pathic ALTEs. This is also in line with recent evidence suggesting that both syndromes could be related.

A limitation of our study is the small sample size, but severe idiopathic ALTE is a rare condition. Larger studies are needed to assess the potential clinical implications of this novel, easily detectable, circulating marker, to understand the mechanisms and develop preventative strategies.

Evaluation of Effectiveness of Mixed Rotavirus Vaccine Course for Rotavirus Gastroenteritis

Two rotavirus vaccines—RotaTeq (RV5; Merck and Company), a 3-dose series, and Rotarix (RV1; GlaxoSmitkline Biologicals), a 2-dose series—are licensed for use in US children. The US Advisory Committee for Immunization Practices (ACIP) recommends that a rotavirus vaccine series be completed with the same product whenever possible but allows for administering mixed vaccine types if a previous dose type is not available or is unknown. In such situations, the ACIP recommends, “If any dose in the series was RV5 or the vaccine product is unknown for any dose in the series, a total of 3 doses of rotavirus vaccine should be administered.” However, the effectiveness of a mixed rotavirus vaccine series remains unclear.

We evaluated the postlicensure vaccine effectiveness (VE) of a complete 3-dose course of mixed rotavirus vaccine types according to the ACIP definition and compared these results with published VE results for the same population and time.

Methods | We collected data on children enrolled in the New Vaccine Surveillance Network from pediatric hospitals and emergency departments in Nashville, Tennessee; Rochester, New York; Cincinnati, Ohio; Seattle, Washington; Houston, Texas; Kansas City, Missouri; and Oakland, California. Each child exhibited diarrhea (≥3 episodes within 24 hours) and/or vomiting (≥1 episode within 24 hours) from December 1, 2011, through November 30, 2013. Rotavirus infections were confirmed using enzyme immunoassays and reverse transcription-polymerase chain reactions. Approval was obtained from each institutional review board, and written informed consent was obtained from each patient’s parent or legal guardian. Further details of these methods were previously published.

Verifications of rotavirus vaccination from primary care professionals were supplemented by regional immunization information systems. Among vaccine-eligible children who had reached the maximum ACIP-recommended age for completion of the vaccine series (ie, 8 months and older) and who had complete, valid vaccination data, we compared rotavirus test positivity from 715 children who were unvaccinated with 75 children who had received a mixed, 3-dose course of rota-
virus vaccines (Figure). The odds of immunization among 212 participants with rotavirus were compared with 578 control children whose specimens tested negative for rotavirus. To estimate VE, we controlled for month and year of birth, month and year of symptom onset, and surveillance location in an adjusted, unconditional regression model.

Results | Of 2425 children who were considered fully vaccinated, 75 (3.1%) had received a complete 3-dose course of mixed rotavirus vaccine types (Figure). For the 212 patients test-positive for rotavirus, the median (interquartile range) age was 36 (21-63) months and 36 (18-62) months for the 578 patients test-negative for rotavirus; further comparisons between these groups are demonstrated in the Table. Our adjusted VE for a complete mixed rotavirus vaccination course was 80% (95% CI, 51%-92%).

Discussion | A complete 3-dose rotavirus vaccination regimen with mixed RV5 and RV1 vaccines retains a statistically significant level of protection (80%) against rotavirus gastroenteritis that is nearly identical to the level observed for complete, single vaccine-type regimens. Previously published analyses for this same population and time showed a VE of 80% (95% CI, 74%-84%) for a complete 3-dose vaccination with RV5 only and a VE of 80% (95% CI, 68%-88%) for a complete 2-dose vaccination with RV1 only.

The National Immunization Survey found that 73% of age-eligible US children were fully vaccinated with rotavirus vaccines in 2013 among an annual birth cohort of approximately 4.6 million participants. If our results can be extrapolated, then roughly 100,000 US children annually would be immunized with mixed rotavirus vaccine types. Even though phase 3 clinical trials did not assess the efficacy of this practice before US licensure, the topic is currently under study in a postlicensure clinical trial and is supported by another recent study, albeit with numbers too small to achieve statistical significance.

Conclusions | Our results provide empirical evidence supporting the US ACIP recommendation, which allows for the completion of a 3-dose rotavirus vaccination series with either of the licensed rotavirus vaccines when necessary. This practice appears to significantly protect vaccinated infants against rotavirus gastroenteritis.

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COMMENT & RESPONSE

Prenatal Antidepressant Use and Risk of Autism Spectrum Disorders in Children

To the Editor Boukhris et al1 have reported their findings from a population-based study stating that antidepressant use among pregnant mothers, specifically selective serotonin reuptake inhibitors, increases the risk for autism spectrum disorders in offspring. This finding considered maternal history of depression in the analysis, suggesting underlying interactions that contribute to a maternal depressive phenotype may explain the higher autism spectrum disorder offspring risk. Shelton et al2 described an increased risk of autism spectrum disorder in offspring among mothers living near agricultural areas with exposure to various chemicals and pollutants. It is possible that the increased risk from such exposures may be direct, or these pesticides may be confounding other undocumented exposures that are associated with the use of these pesticides.

Nitrous oxide is an agricultural pollutant known widely for being associated with nitrogen fertilizer use. The compound is also a popular analgesic and anesthetic used in medicine. The compound exerts its antinociceptive properties via targeting of opioid receptors including primarily the κ-opioid receptor, as well as other receptors such as N-methyl-D-aspartate receptors.3 Tao and Auerbach4 have shown that κ-receptor agonists induced decreases in extracellular serotonin (5-hydroxytryptamine) in mammalian central nervous systems. This particular mechanism may partly undergird the role of the dynorphin/κ-opioid receptor system in prodepressant effects.5 Therefore, exposure to air pollutants, such as nitrous oxide, may play an etiological role in the development of an autism spectrum disorder phenotype through its targeting of fetal neural receptors and, in so doing, may predispose mothers to use of antidepressants, such as selective serotonin reuptake inhibitors, through similar receptor-specific mechanics.

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Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the US Centers for Disease Control and Prevention.


