

# Is breast milk effective in reducing colic in infants?

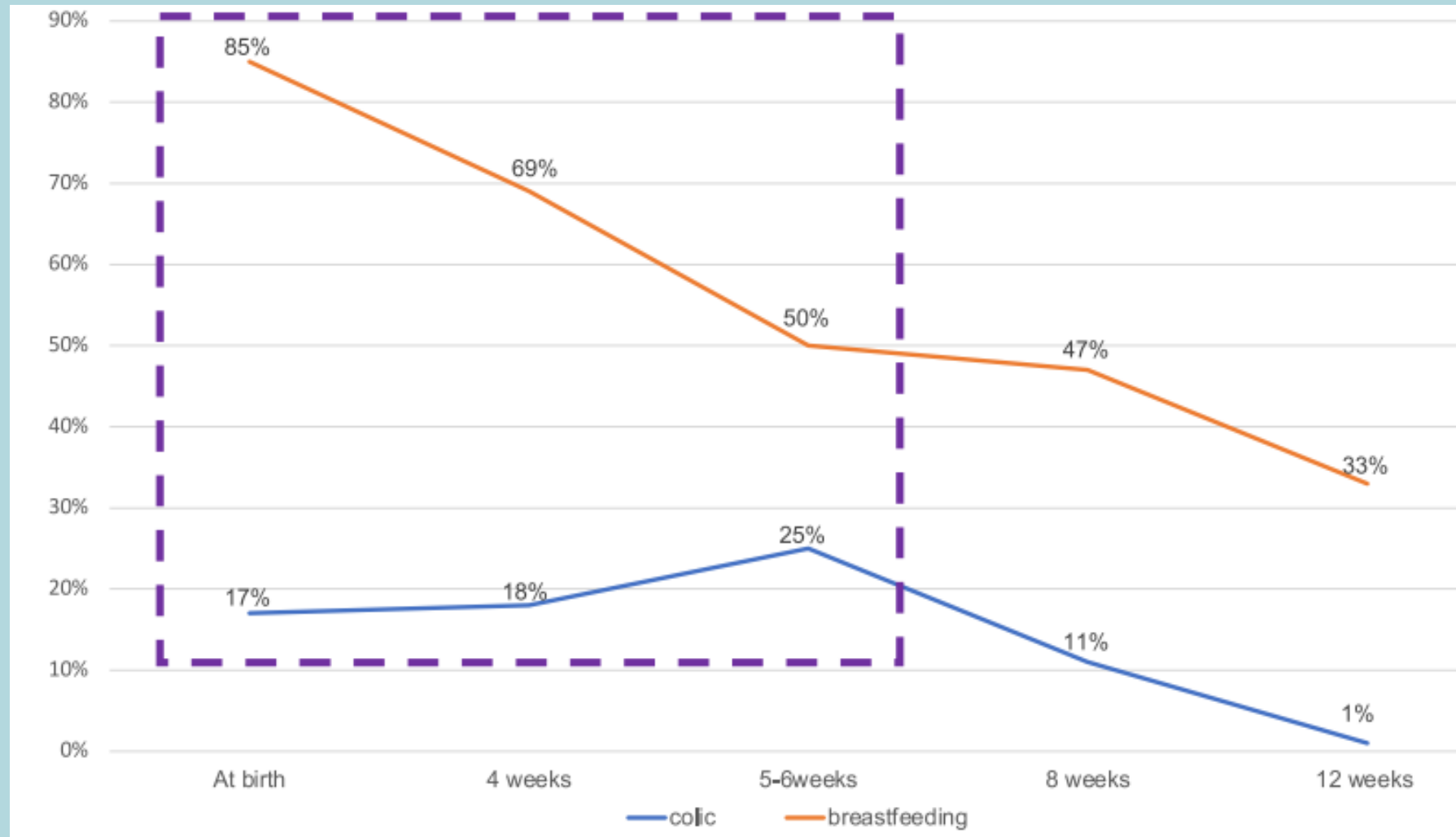
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# Introduction

- Colic is inconsolable crying in an infant that lasts many hours a day, starting in the second week of life and lasting until about 3 months of age
- The word "colic" originates from the Greek word "kolikos," referring to the colon
- The classic definition of infant colic was given in 1954 by Wessel
- His definition of a colicky infant was a child who cried for more than 3 hours a day, for more than 3 days a week, for over 3 weeks
- This is often referred to as the “Rule of 3’s” and these rules came to be known as the Wessell Criteria

# Relationship between breastfeeding and infant colic rates



- Infantile colic is classified as a **functional gastrointestinal disorder** with recurrent symptomatic episodes that lack identifiable organic cause
- Stress resulting from colic places a significant burden on infants, their families, and the healthcare system
- Inability to soothe the crying infant may increase caregiver frustration, straining relationships within the family unit; in severe cases, this can lead to physical abuse toward the infant
- The 2016 Rome IV criteria define colic as a **behavioral syndrome**

## The Rome IV criteria include the following guidelines:

- The symptoms start and stop when the newborn or infant is younger than 5 months.
- Recurrent and prolonged periods of crying, fussing, or irritability without an apparent cause that caregivers cannot prevent or resolve.
- No evidence of poor weight gain, fever, or illness.

# Epidemiology

- Infantile colic affects an estimated 3% to 28% of infants worldwide
- The prevalence of infantile colic varies across studies, with some suggesting it to be as high as 40%
- One study showed an incidence of:
  - 17% to 25% among newborns and infants under 6 weeks
  - 11% among those aged 8 to 9 weeks
  - 0.6% among those aged 10 to 12 weeks
- Wolke D, Bilgin A, Samara M. Systematic Review and Meta-Analysis: Fussing and Crying Durations and Prevalence of Colic in Infants. J Pediatr. 2017 Jun;185:55-61.e4. [[PubMed](#)]

# Pathophysiology

- Generally, the episodes associated with colic have a clear beginning and end, and they occur during the evening hours
- The behavior of a newborn or infant can vary between being happy, sleeping, playing, or eating, and the specific triggers for these behaviors are not known
- The cry associated with colic is typically louder and more urgent and is sometimes described as screaming
- **Less than 10% of infants** with excessive and inconsolable crying have an **organic cause**, and standard soothing techniques are often ineffective

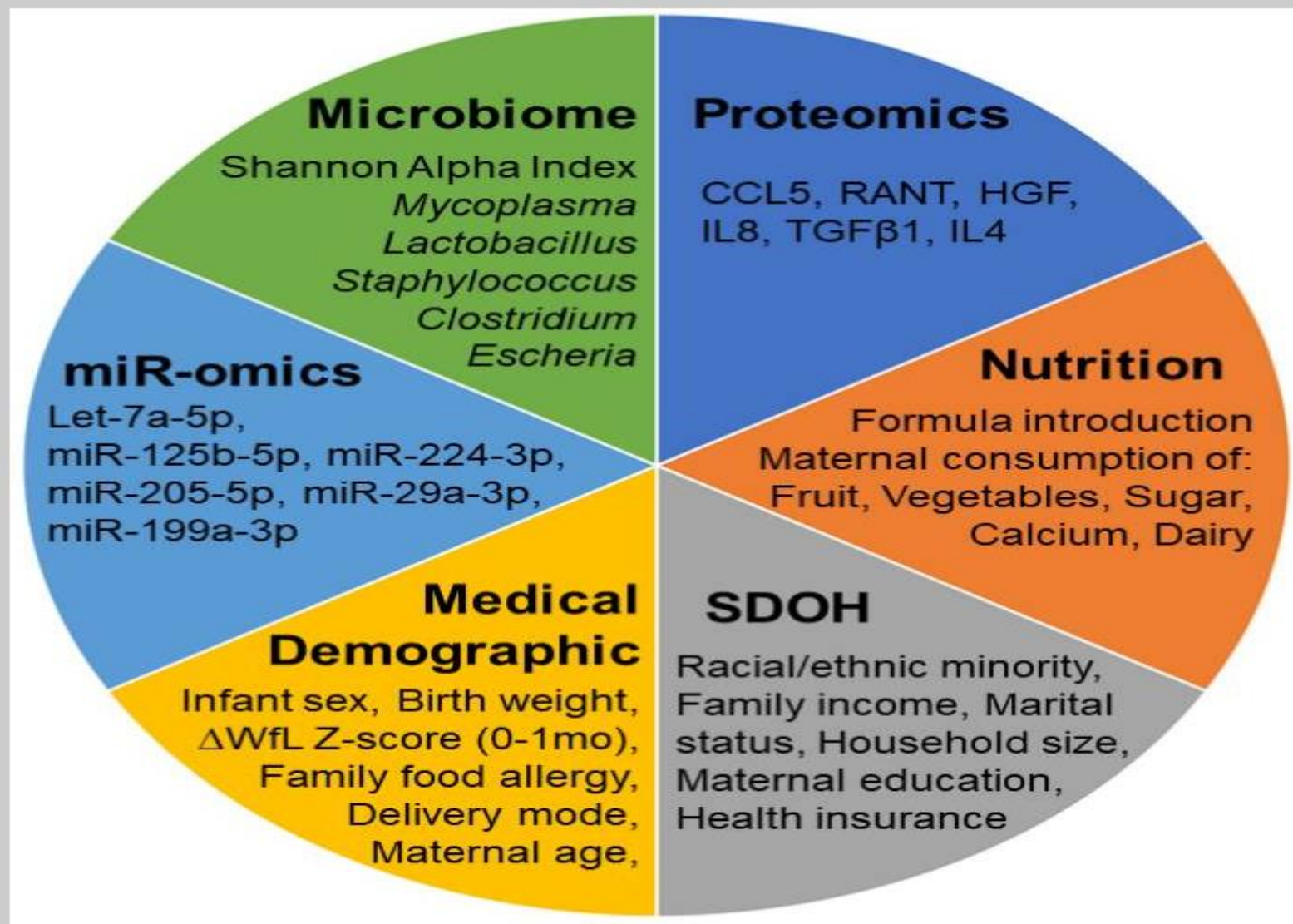
- People often attribute colic to **incorrect feeding techniques**, overfeeding, underfeeding, and insufficient burping
- **Maternal diets that include cow's milk** may contribute to infant distress in breastfed infants with colic, suggesting a link to cow's milk protein intolerance
- The connection to **lactose intolerance** presents more contradictory evidence
- Some studies support the presence of **increased motilin** in newborns and infants with colic, suggesting gut hypermotility as a **result of autonomic imbalance**

- **Gut inflammation**, as measured by fecal calprotectin, and alterations in the **fecal microbiome** may also contribute to infantile colic
- Certain studies have suggested a **link between colic and migraine**, demonstrating an association between infantile colic and the later development of migraine headaches during adolescence
- **maternal smoking** or nicotine replacement therapy
- **Immaturity of the nervous and gastrointestinal systems**, sleep disruption, hypersensitivity to the environment, sensory overload, family stress, and parental anxiety.
- **gastroesophageal reflux**

# POSSIBLE CAUSES FOR UNEXPLAINED CRYING

1. Cows' milk allergies
2. Reflux
3. Parenting style and expectation
4. Baby's temperament
5. Lactose overload
6. **Smoking**(Ito, 2000; Lauwers & Swisher, 2011; Leung et al., 2004)
7. Microbiome
8. Physical pain
- 9.Flatulence, wind or gas
- 10.Infant migraine
- 11.Hunger
- 12.Overfeeding the infant or feeding too quickly
- 13.Not burping after a feeding or incorrect positioning after a feeding
- 14.A low birth weight baby
15. Hormone imbalances

# Conceptual framework for a multi-omics study of human milk factors involved in infant colic

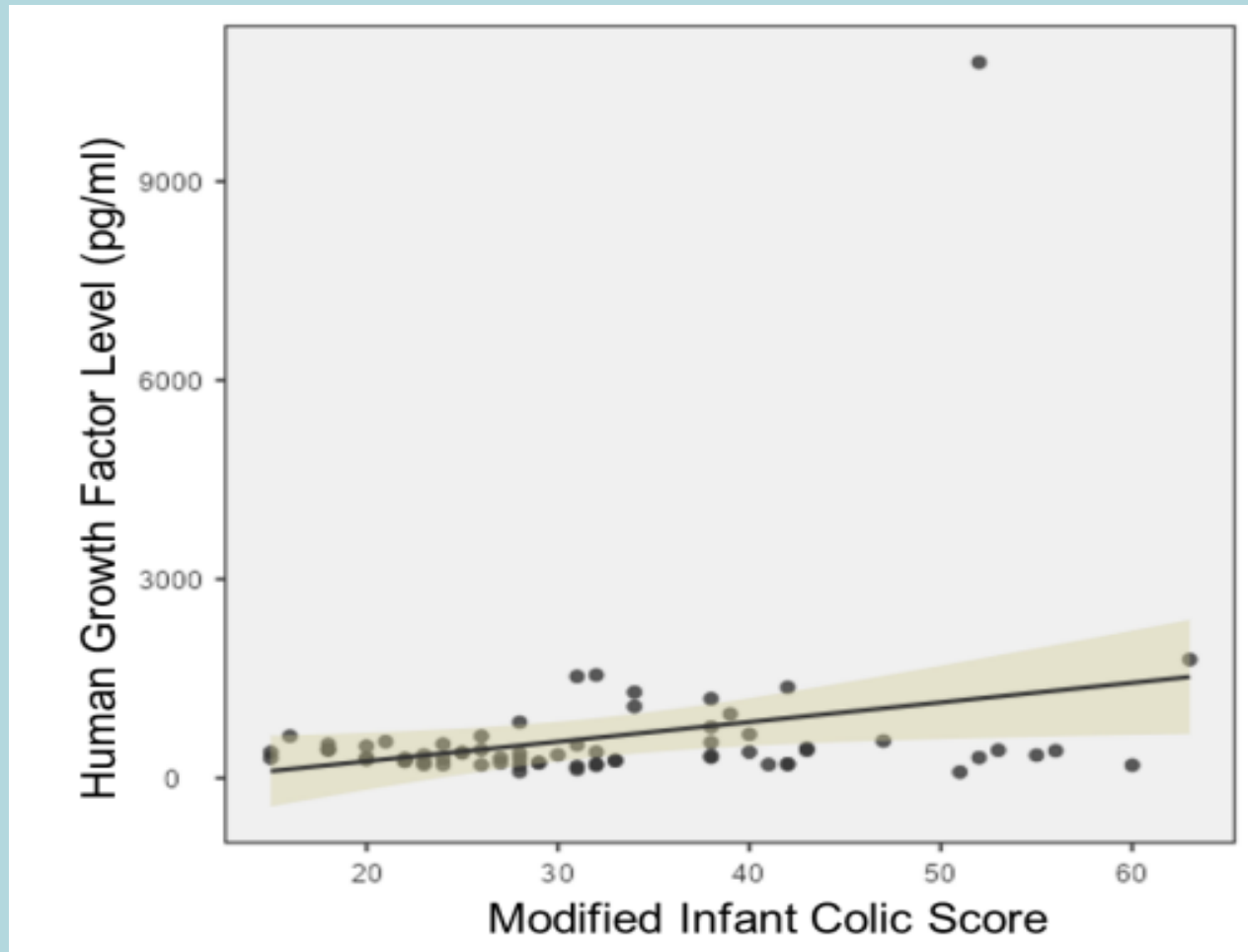


■ A commonly proposed mechanism for infant colic involves :

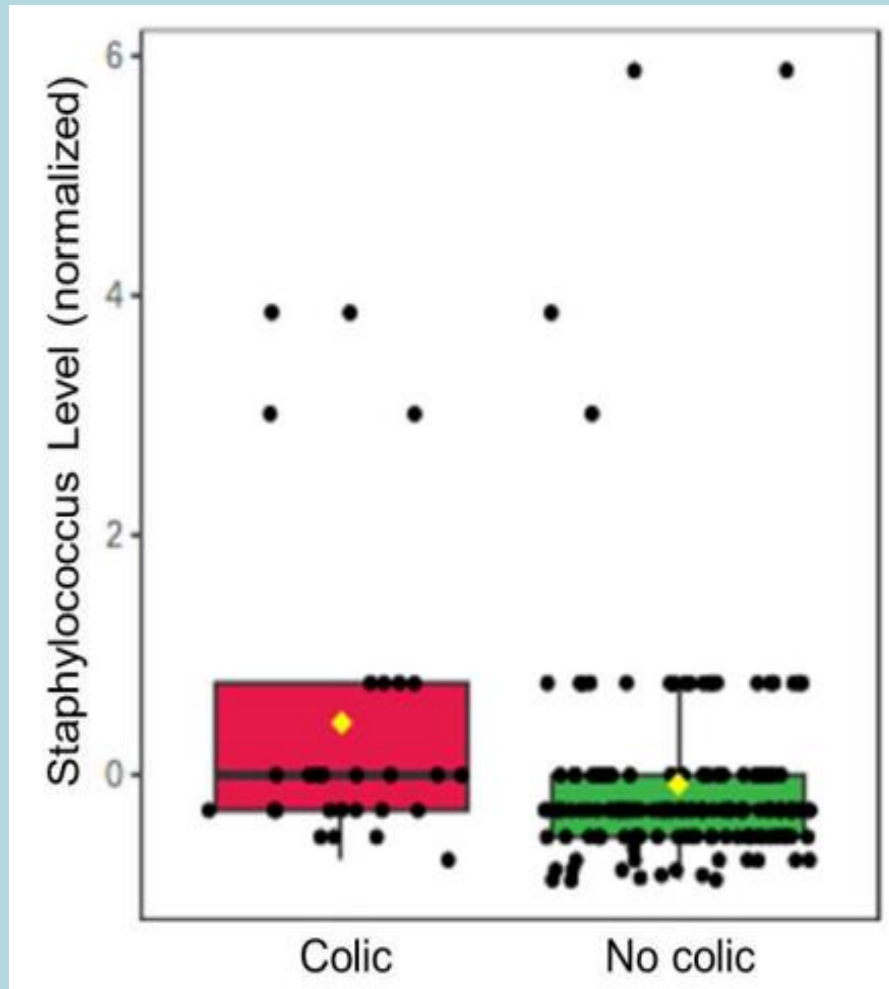
- dysbiosis
- inflammation
- and heightened pain sensitivity

■ Indeed, the current study identifies bacterial pathogens (i.e., *Staphylococcus*), and inflammatory miRNAs (i.e., let-7a-5p) which are elevated in the milk of mothers with colicky infants.

## Levels of hepatocyte growth factor in human milk

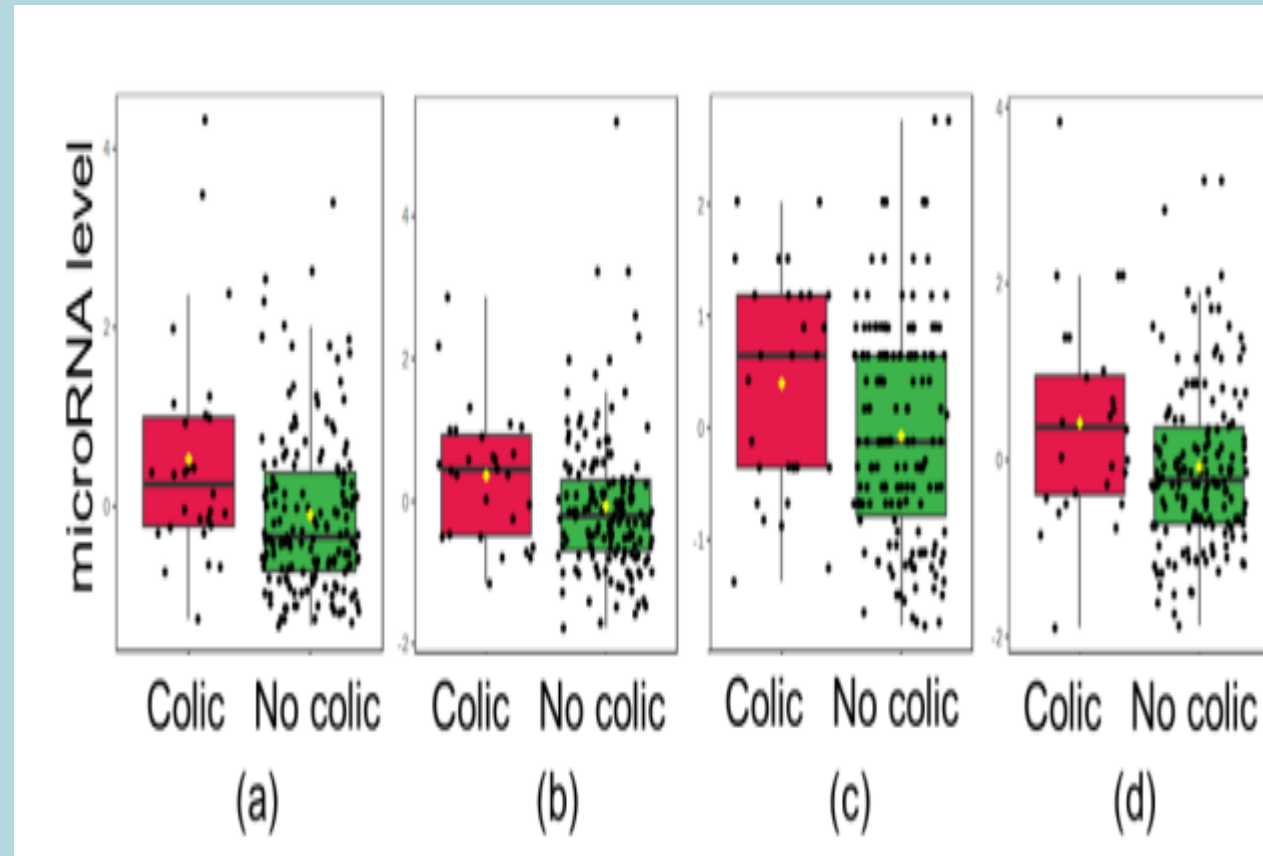


# Levels of Staphylococcus in human milk

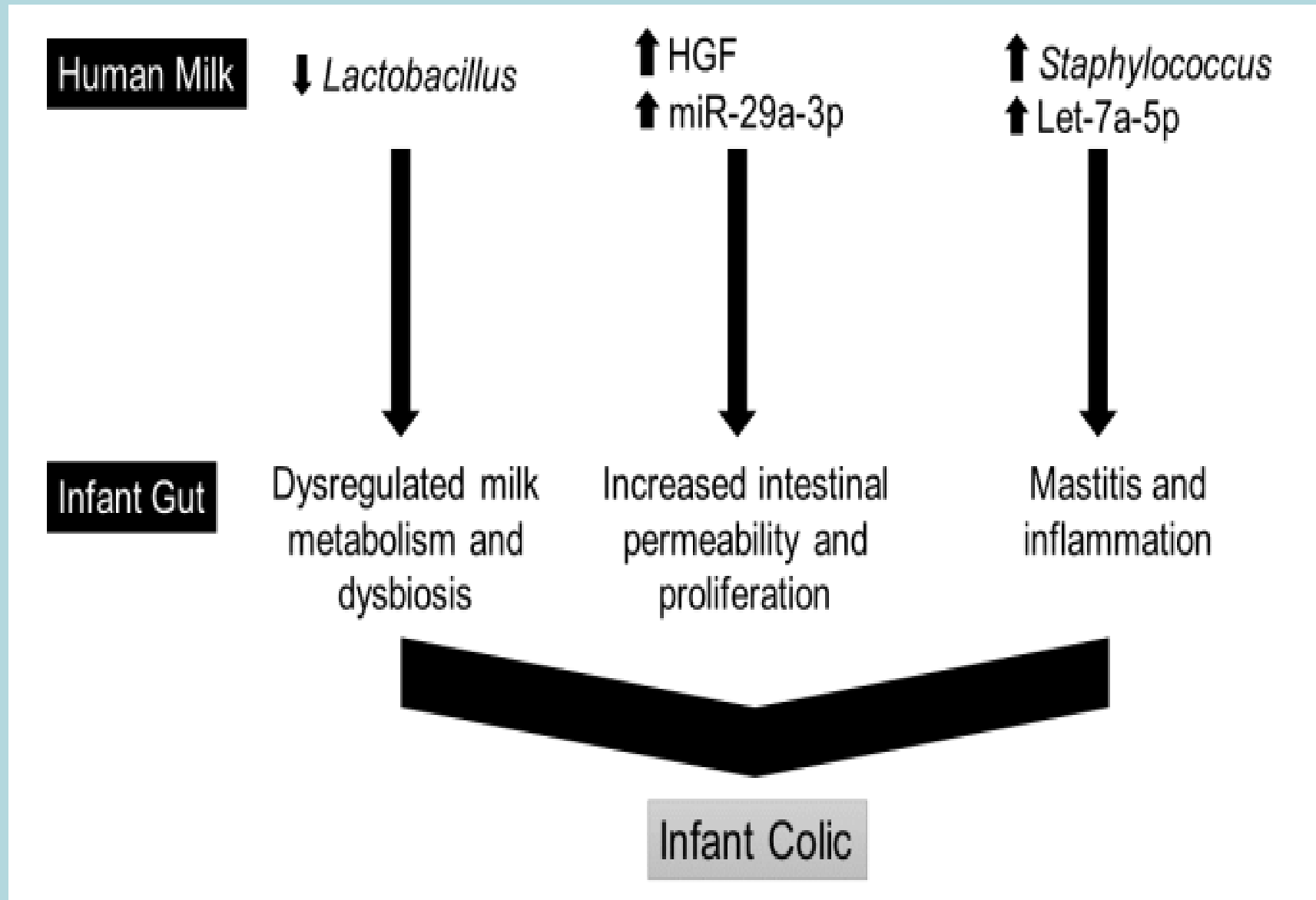


# Levels of four miRNAs in human milk differ among mothers of infants with colic

- (a) miR-224-3p
- (b) miR-125b-5p
- (c) let-7a-5p
- (d) miR-205-5p



# Multi-omic network implicated in infant colic



# What are NOT signs of Colic?

- Fever
- Mucus or bloody stools
- Vomiting or projectile spit up
- Decreased appetite
- Limp or pale skin
- Diarrhea
- Rashes

# Differential Diagnosis

- Increased intracranial pressure, sepsis, or meningitis
- Foreign body in the eye
- Ankyloglossia or other oral feeding difficulties
- Otitis media
- gastrointestinal conditions, including pyloric stenosis, gastroesophageal reflux, or obstruction
- Cardiovascular conditions, such as supraventricular tachycardia
- Cow's milk protein allergy or formula intolerance
- Hair tourniquet of the penis, fingers, or toes
- Torsion of testes or inguinal hernia
- Non-accidental trauma
- Lactose intolerance
- Neonatal abstinence syndrome
- Hunger
- Glaucoma
- Anal fissure

# HOW TO HELP A BABY WITH COLIC?

1. Try an elimination diet
2. Hold and comfort your baby
3. No evidence for medications
4. Keep breastfeeding

# Effects of breastfeeding on infant colic

- **Breastfeeding is a great comfort to a crying baby** as it provides close contact with mother, food, warmth and immune protection (Wambach and Spencer, 2021, p 265-266 )
- **Breastfeeding provides pain relief**
- **Breastfeeding is the biologically normal food for a baby**
- **Breast milk contains hormones**
- **Switching to infant formula is likely to make a baby's symptoms even worse** (Wambach and Spencer, 2021, p 265-266; Lawrence, 2016, p 274-280)
- **Specialist formulas have not been shown to improve comfort levels**

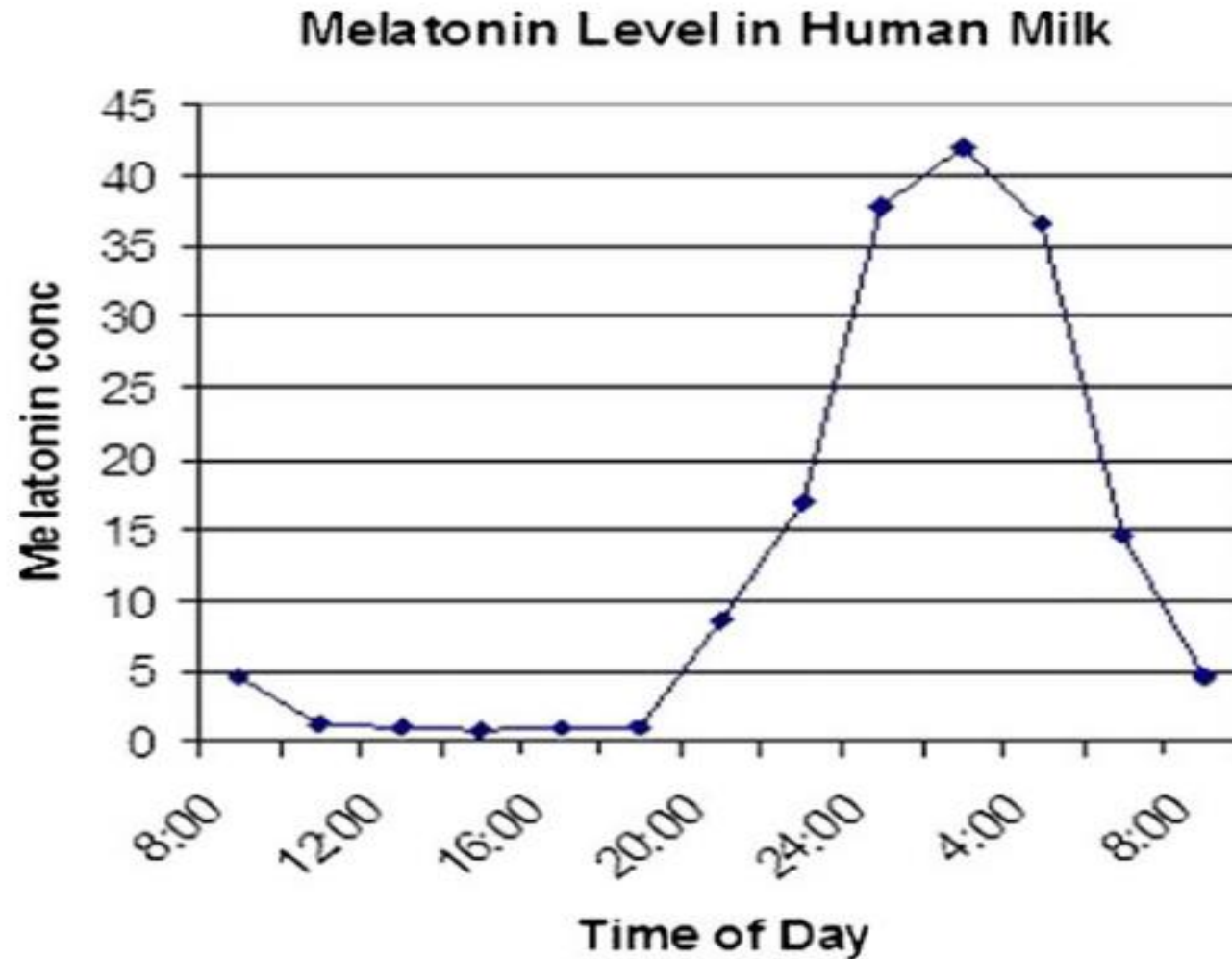
# Correcting breastfeeding technique

- Breastfeeding mothers may reduce colic by making sure the baby is getting lots of “hindmilk” at each feeding and not just “foremilk.”
- This can happen by making sure one breast is finished before offering the other or only offering one at feeding and emptying it completely

# Melatonin and infantile colic

- Infants during their first months of life may demonstrate two known nocturnal problems: infantile colic and fragmented nocturnal sleep
- There is no consensus about the relation of breastfeeding to infantile colic or nocturnal sleep
- The nocturnal breast milk provides an exogenous source of melatonin which may be absorbed through the gastrointestinal tract of the infant
- Based on the known properties of the hormone, hypnosis and relaxing GI smooth muscle, it is plausible that the nocturnal melatonin provided to the breast-fed infant results in reduced gastrointestinal activity and therefore less infantile colic as well as promoting nocturnal sleep
- few studies demonstrated that external melatonin added to infants' nutrition resulted in earlier development of circadian rhythm and in improved nocturnal sleep

## Average melatonin levels in breast milk per time of the day



Eur J Pediatr (2012) 171:729–732

DOI 10.1007/s00431-011-1659-3

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SHORT COMMUNICATION

## **Breastfeeding may improve nocturnal sleep and reduce infantile colic: Potential role of breast milk melatonin**

**Anat Cohen Engler • Amir Hadash • Naim Shehadeh •  
Giora Pillar**

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- Ninety-four mothers of healthy 2 to 4-month-old infants filled a questionnaire regarding irritability/potential infantile colic and sleep characteristics
- For the second part, we measured melatonin levels in breast milk of five women every 2 h during 24 h and in three samples of commonly used artificial formulas
- Exclusively breast-fed infants had a significantly lower incidence of colic attacks ( $p=0.04$ ), lower severity of irritability attacks ( $p=0.03$ ), and a trend for longer nocturnal sleep duration ( $p=0.06$ )
- Melatonin in human milk showed a clear circadian curve and was unmeasurable in all artificial milks.

**Table 1** General data, characteristics of colic attacks, and sleep characteristics

|                                  | Breast fed          | Formula fed         | All subjects        | <i>p</i> |
|----------------------------------|---------------------|---------------------|---------------------|----------|
| General data                     |                     |                     |                     |          |
| Number                           | 54                  | 40                  | 94                  | –        |
| Male                             | 19                  | 17                  | 36                  | –        |
| Female                           | 35                  | 23                  | 58                  | –        |
| Age (months)                     | 3 (2–4)             | 3 (2–4)             | 3 (2–4)             | 0.14     |
| Weight (g)                       | 5,400 (3,200–6,930) | 5,650 (4,400–7,800) | 5,450 (3,200–7,800) | 0.038    |
| Duration of gestation (weeks)    | 40 (34–42)          | 40 (33–42)          | 40 (33–42)          | 0.27     |
| Characteristics of colic attacks |                     |                     |                     |          |
| Paroxysmal irritability          | 55.6%               | 72.5%               | –                   | 0.047    |
| Severity (0=no attacks, 10=hard) | 5 (2–10)            | 6 (3–10)            | –                   | 0.037    |
| Frequency (times per week)       | 6 (1–7)             | 7 (2–7)             | –                   | 0.050    |
| Sleep characteristics            |                     |                     |                     |          |
| Total sleep time (hours)         | 9 (6–12)            | 9 (5–12)            | –                   | 0.060    |
| Number of awakenings per night   | 2 (0–4)             | 1 (0–3)             | –                   | 0.044    |
| Wake after sleep onset (minutes) | 30 (0–120)          | 30 (0–180)          | –                   | 0.41     |

Data are presented as median and ranges

- Conclusion :Exclusive breastfeeding is associated with reduced irritability/colic and a tendency toward longer nocturnal sleep
- Breast milk (nocturnal) consists of substantial melatonin levels, whereas artificial formulas do not
- We speculate that melatonin which is supplied to the infant via breast milk plays a role in improving sleep and reducing colic in breast-fed infants compared to formula-fed ones

# Infant Colic

## *Empirical Evidence of the Absence of an Association With Source of Early Infant Nutrition*

*Tammy J. Clifford, PhD; M. Karen Campbell, PhD;  
Kathy N. Speechley, PhD; Fabian Gorodzinsky, MD, FRCPC*

Arch Pediatr Adolesc Med. 2002;156:1123-1128

- A prospective cohort study of 856 mother infant dyads. Eligible participants included English speaking adult residents of a region in Ontario, who gave birth, at term, to a live singleton whose birth weight was appropriate for gestational age

- Self-administered questionnaires, mailed to mothers at 1 and 6 weeks post partum, requested information on several infant and maternal factors, including source of infant nutrition (exclusively breastfed, complementary fed, and exclusively formula fed). Cases of colic were identified by applying modified Wessel criteria to data recorded in the Barr Baby Day Diary or by interpreting responses to the Ames Cry Score
- Ames cry score is a simpler score which consists of three questions with four responses which are scored from 0-3
- A total score of more than three is considered as colic

# Ames Cry Score:

## 1. Questions:

The score is based on three questions:

- How often does your baby cry?
- What is the average duration of crying episodes?
- What is the maximum duration of crying episodes?

Each question has 4 response categories that are scored from 0 to 3.

## 2. Scoring:

Individual item scores are summed to create an overall score.

Overall scores range from 0 to 9.

A score of 3 or higher is generally considered to indicate colic.

- Results: Of 856 mothers, 733 (86%) completed the first questionnaire and 617 (72%) completed the second questionnaire
- Overall, the prevalence of colic at 6 weeks was 24%
- No association was seen between the source of infant nutrition and colic's development
- Conclusions: Breastfeeding did not have a protective effect on the development of colic
- Although colic was statistically associated with several variables, including preexisting maternal anxiety, much of colic's etiology remains unexplained

## Unproven treatments that are not found to be effective for colic pain in infants are as follows:

- Lactose-free infant formulas or lactase supplements
- Sucrose
- Full body massage, with risk of overstimulation
- Herbal remedies, such as gripe water or camomile tea
- Homeopathic preparations, with the possibility of toxic ingredients
- Chiropractic manipulation
- Acupuncture

# What is gripe water?

- Gripe water is a liquid made with a variety of herbs
- There are many formulations available
- Some of them may contain sugar or alcohol, and a mixture of different herbs, such as:
  - fennel
  - ginger
  - chamomile
  - liquorice
  - cinnamon
  - lemon balm
- رازیانه زنجبیل بابونه شیرین بیان دارچین بادرنجبویه

## Encourage the mother to try soothing techniques such as:

- Holding the baby skin-to-skin (chest-to-chest)
- Cuddling or rocking the baby
- Carrying the baby in a carrier
- Wrapping the baby loosely in a blanket to reduce stimuli
- Breastfeeding the baby
- Burping the baby
- Changing the baby's diaper
- Giving the baby a bath
- Giving the baby a massage
- Taking the baby to a quiet room
- Placing the baby near “white noise”, e.g., vacuum cleaner, kitchen or bathroom fan, running water, clock, hairdryer, bubbling fish tank
- Laying the alert baby in a prone position and patting the baby's back

# Complications

- Recent evidence establishes a link between excessive crying early in life and preschool adaptive problems, attention-deficit hyperactivity disorder, and behavioral problems, but it has not proven a causal relationship
- In the long term, infants and newborns with colic may face an elevated risk of developing migraine headaches without aura by age 18
- Infants with colic are at significant risk of shaken baby syndrome

# Take home message

- Colic is benign and self-limiting
- Most infants resolve colic spontaneously, with no lasting effects
- There is no proven association between gender, formula-fed or breastfed infants, pre- or full-term birth, socioeconomic status, or birth order
- Breastfeeding to comfort a crying baby had a protective effect on the duration of partial but not exclusive or full breastfeeding (Howard et al., 2006).

THANK YOU

