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Zinc, Low Birth Weight, and Breastfeeding

ABBREVIATION. SGA, small for gestational age.

The article by Sur et al¹ in this issue further emphasizes the value of both breastfeeding and an adequate zinc intake for infants. The notable contribution of zinc deficiency in infancy and early childhood to stunting² and infectious disease morbidity³ and mortality,⁴ especially from diarrhea and pneumonia, is now well-documented in developing countries.

In the study by Sur et al, zinc supplementation of low birth weight infants for the first year of life was associated with improved growth and reduced diarrheal morbidity. In another study from India, zinc supplementation of small for gestational age (SGA) infants from ~1 to 10 months postnatal age was associated with a two-thirds reduction in mortality.⁵ Most low birth weight infants in developing countries are SGA. Neonatal reserves of zinc in SGA infants are lower than those of appropriate for gestational age infants, even on a body weight basis,⁶ and these supplementation studies support a particular vulnerability to zinc deficiency in this group. Thus special attention to an adequate postnatal zinc intake is indicated for the SGA infant.

The independent protective effect of exclusive breastfeeding noted in this study raises the question of whether the diarrhea associated with introduction of potentially contaminated complementary foods at 4 months caused increased zinc losses and whether, had exclusive breastfeeding been continued longer, the onset of zinc deficiency would have been delayed. Alternatively, zinc deficiency may have been developing by 4 months, resulting in increased susceptibility to diarrhea. This study does not answer these questions but illustrates well the challenge of defining optimal timing of introduction of complementary foods, especially in vulnerable infants in vulnerable conditions. There is little doubt that even the term, appropriate for gestational age, older breastfed infant is susceptible to zinc deficiency after ~6 months when milk zinc concentrations are very low relative to requirements.^{7,8} The availability of complementary foods of favorable bioavailability, especially animal products, is critical to attaining adequate zinc intake. In our experience, poor appetite and slow growth attributable to zinc deficiency occur in North America in older breastfed infants if complementary foods with bioavailable zinc, such as meats, are not consumed. The studies by Sur et al and others are reminders of both the importance and complexity of meeting the needs of this micronutri-

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ent in the breastfed infant by midinfancy and of the special vulnerability to zinc deficiency associated with even modestly low birth weight.

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The Difficulty of Diagnosing Ventilator-Associated Pneumonia

ABBREVIATIONS. VAP, ventilator-associated pneumonia; CDC, Centers for Disease Control and Prevention; NNIS, National Nosocomial Infections Surveillance System.

The diagnosis of pneumonia in intubated, ventilated patients is difficult to confirm. This relates to the lack of specificity of physical examination findings, diagnostic imaging, cultures, and other laboratory tests. Organisms recovered from the upper airway or by suction through an endotracheal tube may be colonizers and not represent lower respiratory flora. Even bronchoscopic specimens may be contaminated by pharyngeal flora. Advances have been made in diagnosing adult ventilator-associated pneumonia (VAP) by quantitating the number of organisms recovered in bronchoalveolar lavage

fluid. Organisms recovered in large numbers are the presumed etiologic agent.^{1,2}

This problem is more challenging for diagnosing the intubated newborn because of the lack of specimens other than secretions suctioned through an endotracheal tube and the ease with which the neonate is colonized by organisms transmitted from the environment or from caretakers.³ For the purpose of performing surveillance, the Centers for Disease Control and Prevention (CDC) published recommendations in 1988 that included special criteria for the infant <1 year old.⁴ Recently this was updated for CDC-sponsored surveillance studies such as National Nosocomial Infections Surveillance System (NNIS).² The problem with these recommendations is the lack of a "gold standard" with which to compare any of the surveillance studies. The diagnostic value of the CDC surveillance recommendations for infants is unknown other than for following year-to-year trends. For these reasons (difficulty of diagnosis and lack of validations of the standards), there have been few studies of VAP in neonates. Treatment of VAP is generally with antibiotics used for neonatal sepsis, because there is a great deal known about the organisms causing neonatal bloodstream infections.⁵

In this issue, Apisarnthanarak et al⁶ bravely look at VAP in preterm neonates in the neonatal intensive care unit. The authors examine the epidemiologic features of premature infants with VAP, analyze putative risk factors, and enumerate the organisms presumably responsible for VAP. They state that "the CDC/NNIS definitions for infants ≤12 months were used for nosocomial infections, specifically bloodstream infections and ventilator-associated pneumonia."⁶ Later they state that "associated organisms were designated as those organisms recovered from tracheal aspirates or bronchoalveolar lavage." The first problem is that, although the CDC definitions paper is a frequently used reference for epidemiologic surveillance, it is not validated for microbial diagnosis or descriptive clinical research. Second, although this reference contains criteria for the diagnosis of pneumonia, there is nothing specifically about VAP, although this is addressed in the newer criteria where endotracheal aspirates are specifically considered unsuitable.²

Although it is true that the 1988 NNIS guidelines allow for the diagnosis of nosocomial pneumonia in an infant to be made on the basis of a new or progressive infiltrate and isolation of a respiratory pathogen, an infiltrate in the chest radiograph of an intubated premature neonate may represent hyaline membrane disease, progression of meconium aspiration, early development of bronchopulmonary dysplasia, or atelectasis. Apisarnthanarak et al⁶ state that expert review of the cases ruled out other conditions, but we must accept this on faith. Thus, some or many of the organisms recovered from tracheal aspirates may represent colonization rather than causes of VAP. Therefore the interesting data presented by Apisarnthanarak et al should be a first step in discovering the causes of VAP in premature infants, but

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