



## Reports

Gross gods and icky atheism: Disgust responses to rejected religious beliefs<sup>☆</sup>Ryan S. Ritter<sup>\*</sup>, Jesse Lee Preston

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## ABSTRACT

Disgust is an emotional response that helps to maintain and protect physical and spiritual purity by signaling contamination and motivating the restoration of personal cleanliness. In the present research we predicted that disgust may be elicited by contact with outgroup religious beliefs, as these beliefs pose a threat to spiritual purity. Two experiments tested this prediction using a repeated taste-test paradigm in which participants tasted and rated a drink before and after copying a passage from an outgroup religion. In Experiment 1, Christian participants showed increased disgust after writing a passage from the Qur'an or Richard Dawkins' *The God Delusion*, but not a control text. Experiment 2 replicated this effect, and also showed that contact with an ingroup religious belief (Christians copying from the Bible) did not elicit disgust. Moreover, Experiment 2 showed that disgust to rejected beliefs was eliminated when participants were allowed to wash their hands after copying the passage, symbolically restoring spiritual cleanliness. Together, these results provide evidence that contact with rejected religious beliefs elicits disgust by symbolically violating spiritual purity. Implications for intergroup relations between religious groups is discussed, and the role of disgust in the protection of beliefs that hold moral value.

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Disgust has been described as “the body and soul emotion” for its role in providing the affective input for the intuitions that inform us of *purity violations*: acts that defile the sanctity of the physical or spiritual self (Rozin, Haidt, & McCauley, 1999). Although disgust originally evolved to motivate the avoidance of threats that could harm the physical body (e.g., toxins, disease), it has since extended to social contexts as well. That is, we can be disgusted by a rotting corpse as well as a “rotten” lie; an unclean bathroom and an “unclean” adulterer. Indeed, past research has borne out the hypothesis that purity violations are closely associated with the emotion of disgust (Horberg, Oveis, Keltner, & Cohen, 2009; Rozin, Lowery, Imada, & Haidt, 1999). For example, people report feeling disgust in response to moral violations such as sexual taboos (Gutierrez & Giner-Sorolla, 2007; Rozin, Lowery, et al., 1999). Likewise, fMRI research demonstrates that thinking about socio-moral violations (e.g., incest, killing your sister's child) activates areas of the brain associated with more primitive forms of disgust (Borg, Lieberman, & Kiehl, 2008). Feelings of disgust can also impact moral judgments, as researchers have found that inducing people to experience disgust leads them to make more harsh moral judgments (Schnall, Haidt, Clore, & Jordan, 2008; Wheatley & Haidt, 2005), and increases the condemnation of purity violations (Horberg et al., 2009). Such evidence demonstrates the

importance of disgust in our subjective experience of moral purity, and suggests that threats to one's sense of physical or spiritual purity are likely to elicit disgust.

The present research contributed to existing literature by examining the role of disgust in the context of rejected religious beliefs. Specifically, we predict that people may become literally disgusted by contact with an outgroup religion. Just as disgust can be elicited by the purity violations described above, contact with rejected religious beliefs may be perceived as a threat to one's spiritual self and so be rejected by the same intuitive emotional mechanism. There are several reasons to anticipate this finding. First, people often report disgust in response to outgroups that threaten their moral ideals (e.g., homosexuals; Cottrell & Neuberg, 2005). Likewise, incidental feelings of disgust can exacerbate ethnocentrism and outgroup bias (Navarrete, Fessler, & Eng, 2007). Religions are not just belief systems, but also delineate important social categories, and therefore may similarly elicit disgust as a means of protection from threatening outgroups. Second, religious beliefs tend to have a strong moral component—that is, there are “right” and “wrong” beliefs to hold, and there is a perceived moral consequence for believing (e.g., eternal reward) or disbelieving (e.g., eternal torture) the prescribed truth. To the extent that a given thought or action has been moralized by one's religious tradition, we should expect its violation to be perceived as a threat to one's purity. This idea has been demonstrated, for example, by the finding that Protestants tend to moralize the contents of their thoughts more than Jews, and so find it more morally wrong to merely contemplate a sinful action (e.g., committing adultery) even without engaging in it (Cohen & Rozin, 2001). Likewise, merely considering taboo thoughts (“heretical

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counterfactuals”) tends to elicit moral outrage and an increased desire for moral reaffirmation (Tetlock, Kristel, Elson, Green, & Lerner, 2000). Engaging in contact with rejected religious beliefs – a kind of culturally proscribed cognition – should thus be perceived as a threat to one’s own sense of spiritual purity, and therefore elicit disgust.

Finally, religious belief is closely connected with the moral virtues of sanctity and purity, which are symbolically represented in many different religious practices (Graham & Haidt, 2010). Thus, not only are *beliefs* often moralized as described above, but religious *rituals* all throughout the world include prescribed acts of bodily cleansing intended to symbolically purify the spirit and prepare the believer for communion with God. Examples abound, including the Christian practice of baptism, the Islamic practice of ablution prior to prayer, or the Hindu practice of bathing in the sacred river Ganges. Many religions are also replete with strict rules governing sexual behavior (e.g., no premarital sex), clothing (e.g., sacred garments), and the appropriate preparation and/or consumption of food and alcohol. These ubiquitous concerns with spiritual and physical cleanliness again suggest that contact with “unclean” beliefs should elicit disgust, but further suggest that religious purity violations may literally leave people feeling physically dirty.

Related to these points, recent studies have in fact demonstrated the embodiment of moral purity in feelings of physical cleanliness, thus lending credence to the psychological utility of the kinds of purification rituals common in religious practice. Zhong and Liljenquist (2006), for example, have demonstrated that feelings of moral impurity (as induced by asking participants to imagine a past transgression) leave people feeling dirty and wanting to physically cleanse themselves. When given the opportunity to wash their hands, however, it had the effect of “washing away one’s sins”, making people less likely to engage in compensatory prosocial behavior (Zhong & Liljenquist, 2006). Physical cleansing can also alleviate incidental feelings of disgust (Schnall, Benton, & Harvey, 2008) or lead to a heightened sense of having a “clean self” (Zhong, Strejcek, & Sivanthan, 2010) and impact subsequent moral judgments. Moreover, researchers have also demonstrated that feelings of purity can be embodied in our olfactory sense; that clean smells can promote virtuous behavior (Liljenquist, Zhong, & Galinsky, 2010) and disgusting smells (e.g., from a commercial “fart spray”) can render more harsh moral judgments (Schnall et al., 2008). It should not be surprising, then, that religions all throughout the world have been incorporating rituals involving cleaning and fragrance for thousands of years, as they literally help establish, restore, or maintain a sense of moral or spiritual purity.

Besides touch and smell, moral (im)purity may also be embodied in the sense of taste (for more on taste as a metaphor for morality, see Hume, 1998, p. 495; Haidt & Joseph, 2007). For example, Eskine, Kacirik, and Prinz (2011) found that participants who tasted an unpleasant beverage subsequently made more harsh moral judgments than participants who tasted water or a sweetened beverage. In other words, experiencing gustatory disgust increased moral condemnation. But we may also expect the direction of causality to be reversed—that moral impurities may *elicit* gustatory disgust. In fact, anecdotal support for this hypothesis can be found in some of our everyday language about moral events. We often speak of someone’s immoral actions as being “tasteless” or as “leaving a bad taste in the mouth,” for example, and we associate pleasant tastes with moral purity and divinity (e.g., “taste and see that the Lord is good” Psalms 34:8, NIV; “this cheesecake is divine!”).

## The present research

The present research addresses two related questions. First, does contact with rejected religious beliefs elicit disgust? Second, if contact with rejected beliefs elicits disgust, can acts of physical cleansing (e.g., hand washing) function to restore a sense of purity following contact? Two experiments addressed these questions using a novel repeated

taste-test paradigm whereby ratings of disgust toward a beverage were taken before and after hand-copying a passage from a religious or control text. **Experiment 1** investigated disgust responses after Christian participants copied a passage from the Qur’an, Richard Dawkins’ *The God Delusion*,<sup>1</sup> or a control text. **Experiment 2** compared disgust before and after copying a rejected (i.e., Qur’an/Dawkins) vs. an accepted religious text (i.e., Bible). In both studies we predicted greater disgust after copying texts from rejected religious beliefs, but not neutral or accepted beliefs. That is, contact with outgroup religious beliefs may literally leave a bad taste in the mouth, causing a beverage to be perceived as more disgusting after contact.

**Experiment 2** further explored the embodiment of disgust by introducing a hand-cleaning manipulation following contact. We predicted that physical cleansing would eliminate the gustatory disgust response by symbolically removing the moral impurity associated with the rejected belief.

## Experiment 1

Participants in **Experiment 1** tasted and rated a lemon drink before and after writing a passage from the Qur’an, *The God Delusion*, or a control text. We predicted that the second drink would be rated more disgusting than the first after contact with a rejected belief system (i.e., Islam and Atheism), whereas no differences between drink ratings were anticipated after contact with the control text.

### Method

#### Participants

Participants were recruited through the Psychology Subject Pool at the University of Illinois at Urbana-Champaign. It was critical that participants reject the beliefs of the target religious texts, we therefore prescreened for Christian volunteers using a questionnaire administered to the Subject Pool. 88 self-reported Christian undergraduates participated for partial course credit. Six people were excluded for either failing to follow directions or guessing the hypothesis, leaving 82 participants (29 men, 53 women; mean age = 19) included in the analysis.

#### Repeated taste-test paradigm

To measure disgust responses we developed a novel repeated taste-test paradigm. Participants were told that they would complete two separate studies: a consumer marketing survey, and an investigation into the relation between handwriting and personality. As part of the consumer marketing study participants were asked to taste and rate two slightly different variations of a beverage (in reality, the two beverages were identical). The handwriting portion of the study was framed as an unrelated task administered between tasting the two beverages, ostensibly so the participants would have time to refresh their palate. During this task, participants copied the target religious/control text. This cover story allowed us to measure participants’ disgust rating of a lemon-water solution on two separate occasions: immediately before and after copying a rejected or neutral passage, and so provides a simple way of measuring change in feelings of disgust while controlling for baseline responses to the beverage. Further, rather than relying on explicit questions (e.g., “how disgusted were you by the passage?”) that tend to be more susceptible to response biases and demand characteristics, this paradigm provides a more indirect measure of people’s intuitive responses by asking participants to rate a beverage during a seemingly unrelated task.

<sup>1</sup> Although Atheism is not a religion, but the absence of religion, we refer to it as a “rejected religious belief” throughout the paper because the denial of belief is antithetical to subjects’ religious beliefs.

**Lemon–water solution.** A solution consisting of 1 cup of lemon juice concentrate and 1 gal of water was pre-tested among a separate sample of 29 undergraduates. Participants rated how disgusting the beverage tasted on a 7-point scale (1 = *not at all*; 7 = *extremely*). The beverage was rated at the midpoint of the scale ( $M = 3.6$ ,  $SD = 1.63$ ).

### Procedure

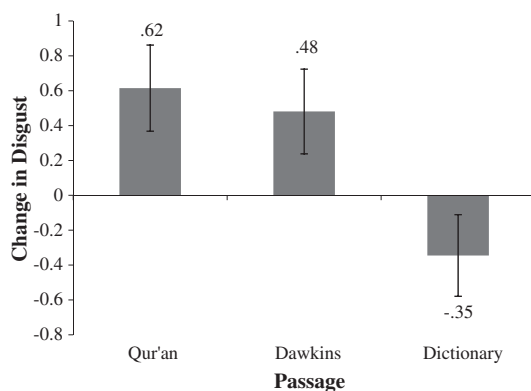
Participants were randomly assigned to one condition of a single factor between subjects design (Qur'an/Dawkins/Dictionary) and seated in a private laboratory room in front of a computer. Instructions were given briefly by the experimenter, and then participants were left alone to follow instructions and give responses on the computer. The experimenter gave participants a sheet of paper and a pen for the handwriting sample, and two cups of the lemon water solution (labeled "A" and "B") they were told would be used for the consumer marketing portion of the study. Participants first tasted beverage "A" and rated the drink on how disgusting it tasted on a 7-point scale (1 = *not at all*; 7 = *extremely*), along with some additional taste ratings (i.e., sweetness, bitterness, sourness, deliciousness) and measures of their current positive/negative affect on a 5-point scale (1 = *very slightly/not at all*; 5 = *extremely*) (Thompson, 2007).

Participants next completed the handwriting portion of the study before tasting the second drink. Participants completed a six-item religiosity scale (Shariff, Cohen, & Norenzayan, 2008; e.g., "I consider myself a religious person", "I believe in God") to activate their religious identity, rated on 5-point scales (1 = *strongly disagree*; 5 = *strongly agree*). Next, one of three passages appeared on the screen. Passages were taken from The Qur'an (Surah 47: 1–2), Richard Dawkins (2006, p. 31) *The God Delusion* (each selected to be strong affirmations of the respective beliefs), or the preface of Merriam-Webster's dictionary (see Appendix A). Participants hand-copied the passage, then tasted and rated beverage "B" using the same measures as above, and completed a 44-item personality inventory (John, Donahue, & Kentle, 1991) included to uphold the cover story.

## Results

### Disgust

A disgust difference score was computed for each participant by subtracting the disgust rating of beverage A from beverage B, such that greater values indicate a stronger disgust response to beverage B. Difference scores were submitted to a single factor ANOVA on condition (Qur'an/Dawkins/Control). The predicted effect of condition was significant  $F(2, 79) = 4.8$ ,  $p = .01$  (see Fig. 1). A planned contrast (weights: Qur'an = 1; Dawkins = 1, Control = -2) showed that the disgust difference scores were significantly higher in the Qur'an ( $M = .62$ ,



**Fig. 1.** Mean differences in disgust ratings of beverages by condition (Experiment 1). Higher values on this scale indicate that the second drink (after writing the passage) was rated more disgusting than the first drink (before writing the passage). Error bars represent  $\pm 1$  standard error.

$SD = 1.3$ ) and Dawkins ( $M = .48$ ,  $SD = 1.4$ ) conditions combined relative to the control condition ( $M = -.34$ ,  $SD = 1.1$ ),  $t(79) = 3.1$ ,  $p = .003$ . Pairwise comparisons using Bonferroni correction confirmed that the disgust difference scores in the control condition were significantly different from both the Qur'an ( $p = .02$ ) and Dawkins conditions ( $p = .05$ ), but the Qur'an and Dawkins conditions did not differ from one another ( $p = 1$ ).

### Religiosity

The religiosity scale showed strong reliability ( $\alpha = .96$ ;  $M = 3.5$ ,  $SD = 1.0$ ), therefore we averaged the six items to create a composite measure of religiousness. A single factor ANCOVA on condition including the composite measure of religiosity revealed no effect of religiosity on disgust ( $F < 1$ ), and the main effect of condition on disgust remained significant ( $p = .01$ ).

### Other drink ratings

Difference scores were also computed as described above for the other drink ratings. There was no evidence of any significant differences across conditions on ratings of bitterness, sourness or sweetness (all  $ps > .25$ ). A marginal effect on ratings of deliciousness was found ( $F(2, 79) = 2.9$ ,  $p = .06$ ), driven primarily by participants in the Dawkins condition rating the second drink to be less delicious than the first drink ( $M = -.52$ ,  $SD = 1.5$ ) relative to participants in the Qur'an ( $M = -.15$ ,  $SD = 1.5$ ) and control ( $M = .24$ ,  $SD = 1.5$ ) conditions.

### Affect

Composite positive and negative affect scores were computed by averaging ratings made after tasting beverage A (PA  $\alpha = .72$ ,  $M = 2.8$ ,  $SD = .73$ ; NA  $\alpha = .72$ ,  $M = 1.4$ ,  $SD = .46$ ) and after tasting beverage B (PA  $\alpha = .75$ ,  $M = 2.7$ ,  $SD = .77$ ; NA  $\alpha = .81$ ,  $M = 1.4$ ,  $SD = .55$ ). Difference scores of these composite positive/negative affect scores were computed and included as covariates in the linear regression to assess whether changes in general affect had any systematic effect on the drink ratings. Although a higher negative affect difference score was associated with a higher disgust difference score ( $\beta = 1.1$ ),  $t(77) = 2.6$ ,  $p = .01$ , the effect of condition remained significant ( $F(2, 77) = 5.2$ ,  $p = .007$ ). No other main effects or interactions were found, suggesting that the increased disgust cannot be attributed to a more general increase in negative affect alone.

## Discussion

As predicted, participants in Study 1 showed an increased disgust response following contact with rejected religious beliefs (i.e., Islam and Atheism) but not a neutral text. Other ratings of the drink (e.g., sweetness, sourness) were not as strongly influenced by writing the passage, indicating that the effect was limited to disgust responses and not taste in general. Likewise, increases in general negative affect alone could not account for the results. The effect did not appear to be moderated by participants' religiosity, however it is possible that the effect of religiosity was obscured by the selective recruitment of Christian participants, a homogeneously religious sample. Indeed, mean religiosity was well-above the midpoint of the scale, suggesting a restricted range of religiosity scores. In sum, Study 1 provided evidence that contact with outgroup religions elicits disgust, by violating the symbolic spiritual purity of the self. In Study 2, we explored whether this symbolic purity could be restored by allowing subjects to clean themselves after contact with a rejected religious belief.

## Experiment 2

Experiment 1 provided initial evidence that contact with a rejected religious belief elicits disgust. In Experiment 2 we extended this result

in two ways. First, rather than a neutral passage for comparison, disgust following contact with rejected religious beliefs (i.e., Islam and Atheism) was contrasted with responses following contact with an *accepted* religious belief (i.e., Christianity). Second, we examined whether the disgust reaction to the rejected religious belief might be extinguished if participants are given an opportunity to purify themselves following contact with the rejected belief. As discussed above, cleaning manipulations (e.g., washing hands) have been shown to assuage the effect of moral threats, presumably because the act of cleaning symbolically purifies the self. Physical cleansing may likewise reduce feelings of moral impurity (i.e., gustatory disgust) after contact with a rejected religious passage. Accordingly, half of participants in [Experiment 2](#) washed their hands following exposure to an accepted/rejected religious text. We predicted that – in the same way that religious cleansing rituals help establish a sense of spiritual purity – hand washing after copying a rejected religious passage would eliminate the disgust response by restoring a sense of spiritual purity.

## Method

### Participants

218 undergraduates participated for partial course credit, recruited by the same procedure as [Experiment 1](#). Twelve people were excluded for either correctly guessing the hypothesis or failing to follow directions, leaving 206 participants (67 men, 139 women; mean age = 19.4) included in the analysis.

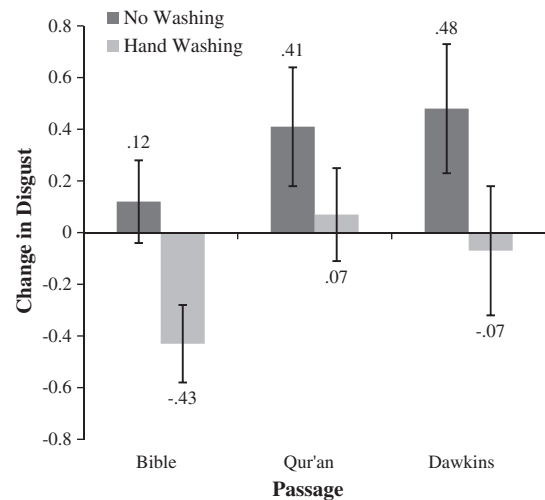
### Materials and procedure

Participants were randomly assigned to one of the six conditions of a 3 (Passage: Bible/Qur'an/Dawkins)  $\times$  2 (Antiseptic Wipe: Look/Use) between subjects design. The procedure and materials were the same as in [Experiment 1](#), with the following exceptions. Participants in the Bible condition copied from Romans 5: 8–10, selected because it is a strong affirmation the core belief in Jesus' divinity (see [Appendix A](#)). Following the handwriting task, all participants were asked to estimate the retail price of an individually wrapped antiseptic hand-wipe, ostensibly as part of the consumer marketing phase of the experiment. Critically, half of the participants were asked to open and use the wipe, and half were instructed only to look at the wipe without using it (see [Lee & Schwarz, 2010](#)). Finally, the same religiosity scale used in [Experiment 1](#) was included at the end of the experiment to rule out the possibility that priming participants with their religious identity before the passage manipulation had any systematic effect on our results.

## Results

### Disgust

Disgust difference scores were computed as in [Experiment 1](#) and submitted to a 3 (Passage: Bible/Qur'an/Dawkins)  $\times$  2 (Antiseptic Wipe: Look/Use) ANOVA with two planned contrasts on Passage (weights: Bible = 2, Qur'an = -1, Dawkins = -1 and Bible = 0, Qur'an = 1, Dawkins = -1). The planned contrasts revealed the predicted effects: participants showed greater disgust to the second beverage in the Qur'an ( $M = .25, SD = .84$ ) and Dawkins ( $M = .19, SD = 1.35$ ) conditions combined relative to the Bible condition ( $M = -.16, SD = 1.23; p = .03$ ), and there were no differences between the Qur'an and Dawkins conditions ( $p = .90$ ). The predicted main effect of Wipe was also significant ( $F(1, 200) = 6.3, p = .01$ ), with less disgust for participants who used the wipe ( $M = -.26, SD = 1.19$ ) vs. those who just looked at the wipe ( $M = .25, SD = 1.20$ ) (see [Fig. 2](#)). The Passage  $\times$  Wipe interaction was not significant ( $F < 1$ ). Due to the anticipated similar pattern of responses across the Qur'an and Dawkins conditions, we collapsed them into a single "outgroup" level of the passage factor for all subsequent analyses.



**Fig. 2.** Mean differences in disgust ratings of beverages in each Passage  $\times$  Wipe condition ([Experiment 2](#)). Higher values on this scale indicate that the second drink (after writing the passage) was rated more disgusting than the first drink (before writing the passage). Error bars represent  $\pm 1$  standard error.

### Religiosity

The religiosity scale again showed strong reliability ( $\alpha = .91, M = 3.7, SD = 0.80$ ). A 2 (Passage: Bible/Outgroup)  $\times$  2 (Antiseptic Wipe: Look/Use) ANCOVA including the composite measure of religiosity revealed no effect of religiosity on disgust ( $F < 1$ ), and the main effects of Passage and Wipe on disgust both remained significant ( $ps < .03$ ).

### Other drink ratings

We also analyzed ratings of other taste ratings (delicious, sour, sweet, bitter) using a 2  $\times$  2 ANOVA as with disgust. A main effect of Wipe was observed for bitterness ( $F(1, 202) = 5.9, p = .02$ ); participants rated the second beverage as being more bitter when they did not wash their hands ( $M = 0.37, SD = 1.3$ ) relative to when they did wash their hands ( $M = -0.1, SD = 1.4$ ). Important, however, there was no effect of the religious text on bitterness ( $F < 1$ ). No other main effects or interactions were found (all  $ps > .12$ ).

### Affect

Composite positive and negative affect scores were again computed for ratings made after tasting beverage A (PA  $\alpha = .81, M = 2.7, SD = 0.84$ ; NA  $\alpha = .70, M = 1.3, SD = 0.43$ ) and after tasting beverage B (PA  $\alpha = .85, M = 2.6, SD = 0.91$ ; NA  $\alpha = .77, M = 1.2, SD = 0.42$ ). As in [Experiment 1](#), we included difference scores of these composite positive/negative affect values as covariates in the regression to control for changes in general affect. This analysis revealed that a higher negative affect difference score was again associated with a higher disgust difference score ( $\beta = 0.90, t(200) = 4.1, p < .01$ ). The main effect of Passage dropped to marginal significance ( $p = .08$ ), and the main effect of Wipe remained significant ( $p < .01$ ). There was no effect of positive affect and no higher order interactions were found, thus confirming that the association between negative affect and increased disgust was constant across all conditions. As in [Experiment 1](#), these results suggest that the increased disgust following contact with the rejected beliefs cannot be accounted for by more general increases in negative affect alone.

## Discussion

Participants showed increased disgust after writing a passage from the Qur'an or *The God Delusion*, replicating [Experiment 1](#), but the effect was eliminated when participants washed their hands

following contact. This result is consistent with the hypothesis that hand washing would help restore a sense of purity following contact with a rejected belief, and is further corroborated by previous research demonstrating that feelings of disgust can be alleviated with physical cleansing (e.g., Schnall, Benton, & Harvey, 2008). Important, these results also demonstrate that no disgust was elicited when copying from an ingroup religious text (i.e., the Bible) and that hand-washing had a compound effect. In other words, Christian participants copying a passage from the Bible presumably already felt clean (or at least *not* dirty/disgusted), but hand washing afterward served to decrease general disgust even further. This latter effect also appears to be consistent with past research demonstrating that hand-washing can heighten feelings of purity (e.g., Zhong et al., 2010). As in Experiment 1, these effects could not be accounted for by increases in general negative affect alone, but was rather specifically related to ratings of disgust.

### General discussion

Two studies provide evidence that contact with rejected religious ideologies produce a disgust response. In Experiment 1, Christian participants rated a drink to taste more disgusting after writing a passage from the Qur'an or Richard Dawkins' *The God Delusion*, but not a control text. Of key importance, this effect was eliminated in Experiment 2 when participants were instructed to wash their hands after copying the passage. This suggests that contact with rejected religious beliefs constituted a purity violation, and that physical cleansing restored a sense of purity following contact. Importantly, no evidence of a disgust response was found when participants copied a passage from a control text (Experiment 1) or an ingroup religious text (Experiment 2). Hand-washing after contact with the ingroup religious text (Bible) further reduced overall disgust. These results are consistent with past research arguing that disgust is closely tied to intuitive moral judgments (e.g., Haidt & Graham, 2007) and that feelings of moral impurity are embodied (Zhong & Liljenquist, 2006) leaving people feeling physically unclean after contact with impure beliefs. To the best of our knowledge, these results are the first to demonstrate that feelings of moral impurity elicit gustatory disgust. That is, that contact with moral impurities or immoral actions may literally leave a bad taste in the mouth.

An important question left unanswered by the current studies is what precise aspect of the procedure was responsible for participants' disgust response. One possibility is that the "bad taste" was elicited from *mere contemplation* (Tetlock et al., 2000) of the rejected religious belief. As an analogy, imagine drinking a glass of old spoiled milk; its rotten smell, thick consistency, and warm temperature. We can be disgusted by the mere thought of it, and this is certainly more adaptive than only being disgusted *while* we drink it. The same may hold true for moral disgust; "impure" information should elicit disgust upon its mere perception as a signal of its wrongness and potential to undermine a given sacred social order. Indeed, some recent evidence supports mere contemplation as the primary cause of moral disgust. For example, people tend to feel unclean after simply thinking about a past transgression (Zhong & Liljenquist, 2006) and areas of the brain associated with disgust are activated upon merely reading and classifying a sentence as false (Harris, Sheth, & Cohen, 2008). If disgust observed in these studies was elicited by mere contemplation, it is possible that simply reading the rejected religious passage would have also elicited disgust. A second possibility is that the disgust is elicited by the self's involvement with the outgroup religion, that is by personally engaging in the beliefs of the rejected religion. In these studies, subjects actively copied core ideas of the outgroup belief in their own handwriting, so they may feel that they have violated their own sanctity by committing heresy. Important, the disgust was removed by washing oneself with the sanitary wipe (rather than wiping the text or the pen, for example). The fact that a personal-

cleanliness action restored the symbolic purity may suggest it was a personal-purity issue that was violated by copying the passage down.

The answer to this question may have profound implications for intergroup relations. On the one hand, if purity is compromised upon merely contemplating ideas that conflict with one's own sacred beliefs (e.g., by simply reading an outgroup religious passage or upon seeing an outgroup religious text), this suggests a bleak potential for peaceful intergroup relations. How can religious groups hope to overcome their differences in culture and beliefs if they are also divided by gut-level disgust that repels them further apart? On the other hand, if purity is only compromised when actively copying a passage that conflicts with one's own sacred beliefs, this suggests a relatively optimistic potential for peaceful inter-religious relations. Members of different religious groups may be able to maintain a sense of personal purity even when other beliefs and practices are part of the social milieu, as long as one is not required to actively participate in the outgroup religious traditions.

We acknowledge that the present studies used only a limited sample of American Christians as participants, but we expect that these effects generalize to other religious groups and cultures. Important, however, we expect that the effect is moderated by the degree of perceived threat presented by the outgroup religions. For example, American Christians are probably more threatened by Islam than by Buddhism, and so we may not have observed the same disgust response if these subjects had copied from the Tripitaka (a sacred text of Buddhism) rather than the Qur'an. Likewise, Palestinian Muslims may be more threatened by Judaism than Hinduism, but Indian Muslims may hold the opposite biases, which may be reflected in their disgust responses to the respective beliefs. It is also important to note that although we have focused here on the domain of religious beliefs, we predict that these effects will hold for any kind of belief or idea that has been moralized. Research is thus currently underway to replicate these effects cross-culturally with non-Christian populations, as well as to examine the relation between disgust and "truth" in a wider range of moral domains.

In sum, the present research provides evidence that contact with rejected religious beliefs elicits disgust, and so represents an important contribution to the study of religious beliefs and moral cognition. Whereas the majority of past work on moral purity has focused on disgust in response to morally questionable objects and actions, these data suggest that contact with outgroup religious beliefs may be an equally threatening source of impurity, and can literally leave a bad taste in the mouth. Future research in this area has the potential to lead to important insights in the study of religion and religious cognition, as well as the moralization of "truth" more generally, topics that clearly make up an important part of the lives of so many people throughout the world.

### Appendix A

#### *Dictionary passage (Study 1)*

*The Merriam-Webster dictionary has been created by a company that has been publishing dictionaries for 150 years. It has been edited by an experienced staff of lexicographers, who believe it will serve well those who want a concise and handy guide to the English language of today (Preface to The Merriam-Webster Dictionary, 1997).*

#### *Qur'an passage (Studies 1 and 2)*

*As for those who are bent on denying the truth and on barring others from the path of God—all their good deeds will He let go to waste; whereas those who have attained to faith and do righteous deeds, and have come to believe in what has been bestowed on high on Muhammad – for it is the truth from their Sustainer – shall attain God's grace: He will efface their past bad deeds, and will set their hearts at rest (Surah 47: 1–2).*

### Dawkins passage (Studies 1 and 2)

*The God of the Old Testament is arguably the most unpleasant character in all fiction: jealous and proud of it; a petty, unjust, unforgiving control freak; a vindictive, bloodthirsty ethnic cleanser; a misogynistic, homophobic, racist, infanticidal, genocidal, filicidal, pestilential, megalomaniacal, sadomasochistic, capriciously malevolent bully* (Dawkins, 2006, p. 31).

### Bible passage (Study 2)

*But God commendeth his love toward us, in that, while we were yet sinners, Christ died for us. Much more then, being now justified by his blood, we shall be saved from wrath through him. For if, when we were enemies, we were reconciled to God by the death of his Son, much more, being reconciled, we shall be saved by his life* (Romans 5: 8–10).

### References

- Borg, J. S., Lieberman, D., & Kiehl, K. A. (2008). Infection, incest, and iniquity: Investigating the neural correlates of disgust and morality. *Journal of Cognitive Neuroscience, 20*, 1529–1546.
- Cohen, A. B., & Rozin, P. (2001). Religion and the morality of mentality. *Journal of Personality and Social Psychology, 81*, 697–710.
- Cottrell, C. A., & Neuberg, S. L. (2005). Different emotional reactions to different groups: A sociofunctional threat-based approach to "prejudice". *Journal of Personality and Social Psychology, 88*, 770–789.
- Dawkins, R. (2006). *The God delusion*. New York, NY: Houghton Mifflin Company.
- Eskine, K. J., Kaciniak, N. A., & Prinz, J. J. (2011). A bad taste in the mouth: Gustatory disgust influences moral judgment. *Psychological Science, 22*, 295–299.
- Graham, J., & Haidt, J. (2010). Beyond beliefs: Religions bind individuals into moral communities. *Personality and Social Psychology Review, 14*, 140–150.
- Gutierrez, R., & Giner-Sorolla, R. (2007). Anger, disgust, and presumption of harm as reactions to taboo-breaking behaviors. *Emotion, 7*, 853–868.
- Haidt, J., & Graham, J. (2007). When morality opposes justice: Conservatives have moral intuitions that liberals may not recognize. *Social Justice Research, 20*, 98–116.
- Haidt, J., & Joseph, C. (2007). The moral mind: How 5 sets of innate moral intuitions guide the development of many culture-specific virtues, and perhaps even modules. In P. Carruthers, S. Laurence, & S. Stich (Eds.), *The innate mind*, 3. (pp. 367–391) New York: Oxford.
- Harris, S., Sheth, S. A., & Cohen, M. S. (2008). Functional neuroimaging of belief, disbelief, and uncertainty. *Annals of Neurology, 63*, 141–147.
- Horberg, E. J., Oveis, C., Keltner, D., & Cohen, A. B. (2009). Disgust and the moralization of purity. *Journal of Personality and Social Psychology, 97*, 963–976.
- Hume, D. (1998). An enquiry concerning human understanding. In R. Ariew, & E. Watkins (Eds.), *Modern philosophy: An anthology of primary sources* (pp. 491–557). Indianapolis: Hackett Publishing Company (Original work published 1748).
- John, O. P., Donahue, E. M., & Kentle, R. L. (1991). *The big five inventory: Versions 4a and 54*. Technical report: Institute of Personality and Social Research, University of California, Berkeley, CA.
- Lee, S. W. S., & Schwarz, N. (2010). Washing away postdecisional dissonance. *Science, 328*, 709.
- Liljenquist, K., Zhong, C. -B., & Galinsky, A. D. (2010). The smell of virtue. Clean scents promote reciprocity and charity. *Psychological Science, 21*, 381–383.
- Navarrete, C. D., Fessler, D. M. T., & Eng, S. J. (2007). Elevated ethnocentrism in the first trimester of pregnancy. *Evolution and Human Behavior, 28*, 60–65.
- Rozin, P., Haidt, J., & McCauley, C. R. (1999). Disgust: The body and soul emotion. In T. Dalgleish, & M. Power (Eds.), *Handbook of cognition and emotion* (pp. 429–445). Chichester, UK: Wiley.
- Rozin, P., Lowery, L., Imada, S., & Haidt, J. (1999). The CAD triad hypothesis: A mapping between three moral emotions (contempt, anger, disgust) and three moral codes (community, autonomy, divinity). *Journal of Personality and Social Psychology, 76*, 574–586.
- Schnall, S., Benton, J., & Harvey, S. (2008). With a clean conscience: Cleanliness reduces the severity of moral judgments. *Psychological Science, 19*, 1219–1222.
- Schnall, S., Haidt, J., Clore, G. L., & Jordan, A. H. (2008). Disgust as embodied moral judgment. *Personality and Social Psychology Bulletin, 34*, 1096–1109.
- Shariff, A. F., Cohen, A. B., & Norenzayan, A. (2008). The devil's advocate: Secular arguments diminish both implicit and explicit religious belief. *Journal of Cognition and Culture, 8*, 417–423.
- Tetlock, P. E., Kristel, O. V., Elson, S. B., Green, M. C., & Lerner, J. S. (2000). The psychology of the unthinkable: Taboo trade-offs, forbidden base rates, and heretical counterfactuals. *Journal of Personality and Social Psychology, 78*, 853–870.
- The Merriam-Webster Dictionary (5th ed.). (1997). Springfield, MA: Merriam-Webster, Inc.
- Thompson, E. R. (2007). Development and validation of an internationally reliable short-form of the positive and negative affect schedule (PANAS). *Journal of Cross-Cultural Psychology, 38*, 227–242.
- Wheatley, T., & Haidt, J. (2005). Hypnotic disgust makes moral judgments more severe. *Psychological Science, 16*, 780–784.
- Zhong, C. -B., & Liljenquist, K. (2006). Washing away your sins: Threatened morality and physical cleansing. *Science, 313*, 1451–1452.
- Zhong, C. -B., Strejcek, B., & Sivanthan, N. (2010). A clean self can render harsh moral judgment. *Journal of Experimental Social Psychology, 46*, 859–862.