

levels of bilirubin approaching those recommended for initiating phototherapy. Such decisions should be individualized with the goal of keeping mother and infant together as well as preserving and optimizing breastfeeding while effectively preventing or treating the hyperbilirubinemia.

- a. First and best supplement is expressed own mother's milk. It can be hand expressed into a small cup or spoon and directly fed to the infant with help from staff who are knowledgeable in this technique. In this way, breastfeeding is best supported.
 - b. If own mother's milk is not available, supplementing with donor human milk will increase enteral intake. Breastfeeding infants supplemented only with donor milk meet the World Health Organization definition of exclusive breastfeeding. The specific effect of donor milk supplementation on bilirubin levels has not been studied.
 - c. It may be necessary to supplement with infant formula if neither own mothers' milk nor donor human milk is available. The impact of introducing formula to an exclusively breastfed infant must be considered. The effect of supplementation with donor human milk versus infant formula is not well studied.
 - d. Supplementation with water or glucose water is contraindicated because it does not reduce serum bilirubin,^{94,95} (IIA, III) interferes with breastfeeding, and might cause hyponatremia.
 - e. Supplementation of breastfeeding should preferably be undertaken using a cup, spoon, syringe, or supplemental nursing system (if infant is latching) simultaneously with or immediately following each breastfeed. Nipples/teats and bottles should be avoided where possible. However, there is no evidence that any of these methods are unsafe or that one is necessarily better than the other.^{77,96} (IA)
3. When TSB levels are very high or associated with evidence of poor breast milk intake despite appropriate intervention, supplementation with infant formula can eliminate the deleterious effect of *UGT1A1* polymorphisms on serum bilirubin and is a reasonable addition if it can be done in a way that is supportive of breastfeeding.⁵¹ (IIA) Depending on the TSB level, follow-up TSB measurements within 4–24 hours are needed. Supplementation cannot be substituted for phototherapy in the treatment of infants with hemolytic hyperbilirubinemia.
- a. Supplementation of breastfeeding with infant formula. As infant formula inhibits the intestinal reabsorption of bilirubin,⁹⁷ (IV) it may sometimes be used to lower TSB in breastfeeding infants.⁷⁷ Small-volume (10–15 mL) feedings of formula immediately following a breastfeeding may be preferred to intermittent large-volume (30–60 mL) supplementation so as to maintain frequent breastfeeding and preserve maternal milk production at a high level.⁹⁸ (IA) Larger volumes may be required if the infant is not receiving sufficient milk at the breast (i.e., low milk supply or poor milk transfer).
 - b. Temporary interruption of breastfeeding. Temporary interruption of breastfeeding is very rarely needed, but may be considered for specific clinical scenarios in

which rapid reduction in TSB is urgently needed or if phototherapy is unavailable.⁹⁹ (IIA) If urgent clinical needs necessitate the temporary interruption of breastfeeding, it is critical to maintain maternal milk production by teaching the mother to effectively and frequently express milk by hand or pump. The infant needs to return to a good supply of milk when breastfeeding resumes, or poor milk supply may result in a return of higher TSB concentrations.

Post-treatment follow-up and evaluation

Infants who have had any of the above treatments for excessive hyperbilirubinemia need to be carefully followed with repeat TSB determinations and support of breastfeeding because suboptimal breast milk intake may result in recurrence of hyperbilirubinemia.

Encouragement to continue breastfeeding is of the greatest importance since many parents will be fearful that continued breastfeeding may result in more jaundice or other problems. Parents can be reassured that almost all hyperbilirubinemia requiring treatment resolves within the first 5 days after birth. Even those infants with more prolonged breast milk jaundice who required and received treatment rarely have sufficient rise in bilirubin with continued breastfeeding to require further intervention.

Summary and Conclusions

Breastfeeding and some degree of hyperbilirubinemia are normal and expected aspects of neonatal development.⁴⁵ Managing the confluence of jaundice and breastfeeding in a physiologic and supportive manner to ensure optimal health, growth, and development of the infant is the responsibility of all healthcare providers. A complete understanding of normal and abnormal states of both bilirubin and breastfeeding is essential if optimal care is to be provided and the best outcome achieved for the child. We provide guidelines for managing this problem while recognizing the need for adjusting the guidelines to the individual needs of each infant.

Research Needs

The recommendations above are based on the most current research and clinical experience available. Identifying the components in human milk that increase total serum bilirubin and whether and to what extent these components interact with genetic variation to increase jaundice might substantially improve risk-based strategies to prevent and treat hyperbilirubinemia. Because both commercial and noncommercial sources of banked donor milk are increasingly available,^{100–104} further research on the effect of supplementing breastfed infants with banked donor milk on TSB levels is urgently needed. Small volumes of L-aspartic acid, enzymatically hydrolyzed casein or whey/casein, immediately after breastfeeding show potential promise in reducing TSB without interfering with breastfeeding or milk supply, but such interventions need further evaluation before they can be recommended for use.¹⁰⁵ In addition, widely generalizable research is also needed to evaluate specific strategies for feeding management of the breastfed infant with hyperbilirubinemia that allow uninterrupted breastfeeding while reducing serum bilirubin concentrations to safe levels. Additional strategies to maximize maternal milk intake and