

# On the epidemiology, clinical presentation and transmission of respiratory viral infections

Akademisk avhandling

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Avhandlingen baseras på följande delarbeten:

- I. Sundell N, Andersson LM, Brittain-Long R, Lindh M, Westin J. **A four year seasonal survey of the relationship between outdoor climate and epidemiology of viral respiratory tract infections in a temperate climate.** *J Clin Virol* (2016);84:59-63.
- II. Sundell N, Andersson LM, Brittain-Long R, Sundvall PD, Alsjö Å, Lindh M, Gustavsson L, Westin J. **PCR detection of Respiratory Pathogens in Asymptomatic and Symptomatic Adults.** *J Clin Microbiology* (2019);57(1):716-718.
- III. Sundell N, Dotevall L, Sansone M, Andersson M, Lindh M, Wahlberg T, Tyrberg T, Westin J, Liljeqvist JÅ, Bergström T, Studahl M, Andersson LM. **Measles outbreak in Gothenburg urban area, Sweden, 2017 to 2018: low viral load in breakthrough infections.** *Euro Surveill* (2019);24(17):2-12.
- IV. Sundell N, Gustavsson L, Andersson LM, Lindh M, Westin J. **Community-acquired lower respiratory tract infections in adults requiring hospitalization: clinical characteristics and outcome in four different etiologic groups.** *In manuscript.*

**SAHLGRENKA AKADEMIN  
INSTITUTIONEN FÖR BIOMEDICIN**



# On the epidemiology, clinical presentation and transmission of respiratory viral infections

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## Abstract

Respiratory viral infections encompass a large heterogenous group of pathogens that constitute a major burden of disease globally. The various routes of transmission including airborne spread make them difficult to control. The aim of this thesis was to investigate the epidemiology, clinical presentation and transmission of viral airborne pathogens and respiratory viruses affecting the airways. In **paper I** over 20 000 clinical airway samples, referred for the detection of respiratory viral pathogens over a period of 3 years, were collected retrospectively and analysed for seasonal variation and relationship with meteorological factors. **Paper II** was a prospective study analysing the prevalence of respiratory viruses, as detected by PCR in nasopharyngeal samples, in 444 adults asymptomatic of respiratory tract infection. In **paper III**, clinical and laboratory differences of naïve measles infection compared to breakthrough infection, with focus on the risk of onward transmission, were investigated, in a retrospective analysis of a measles outbreak in Gothenburg 2017/2018. In **paper IV** we prospectively collected airway samples for multiplex real-time PCR in 220 adults hospitalized at the Department of Infectious Diseases with lower respiratory tract infection across three consecutive winter seasons.

*Conclusions:* The incidence of influenza and several other respiratory viruses are strongly associated with low outdoor temperature and low absolute humidity. The onset of the annual influenza epidemic is preceded by a sudden drop in temperature below 0 °C in our region. The prevalence of respiratory viruses in asymptomatic adults is low (<5%), suggesting that a positive detection by PCR is likely of clinical relevance when symptoms of respiratory tract infection are present. Breakthrough measles infection can be identified by history of vaccination and the detection of IgG at rash onset, and onward transmission from these infections is unlikely due to low viral load and mild respiratory symptoms. Viral infections and viral/bacterial coinfections are a common cause of hospitalization in adults with LRTI. Viral infections may have pronounced symptoms at presentation making them difficult to discern from bacterial infections.

**Keywords:** respiratory viruses, measles, influenza, epidemiology, meteorological factors, real-time PCR, viral transmission, lower respiratory tract infection