

# **The Effects of Whey Protein Concentrate vs. Whey Protein Isolate on Hair**

AUTHOR: Dr. Lawrence Shapiro, Hair Transplant Surgeon (Address: 5050 West Atlantic Avenue, Delray Beach, FL 33484-3475. Phone: 1-800-799-4247) [www.DrShapirosHairInstitute.com](http://www.DrShapirosHairInstitute.com) | [www.HelpHair.com](http://www.HelpHair.com)

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## **ABSTRACT**

While genetics clearly has an impact on the most common types of hair loss, many other factors are at play: thyroid problems, anesthesia, cosmetic surgery, dietary deficiencies, prescription medications, use of growth hormone-based supplements during weight training, use of steroids for weight training, and use of weight-loss products and fat burners. Can a special hormone-free whey-based nutritional supplement improve hair health?

Most whey protein supplements contain whey protein isolate (WPI), which is highly processed. Whey protein concentrate (WPC) is less popular but less processed. This study compared whey protein isolate to a whey protein concentrate formulation called Dr. Shapiro's Help Hair™ Shake, and examined these products' impact on the hair and nails. Help Hair Shake also contains special vitamins, minerals, herbs and a proprietary amino acid blend designed to improve the hair.

This study of 100 men and women experiencing hair loss revealed that 94% of the subjects reported moderate improvement in their hair's appearance after taking a daily or twice-daily dose of Help Hair Shake for at least 4 weeks, in terms of these words: healthy, shiny, less hair loss, less hair breakage, stronger, longer, grew faster, bouncier, fuller and thicker. Significant hair improvement was noted by 62% of the subjects. Perceived nail strength, length, health, less breakage and faster growth was noted by 93% of subjects, with 66% noticing significant nail improvement.

Three-quarters of the subjects had taken supplements containing whey protein isolate in the past for at least 4 weeks. Of these subjects, 95% noticed moderate or worse hair damage from taking whey protein isolates, including hair loss, breakage, dullness, weaker hair, less bounce, thinner and slower growth. Significant damage was reported by 30% of the subjects.

In spite of its widespread acceptance for weight training, weight loss and other purposes, whey protein isolate supplements were associated with perceived hair damage and premature hair loss in genetically prone individuals in this study. The whey protein concentrate formulation in this study, Help Hair Shake, was associated with perceived significant improvement in the hair and nails. Additionally, Help Hair Shake appeared to be associated with reported weight loss, muscle building, increased energy and reduced appetite.

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## INTRODUCTION

Current genetic research is revealing more about how genetics can predict hair loss; however, many factors may exacerbate, accelerate or lead to the early onset of hair loss in genetically prone individuals.<sup>1</sup> These factors may include thyroid problems, anesthesia, cosmetic surgery, dietary deficiencies, prescription medications, use of growth hormone-based supplements during weight training, use of steroids for weight training, and use of weight-loss products and fat burners. Counter-acting some of these factors with a special hormone-free whey-based nutritional supplement may improve hair health.

Whey is a by-product of the manufacture of cheese or casein. Whey protein supplements are popular products used for weight training, weight loss and other purposes. Most of these products use whey protein isolates (WPI), which are highly processed.<sup>2</sup> The proteins and lipids in products containing whey protein isolates are denatured.<sup>3</sup> Powders containing whey protein isolates are easy to prepare because they quickly dissolve in fluids.

Whey protein concentrate (WPC) is less processed than whey protein isolates<sup>4</sup> and is, therefore, closer to its natural state. The Dietary Guidelines for Americans recommends consuming less-processed foods for better health.<sup>5</sup> Formulas containing whey protein concentrate can mix into fluids with the use of a blender, hand blender or wire whisk. Whey protein concentrate contains less protein per gram than whey protein isolate,<sup>6</sup> however, the amount of protein in many of the whey protein isolate formulas are in excess of most users' needs.<sup>7</sup>

Hair is made from nutrients in the body, and nutritional deficiencies can cause hair damage and hair loss. For example, biotin deficiencies have been linked to hair loss and skin disorders,<sup>8 9 10</sup> and sufficient levels of the B vitamins are necessary for hair health and growth.<sup>11</sup> Many Western diets are lacking in nutrients,<sup>12</sup> and a poor diet may contribute to early onset of hair loss symptoms in people genetically prone to hair loss.

The whey protein concentrate formulation utilized in this study, Help Hair Shake, contains structural nutrition and proteins to help make hair stronger, longer, healthier and with less breakage. Help Hair Shake also contains nutrients and herbs specifically selected for their positive effects on hair, including these nutrients per 32 g serving:

- Niacin (vitamin B-3) - 200% DV (Daily Value) - improves circulation<sup>13</sup> including blood flow in the scalp
- Folate - 100% DV - a B vitamins to help reduce the impact of stressors<sup>14</sup>
- Vitamin B-12 - 100% DV - a B vitamins to help reduce the impact of stressors<sup>15</sup>
- Biotin - 833% DV - Deficiency can cause hair loss(REF); abundance can help hair growth<sup>16</sup>
- Zinc - 133% DV - Enhances immune function, which can stimulate hair growth<sup>17</sup>
- Manganese - 100% DV - essential to proper hair growth; deficiency is associated with hair loss<sup>18</sup>
- Fo-ti Root (Ho Shou Wu or Polygonum multiflorum) - a popular Chinese herb traditionally used for many reasons, including to darken pre-mature gray hair<sup>19</sup>, hair darkening, hair thickening and hair regrowth.<sup>20</sup>
- Kudzo Root - Chinese herb<sup>21</sup>, the second-richest plant source of isoflavones which researchers believe may have a positive effect on blood flow and microcirculation<sup>22</sup>
- Pumpkin Seed - may help regulate testosterone levels<sup>23 24 25</sup>
- Honeysuckle Flower - Helpful for skin health<sup>26</sup>
- Chrysanthemum Flower - Used in Chinese medicine<sup>27</sup> - may have anti-inflammatory properties<sup>28</sup>
- PABA - may help restore graying hair to its original color<sup>29</sup>
- Chlorophyll in chocolate flavored Help Hair Shake can remove sebum, which carries DHT

Help Hair Shake contains whey protein concentrate, not whey protein isolate. Natural whey has been used for millennium, both internally and externally, to enhance hair growth, strength and shine.<sup>30</sup> Whey provides calcium, as well as protein necessary for proper hair growth.<sup>31</sup>

Help Hair Shake contains the natural sweetener stevia, which has a negligible effect on blood sugar and is thought to be useful for certain hair conditions.<sup>32 33</sup>

The whey protein concentrate formulation that is studied in this paper, Help Hair Shake, contains an added proprietary amino acid blend in a specific ratio, including L-Methionine, L-Cysteine, Silica,<sup>34</sup> L-Cystine, L-Isoleucine, L-Arginine, L-Leucine, L-Lysine, L-Phenylalanine, L-Threonine, L-Valine, L-Aspartic acid, L-Serine, L-Glutamic Acid, L-Proline, L-Glycine, L-Alanine, L-Tyrosine, L-Histidine. Amino acids are the building blocks of the body, including hair.<sup>35</sup>

Growth hormones are sometimes taken to build muscle, but alter the body's hormones and may therefore cause hair loss. Help Hair Shake contains no growth hormones. Additionally, the cows producing the whey for Help Hair Shake are not injected with Recombinant Bovine Growth Hormone (rBGH), a genetically engineered hormone used by dairy farmers to increase milk production. Milk products from animals injected with rBGH have higher levels of IGF-1, a growth hormone that is usable by humans. Therefore, Help Hair Shake does not contain extra growth hormones that may contribute to hair loss.

The subjects in this study took Help Hair Shake for a minimum of 4 weeks. All the subjects in the study were experiencing hair loss but still had some hair. A history of taking whey protein isolates in the past was not required, but subjects who had taken WPI for at least 4 weeks were asked questions about their hair quality while taking WPI.

Currently, there are two studies showing that whey protein isolate increases testosterone: "Androgen receptors and testosterone in men. . ." in the *Journal of Steroid Biochemistry and Molecular Biology* (2008)<sup>36</sup>; and "Amino Acid Supplements and Recovery from High-Intensity Resistance Training" in the *Journal of Strength & Conditioning Research* (2010).<sup>37</sup>

This study will aim to demonstrate which whey protein supplement is better for the hair: products containing whey protein isolates, or products containing whey protein concentrate?

## MATERIALS AND METHODS

A whey protein concentrate formulation called Help Hair Shake was used in this experiment. This formulation contains whey protein concentrate, and is free from whey protein isolates. The supplement contains additional vitamins, herbs and a proprietary essential amino acid blend.

**Help Hair Shake Nutrition facts.** Serving Size: 1 Scoop (32 g).

	Amount Per Serving (1 Scoop)	% Daily Value
Calories	150	
Calories from Fat	8	
Total Fat	1 g	1.35%
Cholesterol	5 mg	1.83%
Total Carbohydrates	11 g	3.66%
Protein	14 g	26.40%
Niacin (as nicinamide)	40 mg	200%
Folate (as folic acid)	400 mcg	100%
Vitamin B-12 (as cyanocobalamin)	6 mcg	100%
Biotin	2.5 mg	833%
Pantothenic acid (as D-calcium pantothenate)	9 mg	90%
Iodine (as potassiumiodide)	100 mcg	67%
Zinc (as zinc oxide)	20 mg	133%
Manganese (as manganesecitrate)	2 mg	100%
PABA	30 mg	**
Proprietary Blend	255 mg	**

\*\* Daily Value Not Established \* Percent daily values based on a 2,000 calorie diet.

L-Methionine, L-Cysteine, Fo-ti Root (Ho Shou Wu), Kudzo Root, Pumpkin Seed, Honeysuckle Flower, Chrysanthemum Flower, Silica, L-Cystine, L-Isoleucine, L-Arginine, L-Leucine, L-Lysine, L-Phenylalanine, L-Threonine, L-Valine, L-Aspartic acid, L-Serine, L-Glutamic Acid, L-Proline, L-Glycine, L-Alanine, L-Tyrosine, L-Histidine

Calcium -- 28%	Iodine -- 33.5%
Potassium -- 3%	Sodium -- 2%
Phosphorus -- 24%	Magnesium -- 4%
Chlorophyll (none in vanilla flavor) -- **	Chloride -- 1%

\*\* - daily value not established

Other Ingredients: Whey protein concentrate, natural flavors, stevia and xylitol

Flavors: chocolate, vanilla

Help Hair Shake is free of many common allergens: no wheat, no gluten, no soy, no eggs, no nuts, no peanut oil, and no tree nuts. (Whey is a milk product.)

Help Hair Shake has no artificial sweeteners, no xanthan gum, no MSG, no artificial colors, and no artificial flavors. It is sweetened with all-natural stevia and xylitol.

The subjects were adults with thinning hair, of various ages and both genders. They were selected at random. They were all healthy with no serious underlying medical conditions. A full medical history of each subject was taken.

The majority of the subjects were men experiencing androgenetic alopecia (male pattern balding). Androgenetic alopecia has strong genetic causes, but its onset and severity may be influenced by nutrition. In men with male pattern hair loss, the follicles on the top and front of the scalp are genetically pre-programmed to become progressively sensitive to the hormone Dihydrotestosterone (DHT). When these hair follicles are exposed to excessive DHT, they no longer go through the normal growth cycle. The duration of the anagen (or growth) phase becomes progressively shorter, and this results in the hair from an affected follicle becoming thin and short. Ultimately, the follicle will enter the telogen phase but will not re-awaken, resulting in hair loss. Androgenetic alopecia is progressive in nature, and hair loss continues until a "wreath" of hair on the sides and back of the scalp remains.

Six of the females in the study had post-pregnancy hair loss. Nine of the women were menopausal with hair loss, and seven of these nine women had underlying thyroid problems that had been corrected prior to the start of the study.

All the subjects had thinning hair, but were not completely bald. Even if they had hair in one area that was thin and an area that was bald, they could participate in the study. Subjects were not compensated and were given a supply of Help Hair Shake.

The subjects took Help Hair Shake daily for a minimum of 4 weeks. Most of the subjects ingested between 1 and 2 scoops (32 g - 64 g) of Help Hair Shake in water or a beverage each day.

After a minimum of 4 weeks on Help Hair Shake, the subjects completed a survey about the quality of their hair and nails. The survey also asked about their prior use of whey protein isolate. If the subjects had taken whey protein isolates for at least 4 weeks in the past, they indicated how it affected their hair.

For the evaluation of the subjects' hair after taking Help Hair Shake, the survey utilized a scale of 1-10, in which 1 meant "no change", 6 meant "some change" and 10 meant "strong change noticed." The survey asked whether their hair looked healthier, shinier, less hair loss, less breakage, stronger, longer, grew faster, bouncier, fuller and thicker.

To evaluate the nails, the survey utilized a scale of 1-10, in which 1 meant "no change", 6 meant "some change" and 10 meant "strong change noticed." The survey asked whether the subjects' nails were stronger, longer, healthier, less breakage, and faster growth.

The survey asked if the subjects had taken protein shakes containing whey protein isolate for at least 4 consecutive weeks in the past. If they had, a scale of 1-10 was utilized, in which 1 meant "strongly applicable - strong effect noticed", 6 meant "moderate effect" and 10 meant "no difference noticed." Additionally, the survey asked whether subjects' whey protein isolate shakes had been associated with hair loss, breakage, dullness, weaker hair, less bounce, thinner and slower growth.

Taste preference of Help Hair Shake was measured. Additionally, the subjects were asked about their reported lost weight, built muscle, more energy and reduced appetite on a scale of 1-10, in which 1 meant "no change", 6 meant "some change" and 10 meant "strong change noticed."



## **RESULTS**

Nearly all subjects (94%) noticed some improvement in their hair's appearance after taking Help Hair Shake for at least 4 weeks, with a score of 6 or higher in each category: healthy, shiny, less hair loss, less hair breakage, stronger, longer, grew faster, bouncier, fuller and thicker (Table 1). The mean score for all categories ranged from 7.5 to 7.8, with a mean overall score of 7.7. Overall, 62% of participants noticed significant improvement, giving a score of 8 or higher.

Three-quarters of the subjects (n=74) had taken supplements containing whey protein isolate in the past for at least 4 weeks (Table 3). Of these subjects, 95% noticed moderate or worse hair damage from taking whey protein isolates, including hair loss, breakage, dullness, weaker hair, less bounce, thinner and slower growth. Significant damage was reported by 30% of the subjects: hair loss (11%), breakage (12%), dullness (14%), slower growth (18%), less bounce (19%), weaker hair (20%), and thinner (22%).

Nail changes were also reported in the survey. After taking Help Hair Shake, 93% of the subjects noticed some improvement in their nails' strength, length, health, less breakage and faster growth (Table 2). The mean score for all categories ranged from 7.6 to 7.7, with a mean overall score of 7.7. Overall, 66% of participants noticed significant nail improvement, giving a score of 8 or higher.

In terms of muscle building and weight loss, approximately 84% of the subjects reported weight loss, 85% reported built muscle, 85% noticed increased energy and 83% indicated a reduced appetite after taking Help Hair Shake for at least 4 weeks (Table 4). The mean score for all categories ranged from 7.3 to 7.5. Significant improvement in lost weight was noticed by 51% of the subjects; "built muscle" was 47%; "more energy" was 55%; and "reduced appetite" was 53%.

The taste of the product was reportedly "good" or better by 83% of subjects, and 53% indicated an "excellent" taste (Table 5).

### **Subgroups**

Six female subjects who had post pregnancy hair loss indicated improvement from Help Hair Shake.

Nine female subjects were menopausal and had hair loss; of these, seven had underlying thyroid problems that were corrected prior to the start of the study. They all indicated improvement with Help Hair Shake.

Fifteen male subjects took muscle builders in the past and had hair loss, and all these subjects indicated improvement with Help Hair Shake.

## TABLES AND GRAPHS

Table 1: Help Hair Shake Effect on Hair				
n=100	Mean	% of Subjects	% of Subjects	Total: % of Subjects
	Score	Noticing Some Improvement (Score of 6 or 7)	Noticing Significant Improvement (Score of 8 or Higher)	Noticing Improvement (Score of 6 or Higher)
Healthy	7.8	37%	55%	92%
Shiny	7.7	36%	53%	89%
Less hair loss	7.5	36%	49%	85%
Less hair breakage	7.6	36%	49%	85%
Stronger	7.8	36%	55%	91%
Longer	7.7	35%	56%	91%
Grew faster	7.7	31%	56%	87%
Bouncier	7.7	39%	48%	87%
Fuller	7.7	33%	54%	87%
Thicker	7.6	37%	51%	88%
Overall Results	7.7	32%	62%	94%

Table 2: Help Hair Shake Effect on Nails				
n=100	Mean	% of Subjects Noticing	% of Subjects Noticing	Total: % of Subjects
	Score	Some Improvement (Score of 6 or 7)	Significant Improvement (Score of 8 or Higher)	Noticing Improvement (Score of 6 or Higher)
Stronger	7.7	29%	62%	91%
Longer	7.7	25%	62%	87%
Healthier	7.7	29%	60%	89%
Less Breakage	7.6	37%	51%	88%
Faster Growth	7.7	27%	61%	88%
Overall Results	7.7	27%	66%	93%

<b>Table 3: Whey Protein Isolate Effect on Hair</b>			
<b>n=74</b>	Mean Score	% of Subjects Noticing Moderate Damage (Score of 5 or Lower)	% of Subjects Noticing Significant Damage (Score of 3 or Lower)
<b>Hair Loss</b>	4.9	88%	11%
<b>Breakage</b>	4.8	86%	12%
<b>Dullness</b>	4.8	86%	14%
<b>Weaker hair</b>	4.6	93%	20%
<b>Less bounce</b>	4.7	91%	19%
<b>Thinner</b>	4.6	91%	22%
<b>Slower growth</b>	4.7	91%	18%
<b>Overall Results</b>	4.7	95%	30%

<b>Table 4: Effects of Help Hair Shake on Weight, Muscle, Energy and Appetite</b>				
<b>n=99</b>	Mean Score	% of Subjects Noticing Some Improvement (Score of 6 or 7)	% of Subjects Noticing Significant Improvement (Score of 8 or Higher)	Total: % of Subjects Noticing Improvement (Score of 6 or Higher)
<b>Lost Weight</b>	7.3	33%	51%	84%
<b>Built Muscle</b>	7.3	37%	57%	85%
<b>More Energy</b>	7.5	30%	55%	85%
<b>Reduced Appetite</b>	7.4	30%	53%	83%

<b>Table 5: Taste of Help Hair Shake</b>				
<b>n=99</b>	Mean Score	% of Subjects Noting Good Taste (Score of 6 or 7)	% of Subjects Noting Excellent Taste (Score of 8 or Higher)	Total: % of Subjects Noting Good or Excellent Taste (Score of 6 or Higher)
<b>Taste</b>	7.7	30%	53%	83%

## DISCUSSION

Help Hair Shake was shown to significantly improve perceived hair health, shine, hair loss, breakage, strength, length, growth rate, bounce, fullness and thickness for the majority of the subjects, all of whom had experienced hair loss. Perceived nail quality also improved, with the majority of subjects reporting that their nails were stronger, longer, healthier, had less breakage, and had faster growth.

Contrarily, whey protein isolate supplements were strongly associated with perceived hair loss, breakage, dullness, weaker hair, less bounce, thinner and slower growth.

Clearly, nutritional supplementation can have a strong positive or negative impact on perceived hair health. Whey protein isolate is easy to mix with fluids, and it is used in most whey supplements. Whey protein isolate is a highly processed substance and may contain extra growth hormones from the dairy product. This substance may lead to hair damage, and may be linked to premature hair loss in genetically prone individuals.

The whey protein concentrate formulation used in this study, Help Hair Shake, is made with whey protein concentrate, which is whey in a more natural state. The dairy product comes from cows that were not injected with rBGH and this may reduce the amount of the growth hormone IGF-1 in the product to natural levels. Mixing took additional time, but using the product was strongly associated with perceived improvements in hair health and appearance.

Help Hair Shake contains additional nutrients that may be associated with improved hair, including biotin, B vitamins, zinc, and an amino acid blend. The formula contains the Chinese herbal remedies *Kudzo Root* and *Fo-ti Root (Ho Shou Wu)* which are traditionally used for many ailments including hair problems. Help Hair Shake also includes pumpkin seed, honeysuckle flower and chrysanthemum flower.

In addition to the more natural form of whey and the extra ingredients, Help Hair Shake is a completely natural product, with no artificial sweeteners, no xanthan gum, no MSG, no artificial colors, and no artificial flavors. It contains the natural sweeteners stevia and xylitol. Stevia has a negligible effect on blood sugar and is thought to be useful for certain hair conditions.

While this study did not individually examine each ingredient, clearly Help Hair Shake had a significant perceived benefit as compared to the whey protein isolate on hair and nails for nearly all study participants.

Therefore in conclusion, whey protein isolate could be damaging to hair health, while whey protein concentrate with certain added ingredients (Help Hair Shake) appears to improve hair health. Help Hair Shake may also show promise as a muscle-building and/or weight loss product.

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