Background: Following respiratory tract infection, development and course of an ARI disease depends on multiple parameters. With complex arrays of individual immunological performance spreading of an invader is combated, thereby leaving tissues and the immune system in a physiological state, which may prevent or support the further contraction of infectious diseases according to the exposition.

In an effort to reveal the complexity of an individual’s infectious diseases context with a feasible setting, we hypothesized that in households with a child as the index case, the exposition situation may be regarded as defined, and thus may help to describe the dynamics of acute respiratory infections (ARI) with regard to the diagnosed pathogen, specific immunity and epidemiology.

Results:
40 households agreed to participate between Q3-2002 and Q3-2004 (high drop out: 45%). Meanwhile, the cohort of index cases consisted of 35% cases with RSV, 12% influenza A, 12% metapneumovirus, 2% parainfluenza, 2% pertussis, 11% rhinovirus (Fig.1), including 6% coinfections with 1 or 2 ARI viruses. The households typically included index cases below one year of age and household members with 1 or 2 ARI viruses. The households typically included index cases below one year of age and household members had 1-5 ARI episodes caused by 1-4 different ARI pathogens.

Results from T-cell activation with antigens from FluA, RSV, MPV or PIV reviewed in synopsis with IgG antibody levels and reported clinically apparent infections revealed possible other courses of ARI within the study period of 6 months. Index cases didn’t show remarkable rates of stimulated lymphocytes, presumably because of ages < 1 year, which may exemplify vulnerability of this age group (Fig.2).

Levels of antibodies against RSV, PIV1,-2,-3 and FluA were generally close to detection limit, but markedly increased in accordance to reported infections, except for RSV.

mRT-PCR identified additional ARI pathogens, but T cell activation data and antibody level data suggest, that more frequent samples might have revealed higher frequency and presumably also other pathogens then addressed in this household contact study.

Cell-mediated immunity against MPV during the study phase was weak and did not correlate with identification of infection at day 0. Eventual weak boosting effects may indicate, that MPV might circulate in adults (Fig.3).

Methods: Hospitalized children (0 – 16yrs.) with ARI were enrolled together with their household contacts after identification of either RSV, parainfluenza (PIV), influenza A (FluA) or human-metapneumovirus (MPV). At admission and 1, 3, 6 months post admission all household members were interviewed, and agreed to give nasopharyngeal samples (NPS), serum blood and whole-blood. Participants gave informed consent. The ethical board approved the study protocol. Multiplex-RT-PCR for detection of pathogens in NPS was done by Dr. W. Puppe, Kiel, Germany (Puppe, et al. J ClinVirol 2004:30:165) including 19 ARI pathogens. Lymphocytes from whole blood were isolated, stored at –160°C, after thawing stimulated with antigens from FluA, T-cell activation by flow cytometry (FACSCanto™), IgG antibodies against RSV, PIV1,-2,-3 and FluA were detected by ELISA (Serion, Germany).

Conclusion:
- Our household contact study on ARI in children is a valuable tool for assessing real life circumstances of ARI episodes of children.
- A synaptic overview presents individual courses of ARI disease as integral part of complex patterns of ARI episodes even within a household.

Case analysis: Immunological, Microbiological and Epidemiological Data from Household Contacts to Children with Acute Respiratory Tract Infections (ARI).

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