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Facilitating Colostrum Collection by Hospitalized Women in the Early Postpartum Period for Infant Trophic Feeding and Oral Immune Therapy

Barbara Haase, Teresa S. Johnson, and Carol L. Wagner

Correspondence
Teresa S. Johnson, PhD, RN, University of Wisconsin–Milwaukee, College of Nursing PO Box 413, Milwaukee, WI 53201-0413.
tsj@uwm.edu

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ABSTRACT

Administration of colostrum for early trophic feedings and colostrum oral immune therapy for neonates in the NICU is essential to enhance gut maturation and lower risk of infections. However, it is often difficult for women to collect early colostrum because of its thick viscosity and low volume. Women may be unable to sit upright during pumping sessions because of postsurgical pain, acute or chronic illness, or birth complications and may need assistance. In this article, we describe specific techniques that providers can use to help women to collect colostrum when they are unable to accomplish collection on their own. Helping women collect and administer colostrum to their neonates in the NICU may engage and motivate them to continue to pump and provide breast milk for their hospitalized neonates.

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Barbara Haase, PhD, CPNP, IBCLC, APRN, is an advanced practice lactation consultant and pediatric nurse practitioner in the Division of Women's and Children's Services, Medical University of South Carolina, Charleston, SC.

Teresa S. Johnson, PhD, RN, is an associate professor in the College of Nursing, University of Wisconsin–Milwaukee, Milwaukee, WI.

Carol L. Wagner, MD, FABM, is a professor and neonatologist in the Division of Neonatology, Department of Pediatrics, Medical University of South Carolina, Charleston, SC.

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Early trophic feedings and colostrum for oral immune therapy (C-OIT) for newborns hospitalized in the NICU are essential to enhance gut maturation and immune development (American Academy of Pediatrics, 2012; American College of Obstetricians and Gynecologists, 2016; Association of Women's Health, Obstetric and Neonatal Nurses, 2015; Gephart & Weller, 2014; Lucas & Cole, 1990; Meier, Engstrom, Patel, Jegier, & Bruns, 2010; Morgan, Bombell, & McGuire, 2013; Newburg & Walker, 2007; Sift Investigators Group, 2013; Wagner, Forsythe, & Pittard, 1995; World Health Organization & United Nations International Children's Emergency Fund, 2009). In small amounts, trophic breast milk feedings are not intended to be nutritionally meaningful but to enhance feeding tolerance and potentially decrease time to full feedings (Morgan et al., 2013). Neonates who are born premature or ill have immature intestinal development and are at high risk for a prolonged process of gut maturation. Prolonged gut maturation increases their risks of infections, such as necrotizing enterocolitis (NEC) and nosocomial infections, and increases the risk of intestinal malabsorption (Taylor, Basile, Ebeling, & Wagner, 2009). Macrophages, present in colostrum, travel to the neonate's gut, survive up to 1 week, and secrete intestinal growth factors and anti-inflammatory cytokines that are critical to prevent infections (Kobata et al., 2008; Wagner, Taylor, & Johnson, 2008). The result is that colostrum provides growth factors and gut peptides that facilitate the maturation of the neonatal gastrointestinal tract (C. L. Wagner, personal communication, 2017).

The importance of the provision of colostrum for trophic feedings has been documented for many years (Mei, Zhang, Whang, Sangild, & Zu, 2006; Meier et al., 2010; Wagner, 2002) and has been incorporated into standard practice in many NICUs. Early exposure to colostrum and enteral feedings can significantly reduce the use of parenteral fluids, decrease the time to full enteral feedings, and lower the risk of infections for hospitalized newborns in the NICU (Hamilton, Massey, Ross, & Taylor, 2014; Moles et al., 2015; SIFT Investigators Group, 2013).

Researchers have recently shown the safety, efficacy, and effects of the use of oral colostrum as a stimulator of immunity in the oropharynx and upper airway for ill neonates and preterm infants (Gephart & Weller, 2014; Lee et al., 2015; Rodriguez, Vento, Claud, Wang, & Caplan, 2015). This practice is referred to as C-OIT. Many researchers have reported mechanisms through which C-OIT works to protect ill neonates and preterm infants from gastrointestinal dysfunction, NEC, and nosocomial infection (see Supplemental Table S1). The purposes of this article are to discuss the important properties of early C-OIT and trophic feedings and to provide strategies that women can use in the early postpartum period to collect viscous colostrum, especially when they may not be able to sit up in a bed or chair to express colostrum by hand or by breast pump.

The Case for Early Colostrum Collection

Colostrum is rich in proteins, lipids, vitamins, minerals, growth factors, and immune cells (Hassiotou et al., 2013; Lee et al., 2015; Meier et al., 2010). Colostrum and breast milk from mothers of preterm neonates have higher levels of protein, fatty acids, nitrogen, immune factors, cells, immunoglobulins, and anti-inflammatory properties than colostrum and milk from mothers of term neonates (Castellote et al., 2011; Fernandez et al., 2013; Moles et al., 2015). This shows an inverse relationship between the gestational age of a neonate at birth and the concentration of protective factors (Araujo et al., 2005; Dvorak, Fituch, Williams, Hurst, & Schanler, 2003; Koenig, de Alberquerque-Diniz, Barbosa, & Vaz, 2005). There are also transitions in other components of intra- and extrauterine development as fetal and infant life progresses along a continuum. For example, amniotic fluid and human milk share bioactivity and have the capacity to stimulate cell growth and enhance reparative processes. Amniotic fluid plays a significant role in gut maturation as it bathes the primitive gut that later becomes the gastrointestinal tract. Mother's own milk (MoM) provides nutrients and bioactive properties that stimulate neonatal cell growth and provide immune protection to facilitate immunocompetence (Bernt & Walker, 2001; Newburg, 2001; Wagner, 2002). Ultimately, the provision of MoM can decrease morbidity and mortality during the first 60 days of an infant's life (Corpelijn et al., 2012).

It may be difficult for mothers of hospitalized newborns to collect colostrum immediately after birth.

Human growth factors and hormones are also present in colostrum and mature breast milk that enhance growth of epithelial cells and gut maturation (Dvorek et al., 2003; Fernandez et al., 2013), with stem cells identified in human mammary tissue (Cregan et al., 2007). Human growth factors present in colostrum and breast milk include polypeptides such as epidermal growth factor that stimulate the proliferation of the intestinal mucosal epithelium and strengthen the mucosal barrier to antigens (Dvorek et al., 2003; Fernandez et al., 2013). Colostrum and mature breast milk contain bioactive cells that are highest in concentration just after birth (Ballard & Morrow, 2013; Castellote et al., 2011) and are affected by the type of birth (Cabrera-Rubio et al., 2012). The cells in colostrum that are highest in concentration after birth are phagocytes, including macrophages and lymphocytes, which provide significant protection against infection (Castellote et al., 2011; Fernandez et al., 2013). Lymphocytes are highest in breast milk just after birth and are activated into memory T cells that can last for years in the child and are critical to long-term immunity (Wirp, Adkins, Palkowetz, & Goldman, 1992). Along with T cells, some lymphocytes are β cells, which provide antiviral activity and cell-mediated immunity (Wirp et al., 1992). Phagocytes are also present in colostrum and release secretory immunoglobulin A, which is important to absorb and engulf pathogens (Fernandez, et al., 2013).

Although the collection of colostrum from mothers of sick neonates is important to provide the neonates with immune therapy, collection difficulties are faced by nurses, lactation consultants, and midwives who care for women in the early postpartum period. Often, women who give birth to sick or preterm infants may be unable to sit up and must remain side lying or supine because of illness or birth complications. During this time, colostrum may be present in small amounts and too viscous to collect via an electric hospital-grade breast pump. However, collecting colostrum for use for oral care for their neonates has been reported as a strong motivator for these women (Froh, Deatrick, Curley, & Spatz, 2015). Froh and colleagues (2015) reported that for mothers of preterm neonates, the collection of colostrum for oral care for their neonates was a strong motivator that encouraged them to