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Subject: Color Retention Study

December 1, 2006

Purpose:
To find and evaluate what material(s) are currently available to prolong the longevity of hair color on Virgin gray hair after frequent washings and sun exposure and attempt to keep the hair looking as natural as possible over time.

Materials used and evaluated:
Shampoo base JHSCS-100-1 without Sederma Heliogenol
Shampoo base JHSCS-100-2 with Sederma Heliogenol
L'Oreal Preference Permanent Hair Color- Dark Brown #4 Natural with their Color-Saving Conditioner
75% Virgin Gray hair 10 inches long made into 2.2gram swatches (+/- 0.20g).
1cc. syringes
Small and wide tooth combs
Pyrex tray and paint brush

Hair swatch coloring:
Hair was colored as per the directions on the L'Oreal Preference packaging. All hair swatches were colored at the same time where the product was brushed on each individual swatch and laid in a Pyrex tray. Treatment was for 30 minutes and after a thorough rinsing, their Conditioner was used on the hair for 1 minute and again all swatches were thoroughly rinsed. All swatches were left to air dry. The hair coloring covered the gray uniformly but did not come out as being a dark brown color but a slightly lighter dark brown. All gray hairs fully took to the coloring.

Formulations: (JHSCS-100-1 and JHSCS-100-2)

	%w/w	
Phase A:	JHSCS 100-1	JHSCS 100-2
Deionized water	QS	QS
Standapol ES-2	30.00	30.00
Velvetex BA-35	7.00	7.00
Cocamide MEA	4.00	4.00
Na_2 EDTA	0.10	0.10
Silplex J2S	2.00	2.00
Phase B:		
Germaben II	1.00	1.00
Citric Acid (25% soln)	qs	qs
Fragrance	qs	qs
Color	qs	qs
Phase C:		
Sederma Heliogenol (Croda)	----	0.20

Procedure:
In a suitable container weigh and combine all the ingredient s in Phase A and heat to 65 to 70˚C. Mix slowly as to not incorporate air to batch
Begin to cool, after batch looks uniform and at 40˚C add Phase B. Mix well.
At 35 to 40˚C, Add Phase C. Mix well.
Adjust pH with Citric Acid solution to 6.30 to 6.80

Information about Heliogenol by Sederma:

The reason for picking the Sederma Heliogenol and the Silplex J2S were done for specific reasons. The Heliogenol has extensive clinical testing to stand by their claims, results and recommendations. It is a natural material derived from the Sunflower and the protection it gives against the effects of pollution (free radicals) and UV rays. This material was chosen because of its claims of prolonging hair color due to exposures to sunlight and washings which will permit the hair color to remain longer than recommended.

The reason the Siltech material was chosen was due to previous evaluations. The performance of this material was so outstanding for giving hair sheen and continuous manageability, that this was the rationale for the selection. Since hair color tends to dry

hair and cause a dulling effect with time, it was felt Silplex J2S would allow the hair to remain looking shiny, less dry feeling and more manageable even with multiple washings.

The CTFA/INCI name for the Heliogenol is: Butylene Glycol-Sunflower (Helianthus Annuus) Seed Extract

HAIR EVALUATION:

All hair swatches were washed with 1 gram of product per swatch. Hair was then shampooed for one minute, rinsed with 25˚C water for one minute and then blow dried.

An evaluation was performed on non-colored hair only, mostly as a Control, (Virgin gray hair) using the Sederma and Silplex in the respective shampoo bases (JHSCS-100-1 and JHSCS-100-2).
The Control swatches were treated with water only, evaluated then blow-dried.

Scale: 1 to 5 (5 being the best)

WET COMBING ON NON-COLORED HAIR ONLY--- CONTROL			
Evaluation	Control Water Only	Shampoo JHSCS-100-1 w/o Sederma	Shampoo JHSCS-100-2 w/ Sederma
Residual feel	3	4	4
Shine	3	3.5	4
Clean Feel	3	4	4
Rinsing	3	4	4
Squeaky Clean	3	4	4
Wet comb	1	4	3.5
Total:	**2.66**	**3.92**	**3.92**

DRY COMBING ON NON-COLORED HAIR ONLY--- CONTROL			
	Control Water Only	Shampoo JHSCS-100-1 w/o Sederma	Shampoo JHSCS-100-2 w/ Sederma
Dry comb	3	4	4
Shine	2	4	4
Clean feel	3	3.5	3.5
Flyaway	1	3.5	3.5
Softness	2	4	4
Dry feel	1	4	4
Total:	**2.0**	**3.83**	**3.83**

Scale : 1 to 5 (5 being the best)

COLORED HAIR WITHOUT HELIOGENOL WITH MULTIPLE WASHINGS WET COMBING (JHSCS-100-1)				
	1 wash	5 washes	10 washes	15 washes
Wet comb	3	3.5	4.5	4.5
Residual feel	3	3	3.5	3.5
Shine	4	4	4	4
Clean feel	4	4	4	4
Rinsing	4	4	4	4
Squeaky feel	4	4	4	4
Build up	4	4	4	4
Total	**3.71**	**3.79**	**4**	**4**

COLORED HAIR WITHOUT HELIOGENOL WITH MULTIPLE WASHINGS DRY COMBING (JHSCS-100-1)				
	1 wash	5 washes	10 washes	15 washes
Dry comb	3.5	3.5	4.5	4.5
Shine	4	4.5	4.5	4.5
Clean feel	4	4	4	4
Flyaway	3	3	3.5	3.5
Softness	4	4.5	4.5	4.5
Dry feel	3.5	4	4	4
Build up	4	4	4	4
Color retention	No change	Very slightly lightened	Slightly lightened	Slightly lightened
Total	**3.71**	**3.93**	**4.14**	**4.14**

Scale: 1 to 5 (5 being the best)

COLORED HAIR WITH HELIOGENOL WITH MULTIPLE WASHINGS WET COMBING (JHSCS-100-2)				
	1 wash	5 washes	10 washes	15 washes
Wet comb	3	3.5	3.5	4
Residual feel	3	3	4	4
Shine	3	3.5	4	4.5
Clean feel	4	4	4	4
Rinsing	4	4	4	4
Squeaky feel	4	4	4	4
Total	**3.5**	**3.67**	**3.92**	**4.08**

COLORED HAIR WITH HELIOGENOL WITH MUTIPLE WASHINGS DRY COMBING (JHSCS-100-2)				
	1 wash	5 washes	10 washes	15 washes
Dry comb	3	3	4.5	4.5
Shine	3.5	4	4	4.5
Clean feel	4	4	4	4
Flyway	3	3	3.5	3.5
Softness	3	3.5	4	4
Dry feel	3.5	3.5	4	4
Color retention	No change	No change	No change	Very Slightly lightened
Total	**3.33**	**3.5**	**4**	**4.08**

Further evaluations were performed with the “15 time washed swatches”. The swatches with and without Heliogenol were treated with further applications of the shampoo and observations where then made as to any further significant color changes. All swatches were compared to the previous washing. A total of 70 washings (equivalent to 10 weeks, washing hair everyday) were performed on these swatches. All treatments were done exactly the same as mentioned.

Continuation of washings: (using 15 washed swatches only)**
Without Heliogenol (JHSCS-100-1)
1 washing: No color changes noticed
1 washing vs. 5 washings: No color changes noticed
5 washes vs. 10 washes: Very slight color change noted. Insignificant
10 washes vs. 15 washes: Very slight color change noted.
15 washes vs. 20 washes: Slight color change noted.
20 washes vs. 35 washes: Slight color change noted.
35 washes vs. 50 washes: Color changes noted.
50 washes vs. 70 washes: Color changed noted.

Continuation of washings: (using 15 washed swatches only)**
With Heliogenol (JHSCS-100-2)
1 washing: No color changes noticed
1 washing vs. 5 washes: No color changed noticed
5 washings vs. 10 washes: No color changed noticed
10 washes vs. 15 washes: No color change noticed
**15 washes vs. 20 washes: Very slight color reduction
20 washes vs. 35 washes: Very slightly more color reduction
35 washes vs. 50 washes: Slight color change
50 washes vs. 70 washes: Color lighter but still apparent

HAIR COLOR EVALUATION AFTER 3 HOURS OF SUN EXPOSURE WITHOUT HELIOGENOL / WITH HELIOGENOL		
1 Wash	No changed noticed	No changes noticed
5 Washes	No changed noticed	No changes noticed
10 Washes	Very slight change. Slightly reddish	No color change noticed
15 Washes	Very slight change. Slightly reddish	No color change noticed
20 Washes	Slight color change, reddish	Very slightly reddish
35 Washes	Slight color change, reddish	Very slightly reddish
50 Washes	Color change, red highlights	Color change, reddish highlights
70 Washes	Significant red highlights	Red highlights
All hair swatches remained shiny.		

Since Heliogenol offers protection against UVA/UVB rays, a set of each swatch was left in direct sunlight for 15 minute intervals for a total of 3 hours. Swatches were exposed to the sun at peak times, weather permitting. Swatches with and without the Heliogenol were used. See above chart for results.

Conclusion:

Through constant research as to what is in demand for hair color retention, Sederma "Heliogenol" material came up numerous times. Being a little uncertain, I was pleased with the outcome. Having worked on color retention projects through the years, this was quite appealing and interesting. The most significant problem that current hair colorings cause is quicker discolorations due to excessive shampooings and environmental exposures. This with time can cause dullness and unmanageable dry-looking hair.

The combination of Silplex J2S and Sederma Heliogenol helped in prolonging the hair color and to continue giving the hair a shiny, healthy and manageable appearance. It is common for hair coloring companies to recommend about 6 weeks for a permanent hair color reapplication. This 2 material combo, aided in possibly giving the consumer some leeway of an additional 2 to 4 weeks of not recoloring. It was obvious that these materials complimented each other in their performances.

With all the extended washings, the hair remained very shiny and soft. There was no build-up and the hair looked full and vibrant.

In addition with extended washings some color loss was expected which occurred but to a lesser extent. It is also common for a dark brown color to obtain reddish highlights with sun exposure. This was also evident in the final hair evaluation.

These two materials together produce a satisfactory prolonged hair coloring system.