Pertussis: A re-emerging disease

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RE-EMERGING DISEASE

Pertussis (also called whooping cough) is a highly contagious disease affecting human respiratory tract, due to the agents: *Bordetella pertussis* and less frequently *Bordetella parapertussis* (1). It remains a public health problem in many developed and developing countries. This disease is life-threatening in infants under the age of three months and may also be serious in pregnant women and the elderly. A shift in the transmission of the disease was observed in areas with high vaccine coverage from school-age children to adolescents, adults and children under 1 year of age in the last decade (1,2). Two types of vaccines: whole cell and acellular are now used around the world for primary pertussis vaccination. Because of their slightest reactogenicity acellular vaccines are used also as boosters in adolescents and adults (1).

After the introduction of the whole cell pertussis vaccine in 1950s, mortality and morbidity of pertussis in children decreased dramatically. However, despite decades of ongoing high vaccination coverage, pertussis outbreaks have been reported in many countries, including United States, Australia, United Kingdom, Brazil and Chile in the last decade (3-8) and actually in China [Liu X, unpublished data, 2017].

Although the reasons for this resurgence are not fully understood, different factors were implicated in the observed increased rates of the disease worldwide.

Besides the fact that pertussis is a cyclical disease with peaks occurring every 3 to 5 years (1,9), low vaccine coverage hindering optimal vaccine effectiveness play an important role (1,9), also waning vaccine-induced immunity in adolescents and adults have been observed. Furthermore, differences depending on the type of vaccine used were reported: (i) acellular vaccines are effective but less than some effective whole cell vaccines; (ii) accellular vaccines induce a higher level of antibodies and Th1 response unlike whole cell vaccines that produce Th1 response similar to natural infection; (iii) acellular vaccines induce a protection of shorter duration than whole cell vaccines (1,10). Despite these immunological reasons, there have also been reported increased pertussis cases in countries using whole cell pertussis vaccine such as Brazil and Chile (7,8).

Temporal changes of the circulating *B. pertussis* strains have been also implicated in the resurgence of pertussis. Strains that produce increasingly pertussis toxin and strains that are unable to produce pertactin have been isolated (1,11,12). Some authors have suggested that these changes are a consequence of adaptation to human host or vaccine pressure (1,10). Despite the increasing isolation of these strains, there is no definitive demonstration that changes in the organism are leading to a resurgence of disease (1).

The use of more sensitive diagnostic tests (real time PCR) and increased awareness among healthcare workers were also reported as potential factors behind this resurgence (10).

As observed around the world, the epidemiology of pertussis appears to be a result of multiple different factors, including the natural 3 to 5 year cycles, vaccine coverage, waning-vaccine immunity and temporal changes in the circulating *B. pertussis* isolates (1,9,10).

To control pertussis, and so decrease mortality in infants; it is important to ensure high on-time vaccine coverage (over 90%) around the world especially for primary vaccination and first booster, to monitor the changes of the agents of the disease and the evolution of their antibiotic resistance and to evaluate regularly the duration of protection induced by the vaccine (1,10). Finally, continuous and increased investigations are needed for a better understanding of the basics of pertussis infection, immunity and disease.

REFERENCES

1. Bouchez V, Guiso N. Bordetella pertussis, B. parapertussis Vaccines and cycles of whooping cough. FEMS Pathogens and Disease. 2015;7:1-6.
2. Mattoo S, Cherry JD. Molecular pathogenesis, epidemiology, and clinical manifestations of respiratory infections due to Bordetella pertussis and other Bordetella subspecies. Clin Microbiol Rev. 2005;18:326-382.
3. Winter K, Harriman K, Zipprich J, et al. California pertussis epidemic, 2010. J Pediatr. 2012;161:1091-1096.
4. Theofiles AG, Cunningham SA, Nicholas CN, et al. Pertussis outbreak, southeastern Minnesota,2012. Mayo Clin Proc. 2014;89:1378-1388.
5. Campbell P, McIntyre P, Quinn H, et al. Increased population prevalence of low pertussis toxin antibody levels in young children preceding a record pertussis epidemic in Australia. PLoS One. 2012;7: e35874.
6. Campbell H, Amirthalingam G, Andrews N, et al. Accelerating control of pertussis in England and Wales. Emerg Infect Dis. 2012;18:38-47.
7. Druzian AF, Brustoloni YM, Oliveira SM, et al. Pertussis in the central-west region of Brazil: one decade study. Braz J Infect Dis. 2014;18:177-180.
8. Cherry JD. Why do pertussis vaccines fail?. Pediatrics. 2012;129: 968-970.
9. Broutin H, Viboud C, Grenfell BT, et al. Impact of vaccination and birth rate on the epidemiology of pertussis: a comparative study in 64 countries. Proc Biol Sci/ Royal Soc. 2010;277:3239-3245.
10. Guiso N. Bordetella pertussis: Why is it still circulating?. J Infect. 2014;68:119-124.
11. Queenan AM, Cassiday PK, Evangelista A. Pertactin-negative variants of Bordetella pertussis in the United States. N Engl J Med. 2013;368:583-584.
12. Bodilis H, Guiso N. Virulence of pertactin-negative Bordetella pertussis isolates from infants, France. Emerg 18.Infect Dis. 2013;19:471-474.

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