

# Acne Beliefs: Fact and Fiction

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Despite continued efforts to treat patients with acne and educate them about its known causes, the disease and its misconceptions persist. As a result, people with acne sometimes experiment with misguided behavioral changes in an attempt to clear up their skin. To assess the overall prevalence of acne misconceptions and quantify acne myths, we conducted a survey on acne beliefs in 103 college students at Stanford University in California. The results revealed that many acne myths continue to be popular with young adults. Belief in the influence of external factors is not inherently problematic; however, many of the popular misconceptions about acne are based on anecdotal evidence. Although these beliefs are straightforward and easily studied, our review of supporting scientific evidence revealed a paucity of quality research in this area. Nevertheless, familiarity with popular beliefs about acne is integral to its proper management. Once we, as clinicians, understand what patients may be doing outside of our recommendations, we can counsel them about practices that may be harmful and redirect them to proven therapies.

When treating patients with acne, routine behaviors such as diet or personal hygiene can be overlooked. However, many patients may be washing their face too frequently, avoiding chocolate, or drinking excessive amounts of water because they believe that engaging in these practices can improve their skin. Despite continued efforts by dermatologists to treat and educate patients properly about the known causes of acne, the disease and its misconceptions persist. Belief in these misconceptions can lead patients to experiment with misguided behavioral changes in an attempt to clear up their skin.

To assess the overall prevalence of acne misconceptions and quantify which myths persist, we conducted a survey on acne beliefs in 103 college students at

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Stanford University in California. Eleven myths were selected for inclusion based on their repeated appearance in the popular media.<sup>1-7</sup> Previous studies have not focused on acne beliefs in general; rather, they focused solely on factors believed to cause acne.<sup>8-11</sup> Our survey included a broader range of factors that participants objectively noted as having either a positive or negative effect on acne. All 103 students (49 men and 54 women) completed the survey.

Results of our survey revealed that many acne myths continue to be popular among young adults (Table). Poor hygiene was cited most often as an aggravator of acne, with 91.3% of survey participants noting that it worsened their acne. In fact, most survey items were associated with exacerbating acne, including increased stress (88.3%), touching the face (88.3%), popping pimples (85.4%), poor diet (69.9%), and decreased sleep (66.0%). Only 2 practices were perceived to improve acne: drinking more water (68.9%) and increased face washing (59.2%). Results also showed that some beliefs were no longer commonly held; no clear belief trends regarding the influence of increased exercise, sex/masturbation, or tanning on acne were found. Although the effects of some factors

## ACNE BELIEFS

were correctly identified, the erroneous understanding of others is cause for concern.

Belief in the influence of external factors on acne is not inherently problematic; however, many of these popular misconceptions are based on anecdotal evidence. Without direct evaluation of the safety and efficacy of these practices, patients with acne may be wasting their energy and money by pursuing these behaviors; more important, they may be exacerbating their skin condition. Furthermore, these individuals may be delaying professional consultation from a dermatologist who would educate them and take measures to prevent scarring.

### HOW DOES HYGIENE AFFECT ACNE?

Soap has been promoted as an acne treatment since the 19th century,<sup>12</sup> and belief in the positive association between good skin and cleanliness continues today. For example, the largest number (91.3%) of Stanford students we surveyed responded that they believed poor hygiene worsened their acne. The greasy feeling produced by excess sebum and the dirtlike appearance of open comedones may perpetuate this perception; however, dirt itself does not play a role in acne lesion formation.<sup>13,14</sup> In theory, poor hygiene could irritate the skin, and sebum buildup could foster growth of *Propionibacterium acnes*. However, supporting scientific data is sparse, and no studies examining this question could be found in the literature.

### HOW DOES FACE WASHING AFFECT ACNE?

Most popular skin care regimens advocate washing the face twice daily with a mild cleanser,<sup>1-7</sup> but scientific evidence to support this recommendation is limited. To further complicate matters, the general public believes that cleaner skin will result in fewer blemishes, though dermatologists often warn that washing the face too frequently and vigorous scrubbing could intensify acne.

Results from studies attempting to capture the relationship between face washing and acne have been mixed, ranging from slightly positive<sup>15-17</sup> to insignificant.<sup>18-20</sup> These results may be attributable to poor methodology and small sample sizes. Moreover, many of these studies were conducted to evaluate the facial cleanser rather than the behavior.

The widespread recommendation to avoid washing the face too frequently may have been based on a 1980 study by Swinyer et al<sup>21</sup> that tested whether facial dryness contributed to acne development. Three groups were evaluated in a blinded fashion: group A followed a traditional acne treatment regimen aimed at drying

the skin; group B treated acne according to the standard of care at the time; and group C followed a regimen of avoiding using water on the face and moisturizing. The mild regimen followed by group C was found to be just as effective at clearing comedones and inflammatory acne lesions as that of group B, and both groups produced significantly ( $P=.02$ ) better results than the treatment regimen followed by group A. The improvement noted in the group that avoided using water on the face suggests that washing the face may not be as beneficial as believed; however, no study has yet to isolate and evaluate the behavior itself.

### HOW DOES STRESS AFFECT ACNE?

It is commonly believed that high stress exacerbates acne. In our survey of Stanford students, increased stress was the second most cited acne aggravator (88.3%). Additionally, stress was one of the only categories for which belief differences were statistically significant between genders. More women believed increased stress worsened acne ( $P=.04$ ), and more men were unaware of its possible effects. Despite this popular observation, most skin care experts have dismissed the influence of stress on acne.

The results of a 2003 study conducted at Stanford by Chiu et al<sup>22</sup> suggest a need to reconsider popular medical opinion. Twenty-two college students (15 women and 7 men) had their acne evaluated by a blinded and a nonblinded evaluator during nonexamination and examination periods using previously validated scales of acne severity and perceived stress. Of all the factors studied, stress had the strongest association ( $r=.61$ ,  $P<.01$ ); neither diet nor sleep levels correlated as strongly.

A proposed culprit of the effect of stress on acne is the hormones released during stressful situations, such as cortisol, which has been shown to impair wound healing.<sup>23-25</sup> Another proposed molecular mechanism is the neuroendocrine regulation of sebocytes because factors such as corticotropin-releasing hormone, melanocortin, and beta-endorphin have been shown to mediate topically and centrally induced stress toward the sebaceous gland, increasing sebum production and the potential for acne lesion formation.<sup>26</sup>

### HOW DOES TOUCHING THE FACE AFFECT ACNE?

People with acne often are advised in the popular press to stop touching their face to improve their skin, citing the bacteria, oil, and dirt present on their hands as a possible cause.<sup>1-7</sup> This behavior has never been

## Acne Belief Survey Results (N=103)\*

Acne Belief	Worsens Acne, No. of Patients (%)	Improves Acne, No. of Patients (%)	No Effect, No. of Patients (%)	Don't Know, No. of Patients (%)
Poor hygiene	94 (91.3)	1 (0.97)	7 (6.8)	1 (0.97)
Increased stress	91 (88.3)	1 (0.97)	2 (1.9)	9 (8.7)
Touching the face	91 (88.3)	0 (0)	7 (6.8)	5 (4.9)
Popping pimples	88 (85.4)	0 (0)	6 (5.8)	9 (8.7)
Poor diet	72 (69.9)	2 (1.9)	26 (25.2)	3 (2.9)
Decreased sleep	68 (66.0)	0 (0)	14 (13.6)	21 (20.4)
Increased water intake	0 (0)	71 (68.9)	15 (14.6)	17 (16.5)
Increased face washing	16 (15.5)	61 (59.2)	15 (14.6)	11 (10.7)
Increased exercise	22 (21.4)	21 (20.4)	30 (29.1)	30 (29.1)
Increased tanning	22 (21.4)	11 (10.7)	25 (24.2)	45 (43.7)
Increased sex/masturbation	5 (4.9)	9 (8.7)	41 (39.8)	48 (46.6)

\*A total of 103 surveys were given and completed (49 men and 54 women). More women believed that increased stress worsened acne ( $P=.04$ ) and that drinking more water would improve their acne ( $P=.02$ ). In both cases, more men were unsure of the possible outcomes.

scientifically evaluated but may be an extrapolation of the phenomenon acne excoriée. This extreme form of acne manipulation, which is estimated to occur in 2% of patients presenting with acne,<sup>27</sup> is characterized by excessive picking at real or imagined skin irregularities. By creating further injury to their skin, patients with acne excoriée can cause permanent and severe scarring, though no reports have shown that this behavior substantially worsens acne. Acne excoriée often is accompanied by comorbid conditions such as obsessive-compulsive disorder, depression, anxiety, and stress.<sup>27</sup> Case reports have shown the effectiveness of both pharmacologic and behavioral therapies in treating this condition.<sup>28-30</sup>

### HOW DOES POPPING PIMPLES AFFECT SCARRING?

The practice of popping pimples is controversial; most physicians discourage the practice, but many patients believe that squeezing pimples offers an instant solution to their acne. In fact, superficial acne lesions are often popped in clinical practice. The problem arises when people with acne attempt to manipulate their own skin, especially on deeper blemishes. Serious scarring can result when an inflammatory lesion is prematurely manipulated, which can push the inflammation and sebum blockage deeper and either stretch, disfigure, or rupture the pores. The ensuing widespread inflammation can lead to the destruction of

## ACNE BELIEFS

collagen and the dermal layer, ultimately leading to atrophic scars.<sup>31-33</sup>

### HOW DOES DIET AFFECT ACNE?

The skin is the body's largest organ and thus is influenced by nutrition. Pathology can result from nutritional deficiencies,<sup>34,35</sup> but how large is the influence of specific foods?

In a small study conducted in the early 1970s, college students were given chocolate, milk, roasted peanuts (with iodized salt), or cola daily for one week.<sup>36</sup> No major acne flares were observed, and the acne in one half of the group actually improved slightly. However, the small sample size (n=4-8 in each group) and the short study duration may have contributed to these negative results.<sup>36</sup>

The relationship between chocolate and acne has been studied in greater depth, with mixed consequences. In one study, 4 of the 8 subjects given chocolate on 2 successive days developed up to 5 new inflammatory acne lesions; however, the small sample size and short study period may have confounded the results.<sup>37</sup> Results of a larger crossover, single-blind study involving 65 subjects who ate a chocolate bar or a placebo chocolate bar once daily for 4 weeks showed no significant differences between the 2 groups, though twice as many subjects (n=10) experienced acne improvement while eating the pure chocolate bar as subjects who ate the placebo chocolate bar.<sup>38</sup> Study results have reported the high antioxidant activity of cocoa is traceable to the presence of phenolic phytochemicals, which, in fact, could therapeutically benefit the skin.<sup>39,40</sup>

A study using data from the Nurses' Health Study found a positive association between acne and the intake of dairy products.<sup>41</sup> Using self-reported survey responses from 47,355 women, prevalence ratios were 1.22 for total milk (whole, low fat, skim) and 1.44 for skim milk. In addition, a weak inverse relationship was found for saturated fat. Sherbet, cottage cheese, and cream cheese also were positively associated with acne. Proposed explanations for this relationship include exposure to hormones and other biologic agents in milk, such as dihydrotestosterone precursors, insulinlike growth factor-1 increase, and whey protein.<sup>42</sup> These findings, however, may be influenced by recall bias and lack of diagnostic accuracy.

Beyond specific foods, another popular hypothesis attributes acne to a western diet and lifestyle. Based on anecdotal reports of immigrants developing severe cases of acne shortly after moving to the United States and observations that less-westernized populations in Papua New Guinea, Mali, Saudi Arabia, and Paraguay have a

lower prevalence of acne, high glycemic index foods have been implicated.<sup>43-45</sup> Proponents of this theory believe that high glycemic index foods increase testosterone and insulinlike growth factor-1 levels, which leads to hyperkeratinization.<sup>43</sup> The only study (to our knowledge) evaluating the possible influence of glycemic load on acne failed to collect sufficient data,<sup>46</sup> and the role of genetics has not been systemically evaluated.

The obesity epidemic in the United States also has turned attention to the influence of body mass index on acne. No scientific association has been established conclusively between these 2 factors, though a British study conducted in the mid-1950s found that older soldiers with acne were heavier (12.4 lbs) than those without acne.<sup>47</sup> Acne also has been found to worsen in some individuals with anorexia nervosa during a time of weight gain,<sup>48</sup> and a higher incidence of acne vulgaris has been observed in patients with bulimic anorexia nervosa compared with restrictive anorexia nervosa.<sup>49</sup> Girls with higher body mass indexes tend to experience menarche at an earlier age,<sup>50</sup> which may predispose them to developing severe comedonal acne.<sup>51</sup> These girls also have substantially higher dehydroepiandrosterone sulfate, testosterone, and ferritin levels,<sup>51</sup> which puts them at a higher risk for developing polycystic ovary syndrome. The hyperandrogenism associated with polycystic ovary syndrome may explain why these patients may experience moderate to severe acne.<sup>52,53</sup> No scientific consensus has been reached regarding the overall effects of diet on acne. At the present time, patients typically are advised to avoid foods that appear to trigger flares.

### HOW DOES SLEEP AFFECT SKIN?

Reports targeting the relationship between decreased sleep and worsening skin are largely anecdotal and may be related to the fact that people generally sleep less during stressful periods. However, major hormonal changes have been found to occur with the induced stress of reduced sleep. Animal studies show that sleep-deprived rats have decreased wound healing and tissue repair capabilities.<sup>54,55</sup> Additionally, enhanced skin resistance levels have been associated with an increase in sleepiness and a deterioration of reaction time in sleep-deprived subjects.<sup>56</sup> Results of a study on stress and acne showed that the association of sleep as a contributing factor to acne was close to significant (6.6 vs 6.3 h,  $P=.06$ ).<sup>22</sup>

### HOW DOES HYDRATION AFFECT THE SKIN?

A large percentage of the Stanford University students we surveyed (68.9%) believed that drinking more water

improved their acne. Besides increased stress, this was the only other belief that was statistically different between genders. More women ( $P=.02$ ) thought that increasing water intake would improve acne, and more men were unclear about the possible effects.

It is likely that this perception is extrapolated from the widespread idea that increased water intake benefits the body's general health. However, this commonly rendered suggestion is fundamentally flawed. There is no scientific support for the recommendation of drinking 8 glasses of water a day to maintain health in otherwise healthy people or to discount caffeinated beverages in total water consumption.<sup>57,58</sup> Moreover, studies have not supported the relationship between increased water intake and increased skin hydration. In one study, a 3.5% boost in consumed fluid resulted in only a 0.18% surface pH decrease and no detectable association with actual skin hydration.<sup>59</sup>

### HOW DOES EXERCISE AFFECT ACNE?

Results of our survey showed students were equally divided in their beliefs regarding the effects of exercise on acne, which reflects the vast range of observed skin responses to physical activity. For some individuals, exercising regularly appears to have a beneficial effect on the skin, perhaps by providing an outlet for stress release. For others, exercise has been shown to exacerbate the condition. One explanation for acne development in athletes is acne mechanica, a papulopustular eruption caused from heat, friction, pressure, and occlusion that often occurs in individuals required to wear heavy equipment while participating in sports.<sup>60,61</sup>

However, results of a separate small, randomized, controlled pilot study conducted at Stanford University suggest that exercise-induced sweat occlusion does not significantly affect the development of truncal acne in physically active men.<sup>62</sup> No correlation was found between the development of truncal acne and the number of exercise days, minutes spent exercising per day, minutes spent sweating per day, or minutes between exercise and showering.<sup>62</sup>

### HOW DOES TANNING AFFECT ACNE?

Our survey results revealed that most people either did not know tanning could alter acne or believed it had no effect. This finding contradicts results of a 2002 survey of health care professionals in Queensland, Australia, that found 12.3% of nurses and 20.2% of doctors believed sun exposure had therapeutic benefits for acne.<sup>63</sup> Seasonal variations have been observed in Saudi Arabia, with more cases of

acne in the winter and improvement during the summer, which may be the result of increased sun exposure.<sup>64</sup> A similar study conducted in Germany, however, showed that an equal number of patients complained of aggravated acne during both winter and summer.<sup>65</sup>

Since the 1970s, clinicians have been studying actively the potential therapeutic benefits of UV light.<sup>66-68</sup> One possible explanation for the observed benefits of sun exposure is that tanning darkens and reddens the skin, which creates a camouflage for acne lesions. It also has been shown that UV light energy can kill *P. acnes* through photoexcitation and may have anti-inflammatory effects.<sup>69</sup> Consequently, multiple light therapies have been tested or are in use for treating patients with acne vulgaris, including blue, red, violet, and full spectrum light.<sup>70</sup> Results of a study by Elman et al<sup>71</sup> showed an 80% response to 420-nm acne phototherapy, with marked reduction of inflammatory acne lesions after 8 treatments. Ultimately, however, the carcinogenic and photoaging effects of the UV rays from sunlight outweigh its potential applications as an acne treatment.

### CONCLUSION

Environmental influences are just one of many factors affecting the development and progression of acne. A recent study of female twins showed that 81% of acne variance was attributable to genetics, and the remaining 19% was caused by unique external environmental factors.<sup>72</sup> A study focusing on adolescent twins also reported a genetic influence for the severity of acne at all body sites for all ages.<sup>73</sup> Nevertheless, familiarity with popular acne beliefs is integral to its proper management. If we, as clinicians, understand what patients may be doing outside of our recommendations, we can counsel them about practices that may be harmful and redirect them to therapies that have been proven successful.

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