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Comparing viral respiratory tract infections in symptomatic children and adults: multiplex NAT results from 2010 - 2015

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Background: Community-acquired respiratory viruses (CARVs) are a common health problem, which exacerbate in the very young, the very old, and in patients with immune dysfunctions. Although climate and seasonal factors are known to influence CARV emergence and seasonality, comprehensive studies comparing CARV in adults and children are lacking. Here, we compare CARV detection throughout 5 years of multiplex nucleic acid testing (NAT) in symptomatic adults and children

Material/methods: Multiplex NAT results using the RespiFinder-22 covering 22 different CARVs and atypical bacterial agents were extracted from the clinical virology database if performed on children or adults attending the clinics of the University Children's Hospital Basel, and the University Hospital Basel during the last 5 years (2010-2015). The results were analysed as detection rates, time of the

year, patient age, gender, time of sampling and type of material to identify incidence of pathogens, age and seasonal trends, and frequency of co-infections. Repeat testing of the same patient within 30 days were excluded from the analysis.

Results: A total 255,670 detections were stored in the laboratory informatic system during the 5 years' selected period and 11,446 patients' samples were anonymized and available for analysis (IRB EKNZ_2016_00298). Adults and children population were equally represented (55.1% and 44.8% respectively). The detection rate was 48.9% overall, but was significantly higher in children (71.6%) than in adults (30.3%). Children were mainly tested with nasopharyngeal swab (NPS 97%, bronchoalveolar lavage (BAL) 0.8%, tracheal secretion and throat swab 2.2%); whereas BAL was constituted 98.9% of specimens in adults. In children, rhinoviruses were the most detected pathogens, followed by RSV, coronaviruses (OC43, NL63, 223E, HKU1) influenza-A, adenovirus, metapneumovirus, parainfluenza, influenza-B. In adults, rhinoviruses were also most frequent, but followed by coronavirus, influenza-A, RSV, parainfluenzavirus, and metapneumovirus. Detection of 2 and more pathogens were more frequent in children than in adults (10.9% vs 6.4%; $p < 0.05$). Influenza-A/B and RSV showed a strong seasonality for the winter months but seemed to counteract their respective detection rates and the ones for rhinoviruses being detectable throughout the year with dominance through spring, summer and fall. RSV and metapneumovirus showed alternating inverse bi-annual trends. For several viruses, increasing detection rates in children preceded the increases seen in adults suggesting that children were important epidemic amplifiers. Investigating rainfall, humidity and temperature data indicated that the increased humidity was best correlated with increased detection rates in winter.

Conclusions: This comprehensive multiplex NAT study over 5 years identifies important robust seasonal trends whereby humidity and children appear as major drivers of the epidemics with RSV, influenza, and parainfluenzavirus. The potential interaction between different viruses beyond immunity is to be discussed.