Complementary, Holistic, and Integrative Medicine: Colic

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Introduction

According to the Wessel criteria, infantile colic is defined as excessive crying for more than 3 hours a day at least 3 days a week for 3 weeks or more in an otherwise healthy baby. (1) As many as 26% of infants are diagnosed with colic, (2) making the condition one of the most common reasons for infant visits to primary care practitioners today. Colic is a self-limiting condition that resolves in approximately 50% of cases at about 3 months of age. (3) Due, in part, to poor understanding of its causes, (2) there is no widely accepted conventional treatment, and families often turn to complementary and alternative medical (CAM) therapies. (4) The largest systematic review to date of treatments for colic found little evidence to support many conventional therapies, while noting that some nutritional- and botanical-based approaches were relatively safe and effective. (5) This review of published scientific literature assesses the efficacy and safety of common CAM therapies in treating infantile colic.

Natural Health Products

Natural health products have been used historically to treat infantile colic, due, in part, to presumed antispasmodic and anti-inflammatory activity. (6)(7) However, few of these products have been assessed in terms of efficacy and safety for use in infants through well-designed clinical trials.

Fennel Seed Oil

The effectiveness of fennel (Foeniculum vulgare) seed oil in treating infantile colic was investigated in a randomized controlled trial (RCT) in Russia of 125 colicky infants between the ages of 2 and 12 weeks. (8) Infants were assigned randomly to receive 5 to 20 mL of a 0.1% fennel seed oil emulsion and 0.4% polysorbate-80 or a placebo (0.4% polysorbate-80 in water) up to four times per day for 1 week. Parents recorded symptoms in a diary for 3 weeks that included the week before, the week during, and the week after the trial. The primary outcome measure was a decrease in cumulative crying to fewer than 9 hours per week. At the end of the study, colic symptoms had improved significantly in 40 of 62 (65%) infants from the fennel group compared with 14 of 59 (24%) infants in the placebo group (P<0.01). No adverse effects were reported in this study. However, fennel may cause allergic reactions of the skin (rashes) and respiratory tract (asthma and breathing difficulties). Fennel also has been reported to cause seizures. (6) The safety of using fennel long-term is unknown.

Botanical Blends

The efficacy of an herbal tea containing fennel, chamomile, vervain, licorice, and lemon balm to treat colic was investigated in an RCT of 68 Israeli infants ages 2 to 8 weeks. (9) Over a 7-day period, up to a 150-mL dose of herbal tea was offered to infants in the intervention group at the onset of a colic episode up to a maximum of three times a day. The actual average daily intake was two servings per day for a cumulative total of...
approximately 90 mL/d. The control group received a placebo tea (a mixture of glucose and unspecified natural flavorings) that had the same taste, odor, and appearance as the herbal tea. Parents reported that crying was reduced to fewer than 3 hours daily in 57% of infants in the intervention group compared with 26% in the control group ($P<0.01$). This study did not report on adverse effects of herbal tea consumption and the impact, if any, on infants’ nutritional intake. Long-term safety of this herbal combination is unknown.

An Italian RCT examined the efficacy of another herbal preparation in treating breastfed colicky infants ages 21 to 60 days. (10) Each dose consisted of the following standardized extracts: sweet fennel fruit powder extract (PE) standardized to 0.05% to 0.1% essential oil, chamomile flower PE standardized to 0.3% apigenin, lemon balm essential oil standardized to 2% rosmarinic acid, 0.85 mg of vitamin B$_1$, 3.24 mg of calcium pantothenate, and 1.20 mg of vitamin B$_6$. Parents administered 2 mL/kg per day of the herbal preparation twice a day before feeding for 7 days to children in the intervention group (n=41). The control group (n=47) was given a placebo consisting of reverse osmosis-filtered water, fructose, pineapple flavoring, citric acid, and potassium sorbate. Average daily crying time was reduced from about 200 min/d to 76.9 min/d in the treatment group and from about 200 min/d to 169.9 min/d in the placebo group ($P<0.005$). Crying time was significantly reduced in 85% of infants in the intervention group compared with slightly less than 50% of the control group ($P<0.005$). These findings suggest that this standardized herbal preparation relieves infantile colic symptoms. No adverse events were reported in this study; long-term safety is unknown.

**Probiotics**

Probiotics have been defined as “a preparation of or a product containing viable, defined microorganisms in sufficient numbers, which alter the microflora (by implantation or colonization) in a compartment of the host and by that exert beneficial health effects in this host.” (11) These microorganisms colonize the intestinal tracts of infants during the birth process and shortly thereafter. They have been implicated in promoting immunologic balance and digestive health. (12)(13)(14) Savino and associates (15)(16) described quantitative and qualitative differences in probiotic species in colicky versus non-colicky infants.

Most recently, the same research group published results of a trial of *Lactobacillus reuteri* compared with simethicone in the treatment of infantile colic. (17) In this trial, 90 exclusively breastfed colicky infants between 21 and 90 days of age were randomized to either probiotic *L reuteri* (10$^9$ live bacteria per day) or simethicone (60 mg/d) for 28 days. Mothers were instructed to avoid all sources of cow milk during the trial. At the start of the study, both groups of infants reportedly cried for approximately 200 min/d. The probiotic treatment group had a significantly reduced crying time by only 7 days into the trial (159 min/d versus 177 min/d in the simethicone group), a disparity that widened at weeks 2, 3, and 4 (51 min/d versus 145 min/d). At the endpoint of the study, 95% of the probiotic treatment group were considered “responders” (ie, no longer met Wessel criteria) compared with only 7% of the simethicone group. No significant adverse effects were reported.

The use of probiotics in healthy individuals generally is safe, but incidents of bacteremia/septicemia, pneumonia, and meningitis have been documented in immunocompromised and severely debilitated patients. (18)(19)(20)(21)(22) Similar adverse events were documented in two pediatric case reports in which *Lactobacillus GG* (10 billion colony-forming units/d) caused bacteremia. (20) Probiotic use should be discussed with the child’s physician because probiotic safety is relative rather than absolute.

**Nutritional Modulation**

Nutritional modulation is one of the few potentially preventive and therapeutic options for infants who have colic. It does not appear that breastfeeding exclusively prevents colic, (23) but it has been observed that certain foods (eg, cruciferous vegetables, chocolate) ingested by breastfeeding mothers may lead to excessive infant irritability. (24)(25) Although there is no clear consensus on avoidance of these foods for allergy prevention, (26) Hill and colleagues (27) demonstrated via an RCT that exclusion of certain allergenic foods (cow milk, soy, wheat, eggs, peanuts, tree nuts, and fish) was positively associated with a reduction in colic in breastfed infants. In their investigation, 107 infants (mean age, 5.7 weeks) presenting with excessive irritability (average crying time more than 300 min/d) were randomized to a 1-week trial of maternal low-allergen diet versus control (nonelimination) diet. At the completion of the trial, 74% of treated infants were crying/fussing less frequently compared with 37% of the control group.

Whey hydrolyzed formula (hypoallergenic formula) has been shown in a small RCT to be more effective than nonhydrolyzed cow milk formulas in reducing crying times in colicky babies (Table 1). (28) A 2000 report from the American Academy of Pediatrics Committee on
Nutrition recommended the use of hypoallergenic formula for infants who have allergies and a trial of hypoallergenic formula for severe colic. (29) A cost-benefit analysis of hypoallergenic-labeled infant formulas is needed because they cost up to three times more than standard formulas. (29)

Evidence is insufficient to support the use of casein hydrolyzed formula, soy, or partially hydrolyzed formulas as therapies for colic (Table 1). (29)(30)(31)(32)(33)(34)(35)(36) Soy infant formula has a high phytoestrogen content, which may pose a risk to future fertility and sexual development. (37) Because of this effect, the Chief Medical Officer in England has recommended that soy infant milk formula not be the first choice for treatment of infants who have lactose intolerance or cow milk sensitivity. (38)

A small Norwegian crossover RCT examined the analgesic effect of sucrose on infant colic (n=19). (39) Parents gave infants 2 mL of 12% sucrose solution (intervention) or 2 mL of distilled water (control) after persistent crying and failed attempts to console the infant. Parents reported that symptoms improved in 63% of the infants given sucrose and in only one child (5%) given placebo (P<0.01). In this study, the observed benefit of

Table 1. Summary of Nutritional Interventions

<table>
<thead>
<tr>
<th>Authors</th>
<th>Study Type</th>
<th>Population</th>
<th>Intervention</th>
<th>Control</th>
<th>Outcome</th>
<th>Adverse Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lucassen (28)</td>
<td>Randomized, double-blind, parallel trial</td>
<td>43 healthy, formula–fed infants ages younger than 24 wk</td>
<td>Hypoallergenic whey hydrolysate formula milk</td>
<td>Standard cow milk formula</td>
<td>Decreased duration of crying by 63 min/d</td>
<td>None reported</td>
</tr>
<tr>
<td>Forsythe (33)</td>
<td>Randomized double-blind, multiple crossover trial</td>
<td>17 infants ages younger than 8 wk</td>
<td>Hypoallergenic casein hydrolysate formula milk</td>
<td>Standard cow milk formula</td>
<td>No notable difference in incidence of colic between groups</td>
<td>None reported</td>
</tr>
<tr>
<td>Hill et al. (32)</td>
<td>Randomized double-blind, placebo–controlled trial</td>
<td>115 infants ages 4 to 16 wk</td>
<td>Hypoallergenic casein hydrolysate formula milk</td>
<td>Modified cow milk formula</td>
<td>Number of bottle-fed infants too small to determine effect on the bottle-fed subgroup</td>
<td>None reported</td>
</tr>
<tr>
<td>Campbell (34)</td>
<td>Randomized, double-blind, placebo–controlled crossover trial</td>
<td>19 infants ages 3 to 14 wk</td>
<td>Soy formula milk</td>
<td>Standard milk formula</td>
<td>Duration of colic symptoms significantly reduced with soy milk (P&lt;0.01)</td>
<td>None reported</td>
</tr>
<tr>
<td>Evans et al. (35)</td>
<td>Double-blind, placebo–controlled crossover trial</td>
<td>20 exclusively breast–fed infants ages 3 to 18 wk, who had persistent colic</td>
<td>Soy formula milk consumed by the breastfeeding mother</td>
<td>Cow milk consumed by the breastfeeding mother</td>
<td>No beneficial effects on the incidence of colic</td>
<td>None reported</td>
</tr>
<tr>
<td>Lothe et al. (36)</td>
<td>Double-blind crossover study</td>
<td>60 infants ages 2 to 12 wk</td>
<td>Soy formula milk</td>
<td>Cow milk formula</td>
<td>Colic symptoms disappeared in 11 infants (18%) 48 h after receiving soy formula but not after receiving cow milk formula. In 32 infants (53%), the symptoms were unchanged on soy and cow milk formula.</td>
<td>Eight infants had adverse reactions caused by other types of food, two had a severe form of multiple food intolerance, and two reacted to soy oil</td>
</tr>
</tbody>
</table>
sucrose seems to have been short-lived (<30 min), which may indicate that it is not a practical treatment. (5) Although no adverse effects were reported, those considering using sucrose should not substitute honey because unpasteurized honey may cause botulism in infants. (40)

**Manipulative Therapies**

**Chiropractic**
The World Federation of Chiropractic defines chiropractic as “a health profession concerned with the diagnosis, treatment, and prevention of mechanical disorders of the musculoskeletal system, and the effects of these disorders on the function of the nervous system and general health.” (41) Chiropractic manual treatments include vertebral adjustment and other joint and soft-tissue manipulation. Very few reliable data are available regarding the safety of using spinal manipulation in pediatric populations. (42) The Canadian Coordinating Office for Health Technology Assessment assessed the sum of evidence on spinal manipulative therapy (SMT) in the treatment of infantile colic in a systematic review of three randomized controlled trials. (43) These three trials were believed to suffer from significant methodologic flaws. Two (44)/(45) of the trials reported SMT to be effective in treating colic, but the third and largest study (46) found it to be of no benefit (Table 2). At this point, it is not possible to conclude that chiropractic care is an effective treatment for colic. More RCTs are needed to determine the safety and efficacy of chiropractic adjustments in treating colic.

**Osteopathy**
The World Osteopathy Health Organization defines osteopathy as a “system of healthcare which relies on manual contact for diagnosis and treatment.” (47) It emphasizes the structural and functional integrity of the body and the body’s intrinsic tendency for self-healing. One United Kingdom study has investigated the efficacy of osteopathic treatment for infantile colic. (48) In this open, controlled, prospective study, 28 colicky infants were randomized to receive either individualized cranial osteopathic manipulation by the same osteopath once weekly for 4 weeks or to receive no treatment (control). Time spent crying, sleeping, and being held or rocked was recorded in a parent-completed diary. Children in the intervention group had reduced crying (63% compared with 23% for controls) and improved sleeping (11% compared with 2% for controls). Children in the intervention group also required less holding/rocking. No adverse events were reported. These findings suggest that cranial osteopathic treatment benefits some infants who have colic. Confirmatory, larger clinical trials and cost-benefit analyses are needed before general public policy recommendations about osteopathic treatment for colic can be made.

**Table 2. Summary of Chiropractic Interventions**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Study Type</th>
<th>Population</th>
<th>Intervention</th>
<th>Control</th>
<th>Outcome</th>
<th>Adverse Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiberg et al. (45)</td>
<td>Randomized controlled trial</td>
<td>50 infants ages 2 to 10 wk</td>
<td>Spinal manipulative therapy applied with light finger tips</td>
<td>Infants given the drug dimethicone</td>
<td>At days 8 to 11, crying reduced by 2.7 h in treated group compared with 1 h in control group ($P=0.004$)</td>
<td>Symptoms reported to have worsened in four infants from the dimethicone group</td>
</tr>
<tr>
<td>Olafsdottir et al. (46)</td>
<td>Randomized controlled trial</td>
<td>86 infants ages 3 to 9 wk</td>
<td>Spinal manipulative therapy applied with light finger tips</td>
<td>Infants held for 10 min by the nurse</td>
<td>No improvement</td>
<td>None reported</td>
</tr>
<tr>
<td>Mercer et al. (44)</td>
<td>Pilot randomized controlled trial</td>
<td>30 infants ages 0 to 8 wk</td>
<td>Spinal manipulative therapy</td>
<td>Treated with a nonfunctional detuned ultrasonography machine</td>
<td>Colic symptoms resolved in 93% of infants who had received up to six treatments during 2 wk</td>
<td>None reported</td>
</tr>
</tbody>
</table>
Massage
A Finnish RCT compared the effectiveness of infant massage (n=28) with the use of a crib vibrator (n=30) in treating colicky infants younger than 7 weeks of age over a 4-week period. (49) The massage group of infants received parent-administered gentle stroking of the skin over the head, body, and limbs using olive oil and maintaining eye contact three times per day. The crib vibrator was used for 25-minute periods three times daily on the control group. At the end of the study, parents reported similar reductions in total crying: a mean decrease of 48% in the massage group and 47% in the vibrator group. A 2006 Cochrane Database Systematic Review of the effectiveness of infant massage in promoting physical and mental health in infants concluded that there is evidence of benefits on mother-infant interaction, infant sleeping, and crying but noted that more rigorous RCTs are needed before infant massage can be recommended routinely for treating colic. (50)

Education and Behavioral Interventions
Parent education and behavioral management have been evaluated for treatment of infantile colic. Keefe and associates (51) demonstrated in an RCT of 121 term infants (2 to 6 weeks old) that a 4-week home-based behavioral intervention was more effective than routine care in reducing parenting stress. The treatment group cried, on average, for 1.7 hours less per day than the control group (P=0.02). Dihigo (52) evaluated behavior modification in treating colicky infants. Twenty-three infants were assigned randomly to intervention, nonintervention, and control groups. Crying diaries kept by the parents were used to obtain quantitative measurements of crying before and after intervention. Among infants whose parents received individualized counseling and education interventions, crying was reduced significantly from nearly 4 hours to slightly more than 1 hour per child (P<0.05). Parkin and colleagues (53) found no significant difference in average daily hours of crying in a 2-week RCT comparing three interventions for colic (reassuring mothers, providing mothers with focused counseling, and giving infants car ride simulation) in 38 mother-infant pairs (mean infant age, 6.8 wk).

Conclusion
Evidence from small, often pilot studies indicates potential benefit in integrating specific CAM therapies to treat infantile colic. Specific therapies that have promise include some natural health products, nutritional modulation, cranial osteopathy, infant massage, and parental behavioral training. Questions remain regarding both the safety and efficacy of these therapies for the treatment of infantile colic. Larger confirmatory trials are needed to assess safety and cost-effectiveness before routine use of these therapies for colic can be recommended.

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Clarification
In the Complementary, Holistic, and Integrative Medicine: Butterbur article that appeared in the June 2007 issue of Pediatrics in Review, review of a study that examined the effects of butterbur treatment in asthma on page 235 states that 50 g of butterbur extract was administered three times daily. That dose was incorrect. The correct dose is 50 mg.
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