

Ilex Guayusa Leaf Extract as a protector of the scalp epidermal barrier and hair shaft against inflammatory process and oxidative stress induced by oxidative hair dye.

Simone A. F. Stefoni^{1*}, Raissa B. Mastello¹, Raimundo Gonçalves Jr¹, Renato Muchiuti¹., Thais M. Banin¹, Patricia Vesque¹, Michelle S. Silva², Flávia Ador², Sérgio Schalka².

SENSIENT
BEAUTY

1 Sensient Beauty, Brazil / US / France.
2 Grupo Medicin, Brazil.

Introduction:

Exposure of the skin/scalp to oxidative hair dyes can cause acute, subacute or chronic allergic contact dermatitis. The continuous exposure of hair shaft to oxidative hair dye will provide an oxidative damage to it that cause negative effect to sensorial and structural integrity of the hair. A good strategy to help prevent these symptoms is to associate an effective cosmetic ingredient with coloring to protect the scalp and hair shaft, avoiding or reducing the side effects of this inflammatory process and hair structural damage. The objective of this study was to explore the effectiveness of dry leaf extract of Ilex Guayusa as protective agent against inflammatory response and exacerbated oxidative stress, recovery of epidermal barrier and reduction of sensitivity in the scalp promoted by hair color. For this, the study was conducted in three steps: in vitro, ex vivo and clinic. In the first step, cells from hair follicle dermal papilla (HFDPCs) were incubated with 3 non-cytotoxic concentrations of the product concomitant exposure to chemical inducers (0.01 μM PPD and RCN + 3% H₂O₂) for further evaluation of radical protein formation and radical status factor (RSF), semi-quantitative assessment of mitochondrial super oxide using the fluorogenic probe MitoSOX™ Red and quantification of the interleukin 8 (IL-8). In the second step, two Ilex Guayusa concentrations (0.5% and 1.0%) were prepared directly in the hair dye and evaluated in ex vivo scalp fragments culture and human hair shaft submitted to the dyeing process. In the third stage, a single-center, blind, comparative clinical study was conducted to prove the effectiveness of using 0.5% Ilex Guayusa in reducing scalp sensitivity induced by hair dye. Our results demonstrate that Ilex Guayusa can reduce the excessive synthesis of IL-8, an important inflammatory marker of the allergic contact dermatitis process, and recovers the epidermal barrier, strengthening the synthesis of filaggrin. In addition, reduces mitochondrial oxidative stress and protects the scalp and hair shaft from the action of free radicals, increasing hair strength and hydration effect. Clinically, we observed a reduction in scalp sensitization. These results together demonstrate that the use of Ilex Guayusa associated with hair coloring protects the scalp and hair shaft from damage caused by chemical inducers commonly present in hair colorings.

Materials & Methods:

For this, the study was conducted in three steps: in vitro, ex vivo, clinic. In the first step, cells from hair follicle dermal papilla (HFDPCs) were incubated with 3 non-cytotoxic concentrations of the product concomitant exposure to chemical inducers (0.01 μM PPD and RCN + 3% H₂O₂) for further evaluation of radical protein formation and radical status factor (RSF), semi-quantitative assessment of mitochondrial super oxide using the fluorogenic probe MitoSOX™ Red (data not shown) and quantification of the interleukin 8 (IL-8). In the second step, two Guayusa concentrations (0.5% and 1%) were prepared directly in the hair dye and evaluated in ex vivo scalp fragments culture and human hair shaft submitted to the dyeing process. Then, the synthesis of filaggrin, an important marker of the epidermal barrier health, was evaluated and the RSF (radical status factor) on the hair shaft. In the third stage, a single-center, blind, comparative clinical study was conducted to prove the effectiveness of using 0.5% Guayusa in reducing scalp sensitivity induced by hair dye.

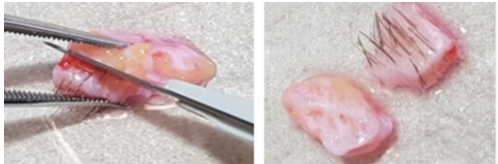


Figure 1. Scalp from plastic surgery (rhytidectomy).

Results & Discussion:

The results obtained demonstrated that the exposure of cultures to chemical inducers promoted an increase of 3.1X (P<0.001) in the IL-8 synthesis, when compared to the baseline control group. Additionally, we can observe that the product has a capacity of cell cultures protection against inflammatory stress caused by chemical inducers of 80% and 48%, in concentrations of 0.32 and 0.10mg/mL, respectively. These results are presented in Figure 2. In addition, it recovers the epidermal barrier, strengthening the synthesis of filaggrin. Clinically it was observed a reduction in scalp sensitization for 80% of the participants who responded the questionnaire claiming their scalp was "less sensitive than normal" after the usage of the investigated product, versus 56% from the control group. These results and additional data not shown together demonstrate that the use of Guayusa associated with hair coloring protects the scalp and hair shaft from damage caused by chemical inducers commonly present in hair colorings, improving consumer health and well-being.

References:

1. Neerja Puri, Asha Puri: A study on contact dermatitis to hair dye and henna. *Our Dermatol Online*. 2013; 4(4): 545-548.
2. Zanoni TB, Pedrosa TN, Catarino CM, Spiekstra SW, de Oliveira DP, Den Hartog G, Bast A, Hagemann G, Gibbs S, de Moraes Barros SB, Maria-Engler SS. Allergens of permanent hair dyes induces epidermal damage, skin barrier loss and IL-1 α increase in epidermal in vitro model. *Food Chem Toxicol*. 2018 Feb; 112: 265-272.
3. Dueñas, J.F., Jarrett, C., Cummins, I. et al. Amazonian Guayusa (Ilex guayusa Loes.); A Historical and Ethnobotanical Overview. *Econ Bot* 70, 85–91 (2016).

Results & Discussion:

Poster ID 7

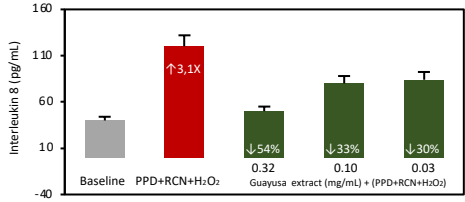


Figure 2. Quantification of interleukin 8 in HFDPCs culture treated with the investigational product Guayusa extract and exposed to chemical inducers. HFDPCs were treated for 72 hours with the investigational product and, at the same time, exposed to chemical inducers, for aftermost quantification of IL-8.

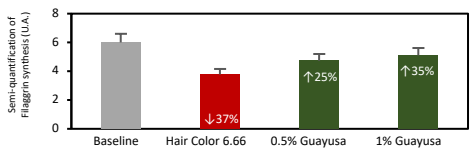


Figure 3. Semi-quantification of filaggrin synthesis in human scalp ex vivo culture treated with the investigational product SENSISHIELD SCALP and exposed hair color. Fragments of human scalp ex vivo were treated for 40 minutes with the investigational product and exposed to hair color for further semi-quantification by image of the fluorescence emitted by the immunostaining of filaggrin.

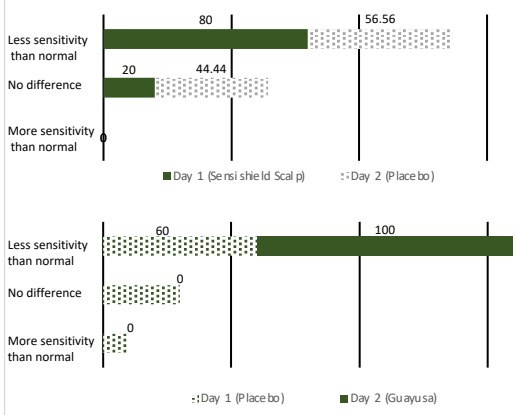


Figure 4. Percentage of responses from participants on applications in comparison between groups I and II. N=17

Conclusions:

Under the conditions in which the product described above was evaluated the data allow to conclude that: the investigational product has an antioxidant action reducing the damage to proteins caused by free radicals, with a radical protection factor of up to 76% and RSF of up to 1.37. All the presented data demonstrate that the product can prevent oxidative stress caused by chemical inducers commonly present in hair dyes and its efficacy was proved during clinical studies of simulation of real use.

Acknowledgements:

Sensient Beauty, Santana do Parnaíba - SP, Brazil.
Medicin Group, Osasco - SP, Brazil.