# Infantile Colic


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- **In cases of vaginal birth, the infant is inoculated as he or she passes through the birth canal. This inoculum is a mixture of gram negative and gram positive bacteria, aerobes and anaerobes.**
- **At birth, the infant gut is an aerobic environment, which gradually becomes anaerobic over a period of days.**

- **The ideal infant intestinal colonization begins with oral inoculation by maternal vaginal microbiota.**

**For a vaginally-delivered newborn, the intestinal microbiota closely resembles the microbiota of the mother's vagina.**

- **In addition, maternal breast milk contains viable bacteria,**
- **Maternal gut, which serves as another source of bacterial diversity for the breastfeeding infant.**

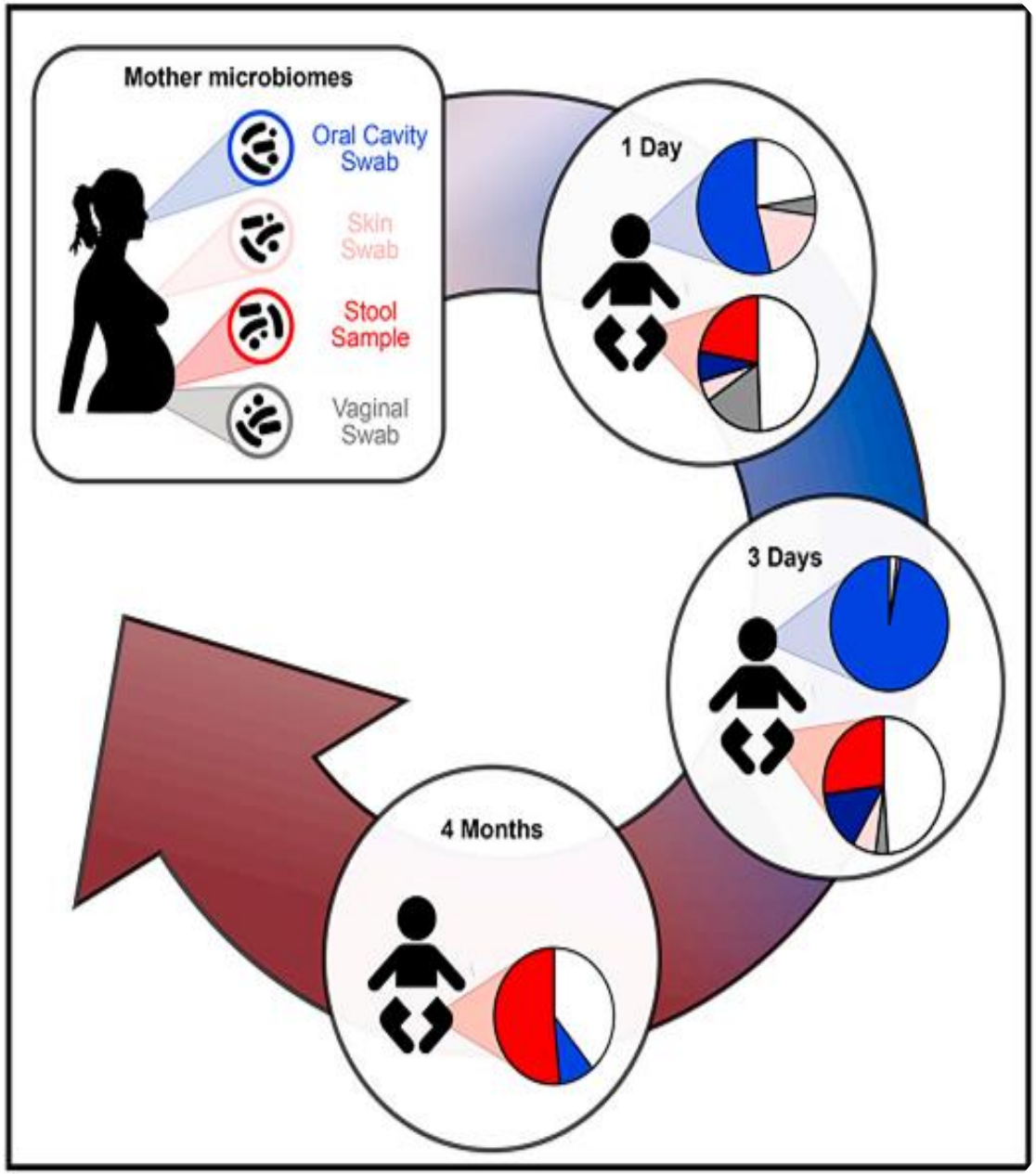
# Organisms?

- **Five potential maternal sources of microbial transmission : skin , breast milk , fecal , vaginal , and oral.**
- **The earliest colonizing bacteria, facultative aerobes including *Escherichia* and *Enterococcus*, eventually establish an anaerobic environment.**
- **Then enables the shift to obligate anaerobes, including *Clostridia*, Bacteroidetes, and especially *Bifidobacteria*.**

- These initial colonizing species have come to be recognized as a pioneer microbiome, one which educates the developing immune system and provides favorable conditions for colonization by subsequent microbes, through production of an anaerobic environment, favorable substrates for bacterial growth, and protection from the systemic immune system,

I. a rapid influx of microbes at birth followed by strong selection during the first few days of life.

II. Maternal gut strains proved more persistent in the infant gut and ecologically better adapted than those acquired from other sources.




Ferretti et al., 2018, Cell Host & Microbe24, 133–145

# Early development of the infant microbiome

- mode of delivery (Dominguez-Bello et al., 2010, 2016)
- Gestational age (La Rosa et al., 2014),
- Maternal and infant antibiotic usage

  (Lemas et al., 2016; Yassour et al., 2016)
- Feeding method (formula or breastfeeding)

  (Backhed et al., 2015)

# Immunonutrition

- Distribution of Microbiome

**Total Bacterial Counts (cfu/ml)**

| | |
|---|---|
| stomach | $0\text{-}10^3$ |
| jejunum | $0\text{-}10^5$ |
| ileum | $10^3\text{-}10^7$ |
| colon | $10^{10}\text{-}10^{13}$ |

Infant ~ $10^{10}$ organisms
(10,000,000,000)
About 60% of fecal mass
Over 400 species

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# Infantil Colic

- ✓ Traditionally, the definition of the Colic was based on the rule of three, that is, unexplained episodes of full-force crying for more than three hours per day for three days per week for at least three weeks. (Wessel 1954)
- ✓ A new definition has been proposed, which refers to a clinical condition of fussing and crying for at least one week in an otherwise healthy infant (Hyman 2006)
- ✓ paroxysms of irritability; fussing or crying that starts and stops without obvious cause; episodes lasting three or more hours per day and occurring at least three days per week for at least three weeks; and no failure to thrive (Rome III Mostafa 2008).
- ✓ It most often peaks during the second month of life, with a prevalence of up to 12%-40%.
- ✓ Symptoms typically resolve by three to six months of age.

# COLIC SYMPTOMS

Difficult to comfort

Excessive Crying

Grimacing/
Frowning

High pitched,
piercing sound

Red Face

Clenched Fists

Knees Drawn
Up to Chest

Excessive Gas

Worse in afternoon/evening
(but can happen anytime)

Typically peaks at about six weeks of age, and can be associated with significant parental guilt and frustration, as well as multiple physician visits.

Colic has been associated with postpartum depression and shaken baby syndrome.

**The incidence is equal between sexes, and there is no correlation with type of feeding (breast vs. bottle), gestational age (full term vs. preterm), socioeconomic status, or season of the year**

# Symptoms

- typically start in the second week of life, and usually resolve by three months of age.
- about 5% of colicky, crying infants do have a serious, underlying medical problem
- there is evidence that older children presenting with migraine are more likely to have been babies who had suffered colic (Romanello 2013)
- Infants who cry more than 3 months are at risk of adverse outcomes during school years, including anxiety , aggressive behaviors and hyperactivity, allergies, sleep disorders

# Etiopathogenesis

- The Etiopathogenesis of infantile colic remains undefined and is most likely multifactorial.
- It has been suggested that a number of behavioural factors (psychological and social) and biological components (food hypersensitivity or allergy, or both; gut microorganisms; dysmotility) can contribute to its manifestation

- **The evidence shows that about 25% of infants with moderate or severe symptoms have cows' milk, proteindependent colic, which improves after some days on a hypoallergenic diet**
- **Additionally, there is growing evidence that colic is 25% more prevalent in the babies of cigarette smokers and mothers who have used nicotine replacement in pregnancy and breastfeeding**

- ✓ **Some studies have identified lactose intolerance - due to a relative lactase deficiency as a possible causative factor in infant colic.**
- ✓ **There is growing evidence that the intestinal microbiota in colicky infants differ from those in healthy controls, since higher levels of anaerobic bacteria, such as coliform and E. coli, and a lower concentration of Lactobacilli have been reported in infants with colic.**

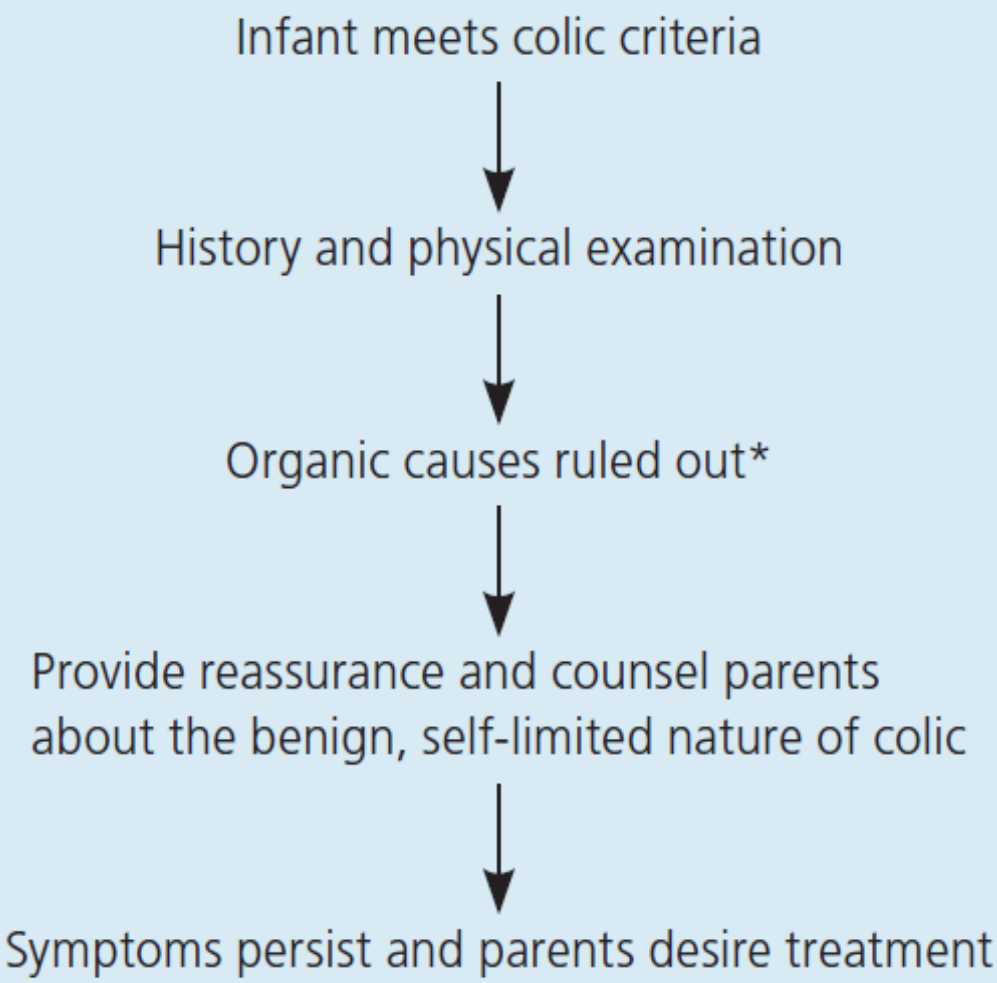
# Proposed causes of Colic

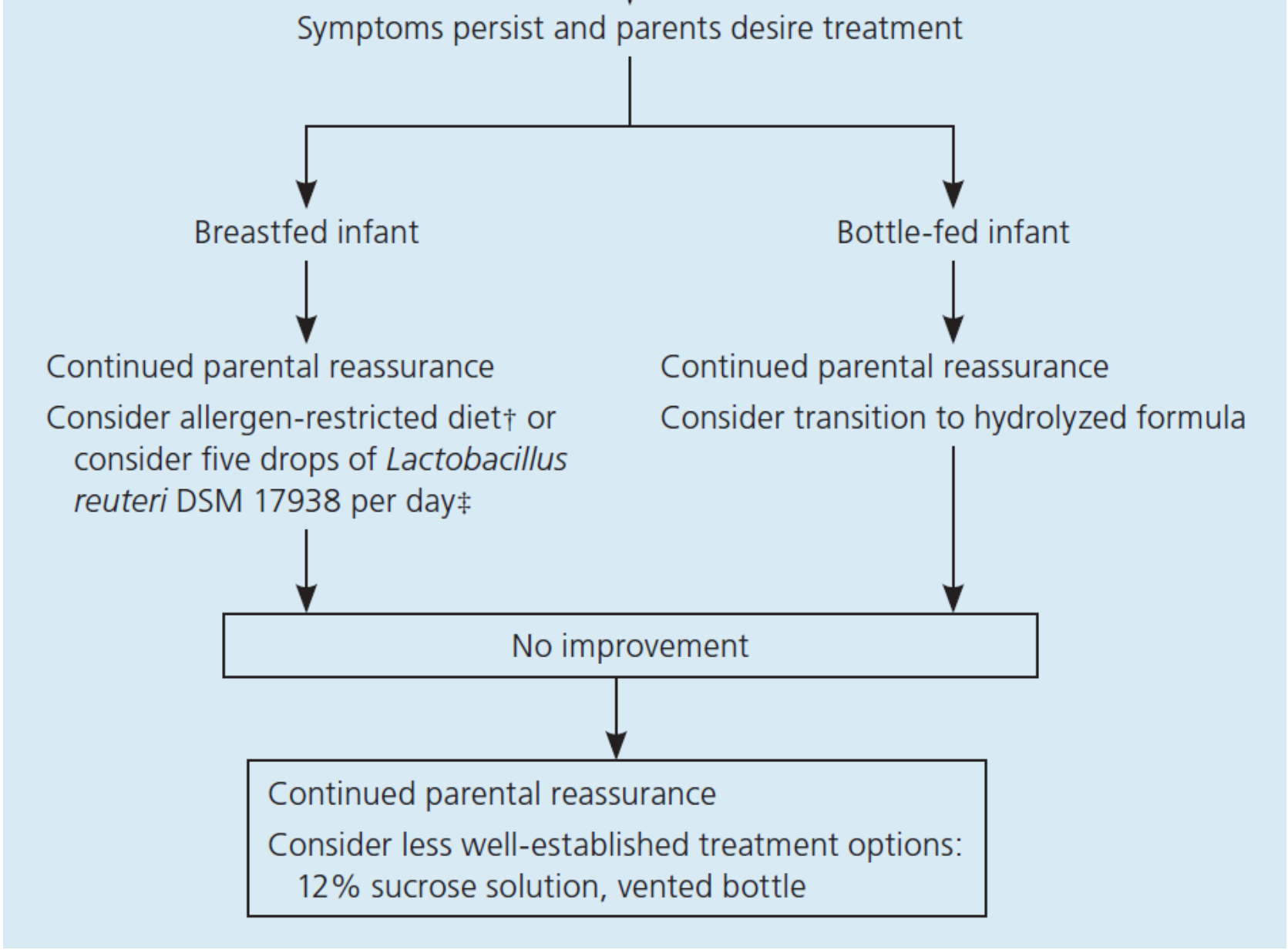
- alterations in fecal microflora,
- intolerance to cow's milk protein
- Lactose intolerance
- gastrointestinal immaturity
- Inflammation
- increased serotonin secretion
- poor feeding technique and
- maternal smoking or nicotine replacement therapy.

# Red Flags in the Evaluation of the Crying Infant

| *Finding* | *Possible cause* |
|---|---|
| Distended abdomen | Abdominal mass, hepatosplenomegaly, Hirschsprung disease, intestinal malrotation with volvulus, necrotizing enterocolitis |
| Fever | Acute otitis media, appendicitis, bacteremia, endocarditis, meningitis, osteomyelitis, pneumonia, sepsis, urinary tract infection, viral respiratory infection |
| Lethargy | Hydrocephalus, meningitis, sepsis, subdural hematoma |

# Treatment of Colic in Infants






***Restricted diet excludes cow's milk, eggs, peanuts, tree nuts, wheat, soy, and fish.***

## SORT: KEY RECOMMENDATIONS FOR PRACTICE

| *Clinical recommendation* | *Evidence rating* | *References* |
|---|---|---|
| Parents should be educated about the benign and self-limited nature of infantile colic. | C | 13 |
| The probiotic *Lactobacillus reuteri* (strain DSM 17938) may reduce crying in breastfeeding infants with colic. | B | 22, 23 |
| *L. reuteri* DSM 17938 should not be given to formula-fed infants with colic. | B | 8 |
| Elimination of allergens (e.g., cow's milk, eggs, fish, peanuts, soy, tree nuts, wheat) from the diet of breastfeeding mothers may relieve colic symptoms. | A | 15, 27 |
| Switching formula-fed infants to a hydrolyzed formula may improve colic symptoms. | A | 27 |

*A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, go to http://www.aafp.org/afpsort.*

# PHYSICAL THERAPIES

- A Cochrane review found insufficient evidence to support chiropractic or osteopathic manipulation, because many studies were small, Nonblinded, and had a high likelihood of bias.

# HERBAL SUPPLEMENTS

- **Herbal supplements, including *Mentha piperita* (peppermint) and various herbal teas (including fennel, chamomile, vervain, lemon balm, and licorice), have decreased crying time in some studies.**

# MEDICATIONS

- ***Simethicone*. Although simethicone drops are readily available and often used to treat colic, a systematic review of three randomized controlled trials found that they are no better than placebo**
- ***Dicyclomine*. Although a systematic review of three randomized controlled trials found that dicyclomine was significantly better than placebo for the treatment of colic, it is contraindicated in infants younger than six months .**

# DIETARY MODIFICATIONS

- **A systematic review of six studies supported the effectiveness of low-allergen diets in reducing colic.**

# Probiotics

- However, evidence is building around the effectiveness of prophylactically supplementing the newborn infant with probiotics to prevent colic and other symptoms.
- Additionally, evidence is accumulating on the safety of such an intervention.

# AUTHORS' CONCLUSIONS

- **There is limited evidence that prophylactic probiotics are more effective in preventing infantile colic than placebo or no intervention.**
- **There is some evidence that they may reduce key outcomes, such as crying time and evidence demonstrating a lack of adverse effects.**

- **The overall certainty of the evidence and strength of these conclusions is extremely limited due to sparse data, heterogeneity and risk of bias in the studies.**
- **Given this current synthesis, it is not possible to advise a change in practice. While the evidence is limited, it is important to note that these agents are available directly to families without physician involvement in many countries. Therefore, these findings may be important to discuss with families, to allow appropriate interpretation.**