Original Contribution

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A comparative clinical study of different hair removal procedures and their impact on axillary odor reduction in men

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Summary

Background Axillary hair can influence the development of underarm odor in men.
Objective To compare different hair removal procedures and their impact on the effectiveness of standard soap washing (SW) in reducing male axillary odor.
Methods The axillae of healthy Caucasian males ($N = 30$; 18–48 years of age) were randomized in a noncrossover, split body design. Two of four axillary treatments were evaluated per subject: clipped with scissors; wet shaved with a razor; waxed; and untreated. Odor evaluations were performed by trained assessors according to the American Society for Testing and Materials organization at baseline (24 h postcontrol SW), immediately, 12 and 24 h following treatment plus SW (Day 1). Further evaluations were conducted immediately and 24 h following SW on Day 2 and Day 3. Mean odor scores were calculated and an analysis of covariance conducted using baseline data as covariate.
Results On Day 1, hair removal by clipping with scissors followed by SW offered no significant improvement in immediate odor control (27.2% reduction from baseline) when compared with SW alone. Both shaving and waxing followed by SW resulted in an immediate, significant reduction in axillary odor compared with SW alone (57.3% and 75.3% reduction, respectively; $P < 0.0001$). This improvement persisted for 24 h after shaving ($P = 0.0682$). Further, a single shaving treatment significantly improved the immediate effectiveness of SW on Day 1, Day 2, and Day 3 compared with SW alone ($P < 0.05$).
Conclusions Blade shaving of the axillae can optimize the cleansing and odor reducing effectiveness of daily hygiene measures for men without the discomfort associated with waxing.

Keywords: hair removal, odor, male axilla, shaving, body grooming

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Introduction

The axillae are uniquely characterized by the presence of squames, hair follicles, hair shafts, and four distinct types of exocrine gland: the eccrine, apocrine, apoeccrine, and sebaceous glands.[1] Eccrine and apoeccrine glands secrete a clear, odorless substance, consisting

primarily of water and salts, through ducts that open onto the skin of the axilla.[2] In contrast, the ducts of the apocrine glands extend into the pilary canal of the hair follicle.[3] Functionally quiescent until puberty, apocrine glands produce a thick, oily secretion that exits the body along the surface of the hair shaft.[4] These secretions are mixed with sebum, as sebaceous glands and apocrine glands open into the same hair follicle. The process of body odor formation in the axillae was found to depend on biotransformation of these odorless secretions into volatile odoriferous substances by commensal bacteria on the skin and hair surface.[5] Two distinct types of axillary microbiota dominated by either Corynebacteria or Staphylococci have been reported, the former being more prevalent in males and contributing to a more pronounced body odor.[6–12]

Body odor, in particular axillary odor, is perceived as unpleasant by most cultures worldwide. Moreover, excessive sweating and the resulting unpleasant odor are reported to adversely affect self-confidence and self-esteem in both men and women.[13] Reducing or eliminating body odor is therefore an essential goal of many people's daily personal care routine.[14] Typical hygiene practices include cleansing of the axillae and use of antiperspirants, both of which have been shown to alter odor production by changing the microbiota profile, its metabolic activity, and/or reducing the microbial biomass.[12,15,16] Over the last decade, removal of underarm hair has become more commonplace in men for hygiene as well as esthetic reasons.[17] It was first demonstrated in the 1950s by Shelley *et al.*[5] that removal of male axillary hair by shaving followed by soap washing resulted in a marked reduction or elimination of axillary odor compared with nonshaved axillae for at least 24 h. The authors concluded that the most effective means of reducing axillary odor included shaving of the axillary hair.

The aim of the current study was to confirm these early findings in a clinical setting, to expand the original research by comparing different underarm hair removal procedures for their potential to improve the effectiveness of standard soap washing in reducing male axillary odor and to quantify any change in body odor development relative to baseline.

Materials and methods

Subjects

Eligible subjects were male, Caucasian, aged 18–48 years with an average malodor intensity score ≥4.0 and right–left difference of <2.0 at baseline as determined by four trained assessors according to guidelines published by the American Society for Testing and Material (ASTM) International.[18] Subjects were excluded if they had any active infection or irritation in the axillae area; any allergies or intolerance to axillary antiperspirants, deodorants or soaps; active eczema or psoriasis within the past 6 months; a diagnosis of skin cancer within the past 12 months; evidence or history of diabetes, any immunologic or infectious disease. No therapy with systemic or topical medications in the underarms within 2 weeks prior to the start of the study was permitted. Subjects had to be willing to participate in a 14-day preconditioning period and abstain from the use of all deodorants, antiperspirants, perfumed products, medicated products, and deodorant soaps on the axillary area for the entire conditioning and test period.

Study design

The study lasted 19 days and the first 14 days were used as a pretreatment conditioning period. Subjects were asked to abstain from the use of all deodorants, antiperspirants, perfumed products, medicated products, and deodorant soaps on the axillary area, otherwise they were free to perform their normal daily activities. On Day 14, subjects were screened for axillary irritation and only subjects free from irritation qualified for entry into the study. Qualifying subjects had both axilla washed with a 2% aqueous solution of unscented soap and were issued with a freshly laundered T-shirt. After 24 h, baseline odor evaluations were carried out by all four trained assessors.

Subjects were eligible for participation in the study based on the inclusion criteria of a mean malodor intensity score ≥4.0 and right–left difference of <2.0 at baseline. For the odor assessments, subjects removed their T-shirt and elevated their arm to allow the odor assessor to place the wide end of a fresh, unused cone shaped cup, from which the narrow end was cut off, tightly against the axillary surface. The axillary region was assessed by placing the nose against the narrow end of the cup and sniffing. All four assessors evaluated first the right; then, the left axillary area of every subject and the odor scores were averaged for the four assessors. Odor assessors were blinded to treatment assignments and any previous odor scores. The odor evaluations followed an eleven-point scale ranging from no malodor (score of 0) to extremely strong malodor (score of 10).

For eligible subjects, the remaining 4 days constituted the evaluation period (Day 1 to Day 4). The

axillae of healthy Caucasian males were randomized to one of four hair removal treatments: clipped with scissors; clipped with scissors followed by wet shaving with a razor; waxed; and untreated. A noncrossover, split body design was employed in which two of the four axillary treatments were evaluated per subject. The randomly assigned hair removal treatment was carried out by study site technicians on Day 1 of the evaluation period:

- Clipping with scissors – Axilla hair was clipped with clean sterile scissors as close to the skin as possible without touching the skin with the scissors.
- Blade shaving – Axilla hair was clipped as described above and a 10% solution of unscented soap applied with a terry towel for 10 s to produce a lather. The area was shaved with a disposable single blade razor using downward strokes until all hair was removed.
- Waxing – A thin layer of heated wax (105°F) was applied to the axilla using a clean wooden tongue depressor followed by a wax remover cloth. The cloth was removed by pulling quickly in the opposite direction to the hair growth. A clean terry towel soaked in ice water was applied to the area after waxing and used to remove any remaining wax.
- No treatment

On Day 1, an odor evaluation was performed by the four trained assessors on the axillae of subjects assigned to the clipped and shaved treatment groups only, after the axilla hair was clipped and prior to shaving or soap washing.

After treatment, all axillary sites were washed with a 10% aqueous solution of unscented soap. The soap was applied with a cotton towel and the area washed for 10 s followed by thorough rinsing with warm water for 20 s to remove all visible signs of soap. The area was patted dry with a clean towel.

Odor evaluations for all subjects were carried out immediately, 12 and 24 h after controlled washing. After the 24-h postwash odor evaluation (Day 2), subjects had both axillae washed as described and odor evaluations were carried out immediately and after 24 h. On Day 3, subjects returned to the test facility for odor evaluations 24 h after controlled washing on Day 2 and 48 h postaxillary treatment. After the 24 h postwash odor evaluation, subjects had both axillae washed as described and odor evaluations were carried out immediately and after 24 h (Day 4, 72 h postaxillary treatments). The study schedule is shown in Table 1.

Data analysis

Analyses were conducted on the "full analysis set" which is as close as possible to the ITT ideal of including all randomized subjects.[19] Mean odor scores were calculated for each time point. An analysis of covariance was conducted using baseline data as covariate and the treatment, side (left or right), and subject were included in the model. Statistical significance was defined as $P < 0.10$. To more easily illustrate the degree of odor control, the percent reduction of body odor from baseline was calculated using the formula:

Table 1 Study schedule

Study day	Evaluation visit	Axillary evaluation	2% soap wash	T-shirt issued	Axillary treatment	10% soap wash	Odor assessment
0		X	X	X			
1	1						X*
	2				X		X†
	3					X	X‡
	4						X§
2	5						X¶
	6					X	X‡
3	7						X**
	8					X	X‡
4	9						X††

*Baseline 24 h after 2% soap wash.
†Postclipping and prior to shaving for clipped axillae sites only.
‡Immediately after 10% soap wash.
§12 h postaxillary treatment.
¶24 h postaxillary treatment and soap wash.
**48 h postaxillary treatment and 24 h after Day 2 soap wash.
††72 h postaxillary treatment and 24 h after Day 3 soap wash.

$$\text{Odor Reduction}\,[\%] = (1 - t_x/t_0) \times 100$$

where t_x = adjusted mean odor score at time t_x; t_0 = adjusted mean odor score at baseline.

Ethics

The study was approved by the institution's review board or ethics committee and all subjects provided written, informed consent in accordance with Title 21 of the Code of Federal Regulations, Part 50.

Results

In total, 30 subjects were enrolled and completed the study. Treatment assignments were randomized and balanced so that each treatment appeared on each axillary site an equal number of times ($n = 15$). There were no adverse events observed or reported during the course of the study; however, subjects reported considerable discomfort during the waxing treatment.

On Day 1, odor evaluations were carried out immediately after treatment plus controlled soap washing (Fig. 1 and Table 2). Soap washing alone resulted in an immediate reduction of 23.5% from baseline in axillary odor (Table 3). Hair removal by clipping with scissors followed by soap washing resulted in an immediate 27.2% reduction from baseline, and this was not significantly different to soap washing alone. Hair removal by shaving with a razor blade followed by soap washing resulted in an immediate reduction of 57.3% from baseline in axillary odor and this reduction was significantly greater than soap washing alone ($P < 0.0001$). Waxing followed by soap washing resulted in an immediate reduction of 75.3% from baseline in axillary odor, and this difference was significant compared with soap washing alone ($P < 0.0001$).

The significant improvement in odor control for a single soap washing after shaving with a razor blade compared with soap washing alone persisted for 24 h post-treatment ($P = 0.0682$) (Table 3). This persistence was not observed 24 h after clipping with scissors or waxing.

A single shaving treatment significantly improved the immediate effectiveness of soap washing on Day 1, Day 2, and Day 3 compared with soap washing alone ($P < 0.05$) (Table 3). Similarly, a single waxing treatment significantly improved the immediate effectiveness of soap washing at all time points compared with soap washing alone ($P < 0.001$) (Table 3). In contrast, clipping with scissors did not significantly improve the immediate effectiveness of soap washing compared with soap washing alone on Day 1 or Day 3 (Table 3). On Day 3 and Day 4, mean odor scores were similar to baseline for all treatments when assessed 24 h after controlled soap washing (Table 4).

Odor assessments were also made on Day 1 to determine whether hair removal by clipping with scissors without subsequent soap washing impacted axillary odor development. A reduction of <20% from baseline in axillary odor was observed after clipping with scissors and before shaving or soap washing.

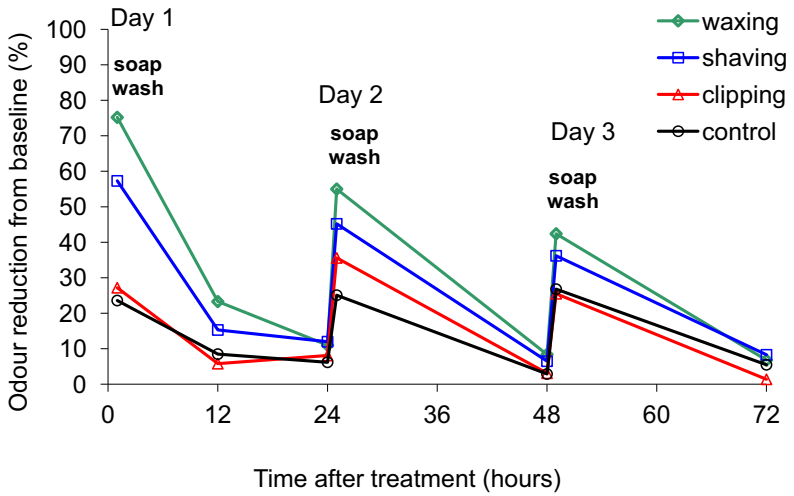

Figure 1 Mean odor reduction from baseline at specified time points after treatment and controlled soap washing of the axillae.

Table 2 Covariant-adjusted mean odor score change from baseline by evaluation time

Treatment	Adjusted mean odor score*	Adjusted mean odor score change from baseline†							
	Baseline (SD)	After clipping with scissors and before shaving (SE)	Immediately after treatment and soap wash (SE)	12 h after treatment and soap wash (SE)	24 h after treatment and soap wash (SE)	Immediately after Day 2 soap wash (SE)	48 h after treatment and 24 h after Day 2 soap wash (SE)	Immediately after Day 3 soap wash (SE)	72 h after treatment and 24 h after Day soap wash (SE)
Soap wash only	6.583 (1.013)	–	−1.550 (0.280)	−0.557 (0.160)	−0.406 (0.195)	−1.646 (0.176)	−0.193 (0.189)	−1.757 (0.200)	−0.357 (0.187)
Clipping with scissors	6.550 (1.358)	−0.996 (0.178)	−1.782 (0.280)	−0.379 (0.160)	−0.532 (0.194)	−2.330‡ (0.175)	−0.198 (0.189)	−1.672 (0.200)	−0.093 (0.187)
Blade shaving	6.600 (1.210)	−1.301 (0.140)	−3.781‡ (0.281)	−1.011‡ (0.161)	−0.964‡ (0.196)	−2.982‡ (0.177)	−0.434 (0.190)	−2.389‡ (0.201)	−0.549 (0.188)
Waxing	6.317 (0.948)	–	−4.754‡ (0.282)	−1.703‡ (0.161)	−0.815 (0.196)	−3.458‡ (0.177)	−0.525 (0.190)	−2.682‡ (0.202)	−0.433 (0.188)

SD, standard deviation; SE, standard error.
*Covariant-adjusted mean odor scores and standard deviation were calculated at baseline.
†Covariant-adjusted least squares mean and standard error were calculated for each time point.
‡Significant difference ($P < 0.1$) compared with soap washing only at each evaluation time.

Discussion

The results presented here show that removal of male underarm hair by waxing or shaving significantly improved the immediate effectiveness of standard soap washing in reducing axillary odor compared with soap washing alone. Although waxing was found to be more effective than blade shaving in reducing axillary odor after soap washing, it should be noted that the waxing procedure was associated with considerable discomfort which might outweigh the potential benefits of axillary hair removal by waxing. The reduction in axillary odor after hair removal by clipping with scissors followed by soap washing was not significantly different to soap washing alone suggesting that the method of hair removal was an important factor in axillary odor control.

Blade shaving followed by soap washing resulted in a marked reduction in axillary odor compared to nontreated axillae and importantly, this reduction remained significantly greater than control for at least 24 h, an effect not observed after axillary hair removal by waxing or clipping with scissors.

Our findings are consistent with the previous findings of Shelley *et al.*[5] where removal of axillary hair in men by shaving resulted in a marked reduction or elimination of axillary odor for the next 24 h. However, the raters indicated only whether they were able to smell any odor; their judgments on odor intensity and change from baseline were not recorded. In another study, the axillary odor of shaved armpits was rated as significantly less intense and more pleasant than the odor of unshaved armpits. It should be noted that nontrained assessors rated odor samples collected using cotton pads worn in the underarms for 24 h pre-assessment.[20].

The present study both supports and extends these findings. A single hair removal event by blade shaving or waxing but not hair clipping with scissors significantly improved the immediate effectiveness of soap washing in reducing axillary odor up to 3 days post-treatment when compared with untreated, washed axillae ($P < 0.05$ on Day 1, Day 2, and Day 3). It is postulated that removal of axillary hair by blade shaving or waxing provides soaps and cleansing products with better access to the skin and follicular openings for more effective odor reduction in the underarm than when hairs are present or clipped with scissors. The trained odor assessors were blinded to treatment assignments and previous odor score; however, they were able to see the underarms of subjects when performing the odor evaluations. It could be argued that

Table 3 Adjusted mean odor score percent change from baseline by evaluation time

Treatment	Immediately after treatment and soap wash (%)	12 h after treatment and soap wash (%)	24 h after treatment and soap wash (%)	Immediately after Day 2 soap wash (%)	48 h after treatment and 24 h after Day 2 soap wash (%)	Immediately after Day 3 soap wash (%)	72 h after treatment and 24 h after Day 3 soap wash (%)
Soap wash only	23.5	8.5	6.2	25.0	2.9	26.7	5.4
Clipping with scissors	27.2	5.8	8.1	35.6*	3.0	25.5	1.4
Blade shaving	57.3†	15.3‡	14.6‡	45.2†	6.6	36.2*	8.3
Waxing	75.3†	27.0†	12.9	54.7†	8.3	42.5†	6.9

*$P < 0.05$ *vs.* soap wash only.
†$P < 0.001$ *vs.* soap wash only.
‡$P < 0.10$ *vs.* soap wash only.

Table 4 Covariant-adjusted baseline and mean odor score by evaluation time

Treatment	Adjusted mean odor score*	Calculated adjusted mean odor score†							
	Baseline (SD)	After clipping with scissors and before shaving	Immediately after treatment and soap wash	12 h after treatment and soap wash	24 h after treatment and soap wash	Immediately after Day 2 soap wash	48 h after treatment and 24 h after Day 2 soap wash	Immediately after Day 3 soap wash	72 h after treatment and 24 h after Day 3 soap wash
Soap wash only	6.583 (1.013)	–	5.033	6.026	6.177	4.937	6.390	4.826	6.226
Clipping with scissors	6.550 (1.358)	5.554	4.768	6.171	6.018	4.220‡	6.352	4.878	6.457
Blade shaving	6.600 (1.210)	5.299	2.819‡	5.589‡	5.636‡	3.618‡	6.166	4.211‡	6.051
Waxing	6.317 (0.948)	–	1.563‡	4.614‡	5.502	2.859‡	5.792	3.635‡	5.884

SD, standard deviation.
*Covariant-adjusted mean odor scores and standard deviation were calculated at baseline.
†Adjusted mean odor scores were calculated for each time point using baseline data as covariate.
‡Significant difference ($P < 0.10$) compared with soap washing only at each evaluation time.

the results may be biased by assessors observing the presence or absence of underarm hair. While a potential limitation of the study, in general no significant difference was observed between odor intensities of clipped and untreated axillae suggesting that this was not the case. Furthermore, no marked reduction from baseline in axillary odor was observed after clipping of hair with scissors (before shaving or soap wash). This finding also challenges the hypothesis that axillary hair plays an important role in retaining chemical compounds active in communication processes[21,22] and suggests that axillary hair plays a minor role, if any, in "trapping" odoriferous axillary chemicals.

A mechanism for the reduced odor development following removal of axillary hair by shaving has been proposed. Retained axillary secretions and debris on the hair shaft act as an excellent medium for the growth of microorganisms and subsequent axillary odor production. Axillary secretions and bacteria have been reported to adhere firmly to the skin and hair, making them difficult to remove by soap washing alone.[5] Removal of axillary hair would therefore be expected to prompt a decrease in odor production compared with soap washing alone as observed in the present study following blade shaving or waxing. Of interest, this effect was not observed after initial hair removal by clipping with scissors suggesting that the method of hair removal was an important factor in determining the extent of improvement in axillary odor reduction after standard soap washing. Removal of

dead skin and sebum by blade shaving or waxing, that otherwise trap odorants and dirt, might provide an additional odor reduction benefit over soap washing alone or hair removal by clipping with scissors followed by soap washing. Thus, hair removal by blade shaving and waxing may allow a deeper cleansing of the axilla than clipping with scissors followed by soap washing or soap washing alone.

Given that the skin microbial community plays an important role in the formation of body odor in the axillae,[1] future studies should evaluate whether the different methods of hair removal followed by soap washing influence the bacterial population in the axillae in addition to the impact on axillary odor formation. The malodorous axillae have been reported to instigate a strong psychological impact on subjects resulting in social and functional impairment. Future studies might also include subjects' self-assessment of axillary odor, wetness perception, and impact on quality-of-life measures.

The management of body odor by hygiene measures including underarm hair removal by waxing or blade shaving is important because axillary odor can be an unpleasant problem affecting a person's confidence and self-esteem. Practical recommendations regarding the most effective means of reducing axillary odor include shaving of underarm hair in men.[5,13] Our findings support these practical recommendations and may be of particular relevance in situations known to stimulate or exacerbate apocrine gland secretion and axillary odor development such as during periods of emotional stress, intense physical activity, or when in a hot or humid environment.

Management of body odor might explain, in part, why removal of axillary hair is becoming a more widespread cross-cultural practice in men. Research by retail analysts Mintel[23] revealed that 60% of 16 to 24-year-old British men now regularly remove their body hair. Of those surveyed, 12% had removed the hair from their underarms in the last 12 months.[23] In a US-based study examining men's motives for removing body hair, the main reason for doing so was for cleanliness (75%) with the majority of men removing hair by blade shaving.[17] Similarly, in Europe, the preferred method of hair removal in the underarms by men is typically blade shaving (Procter & Gamble, unpublished data).

Conclusions

Removal of male underarm hair by blade shaving and waxing significantly improved the immediate effectiveness of standard soap washing in reducing axillary odor compared with soap washing alone. This benefit was not seen when hairs were clipped to skin level with scissors. For blade shaving, this odor reduction benefit was observed up to 24 h after the soap wash. Moreover, shaving with a razor blade was found to improve the immediate odor reducing effectiveness of soap washing for at least 48 h after hair removal when compared with soap washing alone.

Blade shaving of the axillae can optimize the cleansing and odor reducing effectiveness of daily hygiene measures for men without the discomfort associated with waxing. Regular shaving with a razor should be considered as part of a grooming regimen that can be used to effectively manage body odors.

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Conflicts of interest

All authors are employees of Procter & Gamble.

References

1 Callewaert C, Kerckhof FM, Granitsiotis MS *et al.* Characterization of Staphylococcus and Corynebacterium clusters in the human axillary region. *PLoS ONE* 2013; **8**: e70538.
2 Wilke K, Martin A, Terstegen L *et al.* A short history of sweat gland biology. *Int J Cosmet Sci* 2007; **29**: 169–79.
3 Kurosumi K, Shibasaki S, Ito T. Cytology of the secretion in mammalian sweat glands. *Int Rev Cytol* 1984; **87**: 253–329.
4 Lundstrom JN, Olsson MJ. Functional neuronal processing of human body odors. *Vitam Horm* 2010; **83**: 1–23.
5 Shelley WB, Hurley HJ Jr, Nichols AC. Axillary odor; experimental study of the role of bacteria, apocrine sweat,

and deodorants. *AMA Arch Derm Syphilol* 1953; **68**: 430–46.
6 Leyden JJ, McGinley KJ, Holzle E *et al.* The microbiology of the human axilla and its relationship to axillary odor. *J Invest Dermatol* 1981; **77**: 413–6.
7 Natsch A, Gfeller H, Gygax P *et al.* A specific bacterial aminoacylase cleaves odorant precursors secreted in the human axilla. *J Biol Chem* 2003; **278**: 5718–27.
8 Natsch A, Schmid J, Flachsmann F. Identification of odoriferous sulfanylalkanols in human axilla secretions and their formation through cleavage of cysteine precursors by a C-S lyase isolated from axilla bacteria. *Chem Biodivers* 2004; **1**: 1058–72.
9 Natsch A, Derrer S, Flachsmann F *et al.* A broad diversity of volatile carboxylic acids, released by a bacterial aminoacylase from axilla secretions, as candidate molecules for the determination of human-body odor type. *Chem Biodivers* 2006; **3**: 1–20.
10 Taylor D, Daulby A, Grimshaw S *et al.* Characterization of the microflora of the human axilla. *Int J Cosmet Sci* 2003; **25**: 137–45.
11 Troccaz M, Starkenmann C, Niclass Y *et al.* 3-Methyl-3-sulfanylhexan-1-ol as a major descriptor for the human axilla-sweat odour profile. *Chem Biodivers* 2004; **1**: 1022–35.
12 Troccaz M, Gaia N, Beccucci S *et al.* Mapping axillary microbiota responsible for body odours using a culture-independent approach. *Microbiome* 2015; **3**: 3.
13 NHS. NHS choices – body odour. 2014. [WWW document]. URL http://www.nhs.uk/Conditions/Body-odour/Pages/Treatment.aspx [accessed on 02 April 2015].
14 Baki G, Alexander KS. Skin care products. In: G Baki, KS Alexander, eds. Introduction to Cosmetic Formulation and Technology, 1st edn. Hoboken, NJ: John Wiley & Sons; 2015: pp. 125–344.
15 Holland KT, Bojar RA. Cosmetics: what is their influence on the skin microflora? *Am J Clin Dermatol* 2002; **3**: 445–9.
16 James AG, Austin CJ, Cox DS *et al.* Microbiological and biochemical origins of human axillary odour. *FEMS Microbiol Ecol* 2013; **83**: 527–40.
17 Boroughs M, Cafri G, Thompson JK. Male body depilation: prevalence and associated features of body hair removal. *Sex Roles* 2003; **52**: 637–44.
18 ASTM E1207-87. Standard Practice for the Sensory Evaluation of Axillary Deodorancy. West Conshohocken, PA: ASTM; 1988.
19 Department of Health and Human Services, Food and Drug Administration. Docket No. 97D-0174. E9 Statistical Principles for Clinical Trials (Section 5.2.1 Full Analysis Set). Silver Spring, MD: Department of Health and Human Services; 1998.
20 Kohoutová D, Rubešová A, Havlíček J. Shaving of axillary hair has only a transient effect on perceived body odor pleasantness. *J Behav Ecol Sociobiol* 2012; **66**: 569–81.
21 Cohn BA. In search of human skin pheromones. *Arch Dermatol* 1994; **130**: 1048–51.
22 Havlicek J, Murray AK, Saxton TK *et al.* Current issues in the study of androstenes in human chemosignaling. *Vitam Horm* 2010; **83**: 47–81.
23 Mintel. The only way is smooth: half of Britain's men feel the pressure to remove or groom their body hair. 2014. [WWW document]. URL http://www.mintel.com/press-centre/beauty-and-personal-care/the-only-way-is-smooth-half-of-britains-men-feel-the-pressure-to-remove-or-groom-their-body-hair [accessed on 02 April 2015].

