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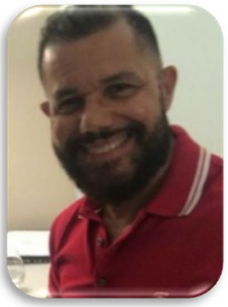

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Oral communications abstracts

CO1 - Development of cosmetic hair and body formulations using pineapple (*Ananas comosus L*) peel juice

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The concept of sustainability in the cosmetics market has become much stronger over the years and the sector is always evolving due to the continuing demands of the market. At the same time, there is a need to develop products that are sustainable and meet the demand for natural active ingredients, especially those from the biodiverse Brazilian flora. In this context we selected the pineapple fruit (*Ananas comosus L.*), belonging to the *Bromeliaceae* family, which is among the most consumed tropical fruits in Brazil. Consequently, there is a large-scale discarding of the fruit peel after consumption. Our proposal in the present study was to develop cosmetic formulations for skin and hair care using pineapple peel juice and its biomass as a cosmetic and sustainable active ingredient, which is usually discarded. The aim was to reuse this byproduct and reinforce the sustainable bias that is increasing in the cosmetic market, thus utilizing waste with industrial potential. The objectives of the study were to evaluate the chemical composition of the juice obtained from pineapple peel and its biomass, and to develop cosmetic skin and hair formulations containing pineapple peel juice. The methodology was to submit the pineapple fruit to a sanitization process and then separate the fruit peel from the pineapple pulp. After the extraction of the juice from the fruit peel, a biomass was also obtained and submitted to drying, milling and specific granulometry. Both materials obtained from pineapple were subjected to physical-chemical characterization of their composition in triplicate and the antioxidant activity of the fruit peel juice was also evaluated in order to verify its ability to sequester the 2,2-diphenyl-1-picrihydrazyl radical (DPPH). The cosmetic formulation emulsion type (o/w) was obtained, containing the juice of the pineapple fruit peel, and submitted to an Anvisa physicochemical and microbiological stability study. The hair formulations (shampoo and conditioner) were submitted to tests on locks of hair to verify criteria such as: resistance to dry and wet combing and checks for shine and color. The results obtained from the chemical composition of the pineapple peel juice and biomass showed an expressive and significant amount of the following components: carbohydrates, total sugars, non-reducing sugars, reducing sugars, proteins and lipids. The presence of significant amounts of sugar in the pineapple peel juice and biomass is of relevance in cosmetics for its moisturizing function. The pineapple peel juice showed a DPPH antioxidant activity value of (16.09 ± 1.35 mg/100g), which indicates that the fruit peel juice has great potential for use as a cosmetic active ingredient. Three cosmetic formulations were elaborated: body cream, shampoo and conditioner. The stability tests of the three formulations were performed at the temperatures of 5ºC, 25ºC, 50ºC and exposed to sunlight for eight weeks. At the end of the stability tests for body cream, it was found that there were no changes in the organoleptic characteristics, viscosity and pH. The same tests applied to the shampoo and conditioner are still in progress, but, so far, no changes have been observed. The tests to verify resistance during dry and wet combing against the control formulation showed an easier combing in both conditions of analysis. The treated strands containing the pineapple peel juice also showed hair alignment and reduced frizz. We conclude then, that the use of pineapple peel juice is a sustainable and natural alternative in the cosmetics market,and can be used as a component in hair and skin formulations.

Keywords: pineapple peel juice; *Ananas comosus L*, shampoo; conditioner, combing, shine

CO2 - Non-invasive technological platform for evaluating cosmetic dermal redensification

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Cosmetic strategies involving actives that promote the biostimulation of dermal structuring molecules leading to skin filling are considered promising to prevent and combat the appearance of unpleasant signs of skin aging. These ingredients exert their effects by stimulating fibroblasts to produce molecules that impart skin elasticity, firmness and support. Many cosmetic products have proven their stimulating effect on collagen and other molecules biosynthesis by in vitro methods. However, it is necessary to develop more reliable methodologies to prove the increased synthesis of these structuring molecules induced by the topical application of products. Among these technologies, we highlight diffuse reflectance spectroscopy, which is characterized as a noninvasive resource used for quantitative determination of extracellular matrix protein production. Given these assumptions, this study aimed to evaluate the dermal filler induced by cosmetic biostimulation of structuring proteins such as hyaluronic acid and collagen by combination of non-invasive methodologies. The open, randomized, controlled clinical study was conducted according to the Helsinki Declaration, with the participation of 22 female volunteers, mean age 47 +/- 12 years, with phototype (Fitzpatrick) II- V. The forearm region was elected as a region for analysis and cosmetic intervention. One arm was considered control while the other was exposed to cosmetic intervention with active biostimulator of dermal structuring molecules. The analysis times considered were: T0; T45 days; T90 days. The proposed dermal content evaluation methods were: Diffuse Reflection Spectroscopy for dermal quantification of Hyaluronic Acid (Fluorolog-Jobin Yvan Horibe, Model FL3-12); High-frequency ultrasound dermal analysis (50mHz) (Dub® SkinScanner); Skin Tightness and Elasticity Assessment (Cutometer® MPA-580 and Multiprobe Adapter MPA-580, CKeletronics, Germany). As a gold standard for recognition of hyaluronic acid stimulation, biopsies from the investigative areas were considered, with protein marking of the hyaluronic acid by immunofluorescence technique. Global dermal redensification / cosmetic filler effect was evaluated by the association of diffuse reflection spectroscopy techniques associated with ultrasound analysis. It was considered 10 parameters of biophysical measurement to understand the phenomenon of dermal filling. Dermal filler produced by the interventional product was observed, with the increase of dermis ecodensity and decrease of the minimum dermis thickness value, contributing to its uniformity and larger amount of dermal structuring protein bundles. Decrease, or near disappearance, of the Sub Epidermal Non-Echogenic Band (SENEB) in the forearm test and decrease in wrinkles (epidermis rectifications) at T45 were detected, while in the forearm control the SENEB and wrinkles remained evident after 45 days. study. Immunofluorescence analysis revealed a significant increase in Hyaluronic Acid synthesis after 45 days of use of the interventional product, when compared to the contralateral forearm as compared to the forearm itself treated at T0. Finally, by the diffuse diffusion spectroscopy technique it was possible to identify stimulus of up to 2x more hyaluronic acid. This study presents an innovative characterization of the skin filling performance produced by a cosmetic product, identifying the potentiality and use of the combination of noninvasive skin biophysical assessment instruments to design innovative benefits of relevance and credibility for the consumers.

Keywords: Skin Filling; Cosmetic; Non-invasive methods

CO3 - In vitro development methodology to assess blue light protection

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Blue light is a wavelength presented in electronic devices and sunlight. It has a wavelength that varies from 400 to 500mn, which leads it to obtain greater capacity for tissue penetration. For this reason, it is observed that it has the potential to cause an intracellular oxidative stress that will result in a premature photoaging of the skin. In order to evaluate the effects of blue light on cells and cosmetics products efficacy, *in vitro* studies are necessary in order to carry out a precise scientific response, with objective analysis specifying the wavelength used. Therefore, the aim of this study was to develop an *in vitro* methodology that can evaluate the effectiveness of products in relation to the protection of the blue light wavelength. For the wavelength simulation, a light source was selected in which the spectrum is between 400 and 500 nm with the peak emission at 455 nm. In order to evaluate the blue light effect, human fibroblast cells were used for this study. Exposure assessments were carried out according to different time points for dose selection. In order to analyze the effectiveness of protection, a cosmetic product sold commercially with this claim was selected. The product was applied to a plate (2mg/cm2) on which the blue light was applied. To assess the effects, a cell viability test was performed. As a result, it was observed that the concentration of 200J / cm2 led to a 73.8% reduction in cell viability. In the group in which the product was applied, a 20.2% reduction in viability was observed. A statistical difference was observed between the group with exposure to blue light and the other groups ($p < 0.05$), which demonstrates that the product evaluated performed protection from the harmful effects of blue light. Therefore, we observed that the methodology developed herein has the potential to evaluate one of the effects of blue light on cells and to evaluate the effectiveness of topical products for this wavelength protection.

Keywords: skin, blue light, fibroblasts, skin damage, skin aging, cell culture

CO4 - Safety and efficacy assessment of astaxanthin nanoparticles to anti-aging cosmetic formulation

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The search for conscious consumption of cosmetics is a trend that has been strengthening worldwide and biotechnology has come to contribute to formulation of new products that don't lose their benefits and at the same time aren't harmful to the environment. Thus, a natural source that can be a “greener” alternative in this search is algae and microalgae, already used and which has represented a promising resource in the industry. Astaxanthin is a carotenoid produced by *Haematococcus pluvialis* microalgae and has gained prominence in the food supplementation industry, due to antioxidant benefit. Obtained by exposing microalgae stressful environmental conditions, the red-orange pigment has a high power against the oxidizing action of free radicals that harm healthy skin cells. This way, the present work aimed to analyze the viability of using the substance and its characteristics in a cosmetic formulation, since it’s an active ingredient of high potency than others found in area, as example vitamin C. Astaxanthin in oily media has been incorporated into a cosmetic emulsion and and after preliminary and accelerated stability was analyzed. From the two analyzes, respectively, the first conditioned to sudden changes in temperatures and the second, under accelerated conditions ensuring the shelf life of final product, it was observed that astaxanthin is a substance that maintains stability under applied conditions over time,

without losing characteristics and without the occurrence of unwanted interactions in formulation of the emulsion. However, asset shows sensitibility when exposed to light, showing a loss of characteristic color, which can lead to changes in antioxidant power. A option for storing the product with the asset is to kept in opaque packaging, where would be protected from the light incidence.

Keywords: Astaxanthin, stability, antioxidant

CO5 - Hand hygiene and skin health in times of COVID-19

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COVID-19, caused by SARS-CoV-2 virus, results in serious clinical manifestations in humans. The reactions, which are mainly respiratory, can also have significant effects on other body systems, such as cardiovascular, and can progress to death. Handwashing with running water and soap, and using alcohol-based antiseptic formulations are recognized measures in controlling COVID-19 spreading. Our study presents a review on hand hygiene and its relation with skin health in times of COVID-19. Handwashing with soap and running water promotes dirt removal and can inactivate SARS-CoV-2 by disrupting the viral lipid membrane. The use of alcohol-based antiseptic preparations on hands inactivates or inhibits the development of pathogenic microorganisms, such as the COVID-19 virus. World Health Organization recommends 80% ethyl alcohol-based or 75% isopropyl alcohol-based formulations for hand antisepsis, as they have a proven virucidal effect against SARS-CoV-2. Numerous problems can occur with frequent hand sanitizing regarding skin health. Skin dryness, increased skin sensitivity, and irritant contact dermatitis are some manifestations, which are mainly noticed in healthcare workers during COVID-19 pandemic. Accidents and burn risk involving alcohol-based antiseptic products are also a concern. From the pandemic beginning until November 2020, the Brazilian Burn Society has counted 700 hospitalizations due to serious burn accidents caused by 70% alcohol use, in liquid or gel form. For minimizing or avoiding dermatological reactions on hands, it is important to use antiseptic formulations and soaps containing moisturizing agents. The presence of humectants such as glycerin and emollients such as vegetable oils in the formulations can attract water and keep it in the skin, relieving hand skin irritation. So, humectants and emollients help maintaining the skin health in a proper hand hygiene routine. Even after most of world's population has been immunized with vaccines to prevent COVID-19, our hands will still have potential to transmit SARS-CoV-2 and it should not be overlooked. Understanding the state of the art of the antiseptic formulations and the impact of these products on hand skin health are critical to develop new knowledge on antiseptic products and their application in controlling infectious diseases spread, such as COVID-19.

Keywords: COVID-19, SARS-CoV-2, hand hygiene, antiseptic formulations, 70% alcohol, soap.

CO6 - Immunocompetent RHE platform adding functionalities to your cosmetic products

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The rise of the application of the 3R's principle has increased the demand for alternative methods to the use of animals to evaluate the safety and efficacy of cosmetic products. Among the several methods proposed by regulatory agencies, the skin tridimensional models stand out in dermal exposure assessment studies. According to the Brazilian Association of Personal Hygiene, Perfumery and Cosmetics Industry (ABIHPEC), skincare products are among the 10 most consumed products by Brazilians. However, the Brazilian Association of Allergy and Immunology (ASBAI) warns that cosmetics are among the main causes of allergic reactions, directly reflecting on the habit of consumers looking for products with minimalist and multifunctional formulations. Functional

cosmetics with claims for anti-pollution, anti-acne, and others active in reducing inflammatory effects and plant actives with anti-inflammatory action are promising for use in cosmetic formulations. In Europe and the United States, for example, the cannabidiol molecule is often used in cosmetic formulations due to the modulation of antioxidant and anti-inflammatory enzymes in the upper layers of the skin, keratinocytes. Thus, in the context of adding functionality to cosmetics products, the present work demonstrated the application of a sophisticated three-dimensional epidermis model (immunocompetent RHE), which simulates an efficient microenvironment to respond to the skin inflammatory stimuli and can prove the action mechanism and effectiveness of a product. To prove the effectiveness of our immunocompetent RHE model to respond effectively to inflammatory stimuli, they were challenged with *Lipopolysaccharides from Escherichia coli (LPS)* associated or not with the exposure of an anti-inflammatory product or isolated molecule. After that, the evaluation of endpoints linked to the inflammatory, such as metabolic activity, pro-inflammatory cytokines quantification, and histological tissue assessment (hematoxylin/eosin and immunohistochemistry) were performed. The parameters related to the quality control of the model (histology, immunohistochemical characterization, viability, and membrane permeability) were within the pre-established criteria by OECD TG 439, which demonstrate the model's reliability. The quantification of IL1-β, IL-8, and PGE2 showed a statistically significant amplitude between baseline levels (healthy tissues) and stress condition levels (inflamed tissues). Additionally, the treatment with an anti-inflammatory product has shown a decrease in cytokines. Unlike the formulation, for the isolated active exposure there was no reduction in the quantification of cytokines, which demonstrates the importance of the formulation for the efficient pharmacological effect of the active substance. This study demonstrated the ability of the immunocompetent RHE model to respond effectively to skin inflammatory stimuli, as well as to prove the modulatory effect on the inflammation cascade, showing different responses with the exposure to the product and the isolated active. In this context, the immunocompetent RHE model is a test system with a valuable prediction for the evaluation of formulations and can provide more reliable responses to what occurs *in vivo*.

Keywords: alternative methods, *in vitro* model, 3D culture, efficiency test, cosmetics

CO7 - Reconstructed human epidermis model as an advanced platform to assess cosmetic product safety and performance

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The Reconstructed Human Epidermis (RHE) models are widely widespread in the scientific community and regulatory agencies due to the search for alternative methods to the use of animals and the high *in vitro* / *in vivo* correlation presented by these models. In this context, the

Organization for Economic Cooperation and Development (OECD) is responsible for regulating several tests for this purpose. Prediction studies of skin irritation and corrosion using the RHE model, for example, have already been validated by the OECD (N° 439 and N° 431, respectively) and recognized by the National Council for the Control of Animal Experimentation (Concea) since 2014. In addition to these assays, the RHE model can be used as a platform for the development of different alternative methods, depending on the product and the desired objective. In this sense, the RHE can also be used as an advanced test system to assess the prediction of *in vitro* skin permeation, presenting as an extremely relevant alternative for the skin permeation studies contained in the Nº428 guide of OECD. Thus, the objective of this work was the development of a test system using RHE to assess the safety (*in vitro* skin irritation) and performance (*in vitro* skin permeation) of cosmetic products. The developed RHE model was subjected to demanding quality control, wherein it was evaluated tissue differentiation (histology and immunohistochemistry) and membrane viability and barrier. The histological results demonstrated the construction of a significantly differentiated epidermis with no abnormalities. The immunohistochemical characterization through the expression of cytokeratin 10, involucrin, and filaggrin, demonstrated that the proliferative/maturation capacity of the model are within preestablished criteria in the literature. Additionally, the tissue viability values and the membrane integrity and permeability tests were within the quality control internally pre-established criteria

and in line with international protocols. The proficiency of the *in vitro* skin irritation assay was performed. The model demonstrated applicability for the safety assessment of cosmetic products due to its ability to differentiate irritating and non-irritating compounds, presenting 100% sensitivity, specificity, and accuracy (according to the OECD established criteria). The *in vitro* skin permeation assay was conducted using a method adapted for the RHE model, based on the recommendations of the N° 428 guide of the OECD. The model was used to evaluate the skin permeation of caffeine in cosmetic products. The assay demonstrated the permeation of the active ingredient through the skin even in the first hour of the study, reaching a maximum concentration at 8 to 10 hours after the application. These results demonstrated the predictive permeation ability of the developed method, as well as it allows the evaluation of product performance without using animal membranes. Therefore, the prediction of skin irritation and permeation demonstrates that the developed RHE model is characterized as a highly relevant tool for the cosmetic industry, because it can be used to leverage the R&D sector regarding decision making in assessing safety and performance of cosmetic products, added the benefit of replacing the use of animals in the research and development process.

Keywords: alternative methods, *in vitro* models, 3D culture, cosmetic, safety and performance assays, *in vitro* skin permeation, RHE permeation, *in vitro* skin irritation, human reconstructed epidermis

CO8 - Guayusa extract as a protector of the epidermal barrier, inflammatory response and oxidative stress induced by hair colorations: an in vitro, ex vivo and clinical approach

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"Permanent" hair dyes are among the most used cosmetic products by the population, which corresponds to about 75% of global consumers in the hair care category. The oxidative hair dye is the most expressive within this category and most contain the dye precursor p-phenylenediamine (PPD) and a coupling agent such as Resorcinol (RCN) which, after successive reactions under oxidative conditions, result in coloring of the hair. PPD is often used to contribute to the development of the final color, especially for dark shades. Exposure of the skin to this compound, in addition to irritation, can cause acute, subacute or chronic allergic contact dermatitis, facial edema and induce the generation of reactive oxygen species (ROS), exacerbating the immune response and contributing to the impairment of the epidermal barrier. A good strategy to help prevent these symptoms is to associate an effective cosmetic ingredient with coloring to protect the scalp, avoiding or reducing the side effects of this inflammatory process. The use of natural ingredients in cosmetics is growing every year, therefore, the association of antioxidant and anti-inflammatory properties of plants can be an interesting approach to mitigate allergic effects. Ilex guayusa is an emblematic tree of the Amazon region, widely present in the region of Ecuador, Colombia, Peru and Bolivia with various uses in folk medicine, however, there are only few researches about the phytochemistry and biological activities in different applications such as nutraceutical or cosmetic. The objective of this study was to explore the effectiveness of dry leaf extract Guayusa as a 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, 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 (0.01µM PPD and RCN + 3% H_2O_2) 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 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 of the hair shaft after coloring was determined. 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. Our results demonstrate that Guayusa can significantly reduce mitochondrial oxidative stress by up to 81% and protect the scalp and hair shaft from the action of free radicals with

a protective RSF greater than 1. In addition, it reduces 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. Clinically, we observed a reduction in scalp sensitization. These results 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.

CO9 - Characterization of bacterial cellulose obtained from different carbon sources

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Nowadays, with the growing concern about skin care, the interest in more natural products has been intensified and through biotechnology it's a way to achieve these expectations. For the production of facial masks, a resource is already widely used, the biocellulose, it's produced by bacteria of the genera Gluconacetobacter, which was first described in 1886, by Adrian Brown. In this work, was used the *Gluconacetobacter hansenii* bacteria and the Alaban Broth has culture medium. The focus of this study was to change the sugar source, opting to use traditional and organic crystal sugars, in order to make the process cheaper. The final objective was a thin layer of biocellulose, that still had resistance and the ability to absorb bioactive compounds. The samples were analyzed qualitatively. Within expectations, the best result obtained was biocellulose produced from organic sugar. This paper is part of the development of a technology of a company incubated at the UTFPR-PG.

CO10 - Optimized development of an equivalent skin model using 3D bioprinting

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Two-dimensional (2D) cell culture models have been used in the development of therapeutic agents, but these models lack many characteristics and complexity of *in vivo* microenvironment. To solve those issues, animal models have been used for studies, however it is an expensive model, does not resemble human biology, involve many ethical considerations and social movements grow to replace tests on animals. In this context, three-dimensional (3D) equivalent skin models are a promising platform to study skin biology and evaluate the safety and efficacy of cosmetic products, as it mimics cutaneous morphology and physiology. Three-dimensional bioprinting technology allows automation of this process, making it faster and more reproducible. The aim of this study was to develop a model of equivalent skin based on 3D bioprinting and to compare it with the conventional model already standardized. In conventional equivalent skin model, human fibroblasts are mixed manually and individually in the extracellular matrix. For the development of the bioprinted model, human fibroblasts in a three-dimensional matrix are extruded using a bioprinter After polymerization, keratinocytes are added to the surface and cultured in order to allow stratification. To compare the processes, a survey of the time, cost and biological profile of the skin models was analyzed. The morphology of the structures is evaluated by optical microscopy. Bioprinting enabled the reduction of 80% the use of consumables, like tips and microtubes, made the process more standardized and 2 times faster. Microscopically, the conventional and bioprint techniques were similar, with a homogeneous presence of elongated fibroblasts embedded in the extracellular matrix and on the surface allowed the formation of the keratinocyte monolayer. Histological and gene expression analysis are still being performed. These results demonstrate that bioprinting is a promising methodology for new developments of equivalent skin.

CO11 - Advantages of the use of equivalent skin model to evaluate effectiveness of cosmetics products

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The use of *in vitro* studies to evaluate the effectiveness of cosmetic products has advantages in that it allows to evaluate the mechanism of action of the products, to screen formulations and to demonstrate functionalities that clinical and animal studies are not possible or feasible. In this understanding, the use of cell culture of skin types is used for in vitro evaluation and there are studies to develop models to reconstitute organ complexity. For this purpose, tissue engineering is used to allow the reconstruction of the dermis and epidermis of the skin to obtain the equivalent skin model. The aim of this study was to compare the gene expression of proteins relevant to the skin when comparing the cultivation of two-dimensional (2D) and three-dimensional (3D) cells, that is, the equivalent skin. For the evaluation of 2D cell culture, human keratinocytes and fibroblasts cells were plated in plates suitable for cell culture. To evaluate the cultivation of 3D cells, human fibroblasts were embedded in an extracellular matrix and keratinocytes were added to the surface and cultured to allow stratification of the epidermis. After culturing the cells, extraction of messenger RNA was performed, conversion to complementary DNA strand and evaluation by polymerase chain reaction (RTq-PCR). So far, the expression of elastin and keratin has been evaluated in relation to the relative expression of the endogenous gene (beta-actin). An increase in elastin and keratin expression was observed, which demonstrates that the complexity of structures and communication between cell types allows greater expression of important proteins for skin health. In addition, evaluations between genes and product efficacy are being carried out to compare the cultivation of 2D and 3D cells. In this sense, one of the observed advantages is that the equivalent skin model allows to evaluate the products in higher concentrations while in the cultivation of 2D cells it is necessary to find a non-cytotoxic concentration. Therefore, it is observed with this study that the use of three-dimensional cultivation models as the equivalent skin allows to evaluate in a biomimetic way what is observed in the cutaneous skin by reconstructing and allowing interaction between the different cell types.

CO12 - Integrated approaches for classification of the eye damage potential of cosmetic preservatives according to GHS classification

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The classification of the potential for eye irritation/damage is a necessary step in the safety assessment of cosmetic ingredients and therefore part of national and international regulatory requirements. However, the ban on animal testing has raised challenges in assessing this endpoint, because up to now there is no alternative method that can completely cover this toxicological parameter, requiring the use of an analysis strategy. Cosmetics, as well as other products, need protection against microbiological contamination, and it is important to use antimicrobial preservatives to prolong the shelf-life of products and ensure consumer safety; nonetheless, preservatives are among the most potentially irritating substances present in these products. Considering that cosmetics are freely accessible to consumers and sometimes may accidentally come into contact with the eyes, the aim of this study was to classify the potential for eye irritation/damage, according to the Globally Harmonized System of Classification and

Labeling of Chemicals (GHS) of preservatives: propylparaben (PP), methylparaben (MP), phenoxyethanol (FE), methylchloroisothiazolinone (CMI), methylisothiazolinone (MI), DMDM hydantoin (DMDMH), imidazolidinyl urea (IMU), sodium dehydroacetate (SD), sodium benzyl alcohol (BA), benzalkonium chloride (BAC), caprylyl glycol (CG), sodium benzoate (SB) and ethylhexylglycerine (EEG) through an integrated data evaluation approach: *in vivo* (It has already published and obtained before European animal testing ban), *in vitro* through the Short Time Exposure methodology (STE; OECD 491) and *in silico* in the OECD QSAR toolbox and iS Ocular Altox. Among the 13 preservatives evaluated, 5 were classified as Category 1 (FE, CMI, MI, BA and BAC) and, within a hazard assessment, could cause serious eye damage; 5 were classified as Category 2 (MP, DMDMH, SD, SB and EEG) and, within a hazard assessment, they can cause eye irritation and 3 (PP, IMU and CG) were classified as No Category because they did not match into Categories 1 and 2 and, possibly, are not strongly eye irritants according to GHS. Despite the challenge of high accordance between the 3 methods (*in vivo*, *in vitro*, *in silico*), the proposed integrated testing approach allowed for robustness during the classification of eye irritation/damage according to the GHS criteria of the evaluated preservatives in this study. The interpretability and mechanics involved in the use of *in silico* tools allows corroborating for a useful strategy in the assessment of new cosmetic ingredients to guarantee the safety of the consumer.

Keywords: eye irritation; eye damage; GHS classification; cosmetic preservatives; safety assessment.

CO13 - Obtainment papaina-alginate nanoparticles for use as a skin permeation promoter of cosmetic bioactives

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Papain is a proteolytic enzyme extracted from the unripe papaya fruit, Carica papaya L., traditionally used in the treatment of skin wounds thanks to its debriding action on damaged tissues. Recently, papain has been studied as a skin permeation promoter, finding wide application for promoting the absorption of pharmaceutical and cosmetic actives. The objective of this work was to develop nanoparticles of papain complexed to sodium alginate, by neutralizing the ionic charges of macromolecules, allowing the obtainment of active and immobilized papain to act as a skin permeation promoter of cosmetic actives. For this purpose, molecular dispersions of papain 4 mg/ml were prepared, in the presence (10 mg/ml) or absence of polysorbate 80, and sodium alginate (10 mg/ml), in the media purified water and phosphate buffer 50 mM pH 5.5. To obtain the nanoparticle dispersions, about 15 ml of papain solution were added dropwise over 25 ml of sodium alginate solution under constant agitation. The formed mixture was kept under agitation for 15 minutes, being later analyzed by laser diffraction to evaluate the size and size uniformity. This same preparation protocol was performed to obtain all samples, considering the two dispersion media and the presence or absence of polysorbate 80. The same procedure was also carried out in the absence of one of the macromolecules as negative controls for particle formation. The dispersions of nanoparticles obtained and the negative controls were frozen and lyophilized for 48 h, after which the residual mass of each sample was determined to determine the process yield. Afterwards, aliquots of the lyophilized samples were taken and redispersed in 5 mL of water, being subsequently analyzed by laser diffraction to determine the corresponding size and uniformity. The laser diffraction results indicate the presence of polydispersed systems, with two distinct populations, one in the range of 100 -500 nm and the other in the range of 7 - 100 μm when mixing the two macromolecules, with the best yield of particles with diameter ≤ 500 nm in passing volume observed for formulations containing 1% polysorbate 80 in aqueous medium (41.57%), followed by the system in water without surfactant (32.50%) and in phosphate buffer with surfactant (32.38 %). On the contrary, in all tested mixtures where one of the macromolecules were not present, particles ≤ 500 nm in passing volume were not recorded, confirming that the nanoparticles are only formed from the interaction between the macromolecules. This fact is corroborated by the expression of laser diffraction analysis in passing number, revealing that the absolute number of particles ≤ 500 nm is equivalent to 0%. This last value also contrasts with the proportion of nanoparticles present in mixtures containing papain and alginate when expressed in number, being greater than 97%. After lyophilization, the mixtures produced resulted in a yield greater than 90% for all preparations,

indicating that the process does not present significant losses, however, none of the tested samples allowed the nanoparticles to be redispersed in water after lyophilization. The results indicate that the presence of the non-ionic surfactant, polysorbate 80, is important for increasing the proportion of papain nanoparticles formed. On the other hand, the use of phosphate buffer pH 5.5 can favor greater solvation of the enzyme by water molecules and by phosphate ions on the positive charges of papain, decreasing the efficiency of complex formation with alginate. New procedures will be conducted to increase the yield of nanoparticle formation, optimization of lyophilization and evaluation of maintenance of enzyme activity.

Keywords: Papain, alginate, nanoparticles, permeation promoters.

CO14 - Development of a skin substitute for wound healing

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Electrospun nanofibers scaffolds are able to mimic extracellular matrix architecture of different tissues, including skin, and as a result, it has possible application in wound healing. Chitosan and poly (vinyl alcohol) are polymers containing necessary characteristics to be used as skin substitutes, such as biocompatibility and biodegradability. In addition, chitosan presents healing and antimicrobial activities. These polymers were characterized by *Nuclear Magnetic Resonance,* Fourier-transform Infrared Spectroscopy and *Size-exclusion Chromatography.* 96 chitosan/ poly (vinyl alcohol) nanofibers scaffolds were prepared by the electrospinning method. In order to evaluate nanofibers morphology (dependent variable), experiments were performed using factorial designs. The independent variables were crude chitosan, pure chitosan, poly (vinyl alcohol) brand 1, poly (vinyl alcohol) brand 2, needle gauge 1, needle gauge 2, high polymer concentration, low polymer concentration, high plasticizer concentration, low plasticizer concentration, final ultrafiltrated dispersion and final dispersion without ultrafiltration. Polymeric dispersions were placed into a syringe and a high voltage power supply (7.5 - 25.5 kV) was linked to the needle. Then, nanofibers were ejected from the needle by this high electric-field force to a collector 14 cm away. Morphological analysis was performed by Scanning Electron Microscopy and nanofibers with different structures and thicknesses were obtained. Scaffolds were also characterized by *Atomic Force Microscopy* and Confocal Microscopy. NF67 presented average thickness of 268.3 nm, uniform distribution and high yield. Therefore, it was possible to obtain scaffolds that could be applied as extracellular matrix-like material, for skin healing.

Keywords: nanofiber; polymeric scaffold; electrospinning

CO15 - Safety and eficacy assessement of a cosmetic emulsion containing panthenol, ceramides, PCA and shea butter for the sensitive and sensitized skin care

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In view of skin's hydrolipidic film composition, ceramides and pyrrolidone carboxylic acid (PCA), as well as panthenol, and shea butter are active ingredients that contribute to the high performance of a cosmetic emulsion for the purpose of repairing the cutaneous barrier (BC) and for intense water retention in the stratum corneum. Considering that sensitive and sensitized skins usually have a compromised skin barrier function, the application of a cosmetic emulsion made with moisturizing and skin barrier protective ingredients is essential to minimize skin changes, such as erythema and flaking, as well as the characteristic discomfort sensations felt by sensitive or sensitized skin after aesthetic procedures.

In this context, the main purpose of the present study is to evaluate the efficacy and safety of a cosmetic emulsion containing panthenol, ceramides, shea butter, and pyrrolidone carboxylic acid in the repair of the skin barrier

through ex-vivo tests on the skin of people with dermatitis atopic, rosacea or sensitive skin (positive stinging-test) and in healthy people after aesthetical procedure.

In order to assess it, after Research Ethics Committee approval, fragments of human skin donated from elective plastic surgery were submitted to BC rupture by sodium lauryl sulfate (LSS). This tissue was treated with the cosmetic emulsion containing the active ingredients under study for a period of 48 hours, for subsequent histological evaluation of epidermal repair and measurement of filaggrin and keratin-14 by immunofluorescence. In addition, a clinical study was conducted with study participants with healthy and unhealthy skin, aged 18 to 59 years (mean 41 years). The group with skin considered healthy had 23 participants, who applied the product for 28 days in the region of the face. Before and after 14 and 28 days, measurements were taken in relation to the parameters of skin hydration (Corneometer®), transepidermal water loss - TEWL (Tewameter®), peeling index (Corneofix® and Visioscan®) and evaluation of areas with erythema (VISIA®) after aesthetic facial treatment in hemiface (15% salicylic acid peeling). Finally, another clinical study was conducted with participants with the following skin changes: 10 of them with atopic dermatitis, 9 with rosacea and 13 with sensitive skin (positive stinging test), as well as 7 participants with recent tattoos. These groups were monitored by a dermatologist and ophthalmologist for 28 days of daily product use.

The results obtained showed that the fragments of skin submitted to the rupture of the barrier presented a reduction in the integrity of the stratum corneum, impairment of the viable epidermis, through the alteration in the keratinocyte cohesion and an apparent reduction in the dermal density. The proposed cosmetic treatment improved the cohesion of the corneocytes and increased the dermal density, when compared to the fragments that did not receive any treatment. Through the analysis of the images obtained, treatment with the cosmetic product under study significantly increased the production of filaggrin by 154.27% ($p<0.001$) and the production of keratin-14 by 75.67% ($p<0.05$), when compared to the untreated group.

In clinical tests it was possible to observe that the product has very good skin tolerance in people with atopic dermatitis, rosacea and sensitive skin, in addition to having clinical efficacy in increasing skin hydration, calming effect, improvement in skin surface by decreasing flaking (parameter Sesc) and increased skin softness (Sesm parameter), as well as decreased erythema ($p <0.05$). In addition, there was a significant reduction ($p=0.01$) in the transepidermal water loss after 14 and 28 days of application, when compared to baseline values, which suggests that there was recovery of the skin barrier in this group of people. After the aesthetic procedure with 15% salicylic acid, the product hydrated the skin and helped the recovery of BC.

In conclusion, the cosmetic emulsion was effective in tissue repair and regeneration and helped to increase the synthesis of filaggrin and keratin-14, favoring the production of natural moisturizer factors (NMFs) and recovery of the skin barrier, suggesting healing potential. The product was proven to present high cutaneous tolerability on people with atopic dermatitis, rosacea, and sensitive skin, in addition to presenting clinical efficacy by instrumental measures in the recovery of the skin barrier and skin hydration. Finally, the proposed cosmetic formulation based on panthenol, ceramides, PCA salts and shea butter showed benefits for the sensitive and sensitized skin care.

Keyword: Panthenol; Skin barrier function; Skin Hydration; Ceramides; Sensitive skin.

CO16 - Vacuum therapy in association with cosmetic bioactives for treatment of telogen effluvium. Part II: post-study

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Aims: To show follow-up results on a previously published study involving hair therapy utilizing vacuum therapy in association with cosmetic emulsions containing plant-derived bioactive compounds, post-biotics and growth

factors on treatment of androgenetic alopecia (AAG), female pattern hair loss (APF) and telogen effluvium (TE). Methods: A total of 7 subjects were selected from the initial 57-day long study (n=25); vacuum therapy and cosmetic treatment were interrupted for these subjects after the initial study was concluded. The subjects were chosen by a multidisciplinary team (composed of a dermatologist, a biologist, a trichologist and other scientific investigators) which had followed the initial study to its completion identifying participants which showed the most serious cases of androgenic/estrogenic alopecia, either alongside or not effluvium. These participants were followed for 10 months after the initial study had finished (D=57 days) by means of clinical and dermatological evaluations; subject perception regarding progression of their condition was assessed by questionnaires. Results and Discussion: Benefits of vacuum therapy for activation of capillary vessels through vasodilating negative pressure could be observed at short, medium and long term even after ceasing therapy. Of the 7 subjects assessed, 29% (n=2) showed intense hair growth, 42% (n=3) showed moderate hair growth and 29% (n=2) showed light hair growth after therapy had ceased. Also, moderate and light increase of hair strand thickness were shown by 57% (n=4) and 43% (n=3) of the subjects, respectively. Conclusions: Even after 10 months of complete absence of any therapeutical interventions, including use of any hair cosmetics at home, satisfactory results of previously employed vacuum therapy on hair loss caused by AAG, AGA and TE could be observed on the assessed subjects.

Keywords: Hair Vacuum Therapy; Androgenetic Alopecia; Microbiome; Telogen Effluvium; Female Pattern Hair Loss

CO17 - Clinical and non-clinical strategies to prove the anti-pollution effectiveness of cosmetic ingredients and products

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The etiology of skin aging is multifactorial, involving intrinsic and extrinsic factors that together influence the appearance of unaesthetic characteristics of the aging skin phenotype. Pollution has been recognized as one of the driving factors that accelerate skin aging, in addition to solar radiation, as proposed by the exposome theory. Cigarette smoke is a highly complex aerosol composed of thousands of chemicals, including reactive oxygen and nitrogen species and electrophilic aldehydes. Environmental cigarette smoke contains carcinogens such as benzo[a]pyrene and 4-(methylnitrosoamino)-1-(3-pyridyl)-1-butanone (NNK), as well as a large amount of oxygen radical-forming substances such as catechol, known to interact with the skin. Reactive oxidants and free radicals in cigarette smoke are associated with oxidative stress or secondary oxidative events such as lipid peroxidation. Chemical substances in cigarette smoke activate transepidermal water loss, skin connective tissue degeneration, and increased matrix metalloproteinases (MMP-1 and MMP-3). These events together result in an acceleration of the skin's chronological aging process, contributing to the appearance of blemishes, wrinkles, and expression lines. Protecting the skin from pollution is considered an essential part of a multifaceted approach to delay skin aging, reinforcing the importance of assessment methods that address, in an integrated way, clinical and biological mechanisms by which a cosmetic product or ingredient can act. Thus, the objective of this study was to join *in vitro*, *ex vivo* and clinical tools in an integrated approach and to validate robust methodologies for evaluating products with anti-pollution claim. The *in vitro* studies were conducted in cultures of human keratinocytes exposed to smoke from the complete combustion of two cigarettes. In these cultures, tissue renewal parameters were evaluated using the Ki67 proliferation marker, and oxidative stress, based on the production of mitochondrial super oxide. In the *ex vivo* human skin model, exposure to cigarette smoke was performed for three consecutive days for further quantification of proteins damaged by free radicals (radical proteins) and establishment of the radical status factor of the skin (RSF). For clinical evaluations, our research group developed an equipment that promotes accelerated burning of cigarettes and concentrates the smoke centralizing it in the exposure area. Instrumental measurements for assessment of transepidermal water loss (TEWL) and skin hydration (corneometry) were performed before (D0) and 15 minutes after skin exposure. Additionally, in all study models we challenged the evaluation methods proposed here with cosmetic products already available on the market that present the anti-pollution claim. The results demonstrate that our experimental pollution models corroborate the biological changes described in the

literature, with an impairment of natural skin renewal significantly reducing Ki67 synthesis, an exacerbation of oxidative stress, evidenced by increased mitochondrial super oxide synthesis and formation of radical proteins, with an RSF less than 1. In addition, it clinically induces an increase in transepidermal water loss, compromising the skin barrier. Together, these results demonstrate that the association of clinical, *in vitro* and *ex vivo* approaches is a promising strategy for proving the efficacy of cosmetic ingredients and products with anti-pollution claim, allowing us to understand from the mechanism of action to the direct clinical effects on the skin consumer.

CO18 - Antioxidant activity of methanolic ultrasound-assisted Plectranthus spp. extracts and their potential use in dermocosmetics

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Currently there is a constant search for skin care products with natural based ingredients. The genus Plectranthus is widely known for its ethnopharmacological use to treat skin problems. However, its cutaneous bioactivity is still poorly characterized. Eight species of this genus (*P. amboinicus, P. barbatus, P. cylindraceus, P. ecklonii, P. fruticosus, P. grandidentatus, P. hadiensis, P. madagascariensis*) were selected and evaluated for antioxidant activity, using the DPPH method. Methanolic extracts of *P. ecklonii, P. grandidentatus, P. madagascariensis* and *P. cylindraceus* were the ones with the highest antioxidant capacity.

NOTE: The authors are responsible for the scientific content presented and its transcription in English.

Posters abstracts

PO1 – Development, evaluation on the skin of volunteers and sensory analysis of a cosmetic formulation containing bentonite clay

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The consumption of personal care items, perfumery and cosmetics, particularly makeup, has increased significantly worldwide. There has been a marked increase in consumer interest in products whose formulation meets the needs of the wide variety of skin types and requirements, such as the demand for cosmetic products with mineral components as active ingredients. The ancient utilization of clays for aesthetic purposes, such as their application in facial masks, for example, continues to this day. Green Bentonite clay, from Boa Vista - Paraíba, was chosen for the present study in order to observe its influence as an active ingredient in a facial foundation cosmetic, evaluating its possible benefits in the control of skin shine and oiliness. Following approval of the studies of cosmetic formulations in volunteers by the Ethics Committee of the Federal University of Paraíba (UFPB), the Bentonite clay in natura was purified and modified and underwent a physical-chemical characterization, for subsequent incorporation as an active ingredient in formulations in three different concentrations. This was followed by studies of emulsion stability, rheological and microbiological analysis and studies of the formulation on the skin of volunteers aged between 18 and 59 years. The characterization results showed improvements in the processed material in cation exchange capacity, uniformity of particle size and a decrease in accessory minerals. The emulsion returned positive results in the accelerated stability test, and remained rheologically stable and microbiologically suitable for application as a topical product. The Bentonite clay proved to be an interesting active ingredient in the control of skin shine and oiliness, maintaining good levels of skin hydration and elasticity throughout the period of use, reducing the appearance of pores and improving the issue of sensitivity, even when compared to a commercially available product. We also observed relevant results when observing a possible influence of the clay in controlling facial pH. The present study has demonstrated that Bentonite clay from Boa Vista, in Paraíba, has great potential for use not only as an excipient in formulations, but also as a cosmetic active ingredient.

Keywords: Bentonite, facial foundation, evaluation in volunteers, anti oily, moisturizing

PO2 - Natural cosmetics and entrepreneurship: service offer to the cosmetic sector through university

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The cosmetic market is always changing based on the consumption trends analyzed annually. During this period, there is a wide search for natural, organic and vegan cosmetics. The cosmetic industry is already inserted in this demand; and there is also a strong movement in relation to handmade production, self-employed professionals and micro-entrepreneurs in this niche. However, the research team believes that, in some cases, they do not have the proper structure for assessing the quality of cosmetic products. Quality control is a system adopted to measure the quality of services and products according to technical specifications. A quality product guarantees credibility in the market, as well as safety for its consumers. According to the Ordinance 348/97 of the Secretariat of Health Surveillance (Ministry of Health), Good Manufacturing and Control Practices should be followed, since it is the sole responsibility of the producer to ensure the safety of their cosmetic products for consumers under normal conditions of use. The laws found in the cosmetic sector are directed towards production and no specific information was found for the research and development phase. Thus, from the analysis of the legislation, it is estimated that the Cosmetics Laboratory of a federal public university will be able to contribute in the research and development (R&D) stage of new cosmetics for micro-entrepreneurs and self-employed producers. Therefore, the objective of this work is to verify the perception of micro-entrepreneurs and autonomous producers in the natural cosmetics sector, in relation to the quality and safety of their products; and, in addition, to verify their interests in quality control services (physical-chemical and microbiological) and sensory analysis during the research and development stage of the formulations, offered through a laboratory at a federal public university. A 5-section survey was developed to assess the types of cosmetics produced; knowledge about quality control and its importance; whether these tests are performed and the perception of the cost; interest in carrying them out through the university; and regularization of products at the National Health Surveillance Agency (Anvisa). From the social networks Instagram and Facebook, 43 microentrepreneurs or small cosmetics producers were located and contacted in the state of Rio de Janeiro. 20 responses have been obtained so far. As a result, 100% of those who were interviewed heard about quality control, but only 60% reported that they used some trial in their products. Among those who already carry out quality control tests, 100% of the respondents pointed

out that they would be interested in carrying out these tests in a laboratory at a public university; mainly due to the cost and credibility of the service provided. Among those who do not carry out quality control, 100% also answered that they are interested in taking these tests at a public university, with an emphasis on physical-chemical assessments (such as pH, density and viscosity). It is important to highlight that 87.5% perceive that these tests are capable of increasing the quality of their products. The project team emphasizes that the execution of this survey has a sole purpose of an exploratory character, in order to verify the interest of producers in offering a certain service. The summary presented does not intend to change regulatory aspects related to handmade production, small producers or micro-entrepreneurs; since the purpose of this work is to enable, in the medium to long term, the offer of a service, more accessible and of lower cost, to guarantee the accomplishment of tests that aggregate information about the safety and quality of the products to the consumers. Based on the legislation related to the production of cosmetics, strategies are being verified for the university's Cosmetics Laboratory to adapt to the available infrastructure and resources, to direct services to the R&D phase of new products, aimed at micro-entrepreneurs, with testing of physical-chemical quality control, stability studies and sensorial analysis, mainly.

Keywords: entrepreneurship, natural cosmetics, quality, service offer.

PO3 - Cosmetic prescription and photodocumentation: virtual model of facial skin assessment and follow-up of continuous use of cosmetics

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After the COVID-19 pandemic, new skin care habits were evidenced through self-care tips, often without professional monitoring. The aim of this work was to highlight the importance of cosmetic prescription and photocomposition, presenting a virtual model of systemic facial skin evaluation and monitoring of the continued use of cosmetics. The methodology adopted used Google Meet with recording as a virtual tool, following the steps: prior submission of the evaluation form with guidelines for attending the volunteer, instructions for capturing images and signing documents (Term of Responsibility, Term of Authorization for Use of Personal Image and Informed Consent Form); scheduling and virtual service; analysis of the results of the systemic evaluation and research of cosmetic products through the selection of components and technology; ending with the delivery of the cosmetic prescription and monitoring of cosmetic use. The proposed model of facial cosmetic prescription and photo documentation documented the need for a systemic anamnesis with information on self-assessment, habits, diet, health history, clinical laboratory and cosmetic evaluation (access, guidelines and use). The standardized photographic record was necessary as a complementary resource of information to effect a safe cosmetic prescription. The results showed that the cosmetic market makes products available according to the clinical need of the evaluated person's skin, but some of these people do not have access to the product due to transport logistics in cities far from large urban centers. Patients reported performing self-care and having the need for specialized professional pharmacist monitoring, as they use cosmetic products that are not compatible with the current state of the skin, with facial care most often associated with hygiene, epidermal pigment spots, periorbital hyperchromia, facial flaccidity, wrinkles, lipid imbalance, comedones and acne. The lack of guidance for a healthy life with balanced habits and diet, in addition to the incorrect use of cosmetics were the probable causes of the need for a careful and safe cosmetic prescription based also on the health history and laboratory tests that proved the skin imbalance. The analysis of photo-documentation was important to assess the extent of the need for care, which was often not revealed in systemic anamnesis. The main cosmetic forms prescribed were liquid soap, tonic, moisturizer, sunscreen, rejuvenating and anti-dark circles cosmetics. All products were selected according to the skin's needs, carefully analyzing the composition and technology of the pharmaceutical form. The follow-up of the assessed person was important in this prescription model, as adjustments to the prescribed cosmetics were necessary due to access, price or incompatibility with the skin. The virtual model of facial care directs the cosmetic prescription to the well-being of the evaluated person's skin according to the current state, suggesting the rational use and credibility of the prescribed cosmetic products. This activity model highlights the need for professional training in cosmetic prescription, the satisfaction of the evaluated and the recognition of the pharmaceutical professional. Care for others can be proposed in several ways: from a correct cosmetic prescription, for example, to multiprofessional partnerships that offer support for artificial intelligence.

Keywords: Systemic facial evaluation; standardized photographic record; virtual skin care; rational use of cosmetics.

PO4 - Xanthan gum: applications, challenges and advantages of this asset of biotechnological origin

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Cosmetic formulators have numerous thickeners at their disposal to stabilize and increase the viscosity of their formulations. Traditionally, some ingredients are the most widely used for these purposes, such as polyvinylpyrrolidone, polyvinyl alcohol, sodium carboxymethylcellulose,

hydroxyethylcellulose, hydroxypropylmethylcellulose and other cellulose derivatives, as well as carbomer and acrylic acid derivatives (acrylates). As an alternative to chemical compounds, many of them of fossil origin, there are gums of natural origin, such as guar gum, arabic gum, pectin and alginate. There are also thickeners of mineral origin, such as aluminum and magnesium silicates, bentonite and hectorite. However, xanthan gum stands out among all the others due to its biotechnological origin, which allows the insertion of an ingredient that in addition to causing an increase in viscosity can also bring a greater degree of sustainability to the final product. Xanthan gum is an anionic polysaccharide, with high molecular weight, industrially produced by the bacterium Xanthomonas sp. This gum forms pseudoplastic solutions, showing good flow behavior. In addition to good formulation stability, it brings good sensory characteristics, such as a pleasant and light structure to the final product. It is versatile, as it can be used in hot and cold formulations and is stable over a wide range of pH and temperature. It can be used in the formulation of toothpastes, creams, lotions, shampoos, etc. This work highlights the properties and applications of xanthan gum in the cosmetic industry, as well as a section dedicated to exposing and discussing the advantages that this asset, of biotechnological origin, brings in relation to its competing ingredients for the final product and, consequently, for the company that uses it.

Keywords: xanthan gum, cosmetics, biotechnological thickener.

PO5 - Development of lipid nanoparticles based on the composition of the stratum corneum for epidermal regeneration

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The stratum corneum (SC) is the layer of the skin with primary barrier function. This layer is composed of a highly organized lipid matrix that prevents water loss through the epidermis and the permeation of xenobiotics (1). The lipid matrix of the SC is composed mainly of ceramides, fatty acids, and cholesterol, and alterations in its constitution are related to several skin dysfunctions (2), including the sensitive skin syndrome. The sensitive skin syndrome seems to be related to increased permeability of the stratum corneum resulting in inflammatory and allergic reactions when applying cosmetic products (3). In this sense, this work aimed to develop lipid nanoparticles consisting of fatty acids present in the SC to promote epidermal regeneration in individuals with sensitive skin syndrome. It was also intended to make a preliminary assessment of the cutaneous compatibility of formulations containing the lipid nanoparticles. To this end, solid lipid nanoparticles (SLNs) and nanostructured lipid carriers (NLCs) were produced by the ultrasonication method. The nanoformulations were characterized in terms of hydrodynamic diameter (Dh) and polydispersity index (PDI) by using dynamic light scattering. The pH and viscosity of the nanoformulations were also evaluated before and after undergoing accelerated stability studies with induction of physical stress (centrifugation test) and thermal stress (gradual temperature increase test). The cutaneous compatibility was assessed *in vivo* by patch test. The results obtained indicated that the type of lipid nanoparticle, the type of solid lipid chosen, and the amount of surfactant used to produce the nanoformulations influence their physicochemical properties. Still, the developed nanoformulations showed interesting properties for cutaneous administration with Dh inferior than 300 nm, PDI inferior than 0.3, pH compatible with skin (~4) and viscosities in the range of 1.5-10 mPa.s. Furthermore, nanoformulations were stable after undergoing accelerated stability testing. After contact with the skin for 24 hours, under occlusion, there were no changes in hydration and transepidermal water loss, or any erythema. Thus, according to the results of the study, the developed nanoformulations show potential for cosmetic applications for the care of sensitive skin.

PO6 - Application of biopolymer and hemisqualane in the development of cosmetic formulations with film-forming properties

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The exposome comprises a series of factors that we are exposed daily. Among them, pollution stands out, which acts on the skin, triggering responses that can accelerate the aging process and compromise the skin's barrier function, unbalancing epidermal homeostasis. Cosmetic products containing active substances of natural origin with film-forming properties, like biopolymers, can reduce skin contact with pollutants. As reported in the literature the raw materials influence the physical-mechanical properties, which reflects on the interaction between the skin and the formulation. This way, the addition of a biopolymer or other components can influence the texture and rheological properties of formulations, changing the sensory properties and the microrelief when applied to the skin. In this context, the aim of this study was to develop and evaluate the physical-mechanical properties of cosmetic formulations containing biopolymer of natural origin. Thus, formulations were developed in the form of a gel, emulsion, emulsions

with hemisqualane (silicone like) and emulsion with synthetic silicones, added or not (vehicle), of 1% of the extract of *Kappaphycus alvarezii* and *Caesalpinia spinosa*. After preliminary stability tests, the texture analyses of the formulation were performed using the Texture Analyser TA.X Plus®, and the rheological behavior were performed in a model DV-III RV Brookfield with a cone-plate. The formulations showed a non-Newtonian pseudoplastic flow behavior with increased shear stress of the rheogram for the formulation with hemisqualane added to the biopolymer. The results of the texture analysis showed that the addition of the biopolymer decreased the parameters of cohesiveness, firmness, consistency, and viscosity index, when compared to their respective vehicles, and only the formulation containing synthetic silicones showed a significant increase in these parameters ($p < 0.05$). However, there was no change in the work of shear for all formulations. The addition of biopolymer and hemisqualane do not change the flow index and the work of shear, when compared to their respective vehicles, which predicts similar sensory performance in relation to the spreadability of the formulations. Finally, *Kappaphycus alvarezii* and *Caesalpinia spinosa extract* and hemisqualane presents a potential application in the development of cosmetic formulations with film-forming and texture properties similar to formulations with synthetics silicones, once they can provide good spreadability and distribution of the formulation on the skin during application.

Keywords: biopolymer, rheology, texture analysis, film-forming properties

PO7 - Evaluation of the phototoxic potential and antioxidant activity of açaí (*Euterpe oleracea*) seed extracts

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The search for a healthier life emphasizes the importance of eating natural foods as one of the consumption options; however, there is great concern about the high amount of residues and by-products from these foods. In the specific case of the açaí food industry, only about 10% of the fruit is used, with excessive residues generation (seeds and shells). In the cosmetic area, the use of products, such as sunscreens and anti-aging products, containing natural substances, has been gaining importance because they present absorption in ultraviolet region (UV) and antioxidant activity, and can potentiate the action of UV filters. Therefore, the proposed use of these residues, containing bioactive substances, also enables the production of a cosmetic product with greater added value, sustainable and effective. Thus, the objective of this research is to evaluate the antioxidant potential and also the phototoxic of Euterpe oleracea seed extracts, as these compounds can absorb UV radiation, they can also lead to phototoxic reactions. For this, extracts (hydroalcoholic and hydroacetonic) were obtained from these seeds through the maceration process, which were compared to commercial extracts of the açaí pulp. The hydroalcoholic extract of the seeds showed greater absorption in the UV region, and all extracts analyzed did not show any phototoxic potential by the phototoxicity test in monolayer fibroblast culture (3T3 NRU-PT, OECD TG 432). In the evaluation of antioxidant activity, both seed extracts showed greater DPPH free radical neutralization activity, and greater reduction in the production of intracellular reactive oxygen species (ROS) induced by UVA in keratinocytes (HaCat), when compared to commercial extracts from açaí pulp.

PO8 - Comparative study between Brazilian legislation applied to cosmetic products for human use and grooming and embellishment products with no therapeutic action for pets

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Pet products and services market is growing globally. Currently, pets are family members due to the changes in the consumer's profile in the last few years. As an example, we can mention couples who prefer to have a pet instead of many children, people who live alone and have a pet as a companion, among others. According to ABINPET (Associação Brasileira da Indústria de Produtos para Animais de Estimação), Brazil occupied the 4th place in the global ranking in 2019 and presented an 8.5% growth in the pet care segment between 2018 and 2019. Among the pet products, there are grooming and embellishment products with no therapeutic action, whose formulations composition are similar to the formulations composition of cosmetic products for human use. Although, the skin morphology, skin physiology, skin histology and behavior are different for each target public, by making the different aspects be considered in order to develop suitable formulations for each one. Additionally, it is necessary to comply with regulatory requirements from each authority responsible, before putting the products on the market. Given the same purpose of both, grooming and embellishment products with no therapeutic action for pets and cosmetic products for human, the aim of this study was to carry out a comparative review between the Brazilian legislations applied for cosmetic products for human and Brazilian legislation applied for grooming and embellishment products with no therapeutic action for pets, as well as to approach the challenges of evaluating the safety of

a product through tests, in face of the worldwide movement to ban animal testing models for cosmetics. As a result, it was noticed that the authorities that regulate cosmetic products for humans have strong regulatory requirements in order to ensure the safe use of cosmetic products by the consumer, besides accepting alternative safety tests to models that use animals.The authority that regulates grooming and embellishment products with no therapeutic action for pets, has few regulatory requirements and does not define which alternative safety tests to animal models are accepted to ensure the safe use of the product in the final consumer.

PO9 - Antimicrobial activity of yerba-mate in cosmetic formulations for facial microbiome control

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Introduction: Currently, there is not much use of yerba mate extract in cosmetic products, unlike what happen in the food area. There are studies proving the biological activities of the chemical compounds of this plant on bacteria, in isolation, but an analysis of the information is necessary to discuss its potential antimicrobial function in cosmetic formulations and the degree of disturbance on the skin microbiome and the aesthetic impact that it may cause in the skin. Objective: Investigate the antimicrobial properties of *Ilex paraguariensis* against *P. acnes*, *S. epidermidis* and *S. aureus*, to insert in cosmetic products to control the facial microbiome. Methodology: Through exploratory reading, academic research data, available online, was used to structure the theme and the desired results, in order to compare the antimicrobial activities of the selected bacteria and the compounds identified in the extractions of yerba mate, and to evaluate the best results for a hypothetical real situation of the facial microbiome. Results and Discussion: Studies suggest that *S. epidermidis* would resist to yerba mate better than *S. aureus*. The methanolic extract showed an efficiency in the MIC of *S. aureus* higher than of *P. acnes*, which also suggests that, in low concentration, it is possible to inhibit mainly only the pathogenic specie; added to this, they also indicate antimicrobial activity of the aqueous extract is superior to the techniques using methanol or hexane. In addition, if the MIC profile of *S. epidermidis* for *C. sinensis* is maintained for *I. paraguariensis*, it is possible that the use of yerba mate does not have harmful effects and keeps the composition of the microbiome healthy. Conclusion: Studies indicate that the bacterium *P. acnes*, which naturally has a higher incidence in the skin's microbiome, would better resist the antimicrobial properties of yerba mate extract compared to the others (*S. aureus* and *S. epidermidis*). It is possible that is added in a cosmetic formulation for facial use, and its use is beneficial for the control of the microbiome.

Keywords: Yerba Mate, Skin Microbiome, Antimicrobial

PO10 - Development and evaluation of the physical-chemical stability of soaps containing liquid algaroba extract (*Prosopis juliflora*)

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The Algaroba tree (*Prosopis juliflora*) is a plant of Peruvian origin that was introduced into Brazil in the 1940s. It is well suited to arid and semiarid regions and has helped to provide greater development to these areas. Due to its exceptional composition, rich in secondary metabolites, the Algaroba tree has been used in different sectors, and its use in cosmetic products is promising. The objective of the present study was to analyze the chemical composition of the Algaroba, to develop bar soaps using liquid mesquite extract, and to evaluate its physical-chemical properties, comparing it to a commercially available sample. The liquid extract was obtained through cold pressing and incorporated into cosmetic bar soap formulations, in different concentrations. Chemical composition analysis was performed following specific methodology. Analysis of the foam index was carried out with the Bartsch method with some adaptations. The wear rate of the soaps was evaluated through mass loss after a 24 h period. For the evaluation of cracks, a scale of levels ranging from (0) zero to (VII) seven was used according to a specific reference. The liquid extract obtained through the cold pressing process presented a pH of 5.52 and a Brixº of 20.23, having the following composition: total proteins (1.40%); lipids (0.41 %); reducing sugars (1.39%); non-reducing sugars (11.41%); total sugars (12.80%); and carbohydrates (16.09%). The results obtained for the formulations under test were compared to commercially available soaps whose composition and application are similar to the formulations studied, as well as to the control (without the addition of liquid Algaroba extract). In general, the lather generated by the soaps containing liquid Algaroba extract remained stable. The cracking test showed promising results for the soaps containing the extract, compared to the commercially available and control products, showing no cracks. Analysis of mass loss demonstrated that the formulation with the highest concentration was subject to the lowest loss. The addition of liquid Algaroba extract to the soap formulations made it possible to visualise the properties under analysis, revealing improved skin hydration and prolonged permanence of the olfactory notes. Liquid Algaroba extract thus represents a new alternative natural raw material for cosmetic products.

Keywords: Liquid algaroba extract; *Prosopis juliflora*, bar soap, cracking, foaming.

PO11 - Evaluation of the sensitizing, photosensitizing and phototoxic potential of preservatives

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Preservatives have been used for decades to prevent the contamination of cosmetics products by fungi, yeasts and bacteria, in order to guarantee microbiological stability. Concerning the growing discussion on the safety of preservatives, there is an increase in reports of allergic reactions, such as allergic contact dermatitis. It is known that among the cosmetic raw materials, preservatives have been considered one of the compounds with the greatest sensitizing potential. Skin sensitization, that can lead to allergic contact dermatitis, has the associated chemical and biological mechanisms summarized in the Adverse Outcome Pathway (AOP), which the molecular initiating event is the covalent binding of electrophilic substances to nucleophilic centers of skin proteins. In order to evaluate the skin sensitization, the Direct Peptide Reactivity Assay (DPRA) (OECD, TG 442C) aims to mimic the proteic haptenization *in chemico*, by quantifying the depletion of two or more synthetic peptides (containing either cysteine – CIS, or lysine – LIS). Thus, this study evaluated the cutaneous sensitizing and photosensitizing potential of different preservatives (methylparaben, propylparaben, phenoxyethanol and DMDM hydantoin) by DPRA (OECD TG 442C and photo-DPRA as well as the phototoxicity potential by 3T3 NRU test (OECD, TG 432). As result, parabens and phenoxyethanol did not show any sensitizing potential, which agrees with literature data on human patch tests. The DMDM hydantoin showed a moderate sensitizing potential and, human *patch* studies corroborate with this classification. Regarding photosensitizing and phototoxicity potential, parabens showed a moderate photosensitizing potential and were considered as probably phototoxic, which may be due to a possible photodegradation of parabens, since there are some studies that indicate that paraben may be susceptible to degradation When exposed to direct light. Phenoxyethanol and DMDM hydantoin did not show photosensitizing or phototoxic potential. However, studies related to the exposure of preservatives to UV light, such as photosensitizing and phototoxicity tests, need to be further investigated and elucidated. Considering the growing Search for the replacement of parabens by other preservatives, the proposed tests may be considered relevant in the field of skin sensitization assessment, since They can act as a screening for the prediction of greater safety of new potential preservative candidates.

PO12 - Analysis of piquiá (*Caryocar villosum*) shell, seed and pulp residues: evaluation of photoprotective and antioxidant potential

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The use of sunscreens has a very important role in reducing the damage caused by sun exposure, such as solar erythema, photoaging and even skin cancer. In order to reduce Reactive Oxygen Species (ROS), sunscreens can be associated with antioxidant compounds, such as the Amazonian fruit of the piquiá (Caryocar villosum), which had antioxidant activity in studies previously carried out in our research group. This study evaluated the photoprotective and antioxidant potential of methanolic extracts of the shell, seed and pulp from piquiá. These samples were submitted to the assessment of UV absorption profile by spectrophotometry, as well as their photostability after being exposed to UVA irradiation. In addition, phototoxicity was evaluated according to the OECD TG 432 using 3T3 fibroblasts and the antioxidant activity through the capture of the free radical DPPH and protection against the generation of intracellular ROS using the DCFH2-DA probe in cell culture of fibroblastos 3T3. The results obtained showed that all the methanolic extracts of the piquiá evaluated (shell, pulp and seed) presented higher absorption in the UVB region. The piquiá shell extract showed the best antioxidant activity, followed by the seed extract; while the extract of the pulp presented the lowest antioxidant activity and was not selected to continue in other studies. The piquiá shell and seed extracts were photostable and were not considered phototoxic (MPE <0.100). The evaluation of the protection of UVA-induced intracellular ROS generation using the DCFH2-DA probe both extracts were able to protect against UVA-induced ROS formation. Therefore, according to the obtained results, the methanolic extract of the shell and seed of piquiá has an interesting potential to be used as a sustainable raw material for photoprotective formulations.

Keyword: piquiá, methanolic extracts, photostability, antioxidant activity, sustainability

PO13 - Safety and efficacy assessment of inaja oil as a pro-aging cosmetic active

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Inaja oil (*Maximiliana maripa*) is obtained from a native plant of Brazil and presents a rich composition in phenolic compounds, carotenes, ascorbic acid, fumaric acid and vaccenic acid, representing a high antioxidant action. The composition of this oil arouses interest for its use as a cosmetic asset for skin rejuvenation. Thus, the goal of this work was to evaluate the safety of inaja oil and efficacy by cytoprotection assay and collagen production in fibroblasts. The inaja oil was obtained from the collected fruit by subcritical CO2 extraction and its characterization and purity were previously determined. MTT reduction method was employed to evaluate cytotoxicity of inaja oil at 50, 100, 250, 500 and 1000 µg.ml-1. For the cytoprotection assay, cells treated with inaja oil (50, 100, 250 and 1000 µg.ml-1) were submitted to additional incubation of 1 h with hydrogen peroxide to achieve 50% cell viability. Collagen production was evaluated in fibroblastos culture by picrosirius method at concentrations of 10, 50 and 100 µg.ml-1. Statistical analysis were performed by the ANOVA and Tukey test. Results showed that inaja oil has no cytotoxic effects to fibroblast cell line. Cytoprotective action was observed when oxidative stress was induced in fibroblasts. In addition, inaja oil demonstrated collagen induction, revealing to be a promising cosmetic active for preventing skin aging.

Keywords: inaja oil, efficacy, safety, active cosmetic ingredient

PO14 - Photostability and in vitro photoprotection characterization of sticks containing TiO_2 incorporated into SBA-15

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Skin is constantly exposed to ultraviolet (UV) radiations, causing photoaging and cancer. Titanium dioxide (TiO_2) is a stable and non-toxic filter with an efficient effect to prevent UV damage. However, the recombination of charge carriers and aggregation tendency of TiO_2 are its main drawbacks. Support substrates, such as mesoporous silica, are biocompatible and photocatalytic strategies to incorporate TiO_2 and control skin penetration. Our research group investigated the photostability and *in vitro* photoprotective efficacy of formulations containing TiO_2 incorporated into mesoporous silica SBA-15. Formulations were prepared as sticks: base, SBA-15, TiO_2 (free form), and TiO_2 incorporated into SBA-15. The photoprotective efficacy was characterized by *in vitro* method using the Labsphere® UV2000S. The sticks were irradiated in a Suntest® CPS+ to evaluate photostability. After irradiation, formulations named base and SBA-15 did not show photoprotective efficacy. Moreover, formulation containing 10.0% TiO_2 incorporated into SBA-15 showed highest photostability and the sun protection factor (SPF) value compared with the formulation containing only 10.0% TiO_2. We concluded that the stick photoprotection by 10.0% TiO_2 + SBA-15 could be considered a broad spectrum ingredient to innovative sunscreens.

Keywords: photostability, sticks, sun protection factor, titanium dioxide, SBA-15.

PO15 - Barriers in the development of a natural cosmetic base: case report

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The cosmetic sector is constantly updating and developing, through the research of new raw materials and cosmetic products. In this context, it is an area extremely alert to consumer demands and trends. A strong current trend is the use of natural, organic and vegan cosmetic formulations, which present different concepts; but all are widely sought after by consumers. From this, the aim of this work was to develop a natural cosmetic base capable of providing a high emollience degree to the consumer's skin and enabling the incorporation of specific volatile oils. For this, a literature search was initially carried out to verify cosmetic ingredients capable of adding this and other properties. Then, a theoretical planning of the formulation was elaborated, evaluating safe and appropriate concentrations of the components, as well as possible incompatibilities between them. This study planned the preparation of an emulsion like cream. Immediately after handling, and 7 days later, the centrifugation test was carried out to detect possible instabilities in the emulsion. The first proposed formulation contained avocado oil, carnauba wax, shea butter, *Aloe vera* gel, potassium sorbate, vitamin E, soy lecithin, EDTA and *Centella asiatica* glycolic extract. As the content of the oil phase was about 62.5% in this first formulation; this percentage was reduced to 26%, for the

purpose of that formulation did not present an unpleasant sensory effect. Additionally, it was included glyceryl stearate and cetyl alcohol to contribute to the emulsification of the product, due to lecithin unavailability in the laboratory. After the centrifugation test, the formulation showed phase separation, and some strategies were used: (1) replacement of the *Aloe vera* gel by the respective glycolic extract; and (2) replacement of glyceryl stearate and cetyl alcohol by a self-emulsifying vegetable base. Despite the use of a self-emulsifying base – which was not the initial proposal of the formulation – there was still a difficulty to completely emulsify the formulation since a part of avocado oil separated after the centrifugation test. In this way, the last suggested natural cosmetic base reduced the concentration of this oil, and as intact formulation was obtained, without phase separation after the centrifugation test performed immediately and after 7 days of manipulation. As a perspective, it is intended to carry out the stability study of this formulation, with and without the essential oil proposed by this study. Thus, despite the predominant use of components of plant origin and previous research on incompatibilities, it appears that there are several challenges for the development of a stable natural cosmetic base, if only information previously know about cosmetic ingredients is considered. Therefore, preliminary laboratory tests are essential for the development of a formulation, as well as the initial planning, considering different possibilities for handling.

Keywords: natural cosmetics, centrifugation, stability, planning.

PO16 - Preliminary and accelerated stability of astaxanthin added cosmetic

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The search for conscious consumption of cosmetics is a trend that has been strengthening worldwide and biotechnology has come to contribute to formulation of new products that don't lose their benefits and at the same time aren't harmful to the environment. Thus, a natural source that can be a "greener" alternative in this search is algae and microalgae, already used and which has represented a promising resource in the industry. Astaxanthin is a carotenoid produced by *Haematococcus pluvialis* microalgae and has gained prominence in the food supplementation industry, due to antioxidant benefit. Obtained by exposing microalgae stressful environmental conditions, the red-orange pigment has a high power against the oxidizing action of free radicals that harm healthy skin cells. This way, the present work aimed to analyze the viability of using the substance and its characteristics in a cosmetic formulation, since it's an active ingredient of high potency than others found in area, as example vitamin C. Astaxanthin in oily media has been incorporated into a cosmetic emulsion and and after preliminary and accelerated stability was analyzed. From the two analyzes, respectively, the first conditioned to sudden changes in temperatures and the second, under accelerated conditions ensuring the shelf life of final product, it was observed that astaxanthin is a substance that maintains stability under applied conditions over time, without losing characteristics and without the occurrence of unwanted interactions in formulation of the emulsion. However, asset shows sensitibility when exposed to light, showing a loss of characteristic color, which can lead to changes in antioxidant power. A option for storing the product with the asset is to kept in opaque packaging, where would be protected from the light incidence.

Keywords: Astaxanthin, stability, antioxidant.

PO17 - *In vitro* methods to assess toxicity and antioxidant potential of commercial amazonic oils for sunscreens

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Sunscreens protect skin against damages caused by solar radiation. Antioxidant agents in sunscreens may protect against UV-induced free radicals production. Aiming its use as raw materials for sunscreen formulations, Brazil nut oil (*Bertholletia excelsa)* and piquiá oil *(Caryocar villosum)* were obtained in regional market from Acre and Pará states, respectively, and were evaluated for toxicity potential and antioxidant activity using *in vitro* methods. The phototoxicity was evaluated in fibroblasts (3t3) monolayer according to OECD TG 432 guide (2019). Also evaluation of their antioxidant effect against UVA-induced ROS production in fibroblasts (3t3) monolayers using difluorescein 2,7-diacetate (DCFH2-DA) fluorescent probe was performed. The range tested was 31,25-500 μg/mL. Furthermore, HET-CAM test for ocular irritation potential was performed. For phototoxic assay Brazil nut and piquiá oils did not present any phototoxic potential (MPE<0.1). Both presented dependent concentration response for antioxidant effect against UVA-induced ROS production in fibroblasts monolayers, and for 500μg/mL decreased free radical production about 44% for Brazil nut oil and 34% for piquiá oil. Also, both did not present ocular irritation potential in HET-CAM test. It can be concluded that both fibroblasts (3t3) monolayer assays (OECD TG 432 and UVA-induced ROS production) could be important tools for screening of new cosmetic raw materials, since they address not only toxicity prediction but also antioxidant potential. Brazil nut and piquiá oils were considered non-phototoxic, non-irritating and had antioxidant activity, thus may be used as raw materials in sunscreen formulations.

Keywords: Brazil nut; piquiá; phototoxicity; antioxidant potential, HET-CAM, sunscreen

PO18 - Rejuvenating dry emulsions obtained by the atomization technique

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A dry emulsion is a solid dosage form obtained after removing free water from a classic primary emulsion. By different processes, the dry emulsion is capable of encapsulating one or more active substances without having to incorporate preservative agents in the formulation. The final preparation results in an anhydrous powder with microencapsulated active ingredient, being bioavailable after rehydration in vivo. Antioxidant substances with rejuvenating properties are excellent candidates for incorporation in this innovative system, as the effectiveness is enhanced. The aim of this work was to obtain dry emulsions through the atomization technique with antioxidant efficacy optimized by the system. Dry sesamol emulsions were obtained from various combinations of sucrose with sodium caseinate (SC) or hydroxypropylmethylcellulose (HPMC) using the 120 ° to 180 ° C atomization technique. Based on physical characteristics, such as droplet size distribution, residual moisture and electron microscopy analysis, the best sample was selected when atomization drying was applied at 150º or 180 ° C with SC or HPMC as excipients, respectively. The extent to which the antioxidant properties of free sesamol for a set of free radicals has been investigated (galvinoxyl radical, 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical, superoxide and hydroxyl) and have been altered in the starting and reconstituted liquid emulsions subjected to normal storage or pre-exposed to hydroxyl radicals. Emulsions were also evaluated for their antioxidant properties in cultured murine 3T3 fibroblasts. It was found that, in the material with the best physical properties, the encapsulation was decisive for: (1) improve the overall antioxidant behavior of reconstituted versus initial liquid emulsions; (2) saving the active antioxidant substance, sesamol, from attack by free radicals; and (3) significantly protect cells against enzymatic release induced by free radicals. The rejuvenating dry emulsions have demonstrated a high activity even at high dilutions, where the interactions of excipients become negligible, and may be of great interest in cosmetic forms of skin care.

PO19 - Aspire, breathe and inspire: assets of biotechnological origin - from the desire to innovate to commercial implementation

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Strategies for a more environmentally correct and sustainable world have been discussed and rethought for many years. Some emblematic landmarks, such as the Rio-92 Conference or the Kyoto Protocol, slowly ended up giving rise to new thoughts, laws, norms, and creating a new collective awareness of respect for nature. It is much clearer to society that we are a unique living and integrated system and that all of us make up life on Earth together, and that maintaining balance is important even to guarantee our own life. But what effectively as consumers can we do to respect our planet? What are our tools or our choice? Parallel to this movement, Biotechnology became popular and consolidated. It has accompanied life on Earth for millennia, through the natural fermentation that is the basis of many foods, such as bread, wine, yogurt, cheeses. But in a recent and modern way, the controlled manipulation of microorganisms grown for certain purposes, such as the production of antibiotics, vaccines, medicines, vitamins and proteins, is still in gear and is far from reaching its full potential. In addition, it still often encounters resistance on part of communities, especially when ethical questions are raised regarding genetic modification and manipulation, which are only one side of Biotechnology. The possibility of clean and sustainable production via controlled cultivation of microorganisms brings to the fore the possibility of using thousands of assets and compounds by the medical, pharmaceutical, food and cosmetic industries. Recently, the market has started to show itself more apt to receive products with biotechnological assets, but what still prevents a massive substitution of assets and products of fossil origin and much less sustainable? Or even, the replacement of assets or products that have a natural origin, but that are obtained through indiscriminate or unsustainable exploitation, extraction, or processes that are harmful to the environment? In this article, we will discuss the great diversity and applicability of biotechnological-based assets for cosmetic purposes, including the barriers that prevent these assets from being used more frequently and intensely, even when it is known that they can bring enormous benefits to formulations, for companies, for consumers, and especially for our planet.

Keywords: Biotechnology. Sustainability. Innovation

PO20 - Intralaboratory validation of an integrated approach to assess skin sensitization without animal testing

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Cosmetic industry has become the center of the actual discussion about animal experimentation. With consumers questioning the ethical and scientific validity of this method, the increasingly rejection of beauty products tested on animals has forced industries to find new approaches for toxicological and efficacy testing. One important toxicological outcome to be evaluated in a cosmetic ingredient is skin sensitization, which is the ingredient's potential to cause allergic contact dermatitis. Through the past years, the OECD has validated many protocols replacing, reducing or refining the use of animals in different experiments. The evaluation of skin sensitization was traditionally done using the Local Lymph Node Assay, which uses mice. With the elucidation of the sensitization's key steps, it's recommended the use of *in vitro*, *in chemico* and *in silico* techniques together in order to obtain sufficiently reliable results to supply the need of animals. This work proposes an initial framework composed of *in silico* and *in chemico* methods with four proficiency substances: 1-chloro-2,4-dinitrobenzene, butane-2,3-dione, cinnamaldehyde and n-butanol. *In chemico* tests are based on Direct Peptide Reactivity Assay (OECD TG 442C), in which is analyzed the potential of covalent binding with two peptides that mimics skin proteins and is the first key step of the sensitization. The *in silico* method uses the software ADMET Predictor™ to obtain skin sensitization, logP and skin permeation data of each molecule to be compared with *in chemico* results and pre-existing data. So far the results shown that the *in silico* methods corroborated the *in chemico* results, adding different information to the already studied proficient chemicals, increasing the reliability of the *in vitro* results.

PO21 - Development of skin color assessment method: statistical model using multiple linear regression matrix equation

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Color is a phenomenon perceived by the human eye on the retina through cones and rods. The color is defined by three characteristics: the hue (wavelength), the brightness or luminosity (proximity to white or black) and saturation or chroma (degree of color purity). In relation to skin color, the natural skin color is optional or constitutive. From this combination, the color of the skin can be captured by colorimetric devices, which quantify the way in which human vision perceives color in numerical terms. Photometry is a colorimetric evaluation where the photographic camera represents the human eye, because in reality what reaches our eyes are not the objects images, but the light reflected from them, so the light that passes through the camera lens is the light reflected by the objects. In the Aesthetics area, the adequacy of products to skin conditions using a color determination method can help aesthetic professionals and researchers to evaluate the effectiveness of aesthetics products and procedures. The research involved in this work proposes a method for assessing skin color. Therefore, the first step of this research and the objective of this work was to obtain a statistical model that makes it possible to estimate the standard values of red (R), green (G) and blue (B) colors from photographs in the book Color Index XL: More than 1,100 New Palettes with CMYK and RGB Formulas for Designers and Artists. The methodology used was to use 283 color patterns by random sampling from the Color Index XL book illuminated exclusively with white light and photographed with a Nikon D3100 camera. It was necessary to develop a routine in Python and apply the least squares method to obtain the multiple linear regression matrix equation. The results were analyzed using the adjusted coefficient of determination r^2. The angular correction matrix showed values close to 1 in its main diagonal and values close to 0 in the other entries, that is, slightly distant from the identity matrix, indicating that there was a small correction in the color hues. The displacement matrix indicated a possible insufficiency in lighting during the taking of the photographs. In the graphical comparison of the 3 colors analyzed, it can be seen that the model presented high adjusted indices of determination (r^2). It can be concluded that the obtained statistical model does not exactly reproduce the RGB standard values, but is capable of performing an estimate with a high determination index. The displacement matrix indicated a possible insufficiency in the lighting during the taking of the photographs. In the graphical comparison of the 3 colors analyzed, it can be seen that the model presented high adjusted indices of determination (r^2). It can be concluded that the obtained statistical model does not exactly reproduce the RGB standard values, but is capable of performing an estimate with a high determination index.

Keywords: Skin color. Colorimetry. Aesthetics and Cosmetics. RGB

PO22 - Formulation development for alopecia areata treatment in eyebrows

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Eyebrow is a small portion of hair that has the main function of protecting the eyeball from sweat and irritating substances, being also important for human communication and facial expression, besides its aesthetic role, acting as a beauty device. Hair loss can cause aesthetic and psychosocial damage, impairing the individual's quality of life. Alopecia areata is an inflammatory disease that causes hair loss and esthetic disfigurement, resulting in bald spots or total absence of hair. These flaws or absence of hair on the eyebrows can be masked through cosmetic procedures, or treated using topical medications. The drugs aim to control the disease, reduce flaws and prevent new ones from appearing, since they stimulate the follicle to produce hair again. In this context, this study aimed to develop and evaluate an alternative product for alopecia areata, which combines aesthetic camouflage and drug treatment. It is a topical use product, colored, containing minoxidil sulfate as active, capable of covering the eyebrow bald spots and stimulating its growth. The gel-cream developed contains an association of pigments, emollients and actives. The preparation was evaluated for organoleptic parameters, pH, dry residue, solubility, centrifugation, spreadability and stability. The permanganometry was used as a quantitative analytical method in the quality control of the active and for its determination in the final product. The first results indicated compatibility between the components (adjuvants) of the formulation with the active, suggesting the viability of using the base as a vehicle for minoxidil. However, other stability studies, in addition to tests to prove safety and possible effectiveness must be done so that this product can be used.

Keywords: Eyebrows. Alopecia. Minoxidil. Formulation

PO23 - Rheological profile comparison of cosmetic formulations containing vegetable glycerin and bi-distilled glycerin

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The use of a humectants of natural origin such as vegetable glycerin is common in cosmetic formulations with the "green" appeal. However, there are few studies that assess the influence of these ingredients on the rheological behavior in the formulation. For this, this study is necessary in order to compare the rheological profile of cosmetic formulations containing vegetable glycerin or bi-distilled glycerin. In this context, the aim of the present study was to compare the rheological profile of a cosmetic formulation containing glycerin of vegetable origin and bi-distilled glycerin. Thus, six cosmetic formulations of the gel-cream type containing vegetable and bi-distilled glycerin of analytical standard at concentrations of 5, 6 and 7% were carried out. After being approved in the preliminary stability test by centrifugation and in relation to pH values, the formulations were submitted to rheological analysis in a cone and plate rheometer (DV-III® AMETEK Brookfield, Middleboro, MA, USA). The parameters obtained through the rheological curve were: minimum apparent viscosity, hysteresis area, flow index and consistency index. According to the sample distribution of data analyzed using the Shapiro-Wilk test, the statistical analysis was performed using the Analysis of Variance test (ANOVA) followed by the Tuckey test. The results obtained showed that for the minimum apparent viscosity and the consistency index there was a statistical difference for the vegetable glycerin 5% in relation to the other concentrations of the same glycerin, which had a lower value in this parameter. Furthermore, for bi-distilled glycerin, the 7% concentration was statistically different from the other concentrations, with a lower value for the same parameters mentioned above. In relation to the hysteresis area, there was a statistical difference for the formulations containing 6 and 7% vegetable glycerin, presenting a higher value in relation to the other study formulations. The flow index parameter did not show statistical differences and the study formulations obtained a pseudoplastic behavior characteristic of cosmetic formulations. Thus, we can conclude that the two types of glycerin evaluated conferred different rheological behaviors for the formulations as a function of the concentration used, and the ideal concentration for use for vegetable glycerin would be 6%, as compared to bi-distilled glycerin 5 % and presents a higher hysteresis area value, which indicates that it takes a long time to reorganize itself after applying tension, which can favor a better spreadability of the formulation. Finally, the rheological profile of vegetable and bi-distilled glycerin are different and the use of a higher concentration is recommended for glycerin of vegetable origin.

Keywords: Humectants, Rheology, cosmetic formulations, vegetable glycerin, bi-distilled glycerin

PO24 - Depilatory wax development containing red propolis of alagoas and evaluation of physicochemical characteristics and antimicrobial activity in front of straws *staphylococcus aureus* and *staphylococcus epidermidis*

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Introduction: The red propolis of Alagoas had its Geographical Indication granted by the National Institute of Industrial Property (INPI), in the modality "Denomination of Origin". It is a natural resin produced from the red exudate of the trunk of *Dalbergia ecastophyllum* (L) Taub. a natural product that contains antibacterial, antioxidant, anti-inflammatory, healing, antitumor and anesthetic properties. Depilatory waxes can be synthetic or natural origin, the latter being artisanal (containing only sugar and lemon). Commercial natural waxes, on the other hand, use beeswax, added with additives such as paraffin, microcrystalline waxes and emollients, to provide softness and reduce the melting point of the resin-wax. Thinking about people who suffer from folliculitis post-depilatory, the aim of the study was to develop handmade depilatory wax containing red propolis from Alagoas and to evaluate the physical-chemical characteristics and antimicrobial activity against *Staphylococcus aureus* (ATCC 25923) and *Staphylococcus epidermidis* (ATCC 12228) strains that are the biggest cause of folliculitis. Methodology: The natural depilatory wax was prepared with sugar and lemon only by simple hot mixing and it was incorporated raw red propolis in the concentration of 5% and 10%, alcoholic extract of red propolis in the concentrations of 5% and 10%, raw red propolis and red propolis extract and sludge (residue from the extraction process) 5% red propolis and compared with commercial depilatory wax containing brown propolis extract. In the physical-chemical tests, organoleptic characteristics and pH determination were analyzed. The evaluation of the antibacterial activity of the samples was carried out in triplicate following the BrCAST methodology (2017), through the well method. Results: The organoleptic characteristics of all propolis samples were: translucent dark reddish yellow color, characteristic odor of propolis and viscous aspect. Regarding antibacterial activity, the result of greater halo formation for both *Staphylococcus aureus* and *Staphylococcus epidermides* was in the sample containing natural wax with 10% red propolis extract, with respective average halos of 17.66 mm ± 0.665 and 18.6 mm ± 1,500. The other samples also showed better results for both *Staphylococcus aureus* and *Staphylococcus epidermides*, when compared to the commercial sample that had its halo formation 10.66 mm ± 1.77 for *Staphylococcus aureus* and did not obtain halo formation for *Staphylococcus epidermides*.

Keywords: Red propolis; Depilatory wax; Staphylococcus aureus; Staphylococcus epidermides; Cosmetic.

PO25 - Menthyl lactate, a refreshing ingredient that supports deodorant activity by acting on the microbiome

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Symrise

Staying fresh and confident all day long is a challenge for many people in the world. To keep cool, our organism naturally produces sweat that helps to decrease body temperature but this is usually associated with body odor.

Different strategies to reduce sweat malodor already exist in the cosmetic industry, either by targeting sweat production itself or by reducing the amount of axillary bacteria. However, these solutions often do not take into account the importance of preserving a healthy microbiome. While axillary bacteria responsible for malodor formation have been identified, most anti-microbial agents have a broad spectrum of action. Those tend to have a negative impact on the microbiome and can lead to a less diverse ecosystem with the dominance of single species.

Knowing this, we developed a human underarm *ex-vivo* microbiome model based on fresh human sweat to evaluate ingredients effective on controlling malodor while minimizing the impact on the microbiome. This model has the advantage of being very close to *in-vivo* conditions by collecting sweat and bacteria together.

Then, this screening tool focuses on the evolution of the full axillary microenvironment over time and provides information ranging from the sweat odor intensity (assessed by a sniffing panel) to metabolite composition (analysed by GC-MS and HPLC-MS) while monitoring the axillary microbiome via 16S rRNA gene sequencing.

Based on this evaluation, we found that 0.5% menthyl lactate reduces sweat malodor of 47% versus untreated for up to 48 hours. It specifically acts on the amount of anaerobic bacteria in the *ex vivo* sweat model, without targeting broadly all axillary bacteria and reduces only relevant bacteria such as *Moraxella, Anaerococcus and Finegoldia.* Menthyl lactate prevents known malodorous compounds as well, such as butyric acid and acetic acid, to be formed in the sweat, which is shown in our metabolite analysis.

Then, menthyl lactate brings the perfect mix of freshness and body odor control with microbiome benefits.

Keywords: Cooling; Deodorant; Sweat microbiome; *ex vivo* model.

PO26 - Cosmetic product development to permanently color white hair: all basic colors with a single product

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The hair cosmetic market is a market that, even in the economic crisis, continues to grow and in 2020 it grew by 5.8%. The coloring segment in Brazil encompasses the following types of hair coloring agents: permanent, semi-permanent, demi-permanent, temporary, mousses, colored masks, hennas, rinse-off products (shampoos, colored conditioners), in addition to colored pencils and chalks. Permanent hair colors are still the products preferred by the consumer, since they are the only ones that perfectly cover gray hair. Another relevant fact is that 50% of women who color their hair do it to cover their white hair. The current

woman's lifestyle makes her not available to stay for a long time in a beauty salon. The time factor is also very important for the professional hairdresser: the faster the product acts on the hair strand, the more time he will have available to serve other clients. The salons keep in their stock 40 to 80 color tubes of different colors of permanent color, aiming to meet all the colors that customers want, in addition to at least 4 different volumes of oxidizers (10, 20, 30 and 40 volumes of hydrogen peroxide), implying a high inventory of products. When exposed to coloration for approximately 50 minutes, often with high oxidant volume, the hair can be damaged.

When the objective is to cover white strands, the coloring also acts on the colored strands unnecessarily. The product presented in this work, patent BR 10 2020 003469 3, aims to solve the difficulties reported above, whether for the salon client or for the hairdresser professional, since it is a single tube of hair coloring and a single volume of oxidant that, when applied to the hair, the result of the color will depend on the time of action in the hair. The longer the contact time, the darker the result on the strand. The color varies from light blonde to dark brown. The product only colors the white strands, without affecting the melanin. The contact time can vary from 2 to 30 minutes maximum, depending on the desired color, that is, 2 minutes for light blonde and 30 minutes for dark brown. The shorter contact time and the low volume of the oxidant bring benefits to the hair, which is exposed to the oxidative agent for a shorter time, meeting the client's desire to spend less time in the salon, in addition to greater turnover in the service for the hairdresser, with inventory reduction being a single color and oxidizer SKU, higher cash flow and lower investment.

PO27 - METHYLNICOTINATE AS AN (UN)SAFE TOOL TO STUDY TOPICAL FORMULATIONS

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Specific irritants such as Methyl Nicotinate (MN) have been proposed as challengers to test the biological efficacy of topical actives (e.g., anti-inflammatory, anti-oxidant). Although used in "supposedly" controlled conditions the variability of response sometimes provoke undesirable reactions. This means that information on its impact on skin is still insufficient. Therefore, our work aims to better understand the skin responses to MN and test its safety profile. For that purpose, aqueous MN solutions (0.5% and 1.0%) of MN were applied in pre-defined regions on the skin of the anterior forearm in eight volunteers using a 5 mm diameter paper disc without occlusion. Solutions were left in contact with the skin for 1 minute before removal. A similar empty area in the same forearm was used as negative control. Immediately following MN exposure skin responses were measured at 0, 30, 60 and 120 minutes by Polarised Spectroscopy (TIVI), Laser Doppler Flowmetry (LDF), Evaporimetry and High-resolution sonography (HRS). The International Contact Dermatitis Group Research (ICDRG) scale was also used for clinical scoring together with skin perfusion, trans-epidermal water loss (TEWL) and edema quantification. All procedures were approved by the institutional Ethics' Committee. Results suggest that MN application caused a characteristic reaction on the skin 30 minutes after exposure, with an increase in the ICDRG score between 1-2. Concomitant changes in microcirculation were detected by increases in local perfusion as monitored by LDF and TIVI, and increased dermal hypoecogenicity (edema) was detected by HRS. An increase in TEWL was also observed. Overall, our findings indicate that skin responses to the MN are complex although local and transient, reaching the highest intensity around 30 minutes following exposure. This involved a significant increase in microcirculatory variables (perfusion, flow rate, red blood cell concentration) and a significant increase in transepidermal water loss and oedema formation, which we might describe as a controlled inflammatory reaction therefore safe enough and useful for topical formulations testing.

PO28 - Ionic liquids as a tactic to optimize the performance of topical formulations

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When developing new delivery systems, the Pharmaceutical and Cosmetic Industries face some challenges, such as the low stability of the developed systems. Thus, finding new materials that improve the performance of these formulations is quite relevant.

The use of cosmetics has significantly increased over the years and, thus developing efficient and stable topical formulations is crucial. Furthermore, rheological properties such as the viscosity of these systems can be vital and lead to the acceptance or rejection of a product by the consumer. In this context, the type of excipients used can be crucial to alter some of these fundamental features.

Ionic liquids (ILs) may be an interesting tactic to surpass these problems due to their versatility. They are quite multipurposed, since they may be integrated into various types of solutions, have proven to be useful to increase the solubility of poorly soluble compounds and hence our group

has been studying many of these functionalities.

Herein, amino acid based ILs were incorporated into topical formulations to assess their impact on the stability of the developed systems.

Our results continue to prove that different ILs may be decisive not only to facilitate the incorporation of poorly soluble compounds, but also to increase the viscosity and stability of topical delivery systems.

PO29 - Evaluation of *in vitro* antioxidant activity of multicomponent systems with ferulic acid aiming cosmetic application

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Ferulic acid (FA) is a phytochemical constituent belonging to the group of polyphenols found mainly in rice and corn bran, with emphasis on its photo protective and antioxidant activity. Thus, FA has been widely studied for application in photo protective and anti-aging skin formulations. Its use is limited by the instability of the molecule against light and/or oxidation. Therefore, its stability can be improved through complexation with cyclodextrins, dispersion in polymers or inclusion in cyclodextrins followed by the association of a polymer forming a multicomponent system. The objective of this work was to evaluate the antioxidant activity of multicomponent systems with cyclodextrins and hydrophilic polymers containing ferulic acid. Regarding the development of multicomponent systems, through the characterization techniques used, it was possible to understand the interactions between FA, cyclodextrins and polymers. The techniques for obtaining the systems proved to be adequate, with a high content of active incorporation and with an increase in the stability of the FA at high temperatures. The antioxidant tests performed were: evaluation of total antioxidant capacity (TAC), evaluation of reducing power, iron chelating capacity (Fe^{2+}), copper chelating capacity (Cu^{2+}) and hydroxyl radical (OH^{-}) scavenging capability. In the antioxidant activity, in general, the multicomponent complexes potentiated the FA antioxidant activity. The results suggest the formation of stable and more effective multicomponent systems, enabling the optimization of the active and providing subsidies for the incorporation of these systems in cosmetic formulations.

Keywords: Ferulic Acid. Antioxidant. Multicomponent complexes. Cosmetics

PO30 - Can diet influence the skin physiology of normal weighted individuals? – data from comparing the body composition of vegetarian-vegan and omnivore

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Adipose tissue is not just passive energy storage of the body but is also a complex and highly metabolically active endocrine organ. Total body fat, involving subcutaneous adipose tissue (SAT) and visceral adipose tissue (VAT) are both associated with pro-inflammatory effects related to the increase of high blood pressure, atherosclerosis, heart attack, stroke, insulin resistance, steatosis, and metabolic syndrome. According to several epidemiological studies, VAT is involved in the production and secretion of various bioactive peptides, known as an adipokine, that exert their effects at the local and systemic level. In turn, SAT expansion seems to ameliorate insulin sensitivity and decrease the risk of type 2 diabetes. In the present study, we aimed to examine the total body composition and the distribution of VAT and SAT among vegetarians-vegans and omnivores individuals. At the same time, a preliminary assessment of skin biomechanics was conducted, having in mind the importance of SAT to body health. A cross-sectional study involving 12 participants of both sexes (27.0$\pm$7.17years old) was conducted, in compliance with good clinical practices. Body composition was assessed using a dual-energy x-ray absorptiometry (DXA Lunar Prodigy Advance - General Electric Healthcare®) while skin characterization was achieved by non-invasive measurements of hydration, cutaneous barrier, sebum secretion, as well as elastic and viscoelastic parameters (CK Electronics GmbH). Other descriptive variables were also collected such as dietary habits, weight, height, physical activity practice, and abdominal perimeter. We found no significant differences between these two groups for weight, height, BMI, smoking status, and physical activity. Also, no differences were observed for total bone mass, fat mass, lean mass, tissue mass, and fat-free mass. Nevertheless, vegetarian-vegan individuals consistently showed higher values of VAT and SAT (p-value>0.05) compared to the omnivores group. Regarding the cutaneous condition of the different dietary groups, no statistically significant differences were established in the skin properties assessed, and further studies are required.

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