

# Whey Protein Precipitating Moderate to Severe Acne Flares in 5 Teenaged Athletes

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*Acne vulgaris has been linked to milk ingestion, both whole and skim milk. The milk fraction that promotes acne is unknown. Five case reports are presented of male patients aged 14 to 18 years who experienced onset of acne shortly after initiation of whey protein supplementation; 3 teenagers used the supplement for muscle building in football training and the other 2 for attempting to gain weight. All 5 patients had poor response to acne treatment regimens of oral antibiotics, topical retinoids, and benzoyl peroxide. Lesions fully cleared in 4 patients after discontinuation of whey protein supplementation, but 1 patient's acne flared after reinstitution of the whey protein supplement. Two patients did not immediately discontinue whey protein supplementation; 1 of them cleared after he discontinued whey protein during his second course of isotretinoin and 1 was lost to follow-up. Among these patients, at least 6 different brands of whey protein supplementation had been used, including whey protein shakes and reconstituted powders. Whey protein may be the fraction of dairy products that promote acne formation. Larger studies are needed to determine the mechanism of comedogenesis.*

*Cutis.* 2012;90:70-72.

A retrospective analysis of 47,355 teenaged girls diagnosed with acne revealed that dairy, both whole milk and skim milk forms, were included in the foods linked to acne.<sup>1</sup> The retrospective approach led to some questioning of the veracity

of the hypothesis that milk may promote acne formation (ie, comedogenesis). The same researchers prospectively assessed 4273 teenaged boys, linking skim milk with acne formation. They hypothesized that skim milk, more than other forms of milk, contained enough bioactivity to cause cutaneous acne formation in teenaged boys.<sup>2</sup>

Milk proteins are composed of casein and whey fractions. Whey protein is described as a supplement for lean muscle development in athletes who are undergoing training. It is a mixture of globular proteins that are water-soluble by-products of the production of cheese, containing  $\beta$ -lactoglobulin,  $\alpha$ -lactalbumin, bovine serum albumin, and immunoglobulins.<sup>3</sup> Whey protein is a component of skim milk and cottage cheese, which both have been linked to acne.<sup>1</sup> The effects of the use of whey protein supplementation in 5 teenaged boys, which may have precipitated inflammatory and cystic acne flares, is described.

## Case Reports

**Patient 1**—A 17-year-old otherwise healthy, white, weight-appropriate adolescent boy began bodybuilding in 2007 as a part of an exercise training program for the football team at his high school. As part of the exercise training, he took whey protein supplements. He tried at least 4 brands and used the recommended daily amount, which he described as 2 scoops. He denied other supplement use, including creatine or anabolic steroids. Within 2 weeks of initiating whey protein supplementation, he noted acne development, which he believed was from exercising. He stated that his lesions usually cleared in the summertime, but in the most recent summer his acne had not cleared despite the fact that he was not training. It was the first summer he persisted in daily whey protein ingestion and had cystic acne, papules, pustules, and a few comedones over his

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The author reports no conflict of interest.

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bilateral cheeks with minimal involvement of his back. The patient was prescribed adapalene 0.1%–benzoyl peroxide 2.5% gel but was lost to follow-up.

**Patient 2**—An 18-year-old otherwise healthy, muscular, Hispanic young man reported acne flares during football season. Prior treatment with 2 oral antibiotics and erythromycin 3%–benzoyl peroxide 5% gel had failed. He had tried 3 different brands of whey protein, which he was ingesting during football season for muscle strength enhancement. He denied other supplement use, including creatine or anabolic steroids. He demonstrated extensive inflammatory papules, pustules, and cysts over his bilateral cheeks and upper shoulders. He was asked to discontinue whey protein supplementation and reinstate acne treatment using a stable combination of erythromycin 3%–benzoyl peroxide 5% gel, along with oral doxycycline hyclate 100 mg twice daily, a treatment regimen that previously failed. The patient, who finally discontinued whey protein, had 75% improvement in lesions and achieved full clearance in 2 months; however, within a week of reinitiating whey protein 1 month prior to football training, he experienced acne disease flares.

**Patient 3**—A 16-year-old otherwise healthy, muscular, white adolescent boy presented with severe acne flares. On physical examination he had extensive papules, pustules, and a few cysts over his bilateral cheeks and forehead. He had poor response to acne medications in the fall while he was playing football. In the middle of winter, the patient began to respond to oral extended-release minocycline hydrochloride 90-mg tablets daily with a stable combination of erythromycin 3%–benzoyl peroxide 5% gel and tazarotene gel 0.05% short-contact therapy daily. The patient admitted that he took a single brand of whey protein supplementation during football season, which he had currently stopped. The patient denied other supplement use, including creatine or anabolic steroids.

**Patient 4**—An 18-year-old Hispanic young man who was underweight at 16 years of age began to take whey protein shakes to gain weight. Within a few weeks he developed cystic acne lesions, which caused him further distress regarding his physical appearance. The patient denied other supplement use, including creatine or anabolic steroids. After a 3-month course each of doxycycline hyclate 100 mg once daily and minocycline hydrochloride 75 mg twice daily failed, he was placed on oral isotretinoin 1 mg/kg daily for 5 months and was advised to discontinue whey protein supplementation. His lesions fully cleared but flared after 4 months; he admitted that he had not discontinued the whey protein supplement. He ultimately required

a second course of isotretinoin. Isotretinoin therapy and discontinuation of the whey protein supplement resulted in complete acne clearance after 6 months.

**Patient 5**—A 14-year-old Hispanic adolescent boy developed cystic acne on the nose 2 months following the initiation of a whey protein supplement for weight gain. The patient denied other supplement use, including creatine or anabolic steroids. Discontinuation of whey protein supplementation combined with tretinoin cream 0.025% and erythromycin 3%–benzoyl peroxide 5% gel resulted in cystic lesional clearance with minimal papules and pustules occurring thereafter. Improvement in acne was noted 2 weeks following the discontinuation of the whey protein supplement, and the lesions continued to improve over the next 3 months to complete clearance.

### Comment

Cow's milk primarily is composed of protein; 80% of the protein is casein and the other 20% collectively is termed *whey protein*. Whey protein supplementation has been described as a natural source of lean protein to enhance lean muscle development with resistance training and to aid in exercise recovery.<sup>4-6</sup> One study suggested that whey protein does not enhance the benefits of resistance training, especially in adult men.<sup>7</sup>

Insulin resistance has been linked to acne and is one of the stigmata of the metabolic syndrome.<sup>8</sup> Increased postprandial insulin and elevated insulin-like growth factor (IGF)–1 due to milk ingestion have been described. One study of prepubertal boys showed that the casein fraction enhanced IGF-1 and the whey fraction enhanced insulin levels,<sup>9</sup> suggesting that whey protein as an isolated milk protein fraction may be associated with insulin resistance, which potentially could be enhanced by weight gain for bodybuilding.<sup>9-11</sup> One putative mechanism is stimulation of the mammalian target of rapamycin complex 1 (mTORC1) pathway, which promotes IGF-1 secretion.<sup>12</sup>

Acne has been linked to milk ingestion, especially skim milk, demonstrating that protein in the absence of milk fat may worsen comedogenesis. Interestingly, one of the studies showed an association of acne with certain dairy products including instant breakfast drinks and cottage cheese,<sup>1</sup> both containing large amounts of whey protein. Individuals who intentionally or culturally limit dairy intake (ie, the paleolithic diet) do not develop acne.<sup>13</sup>

### Conclusion

Five cases of patients with milk protein–exacerbated acne have been described. Whey protein may be

comedogenic in teenagers. In-depth review of the mechanism by which whey protein works is required. It must be determined if whey protein has androgenic effects, works via induction of insulin resistance, or perhaps induces acne flares through some other unknown mechanism.

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