Antibiotics in acute bronchitis: a meta-analysis

Bent S, Saint S, Vittinghoff E, Grady D

Authors' objectives
To assess the effectiveness of antibiotics in the treatment of acute bronchitis.

Searching
The authors searched the MEDLINE electronic database (January 1966 to April 1998) using the search terms: 'bronchitis, drug therapy' and 'xs acute disease'. The reference lists of retrieved articles were also scanned and experts were consulted to identify additional relevant studies. The search was limited to English language publications.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) that provided sufficient data to calculate effect sizes. Studies were excluded if they were non-experimental in design or if they compared one antibiotic with another without a placebo arm.

Specific interventions included in the review
Antibiotics (erythromycin, doxycycline, trimethoprim/sulfamethoxazole) for the intervention group and placebo for the control group. Duration of therapy in included studies was at least 5 days.

Participants included in the review
Otherwise healthy patients with acute bronchitis, no previous history of chronic lung disease, and pneumonia excluded by chest radiograph or clinical exam.

Outcomes assessed in the review
The duration of cough and sputum production and days lost from work.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the authors performed the selection.

Assessment of study quality
The authors do not state that they assessed validity.

Data extraction
Two authors independently extracted the data. Data were extracted for the categories of author, journal title, year of publication, sample size, average age of subjects, antibiotic regimen used, major outcome measure(s), and the inclusion and exclusion criteria. Discrepancies in the extracted data were resolved by consensus.

In studies that did not include the outcome "days of sputum production", the authors chose the outcome in that study that was the most clinically similar. The authors transformed each outcome into units of standard deviation for a comparable effect size for different outcomes. The study-specific effect size was the difference in the mean outcome for the antibiotic and placebo groups, divided by the pooled standard deviation of the outcome measure in that study.

Methods of synthesis
How were the studies combined?
The summary effect size (ES) across studies was calculated as a weighted average of the study specific effect sizes, with weights equal to the inverse of the estimated variance. The authors also calculated 95% confidence intervals.
The authors also calculated summary mean differences for all outcomes reported by four or more studies. The authors investigated publication bias using the correlation between the number of subjects and the effect size in each study.

How were differences between studies investigated?
A test for heterogeneity was calculated using the chi-square statistic by comparing the weighted average of the squared differences between summary and study-specific effect sizes.

Results of the review
Eight RCTs were included in the review with 660 participants.

The use of antibiotics decreased the duration of cough and sputum production by approximately one-half day (summary ES 0.21, 95% CI: 0.05, 0.36). For specific symptoms reported by at least four studies, there were nonsignificant trends favouring the use of antibiotics of a decrease of 0.4 days of purulent sputum (95% CI: -0.1, 0.8), a decrease of 0.5 days of cough (95% CI: -0.1, 1.1) and a decrease of 0.3 days lost from work (95% CI: -0.6, 1.1).

A test for heterogeneity was not significant for the overall summary ES (P = 0.37) or for days of sputum production (P = 0.50). A test for heterogeneity was significant for the summary mean difference for days lost from work (P = 0.03) and days of cough (P = 0.05), suggesting that these outcomes may have been derived from studies that used different methods. There was no correlation between study size and overall effect size r = -0.13, P = 0.75).

Authors' conclusions
The authors state that this review suggests a small benefit from the use of the antibiotics erythromycin, doxycycline, or trimethoprim/sulfamethoxazole in the treatment of acute bronchitis in otherwise healthy patients. The authors further state that since this small benefit must be weighed against the risk of side effects and the societal cost of increasing antibiotic resistance, the use of antibiotics is not justified in these patients.

CRD commentary
The authors have stated their research question and inclusion and exclusion criteria. Since the literature search was limited to only one database and English language publications it is not clear whether additional relevant studies may have been missed. The authors do not report who, or how many of the authors, performed the selection of studies. The authors do report who performed the data extraction. It is also unclear how the authors report that inclusion and exclusion criteria were extracted at the data extraction stage when such information should be determined prior to the data extraction phase. There is no validity assessment of the included studies.

The statistical pooling combined effect sizes that were not similar in the individual studies. The authors did perform tests for heterogeneity and there is some discussion about the differences between the included studies with regard to participants, geographical location, and treatment regimens.

The authors' conclusions appear to follow from the results but as they state, these should be viewed with caution because of the methodological limitations in the included studies.

Implications of the review for practice and research
Practice: The authors state that since this small benefit must be weighed against the risk of side effects and the societal cost of increasing antibiotic resistance, the use of antibiotics is not justified in these patients.

Research: The authors state that more research is needed to determine if there are subgroups of patients who are likely
to have a substantial benefit from treatment with antibiotics. Further research should also determine the risks and benefits of newer antibiotics such as macrolide or floroquinolone.

Bibliographic details

PubMedID
10403354

Other publications of related interest
This additional published commentary may also be of interest. Fahey T. Review: antibiotics have a slight beneficial effect on acute bronchitis. Evid Based Med 2000;5:42.

Indexing Status
Subject indexing assigned by NLM

MeSH
Acute Disease; Anti-Bacterial Agents /therapeutic use; Bronchitis /drug therapy; Doxycycline /therapeutic use; Erythromycin /therapeutic use; Humans; Randomized Controlled Trials as Topic; Treatment Outcome; Trimethoprim, Sulfamethoxazole Drug Combination /therapeutic use

AccessionNumber
11999001491

Date bibliographic record published
28/02/2001

Date abstract record published
28/02/2001

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.