

Are antibiotics effective for acute purulent rhinitis? Systematic review and meta-analysis of placebo controlled randomised trials

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Abstract

Objective To systematically review the evidence for the effectiveness of antibiotics in acute purulent rhinitis (many guidelines advise against their use on the basis of one study that showed no effect).

Data sources Medline, Embase, Cochrane Register of Controlled Trials, and reference lists of retrieved articles.

Review methods Meta-analysis of data from double blind randomised placebo controlled trials comparing antibiotics with placebo for acute purulent rhinitis (duration less than 10 days).

Results Seven studies were retrieved; four contributed data on benefits of antibiotics, and four contributed data on harms of antibiotics. The pooled relative risk of benefit for persistent purulent rhinitis at five to eight days with antibiotics was 1.18 (95% confidence interval 1.05 to 1.33). The numbers needed to treat ranged from 7 to 15 when the pooled relative risk was applied to the range of control event rates. The relative risk for adverse effects with antibiotics was 1.46 (1.10 to 1.94). The numbers needed to harm for adverse effects ranged from 12 to 78. No serious harms were reported in the placebo arms.

Conclusions Antibiotics are probably effective for acute purulent rhinitis. They can cause harm, usually in the form of gastrointestinal effects. Most patients will get better without antibiotics, supporting the current “no antibiotic as first line” advice.

Introduction

Acute purulent rhinitis (a runny nose with coloured discharge) is a common feature of the common cold and can last for about two weeks.¹ The presence of purulent nasal discharge has been shown to be an important determinant of prescribing antibiotics for respiratory tract infections for both adults and children.²⁻⁴ Most guidelines recommend that antibiotics should not be used for this condition,^{5,6} citing one study that found no evidence that antibiotics reduce the duration of acute purulent rhinitis.⁷ However, a recent larger study reported that treatment with amoxicillin reduced the duration of purulent rhinitis, although it found no significant difference between the groups in terms of improvement in symptoms.⁸

Concern exists about overuse of antibiotics leading to bacterial resistance.⁹ As antibiotic use is often based on the presence of purulent rhinitis, determining whether antibiotics are effective in this condition is important. Our aim was to systematically search for studies on the effectiveness and harms of antibiotics for acute purulent rhinitis and to do a meta-analysis and review of the articles.

Methods

Inclusion and exclusion criteria—We included controlled trials in which the intervention was an antibiotic compared with a placebo for patients with acute purulent rhinitis. Primary outcomes were persistence versus clearance of purulent rhinitis and any adverse events reported. We defined “acute” as less than 10 days with this symptom.

Searches—We searched (to 13 November 2005) Medline, Embase, and the Cochrane controlled trials register, using the terms “purulent and (rhinitis or nasopharyngitis or rhinorrhea or rhinorrhoea).” We considered all the papers in the Cochrane reviews on antibiotics for the common cold and acute purulent rhinitis and for acute maxillary sinusitis.^{10,11} We imposed no language restriction.

Selection, validity assessment, and data abstraction—Each author independently assessed the titles and abstracts of potential papers, the quality of randomisation, concealment of allocation, co-interventions, losses to follow-up, intention to treat analysis, degree of blinding, and extraction of data, and scored the trials.¹²

Results

Search results and study characteristics

The searches found five papers on purulent rhinitis (Todd 1984, De Sutter 2002, Howie 1970, Taylor 1977, and Vogt 1966).^{7,8,13-15} A further paper (Herne 1980) reported a reduction in rhinitis without stating if the rhinitis was purulent or clear¹⁶; we did analyses both including and excluding this study. We excluded another study because the numerical data were not suitable for

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What is already known on this topic

General practitioners often prescribe antibiotics for an acute upper respiratory tract infection when the rhinitis is purulent

Most guidelines recommend against using antibiotics for this condition, but this advice is based on one study

What this study adds

Review of seven papers indicates that antibiotics are probably effective for acute purulent rhinitis

This is not a sufficient reason to use antibiotics, however, as no serious adverse events occurred in the placebo group

pooling.¹⁷ Howie used illnesses, not individual patients, as the denominator and hence is not pooled in the analysis of benefit from antibiotics (none found).¹³ Vogt found a significant improvement with antibiotic but was excluded because a placebo control was not used and group allocation is not explained.¹⁵

Taylor (and Vogt) included only children, De Sutter included children and adults, and the other studies included only adults. Three studies reported purulent rhinitis without further explanation.^{7 13 14} De Sutter relied on the clinical decision of the recruiting doctors.

Quantitative analyses

The pooled effect for the studies contributing data on purulent rhinitis shows a significant benefit from antibiotics at five to eight days (figure)—relative risk 1.18 (95% confidence interval 1.05 to 1.33, random effects); 1.21 (1.08 to 1.35, fixed effects). If data from Herne are included as purulent rhinitis, the relative risk is 1.21 (1.09 to 1.34, fixed effects). Using a relative risk of 1.18, the numbers needed to treat for a benefit from antibiotics ranged from seven for a baseline rate of 0.85^{14 15} to 15 for a baseline rate of 0.38.⁷

Various antibiotics were used: demethylchlortetracycline in Howie (1970), amoxicillin and co-trimoxazole in Taylor (1977), cefalexin in Todd (1984), and amoxicillin in De Sutter (2002). Pooling the two studies that used amoxicillin gives a relative risk of 1.26 (1.11 to 1.45, fixed effects).

The pooled relative risk for adverse effects was 1.46 (1.10 to 1.94, fixed effects), obtained from four studies.^{7 8 13 14} The numbers needed to harm ranged from 12 to 78 for control event rates in the statistically significant studies (0.189⁸ to 0.028¹³). The harms were mainly gastrointestinal and a small number of rashes.

Discussion

The findings from this study indicate that antibiotics for acute purulent rhinitis may be beneficial. Harms attributed to antibiotics were mainly vomiting, diarrhoea, and abdominal pain but also included rashes and hyperactivity. No more serious harm occurred in the placebo arm in any of the trials, fitting the clinical notion that this is not a serious condition. At best, a number needed to treat of seven means that six patients get no benefit for every one who gets benefit. Furthermore, the number needed to treat for benefit from antibiotics (7-15) overlaps with the number needed to harm (12-78). Our results are consistent with the Cochrane review of chronic purulent rhinitis, which found a benefit for antibiotics with a pooled relative risk of 0.75 and a number needed to treat of nine.¹⁹

As various terms are used for acute purulent rhinitis, we cannot be sure that we retrieved all the relevant articles. Although the trend of results is towards an effect of antibiotics, the funnel plot indicates that some publication bias may exist. The studies also used different antibiotics, and the only clearly non-significant study used cefalexin.⁷ The relative risk from pooling the two amoxicillin studies was statistically significant, so amoxicillin may be preferred if any antibiotic is to be used.

The difference between sinusitis and acute purulent rhinitis is not always clear, and involvement of the sinus mucosa in the common cold may be the norm.²⁰ We noted that between 53% and 56% of the participants in De Sutter (2002) had unilateral facial pain.⁸ Any future studies should specifically assess the presence of sinus infection.

Our findings differ from the received wisdom in terms of the effectiveness of antibiotics for acute purulent rhinitis. This highlights the dangers of relying on one study (Todd)⁷ to decide on the effectiveness of a treatment. Our summation would be to suggest initial management by non-antibiotic treatments and that antibiotics should be used only when symptoms have persisted for long enough to concern parents or patients. We support the current guidelines in their advice not to use antibiotics.

Contributors: See bmj.com.

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Study or subcategory	Antibiotic (n/N)	Placebo (n/N)	Relative risk (random) (95% CI)	Weight (%)	Relative risk (random) (95% CI)
Taylor 1977a	72/75	25/30		33.43	1.15 (0.98 to 1.36)
Taylor 1977b	51/54	25/30		31.85	1.13 (0.95 to 1.35)
Todd 1984	6/26	9/24		1.79	0.62 (0.26 to 1.47)
De Sutter 2002	125/180	95/179		32.93	1.31 (1.11 to 1.55)
Total (95% CI)	335	263		100.00	1.18 (1.05 to 1.33)
Total events: 254 (antibiotic), 154 (placebo)					
Test for heterogeneity: $\chi^2=3.98$, df=3, P=0.26, $I^2=24.6\%$					
Test for overall effect: z=2.78, P=0.005					

Meta-analysis of studies of outcomes of purulent rhinitis at five to eight days, antibiotic versus placebo (Taylor 1977a is co-trimoxazole arm; Taylor 1977b is amoxicillin arm)

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Mortality after *Staphylococcus aureus* bacteraemia in two acute hospitals in Oxfordshire, 1997-2003: cohort study

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Abstract

Objective To determine the incidence of methicillin resistant and methicillin sensitive *Staphylococcus aureus* (MRSA and MSSA) bacteraemia in inpatients and associated mortality within 30 days after diagnosis.

Design Anonymised record linkage study of data from hospital information systems and microbiology databases.

Setting Teaching hospital and district general hospital in Oxfordshire.

Participants Inpatients aged 18 or over admitted to a teaching hospital between 1 April 1997 and 31 March 2004 and to a district general hospital between 1 April 1999 and 31 March 2004. The main part of the study comprised 216 644 inpatients; patients admitted to haematology, nephrology, or oncology services were not included because most were managed as outpatients.

Outcome measures Nosocomial MSSA and MRSA bacteraemia; death in hospital within 30 days after bacteraemia.

Results Rates of *S aureus* bacteraemia rose between 1997 and 2003, and MRSA was responsible for this increase. Overall mortality 30 days after bacteraemia was 29%. The crude odds ratio for death after MRSA bacteraemia compared with MSSA bacteraemia was 1.49 (95% confidence interval 0.99 to 2.26).

Conclusion The spread of MRSA has greatly increased the overall number of cases of *S aureus* bacteraemia and has contributed to short term mortality after *S aureus* bacteraemia.

Introduction

Rapidly rising rates of infection with methicillin resistant *Staphylococcus aureus* (MRSA) led to the revision of United Kingdom national infection control guidelines in 1998. Previously, an MRSA search and destroy method was used; afterwards, patients were stratified according to risk, and targeted prevention measures

recommended.¹ However, rates of MRSA bacteraemia have continued to rise.^{2,3}

Our understanding of the impact of the high rate of MRSA in the UK on death after *S aureus* bacteraemia is limited. Analyses of death certificates have suggested rising MRSA associated mortality, but analysis of death certificates can result in biased estimates of disease associated mortality.^{4,5} We describe secular trends in nosocomial methicillin sensitive *S aureus* (MSSA) bacteraemia, MRSA bacteraemia, and survival 30 days after bacteraemia in inpatients in acute care hospitals in Oxfordshire after the search and destroy policy changed, and we discuss the impact of the MRSA epidemic on mortality after nosocomial *S aureus* bacteraemia.

Methods

Data sources, linkage, and statistical analysis

Our study took place in a teaching hospital and a district general hospital in Oxfordshire, which together provide acute clinical and bacteriology services to 600 000 people.

We used anonymised record linkage.⁶ We generated a database of all patient admissions, excluding outpatients, between 1 January 1997 and 31 March 2004. In addition to admission data, the database had information on all isolates of MSSA and MRSA detected between 1 January 1995 and 31 March 2004.

Cohort studied

Patients were admitted between 1 April 1997 and 31 March 2004; they were aged 18 or over on the day of admission. We restricted our analysis to patients who stayed in hospital for two or more days, as these patients are at risk of nosocomial bacteraemia.⁷ We excluded patients admitted to renal, haematology, and

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