

Skin Barrier Function

A Quick Formulator's Guide to Supporting the Stratum Corneum

by Joan Morais

Understanding the skin barrier helps a cosmetic formulator make better decisions about cleansing, pH, moisturization, ingredient selection, and product mildness. The goal is not to "seal" or "repair" the skin with one ingredient, but to formulate products that support normal barrier function and skin comfort.

The Barrier at a Glance

BARRIER ELEMENT	WHAT IT DOES	WHY IT MATTERS TO FORMULATORS
Stratum corneum	Outermost epidermal layer; principal permeability barrier	The finished product interacts first with this layer.
Corneocytes	Flattened, protein-rich cells - the "bricks"	Over-cleansing and harsh treatment can increase dryness and discomfort.
Intercellular lipids	Ceramides, cholesterol and free fatty acids - the "mortar"	Lipid composition and emollient design influence softness, flexibility and barrier support.
Natural moisturizing factors	Water-binding substances within corneocytes	Humectants can help support stratum-corneum hydration.
Acidic surface pH	Supports barrier enzymes and the skin's microbial environment	Finished-product pH and cleanser mildness should be considered together.

The "Brick + Mortar" Model

FORMULATORS NOTE

Think of corneocytes as the bricks and the organized lipid matrix as the mortar. An effective barrier depends on both. Ceramides, cholesterol and free fatty acids are major lipid classes in the stratum corneum.

Transepidermal Water Loss (TEWL)

TEWL describes the passive diffusion of water through the epidermis and stratum corneum to the skin surface, where it evaporates. It is widely used as an objective measure of skin-barrier integrity.

- Some TEWL is normal and continuous.
- When barrier integrity is reduced, TEWL can increase.
- TEWL values are influenced by body site, age, temperature, humidity, acclimation and measurement method.
- In product testing, TEWL should be interpreted alongside hydration, clinical observations and the test protocol.

What Can Disrupt the Skin Barrier?

Barrier disruption is rarely caused by one factor alone. Cosmetic products, cleansing habits, environment and individual skin condition can all contribute.

FORMULATION / USE FACTORS	ENVIRONMENTAL / INDIVIDUAL FACTORS
Harsh or overly aggressive surfactant systems	UV exposure and pollution
Frequent cleansing or repeated washing	Low humidity, cold, wind or climate changes
Highly alkaline cleansing conditions	Age and individual barrier differences
Excessive chemical or physical exfoliation	Irritants, allergens and occupational exposure
High fragrance / essential-oil load in reactive-skin products	Certain inflammatory skin conditions
Poorly balanced active load or incompatible ingredients	Stress and changes in skin condition

pH, Cleansing + Barrier Function

Healthy skin has a mildly acidic surface. This acidic environment contributes to barrier enzyme activity and helps support the skin's normal microbial ecosystem. Repeated exposure to alkaline cleansing conditions can raise skin-surface pH and alter stratum-corneum properties.

IMPORTANT

pH is only one part of cleanser mildness. Surfactant type, concentration, micelle behavior, contact time, rinse-off, frequency of use and the complete formula all matter. A low-pH cleanser is not automatically gentle, and a soothing active cannot compensate for an overly aggressive cleansing system.

Common Signs of a Stressed or Compromised Barrier

- Dryness, flaking or rough texture
- Tightness or discomfort after cleansing
- Stinging or burning when normally tolerated products are applied
- Increased sensitivity or reactivity
- Itching or visible irritation
- Skin that feels less supple or has difficulty maintaining hydration

Avoid Over-Simplifying the Cause

These signs are not diagnostic and can occur for many reasons. Cosmetic formulators should avoid presenting acne, eczema, psoriasis, infection or other medical conditions as simple proof of "barrier damage." Products should be positioned with appropriate cosmetic language unless the product is developed and regulated for a medical or drug purpose.

A Better Formulation Question

ASK THIS

Instead of asking, "Which ingredient repairs the barrier?" ask: "Does the complete product cleanse appropriately, maintain comfort, support hydration, provide suitable emolliency or occlusion, and remain compatible with the intended skin type and frequency of use?"

Barrier-Support Formulation Toolbox

Barrier-supportive moisturizers are often most effective when they combine complementary functions rather than relying on one hero ingredient.

INGREDIENT ROLE	EXAMPLES	PRIMARY FORMULATION CONTRIBUTION
Humectants	Glycerin, sodium PCA, betaine, hyaluronic acid, sodium lactate, beta-glucan, propanediol	Help attract and retain water in the stratum corneum; influence tack, cushion and hydration feel.
Emollients	Squalane, jojoba oil, meadowfoam oil, marula oil, esters, plant oils and butters	Smooth and soften the skin; fill spaces between surface flakes and improve slip and flexibility.
Occlusives / film formers	Butters, waxes, selected oils, silicones or other film-forming materials depending on formulation philosophy	Help reduce evaporation by creating a more water-resistant surface film.
Barrier lipids	Ceramides, cholesterol, free fatty acids or well-characterized lipid systems	Can be selected to complement the lipid-rich structure of the stratum corneum.
Soothing support	Beta-glucan, bisabolol, panthenol and other grade-specific soothing actives	Can improve comfort and reduce the feel or appearance of irritation when appropriate for the formula.

Build the Formula in Layers

STEP	FORMULATOR DECISION
1. Define the user	Dry, mature, sensitive, oily, combination, frequently cleansed, climate-exposed or another clearly defined use case.
2. Choose the product format	Cleanser, mist, serum, lotion, cream, balm or treatment - each has different barrier-support opportunities and limitations.
3. Set the hydration strategy	Select humectants and water-phase materials that provide the desired hydration without excessive tack.
4. Build the lipid phase	Choose emollients and, when appropriate, barrier lipids or occlusive materials for the target skin feel.
5. Evaluate irritancy load	Review surfactants, acids, fragrance, essential oils, solvents, preservation and total active load.
6. Confirm pH + compatibility	Set the finished pH for the complete formula, ingredient requirements and intended product type - not from a universal number.
7. Test the finished product	Evaluate stability, preservation, packaging compatibility, sensory performance and appropriate skin-performance endpoints.

Do Not Treat Ingredient Categories as Absolute

Many cosmetic ingredients perform more than one function. An emollient may also contribute occlusion; a humectant may affect sensory feel; a polymer may hydrate and form a film. Evaluate the actual commercial grade and the finished formulation rather than relying only on a marketing category.

SENSITIVE-SKIN REMINDER

For reactive or sensitive-skin concepts, simplicity can be valuable. A long active list does not automatically create a better barrier-support product. Prioritize a mild base, appropriate preservation, suitable pH, restrained fragrance strategy and a well-balanced moisturizing system.

Formulator's Barrier-Support Checklist

- ☐ I have defined the intended skin type, product purpose and frequency of use.
- ☐ The cleansing or exfoliating strength is appropriate for the product's intended use.
- ☐ The finished pH is appropriate for the complete formulation and ingredient system.
- ☐ The formula provides an intentional hydration strategy rather than relying on one marketing active.
- ☐ The emollient / lipid phase matches the desired skin feel and level of richness.
- ☐ Occlusion or film formation is appropriate for the product format and target user.
- ☐ Fragrance, essential oils and potentially irritating actives have been evaluated for the intended user.
- ☐ I have reviewed supplier specifications, solubility, processing limits and recommended use levels for each commercial grade.
- ☐ The preservation system is appropriate for the formula and will be verified by suitable microbiological testing.
- ☐ The product will undergo stability, packaging compatibility and finished-product performance evaluation.

Cosmetic Claim Language

PREFER	USE CAUTION WITH
Helps support the skin barrier	Repairs a damaged skin barrier
Helps reduce moisture loss	Stops TEWL
Helps maintain skin hydration	Treats dehydration
Helps soothe dry, uncomfortable-feeling skin	Treats eczema, dermatitis or inflammation
Leaves skin feeling soft, smooth and comfortable	Heals or restores diseased skin

THE MAIN TAKEAWAY

Barrier-support formulation is a whole-product strategy. Mild cleansing, appropriate pH, hydration, emolliency, lipid support, occlusion, preservation, sensory design and realistic use directions all work together.

Learn Cosmetic Formulation

The Professional Natural Skin Care Formulation Course from Joan Morais Cosmetics School teaches you how to develop professional-quality, vegan, natural and science-based skin care formulations - from ingredient function and emulsion design to preservation, product development and testing.

www.JoanMorais.com

Educational formulation reference by Joan Morais. This guide is not medical advice. Always follow supplier technical documentation and complete appropriate stability, preservation, packaging compatibility and finished-product safety testing.