Should we advise parents to administer over the counter cough medicines for acute cough? Systematic review of randomised controlled trials

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Aims: To determine the effectiveness of over the counter (OTC) cough medicines for acute cough in children.

Methods: Systematic review of randomised controlled trials (RCTs). An all language search of the Cochrane Acute Respiratory Infections Group specialised register, Cochrane Controlled Trials Register, Medline, Embase, and the UK Department of Health National Research Register was performed. RCTs comparing oral OTC cough preparations with placebo in children suffering from acute cough as a result of upper respiratory tract infection (URTI) in ambulatory settings, using cough symptoms as an outcome, were included.

Results: Six trials involving 438 children met all inclusion criteria. Antitussives, antihistamine-decongestant combinations, other fixed drug combinations, and antihistamines were no more effective than placebo in relieving symptoms of acute cough. Based on a single study, the mucolytic preparation letosteine was superior to placebo, with differences in cough scores ranging from 0.1 to 0.3 points from day 4 to day 10. Most drugs appeared to be well tolerated with a low incidence of mostly minor adverse effects.

Conclusion: OTC cough medicines do not appear more effective than placebo in relieving symptoms of acute cough. Even if statistically significant, effect sizes were small and of doubtful clinical relevance. The number of trials in each category was small, and the results of this systematic review have to be interpreted with caution. Based on the available evidence from a small number of studies, we cannot recommend OTC cough medicines as a first line treatment for children with acute cough.

METHODS

Searching
We identified original randomised controlled trials (RCTs) by searching the Cochrane Acute Respiratory Infections Group specialised register, the Cochrane Controlled Trials Register, Medline, Embase, and the UK Department of Health National Research Register. We included all language RCTs comparing oral OTC cough preparations with placebo in children suffering from acute cough as a result of upper respiratory tract infection (URTI) in ambulatory settings, using cough symptoms as an outcome.

Abbreviations: NHS, National Health Service; OTC, over the counter; RCT, randomised controlled trial; URTI, upper respiratory tract infection.
Search strategy*

cough

#1 or #2

antihistamines* ME

#10

(cough: common next cold)
colds

#11 or #12 or #13 or #14

antitussive*

expectorant*

anticholinergic*

suppressant*

mucolytic*

[drug next combinations]

over-the-counter

non-prescription*

#15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23

#11 or #25

*for searching the Cochrane Controlled Trials Register.

We used slightly amended versions for searching Medline and Embase databases.

Study selection and validity assessment

We selected studies for review if: (1) the population of interest was composed of children and adolescents (less than 16 years of age) with acute cough (less than three weeks' duration) as a result of URTI in an ambulatory setting; (2) the interventions were OTC cough preparations; (3) a reported outcome was cough (for example, frequency, duration); and (4) studies were RCTs with a contemporaneous control group receiving a placebo.

We excluded studies if: (1) they tested OTC cough medicines in chronic cough (more than three weeks' duration or caused by a chronic underlying disease such as asthma or tuberculosis); (2) cough was induced artificially in healthy volunteers; (3) they used non-conventional (for example, herbal or homoeopathic) or non-oral preparations.

We (KS and TF) screened potentially relevant citations independently and applied the selection criteria using an in/out/pending sheet in duplicate. We resolved any differences at any stage of the review through discussion. To be included a study had to meet all our inclusion criteria. We extracted data and assessed the quality of studies independently. We contacted investigators for additional information if necessary and obtained translations of abstracts or papers written in languages other than English or German. We were not masked with regard to trial authors or journals and instead of applying a trial quality score, we listed data on potential sources of bias such as randomisation, blinding, and follow up in a separate table (Table 2).
single dose for three nights of dextromethorphan and codeine

One study involving 57 children with night cough compared a

Antitussives
reported by the parents using cough scores. Four studies
Cough outcomes included frequency and severity and were
trials in each group ranged from one to a maximum of two.
we grouped into five drug classes (see table 1). The number of
Table 3 summarises the characteristics of included RCTs which
Study characteristics
criteria (fig 1).

We evaluated 328 citations and abstracts from all sources, of

RESULTS
Trial flow
We evaluated 328 citations and abstracts from all sources, of
which six trials involving 438 children met all our inclusion
Study not testing over-the-counter cough medicine: n = 86
Cough artificially induced: n = 26
Chronic cough lasting more than three weeks: n = 65

RCTs included in the review: n = 6
Figure 1 Progress through the stages of the systematic review.

Individual RCTs were of variable methodological quality with
outcome measures, making them difficult to compare.
populations, interventions (drugs, doses, and frequency) and
small. Studies were very different with regard to settings,
with caution, as the number of trials in each category was
The results of this systematic review have to be interpreted
Study limitations and potential sources of bias
The results of this systematic review have to be interpreted
with caution, as the number of trials in each category was
small. Studies were very different with regard to settings,
populations, interventions (drugs, doses, and frequency) and
outcome measures, making them difficult to compare.
Individual RCTs were of variable methodological quality with
respect to randomisation, blinding of outcome assessment,
and losses to follow up. Many studies described differences in
cough scores between the treatment groups, which are
difficult to interpret for the purpose of making informed
treatment decisions.

Table 1
Potentially relevant RCTs identified and screened for retrieval: n = 328

RCTs excluded: n = 235

Single main reasons:
Study not a randomised controlled trial: n = 19
Study not placebo controlled: n = 39
Study not testing over-the-counter cough medicine: n = 86
Cough artificially induced: n = 26
Chronic cough lasting more than three weeks: n = 65

RCTs retrieved for more detailed evaluation: n = 93

RCTs excluded: n = 87
Reasons:
Study not a randomised controlled trial: n = 4
Study not placebo controlled: n = 2
Study not testing over-the-counter cough medicine: n = 23
Cough artificially induced: n = 3
Chronic cough lasting more than three weeks: n = 25
No cough outcome: n = 15
Participants adults only: n = 15

RCTs included in the review: n = 6

 Nine trials involving 43 children tested two paediatric cough
syrups (Triaminic syrup and Dorcol pediatric cough syrup).11 Compared to placebo, 69% of children in both active
treatment groups showed a satisfactory response reported by
their parents compared to 57% of children in the placebo
group (p = 0.5). Adverse effects were not reported.

Antihistamines
table 3 summarises the characteristics of included RCTs which
we grouped into five drug classes (see table 1). The number of
trials in each group ranged from one to a maximum of two.
Cough outcomes included frequency and severity and were
reported by the parents using cough scores. Four studies
reported data on adverse effects.

The methodological quality of included studies was

quantitative data available, and the notable differences
between trials in terms of participants, interventions, and
outcome measurements.

Effects on cough
Table 3 summarises the impact of OTC cough preparations on
cough outcome.

Antitussives
One study involving 57 children with night cough compared a
single dose for three nights of dextromethorphan and codeine
with placebo.10 Mean cough and composite scores decreased in
each of the three treatment groups on each day of the study.
Neither dextromethorphan (cough score reduction of 2.1,
p = 0.41) nor codeine (cough score reduction of 2.2, p = 0.70)
was more effective than placebo (cough score reduction of 2.2)
on day 3. Adverse effects included drowsiness, diarrhoea, and
hyperactivity with no statistically significant differences
between the three groups.

Mucolytics
One study involving 40 children compared the mucolytic letos-
steine with placebo.10 The symptom score on a four point scale
favoured active treatment from day 4 until day 10, with an
average difference of about 0.2 points (p < 0.01). No adverse
effects were reported in both groups.

Antihistamine–decongestant combinations
Two studies involving 155 children compared antihistamine–
decongestant combinations with placebo.11,12 Brompheniramine/phenylpropanolamine was no more effec-
tive than placebo in reducing the number of children coughing
two hours after each dose (49.0% v 43.1%, p = 0.66). A higher
proportion of children were reported asleep in the active
treatment group (46.6%) than in the placebo group (26.3%,
p = 0.53), and no other adverse effects were reported.11
In the second study (n = 96) brompheniramine/
phenylephrine/phenylpropanolamine was no more effective
than placebo or no treatment in improving cough symptoms
(67% v 58% and 70%, p = 0.5 and p = 0.8 respectively).12

Other drug combinations
One trial involving 43 children tested two paediatric cough
syrups (Triaminic syrup and Dorcol pediatric cough syrup).11 Compared to placebo, 69% of children in both active
treatment groups showed a satisfactory response reported by
their parents compared to 57% of children in the placebo
group (p = 0.5). Adverse effects were not reported.

Antihistamines
One trial involving 143 children compared the antihistamines
clemastine and chlorpheniramine with placebo.14 There was
spontaneous improvement in all groups. In both active
treatment groups, cough scores observed by physicians and
participants improved in 39.6% of individuals compared with
27.6% in the placebo group (p = 0.2). Drowsiness and sleepi-

ness were reported in 20% of children, with no statistically
significant difference between the groups.

DISCUSSION
Summary of key findings
In this systematic review we found that there is no good evi-
dence for or against the effectiveness of OTC cough medicines
in acute cough. This concurs with the findings of previous
reviews.10,11 In the only study showing a statistically significant
result, the effect size was small and of doubtful clinical

relevance. OTC cough preparations were generally well
tolerated and did not lead to major adverse effects. Many of
the reported adverse effects could in fact have been a result of
the underlying URTI.

Study limitations and potential sources of bias
The results of this systematic review have to be interpreted
with caution, as the number of trials in each category was
small. Studies were very different with regard to settings,
populations, interventions (drugs, doses, and frequency) and
outcome measures, making them difficult to compare.
Individual RCTs were of variable methodological quality with
respect to randomisation, blinding of outcome assessment,
and losses to follow up. Many studies described differences in
cough scores between the treatment groups, which are
difficult to interpret for the purpose of making informed
treatment decisions.
### Table 3 Characteristics of RCTs of OTC cough preparations versus placebo for the treatment of acute cough

<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Results</th>
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<tbody>
<tr>
<td><strong>Antitussives</strong>&lt;br&gt;Taylor et al&lt;sup&gt;a&lt;/sup&gt;</td>
<td>57 children, mean age 4.7 years (range 18 months to 12 years), 53% boys, 82% white, private paediatric practices, USA&lt;br&gt;Night cough due to URTI</td>
<td>1. Dextromethorphan/guaiphenesin&lt;br&gt;2. Codeine/guaiphenesin&lt;br&gt;15mg/5ml (dextromethorphan), 100mg/5ml (guaiphenesin)&lt;br&gt;10mg/5ml (codeine)&lt;br&gt;100mg/5ml (age 18 months to 5 years: 2.5ml; 6 to 11 years: 5ml)</td>
<td>Single dose at bedtime&lt;br&gt;3 nights</td>
<td>Parent questionnaire, cough score from 0 to 4&lt;br&gt;Mean reductions in cough scores 2.2 (codeine) and 2.1 (dextromethorphan) versus 2.2 in the placebo group, p=0.52 and 0.97 respectively&lt;br&gt;Mainly drowsiness, diarrhoea and hyperactivity: placebo: 7/13 (54%), dextromethorphan: 6/19 (32%), p=0.2; codeine: 5/17 (29%), p=0.8</td>
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<tr>
<td><strong>Mucolytics</strong>&lt;br&gt;Nespoli et al&lt;sup&gt;b&lt;/sup&gt;</td>
<td>40 children, age range 2 to 12 years (median 7.5 years), paediatric clinic, Italy&lt;br&gt;Acute febrile bronchitis</td>
<td>Letosteine 25mg</td>
<td>Three times daily 10 days</td>
<td>Cough score from 0 to 3, unclear how measured&lt;br&gt;Lower cough scores in the active treatment group compared to placebo (difference between groups ranging from 0.1 to 0.3 points from day four to 10, p &lt; 0.01)&lt;br&gt;No side effects in both groups reported</td>
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<td><strong>Antihistamine–decongestant combinations</strong>&lt;br&gt;Clemens et al&lt;sup&gt;c&lt;/sup&gt;</td>
<td>59 preschool children (6 months to 5 years, mean age 2 years), 4 paediatric offices, USA&lt;br&gt;URTI of less than 7 days duration</td>
<td>Brompheniramine Phenylpropanolamine&lt;br&gt;2mg/5ml&lt;br&gt;12.5mg/5ml (6 mths to 1 year: ½ teaspoon, 2 to 5 years: 1 teaspoon)</td>
<td>4-hourly ‘as needed’&lt;br&gt;48 hours</td>
<td>Parent questionnaire, 7-point Likert scale, also counted ‘responses’ after each dose&lt;br&gt;Mean cough scores 4.67 (active treatment) and 4.57 (placebo), p=0.53.&lt;br&gt;Not reported. Higher proportion asleep in the active treatment group (41/88 responses = 47%) compared to placebo (28/65 responses = 26.5%)&lt;br&gt;Loose stools (n=1) in the placebo group and hyperactivity in the active treatment group (n=1)</td>
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<td><strong>Other combinations</strong>&lt;br&gt;Hutton et al&lt;sup&gt;d&lt;/sup&gt;</td>
<td>96 inner-city black children, 6 months to 5 years, mean age about 2 years, primary care clinic, USA&lt;br&gt;Symptoms of URTI</td>
<td>Brompheniramine Phenylephrine Propanolamine&lt;br&gt;4mg/5ml&lt;br&gt;5mg/5ml&lt;br&gt;5mg/5ml (doses calculated to achieve brompheniramine dosage of 0.5 to 0.75 mg/kg/day)</td>
<td>Three times daily 2 days</td>
<td>Parent questionnaire, 7 point Likert scale, 9-point symptom score by parents or physician, follow-up telephone interviews&lt;br&gt;‘Improvement’ reported in 20/30 (67%) in the active treatment group compared to 14/24 (58%) in the placebo group and 21/30 (70%) in the group receiving treatment (p=0.5 and 0.8 respectively)&lt;br&gt;Loose stools (n=1) in the placebo group</td>
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</table>
| **Other combinations**<br>Reece et al<sup>e</sup> | 43 children, mean age 3.6 years (range 2 months to 12 years), 58% boys, ambulatory private practice, USA<br>Cough due to URTI | 1. Triaminicol syrup: Pheny1propanolamine Pheniramine, Pyrilamine Dextromethorphan Ammonium chloride<br>2. Dorcol paediatric cough syrup: Dextromethorphan Phenylpropanolamine Glycerol guaiacolate Alcohol<br>12.5mg, 6.25mg, 6.25mg, 15mg, 90mg<br>7.5mg<br>8.75mg<br>37.5mg<br>5% | Unclear<br>Unclear | Parent assessment<br>‘Satisfactory’ response in 11/16 (69%) and 9/13 (69%) in the intervention groups compared to 8/14 (57%) in the placebo group, p=0.5 for both comparisons*<br>Not reported**
Although we attempted to obtain information on unpublished studies, we received little response from pharmaceutical companies and study authors. If studies with negative results were less likely to be submitted for publication, this could have led to publication bias.

Implications
Cough caused by URTI can be a very troublesome symptom for a child, and for a health professional, not to offer any treatment may seem unacceptable to many parents and lay people. However, as this systematic review shows, there is very little evidence to suggest that OTC cough medicines are effective. For this reason, we cannot recommend these as first line treatment for acute cough. It is, however, vital that paediatricians, GPs, and other health care workers take the symptoms of acute cough seriously, taking a careful history and performing a thorough physical examination to search for possible underlying diagnoses. If a viral URTI seems the most likely diagnosis, the treatment options and the lack of evidence for the effectiveness of OTC cough medicines should be discussed carefully with parents. Whether a child is being treated or not, parents should always be offered a further appointment in case the cough persists, which may suggest the possibility of another underlying condition.

At present, the NHS encourages self medication for acute self limiting illnesses and the use of cough preparations as a home remedy. Though OTC cough preparations appear to be relatively free from adverse effects, their safety in children has been questioned. In addition, purchase of OTC cough medicines may lead to an unnecessary financial burden for health care consumers.

If health professionals want to recommend OTC cough medicines to parents of children who suffer from cough caused by acute URTI, advice should be restricted to less expensive preparations until more evidence about their effectiveness becomes available.

Suggestions for future research
Health professionals need more evidence from carefully designed RCTs before recommending OTC cough medicines to their patients. Identification of effective self care treatments may help reduce suffering in children with cough as well as the number of consultations in primary care. Future studies should therefore use outcome measures that can be easily used in a primary care setting and that produce clinically meaningful results.

Conclusions
We conclude from the limited evidence available that OTC cough medicines do not appear to be more effective than placebo in acute cough caused by URTI and should not be recommended as a first line treatment for the resolution of acute cough. Although these medicines are generally well tolerated, their use may lead to unnecessary expenses for health care consumers.

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REFERENCES


ARCHIVIST

Schoolchildren born of heroin dependent mothers

A report from Jerusalem (Asher Ornoy and colleagues. Developmental Medicine and Child Neurology 2001;43:668–75) has shown the effects of maternal heroin dependency on school age children. The study included 65 children born to heroin dependent mothers, 34 of whom had been adopted. They were compared with 33 children of heroin dependent fathers, 32 children with environmental deprivation but no parental addiction, and 30 control children. All children in the study were aged 5–12 years and attending mainstream schools. The children of heroin dependent mothers raised at home were of low gestational age (mean 35 weeks) and birthweight (mean 2410 g). On tests of verbal and performance skills, reading, and arithmetic the environmentally deprived, drug dependent father, and home-raised drug dependent mother groups all did significantly worse than the control group. The adopted children born of drug dependent mothers, however, performed normally apart from poor performance skills. Attention deficit hyperactivity disorder (ADHD) was common among all children of heroin dependent parents and among environmentally deprived children, but commonest among home raised children of heroin dependent mothers. These mothers also had a high rate of childhood ADHD.

The children of drug dependent parents performed poorly at school when raised at home. Those adopted at an early age performed almost normally. ADHD was common in the children and their mothers.