001$) Like penicillin, the CLSI updated the MIC interpretive levels for third-generation cephalosporins in 2002, making it difficult to determine a direct link between actual resistance levels and policy shifts. If the trending is performed for 2002-2008, there is a stabilization in rates of resistance. There were no statistically significant

changes in resistance to macrolides (azithromycin, erythromycin, and clarithromycin) (p = 0.49).



Multidrug resistance (MDR) is defined as resistance to three different antimicrobial drug classes. Within Indiana, MDR cases account for approximately 10% of total cases per year. As Figure 4 demonstrates, there has been a slight decrease in the percentage of MDR cases between 1999 and 2008. The average percentages for 1999-2001 and 2006-2008 were 12% and 9% respectively. Cochran Armitage trend testing provided further evidence of a statistically significant trend (p= 0.002.)



Serotypes

The final aim of this study was to trend the changes in serotype distribution in Indiana since the licensure of the PCV7 vaccine in 2000. Serotypes of cases under the age of 5 years were included in this analysis. Prior to December 2008, pneumococcal isolate submission was voluntary in the state of Indiana; therefore, not all reported cases are

represented in Figure 5. During this timeframe, there was a shift in the distribution of serotypes. PCV7 vaccine includes serotypes 4, 6B, 9V, 14, 18C, 19F, and 23F. As seen in Figure 5, the percentage of cases caused by PCV7 serotypes have greatly decreased in recent years. An example of this is serotype 18C, which was responsible for 17% of cases in 2002 and none of the cases from 2005-2008.

This shift has also allowed for the emergence of non-vaccine serotypes, causing a well-studied phenonmenon known as serotype replacement. Serotypes 19A and 7F are just two examples of non-vaccine serotypes that have been of great interest. Incidence of IPD caused by 19A has increased from just 11% of submitted isolates in 2002 to a peak of 48% of submitted isolates in 2004.

Conclusions

Overall, Indiana has done well in decreasing the incidence of IPD among children under 5 years of age, exceeding the goals set forth by Healthy People 2010 by 2008 for both IPD and penicillin resistant IPD. However, the same cannot be said for the 65 and older population. Indiana has failed to meet the Healthy People 2010 goals for both IPD and penicillin resistant IPD for this age group, and incidence has actually increased since 1999 (Table 1). Greater vigilance for vaccination with polysaccharide vaccine PPV23 among this older population may be necessary in order to reverse this trend.

Antimicrobial resistance has since stabilized among penicillin, macrolides, and third-generation cephalosporins. Additionally, data suggest that the percentage of cases displaying MDR is also decreasing. Although stabilization has been seen in recent years, resistance should be continuously monitored, especially due to constant changes in serotype distribution. Preliminary data from 2009 suggests that Indiana is maintaining this trend of stabilization for incidence of IPD. Additionally, MDR resistance should be monitored in order to prevent the spread of resistant clones.

Despite great advances in decreasing the incidence of IPD caused by PCV7 vaccine serotypes shifts in serotype distribution due to emergent non-vaccine serotypes has been identified in Indiana and nationwide. Research concerning non-vaccine serotypes will become increasingly important, as the PCV13 vaccine was recently licensed for use in the childhood immunization schedule. Updating healthcare providers within Indiana about the changes in antimicrobial resistance and serotype distribution will allow for more evidence-based decisions in treating IPD cases and prescribing antimicrobial drugs.

For more information regarding *Streptococcus pneumoniae*, IPD, or associated vaccines, please visit the following websites:

- CDC Disease Listing: http://www.cdc.gov/ncidod/dbmd/diseaseinfo/streppneum_t.htm
- CDC Pink Book, Ch 15 Pneumococcal Disease: http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/pneumo.pdf
- PCV7/PCV13/PPV23 Vaccine Information: http://www.cdc.gov/vaccines/vpd-vac/pneumo/default.htm

References

1. Centers for Disease Control and Prevention. (2009). Pneumococcal Disease. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Atkinson W, Wolfe S, Hamborsky J, McIntyre L, eds. 11th ed. Washington DC: Public Health Foundation

2. Centers for Disease Control and Prevention (CDC) (2005). Direct and indi*rect effects of routine vaccination of children with 7-valent* pneumococcal conjugate vaccine on incidence of invasive pneumococcal disease – United States, 1998-2003. *MMWR*, 54(36):893-897.

3. Hoban, D.J., Doern, G.V., Fluit, A.C., Roussel-Delvallez, M., Jones, R.N. (2001) Worldwide Prevalence of Antimicrobial Resistance in *Streptococcus pneumoniae, Haemophilus influenzae,* and *Moraxella catarrhalis* in t*he S*ENTRY Antimicrobial Surveillance Program, 1997-1999. *Clinical Infectious Diseases*, 32(Suppl 2): S81-93.

4. Lynch, J.P. 3rd, & Zhanel G.G. (2009). Streptococcus Pneumoniae: epidemiology, risk factors, and strategies for prevention. *Semin Respir Crit Care Med***.,** 30:189-209.

5. Ogilvie, I., Khoury, A.E., Cui, Y., et al. (2009). Cost effectiveness of pneumococcal polysaccharide vaccination in adults: a systematic review of conclusions and assumptions. *Vaccine*, 27:4891-4904.

6. SAS Insititute Inc. (2004-2007) SAS version 9.1.3, Gary, NC, SAS Institute.

7. US Department of Health and Human Services. (2000) *Healthy People 2010.* 2nd. Ed. With understanding and improving health and objectives for improving health (2 vols.). Washington DC: US Department of Health and Human Services, 2000.

Cervical Cancer

Erin Triplett, MPH
Director, Breast & Cervical Cancer Program

According to the National Cancer Institute, it is estimated that nationwide in 2010, more than 12,200 women will be diagnosed with cervical cancer, and 4,210 will die from cervical cancer. Cervical cancer is a disease in which malignant cancer cells form in the uterine cervix. Cervical cancer generally develops very slowly, and can be prevented and treated effectively and efficiently when detected early.

Before cancer appears in the cervix, the cells of the cervix under go a series of changes, known as dysplasia. Dysplasia is a condition in which cells of the cervix become abnormal. Dysplasia is a pre-cancerous condition; however, depending on the number of abnormal cells the condition may resolve without treatment. If left untreated, dysplasia may become malignant over time, although this can take several years. Generally, dysplasia can be spotted through a regular screening exam known as a Pap test or Pap smear, a procedure in which cells are scraped from the cervix for examination under a microscope, and treated as necessary.

Because changes in cervical cells can be detected before they become malignant through regular screenings, cervical cancer is preventable. Worldwide, cervical cancer is the third most common type of cancer in women, affecting more than half a million women each year. However, due to the routine use of Pap smears, cervical cancer is much less common in the United States.

The majority of cases of cervical cancer are caused by the human papillomavirus (HPV), a group of more than 100 related viruses. The term “papillomavirus” refers to the fact that

certain types of HPV may cause papillomas, or warts, which are benign tumors. Other types of HPV have been associated with cancer, including cervical. More than 30 types of HPV can be transmitted through sexual contact, and according to the National Cancer Institute, there are more than 6 million new genital HPV infections nationwide each year. Most of these infections occur without any symptoms and vanish without treatment over the course of a few years. Almost all women will have an HPV infection at some point, but very few will develop cervical cancer.

Two major vaccines are available currently to prevent HPV-- Gardasil and Cervarix. Gardasil protects against four HPV types (6, 11, 16 and 18) and is given through a series of three injections. Gardasil has been approved for the use of females for the prevention of cervical cancer and some vulvar and vaginal cancers caused by types 16 and 18 and for the use of males and females for the prevention of genital warts caused by types 6 and 11. The vaccine is approved for these uses in males and females ages 9 to 26 years. Cervarix targets HPV types 16 and 18 and is given in three injections over a six month period. It has been approved by the FDA for use among females ages 10-25 years.

According to studies reported in the *New England Journal of Medicine*, both Gardasil and Cervarix have been shown to be highly effective in preventing infection with the types of HPV they target. However, because they do not target all types of HPV that are associated with cervical cancer, routine pap smears still play an important role in the prevention of cervical cancer. Women should begin receiving an annual Pap test at the age of 21 years, or when they first become sexually active, according to guidelines of the United States Preventative Task Force. Cervical cancer is preventable through routine Pap smears that can detect abnormal changes in cervical cells before they become malignant. Therefore, efforts should be made to increase awareness around the importance of routine screenings for cervical cancer.

Although the article below describes an outbreak investigation occurring early in 2010, it is a good example and reminder of norovirus transmission as we approach the same time period in 2011.

Norovirus Outbreak at a Birthday Party

Sandra Gorsuch, MS
ISDH Field Epidemiologist, District 5

Background
On February 2, 2010, the Hamilton County Health Department (HCHD) notified the Indiana State Department of Health (ISDH) of a food complaint from an individual who attended a birthday party on January 30, 2010, at a local banquet facility. At least 21 of 90 birthday party attendees became ill with gastroenteritis symptoms, including nausea, vomiting and diarrhea following the party. A child was reported ill the night before the party with vomiting and diarrhea.

Epidemiologic Investigation
The ISDH and the HCHD initiated a collaborative investigation on February 2, 2010 to determine the cause of the outbreak and implement control measures to prevent further transmission of the illness.

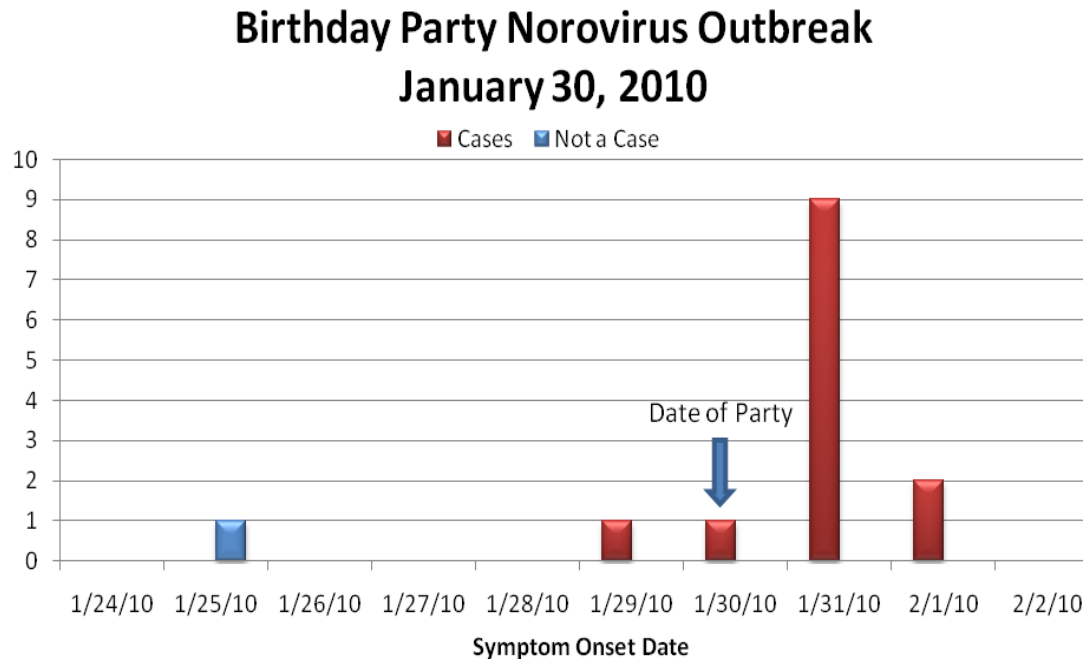
The event was partially catered by a catering service that provided deli meat, bread, condiments, fruit bowl, and coleslaw. Veggie trays and fruit trays were purchased from a local grocery store. Three birthday cakes were prepared by the complainant, and three other individuals made one dessert each.

The HCHD contacted the banquet facility and requested that the facility be properly cleaned and disinfected with a1:10 bleach and water dilution, and faxed the ISDH Gastrointestinal Virus Infection (GVI) Control Measure Guidelines for Restaurants detailing how to stop the spread of GVI. The manager indicated the facility was bleached and disinfected after each event. The catering service was located in a different county, and the HCHD contacted the local health department of jurisdiction regarding the association of the catering service in this outbreak and requested an inspection.

An unmatched case-control study was conducted to determine if the outbreak was person-to-person or foodborne. The ISDH and the HCHD developed a questionnaire which documented clinical illness and food history. A case was defined as any previously healthy birthday party attendee who became ill with acute onset of vomiting or diarrhea on or after January 30, 2010, or one confirmed disease incubation period prior to January 30, 2010. Those who did not meet the case definition were eligible controls.

The HCHD interviewed 26 birthday party attendees. Thirteen individuals met the case definition (see Figure 1). Reported signs and symptoms included diarrhea (84%), vomiting (84%), fatigue (76%), nausea (69%), cramps (53%), body aches (53%), chills (46%), headache (38%), and low-grade fever (23%). The median incubation period was 40 hours (range: 6 to 79 hours) and median symptom duration was 26 hours (range: 8 to 120 hours). At least two persons consulted a physician, and others recovered on their own without treatment. One participant, believed to be a possible index case, was interviewed and determined to have had diarrhea and vomiting lasting eight hours with onset the night before the party.

Figure 1: Epidemiologic Curve (N=13)



Statistical analysis of 20 food items served at the birthday party indicated that ham was statistically associated with the illness, (p-value 02). However, due to the large variability in the confidence interval (95% CI - 1.09 – 38.7) it cannot be definitively confirmed as the source of the outbreak. No other food items were statistically associated with illness.

Environmental Assessment

On February 3, 2010, a representative of the HCHD conducted an inspection of the grocery store where fruit trays were purchased. No temperature violations were identified. All fruit and vegetable trays with T Marzetti dips were packaged and shipped from Pearson Foods in Grand Rapids, Michigan. Fruit trays packaged by the grocery had a grocery company label, and dip was not included. The produce manager indicated there were no ill employees working in the produce section. The HCHD requested the manager review and implement proper hand washing technique and exercise glove use with staff. No prep work was observed during the inspection. Several violations of the Indiana Retail Food Establishment Sanitation Requirements (410 IAC 7-24) unrelated to the outbreak were identified. Corrective measures were discussed and implemented upon observation of violations.

On February 3, 2010, a representative of the Marion County Health Department (MCHD) conducted an inspection of the catering service. No food safety code violations were noted during the inspection. All food for the event was prepared on location the morning of January 30 and transported to the banquet facility about noon. The MCHD verified employee attendance and conducted interviews.

Laboratory Results

Two birthday party attendees submitted stool specimens to the ISDH Laboratory for analysis. Both specimens tested positive for *Norovirus* Genogroup II by reverse transcription-polymerase chain reaction (RT-PCR).

Conclusions

The investigation confirmed an outbreak of viral gastroenteritis occurred at the birthday party held January 31, 2010. The causative agent of this outbreak was *Norovirus*. Since 2002, GII.4 genotype variants have been the most common cause of *Norovirus* outbreaks.[2]

The predominant signs and symptoms (vomiting and watery non-bloody diarrhea), median incubation of 40 hours, and the median duration of 20 hours are typical of *Norovirus* outbreaks. *Norovirus* is characterized primarily by abrupt onset of nausea, vomiting and/or diarrhea, headache, body aches, chills, but little or no fever.[1] The incubation period for *Norovirus* is 24-48 hours, but cases can occur within 12 hours of exposure. Illness usually resolves on its own within 1-3 days without complications. Treatment is supportive and usually involves maintaining adequate hydration. Dehydration may result after prolonged vomiting and diarrhea, particularly in young children, the elderly, and those with weakened immune systems. *Norovirus* infections typically occur during cooler months of the year (October to April), but can occur year-round.

Norovirus is thought to be responsible for 50% of all foodborne gastroenteritis outbreaks in the United States.[2] The mode of transmission is fecal-oral, and persons are infected by ingesting contaminated food or water, through close contact with an infected person, or

contact with contaminated environmental surfaces and objects (fomites). *Norovirus*, which is shed in stool, is highly contagious, and an infectious dose can be as little as 10 viral particles.[2] Persons with *Norovirus* usually are infectious when symptoms begin and can continue to shed virus in their stool for up to 2 weeks after symptoms cease. Up to 30% of individuals infected with *Norovirus* are asymptomatic, although the role of asymptomatic *Norovirus* infection in transmission is not well understood.[2]

Although not capable of multiplying outside the human body, *Norviruses* are extremely hardy, surviving for 24-48 hours on environmental surfaces. *Norovirus* survives chlorine up to 10ppm (above levels recommended for swimming pools and public water systems)[1] and temperatures below 32°F and up to 140°F.

Foodborne outbreaks of *Norovirus* occur when food is contaminated by an infected food handler immediately before its consumption. Outbreaks have frequently been associated with consumption of ready-to-eat foods, including salads, sandwiches, and bakery products. Semi-liquids, e.g., salad dressing or cake icing, that allow the virus to mix evenly are often implicated as a cause of outbreaks.[2]

The epidemiologic curve suggests a point source outbreak at the birthday party by foodborne, close contact, or environmental transmission (see Figure 1).
One participant reported illness onset the day before the party. Although the disease agent in this participant was not confirmed, symptoms reported were compatible with norovirus infection. Even in the absence of symptoms, this individual was likely still infectious and may have contaminated the environment or food or transmitted infection via close contact with individuals at the party. One case reported vomiting from January 25-27 and also reported vomiting and diarrhea onset February 1. The initial onset was more than one *Norovirus* incubation period (24-48 hours) from the date of the birthday party, and this individual was not in contact with the index case (onset January 29th) prior to the event; therefore it is not likely that secondary transmission occurred.

Data analysis suggests ham was statistically associated with the illness, (p- value - .02), but due to the large variability in the confidence interval (95% CI - 1.09 – 38) it cannot be substantiated as the mode of transmission in this outbreak.

Recommendations
Most Norovirus outbreaks can be prevented by the following practices:

- Practice good hygiene
  - Thoroughly wash hands with soap and water after using the restroom; after changing diapers; after assisting someone with diarrhea and/or vomiting; after swimming; and before, during, and after food preparation.
  - Clean food preparation work surfaces, equipment, and utensils with soap and water before, during, and after food preparation.

- Eat safe foods and drink safe water (Remember: Contaminated foods may look and smell normal)
  - Wash all produce before eating raw or cooking.
  - Use treated water for washing, cooking, and drinking.

- Protect others

- Persons with diarrhea and/or vomiting should not prepare food or provide health care for others and should limit direct contact with others as much as possible.
- Persons with diarrhea and/or vomiting should not attend a child-care facility or school.
- Persons with diarrhea and/or vomiting shall be excluded from employment involving food handling (Indiana Retail Food Establishment Sanitation Requirement, (410 IAC 7-24-122).
- Do not change diapers near recreational water.
- Do not go swimming or use hot tubs if you have diarrhea and for at least two weeks after diarrhea stops.

The Indiana State Department of Health extends its appreciation to the Hamilton County Health Department and the Marion County Health Department for their quick response and outstanding professionalism during this investigation. Their prompt and appropriate actions were instrumental in minimizing the effect of the disease.

References

1. "Norwalk-Like Viruses" Public Health Consequences and Outbreak Management. Centers for Disease Control and Prevention. *MMWR*, June1, 2001 50(9); 1-17.
2. Norovirus: Technical Fact Sheet. February 23, 2010. Centers for Disease Control and Prevention Web site, http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus-factsheet.htm.
3. ISDH November 13, 2004. Retail Food Establishment Sanitation Requirements; Title 410 IAC 7-24-122. http://www.in.gov/isdh/21367.htm.

Training Room

INDIANA STATE DEPARTMENT OF HEALTH IMMUNIZATION PROGRAM PRESENTS:

Immunizations from A to Z

Immunization Health Educators offer this FREE, one-day educational course that includes:

- Principles of Vaccination
- Childhood and Adolescent Vaccine-Preventable Diseases
- Adult Immunizations
    - Pandemic Influenza
- General Recommendations on Immunization
    - Timing and Spacing
    - Indiana Immunization Requirements
    - Administration Recommendations
    - Contraindications and Precautions to Vaccination
- Safe and Effective Vaccine Administration
- Vaccine Storage and Handling
- Vaccine Misconceptions
- Reliable Resources

This course is designed for all immunization providers and staff. Training manual, materials, and certificate of attendance are provided to all attendees. Please see the Training Calendar for presentations throughout Indiana. Registration is required. To attend, schedule/host a course in your area or for more information, please reference http://www.in.gov/isdh/17193.htm.

Epi-Ready Training in Indiana

During the fourth quarter of 2009, ISDH staff members Amie May (Epidemiology Resource Center), Dan Gala (Food Protection) and Jerry Hege (Laboratories), participated in Epi-Ready: Foodborne Illness Response Strategies training. Epi-Ready Team Training is a nationwide initiative intended to provide current foodborne disease outbreak investigation and surveillance training to public and private sector environmental health professionals as well as other professionals who collaborate in conducting foodborne disease outbreak investigations. These staff members returned to Indiana and formed an Epi-Ready Training Team to providetraining opportunities in foodborne disease outbreak investigation and surveillance to public health officials, private sector professionals, and other professionals who collaborate in conducting foodborne disease outbreak investigations.

Throughout the first half of 2010, the Indiana Epi-Ready Training Team created a training program based on the nationwide Epi-Ready initiative but specific to Indiana needs, since local and state agencies vary in their approach, experience, and capacity to respond to foodborne disease outbreaks. This program is intended to give all agencies a common foundation from which to work and to provide examples of the key activities that should occur during the response to outbreaks of foodborne disease.
Starting in September, 2010, the Indiana Epi-Ready Training Team conducted five two-day workshops in Allen, Vanderburgh, Porter, Dearborn, and Marion counties. The goal of these trainings was to integrate the methods use to detect, investigate, and control foodborne outbreaks. The five trainings reached 169 attendees from local health departments and ISDH, including environmental health specialists, public health nurses, epidemiologists, and laboratorians. Trainings were provided at no cost to participants and included interactive group exercises, question and answer sessions, and didactic lectures on passive surveillance, outbreak determination, environmental assessment, epidemiological investigation, laboratory guidance, and final report writing.

ISDH Data Reports Available

The following data reports and the *Indiana Epidemiology Newsletter* are available on the ISDH Web Page:

http://www.IN.gov/isdh/

HIV/STD Spotlight Reports (June 2007, December 2007, June 2008, January 2009)	Indiana Mortality Report (1999-2007)
Indiana Cancer Report: Incidence; Mortality; Facts & Figures	Indiana Infant Mortality Report (1999, 2002, 1990-2003)
Indiana Health Behavior Risk Factors (1999-2008)	Indiana Natality Report (1998-2007)
Indiana Health Behavior Risk Factors (BRFSS) Newsletter (2003-2010)	Indiana Induced Termination of Pregnancy Report (1998-2007)
Indiana Hospital Consumer Guide (1996)	Indiana Marriage Report (1995, 1997, & 2000-2004)
Public Hospital Discharge Data (1999-2008)	Indiana Infectious Disease Report (1997-2008)
Assessment of Statewide Health Needs – 2007	Indiana Maternal & Child Health Outcomes & Performance Measures (1989-1998, 1990-1999, 1991-2000, 1992-2001, 1993-2002, 1994-2003, 1995-2004, 1996-2005)

HIV Disease Summary

Information as of October 31, 2010 **based on 2000 population of 6,080,485)**

HIV - without AIDS to date:

369	New HIV cases November 2009 thru October 31, 2010	12-month incidence	6.07 cases/100,000
4,458	Total HIV-positive, alive and without AIDS on October 31, 2010	Point prevalence	73.32 cases/100,000

AIDS cases to date:

317	New AIDS cases from November 2009 thru October 31, 2010	12-month incidence	5.21 cases/100,000
5,342	Total AIDS cases, alive on October 31, 2010	Point prevalence	87.85 cases/100,000
11,027	Total AIDS cases, cumulative (alive and dead) on October 31, 2010		

REPORTED CASES of selected notifiable diseases

Disease	Cases Reported in September - October *MMWR* Weeks 35-43		Cases Reported in January - October *MMWR* Weeks 1-43	
	2009	2010	2009	2010
Campylobacteriosis	108	52	544	578
Chlamydia	3,357	3,631	15,087	16,217
Cryptococcus	5	3	24	20
Cryptosporidiosis	53	31	241	222
E. coli, shiga toxin-producing	7	1	54	39
Giardiasis	79	49	248	312
Gonorrhea	1,047	1,030	4,739	4,575
Haemophilus influenzae, invasive	12	17	66	82
Hemolytic Uremic Syndrome (HUS)	1	2	6	6
Hepatitis A	1	0	17	17
Hepatitis B	15	9	63	55
Hepatitis C Acute	3	2	16	23
Histoplasmosis	22	18	109	89
Influenza Deaths (all ages)	14	0	18	3
Legionellosis	18	12	54	50
Listeriosis	2	3	8	13
Lyme Disease	11	2	59	62
Measles	0	0	0	0
Meningococcal, invasive	7	3	28	21
Mumps	1	1	2	4
Pertussis	82	150	314	571
Rocky Mountain Spotted Fever	0	0	1	1
Salmonellosis	99	80	486	597
Shigellosis	8	3	58	46

REPORTED CASES of selected notifiable diseases

Disease	Cases Reported in September - October *MMWR* Weeks 35-43		Cases Reported in January - October *MMWR* Weeks 1-43	
	2009	2010	2009	2010
Severe *Staphylococcous aureus* in Previously Healthy Person	2	6	15	23
Group A Streptococcus, invasive	5	22	147	96
Group B, Streptococcus, Invasive (All ages)	56	50	253	229
Streptococcus pneumoniae (invasive, all ages)	105	82	414	515
Streptococcus pneumoniae (invasive, drug resistant)	24	1	205	165
Streptococcus pneumoniae (invasive, <5 years of age)	15	5	69	41
Syphilis (Primary and Secondary)	21	32	94	150
Tuberculosis	11	7	93	66
Vibriosis	0	0	3	3
Varicella	5	24	72	165
Yersiniosis	0	1	7	7
Animal Rabies	7 (Bats)	7 (Bats)	38 (Bats)	24 (Bats)

For information on reporting of communicable diseases in Indiana, call the *Surveillance and Investigation Division* at 317.233.7125.

Indiana State Department of Health
Epidemiology Resource Center
2 North Meridian Street, 5 K
Indianapolis, IN 46204
317/233-7125

Cover photo of Cryo-EM reconstruction of a norovirus capsid.courtesy of Dr. B.V.V. Prasad, Baylor College of Medicine, Houston, TX 77030

The *Indiana Epidemiology Newsletter* is published bi-monthly by the Indiana State Department of Health to provide epidemiologic information to Indiana health care professionals, public health officials, and communities.