The Use of Probiotics in the Reduction of Necrotizing Enterocolitis in Neonates

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BACKGROUND & SIGNIFICANCE

- Necrotizing Enterocolitis (NEC) is one of the leading causes of infant mortality in premature or low-birth-weight infants (AlFaleh et al., 2014; Chang et al., 2017; Bernardo et al., 2013; Meyer et al., 2017; Patole et al., 2016; AlFaleh & Anabrees, 2014; Thomas et al., 2017; Uberos et al., 2017; Fernandez-Carrocera et al., 2013; Samuels et al., 2016; Repa et al., 2015; Oncel et al., 2014).
- NEC is considered a medical emergency and is the most common form of gastrointestinal condition seen in neonates (Bernardo et al., 2013).
- Approximately 27-63% of affected infants require surgical intervention (Alfaleh & Anabrees, 2014).
- NEC is associated by bowel wall necrosis and can cause bowel perforation. It has been reported to affect up to 10% of very low birth weight infants (Alfaleh & Anabrees, 2014).
- The incidence of NEC greater than or equal to stage 2 varies from 2.6-28% of low birth weight infants, with associated mortality ranging from 16-42% (Chang et al., 2017).
- Very low birth weight infants with NEC have a mortality rate of up to 20% (Alfaleh & Anabrees, 2014).

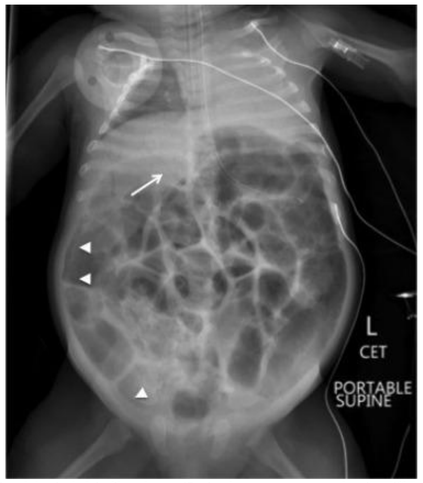


Fig. 1. Supine abdominal plain film taken at 45 min after symptom onset, showing diffuse bowel dilation, pneumatosis intestinalis (arrowheads), and portal venous gas (arrow). From "Fatal Clostridial necrotizing enterocolitis in a term infant with gastroschisis" by Riggle, K. et al., 2016, https://www.sciencedirect.com/science/article/pii/S2213576616301154. Copyright 2016 by Kevin Riggle. Reprinted with permission.

RESEARCH QUESTION

- Does the use of probiotics decrease the instance of necrotizing enterocolitis (NEC) in neonates?

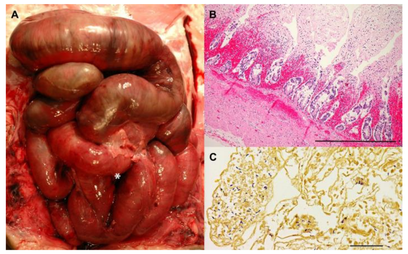
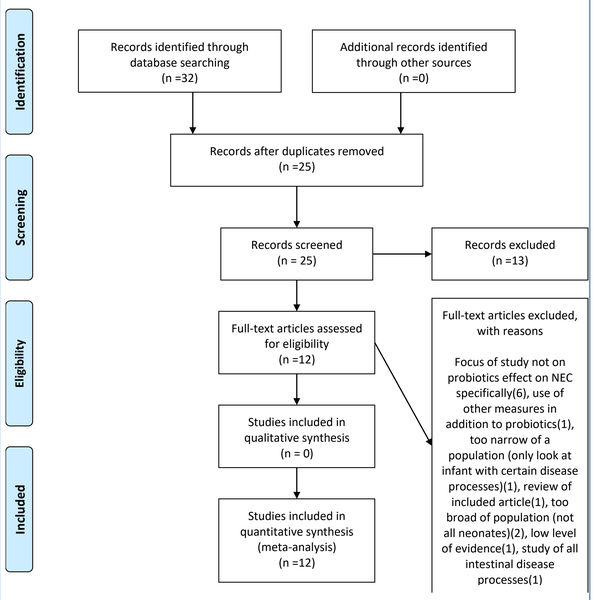


Fig. 2. A. Small bowel, in situ, with diffuse distention and dusky discoloration consistent with ischemia; B. Microscopic image with severe mucosal necrosis and ischemic changes; C. Collections of "rod-shaped" gram-positive bacilli present within the mucosa and submucosa. From "Fatal Clostridial necrotizing enterocolitis in a term infant with gastroschisis" by Riggle, K. et al., 2016, https://www.sciencedirect.com/science/article/pii/S2213576616301154. Copyright 2016 by Kevin Riggle. Reprinted with permission.

METHODOLOGY

- An integrated review of the literature was conducted using the methodology described by Whittemore and Knafl (2005) and Brown (2018).
- Cochrane, CINAHL, and Medline Complete were searched using the following key terms "probiotics", and "necrotizing enterocolitis", and "reduction".
- Search criteria was limited to "full text articles" between the years 2013-2018 for all data bases.
- Inclusion criteria included studies involving the evaluation of preterm infants only and specific to probiotic effects on NEC.
- The original search identified a total of 32 articles. Of the 32 articles found, 7 were duplicates and removed, and 13 were excluded for various reasons; including, study focus not on probiotics effect on NEC specifically, use of other measures in addition to probiotics, focus on infants with a certain disease process only, a review of included article, not specific to neonates, low level of evidence, and study of all intestinal disease processes. Twelve met specifications to be included in this review.
- All articles were critically analyzed using evaluative checklists; PRISMA and Appendix A and F of the appraisal Guide (Brown, 2018) Findings from the studies were synthesized for comparative analysis of results.

LITERATURE SEARCH FLOW DIAGRAM



RESULTS

- Thirty two articles were initially identified; Twelve included in final sample. Of the 12 articles, five were Level 1, two were Level 2, and five were Level 4.
- Level of evidence rated using evidence pyramid published by Long & Gannaway and Appraisal Guides by Brown (2015; 2018).

LITERATURE SYNTHESIS

- Evidence suggests that the use of probiotics may reduce the incidence of developing necrotizing enterocolitis in infants born less than 32 weeks gestation and/or less than 1500 grams.
- Nine of the twelve articles found significant reduction in NEC with the use of probiotics in neonates that were born less than 32 weeks (AlFaleh et al., 2014; Chang et al., 2017; Bernardo et al., 2013; Meyer et al., 2017; Patole et al., 2016; AlFaleh & Anabrees, 2014; Thomas et al., 2017; Uberos et al., 2017; Fernandez-Carrocera et al., 2013).
- Two studies found statistically insignificant; both trials used the same strain of probiotic, *Infloran* (Repa et al., 2015; Samuels et al., 2016).
- Oncel et al. (2014) concluded that the strain L reuteri did not effect the overall rates of NEC in preterm infants.
- Four of the articles specifically reported the need for more research in strain and dosage to be used (AlFaleh & Anabrees, 2014; AlFaleh et al., 2014; Chang et al., 2017; Thomas et al., 2017).
- Samuels et al. (2016) and Repa et al. (2015) found that the type of feeding, whether breastmilk or formula, altered the effectiveness of the probiotics.

CLINICAL IMPLICATIONS

- Necrotizing Enterocolitis in neonates could be significantly reduced with the use of probiotics.

CONCLUSION

- Probiotics have been shown to reduce the instance of NEC in preterm infants.
- More emphasis should be placed on the strain of probiotic and the dosage needed to be effective.
- Additionally, more research is needed on the effectiveness of probiotic use in infants born before 27 weeks gestation.

REFERENCES

Available upon request.

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