Type III hypersentivity immune response during the chronic course of the illness. This immune response presents as systemic symptoms and neutrophilic leukocytosis, similar to sepsis. Capsule Thalidomide is considered the drug of choice, when it comes to the treatment of this acute immunological emergency. A rational study into the immunological markers involved in the pathogenesis of erythema nododsum leprosum and its successful suppression by Thalidomide should be helpful in early diagnosis and prompt successful therapy. On the basis of previous studies, our aim was to find a correlation with interferon-γ, tumour necrosis factor-α, and Cd-64 expression on activated circulating neutrophils during Type II lepra reaction and successful response to capsule Thalidomide.

Methods. This case-controlled study included one group of patients diagnosed to have leprosy and the other group was healthy controlled individuals with matched age, sex, and area of residence. All the patients with type II lepra reaction responded to Capsule Thalidomide clinically, and all the skin lesions resolved in 7–14 days. Blood samples and skin biopsy were subjected to histopathology, immunoflourescence assay, immunohistochemical staining, quantitative RT-PCR (reverse transcriptase-polymerase chain reaction), and flow cytometry.

Results. Interferon-γ and TNF-α are sensitive markers in diagnosing erythema nodosum leprosum and Cd-64 expression on activated circulating neutrophils is both a specific and sensitive marker in Type II lepra reaction. Cd-64 expression also had a positive correlation with Thalidomide treatment and clinical response. High polymorphonuclear Cd-64 expression was correlated with severity of ENL.

Conclusion. Cd-64 expression on circulating neutrophils is a potential early biophysical marker for diagnosing erythema nodosum leprosum and can be used as a tool to assess thalidomide response. It is however not a good index to diagnose leprosy infection as it was specific for Type II lepra reaction. Interferon-γ and TNF-α are sensitive markers to screen for lepra reactions and this study showed no significant correlation with Thalidomide therapy.

Disclosures. **All authors:** No reported disclosures.

813. Combination of *N*-Acetyl-Cysteine With Clarithromycin Against *Mycobacterium avium* Infection

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Session: 70. Tuberculosis and Other Mycobacterial Infections
Thursday, October 4, 2018: 12:30 PM

Background. *N*-Acetyl-cysteine (NAC) is widely used in patients with chronic pulmonary diseases. In previous studies, its antimicrobacterial and antimycobacterial effects have been reported. Among its effect in Mycobacteria, it has been mainly studied in *Mycobacterium tuberculosis*. Here, we examined whether NAC has antibiotic activity against *M. avium*.

Methods. The antimycobacterial effect of NAC was assessed in JCM 15430 *M. avium* strain infected A-549 (human lung epithelial cells) and MH-S (mouse alveolar macrophages). These cells were infected with *M. avium* at multiplicity of infection of 10 for 1 hours, washed and then cultivated for 5 days. Bacterial uptake was evaluated at 0 days and 5 days of cultivation. For the NAC treatment group, 5% FBS medium with 10 mM NAC was used as culture medium. We also tested its effect in combination with clarithromycin *in vivo*. BALB/c mice were infected intranasally with *M. avium*, and were given NAC (400 mg/kg) or clarithromycin (100 mg/kg) or both by gavage daily for 6 days. On day 7 of infection, lungs were harvested and CFU, cytokines and antimicrobial peptides were measured.

Results. NAC treatment of *M. avium*-infected A-549 and MH-S resulted in a significant reduction of mycobacterial loads ($P = 0.014$ and $P = 0.014$). *In vivo*, NAC treatment resulted in a significant reduction of mycobacterial loads in the lungs of *M. avium*-infected mice ($P = 0.007$). When in combination with clarithromycin, we also had an additional reduction (vs. clarithromycin monotherapy; $P = 0.001$). Several antimicrobial peptides significantly increased when treated with NAC and clarithromycin combination therapy.

Conclusion. NAC exhibits potent anti-mycobacterial effects and may limit *M. avium* infection. In addition with clarithromycin, it showed an additive effect in reduction of mycobacterial loads. Interestingly, in our study, several antimicrobial peptides increased significantly which may be one of the possibility on how NAC is involved in antimycobacterial effects. These results indicate that NAC may be an additional option in treating *M. avium*-infected patients in future, along with its classical drug regimens containing clarithromycin.

Disclosures. **All authors:** No reported disclosures.

984. Maternal and Infant Factors Influencing Influenza Vaccination Among Young Children Born in Colorado From 2008 to 2016

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Session: 130. Adult and Pediatric Influenza Vaccine
Friday, October 5, 2018: 12:30 PM

Background. Factors influencing influenza vaccination in the first 2 years of life are important to identify and target strategies to increase vaccination rates, since this group is at high risk of morbidity from influenza. The objectives of our study were to determine maternal and neonatal factors associated with influenza vaccination in the first 2 years of life.

Methods. We conducted a retrospective cohort study using linked data from the Colorado Birth Registry Database and the Colorado Immunization Information System of live births between 2008 and 2016. Our population was limited to singleton, first births with first varicella vaccination documented in the immunization registry. Our primary outcome was receipt of at least one influenza vaccination in children ≤2 years. Exploratory variables included maternal (number of prenatal visits, urban vs. rural residence) and infant factors (term birth, admission to neonatal intensive care [NICU] at birth). Multivariable logistic regression was used to assess the association between these factors and influenza vaccination.

Results. Among 126,763 births in the cohort, 50.2% were vaccinated against influenza by 2 years of age. Mothers of unvaccinated children were older (27 vs. 26 years), married (67.8% vs. 66.8%), and more likely to have at least some college education (25.4% vs. 24.1%). A higher proportion of infants admitted to the NICU or who received oxygen were unvaccinated compared with vaccinated (8.5% vs. 8.0% and 2.5 vs. 2.1, respectively), $P < 0.001$ for all. There were no differences between urban vs. rural residence. In adjusted/stratified analyses, an increase in pre-natal visits was associated with a decrease in early influenza vaccination (IR = 0.992, 95% CI 0.986– 0.998, $P = 0.0084$ for Hispanic mothers and IR = 0.984, 95% CI 0.973–0.996, $P = 0.0069$ for non-Hispanic mothers). After adjusting for maternal age, preterm birth, and oxygen at birth, children admitted to the NICU were less likely to be vaccinated (IR = 0.915, 95% CI 0.873–0.959) against influenza by 2 years.

Conclusion. There were statistically significant differences in maternal and neonatal factors between unvaccinated and vaccinated children with influenza in the first 2 years of life, but the differences were too small to be clinically significant. Ongoing studies are needed to devise strategies to target early influenza vaccination.

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985. Safety of Guidelines Recommending LAIV for Routine Use in Children and Adolescents With Asthma

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Session: 130. Adult and Pediatric Influenza Vaccine
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Background. Asthma is the most common chronic medical condition in children. Prior observational studies of live attenuated influenza vaccine (LAIV) safety in asthmatic children have been limited due to confounding by indication, with LAIV restricted to patients with mild asthma. To minimize bias, we evaluated safety of LAIV in children with asthma using a natural experiment in which two medical groups, within a single health system, serving similar populations, differed in vaccination guidelines. Prior to 2010 both groups recommended inactivated influenza vaccine (IIV). Starting in 2010, one group recommended LAIV for children with asthma.

Methods. Asthmatic children age 2–18 years with visits to two large medical groups in the upper Midwest from 2007 to 2015 were identified and classified by severity and control using validated algorithms. Primary outcomes were lower respiratory events (LRE) occurring within 21 and 42 days after influenza immunization. Multiple records per subject were included when children received influenza vaccines in more than one season. The analysis was intention to treat with each medical group's subjects analyzed as a group. A pre-/post-ratio of ratios (ROR) approach was used to estimate the LAIV guideline impact using a generalized linear model with a Poisson distribution, accounting for multiple records per subject and adjusting for age and asthma classification. Analyses were for the overall population, and stratified by age group: 2–4 and 5–18 years.

Results. A total of 7,959 observations from 4,824 unique asthmatic children were analyzed, with 1,896 from the IIV guideline and 6,061 from the LAIV guideline medical groups. Postimplementation, 67% received LAIV. Age and asthma classification adjusted ROR showed no increase in LREs using the LAIV guideline: overall ROR (95% CI): 0.79 (0.46–1.37) for LRE 21 days and 0.82 (0.56–1.20) for 42 days; age 2–4: 1.07 (0.40–2.83) for 21 days and 1.0 (0.53–1.90) for 42 days; and age 5–18: 0.72 (0.37–1.41) for 21 days and 0.75 (0.46–1.21) for 42 days.

Conclusion. A guideline recommending LAIV rather than IIV for asthmatic children did not result in more LREs following vaccination in children age 2–18. Guidelines for influenza vaccination in asthmatic children should be based on effectiveness studies.

Disclosures. **All authors:** No reported disclosures.

986. Evaluation of Moderate-to-Severe Influenza Disease in Children 6 Months to 8 Years of Age in Colorado

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Session: 130. Adult and Pediatric Influenza Vaccine
Friday, October 5, 2018: 12:30 PM

Background. A clinical endpoint of moderate-to-severe (M/S) influenza has been proposed in children, defined as fever >39°C, otitis media, lower respiratory tract infection, or serious extrapulmonary manifestations. This definition has not been evaluated against clinically relevant outcomes like hospitalization, emergency room care, antimicrobial use, and child/parental absenteeism.

Methods. We conducted a prospective observational study of children aged 6 months–8 years with influenza at the Children's Hospital Colorado Emergency Department (ED) and its affiliates during two influenza seasons (2016–2017 and 2017–2018). Children with influenza-like-illness (ILI) were enrolled and tested for influenza by polymerase chain reaction (PCR). Parents of influenza cases and matched influenza-negative controls were contacted 2 weeks later for follow-up. The primary outcome was hospitalization for M/S influenza vs. mild influenza. Secondary outcomes included recurrent ED visits, antimicrobial use, child/parental absenteeism. Interim analyses were conducted using SAS v9.4.

Results. Among the 1,480 enrolled children with ILI, 410 (28%) tested positive for influenza by PCR. The median age of influenza cases was 4.0 years (IQR 2.2–6.1), and 20% were considered high-risk for influenza complications. Of influenza cases, 284 (69%) met the definition for M/S influenza. Among M/S influenza subjects, 8.4% were hospitalized, compared with 1.6% with mild influenza (risk difference (RD) 6.9%; 95% CI: 3.0–10.8, $P < 0.01$). Subjects with M/S influenza were more likely to receive antibiotics (RD 12.0%, 95% CI: 3.4–20.6, $P < 0.01$) with a trend to higher antiviral use (RD 6.9%, 95% CI: −0.7–14.5, $P = 0.09$). There was no significant difference for recurrent ED visits nor child/parental absenteeism. After adjusting for comorbidities, age, and influenza strain, the relative risk (RR) of hospitalization or recurrent ED visits was higher among those with M/S influenza vs. mild influenza (RR 2.18, 95% CI: 1.02–4.64, $P = 0.04$).

Conclusion. Children with M/S influenza have a higher risk of hospitalization compared with mild disease. This proposed definition is a useful clinical endpoint to study the public health and clinical impact of influenza interventions in children.

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987. Repeated Exposure to an Adjuvanted Quadrivalent Subunit Influenza Virus Vaccine (aQIV): A Randomized, Observer Blind, Multicenter Study

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Background. The safety, immunogenicity, and efficacy associated with administration of of aQIV in children 6 months through 5 years of age was investigated.[1] Although enhanced immunogenicity in children was demonstrated for MF59-adjuvanted influenza vaccines after first administration, the impact of repeated vaccination on immunogenicity and safety has not been evaluated.

Methods. A total of 607 subjects who participated in parent study, now aged 12 months through 6 years, were enrolled the subsequent year and received a single dose of study vaccine. Enrolled subjects received the same type of influenza vaccine administered in the parent study (aQIV or nonadjuvanted comparator). Blood samples were taken for immunogenicity assessment prior to the second year vaccination, and 21 and 180 days after vaccination.

Results. At baseline, approximately 12 months after vaccination in the parent study, subjects in the aQIV group had significantly greater geometric mean titer (GMT) values against all four homologous strains compared with subjects in the nonadjuvanted vaccine group. After year 2 vaccination, CBER criteria for seroconversion and hemagglutination inhibition (HI) titer ≥1:40 were met for the aQIV group for all four homologous strains tested at Day 22. At both Day 22 and Day 181, subjects who received aQIV had significantly greater GMT values for HI against all four homologous strains compared with those who received nonadjuvanted vaccine. Increased immune response of aQIV vs. nonadjuvanted vaccine was also observed for the selected heterologous strains tested at baseline, Day 22 and Day 181. In terms of safety, transient and generally mild to moderate reactogenicity was more commonly observed in the aQIV group vs. the nonadjuvanted group, but overall safety profiles were similar and comparable to the parent study.

Conclusion. This first-year revaccination study in young children confirms enhanced immunogenicity and similar safety profile after repeat aQIV vaccination compared with repeat nonadjuvanted influenza vaccination.

Reference

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988. Effectiveness of Seasonal Influenza Vaccines Against Influenza A(H3N2) Illness Among Children Aged <18 Years, US Flu VE Network, 2010–2018

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Session: 130. Adult and Pediatric Influenza Vaccine
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Background. Interim estimates of 2017–2018 influenza vaccine effectiveness (VE) against influenza A(H3N2)-related illness in the United States indicated better protection among young children than among older children and adolescents. We examined VE against influenza A(H3N2) illness during five A(H3N2)-predominant seasons from 2010–2011 through 2016–2017 to investigate differences between VE among younger vs. older children.

Methods. We analyzed data from 11,736 outpatients aged <18 years with medically attended acute respiratory illnesses enrolled at US Flu VE Network study sites during five influenza A(H3N2)-predominant seasons. Respiratory specimens from all enrollees were tested for influenza viruses using reverse transcription PCR. Children with documented receipt of the recommended number of doses of current season inactivated influenza vaccine at least 14 days before illness onset were considered fully vaccinated; partially vaccinated children and those who received live attenuated influenza vaccine were excluded. Vaccine effectiveness was estimated as 100 × (1 – adjusted odds ratio) from multivariable logistic regression adjusting for study site, age, sex, presence of high-risk medical conditions, and days from illness onset to enrollment comparing odds of vaccination among A(H3N2)-positive cases vs. influenza-negative controls.

Results. A total of 1,854 influenza A(H3N2) cases and 9,882 influenza-negative controls were included; 494 (28%) influenza A(H3N2) cases and 3,637 (41%) controls were fully vaccinated before illness onset. VE ranged from 26% (95% confidence interval [CI], −17% to 53%) to 60% (38%–75%) among children aged 6 months–4 years and from 9% (−16% to 29%) to 66% (37%–82%) among 5–17 year olds (figure). During 2012–2013 and 2014–2015, A(H3N2) VE estimates were significantly higher among younger compared with older children ($P < 0.05$); in other seasons before 2017–2018, A(H3N2) VE estimates were similar among younger and older children.

Conclusion. Higher VE against A(H3N2) viruses in younger vs. older children in some seasons suggests immunologic differences in response to vaccine components. Overall, inactivated influenza vaccine provided moderate protection against A(H3N2)-related illness among children.

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989. Clinical Effectiveness of High-Dose Trivalent vs. Quadrivalent Influenza Vaccination Among Veterans Health Administration Patients

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Session: 130. Adult and Pediatric Influenza Vaccine
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Background. Despite the widespread availability of several injectable inactivated influenza vaccines (IIV), including the trivalent standard-dose (IIV3-SD) and high-dose (IIV3-HD), and the quadrivalent (IIV4), the US Advisory Committee on Immunization Practices does not currently recommend one over another. The objective of this study was to assess the relative vaccine effectiveness (rVE) of IIV3-HD and IIV4 vs. IIV3-SD.

Methods. rVE was estimated from a retrospective cohort study of Veterans aged 65 years and older who received an IIV during the 2014–2015 influenza season.