Process and Outcome

Audits of antibiotic prescribing in a Bristol hospital

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Abstract

Audits of antibiotic prescribing were done for periods of up to eight weeks in two successive years on medical, surgical, orthopaedic, gynaecology, obstetric, and urology wards and in an accident and emergency department. Clinical details were matched with antibiotic prescribing, and the appropriateness of the latter was judged independently by two medical microbiologists. Only when they agreed was an individual prescription included in the analysis. Overall, 28% of prescriptions in 1979 and 35% in 1980 were judged as unnecessary, with 17% and 16%, respectively, being for inappropriate choices of antibiotic. An educational programme about antibiotic prescribing carried out between the audits had no beneficial effect overall. Though the results compared favourably with those of audits published, prescribing could still be much improved. To judge by the failure of education, however, this might be difficult to achieve. Most prescriptions were written by junior staff, who in the absence of guidance from their seniors and because of their frequent moves would require a widespread and continual education programme. Published concern about the quality of antibiotic prescribing appears to be justified.

Introduction

In recent years there has been considerable concern about the use of antibiotics in hospitals.[1] American, Canadian, and Israeli studies have concluded that prescribing was often irrational.[2-7] Consequently the American Medical Association recommended that each hospital should have a committee to monitor the use of antibiotics[8] and the Veterans Administration Group published prescribing guidelines.[9] A large American study showed that the average prescribing physician's knowledge of antibiotic use showed substantial deficiencies.[10] There have been few studies in the United Kingdom. One showed considerable confusion in prophylactic prescribing,[11] and another relied on interviews with prescribers and made no attempt to educate or to follow up.[12] Our study conformed with recently published suggestions.[1] We examined antibiotic prescribing and on the basis of the results issued advice designed to improve it. One year later we repeated the survey to observe the effect of our efforts.

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Methods

During the first half of 1979 prescriptions for antibiotics on orthopaedic, gynaecology, and obstetric wards were observed for four weeks and on two general medical, two general surgical, and a urology ward for eight weeks. The accident and emergency (casualty) department was observed for one calendar month. During 1980 wards were observed for six weeks (obstetric and gynaecology four weeks; orthopaedic eight weeks) and the casualty department again for one month.

The wards were visited daily by the same observer (PJS) and all new prescriptions for antibiotics were recorded, along with any concurrent treatment. Details of the patients (name, age, sex, clinical history and diagnosis, renal function, and indication for antibiotic treatment) were extracted from their notes. The results of any microbiological investigations were also recorded. Subsequently, each patient's notes and prescription sheets were reviewed daily, along with any changes in their clinical condition, until the antibiotic was discontinued. When a drug was prescribed for a specified period—for example, five days—the prescription sheet was still reviewed daily to ascertain the exact date of stopping treatment.

The medical staff were aware of the survey but, to minimise influence on prescribing habits, they were questioned about prescriptions only if information in the case notes was seriously inadequate. The normal service of the microbiology department in providing advice on problems of infection operated throughout the survey. No formal antibiotic prescribing policy existed at the time, although prescriptions for expensive or potentially toxic antibiotics were notified by pharmacy to the microbiology department as had been the case for some years. We usually discussed such prescriptions with the clinicians concerned.

Bed occupancy for each ward during the study periods was obtained from the ward admissions register and from the admissions officer. Completed data sheets were submitted separately to two medical microbiologists (DSR and DWB) working independently at that time in separate departments of microbiology. They answered sequentially the following questions about each prescription:

(1) Should the patient have received an antibiotic?
(2) Was the antibiotic an appropriate choice?
(3) Was the dose appropriate?
(4) Was its frequency of dosage appropriate?
(5) Was its route of administration appropriate?
(6) Was the course of treatment of suitable duration?

They were asked to answer "yes," "no," or "questionable," using questionable as infrequently as possible. If the answer to the first or second question was "no" then no further questions were answered. There was no discussion of individual cases between the assessors. Assessment was based on currently recognised forms of treatment and prophylaxis.

In autumn 1979 the results of the first survey together with "Recommendations for improved antibiotic prescribing" were distributed to all medical staff in the hospital. The medical staff were asked to consider carefully whether a clinical problem would be influenced by antibiotic treatment. In particular it was emphasised that only recognised forms of prophylaxis should be prescribed. They were asked to pay attention to the results of laboratory investigations and to make doses and routes of administration appropriate for individual patients, to keep treatment courses short, and to seek advice when in doubt. The recommendations were reinforced as far as possible in open meetings and in discussions about individual patients. In addition, with the agreement of clinical staff, all prescriptions for antibiotics were restricted by the pharmacy to a maximum of five days without reordering.

Results

DISTRIBUTION OF PRESCRIPTIONS AMONG DEPARTMENTS AND SURVEYS

The proportion of patients in each department who received antibiotics varied widely among departments, largely because of prophylactic use in surgical specialties (table I). There was a small reduction in overall use between 1979 and 1980, which was almost entirely due to abandoning some prophylactic treatment in obstetrics and to more rational prophylaxis for gynaecological surgery.

TABLE I—*Distribution of prescriptions among departments and between surveys*

Department	Total No of antibiotic prescriptions		No (%) of patients receiving antibiotics	
	1979	1980	1979	1980
Medicine	93	32	63 (19)	28 (14)
Surgery	108	74	105 (19)	51 (25)
Urology	59	8		
Gynaecology	101	36	60 (17·5)	22 (12)
Obstetrics	40	10	33 (8)	9 (3)
Orthopaedics	31	30	20 (16·5)	21 (12·5)
Casualty	114	76	112 (4·8)	74 (3·6)
Total	546	266	393 (10)	205 (6·5)

AGREEMENT BETWEEN THE ASSESSORS

It is obviously irrational to judge the quality of other doctors' prescribing habits unless the assessors agree. The answers of the two assessors were therefore compared, and this also provided some impression of topics of difficulty or doubt in prescribing. Agreement between the assessors' answers were graded as:

Total agreement—both answering "yes," "no," or "questionable."

Partial agreement—one answering "yes" or "no" and one "questionable."

Total disagreement—one "yes" and one "no."

The quality of a prescription was evaluated only when both assessors were in agreement.

Should the patient have received an antibiotic?

Some specialties—for example, obstetrics and orthopaedics—produced much more difficult antibiotic problems than others, as judged by the percentage of partial agreements (table II). On the whole, agreement between the assessors was much the same in both years, and they were not often in total disagreement in any specialty. In 1979 orthopaedic prescriptions gave poor agreement between assessors because there were several difficult cases of possibly infected postoperative sinuses that did not occur in 1980; thus increased agreement in 1980 reflects a different variety of infections rather than changes in the attitudes of the assessors. In obstetrics in 1979 the administration of antibiotics to patients who were feverish during or shortly after labour accounted for 11 of 19 partial agreements, but these disappeared in 1980 owing to a change in prescribing practice. One assessor was consistently more in favour of treating patients with minor or moderate injuries with minor signs of infection. This accounted for 54% of partial agreement in 1979 and 31% in 1980. Other topics of disagreement, spread through all specialties were: afebrile exacerbation of chronic bronchitis; afebrile postoperative chest infection; afebrile urinary infection, especially when the patient was catheterised and asymptomatic, or was symptomatic but before microbiological proof of infection had been received.

TABLE II—*Grades of agreement* between the two assessors for the question "Should the patient have received an antibiotic?"*

		Total agreement (%)	Partial agreement (%)	Total disagreement (%)
Medicine	1979	67	26	7
	1980	65	29	6
Surgery	1979	71	22	7
	1980	61	36	3
Urology	1979	70	24	6
	1980	86	14	0
Gynaecology	1979	68	31	1
	1980	78	22	0
Obstetrics	1979	46	49	5
	1980	46	49	5
Orthopaedics	1979	29	71	0
	1980	75	25	0
Casualty	1979	50	42	8
	1980	63	30	7
All departments	1979	61	34	5
	1980	66	30	4

* See text.

Was the antibiotic and its dose appropriate?

Disagreements were few in both years and tended not to fall into any particular pattern, although there was regular disagreement whether 250 mg of amoxycillin or flucloxacillin should be used for chest infections and soft-tissue infections respectively. One assessor also thought that sulphadimidine 1 g every six hours was too large a dose for treating a simple urinary infection.

Was the frequency of the dose appropriate?

Again, there were few disagreements in either year and those that occurred were almost all due to one assessor insisting on the manufacturer's recommended dose schedule while the other was prepared to accept interchange between six and eight hourly dosing, especially for amoxycillin.

Was the route of administration appropriate?

It was difficult on a data sheet to convey the patient's exact clinical state, and in both years this caused difficulty in deciding whether in some cases oral or parenteral treatment was appropriate. Nevertheless, there were still few disagreements.

Was the duration of treatment appropriate?

In both years there was some disagreement, partial or total, over the duration of courses of treatment for both treatment and prophylaxis, with one assessor tolerating rather longer courses than the other, especially for urinary infections. Both agreed, however, that on the whole courses of treatment were too long.

ASSESSING THE PRESCRIBERS

The prescribers were assessed only when there was total agreement between the assessors.

Should the patient have received an antibiotic? (table III)

In 1979 some 61% of prescriptions were judged to be clinically indicated compared with 51% in 1980; 28% in 1979 and 35% in 1980 were judged to be unnecessary, the remainder being questionable. Unnecessary prescriptions fell into two main categories:

(1) Inappropriate prophylaxis—for example, (*a*) oral phthalylsulphathiazole and neomycin before bowel surgery; (*b*) oral antibiotics for uninfected patients with urethral catheters; and (*c*) extension from procedures where prophylaxis is accepted, such as using metronidazole for hysterectomy and large bowel surgery, to others for which there is no proved indication for prophylaxis, such as oophorectomy, prostatectomy, and nephrectomy.

TABLE III—*Prescriber's performance as % of all scripts (287 in 1979 and 150 in 1980) by departments in response to the question "Should the patient have received an antibiotic?" when assessors were in total agreement*

	Antibiotics necessary		Unnecessary		Questionable	
	1979	1980	1979	1980	1979	1980
Medicine	82	65	9	20	9	15
Surgery	69	46	21	40	10	14
Obstetrics	50	50	30	50	20	—
Gynaecology	59	89	28	11	13	—
Orthopaedics	75	28	12·5	61	12·5	11
Casualty	26	45	61	34	13	21
Urology	75	50	19	50	6	—
Mean	61	51	28	35	11	14

TABLE IV—*Distribution of all antibiotic prescriptions by departments and year*

	Medicine		Surgery		Urology		Gynaecology		Obstetrics		Orthopaedics		Casualty		Total	
	1979	1980	1979	1980	1979	1980	1979	1980	1979	1980	1979	1980	1979	1980	1979 (n = 546)	1980 (n = 266)
Ampicillin	14	4	9	8	16	1	9	4	10	6	8	3	25	8	128	54
Amoxycillin	20	11	6	4	3	1	3	1	—	1	1	—	5	2		
Flucloxacillin	5	2	9	5	—	—	1	—	—	—	9	14	14	43	38	64
Ampicillin (Magnapen)	—	—	—	—	—	—	—	—	—	—	—	—	37	—	37	—
Co-trimoxazole	13	3	7	3	16	4	18	5	—	—	6	2	3	—	63	17
Metronidazole	3	—	31	22	4	1	40	17	2	1	—	—	—	—	80	41
Cephradine	4	1	—	—	2	—	22	4	22	2	—	—	—	1	50	8
Cephazolin	—	—	20	13	3	—	—	—	—	—	—	—	—	—	23	13
Penicillin	6	6	8	3	1	—	1	1	1	—	—	5	4	12	22	27
Gentamicin	2	—	7	—	6	—	2	1	—	—	—	1	—	—	17	2
Others	26*	5	11	16†	8	1	5	3	5	—	7	5	26‡	10	88	40

* Includes sulphonamides (6), chloramphenicol (2), tetracycline (2), fusidic acid (2), erythromycin (2), antifungals (1).
† Includes sulphonamides (3), neomycin (2).
‡ Includes local chloramphenicol (16), erythromycin (4), local neomycin (3).

(2) Treatment of patients with no real evidence of infection such as vaguely unwell elderly patients or even of "urinary infection" despite prior receipt of negative bacteriological findings.

Both surveys found that the prescribing on the medical wards was good, but the standards on the general surgical wards appeared to deteriorate between 1979 and 1980. Although phthalylsulphathiazole and neomycin prophylaxis was abandoned in 1980, other prophylaxis was still being used in cases with no proved indication. The urology ward was closed for structural alterations in 1980, and too few patients were lodged on other wards to draw firm comparisons with 1979 but in general the same mistakes were made. The standard improved greatly on the gynaecology wards with most dubious prophylactic treatments being abandoned. In the orthopaedic department, however, standards deteriorated considerably from 1979 to 1980 with 61% of prescriptions being judged unnecessary in 1980 compared with only 12·5% in 1979. This was almost entirely due to the introduction of the use of prophylactic flucloxacillin for a wide range of routine clean operations.

The casualty department produced the worst results in 1979, with only 26% of prescriptions judged to be necessary and 61% unnecessary. There seemed to be reluctance to offer simple advice and give local treatment to minor cuts and abrasions. By 1980 the standard had improved considerably with 45% of prescriptions being judged necessary and 34% unnecessary. Though alleviated, the problem, however, was not solved.

Was the antibiotic appropriate?

In 1979, 251 prescriptions were available for assessment and in 1980 116. In 1979 and 1980, respectively, 79% and 80% were judged appropriate and 17% and 16% inappropriate, the remainder being questionable. Errors fell into five main categories:

(1) Penicillin was prescribed for patients with stated hypersensitivity (two in 1979 and one in 1980). Fortunately no harm ensued.

(2) The organism was known on basis of existing bacteriological reports to be resistant to the drug chosen (three times in 1979 and once in 1980).

(3) An inappropriate choice was made for the clinical condition. There were a few such errors in the medical, surgical, urology, and obstetric and gynaecology wards in both years—for instance, flucloxacillin for known pneumococcal pneumonia; metronidazole for superficial wound infection; gentamicin alone for infected amputation stump; benzylpenicillin alone for diabetic gangrene with cellulitis; and ampicillin alone for psoas abscess.

In 1979 both the orthopaedic and casualty departments were using large amounts of ampicillin (as Magnapen in casualty) for soft-tissue infections and potentially infected hip joint prostheses. After discussion this practice was abandoned, and in 1980 the only errors in the orthopaedic ward were to use benzylpenicillin for a probable staphylococcal infection when flucloxacillin would have been more appropriate. In the casualty department phenoxymethylpenicillin was chosen three times for staphylococcal skin infections; otherwise prescribing improved from 54% correct choices in 1979 to 81% in 1980.

(4) An inappropriate choice was made for prophylaxis. The general surgeons and urologists usually selected their drugs correctly. The gynaecologists, however, often chose co-trimoxazole as prophylaxis before hysterectomy, and this practice continued in 1980 despite discussion. There were also two patients in 1979 with known rheumatic heart disease who were given only benzylpenicillin as prophylaxis before gynaecological surgery; this did not arise in 1980.

(5) Unnecessary changes or additions were made to treatment. In 1979 on the urology and gynaecology wards there was a tendency to rush to change treatment when, after only one or two doses, the patient failed to respond dramatically. For example, a change was made from co-trimoxazole to ampicillin for urinary infection, although the organism was known to be sensitive to both; ampicillin was added to co-trimoxazole in similar circumstances; ampicillin was changed to cephradine, again for a urinary infection, "because it is stronger" and a prostatectomy was planned; amoxycillin was altered to co-trimoxazole for a *Haemophilus influenzae* chest infection in the mistaken belief that the organism would be resistant to amoxycillin. By 1980 the position had improved somewhat, but there were similar instances. The other departments did not make the same mistakes.

Were the dose and its frequency and route of administration of the antibiotic appropriate?

In both surveys and all departments the errors were few, but there tended to be reluctance to prescribe adequate parenteral doses of antibiotics for seriously ill patients. Several patients with severe pneumonia or postoperative infections received only 250 g ampicillin or flucloxacillin by mouth or benzylpenicillin only every six to eight hours.

There were no instances of overtreatment or of prolonged parenteral treatment when oral treatment would have been appropriate, in contrast to the findings of Leigh on metronidazole.[13] In 1979 the dosages of gentamicin were not changed in accordance with observed blood concentrations of gentamicin in two patients, but this did not occur in 1980.

Was the duration of treatment appropriate?

Apart from those patients in both years whose treatment was cut short by unnecessary changes, the errors were all of excessively long courses of treatment. A few patients, in both years, continued to receive antibiotics to which their infecting organism (usually urinary) was known to be resistant, or when their urine was known to be originally sterile. In both 1979 and 1980 many patients were treated for far too long, both prophylactically and therapeutically. Only 65% (71% in 1980) of all courses of treatment were judged to be of correct duration with 31% (29% in 1980) incorrect. The errors were evenly spread through all departments. The overlong treatment was sometimes intentional—for example, by using perioperative prophylaxis prescribed for five or even seven days, or by treating a simple urinary infection for 10 days—but often it occurred because the drug was not discontinued until the prescription chart was revised on the patient's discharge. This resulted in one patient receiving treatment for 19 days for urinary infection and another metronidazole prophylaxis for three weeks. As a result of the 1979 survey, no antibiotic was prescribed for more than five days initially, and by 1980 this practice had solved the excessively long therapeutic courses of treatment. Prophylactic antibiotics were still being administered for five days, however, despite published evidence that 48 hours or under is usually adequate,[14] and this meant that the overall figures for appropriateness were largely unchanged.

DISTRIBUTION OF DIFFERENT ANTIBIOTICS AMONG DEPARTMENTS (table IV)

The distribution of prescribing was greatly influenced by prophylactic use with almost all cephalosporins and metronidazole being used for patients in the surgical and gynaecological departments. Several

antibiotics used in 1979 were not used at all in 1980—for instance, neomycin, phthalylsulphathiazole, tobramycin, lincomycin, clindamycin, and ampicillin (Magnapen). Netilmicin was used in a clinical trial in the hospital in 1980 and accounted for a decline in prescription for gentamicin. In both years amoxycillin was used almost entirely by the medical wards with the other departments using ampicillin.

Discussion

Both underprescribing and overprescribing of antibiotics are bad practice; underprescribing leads to failure of treatment and increased patient morbidity and overprescribing to drug resistance and increased side effects, as well as being overly expensive. There appears to be little immediate incentive for accurate prescribing because, clinically, most antibiotics have a large therapeutic index. Evaluation of quality of prescribing is necessarily somewhat arbitrary, and various methods have been used. Achong *et al*[3 15] assessed prescribing according to predefined criteria, while Castle *et al*[5] used the criteria of Kunin *et al*,[4] which were similar to ours. Roberts and Visconti[7] and Jones *et al*[16] used two main assessors (a specialist in infectious diseases and a pharmacist) but no predefined criteria and yet achieved a high degree of concord of 91·6% and over 99%, respectively, in the two studies. When there was disagreement, however, the physician's decision was used, whereas we thought that in the absence of agreement between the assessors the prescription should not be included in the final assessment. Our lower degree of agreement probably reflects our more detailed analysis of the prescriptions than has been done previously and our insistence on agreement between assessors about a prescription before including it in the analysis. To use more than two assessors would make the evaluation of prescribing less arbitrary but it would be complicated to organise and analyse the results.

Although details of the criteria of assessment varied between surveys, the principle has been the same, which was "assessment in the light of currently accepted practice," so it seems reasonable to compare the performance of our clinicians with those in other hospitals. Most surveys have found that prescribing is better in medical departments than in surgical, obstetric, or gynaecological departments, and our results follow this trend. Our physicians, with 9% irrational prescriptions in 1979, performed better than others reported with, for example, 12% irrational prescriptions in Hamilton, Ontario,[3] 19% in Duke University, South Carolina,[5] and 39% in Dallas, Texas.[15] Our surgeons and gynaecologists were apparently considerably better than their peers elsewhere, with, respectively, 21% and 28% irrational prescriptions in 1979 compared with 42% and 50% in Hamilton, 50% for surgeons in Duke University, and 69% for surgeons in Dallas. The recent study from the Central Middlesex Hospital[12] did not analyse data by specialty. No other group has looked at obstetrics separately or at orthopaedic surgeons, urologists, or casualty departments.

Although prescribing standards in Southmead Hospital seemed to be higher than those in North America, there was still room for improvement and the advice issued after the 1979 survey attempted to do this. As a result, several erroneous practices identified in 1979 were corrected by 1980. The unnecessary treatment of patients in the casualty department was substantially reduced, and the use of ampicillin, alone and in combination with flucloxacillin for soft-tissue infections, was stopped. The institution of a five-day limit on antibiotic prescriptions reduced both accidental and deliberately long courses of therapeutic treatment but could not stop excessively long prophylactic courses. Despite discussions, some departments continued to make the same mistakes in 1980 as in 1979. Although the obstetric and gynaecological surgeons stopped unnecessary prophylaxis, the general surgeons continued unchanged, and the orthopaedic department introduced new procedures judged to be inappropriate. The gynaecologists continued to use the same unsuitable drug for prophylaxis. Overall, the standard was the same, or even slightly worse in 1980 than in 1979. Other studies have also found that prophylaxis is the most abused and least easily improved type of antibiotic use.[3 12 16]

Other groups have also had limited success in altering prescribing habits. Achong *et al*[15] achieved a reduction only in duration of prophylactic treatment after a quality-of-use survey; McGowan and Finland[14] managed to limit the use of potentially toxic and expensive agents by requiring justification for their prescription, and Jones *et al*[16] were able to reduce prophylactic prescribing only after an educational programme designed to improve all prescribing. To question the cost effectiveness of antibiotic audit is therefore entirely justifiable. It seems unlikely that very high standards of prescribing would be achieved without a continuing education programme or, impracticably, monitoring all scripts. A particular problem, we found, is that antibiotic prescribing is usually left to the more junior medical staff and that they move frequently to other hospitals. Thus education would need to be widespread and not confined to isolated hospitals if it were not to be rapidly diluted. An alternative would be for the more senior staff to take an active interest in prescribing antibiotics since educational effort directed at them would produce more long lasting results. Other suggestions to improve prescribing have been the use of local committees to formulate prescribing policy[17] and the peer audit.[18 19]

Despite our activities having little beneficial effect on prescribing, there are reasons to think that this may not be universally applicable. Prescribing in our hospital was probably in any case already reasonably satisfactory relative to many other hospitals because of the generally high quality of its medical staff and the presence of an active microbiology department. It might well be thought that an educational programme directed at less satisfactory prescribing would have produced more effect, at least temporarily. Furthermore, an audit might show easily correctable faulty prescribing patterns or other errors, such as the virtual elimination of overlong courses of treatment by the introduction of the five-day limit as in our hospital. Topics of uncertainty, as shown by the lack of agreement between the assessors in our survey of orthopaedic prescribing, may be highlighted and justify their being researched. Thus, although it is difficult for a microbiology department or other small groups of workers to persuade some clinicians to alter their prescribing habits, much might be achieved by audit if this desire for improvement emanated from the clinicians themselves.

Our study endorses the findings of Moss *et al*,[12] who found cause for concern over antibiotic prescribing and also suggested that there is need for constant surveillance of prescriptions to maintain any improvement in standards. The latter would be easier with the use of computerised pharmacy records but would otherwise be very expensive in terms of medical manpower. At present antibiotics are developing rapidly, and education in their use needs to be a continuing process.

We are grateful to our clinical colleagues who allowed us completely unhindered access to their patients and records.

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Is a raised erythrocyte sedimentation rate a normal finding in patients with temporal arteritis, and can sudden blindness occur in this condition?

A raised ESR is usually found in temporal arteritis. In a large series reviewed by Wagener and Hollenhorst[1] the ESR was raised in 91%, and was normal only in patients who had already received cortisone, or who had lost vision some months before. Hollenhorst later stated[2] that he had "never seen a patient with a low sedimentation rate that had temporal arteritis," meaning presumably *active* temporal arteritis. There are, however, well-documented cases of biopsy-positive giant-cell arteritis with normal ESR,[3] so a high ESR is not essential for the diagnosis. Blindness can occur suddenly in this condition. The second eye can also become blind in less time than it takes to obtain a temporal artery biopsy report. The latter may be negative anyway, and while it is helpful to have a positive biopsy to support the administration of high doses of corticosteroids to elderly and often frail patients, it should not be awaited before starting treatment. In the final analysis treatment should be started without delay if the diagnosis seems likely on clinical grounds.—W J DINNING, consultant ophthalmologist, London.

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A family are plagued every summer with itchy red spots that a dermatologist has diagnosed as insect bites but which have not responded to the usual treatments. Recently a black spot was identified as the larva of a harvest mite. Is this likely to be the offending animal? If so, how can bites be prevented and what is the treatment?

The fact that several members of the same family are affected does suggest that the itchy red spots are due to insect bites. While a considerable amount is known about the different species of mites or acari, and there are excellent reviews of their natural history published by acarologists such as Baker,[1] less is known about the mechanisms whereby they produce differing reactions in human hosts. The eggs of the harvest mite *Trombicula autumnalis* are laid in the soil, and the larvae feed on low vegetation from which they are transferred to animal hosts including man. They then tend to obtain their meal of animal protein from an accessible area with thin skin, such as the ankles and thighs, groins or waist. The larva is normally attached to the skin, rather than burrowing into it, and possibly such a larva was isolated by the inquirer. The response varies considerably from individual to individual, and in those who do not have any allergic sensitivity there may be only minimal redness and itching, whereas in other individuals considerable inflammation and oedema may develop at the site of the mite. Assuming that the more common mites such as cheyletiella from household pets have been eliminated, then insect repellants are the best way of preventing further bites during the summer months. Most of the proprietary preparations such as dimethylphthalate have a transient effect and need frequent application. Lorexane (γ-benzene hexachloride) is effective and is apparently safe when used in not more than a 1% concentration. If the itching after bites is severe then dilute topical steroids such as 0·5% hydrocortisone ointment would give relief and for a more pronounced allergic reaction antihistamines could be used as well.—P K BUXTON, consultant dermatologist, Edinburgh.

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Does the low-dose contraceptive pill prevent ovulation? If ovulation occasionally occurs how is conception prevented? If conception occurs how is pregnancy prevented?

The combined oestrogen-progestagen oral contraceptive prevents ovulation because oestrogen acts on the hypothalamus to suppress secretion of gonadotrophin.[1] The newer low-dose combined pills seem to act in the same way as older preparations containing more oestrogen,[2] and the failure rate of low-dose combined preparations is probably similar to that of other combined preparations.[3] By contrast, low-dose progestagen-only preparations (often called the "mini-pill") suppress ovulation in only about 50% of cycles.[1] If ovulation occurs the chance of conception is reduced because of the effects of progestagen on cervical mucus (and perhaps on the Fallopian tube) which tend to reduce the numbers of sperm reaching the ovum. If conception does occur pregnancy is usually prevented by the progestagen-induced changes in the endometrium causing failure of implantation—the endometrium is said to be the primary site of the contraceptive action of low-dose progestagens.[1]—JAMES OWEN DRIFE, senior lecturer in obstetrics and gynaecology, Leicester.

[1] Hawkins DF, Elder MG. *Human fertility control.* London: Butterworth, 1979.
[2] Fay RA. Failure with the new triphasic oral contraceptive Logynon. *Br Med J* 1982;**284**:17-8.
[3] Bye P. Failure with the new triphasic oral contraceptive Logynon. *Br Med J* 1982;**284**:422-3.

Is a single dose of 300 mg of aspirin used to prevent thrombus formation effective for 48 hours?

Aspirin has a complex effect on clotting. In platelets it inhibits the cyclo-oxygenase enzymes of the prostaglandin pathway and thus prevents the formation of the prothrombotic end product, thromboxane A_2. This would be a good thing if it did not at the same time act on a similar enzyme system in the vessel wall to inhibit prostacyclin (PGI_2), which is anti-aggregatory. Numerous in-vitro experiments have shown that platelets and vascular tissue vary in their sensitivity to aspirin, and dosage is the crucial factor. Thus 300 mg aspirin will inhibit both thromboxane A_2 and prostacycline for up to 48 hours, whereas a dose of 40 mg may effectively prevent formation of thromboxane A_2 while allowing regeneration of prostacycline.[1] So far clinical trials have used daily divided doses of aspirin that are large by the above standards, and the results have been contradictory.[2] The outcome of prophylactic trials using small intermittent dosage regimens is awaited with interest.—ALEX PATON, postgraduate dean, North-east Thames Region.

[1] Hanley SP, Bevan J, Cockbill SR, Heptinstall S. Differential inhibition by low dose aspirin of human venous prostacyclin synthesis and platelet thromboxane synthesis. *Lancet* 1981;i:969-71.
[2] Mitchell JRA. Anticoagulants, aspirin, Anturan in transient cerebral ischaemic attacks. In: Tunbridge WMG, ed. *Advanced medicine, Newcastle upon Tyne.* London: Pitman Medical, 1981:276-86.