

## **Gastroenteritis and Pertussis: Contrasting and Comparing Two Infectious Diseases**

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### **Abstract**

Both pertussis and gastroenteritis are communicable diseases that can spread from one host to another (Lee and Bishop 2010, p. 153) and have severe implications for young children (Steiner and Guerrant 2009, p. 1335; Long and Edwards 2009, p. 859) and the elderly who are at risk of developing complications (Gould 2009, p. 117; Long 2011, p.448). Therefore, prevention of these diseases is paramount (Spratling and Carmon 2010, p. 243). This essay, by comparing and contrasting gastroenteritis and pertussis (whooping cough) offers health care workers (HCWs) an insight into the similarities and differences between these two diseases. A description of the diseases emphasizing clinical manifestations, incidence and occurrence, transmission and the risk to HCWs is discussed, as well as the management of the spread of these diseases within the community and the health care setting.

Both pertussis and gastroenteritis are communicable diseases that can spread from one host to another (Lee and Bishop 2010, p. 153) and have severe implications for young children (Steiner and Guerrant 2009, p. 1335; Long and Edwards 2009, p. 859) and the elderly who are at risk of developing complications (Gould 2009, p. 117; Long 2011, p.448). Therefore, both warrant a watchful eye by health care workers (HCWs) who have an important role in prevention of these diseases (Spratling and Carmon 2010, p. 243). In this essay I will compare and contrast gastroenteritis and pertussis (whooping cough). A description of the diseases emphasizing clinical manifestations, incidence and occurrence, transmission and the risk to HCWs will be discussed, as well as the management of the spread of these diseases within the community and the health care setting.

Gastroenteritis is an acute and chronic condition (Craig and Zich 2009, p.1200) defined as ‘the inflammation of the stomach and intestines accompanying numerous gastrointestinal disorders’ (Harris, Nagy and Vardaxis 2010, p. 725) associated with many causative pathogens of bacterial, viral or parasitic origin (Craig and Zich 2009, p. 1200). Pertussis, however, is an acute respiratory

disease caused by contact or inhalation of an organism, *Bordetella pertussis* (Harris, Nagy and Vardaxis 2010, p. 1330) which causes inflammation of the larynx, trachea and bronchi (Spratling and Carmon 2010, p. 239). By killing cells it immobilises the mucociliary escalator causing an accumulation of mucous in the airway (Lee and Bishop 2010, p. 405). Conversely, gastroenteritis displays similarities with pertussis where an organism multiplies in the gastrointestinal tract inducing inflammation as *Escherichia coli* does or destroys cells of the intestinal villi as does the rotavirus (Grimes, Grimes and Zack 2002).

In gastroenteritis, gastrointestinal motility and the rate of fluid and electrolyte secretions is increased into the intestines resulting in rapid dehydration, electrolyte imbalance and in severe cases circulatory failure and death (Grimes, Grimes and Zack 2002). Similarly, the pertussis toxin increases respiratory secretion and mucous production (Lee and Bishop 2010, p. 405) resulting in the characteristic spasmodic ‘whooping cough’ caused by an accumulation of mucous in the airway which in infected babies can lead to cerebral hypoxia resulting in brain damage and death (Lee and Bishop 2010, p. 406).

Pertussis has three stages each of which lasts approximately two weeks (Long and Edwards 2009, p. 861). The catarrhal stage resembles a cold with runny nose, fever and mild cough (Lee and Bishop 2010, p. 406). The paroxysmal stage is identified by coughing that evolves into paroxysmal coughing followed by whooping inspiration (Harris, Nagy and Vardaxis 2010, pp. 1330-1331) ending with vomiting and exhaustion (Long and Edwards 2009, p. 861). Symptoms decline during the convalescent stage (Harris, Nagy and Vardaxis 2010, p. 1331). In contrast the primary manifestation of gastroenteritis is persistent diarrhoea (Harris, Nagy and Vardaxis 2010, p. 725) and depending on the causative pathogen symptoms can last from hours to weeks (Craig and Zich 2009, pp.1201, 1209) ranging from asymptomatic (Grimes, Grimes and Zack 2002) to vomiting, diarrhoea, fever, abdominal pain, anorexia, malaise, headache, myalgia and blood in the stools (Craig and Zich 2009, pp. 1200, 1215). However, comparing the mechanism of expulsion of pathogens the cough in pertussis, which often ends with vomiting of tracheal secretions (Long and Edwards 2009, p. 861) is analogous to the gut motility and diarrhoea in gastroenteritis which helps rid the host of offending pathogens (Steiner and Guerrant 2009, p. 1337).

Gastroenteritis is spread through close contact with infected persons by sharing food, water and eating utensils (Mosby's Nursing Consult 2012, p. 2). Thus gastrointestinal pathogens are mainly acquired by the faecal-oral route by consuming contaminated food or fluids, transmission from the host's hands (Lee and Bishop 2010, p.425) or via aerosolised particles (NSW Government Health 2012a). Pertussis is transmitted by direct or indirect contact with contaminated items but is commonly spread via respiratory droplets from an infected person (Spratling and Carmon 2010, p. 239) coughing or sneezing while in close contact with others, who then inhale infectious particles (Harris, Nagy and Vardaxis 2010, p. 1330). Pertussis attack rates are as high as 100% in susceptible persons exposed to aerosol droplets at close range (Long and Edwards 2009, p. 860) whereas acquiring gastroenteritis is dependent on the number of pathogens ingested (Steiner and Guerrant 2009, p. 1337).

All HCWs are at risk of acquiring gastroenteritis or pertussis from patients by nature of transmission. Therefore, HCWs exposed to gastroenteritis or pertussis that are negligent in performing standard contact and droplet precautions for infection control before and after direct contact with the infected person, soiled surfaces, or contaminated items are at risk. Adherence to standard precautions for respiratory secretions is particularly pertinent for pertussis exposure (University of Tasmania, Australia 2012, pp. 4-7). In addition, HCWs without adequate vaccine protection with the combined diphtheria, tetanus, pertussis vaccine (DTPa) (MyDr from MIMS 2012) are also at risk (CDC Centers for Disease Control and Prevention 2012).

Anyone is susceptible to pertussis which is highly contagious spreading to 80% of susceptible household contacts (Queensland Government 2012). Adults are the main reservoir of infection due to waning immunity after vaccination in childhood (Department of Health, Victoria, Australia 2012). Pertussis spreads easily through families, childcare centres, health-care facilities, neonatal nurseries and schools (NSW Government Health 2012b). There are high infection rates in developing countries because of the lack of immunization whereas incidence in developed countries has been reduced through immunization (Lee and Bishop 2010, p. 405). However, despite the

availability of a vaccine, epidemics of pertussis tend to occur every 3-5 years occurring in Australia in 1993-94, 1997-98, 2001-02 and 2005-06 (Lee and Bishop 2010, p. 405).

Gastroenteritis too occurs in people of all ages and backgrounds (Mosby's Nursing Consult 2012, p. 2) with an estimated incidence of approximately 17.2 million cases per year in Australia (The University of Western Australia 2012). Outbreaks of gastroenteritis occur often in the general community particularly where people live together such as boarding schools, cruise ships and aged care homes (Australian Government Department of Health and Ageing 2012a) and within families and group settings including hospitals, childcare centres, youth refuges, restaurants and schools (Australian Government Department of Health and Ageing 2012b; NSW Government Health 2012a).

Management of gastroenteritis and pertussis outbreaks in the community and health care setting concerns interruption of transmission and prevention of further cases (Australian Government Department of Health and Ageing 2012c; Teng and Wang 2011). In gastroenteritis outbreaks which are spread from person-to-person immediate infection control measures need to be instituted (Australian Government Department of Health and Ageing 2012c). But the first step to managing pertussis is to confirm the disease by screening household members and close contacts at risk of infection or who would serve as vectors, then to administer post-exposure prophylaxis to all close contacts of infected individuals to prevent transmission (Teng and Wang 2011).

Regardless of the type of setting, managing both gastroenteritis and pertussis outbreaks involves three important control measures: cleaning and disinfection of all surfaces and equipment that has had exposure to infected individuals, regular hand washing and exclusion and cohorting of ill people (Australian Government Department of Health and Ageing 2012c). Hand washing is one of the best tools in controlling the spread of infections (Colorado Department of Public Health and Environment 2012, p. 2) and should be routinely carried out by all HCWs in accordance with Hand Hygiene Australia's 'Five Moments for Hand Hygiene' (University of Tasmania, Australia 2012, p. 5).

People with gastroenteritis should stay at home for 48 hours after all symptoms have stopped (Australian Government Department of Health and Ageing 2012c). However, exclusion for individuals who have pertussis should continue until completion of the appropriate antibiotic treatment (Teng and Wang 2011). In health care settings appropriate personal protective equipment should be used to minimise risk observing droplet precautions and wearing a respiratory mask when exposed to pertussis infections (University of Tasmania, Australia 2012, pp. 6-7; Teng and Wang 2011).

All patients with confirmed pertussis should be started on antibiotic treatment (Teng and Wang 2011) to reduce the numbers of organisms in the nasopharynx decreasing pathogen transmission (Lee and Bishop 2010, p. 406). However, antibiotics for gastroenteritis are rarely appropriate because they can cause diarrhoea and encourage the growth of resistant organisms (The Merck Manual Home Health Handbook 2011). Immunisation for susceptible persons is the most effective means of controlling pertussis (Teng and Wang 2011). Gastroenteritis is harder to control but improved water supply and sanitation facilities, quality control of food and beverages and high standards of hygiene are highly effective in reducing the transmission of infection (Steiner and Guerrant 2009, p. 1346). No vaccine is available to protect against gastroenteritis except the Rotavirus vaccine for babies less than 6 months old and typhoid and cholera vaccines for travelers to high risk areas (Government of Western Australia Department of Health: Public Health 2012).

Health care providers also need to report pertussis cases to health departments so appropriate measures can be advised to control the disease (Teng and Wang 2011).

By comparing pertussis and gastroenteritis similarities have been revealed not only in the pathogenesis of the diseases where colonisation of the pathogen causes inflammation and destruction of cells (Grimes, Grimes and Zack 2002; Lee and Bishop 2010, p. 405) but also in the mechanisms for expelling pathogens from the body, where the cough and post-tussive emesis in pertussis is analogous to the gut motility and diarrhoea of gastroenteritis (Steiner and Guerrant 2009, p. 1337).

Although they are two completely different diseases attacking different systems of the body the similarities again are revealed in the method of transmission and subsequently who is at risk. Both pertussis and viral gastroenteritis are highly contagious (Queensland Government 2012; Gould 2009, p. 117) thus both require stringent measures for management and control employing the elements of infection control such as hygiene, disinfection and exclusion.

Where pertussis and gastroenteritis depart is in the causative nature of the disease. Pertussis is caused by one organism, *Bordetella pertussis* for which a vaccine is effective in preventing the disease and antibiotics are effective in controlling the transmission of infection (Lee and Bishop 2010 pp. 405-406). By contrast gastroenteritis is much harder to control primarily because it encompasses a wide variety of symptom complexes and infectious agents (Steiner and Guerrant 2009, p. 1335). Therefore, immunization against causative pathogens is difficult (Steiner and Guerrant 2009p. 1346) and antibiotics are not always appropriate (The Merck Manual Home Health Handbook 2011).

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