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April 14, 2015

Information on Measles and Whooping Cough: Vaccination and Disease

Vaccine's Mechanism of Action

Vaccines expose the recipient to a small amount of an weakened organism. Through this exposure, the body is able to mount an immune response by developing antibodies. From that first exposure, the immune system develops "memory cells" that are able to rapidly recognize and kill the foreign organism when the body is exposed to the organism again (Loeffler, *The Immune System*, 2015.) Vaccines increase herd immunity, which protects the majority of a community from disease. When the chain of infection begins, it will continue to grow until it is broken. In the community, vaccines help to break that chain because it stops transmission (See figure 1, Wilingham, 2014).

Measles (Rubeola)

History:

In 1676, Thomas Sydenham was the first to document measles in a medical paper, however the first described case was in 900 A.D. Before a vaccine was created, there have been multiple measles outbreaks throughout the world, claiming many lives including outbreaks in 1713, 1861, 1878, and 1951. In 1968 after much testing, a vaccine with fewer side effects began to be distributed. In 1978, the CDC campaigned to eliminate measles from the US, which helped to decrease the spread of measles because vaccination rates increased. In 1981, measles cases dropped 80% in one year.

Unfortunately, there was an outbreak in the US in 1989, predominantly in areas where vaccination numbers had fallen. Deaths were mainly in those that were unvaccinated. In 1998, Andrew Wakefield published a study where he linked the MMR vaccine with autism. In the aftermath, vaccination rates declined and measles again began to resurface. However, since then, Wakefield's study has been widely discredited because he did not follow proper protocol to ensure that his results were valid. The study's co-authors withdrew their support of the linkage. Additionally, many studies were performed to see if the link existed and no link was found.

The most recent outbreak of measles was in 2015 out of Disneyland, California (The College of Physicians of Philadelphia, 2015). This outbreak is particularly dangerous because Disneyland is a place that people from all over the country travel to. Unfortunately, when guests that were infected left, they took the virus to their individual states causing it to spread across the country (Figure 2, CDC, 2015).

Signs and Symptoms:

The incubation period, the time it takes for the virus to multiply enough to cause signs and symptoms, is 10-14 days. The course of symptoms begins with a fever, cough, runny nose, and red, itchy eyes. After a few days, white spots may emerge in the mouth. A rash will typically develop on the face and spread to other parts of the body like neck, arms, and legs three to five days after the initial symptoms develop. The rash starts as flat red spots, but raised red spots can begin to develop on top of them (CDC, 2015).

An infected person is able to pass along the virus about four days before and four days after the rash begins to appear. The virus lives and duplicates in the nose and throat.

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Whenever someone infected with measles coughs or sneezes, droplets containing the virus exit the body into the air (Mayo Clinic, 2015). Someone may inhale the droplets, or they touch surfaces where droplets can remain virulent for two hours. Because it is so contagious, 90% of people that do not have immunity to measles will develop the infection if exposed (CDC, 2015).

Vaccine information:

The CDC recommends that children get two doses of the MMR vaccine (Mealses, Mumps, Rubella). The primary dose should be given at 12-15 months and the second at 4-7 years, but can be given earlier as long as it's 28 days after the primary dose (CDC, 2014). It is also recommended that adults born during or after 1957 get one dose (CDC, 2015).

Resources:

Centers for Disease Control and Prevention. *Measles Cases and Outbreaks*. (2015, February 9). Retrieved April 11, 2015, from http://www.cdc.gov/measles/cases-outbreaks.html

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Loeffler, A. (2014). Inflammation. *Pathology 404*. Lecture conducted at UW-Madison in Madison, WI.

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Willingham, E., & Helft, L. (2014, September 5). What is Herd Immunity? Retrieved April 11, 2015, from http://www.pbs.org/wgbh/nova/body/herd-immunity.html

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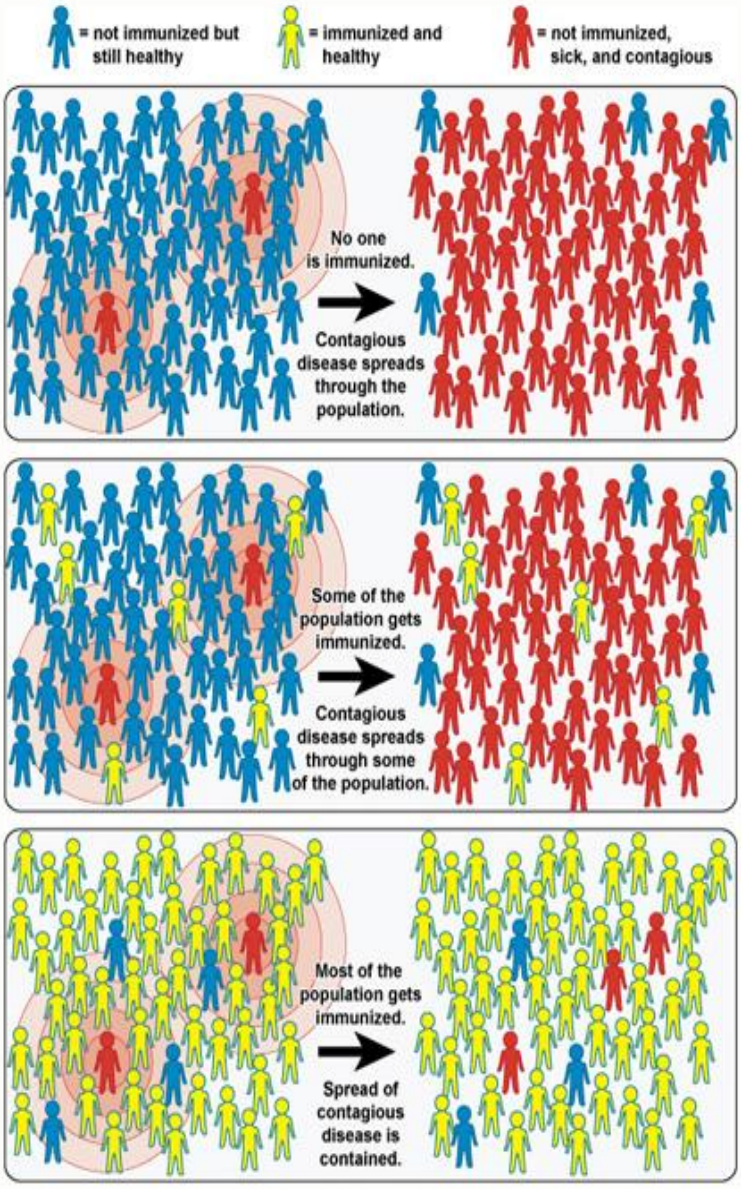

Figure 1.

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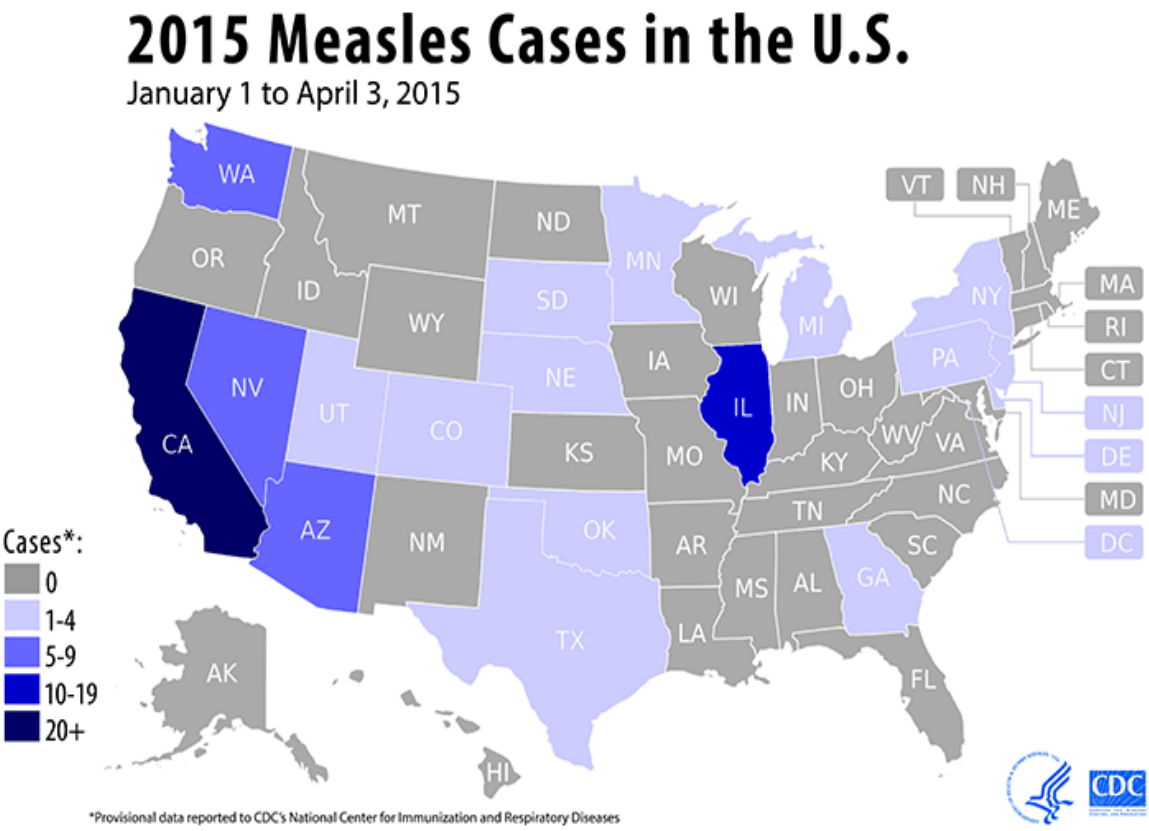

Figure 2.

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Whooping Cough (Pertussis)

History:

Since the introduction of the pertussis vaccine, the US has seen a decrease in the number of cases, but there have still been outbreaks. During the most recent outbreak in 2012, 48,277 cases were reported to the CDC with 20 deaths. The age group with the highest rates of pertussis was infants less than three months and was also the majority of the deaths (CDC, 2014). Those trends are still observed today, with infants less than one year being at the greatest risk of infection and 7-10 year olds being the second (Figure 1. CDC, 2014). The childhood vaccine can begin to wear off as the child gets older, especially when entering adolescence (Nation Foundation for Infectious Diseases). The FDA suggested that reasons for increased rates of pertussis are increased reporting, improved testing, and decreased efficacy of childhood vaccines (FDA, 2013). Wisconsin increased it's reporting of pertussis from 2013 and 2014 (Figure 2. CDC, 2014). Wisconsin has also seen an increase in cases in 2012 and 2014 (Figure 3, Wisconsin Department of Health Services, 2015).

Signs and Symptoms:

The bacterial infection causes inflammation in the respiratory tract. Symptoms include having a runny nose, sneezing, cough, or mild fever. As time goes on, the cough becomes more severe and more persistent, lasting for weeks. The infected person will have bouts of severe coughing; when trying to inhale, a "whooping" sound is made. Infants are at higher risk for contracting pertussis, and the infection can lead to more serious complications; 1 in 4 will get pneumonia and 1-2 in 100 will die from complications (CDC, 2013).

Symptoms typically emerge 5-10 days after exposure, but may not for up to 3 weeks. It is spread when those infected cough or sneeze into the air and another inhales the virulent droplets (CDC, 2014). Family or caregivers are more likely to infect infants, particularly those who are too young to be vaccinated (Haberling, et al, 2009). They are more likely to transmit the bacteria because "whooping cough" is difficult to diagnose since the initial symptoms are similar to that of a cold. Transmission can also occur before symptoms appear (National Foundation of Infectious Diseases).

Vaccine information:

The CDC recommends that healthy children under 7 get the DTaP (diphtheria, tetanus, pertussis) vaccine. There are five shots to the series and should be administered at 2 months, 4 months, 6 months, 15-18 months, and 4-6 years. Tdap is given to adolescents, 11-18, adults older than 19 who did not get it as an adolescent, and pregnant women between 27 and 36 weeks with each pregnancy (CDC, 2015). Tdap boosters should be given to adults and adolescents, especially if in contact with an infant less than 12 months (National Foundation of Infectious Diseases).

In closing, it is important to talk with your health care provider if you have any questions, concerns, or want more information about vaccines. It is also important to talk with your provider about the risks and side effects such as swelling and redness around the injection site, fever, and rash (CDC, 2015).

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Resources:

Centers for Disease Control and Prevention. *Complications.* (2013, January 15). Retrieved April 12, 2015, from http://www.cdc.gov/pertussis/about/complications.html

Centers for Disease Control and Prevention. *Pertussis Outbreak Trends*. (2015, March 11). Retrieved April 12, 2015, from http://www.cdc.gov/pertussis/outbreaks/trends.html

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National Foundation of Infectious Diseases. *Pertussis (Whooping Cough)*. Retrieved April 12, 2015, from http://www.nfid.org/pertussis/

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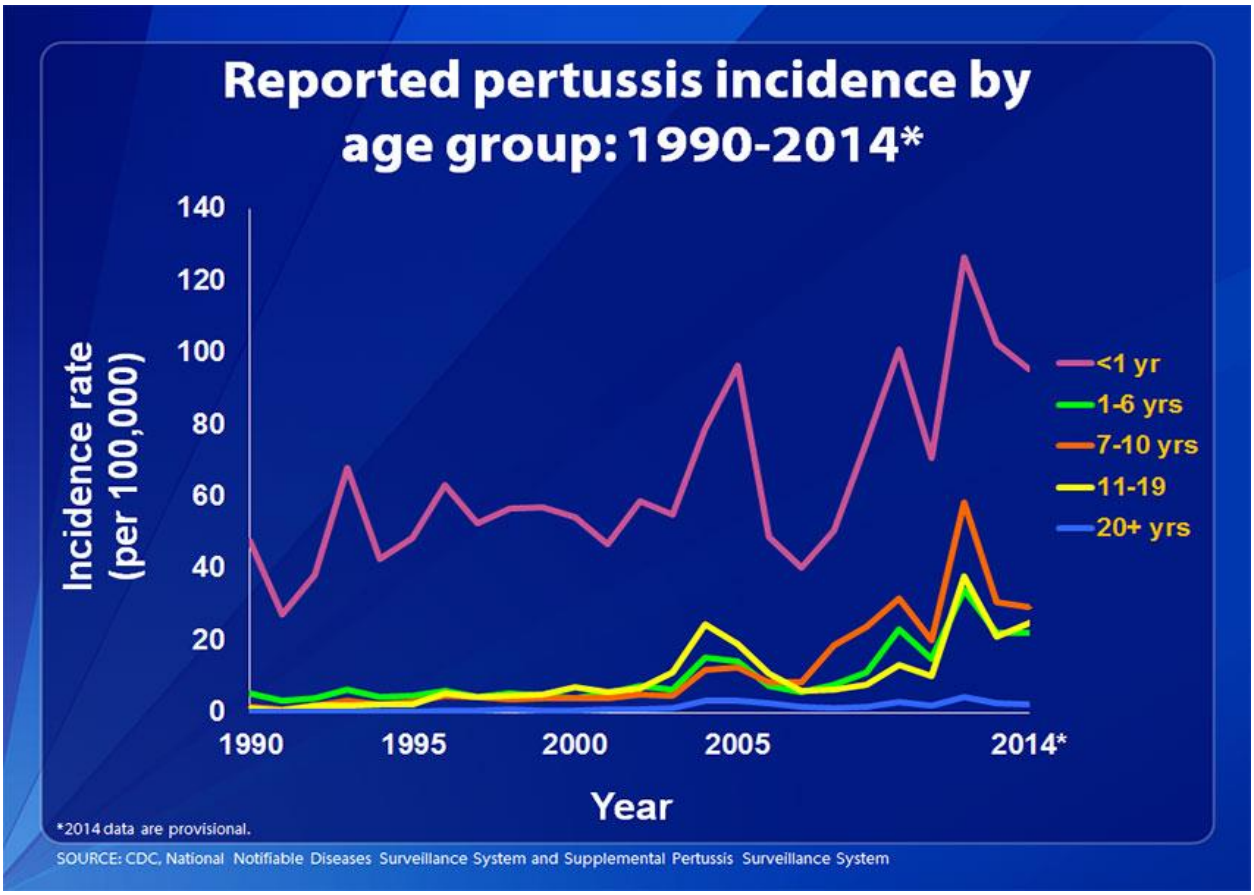

Figure 1.

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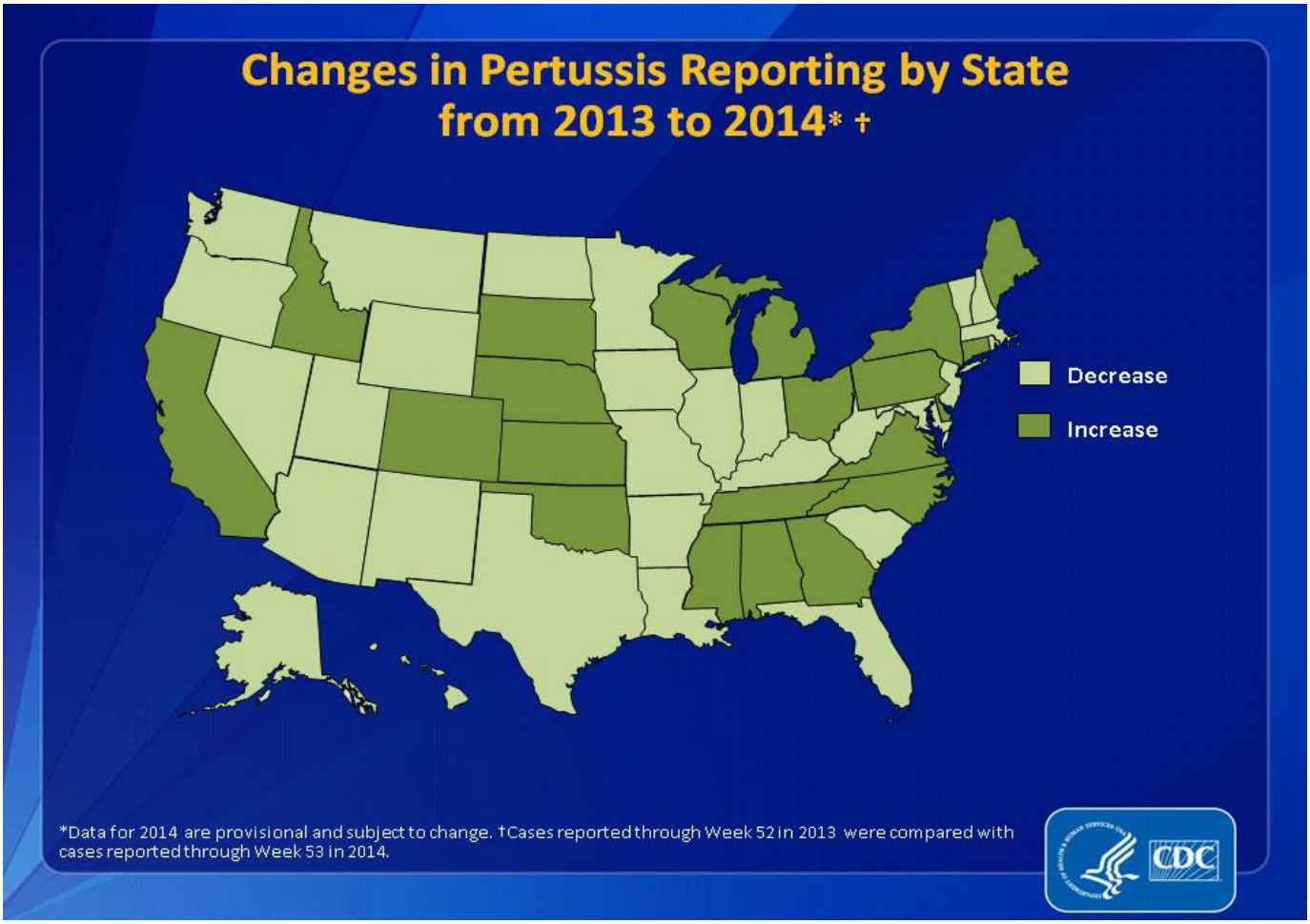

Figure 2

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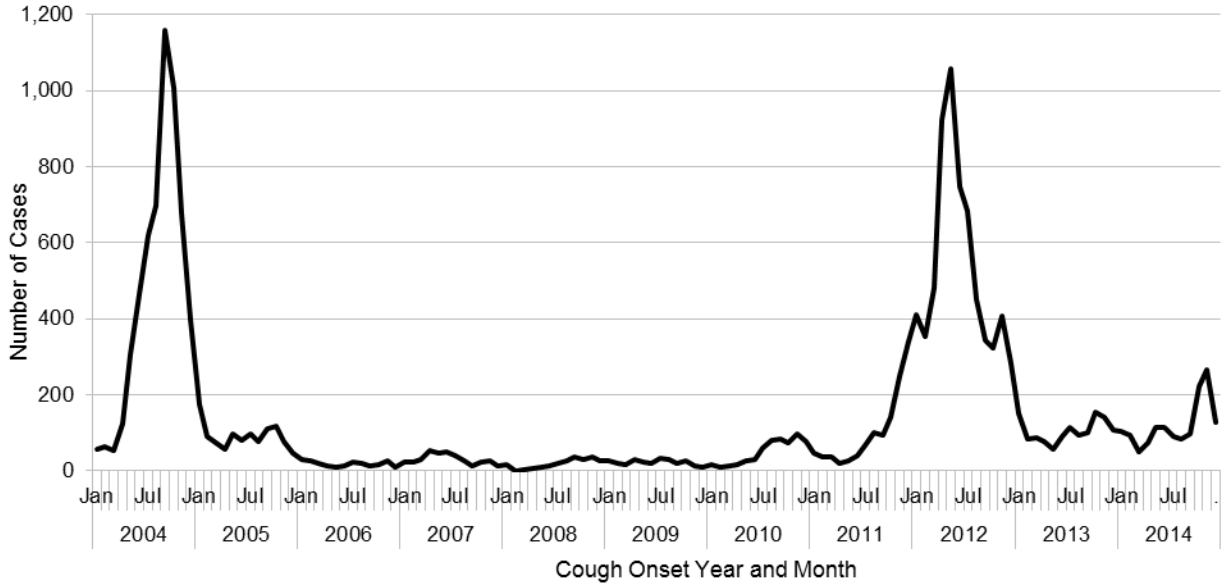

Figure 3.