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A survey of practice and opinions on the use of topical antibiotics to prevent surgical site infection: more confusion than consensus

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Background: Surgical site infection (SSI) is one of the most common causes of healthcare-associated infection. Although the use of topical antibiotics to prevent SSI is not recommended by current guidelines, published studies document conflicting results and conclusions.

Objectives: The objectives of this survey were to: (i) determine the extent of the use of topical antibiotics to prevent SSI in clinical practice; and (ii) gather the opinions of healthcare professionals most likely to be involved in their use.

Methods: A questionnaire was circulated to members of BSAC and the European Wound Management Association (EWMA).

Results: The questionnaire received 160 responses from a variety of healthcare professionals around the world. Most respondents (70%) did not have guidelines for the use of topical antibiotics for the prevention of SSI in their institution; if present, local guidance was based on national guidelines (20/31, 65%). Most respondents did not use or recommend topical antibiotics to prevent SSI; of those that did, gentamicin collagen sponges were most commonly used (24/96 responses, 25%). Over half of the surgeons (18/33, 55%) who responded to the survey did not use topical antibiotics for the prevention of SSI but, when used, contaminated surgery (8/33, 24%) was the most commonly stated indication.

Conclusions: There are diverse opinions and practices among healthcare professionals about the use of topical antibiotics for the prevention of SSI. This considerable, and possibly inappropriate, variation in clinical practice needs to be addressed as part of antibiotic stewardship.

Introduction

Surgical site infection (SSI) is one of the most common causes of healthcare-associated infection.[1,2] Patients who develop an SSI are associated with a marked increase in morbidity and mortality rates and prolonged hospital stays.[1] Once discharged from hospital, these patients are five times more likely to be readmitted.[1] Reducing the incidence of SSI is important, both in terms of patient care and optimizing healthcare resources.

The use of perioperative intravenous antibiotics for the prevention of SSI is an established approach with guidelines, in general, recommending use for contaminated and clean-contaminated surgical procedures.[1,3] In contrast, there are few well-controlled, comprehensive studies that assess the efficacy of topical antibiotics[4] and, as such, their use is not recommended in current guidelines.[3,5,6] Concerns about the use of topical antibiotics focus on adverse reactions, such as contact dermatitis, interference with wound healing and the potential for increased antibiotic resistance.[7,8] However, the use of topical antibiotics may provide additional benefits to systemic prophylaxis in the prevention of SSI, namely sustained high local concentrations of antibiotics at the site of the incision with limited systemic absorption, leading to reduced toxicity compared with intravenous perioperative antibiotics, and potentially a reduction in the incidence of SSI, the overall use of antibiotics and the associated risk of resistance.[9] The use of topical antibiotics may be of particular benefit to those with a high risk of developing an SSI including, but not limited to, those with diabetes mellitus, patients who are obese (BMI >30 kg/m^2) and those who smoke.[4,10]

The aims of the present study were to: (i) determine the extent of the use of topical antibiotics to prevent SSI in clinical practice, despite the lack of peer-reviewed guidelines advocating this approach, and (ii) gather the opinions of healthcare professionals most likely to be involved in the prescription of, or in advising on the use of, topical antibiotics and to identify reasons behind their choices or opinions.

Methods

Definitions

Topical or local use of antibiotics is defined here as the application of an antibiotic agent directly to a surgical site intraoperatively or immediately post-operatively. These agents may be applied in the form of powders, sponges, irrigation solutions and sealants or dressings.[7] Our definition did not include antiseptic agents.

Survey

The development of the questionnaire was informed by a literature review (2010–17) to supplement the previous review by McHugh *et al.*[4] (2011). The questionnaire comprised 13 questions and was designed to determine the demographic nature of the participant (current role, number of years in practice, country of practice and type of institution) plus their beliefs and opinions about the use of topical antibiotics for the prevention of SSI (Figure S1, available as Supplementary data at *JAC* Online). Before the survey was launched, feedback about question content and survey design was solicited from five professionals (listed in the Acknowledgements section).

The content of the questionnaire was tailored according to the job role specified by the participant. Participants who identified themselves as surgeons or associate specialists and specialist registrars in surgery were classified as surgical participants, i.e. those who may be directly responsible for the use of topical antibiotics during surgery. Participants who identified themselves as an antimicrobial pharmacist, clinical microbiologist, infectious disease physician or other healthcare professional providing advice or formulating local guidelines were classified as advice-giving participants. All others who did not fit into either of these categories, but who provided their views on the topic, were classified as opinion-only participants.

The questionnaire was designed using Survey Monkey® (https://www.surveymonkey.com). The link to the survey was circulated by email to all members of BSAC ($n = 642$) and to all individual members of the European Wound Management Association (EWMA) ($n = 1596$). The survey link was open for 3 weeks (26 May 2017–16 June 2017) and a final reminder was sent by email to members of BSAC. The survey link was also displayed on the front page of the BSAC web site (www.bsac.org.uk) and circulated using social media. All responses were anonymous, but participants were invited to submit their contact details if they wanted to be kept informed of the results of the survey or were interested in participating in further qualitative interviews. Descriptive statistics are presented.

Results

Participant demographics

The questionnaire received 248 responses. The total number of responses varied per question and 160 (65%) were considered sufficiently completed to be analysed in further detail. There were 33 (21%) participants in the surgical category; 75 (47%) participants in the advice-giving category and 52 (33%) participants were classified as opinion-only participants with other roles ranging from tissue viability and wound management nurses to research scientists and those in academia (Table 1). Most of the responses received were from Europe ($n = 133$, 83%); however, responses were also received from Australasia ($n = 10$, 6%), Asia ($n = 9$, 6%), North America ($n = 7$, 4%) and Africa ($n = 1$, <1%).

The majority of respondents ($n = 110$, 69%) had spent 11 or more years in their current role. The majority worked in the public healthcare sector ($n = 114$, 71%). A higher percentage of participants in the surgical category worked in both the private and public healthcare sectors (33%, $n = 11$), compared with the advice-giving or opinion-only participants 15% ($n = 11$) and 12% ($n = 6$), respectively (Table 1). Only those in the surgical category were asked about the speciality in which they worked; participants from general surgery ($n = 8$, 24%) were most commonly represented followed by abdominal ($n = 4$, 12%), vascular ($n = 4$, 12%) and orthopaedic ($n = 4$, 12%) surgery, with smaller numbers representing other surgical categories.

Practice

Those in the surgical and advice-giving categories were asked a series of questions about practice. Of the 108 respondents, 29% ($n = 31$) stated that guidelines for the use of topical antibiotics to prevent SSI were available in their institution, the majority of which were based on national guidelines ($n = 20$, 65%). Local guidance and national and international guidelines appeared to be the predominant basis for local guidelines, whereas the preference of individual surgeons was less important (Table 1).

Only surgical participants were asked specifically about their clinical use of topical antibiotics ($n = 33$); 18 (55%) did not use topical antibiotics for the prevention of SSI. 'Contaminated surgery only' ($n = 8$, 24%) was the most commonly stated indication for using topical antibiotics, with fewer respondents using them in 'clean-contaminated surgery' ($n = 2$, 6%) or 'clean surgery only' ($n = 1$, 3%). Only three surgical participants (9%) used topical antibiotics to prevent SSI in all procedures. Five surgical participants (15%) used topical antibiotics in surgery for patients considered to be at high risk of SSI. Just over half of the respondents who stated they used topical antibiotics ($n = 8$, 53%) used them in <50% of cases.

Advice-giving participants were asked to indicate the extent to which they provided advice on the use of topical antibiotics to prevent SSI; 64% ($n = 48$) indicated that they provided advice on this area directly to surgical teams and 85% ($n = 64$) indicated that they were involved in formulating local guidelines; however, given that only 29% of respondents had a local guideline about the use of topical antibiotics for prevention of SSI, it is unclear whether the response to this question indicates that associated guidelines are in development, or that respondents indicated that they were involved in guideline development in general, or something else.

Participants in the surgical and advice-giving categories were asked to indicate methods of administration and associated topical antibiotics that were used or recommended in their practice, if at all (Figure 1). The total numbers of responses varied per option (84–102 responses); however, collagen sponges or implants were used/advised by 42% ($n = 40/96$ responses), powders or pastes by 42% ($n = 43/102$ responses), wound irrigation or lavage by 28% ($n = 26/92$ responses) and dressings or wound sealants by 19% ($n = 16/84$ responses). Based on the responses of those who indicated they used gentamicin in topical form, collagen sponges/implants were the most common method of administration (24/45 positive responses, 53%) and then powders and pastes (13/45,

Table 1. Demographics of the participants who responded to the questionnaire ($n = 160$), including an indication of the presence or absence of guidelines and their basis, for the use of topical antibiotics to prevent SSI

	Experience[a] (years)		Type of institution[b]			Presence of SSI guidelines		Basis of local SSI guidelines				
Category (n, %)	≤10	>10	public	private	both	yes	no	international guidelines	national guidelines	local guidance	surgeon preference	other
Surgeons (33, 21%)	7 (21%)	26 (79%)	19 (58%)	3 (9%)	11 (33%)	7 (21%)	26 (79%)	3 (43%)	3 (43%)	2 (29%)	0	0
Advice-giving[c] (75, 47%)	22 (29%)	53 (71%)	57 (76%)	7 (9%)	11 (15%)	24 (32%)	51 (68%)	7 (29%)	17 (71%)	12 (50%)	5 (21%)	1 (4%)
Opinion-only[d] (52, 33%)	21 (40%)	31 (60%)	38 (73%)	8 (15%)	6 (12%)	—	—	—	—	—	—	—

[a]Experience relates to the number of years' experience in the current role of the participant.
[b]Type of institution: public, NHS or state-funded institute; private, non-NHS or state-funded institute.
[c]The advice-giving category comprised participants belonging to the following professional groups (listed alphabetically): antimicrobial pharmacists, clinical microbiologists and infectious disease physicians.
[d]The opinion-only category comprised participants belonging to the following professional groups (listed alphabetically): doctor (speciality unknown), infection control professional, nurse (speciality unknown), wound care nurse, tissue viability nurse, pharmacist (speciality unknown), scientist, professor/academic and ward/unit manager.

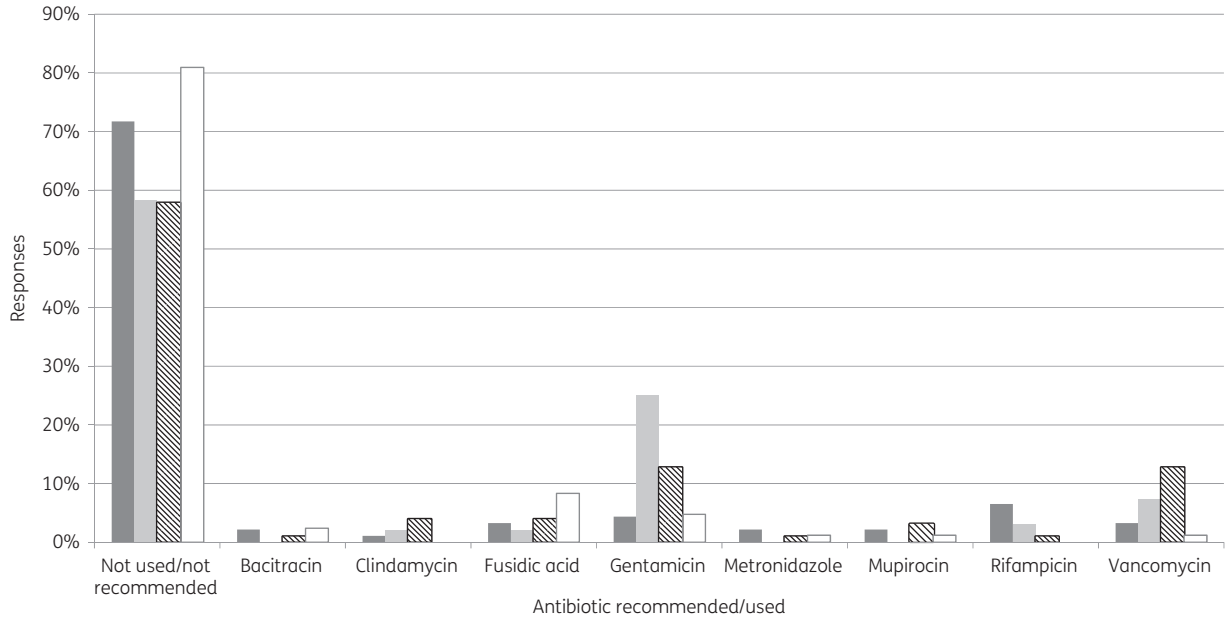

Figure 1. Administration methods and corresponding antibiotics used to prevent SSI, as indicated by surgical and advice-giving participants (dark grey bars, wound irrigation or lavage; light grey bars, collagen sponges or implants; diagonal line bars, powders or pastes; white bars, dressings or wound sealants) ($n = 108$ participants).

29%). With regard to topical vancomycin use, powders/pastes were the most common method of administration used/advised (13/24, 54%) followed by collagen sponges/implants (7/24, 29%) (Figure 1).

Opinions and beliefs

Participants indicated that evidence from published studies (58%, $n = 92$), advice from microbiologists/infectious disease physicians (44%, $n = 71$) and national/international guidelines (41%, $n = 65$) were the most common factors that influenced prescribing practice. Information from conferences, peers or mentors (36%, $n = 58$) and personal beliefs and views (29%, $n = 46$) were also cited. There were differences in the source of influence identified between each category of participant. Those in the surgical group ranked evidence from published studies, personal beliefs and proceedings from conferences as most likely to influence practice, whereas the advice-giving participants ranked evidence from

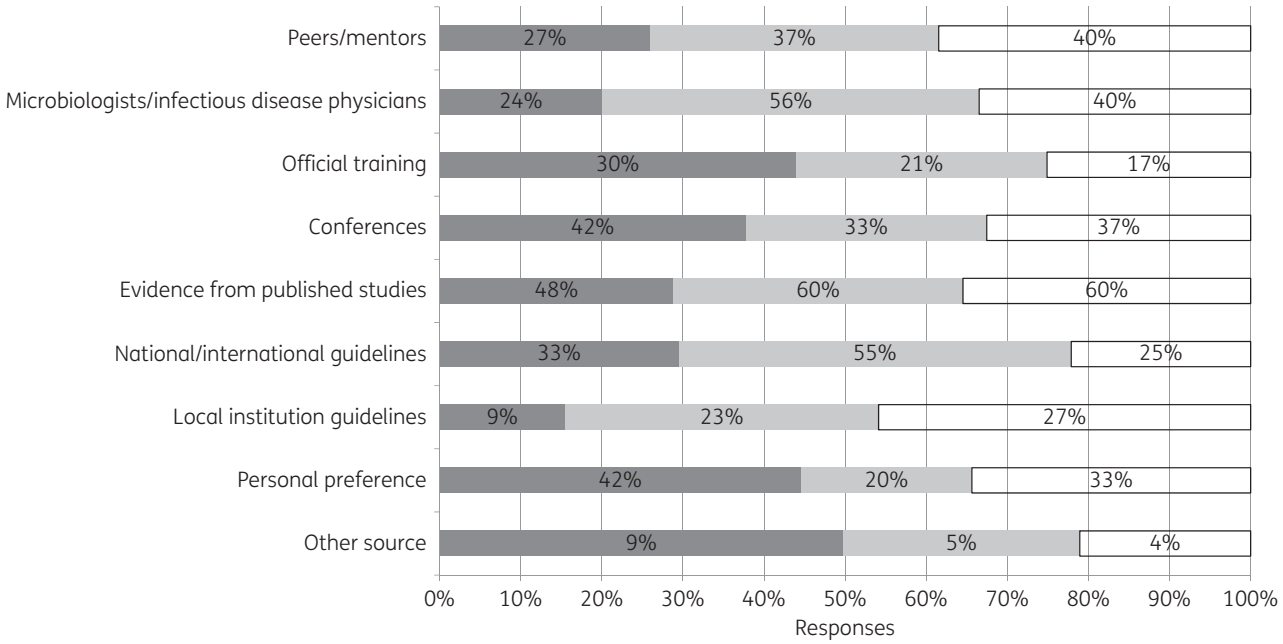

Figure 2. Influences on the use of topical antibiotics to prevent SSI, as indicated by participant category (dark grey bars, surgical category; light grey bars, advice-giving participants; white bars, opinion-only participants) ($n = 160$ responses). Each row represents all responses from all respondent categories for each potential influence. Each shaded bar within each row shows the % of each participant category that indicated the influence was a factor impacting practice (hence figures within rows do not add up to 100%).

published studies and advice from microbiology/infectious disease colleagues as the most common influences, followed by national/international guidelines. Similarly, participants in the opinion-giving category ranked evidence from published studies as most likely to influence practice with advice from microbiology/infectious disease colleagues and peers and mentors being next and equally important (Figure 2).

Responses to a series of statements about the use of topical antibiotics to prevent SSI were combined (Figure 3). The majority of participants ($n = 90$, 56%) did not agree that there was a significant body of evidence in favour of using topical antibiotics to prevent SSI and 46% ($n = 73$) did not agree that topical antibiotics are cost-effective (Figure 3). Thirty-one percent of respondents ($n = 50$) agreed that the use of topical antibiotics rarely resulted in detrimental side effects; 35% ($n = 56$) did not agree with this statement and 34% ($n = 54$) neither agreed nor disagreed. A small minority ($n = 11$, 7%) of participants agreed with the statement 'the use of topical antibiotics does not contribute to antibiotic resistance', with 81% ($n = 130$) of respondents disagreeing with this statement. Fifty-three percent of contributors ($n = 85$) did not agree with the statement 'topical antibiotics confer additional benefits over other forms of prophylaxis'; a similar number ($n = 37$, 23%) of participants either agreed or gave a neutral response ($n = 38$, 24%). With regard to statements of opinion about guidelines, 64% ($n = 69$) of participants questioned ($n = 108$) agreed that they followed national or international guidelines and 59% ($n = 64$) agreed they followed their institution's guidelines. The majority of advice-giving participants ($n = 60$, 80%) did not frequently give advice on the use of topical antibiotics.

With regard to specific participant categories, a minority of surgical respondents (36%) believed that topical antibiotics provide additional benefits, whereas 70% believed that they contributed to the development of antibiotic resistance. In the category of 'advisors', and in contrast to actual reported use in the surgical group, a minority (13%) said that they frequently provided advice on the use of topical antibiotics. When topical antibiotics were advised, gentamicin and vancomycin were the most common agents. Within this category, and broadly in keeping with that of the surgical group, 63% disagreed with the suggestion that topical antibiotics confer additional benefits, 89% believed that they contributed to antibiotic resistance and 64% believed there is not a scientific body of evidence in favour of topical antibiotics. Over half (68%) of respondents did not have local guidelines in place to advise about this subject.

The questionnaire also invited free-text comments to enable participants to add further information. These comments ($n = 41$) indicated a range of opinions for and against the use of topical antibiotics in the prevention of SSI.

Discussion

The results of this survey indicate the diverse opinions of healthcare professionals about the use of topical antibiotics for the prevention of SSI and suggest considerable, and possibly inappropriate, variation in clinical practice. Responses were received from a range of healthcare professionals from around the world and, as such, the results may be used as a general indicator of practices and beliefs and a baseline for further work in this area. However, the responses may be skewed towards those interested in this topic, those more likely to use topical antibiotics or those with a strongly held viewpoint.

Over half of the respondents in the surgical category of participants (55%) stated that they do not use topical antibiotics and, of those that do, gentamicin collagen sponges were most commonly used. A previous survey of North American orthopaedic surgeons

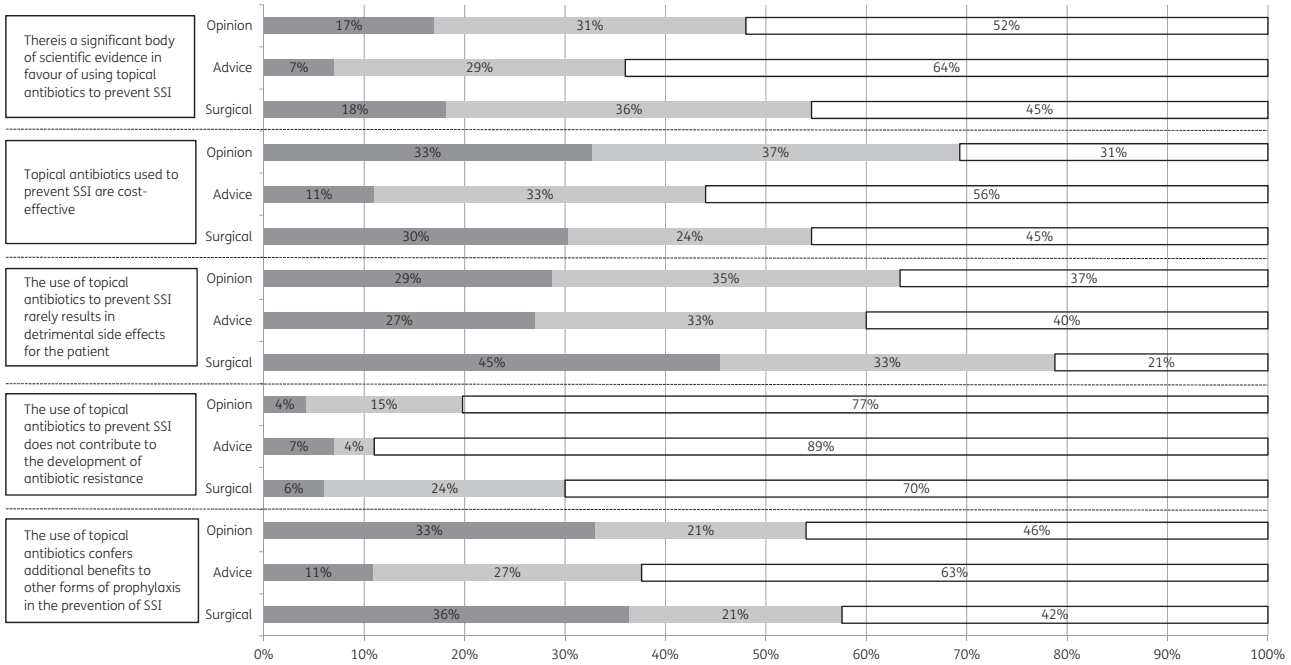

Figure 3. Extent to which categories of participants agree or disagree with selected statements about the use of topical antibiotics to prevent SSI (dark grey bars, agree/strongly agree; light grey bars, neither agree nor disagree; white bars, disagree/strongly disagree) ($n = 160$ responses).

found that 56% reported the common use of antibiotic irrigation in surgery.[11] Most respondents questioned (70%) did not have guidelines for the use of topical antibiotics for the prevention of SSI in their institution, in keeping with evidence suggesting that many antimicrobial stewardship programmes do not monitor appropriate use of such agents.[8,12] Interestingly, most respondents (59%) believed that they followed local guidelines despite the lack of local guidelines. Only a small proportion (13%) agreed that there was a significant scientific body of evidence in favour of topical antibiotics. Therefore, although almost half in the surgical category of professionals use topical antibiotics, there is no consensus on their effectiveness and most believe their use contributes to antibiotic resistance. In summary, the present survey showed that few are involved in advising in this area, many do not believe in the effectiveness of topical antibiotics and there is concern over the potential emergence of resistance.

Limitations of this study are acknowledged. The survey tool used was an unvalidated self-administered instrument, which did not undergo internal or external validation before launch, but was reviewed by five experienced healthcare professionals representing all respondent groups. There were a relatively small number of fully completed responses; however, similar results from a small dataset ($n = 164$) have been reported by Edmiston *et al.*[8] (2017) and our study therefore supports these data. The survey was circulated to members of two societies with an interest in the use of topical antibiotics to prevent SSI; however, the survey was not directly sent to surgeons. Owing to the small numbers within each subgroup, answers cannot be analysed to determine differences in practice between countries, professionals with more or less experience or by surgical speciality. Although the opinion-only group of participants did not use and did not offer advice on the use of topical antibiotics to prevent SSI, it is important to include responses from this group in order to reduce sources of bias. For instance, if compelling evidence for the use of topical antibiotics to prevent SSI were to emerge in the future, understanding why people do not use or advise this option would be important.

Notwithstanding certain caveats, including the size of the study and how representative the respondents were, the results of this survey are revealing. It has identified that although use by surgeons is relatively common, there is a considerable level of uncertainty about key areas of the use of topical antibiotics for preventing SSI, indicating the need for high-quality, well-controlled studies and systematic reviews to provide evidence in this field. The results also suggest a lack of local guidance and the inadequacy of antimicrobial stewardship initiatives in this area. The answers to this questionnaire will serve to provide material for additional investigations and further debate on the subject.

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Transparency declarations

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Supplementary data

Figure S1 is available as Supplementary data at *JAC* Online.

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