

# FOCUS

by skinobs

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Testing expert discussion around hair  
and scalp evaluation



They contribute to this expert panel



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# Skinification of the hair: the latest trends to substantiate new claims



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## Skinobs

The hair care category, encompassing both treatment and hygiene, is increasingly shaped by the concept of skinification, a movement that treats hair and scalp with the same high-quality ingredients, science, and routines traditionally reserved for skin care. The global hair care market is currently valued at approximately USD 106.9 billion in 2024, and projections indicate it could reach over USD 213 billion by 2032, driven by rising consumer expectations, demographic shifts, and technological innovation. **Premiumization** continues to influence purchasing behaviors, and digital platforms offer customized regimens that may be combined with nutritional supplements or beauty devices. Women generally prefer conditioners, masks, and treatments, while men increasingly consider hair care a priority within their personal grooming routines. The **men's haircare segment is expanding rapidly**, particularly in scalp health and hair-density treatments. Male scalp biology, higher sebum output, androgen sensitivity, and increased inflammation markers, drives development of targeted soothing, anti-sebum, and anti-thinning solutions. The worldwide aging population further boosts demand for products addressing greying, thinning, and maturing hair.

The trend of skinification is burgeoning with a “premium-prestige” effect in markets where the cosmetics industry is mature, such as Europe, North America, Japan, and Korea, and a “masstige” impact in emerging regions like China, Brazil, Vietnam, and Indonesia. In the USA, hair care products priced above \$30 continue to outpace mass-market growth, with the premium segment contributing about one quarter of total value. Consumers increasingly focus on **scalp health**, recognizing its direct influence on **follicular activity**, **sebum composition**, and **keratin quality**. High consumer expectations drive the use of various techniques to validate claims like conditioning, hydration, damage repair, and color protection.

These more sophisticated, multi-benefit products offer substantial opportunities for precise clinical and biometrological evaluations, whether through **in-vivo studies on volunteers or ex-vivo assessments on standardized hair strands**. Social

media amplifies the importance of high-performance routines, accelerating the demand for targeted solutions that address chemical damage, heat styling, environmental stress, and dryness. At the same time, the emphasis on **well-being and longevity** remains central for consumers seeking nourishing treatments with proven anti-aging performance, aligning with the broader desire to age well.

Hair biology is increasingly studied through the lens of **hormonal fluctuations** associated with stress, postpartum changes, perimenopause, and menopause. These shifts affect follicular cycling, sebum composition, scalp inflammation, and fiber diameter, creating demand for targeted actives such as phytoestrogens, anti-inflammatory peptides, and mitochondrial-support ingredients.



In 2025, the key drivers of hair care innovation revolve around **environmental responsibility**, high-performance claim substantiation, and personalization through AI-supported diagnostic systems and tailored product recommendations. **Inclusivity**, now an essential pillar of the global beauty industry, remains fundamental in hair care due to the diversity of hair types, textures, and cultural grooming practices. According to recent research, the **primary attributes defining hair characteristics** include texture, curl pattern, and fiber diameter. Scientific study of textured hair now incorporates geometry-based analyses, ellipticity, twist frequency, fiber torsion zones, and porosity gradients, confirming that curlier hair tends to be more fragile in torsion zones and is therefore more prone to



breakage compared to wavy or straight hair. These structural features influence **hydration dynamics, friction coefficients, mechanical fatigue, and breakage probability**, requiring dedicated formulation strategies.

Products formulated for **sensitive scalps** aim to respect the microbiome, prevent dryness and flaking, reduce dandruff, and incorporate gentle exfoliants to rebalance scalp sebum, particularly relevant in environments where pollution and other exposome factors play a significant role. Brands such as 107 Beauty have developed shampoos designed to soothe irritation, rebalance sebum, and maintain microbial equilibrium, reflecting the industry's deeper understanding of scalp physiology. In parallel, **digital tools** such as Lushair, Hairoscope.ai, and MyHair.ai are revolutionizing how consumers and professionals assess scalp and hair conditions. Lushair uses AI-driven high-resolution imaging to analyze scalp sebum, redness, follicle density, and hair shaft quality, while Hairoscope.ai provides clinics and dermatologists with **real-time follicle-level insights** including miniaturization and hair growth phase analysis. MyHair.ai allows **consumers to scan their hair at home** and receive personalized recommendations for shampoos, conditioners, and scalp treatments.

Hair itself is deeply investigated to mitigate breakage, frizz, and porosity, while improving strength, shine, and cuticle integrity. Claims related to cuticle protection, repair, densification, and anti-greying are increasingly central to treatment strategies.

Hair is an **integral part of one's identity**, and people around

the world place a great deal of importance on its look and style. Consumers are now looking for **more inclusive, natural, ethical, and sustainable products** that can help them improve their hair grooming rituals while still providing the necessary cleansing and caring benefits.

Taking care of the scalp and hair is an essential part of any daily beauty regimen. The 3 main objectives of this routine are mainly:

- **Maintain the good condition of this unique scalp-hair ecosystem** considering the internal triggers (stress, diet...): Exfoliation, Moisture, sebum, sweat, microbiota (Malassezia), acidic pH ...
- **Cure and protect it from external aggressions** such as UV, heat, and various pollution...
- **Give the hair a makeover**, make it more attractive and change its style and appearance.

Evaluating the efficacy and safety of hair and scalp grooming products and treatments is a **key part of R&D**. For this, clinical tests, consumer tests, sensory analysis, biometrological studies, and in-vivo or hair strand tests are used. However, the challenge for evaluation managers and cosmetic chemists is to find the right method, a reliable protocol, and a suitable testing partner.

A multitude of benefits whatever is the type and ethnicity of hair: Care, Volume, Anti-Frizz, Smoothing, Flat Hair, Repair, Gloss, Shine, Color, Fine Hair, Curly Hair, straightening effect, Restore, Anti-Sebum, Anti-Dandruff, UV Protection, Anti-Breakage, Moisturizing...

The various biometrological measurements dedicated to fibers, strands, and hair testing focus on different targets: the scalp, the cuticle, the cortex, the hair structure, and growth. Tests are conducted under controlled conditions (humidity, temperature, hygrometry). Standardized hair tress can simulate real-life aggression including UV exposure, saltwater, chlorinated water, sweat, and thermal stress.

### **What are the best practices for assessing haircare products?**

A comprehensive approach should be taken, which includes a panel tailored to the product's claims, clinical scoring, self-evaluation, instrumental measurements, samples for analysis (such as scanning electron microscopy and microbiota), and illustrative pictures. Additionally, it is recommended to include protocols such as scoring by dermatologists or hairdressers, consumer insights via lifestyle questionnaires, sensory analysis, and emotion studies.

The study of the hair can be classified in 3 main areas:

- **The analysis of the chemical properties** with the measure of the color and the permeability of the hair,
- **The measurement of the mechanical properties** of the hair
- **The study of the hair volume** and the fibers aspect
- **The evaluation of the scalp conditions** and the aspect of its surface

At Testing Laboratories, hair locks are tested in a controlled environment with a specific temperature and humidity. Standardized hair tresses are used to accommodate different types of hair, such as Caucasian, Asian, Brazilian, African, straight, wavy, or curly. Treatments can be done prior to product application to assess its effectiveness on weakened hair. Additionally, real-life scenarios such as sun exposure, sea exposure, swimming-pool exposure, and sports activities can be simulated to better back up innovative cosmetic claims.

### 1. Chemical properties

- Color and brightness and permeation, Colour Fade, bleaching test using: Goniolux (Orion), GlossyMeter (C+K), SkinColorCatch & SkinGlossMeter, Samba Hair, Mambo, Salsa and Brightness index using the Samba Hair (Bossa Nova), SkinCam & SpectraCam (Newtone), C-Cube CR (Pixience), OptoSurf (Eotech).
- Hair permeability: infra-red microscopy, Confocal microscopy, Scanning electron microscopy, Optical multiphoton tomography, Atomic Force Microscopy ...
- Hair protection: against temperature, radiation, chemicals, odour, or anti-pollution assessment. With anti-pollution end points such as Malondialdehyde (MDA), free fatty acids, the melanin and protein content, and Tryptophan degradation.

### 2. Mechanical properties

- Fiber aspects and swelling Analysis: hair cross-section by dimensional Analysis and surface analysis with interferometry and confocal microscopy.
- Mechanical properties analysis (Young's modulus, Extension to breakage, Stress to break), thanks to the Micro-Tensile Tester MTT675 extensometer coupled to the FDAS. This technique evaluates the impact of hair treatments on the mechanical characteristics of the treated fibers.
- Combing and abrasion of the hair: Friba.one, Sirtaki (Bossa Nova), Fibrestress. Micro-Tensile Tester MTT175 extensometer.

**3. Hair volume and straightness**, and anti-frizz effect: 3D reconstruction of a Bolero and Rumba (Bossa Nova).

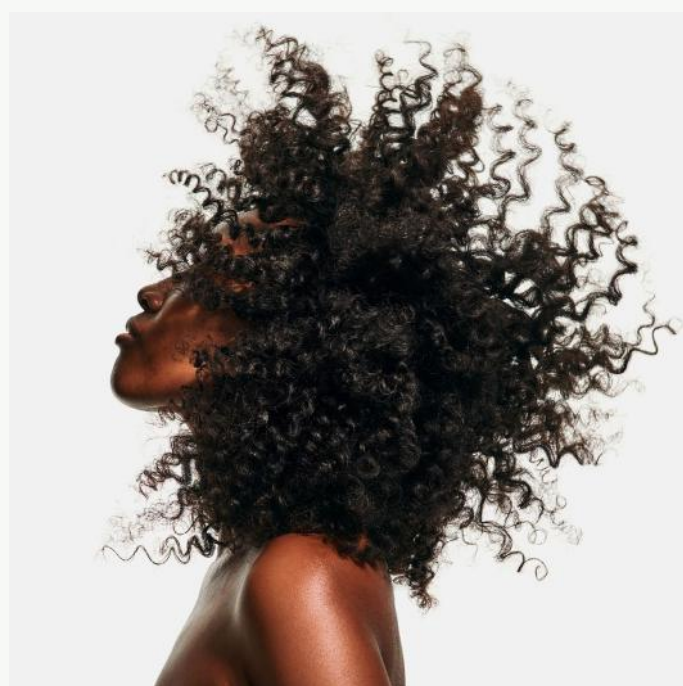
### 4. Scalp conditions and skinification performance

Are you an R&D manager or Cosmetics chemist looking to study

the scalp? If so, you can access the **Clinical Testing Platform** for free and find all the instrumentation and tests used to analyze the scalp. These tests are adapted to the surface topology and size of the area being studied and can be conducted in-vivo on men or women. The results can be quantified and visualized to get the best results you want for your products or actives.

### How do the methods used to study the scalp compare to those used to study the skin?

- Moisturizing effet: MoistureMap & Corneometer(C+K), Dermalab Hydration, Aquaflux & Epsilon (Biox), MoistureMeter SC, MoistureMeterEpi, MoistureMeterD, C-Cube (Pixience)
- Barrier Function and scalp protection: Vapometer, Aquaflux (Biox), pH-meter measures, or the Tewameter Nano (C+K). Scalp visualization: VisioScan (C+K), Antera 3D (Miravex), C-Cube (Pixience), Skin Damage Vizualizer and all dermoscopes...
- Soothing effect: Tivi 700 & Tivi 8000 (Wheesbridge), Thermographie infrar-red, Neurometer, C-Cube (Pixience) ...
- Seboregulation: QuantiSeb, DermaLab Sebum, Sebumeter (C+K), SebumScale including sebum analysis: Shotgun mass spectrometry, Metabolomic MS/MS-16srDNA-PCR (Phylogene), Raman microscopy, ATR-FTIR spectroscopy (Newtone)...
- Anti-Dandruff by gravimetry and imaging, DandruffMeter (C+K), C-Cube (Pixience) ...
- Hair loss and hair growth and density by phototrichogram, C-Cube (Pixience), Trichoscan, SkinCam (Newtone).
- Microbiome of the scalp: Propionibacterium acnes, Staphylococcus epidermidis, Malassezia. Metagenomic analysis such as 16s ribosomal gene sequencing (Phylogene).





As consumers become increasingly aware of the need for eco-responsibility, a new trend is emerging in the form of biodegradability and ecotoxicology tests. Additionally, tests are being developed to measure the **rinsability**: amount of water needed to rinse both solid and liquid products, to evaluate the biodegradability and the absence of critical chemicals for the environment.

The field of hair care science is evolving significantly, driven by biological research, advanced materials, and artificial intelligence, leading to innovative developments. These advancements are transforming hair treatment and maintenance, although their ability to fully meet consumer expectations remains uncertain. Recent trends highlight technologies aimed at repairing hair damage from chemical treatments by **restoring essential bonds within the hair structure**, inspiring innovations with various compounds. For instance, Olaplex remains a reference with its “Complete Bond Technology,” repairing

disulfide bonds and restoring hair strength. Additionally, there is a trend towards incorporating skin care benefits, such as anti-aging properties and scalp treatments, into hair care products. Scalp care has seen substantial progress, moving beyond addressing flakes and dandruff to enhance overall scalp health, thereby improving hair health. The integration of AI with these technologies offers significant potential for **enhancing product efficacy and personalization**.

**How is the new digital era impacting the beauty lifestyle and the personalization of the hair care experience?** It is pushing hair salons into the digital age with the use of hair diagnostics and augmented reality solutions. For example, the company Revieve offers an AI-based Hair Care Advisor that analyses hair & scalp (via upload/photo) and recommends products & personalized hair care treatment on-site based on a client’s hair data.

Hair treatments must now address the restoration of routine damage, including chemical treatments such as coloring, bleaching, and perming; UV exposure; heat application; and physical stressors from combing and brushing. This damage is particularly significant as they can compound one another, exacerbating perceptions of dissatisfaction. Consumers have a genuine expectation for effective reparative care that scientifically demonstrates its efficacy.

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# Perfect your hair products to maintain the balance of the scalp and achieve healthy hair



Jean Robert CAMPOS - Scientific Director

IEC France

Because the scalp plays an important role in hair health by determining the condition, lifespan, tone and shine of the hair, hair care routines are becoming increasingly complex.

The scalp is sensitive to many external factors (pollution, climatic conditions, etc.), hormonal factors and the products used; these factors will affect the health of the scalp and therefore the health of the hair in the short and long term.

To assess the health of the scalp and hair, IEC recommends using several complementary methods to enable an accurate diagnosis.

Clinical grading specific to the scalp are provided during an In Use Test under Dermatological control or Consumer Test, to assess the effect on **dandruff, seborrhea, dryness or redness**.

We propose to objectively measure the **reduction in dandruff** using the **C-Cube® (Pixience)** or the **Dandruff Meter DA 20® (C & K)** to monitor the quantity and size of dandruff flakes. The rate of desquamation is assessed after sampling by **Corneofix® F20** and analysis by **Visioscan® (C & K)**.

Measure the **reduction in scalp lipids** using the **Sebumeter® (C & K)** or the **Meibometer MB 560® (C & K)** combined with an adapter that allows measurement with the strip.

Assess the **protective effect** on the scalp using **Tewameter® TM Nano probe (C & K)** as well as the moisturizing effect with the **Dermalab PIN hydration probe (Cortex)** available in IEC France and IEC Japan.

Biochemical analyses after sampling from the scalp provide the **qualitative and quantitative composition of sebum** and **squalene peroxide** as a potential contributor to dandruff.

Measurements of **inflammation markers** and determination of the **microbiota** can also be performed.

Certain claims relating to hair, such as “**softness**”, “**shine**”, “**volumizing**”, “**smoothing**” and “**long-lasting shine**”, can be evaluated using subjective methods (visual and/or tactile scoring) and combined to the Andrew Walker Hair Typing Scale to define hair types or the effect on curly hair, in particular in

IEC South-Africa on Ethnic hair.

“**Shine**” can be objectified by image analysis using **Skin Cam Pro® (Qima Life Sciences)** and the **Glossymeter® (C & K)**.

The **long-lasting** and **homogeneity of hair dye** can be assessed by measuring colours (L\*, a\*, b\*) using **C-Cube® (Pixience)** or **Chromameter® (Minolta)**.

To determine **hair regrowth**, the **C-Cube® (Pixience)** or the **TrichoScan® (Tricholog GmbH)**, are equipment of interest to assess **hair diameter** and the percentage of hair in the **anagen and telogen phases**, in combination to hair sampling which can be analyzed by other SGS centers.

**Restructuring effect** on the hair shaft by scoring photographs obtained by **Scanning Electron Microscopy** or **Interferometry analysis** using software (Toposurf) that determines roughness parameters and the degree of scale opening.

Based on its multi-ethnic panel due to the geographical distribution of its centers [Europe, Asia, Africa] and its integration into the SGS Group, IEC offers a global evaluation of the effectiveness of hair products on the scalp and different hair types.

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# Standardization, AI, Visual Evidence: Rethinking Capillary Evaluation with the C-Cube



Sébastien MANGERUCA - CEO

Pixience

Hair assessment protocols have become considerably more refined in recent years. With increasingly targeted skincare (anti-hair loss, strengthening, soothing, anti-dandruff), expectations in terms of evidence have become more pointed.

Faced with these challenges, **clinical imaging is evolving**. The C-Cube Clinical Research embodies this new generation of tools designed to reconcile scientific rigor and field effectiveness in hair and scalp studies.

## Standardizing to better compare

The C-Cube is based on ultra-high-resolution optics, patented homogeneous LED lighting, and above all metric and **colorimetric calibration**. With each



shot, these elements ensure perfectly reproducible images, regardless of the operator, the environment or the study time. This rigorous standardization not only makes it possible to **objectively compare** the evolution of a parameter, but also to establish a reliable basis for automated analyses, without time-consuming manual reprocessing.

## A solution designed for clinical studies

The format of the C-Cube is designed for the field:

- **Compact**, it can be easily integrated into your laboratories.
- **Simple** to use, it does not require heavy training.
- **Accurate**, it ensures full reliability of results.
- **Versatile**, one-stop tool for 2D, 3D, capillary, and ex-vivo measurements.

The C-Cube Clinical Research provides reproducible data on the most frequently studied hair parameters. Here's a look at the key metrics that the C-Cube can extract, and the claims they can help validate.

## Hair density

The C-Cube automatically detects visible follicles on the surface of the scalp. This analysis yields the following metrics:

- Total number of hairs
- Hair density per  $\text{cm}^2$
- Average density per zone ( $\text{N}/\text{cm}^2$ )
- Total number of follicles
- Follicle density per  $\text{cm}^2$
- Average hair per follicle

These analyses can help in the **objectification of anti-fall, densifying, regrowth, and strengthening claims**.



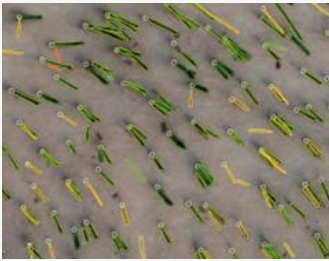
| General                |                        |
|------------------------|------------------------|
| Area                   | 0.25 $\text{cm}^2$     |
| Hair count             | 44                     |
| Hair density           | 176.00 / $\text{cm}^2$ |
| Follicular             |                        |
| Total count            | 20                     |
| 1 Hair                 | 3 ( 15 % )             |
| 2 Hairs                | 11 ( 55 % )            |
| 3 Hairs                | 5 ( 25 % )             |
| 4+ Hairs               | 1 ( 5 % )              |
| Average per follicular | 2.20                   |
| Follicular density     | 80.00 / $\text{cm}^2$  |

## Hair diameter

The analysis of the capillary diameter is based on a measurement of each fiber detected in the field. This precision makes it possible to obtain a complete mapping of **the thicknesses**, with an automatic classification of the hair into **Vellus or Terminals**.

- Number of Vellus and Terminals
- Hair Rate (Vellus and Terminals)
- Density (Vellus per  $\text{cm}^2$  and Terminals per  $\text{cm}^2$ )
- Average thickness in  $\mu\text{m}$
- Cumulative thickness  $\text{mm}/\text{cm}^2$

Relevant to evaluate the effect of a fortifying, thickening or stimulating treatment intended to stimulate the conversion of vellus into terminals.



## Hair length

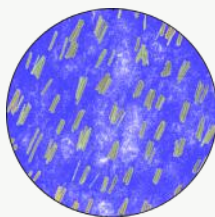
The C-Cube allows hair length to be calculated automatically from an image. This analysis is relevant in the context of studies on **regrowth** or to compare the condition of the hair before and after the procedure. The parameters to be studied are the following:

- Number of Anagens and Telogens
- Hair content (Anagen and Telogen)
- Density (Vellus per cm² and Terminals per cm²)
- Average thickness in µm
- Cumulative thickness mm/cm²



## Redness of the scalp

The system is able to calculate an erythema index on the scalp, **without interference from the hair**. The analysis is done by automatically excluding hair areas, thanks to intelligent segmentation. This analysis is ideal for validating the **following claims**: «soothes the scalp», «reduces redness and itching», or «improves skin comfort».

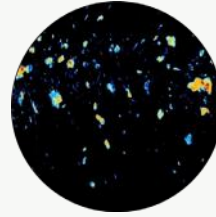
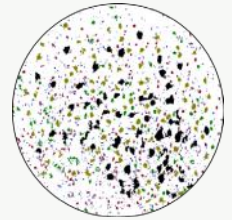


## Ex vivo measurements

Combined with a sample reader and Sebutape®, Sebufix®, D-Squame® or Corneofix® patches, the C-Cube has the ability to perform ex-vivo analyses.

## Sebum

- Sebum index (%)
- Classification into 5 categories according to the size of the sebum spots



## Peeling

- Desquamation Index (%)
- Classification into 5 categories according to the thickness of the scales

These data are used to complement studies on sebum-regulating, anti-dandruff or balancing scalp treatments.

The C-Cube Clinical Research integrates artificial intelligence algorithms dedicated to hair analysis. These models, trained on annotated images, ensure the automatic detection of follicles, the segmentation of fibers and the classification of hair according to their type (vellus, terminal, anagen, telogen). This automation ensures fast and consistent analysis, while reducing inter-operator variability. However, the system always remains under human control: the software offers the operator the possibility of **checking and correcting detections**, when necessary, for example in the case of complex areas or very high capillary densities. This hybrid approach, combining AI and expert validation, makes it possible to obtain measurements **that are both automated and scientifically robust**, reconciling processing speed, traceability and clinical reliability.

As hair care becomes more sophisticated, it is becoming essential to have tools that meet the scientific and operational requirements. By automating these analyses, the C-Cube saves a **significant amount of time**, while providing greater **reliability and reproducibility** than manual visual evaluations. The system thus becomes a real strategic support for the validation of hair claims, in direct connection with the regulatory and marketing expectations of brands.

**The C-Cube, the essential ally for hair and scalp studies.**

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# Scientific Evaluation of Frizz, Volume and Hairstyle Durability in Hair Styling Studies



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Human hair is a highly structured biological system composed mainly of keratin, lipids and water. Its behavior in response to environmental, mechanical or cosmetic factors depends on the integrity of its internal structure and on the interactions among hair fibers. In this context, styling studies allow an objective analysis of how hair care products modify the shape, alignment and volume of hair, providing scientific data to support claims such as anti-frizz, anti-weigh-down or hairstyle durability.

At Zurko Research, these studies are performed through a methodological approach that combines instrumental assessment, image analysis and expert evaluation, adapted to the specific characteristics of each formulation.



## Frizz: A Physical Response to Ambient Humidity

Frizz is the visible manifestation of a physical–chemical phenomenon: the breaking and reformation of hydrogen bonds in keratin as a reaction to changes in ambient humidity. When hair absorbs or releases water, the internal forces that keep the fibers aligned are altered, producing a disordered appearance.

Chemical or thermal damage increases porosity and water absorption capacity, making hair more prone to frizz. For this reason, this parameter is essential in efficacy studies of products aimed at humidity protection and frizz control. In our tests, frizz is evaluated through image analysis by determining the maximum width of the hair tress after exposure to controlled humidity conditions. This measurement quantifies the degree of expansion and, therefore, the level of frizz generated.

The experiments are commonly performed under controlled low-to-high relative humidity conditions (30% to 80%), simulating what occurs when straightened or styled hair is later exposed to a humid environment. This approach realistically reproduces the daily situations faced by consumers.

## Volume, Alignment and Curl Retention: Complementary Efficacy Parameters

Volume is another key parameter in styling evaluation, as it directly influences the perception of lightness, manageability and hairstyle longevity. Excessive volume may be associated with frizz or lack of control, while loss of volume can lead to a heavy or flattened appearance.

To quantify this, we measure changes in tress volume after product application and exposure to controlled humidity. These measurements are complemented by expert evaluation of alignment and width, determining whether the product maintains the desired shape without stiffness or excessive weight.

For curly or wavy hair, additional parameters such as curl retention and curl elasticity are evaluated. Curl retention refers to the product's ability to maintain the original curl pattern over time or under defined environmental or mechanical stress. It can be quantified through image analysis by measuring curl length, height or curvature radius at different time points.

Curl elasticity, on the other hand, reflects the fiber's ability to recover its original shape after stretching or deformation. It can be assessed through mechanical or visual observation, indicating whether the curl maintains its natural flexibility while resisting humidity-induced relaxation.

Together, these parameters —tress width, volume, alignment, curl retention and elasticity— provide a comprehensive picture of the hair's structural behavior under real-life conditions.

## Anti-Weigh-Down and Hairstyle Durability Claims

In addition to frizz control, styling studies enable the substantiation of other high-value cosmetic claims, such as anti-weigh-down and hairstyle durability.

The anti-weigh-down claim is related to a product's ability to maintain the natural lightness and movement of the hair without

visible accumulation or loss of volume over time. This effect can be evaluated by comparing the volume and alignment of hair tresses immediately after application and after a defined period of rest or controlled environmental exposure.

On the other hand, hairstyle durability refers to the product's capacity to preserve the initial style despite physical or environmental stress (repeated combing, humidity cycles, or heat exposure). In these tests, changes in hair volume or shape are quantified after several humidity or manipulation cycles, establishing the product's ability to maintain the intended hairstyle over time.

These studies provide valuable insights both for formulation development and for the scientific substantiation of cosmetic claims, which are increasingly demanded by consumers and regulatory authorities alike.

## A Scientific Approach to Real-World Beauty

The evaluation of frizz, volume and hairstyle durability bridges the gap between scientific measurement and consumer experience. Through reproducible protocols, controlled humidity conditions and image analysis, it becomes possible to translate subjective sensations —such as smoothness, lightness or control— into quantifiable and comparable parameters.

The styling studies carried out at Zurko Research provide a robust foundation to demonstrate the efficacy of products designed for frizz control, heat protection, shaping or long-lasting hold.

By applying scientific rigor to aesthetic observation, we contribute to the development of a more precise and evidence-based hair care industry, where visible beauty is supported by measurable science.

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# Why measure the impact of cosmetic products on the scalp microbiome?

**Stéphanie BADEL-BERCHOUX** - Laboratory director

**Margaux JEANMOUGIN** - Marketing director

**Emma TRAPEAUX** - Marketing project manager

Byome Labs

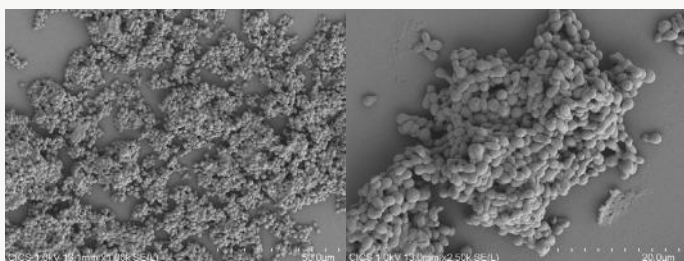


## Composition and role of the scalp microbiome:

A balanced and diverse microbiome is essential for maintaining a healthy scalp: it supports the skin's barrier function, acts as protection against colonization by pathogens, and helps preserve the integrity of the skin (1,2).

The scalp microbiome is dominated by commensal bacteria and fungi, the most representative of which are: (1,3–5)

- Bacteria of the genus *Cutibacterium*: these anaerobic bacteria, particularly *Cutibacterium acnes*, play a role in regulating sebum and maintaining skin balance.
- Bacteria of the genus *Staphylococcus*: *Staphylococcus epidermidis* has beneficial effects, including protection against pathogens, while *Staphylococcus aureus*, found in higher proportions in certain scalp conditions, can become problematic.
- In terms of fungal commensals, *Malassezia* yeasts (particularly *M. restricta* and *M. globosa*) are very abundant on the scalp. These lipophilic fungi dominate the fungal flora of the scalp. They break down triglycerides from sebum into fatty acids, but if they become overrepresented or under specific conditions, they can cause inflammation and irritation of the scalp.



Scanning electron microscope images of a *M. restricta* biofilm produced by BYOME LABS

## Dysbiosis of the scalp microbiome:

A disturbed scalp microbiome (dysbiosis) is clinically correlated with a sensitive scalp and is physiologically characterized by excess sebum. Overall, a disturbed balance of resident skin microorganisms is correlated with inflammatory disorders and skin infections (1).

### • Cases Dandruff and seborrheic dermatitis

Dandruff and seborrheic dermatitis are part of the same disorder,

which varies only in its location and severity. Dandruff is a common scalp condition affecting approximately 50% of the world's population. It is characterized by itching and flaky skin with white or yellowish scales (8).

An excess of *Malassezia spp.* (particularly *M. restricta*) and the oxidation of squalene on the scalp have been linked to dandruff and seborrheic dermatitis. This is thought to be partly related to reactive oxygen species (ROS) produced by *Malassezia spp.*, which can damage emerging hair follicles (1,8).

The impact of dysbiosis on the alteration of the epidermal barrier function, as well as on the triggering of inflammation, is not yet fully understood. However, it is accepted that restoring the skin's microbial flora by increasing the amounts of protective microorganisms and reducing the amounts of potential pathogens can help rebuild the skin barrier (8).

### • Cases of alopecia

Alopecia is common and can severely affect quality of life, both medically and psychologically. Its cause remains unknown. However, the condition of the scalp skin and hair quality are recognized as risk factors involved in its pathogenesis (5).

In a 2022 clinical study on the composition of the scalp microbiome in patients with alopecia areata, a significantly higher proportion of *Corynebacterium* species and a lower proportion of *Staphylococcus* species were observed in subjects with severe alopecia areata compared to healthy controls and subjects with mild forms of the condition (9). This is logical since the ecological niches conducive to the development of lipophilic microorganisms (*Cutibacterium* and *Malassezia*) are absent.

## Factors influencing the scalp microbiome:

The balance of the scalp microbiome can be affected by a combination of factors. Intrinsic determinants (age, gender, diet, genetics) and extrinsic factors (pollution, UV radiation, cosmetics) modulate its composition (1).

## BYOME LABS' expertise:

We support cosmetic, dermo-cosmetic, and pharmaceutical brands with robust in vitro tests based on culturomics approaches to evaluate the effect of finished products and ingredients (all galenic forms) on microorganisms representative of the scalp microbiome. Nearly 20 years of expertise have enabled us to develop true mastery in the cultivation of demanding microorganisms.

We have developed specific culture media that now enable us to characterize *Malassezia spp.* in planktonic and biofilm conditions.

These models are particularly relevant for measuring the impact of your product on *Malassezia spp.* imbalances in scalp dysbiosis. Our models are based on the latest scientific data to design relevant contexts, including dandruff/seborrheic dermatitis, sensitive and unbalanced scalp, with artificial sebum addition.

What we deliver: clear results that provide scientific evidence for your claims (anti-dandruff and preserves scalp balance for example), whether demonstrating preventive or corrective action or the preservation of microbial homeostasis.

Our goal: to transform your promise into scientific evidence that can be used for both marketing and regulatory purposes.

## Sources:

1. Townsend N, Hazan A, Dell'Acqua G. New Topicals to Support a Healthy Scalp While Preserving the Microbiome: A Report of Clinical and in Vitro Studies. *J Clin Aesthetic Dermatol.* oct 2023;16(10 Suppl 1):S4-11.
2. Paul JK, Azmal M, Talukder OF, Haque ASNB, Meem M, Ghosh A. Unlocking the secrets of the hair microbiome: From scalp health to therapeutic advances. *The Microbe.* 1 juin 2025;7:100353.
3. Shah RR, Larrondo J, Dawson T, McMichael A. Scalp microbiome: a guide to better understanding scalp diseases and treatments. *Arch Dermatol Res.* 29 juill 2024;316(8):495.
4. Hu P, Henry J, Tiesman JP, Parlov M, Bacon R, Charbonneau D, et al. Scalp microbiome composition changes and pathway evaluations due to effective treatment with Piroctone Olamine shampoo. *Int J Cosmet Sci.* juin 2024;46(3):333-47.
5. Mayer W, Weibel M, De Luca C, Ibragimova G, Trakhtman I, Kharaeva Z, et al. Biomolecules of Fermented Tropical Fruits and Fermenting Microbes as Regulators of Human Hair Loss, Hair Quality, and Scalp Microbiota. *Biomolecules.* 20 avr 2023;13(4):699.
6. Lousada MB, Edelkamp J, Lachnit T, Fehrholz M, Pastar I, Jimenez F, et al. Spatial Distribution and Functional Impact of Human Scalp Hair Follicle Microbiota. *J Invest Dermatol.* 1 juin 2024;144(6):1353-1367.e15.
7. Lousada MB, Edelkamp J, Lachnit T, Fehrholz M, Jimenez F, Paus R. Laser capture microdissection as a method for investigating the human hair follicle microbiome reveals region-specific differences in the bacteriome profile. *BMC Res Notes.* 6 mars 2023;16:29.
8. Mayser P, Genrich F, Meunier L, Nordzieke S. Scalp Microbiome and Dandruff—Exploring Novel Biobased Esters. *Cosmetics.* oct 2024;11(5):174.
9. Won EJ, Jang HH, Park H, Kim SJ. A Potential Predictive Role of the Scalp Microbiome Profiling in Patients with Alopecia Areata: *Staphylococcus caprae*, *Corynebacterium*, and *Cutibacterium Species*. *Microorganisms.* 21 avr 2022;10(5):864.
10. Fournière M, Latire T, Souak D, Feuilleley MGJ, Bedoux G. *Staphylococcus epidermidis* and *Cutibacterium acnes*: Two Major Sentinels of Skin Microbiota and the Influence of Cosmetics. *Microorganisms.* 7 nov 2020;8(11):1752.

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# Integrated preclinical and clinical evaluation framework in trichology and hair health: molecular, structural and biometrics correlates

Iván PARRA - Commercial Director  
Dr. Goya Analysis



Modern trichology employs a multidimensional framework that integrates preclinical and clinical methodologies to characterize hair follicle biology, understand scalp pathophysiology, and validate cosmetic, nutraceutical, or therapeutic interventions. This approach enables the correlation of molecular and cellular processes with quantifiable clinical outcomes, enhancing diagnostic precision and treatment efficacy.

## Preclinical evaluation: in vitro and ex vivo models

In vitro studies include cultures of keratinocytes, dermal fibroblasts, melanocytes, and dermal papilla cells, as well as isolated human hair follicles. These systems allow the assessment of:

- Inflammatory markers: IL-1 $\beta$ , IL-6, TNF- $\alpha$ , COX-2, among others
- Oxidative stress: ROS, SOD, catalase, glutathione peroxidase
- Gene expression: FGF7, IGF-1, BAX, BCL2, KRT1, KRT5, TYR, MITF
- Signaling pathways: Wnt/ $\beta$ -catenin, Shh, Notch — fundamental for follicular activation and regeneration

**Ex vivo models** use human scalp biopsies and follicles under controlled conditions to evaluate follicular viability, skin penetration, modulation of inflammatory and antioxidant pathways, as well as alterations in structural proteins and lipid profiles. Lipidomic analyses quantify ceramides, sphingolipids,

and essential fatty acids, which are critical for sebaceous homeostasis and barrier integrity.

**Scanning electron microscopy (SEM)** is an advanced preclinical tool essential for ultrastructural characterization. SEM enables micrometric and nanometric visualization to:

- Examine hair cuticle ultrastructure, including scale lifting, erosion, or compaction
- Assess surface morphology of the hair shaft and quantify structural damage from chemicals, UV radiation, friction, or pathology
- Evaluate the effect of active ingredients on cuticle repair, sealing, or cohesion
- Visualize cuticle-product interactions, such as polymer, conditioner, or nanoparticle deposition
- Correlate ultrastructural changes with biochemical markers of oxidative stress and barrier disruption

## Microbiome analysis (16S rRNA)

Preclinical microbiome studies using co-cultures with *Cutibacterium acnes*, *Staphylococcus epidermidis*, and *Malassezia* spp. allow assessment of modulatory effects on dysbiosis, bacterial/fungal proliferation, biofilm formation, and the antimicrobial potential of active compounds.

## Clinical evaluations



The clinical validation phase integrates imaging techniques, biomarkers, and quantitative scalp and hair assessments:

- Trichogram and trichoscopy: anagen/catagen/telogen ratios, density, shaft diameter, follicular morphology
- 2D/3D biometric imaging: hair density, thickness, tensile strength, growth rate
- In situ biomarkers: IL-1 $\beta$ , TNF- $\alpha$ , IL-6, ROS, and antioxidant enzymes using microdialysis or microbiopsies

- Lipid profile: ceramides, fatty acids, and surface sebum measured via sebumeter, GC-MS, or LC-MS



- Clinical Analysis microbiome: 16S

rRNA and ITS sequencing for characterization of bacterial and fungal communities in conditions such as inflammation, dandruff, dysbiosis, and alopecia

- Functional parameters: TEWL, hydration, and local microcirculation via laser Doppler
- SEM in clinical studies: evaluation of real structural impact of cosmetic or therapeutic interventions on cuticle compaction, scale removal, thermal/chemical damage, and active ingredient deposition or retention

### Preclinical and Clinical Integration

The integration of molecular, cellular, ultrastructural (SEM), and clinical data enables:

- Validation of mechanisms of action
- Correlation between gene expression, oxidative stress, and SEM-observed cuticular damage
- Optimization of formulations and concentrations
- Identification of high-response phenotypes

### Conclusion

A combined and integrated approach encompassing in vitro and ex vivo studies, molecular analyses, lipidomics, microbiome profiling, SEM microscopy, and clinical biometry constitutes a robust and comprehensive framework to understand and modulate hair and scalp health. This holistic model strengthens the development of evidence-based treatments and personalized strategies for alopecia, hair damage, and inflammatory scalp disorders.

The entire process must be carried out under the supervision of qualified technical personnel, dermatologists, and specialized trichologists.

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# Hair surface condition: how to correlate visual aspect and physical quantification



Edouard MACE - CEO

Eotech



When one needs to demonstrate the effectiveness of hair care products, they most often resort to **methods on hair strands**.

These will therefore highlight a macroscopic effect, often reflecting the effect perceived by the user. It is also possible to use methods on hair fiber to

look at the effect of products or treatments on the fiber itself, but these are less varied, more costly and by nature require more measurements to obtain representative results.

If the former are quite successful in **quantifying a perceived effect** (Frizz control, Ease-of-Combing, Dry Hair Smoothness, Hair Shine), they are difficult to relate to a well-defined state of the hair. This often means that if the effect of a hair care product can be measured, it is not always easy to relate it to its mode of action at the microscopic scale, particularly with regard to the surface condition of the fiber.

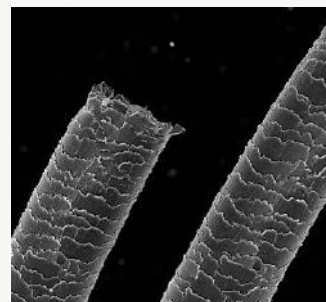
It is therefore often necessary to **combine the two types of tests: macroscopic and microscopic**. Thus, in the case of **Scanning Electronic Microscope**, one can observe with great precision the condition of the hair fiber but it is impossible to quantify it and one will be limited to a visual scoring, for example, of the damage of the keratin cuticles. It is also not possible to make accurate dimensional measurements of the fiber. For this, a **Laser Scanning Micrometer** must be used which will allow access to its diameter but will not provide any information on the surface state of the cuticles.

To reproduce the touch of your fingers, **the friction test** measures the force needed to pull a lock of hair through two rubber cylinders joined together. The result will vary depending on the speed at which the hair is pulled, the pressure between the cylinders and ambient conditions (humidity and temperature), which makes this measurement difficult to reproduce without a large number of measurements.

**Another friction measurement**, based on hair combing, will also provide information on the surface condition of the hair. We

measure the tensile strength created by friction forces when a lock of hair is pulled through a comb at a controlled speed.

However, **studies on hair friction are sensitive to curling and therefore subject to great variability**.



Let's now talk about **interferometry**, applied to the measurement of the surface state of hair fibers. This technique makes it possible to generate **topographic coordinates of the surface of the hair with great precision** (in the order of a few nanometers in z), and thus

to **generate 3D visuals** in false colors highlighting the relief of the cuticles. We can also obtain contrast images that will provide information on the brightness due to the good condition of the fibers.

Working as an **optical profilometer**, the device also provides linear roughness measurements in the fiber axis. These values are directly representative of hair damage, whether it is related to age or chemical or thermal stress. Conversely, roughness allows measuring the smoothing or repairing effect of a hair care product.

Compared to previous techniques, this measurement method therefore **offers a unique combination of microscopic imaging of the hair and quantification of its surface state**. It is reproducible, quite fast, easy to implement since it does not require particular sample preparation, and moreover non-destructive.

There is no doubt that it has a certain future in the field of efficacy testing of hair care products and active ingredients.

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**SCAN ME**



# CIDP's comprehensive hair and scalp testing capabilities: in vitro, ex vivo, and in vivo



**Renato MOURA-** Medical Director & Principal Investigator

CIDP Brazil

## Introduction

The hair and scalp constitute a highly specialized biological ecosystem that reflects both local and systemic physiological conditions. As consumer awareness regarding hair health continues to increase, the **demand for scientifically validated cosmetic solutions has grown in parallel**. Conditions such as androgenetic alopecia, telogen effluvium, dandruff, seborrheic dermatitis, hair fragility, and scalp sensitivity have become key targets for innovation in cosmetic product development.

In this context, CIDP has developed a **robust portfolio of haircare studies across in vitro, ex vivo, and in vivo models** to support cosmetic companies in substantiating their product claims. Our protocols integrate advanced hair and scalp evaluation methods, **combining macro- and dermoscopic imaging, instrumental biometrology, standardized in-center procedures, and dermatologist-led assessments** based on validated clinical scales.

## Global clinical research and multi-ethnic evaluation

Hair and scalp characteristics exhibit marked variability across **ethnic groups, phototypes, curl patterns, sebum profiles, and fiber morphologies**, directly influencing both treatment response and cosmetic performance. For this reason, multi-ethnic clinical evaluation is no longer optional, but a strategic requirement for global product development as they help capture real-world biological variability, ensuring that efficacy, tolerance, and safety claims are both robust and globally relevant. Harmonized protocols, standardized instrumental techniques, and unified dermatological evaluations across international sites enable direct comparison of results, enhancing regulatory credibility and market transposability.

At the forefront of this global approach, CIDP leverages its strategic presence in **Brazil, India, Mauritius and Romania** to recruit volunteers across **phototypes I to VI and varied hair types**. This global clinical approach not only enhances the scientific quality of efficacy assessments but also supports inclusive product positioning, ensuring that cosmetic innovations deliver consistent performance across different hair types, scalp conditions, and geographic realities.

## Our in vitro and ex vivo models

Alongside clinical and instrumental methods, **in vitro and ex vivo studies are key to hair research**. While our **in vitro assays** explore follicular cell activity, keratinocyte behavior, pigmentation, and biomarkers such as oxidative stress and protein degradation, providing early insights into ingredient efficacy, we rely on **ex vivo models** (using natural hair strands from diverse ethnic origins such as Asian, African, Indian and Caucasian) to evaluate fiber resistance, shine, color durability, and responses to **environmental stressors** like UV radiation and pollution, supported by biochemical marker analysis. The hair strands can be exposed to **external stressors** such as UV light, air, and water pollution, with subsequent assessment of biomarkers such as malondialdehyde (MDA), free fatty acids, melanin and protein content, and tryptophan degradation.

## Insights into CIDP's in vivo hair testing protocols

CIDP in vivo protocols cover a **wide range of hair-care claims**, including hair moisture, volume, frizz control, density, thickness, manageability, combing forces, shine, breakage, softness, suppleness, color, curl effect and retention, gloss, hair loss, and hair photoprotection.

With dedicated shampoo stations, we can conduct **studies in-house** and, depending on client needs, in collaboration with **salon experts**.

Our study designs combine dermatological assessments with instrumental evaluations such as pH meter, sebumeter, glossymeter, and corneometer measurements, all conducted under controlled temperature and humidity conditions. While these instrumental methods provide highly objective endpoints, clinical evaluation by our dermatologists remains essential—particularly for the **scalp**, where inflammatory, seborrheic, desquamative, and sensitive conditions frequently overlap. Our dermatologist-led **scoring systems** ensures standardized assessment of key parameters including erythema, scaling, sebum excess, pruritus, scalp dryness, and overall scalp balance, and can be complemented by trichoscopic imaging.

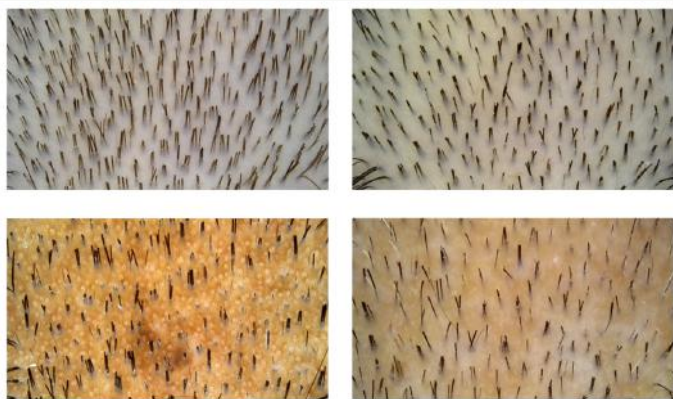


Figure 1: Scalp dermoscopy at standardized 40x magnification reveals pigment network, microscopic erythema and micro desquamation in different phototypes and hair curl types.

Because hair and scalp studies are highly sensitive to environmental and **behavioural variability**—such as washing frequency, styling habits, brushing, and cosmetic residue—we adhere to strict procedural standardization. This includes controlled investigational product applications at the centre to ensure data reliability. Another key aspect is the careful monitoring of wash-out phases to eliminate interference from previous cosmetic use, particularly residues of silicones, conditioning polymers, and styling agents.

Through our **in-center washing protocols**, standardized drying procedures, and subsequent evaluations by dermatologists or hair experts, we deliver robust and reliable assessments of scalp and hair attributes.

#### Instrumental capabilities for hair growth and fiber evaluation

Among the available instrumental techniques, the **phototrichogram** (PTG) associated with dermoscopy remains one of the most reliable and widely used methods for the quantitative assessment of hair growth and scalp disorders. This non-invasive technique is based on the standardized shaving of a small scalp area, followed by **high-resolution dermoscopic imaging performed at baseline (D0)** and again after a 48-hour re-evaluation (D2).



Figure 2: Scalp dermoscopy at T0 and T+48h

The comparison between these two points allows the **precise identification of hairs** that remained static and those that exhibited measurable growth. Through automated software processing combined with expert interpretation, the PTG enables the objective quantification of key follicular parameters, including hair density (hairs/cm<sup>2</sup>), anagen and telogen ratios, growth rate, hair shaft diameter, and follicular miniaturization patterns.

The 48-hour interval is particularly critical, as it allows the **direct calculation of growth velocity** while minimizing biological variability and external interference. This methodology provides a **highly sensitive and reproducible assessment** of follicular dynamics, making it the gold standard for studies involving anti-hair loss products, regrowth stimulants, and scalp treatments targeting follicular vitality.

#### Conclusion

Hair and scalp evaluation in cosmetic research has evolved into a **highly specialized and multidisciplinary field**, where follicular biology, scalp physiology, fiber biomechanics, barrier science, and cosmetic performance converge. By combining methodological rigor with multi-ethnic clinical approaches and real-life exposure models, research partners such as CIDP are driving innovation and ensuring that cosmetic claims are not only scientifically substantiated but also **globally relevant and consumer focused**.

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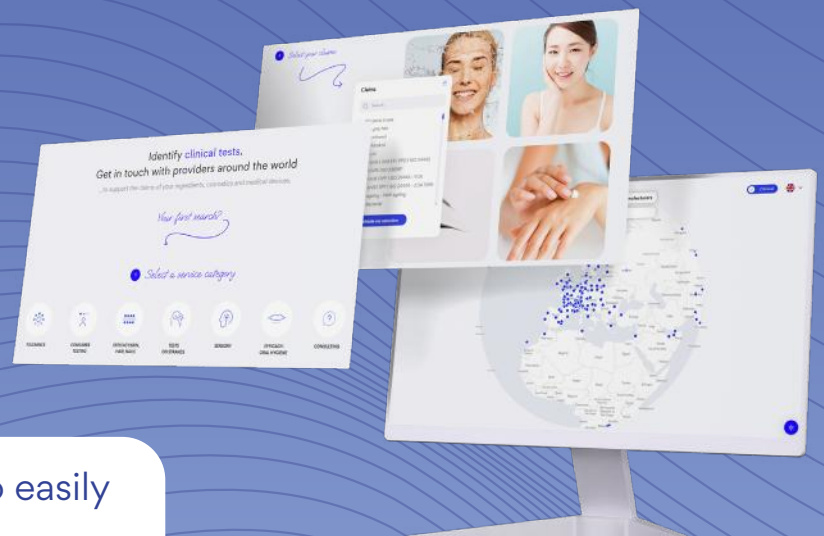


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