

# The crying baby: what approach?

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## Purpose of review

Cry-fuss problems are among the most common clinical presentations in the first few months of life and are associated with adverse outcomes for some mothers and babies. Cry-fuss behaviour emerges out of a complex interplay of cultural, psychosocial, environmental and biologic factors, with organic disturbance implicated in only 5% of cases. A simplistic approach can have unintended consequences. This article reviews recent evidence in order to update clinical management.

## Recent findings

New research is considered in the domains of organic disturbance, feed management, maternal health, sleep management, and sensorimotor integration. This transdisciplinary approach takes into account the variable neurodevelopmental needs of healthy infants, the effects of feeding management on the highly plastic neonatal brain, and the bi-directional brain–gut–enteric microbiota axis. An individually tailored, mother-centred and family-centred approach is recommended.

## Summary

The family of the crying baby requires early intervention to assess for and manage potentially treatable problems. Cross-disciplinary collaboration is often necessary if outcomes are to be optimized.

## Keywords

breast-feeding, colic, infant, infant crying, infant feeding, sleep

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## Introduction

Cry-fuss behaviour, or excessive crying, is among the most frequent presentations in the first months of life, reported by one in five parents [1]. The problem is most usefully defined by parental perception and is a transient, neurodevelopmental phenomenon in otherwise healthy, full-term infants [2]. Neurodevelopmental maturity varies at birth between healthy individuals, and neonates are remarkably neuroplastic. Some infants, depending on temperament, neurodevelopmental maturity and adaptivity or other unknown factors, are more susceptible to the habituation of difficult-to-soothe, full-blown cries, quickly learning to by-pass precry cues [3,4]. Cue-based care and physical contact with the caregiver, when applied even moderately from birth, are associated with more settled infant behaviour in the first 12 weeks [5,6].

Infant problems of crying, feeding and sleeping which persist beyond the first few months of life are associated with adverse behavioural outcomes in later childhood. Persistent problems at 5 months have been estimated to occur in perhaps 5% of crying babies and may also be associated with a small but significant adverse effect on cognitive development [7<sup>••</sup>,8<sup>••</sup>,9]. Crying babies are also at increased risk of premature breast-feeding cessation

and child abuse [10,11]. Their mothers are at increased risk of postnatal depression [12]. These potential adverse effects in a significant minority of crying babies and their mothers emphasize the importance of early intervention.

Throughout the evolutionary history of species *Homo sapiens*, infants have received 'proximal' care, characterized by frequent waking in the night in expectation of parental co-regulation, close physical contact with a caregiver and unpredictable and frequent feeding at the breast, by which the infant self-regulates the mother's milk supply to match its variable need [13]. Evolutionary medicine teaches that novel environmental pressures quickly arise, however, to which the human organism is not adapted [14]. 'Distal' infant care, which emphasizes early independence, is an example of a novel environmental pressure, which became dominant in the west from the time of the Industrial Revolution. An evolutionary perspective makes sense of evidence that infants receiving 'distal' care are less likely to be settled [5,6]; that routinized, three to four-hourly feeds are associated with failure to thrive, cry-fuss behaviours and lactation failure [5,15,16]; and that attempts to train infants in the first months of life to sleep through the night do not help cry-fuss problems [17,18]. For the clinician, it is important to know that infant cry-fuss problems in the first

months of life emerge out of a complex interplay of cultural, psychosocial, environmental and biological factors [19<sup>••</sup>].

Clinicians and researchers may recognize that infant crying has multiple causes, but conceptualize the incidence of various contributing factors in a ‘diagnostic pie’ [20]. This approach assumes that predictable outcomes are achievable if each separate ingredient can be identified and treated, and fails to consider nonlinear relationships between interacting and co-evolving constituents [19<sup>••</sup>]. For this reason, programmatic, multi-component health interventions are regularly found to be less than successful on evaluation [21]. For example, high-quality randomized controlled trials (RCTs) have demonstrated that ‘The Period of Purple Crying’ and ‘The Happiest Baby’ programs fail to help – or paradoxically increase – parental stress and infant crying [22<sup>••</sup>,23].

This review maps the implications of new research for the clinical management of crying babies across five domains: organic disturbance, feed management, maternal health, sleep management and sensorimotor integration [24]. Out of this review, a culturally-sensitive, mother-centred approach is recommended, that

- (1) assesses early for treatable factors,
- (2) reassures families the problem is self-limiting,
- (3) informs parents of relevant evidence in each domain,
- (4) supports parents as they weigh up what they consider to be manageable or appropriate strategies to experiment with, in their own unique context
- (5) collaborates cross-professionally with feeding experts, and perinatal and infant mental health experts, as necessary and
- (6) plans regular follow-up.

### Organic disturbance

Organic problems are implicated in 5% of afebrile unsettled babies. A careful history is needed, and a thorough physical examination. Because urinary tract infection is the most commonly occurring physical problem, urine analysis is mandatory [25]. But, unless other indications emerge, further investigations are not warranted.

The prevalence of the diagnosis of gastro-oesophageal reflux disease (GORD) in crying babies has increased dramatically over the past two decades. However, there is no evidence that the cluster of signs commonly attributed to ‘reflux’ in the first months of life, that is, crying, failure to thrive, feeding refusal, regurgitation, sleep disturbance, back-arching, flexion of knees and hips, tense

### Key points

- New evidence that excessive crying in the first months of life is associated with adverse outcomes in some mothers and babies emphasizes the importance of early intervention.
- There is no indication for proton pump inhibitors in crying babies in the first months of life and a credible concern that proton pump inhibitors predispose to food allergies.
- Early assessment for feeding difficulty and perinatal anxiety and depression is essential and cross-professional collaboration with feeding and perinatal and infant mental health experts may optimize outcomes.
- Babies who receive cue-based care and physical contact even in moderate amounts from birth are more settled.

abdomen and clenched fists, correlate with acid-peptic GORD. Each of these has other explanations, or is a normal sign of infant distress, not necessarily – or even usually – of pain [26,27<sup>••</sup>,28,29]. Vomiting, after pyloric stenosis, cow’s milk allergy (CMA) or other gastrointestinal disease has been excluded, is a normal phenomenon that occurs frequently and in up to 50% of infants, peaking at 4 months of age. Refluxate is pH neutral for 2 h after a feed, due to the buffering effect of milk [30]. Two consensus statements by international committees of paediatric gastroenterologists conclude that acid-peptic GORD is not a cause of cry-fuss or sleep problems under 3–4 months of age [31,32]. The hypothesis that inappropriate use of proton pump inhibitors (PPIs) in crying babies predisposes to food allergy is highly credible [33,34], yet PPIs and other interventions continue to be inappropriately prescribed for GORD in crying babies in the first months of life [30,35<sup>••</sup>].

CMA, the most common food allergy in infants, is linked with infant cry-fuss problems, particularly in its non-IgE-mediated form, although the prevalence in this population is yet to be determined [36–40]. In an exclusively breast-fed, crying baby, the diagnosis of CMA is confirmed by a 2-week maternal cow’s milk protein elimination diet; breast milk substitution is not indicated. In a formula-fed baby with cry-fuss problems, hypoallergenic formula may help [40]. Studies cited to support the claim that eosinophilic oesophagitis or food allergies (other than CMA) are associated with unsettled infant behaviour either have been conducted with toddlers and older children [41] or have significant methodological flaws [42]. There is no convincing evidence that food allergy, other than CMA, occurs in babies in the first weeks and months of life. There is no evidence that low-allergen diets for breast-feeding mothers resolve parent-reported

crying, other than in the case of maternal elimination of dietary cow's milk protein.

New studies demonstrate that crying babies have higher levels of the inflammatory marker faecal calprotectin, less diverse fecal microflora and increased levels of gas-producing coliform bacteria [43–45]. A randomized, double-blind, placebo-controlled trial shows that, in 'colicky' breast-fed babies whose mothers are on a cow's milk protein elimination diet, crying is reduced by administration of the probiotic *Lactobacillus reuteri* [46\*\*]. This organism is also found in breast milk and modulates gut motility. These findings of positive effects of *L. reuteri* are exciting, but breast-feeding management (in particular, functional lactose overload) may be a confounder. Moreover, stress affects gut motility; altered gut motility causes changes in the gut microflora; stress also affects gut inflammatory markers and the permeability of the gut epithelium. These results need to be interpreted in the context of the bidirectional interactions of the brain–gut–enteric microbiota axis [47\*,48,49\*]. *L. reuteri* is not universally available for clinical use and trials are continuing.

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### Feed management

Persistent feeding difficulties are related to excessive infant crying in the first few months of life. Societies that offer more 'proximal' care, which includes cue-based breast-feeding and moderate levels of physical contact, are likely to have more settled babies [5,6]. Other studies show that cue-based breast-feeding is more likely to be successful [15,16] and that breast-feeding mothers respond more sensitively to infant distress [50,51]. Successful breast-feeding protects against feeding problems at 5 months of age [52\*], and babies with crying, feeding or sleeping problems persistent at 5 months of age are more likely to have feeding problems in later childhood [8\*\*,9,52\*]. These findings concerning feeding difficulties and crying infants should be interpreted in light of evidence that many doctors, nurses and midwives – including those with positive attitudes to breast-feeding – remain unaware of their knowledge deficits concerning identification and management of lactation problems [53\*,54\*,55\*]. Inadequate breast-feeding management and poor definitions concerning breast-feeding are significant confounders of crying baby research [56].

High-volume breast-feeds with low fat content may result in functional lactose overload in breast-fed babies in the first weeks and months, causing poor satiety, low-grade intestinal inflammation and an irritable hungry infant with tympanic abdomen, excess flatus and frequent, explosive stools [57]. It is resolved with appropriate breast-feeding management [58]. Functional

lactose overload is not to be confused with congenital lactose intolerance, which is rare. Babies may acquire transient, secondary lactose intolerance from damage to the intestinal villi, most commonly caused by gastroenteritis or CMA but perhaps also by functional lactose overload [58]. Weaning is not indicated in breast-fed babies with secondary lactose intolerance, although probiotics and CMA maternal elimination diet may have a role. In formula-fed infants, secondary lactose intolerance may respond to lactose-free formula. Formula-fed babies with CMA who are mistakenly diagnosed with lactose intolerance could experience perpetuation of their gut lesion, if the lactose-free formula contains cow's milk protein.

Other breast-feeding difficulty, including problems of attachment and positioning, poor suck–swallow–breath coordination, oral motor dysfunction, ankyloglossia, and sensory processing problems, may interfere with self-organizing neurohormonal and autocrine feedback loops, causing cry-fuss behaviours, failure to thrive or both, and these problems also remain underidentified and under-researched [59–62]. It is likely, due to the highly plastic feedback loops in the infant brain, that unidentified and unmanaged feeding difficulties entrench cry-fuss behaviours and aversive feeding behaviours in some infants. Aversive feeding behaviours may result in maternal anxiety, disrupted maternal–infant interactions and long-term feeding problems [63,64].

Mothers of crying babies in the first weeks to months should not hesitate to offer feeding in response to precry cues, as it is not possible to reliably distinguish between tired, bored or hungry cues at this age. Once the problem of functional lactose overload has been addressed with appropriate breastfeeding management, a baby cannot be overfed at the breast, and cue-based breast milk substitution also enhances mother–infant bonding [65]. Crying babies with feeding problems or whose mothers complain they feed overly frequently require prompt intervention by a feeding expert. Breast milk substitution subjects infants to health risks [66], including, for example, CMA and increased infections in the first year of life [67,68], and is not indicated in these infants.

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### Maternal health

Assessing mothers of crying babies for psychosocial risk factors and perinatal anxiety and depression is essential. There are well established links between infant regulatory problems in the first months postpartum, psychosocial stressors and perinatal anxiety and depression [12,52\*, 69\*\*,70,71]. Paternal depression during pregnancy is also related to excessive crying at 2 months [72]. Physical complications in the mother after childbirth, planned

resumption of work at 15–16 weeks, older maternal age and having a first child have also been implicated in cry-fuss problems [69\*\*]. A rapidly growing body of evidence, arising out of hormonal parameters and functional brain imaging, is elucidating the neural bases of maternal and infant behaviour. This research emphasizes the importance of maternal sensitivity to infant cues for children's physiological, cognitive and social–emotional growth; conversely, maternal depression negatively affects an infant's neuroendocrine and neurodevelopmental adaptation [73–75]. But the cues of a crying baby are notoriously difficult to read, and early referral to perinatal and infant mental health experts, who can support parent–infant interactions, is often indicated [76]. Instructing parents to place the crying baby in a safe place and walk away if they feel at risk of harming the crying baby is a recommended strategy for reducing the risk of child abuse [23].

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### Sleep management

Cue-based breast-feeding and co-sleeping (i.e. in the same room as caregivers) from birth decrease infant crying in the first 3 months of life [5]. Co-sleeping, in the mandatory supine position, facilitates the exchange of sensory data between caregiver and child and is safest for babies in the first months of life [77,78]. Young infants are also safest co-sleeping in the same room as the parent during the day [79], a practice that helps consolidate sleep in the nocturnal segment of the diurnal period [80].

Infants who cry excessively at 5–6 weeks do not wake more at nights at 12 weeks than other infants [81\*\*]. At 12 weeks of age, only 37% of infants sleep for 8 hours without waking their parents most nights [82]. Although there is significant concern about sleep problems in infants from the second half of the first year of life onwards, because of links with perinatal anxiety and depression and adverse infant outcomes [83], these sleep problems are separate from and not linked with unsettled infant behaviour in the first few months of life [81\*\*]. Two RCTs have found that parent delivery of a behavioural sleep intervention for babies in the first 3 months of life did not decrease crying [17,18], and the weight of the evidence is strongly towards the positive effects of mother–infant reciprocity rather than behavioural management in unsettled babies in the first weeks and months of life.

Breast-feeding is more likely to be successful if mother and baby co-sleep. There is no evidence that parents of breast-fed infants have less total sleep at night than parents of infants receiving formula [84]. Co-sleeping and breast-feeding are associated with more night-waking when the baby is older than 12 weeks, though this is

not associated with later adverse effects in breast-fed babies [52\*]. In older infants, sleeping problems are amenable to behavioural approaches [83].

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### Sensorimotor integration

Inadequate opportunity for sensory and motor nourishment compromises optimal development of brain architecture [85,86]. Sensory stimulation in the form of skin-to-skin contact from birth promotes self-regulation in the neonate [87–90]. Carrying is a rich source of sensorimotor stimulation and physical contact from birth – even in modest amounts, at levels a family decides is manageable and appropriate for them – combined with relaxed, cue-based care is associated with more settled behaviour in infants [5,6].

A small number of crying babies may have sensory over-responsivity to touch, movement or sound and require referral to a paediatric occupational, speech or physical therapist [62]. Chiropractic and craniosacral therapy have not been found to be efficacious in this population [91,92]; nor is there evidence that any other form of complementary or alternative medicine makes a difference [93]. Parents of crying babies may find that infant massage with moderate touch has some benefit [94,95], and swaddling – once satiety is assured and safe swaddling practices taught – helps settle some babies [96]. There is no evidence that pacifier use interferes with prevalence or duration of breast-feeding in motivated mothers [97].

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### Conclusion

New evidence that crying in the first months of life is associated with adverse outcomes for some mothers and babies emphasizes the importance of early intervention. The positive effects of administration of *L. reuteri* in crying breast-fed babies emphasizes the complexity of interactions between the crying infant's brain, gut, gut microbiota and feeding management. Simplistic solutions, such as use of PPIs, may be associated with unintended consequences. Crying babies and their mothers should be assessed for psychosocial risk factors, feeding problems and perinatal anxiety and depression. Cross-professional collaboration with feeding experts and perinatal and infant mental health experts is important if outcomes for crying babies and their families are to be optimized.

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### Conflicts of interest

None declared.

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- of outstanding interest

Additional references related to this topic can also be found in the Current World Literature section in this issue (p. 577).

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