

DRY SKIN AND HYDRATION

DRY SKIN OR XEROSIS IS A COMMON SKIN PRESENTATION



FROM THE NE LAB

Dry skin or Xerosis, is a common skin presentation. Often a minor ailment, dry skin can progress to have physical and social impacts including emotional distress, activity restriction and physical discomfort.

Recent epidemiological studies in Germany recorded dry skin prevalence at 30% for the adult population, this statistic is not unexpected as dry skin frequency increases with age¹.

Dry skin is characterised by dull, rough, scaly, red, and often itchy skin. The principal mechanism responsible for the development of dry skin is trans-epidermal water loss (TEWL); a normal process whereby water moves from the underlying dermis, through the epidermis and stratum corneum to evaporate on the skin surface. The rate of TEWL can be affected by internal and external factors including²

- Decreases in natural moisturising factor;
- Abnormal enzyme function;
- Temperature and humidity changes;
- UV radiation and pollution exposure;
- Severe skincare routines;
- Aging, genetics, and hormones;
- Diet and water intake.

All these factors influence TEWL by modifying skin barrier function. Consequently, optimal barrier function is the cornerstone of achieving and maintaining skin hydration.

In pursuit to learn more about specific phyto-compounds and their potential applications, this information is compiled from publicly available peer reviewed literature.

This is for educational purposes and to explore new botanical sources and their plant profiles.

This information is not based on clinical trials of the Cellular Extract.

Figure 1

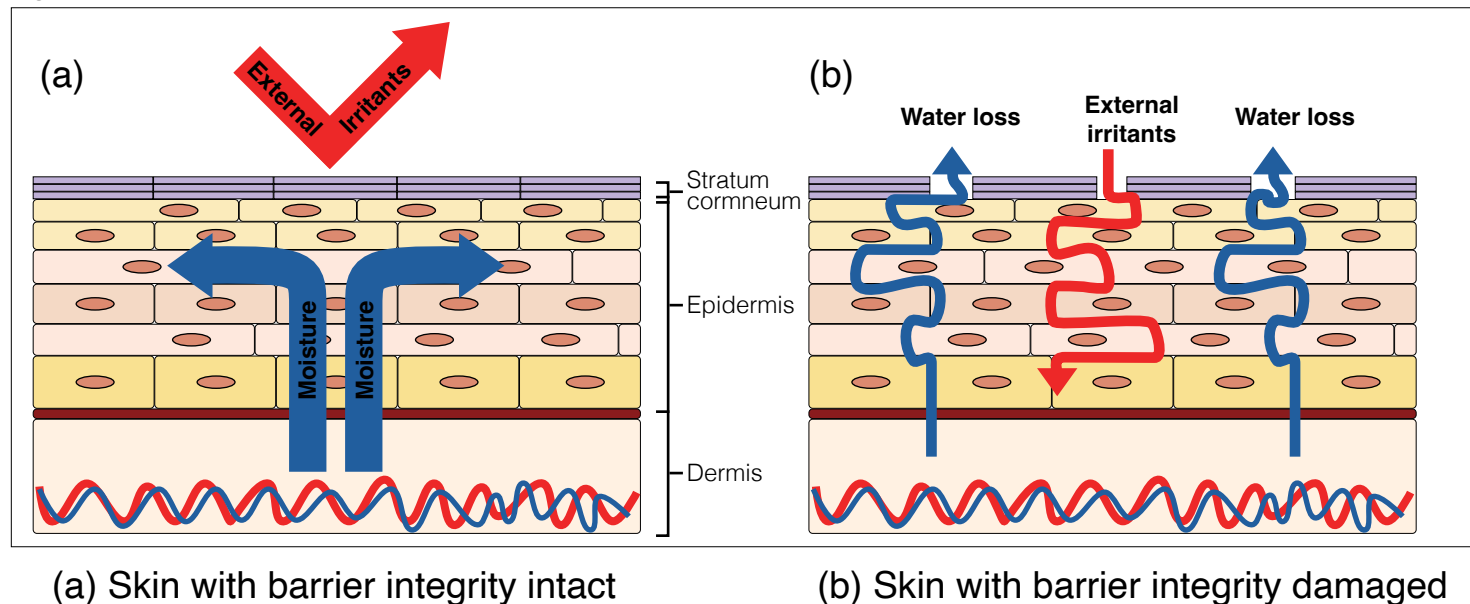


Figure 1: Trans-Epidermal Water Loss (TEWL) in skin with barrier function integrity and barrier function damage as seen in dry skin
Source: <http://www.skintrate.com/trans-epidermal-water-loss.html>

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Barrier Function

Barrier function takes place in the stratum corneum, the topmost layer of the epidermis. Here flattened corneocytes are filled with keratin, layered and held together by protein envelopes; the resulting structure is often referred to as 'bricks and mortar' (See Figure 2)³. The 'mortar' is made up of lipids, cholesterol, and ceramides, tightly packed in formations that favour their hydrophobic properties; forming a barrier to limit TEWL.

The barrier is not watertight though, water moves passively through the mortar to evaporate on the skin surface as a result of water vapour pressure gradients. It is estimated that the average rate of TEWL per day is 300-400mL⁴. An intact barrier will capture the remaining water and trap it in the stratum corneum where it swells the corneocytes (bricks), forms water-pools within the extracellular lipids and plays a critical role in physiological processes. Water is necessary for the enzymatic activity that regulates desquamation (shedding) of corneocytes and the formation of natural moisturising factors (NMF); it also impacts the fluidity of gel/liquid phase lipids for skin flexibility⁵. Homeostasis between barrier function, water retention and physiological functions are essential for plump, and vibrant skin.

Barrier function in the stratum corneum can be disrupted by environmental exposures to pollution, microbes, UV radiation, oxidative stress, and the physical removal of the acid mantle (which protects the epidermis) and lipids^{6,7}. As a consequence, TEWL increases³. Poor barrier function allows foreign molecules and organisms (bacteria and mould) to penetrate below the stratum corneum (See Figure 1). Foreign matter quickly initiates inflammation pathways, a cascade that promotes further destruction of barrier function.

The good news- barrier function can be restored. Topical application of fatty acid rich oils can replenish the hydrophobic component of the barrier; additionally, oils can reduce inflammation (which deteriorates barrier function) and have been effective in the treatment of diseases such as atopic dermatitis, and psoriasis that are characterised by inflammation and poor barrier function. Similarly, application of biological phyto-compounds can be used to improve barrier function by protecting from UV harm, oxidative damage, and pathogens. Combined therapy of oil and water-soluble compounds can improve barrier function to get skin back to a hydrated and vital state.

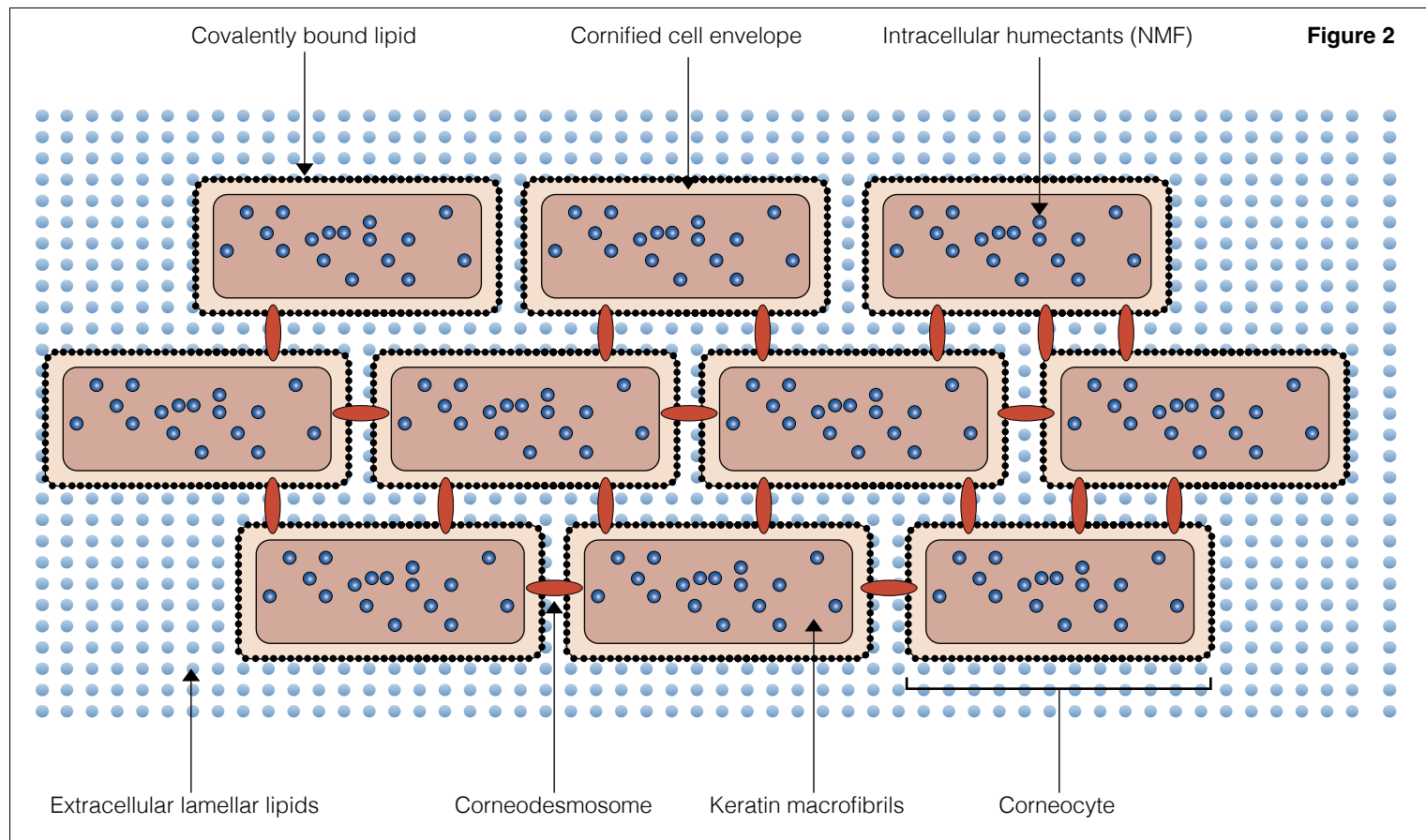


Figure 2: Bricks and Mortar of the Stratum corneum, detailing structures that maintain barrier function and hydration such as Corneocytes, Extracellular lamellar lipids, and NMF
Source: Harding; 2004 <https://doi.org/10.1111/j.1396-0296.2004.04S1001.x>

Natural Moisturising Factor

Natural moisturising factors (NMF) are predominantly manufactured in the stratum corneum from the protein filaggrin. Enzymatic digestion of the protein forms short peptides, which are further degraded to amino acids and their derivatives⁸. Additional compounds considered as NMF include hyaluronic acid, lactic acid, urea, glycerol, and sugars^{5,9}. NMF have two principal roles:

1. To modulate the pH of the acid mantle - which is a mixture of NMF, fatty acids and sebum that sits on top of the stratum corneum to protect from pathogens, microbiome dysbiosis and to regulate desquamation¹⁰. These actions aid in protecting barrier function.

2. Humectant action - boosting water retention within the corneocyte by absorbing water from the atmosphere. In total, 1/3 of the water in the stratum corneum is bound to NMF.

NMF synthesis is dependent on adequate water concentrations in mature corneocytes, and therefore, adequate barrier function to retain water in the top layers of the stratum corneum¹¹.

NMFs superficial location exposes them to degradation and removal by exfoliation, cleansing, and UV radiation. NMF protection is critical to skin hydration.

Common Topical Application Category for Improvement of Dry Skin

The traditional approach to skin hydration is applying topical moisturisers. The purpose of which is to support barrier function, increase NMFs and improve skin texture. Topical moisturisers can provide an effective treatment option for dry skin, Table 1 below summaries the classes of moisturising components which can be used individually or mixed in formulations^{11,94}:

Table 1: Moisturising Categories for Topical Application

Topical Application Type	Humectants	Occlusives	Emollients
	Humectants are molecules that bind water (internal and from the atmosphere) in the stratum corneum. NMF are humectants. Compounds are predominately water soluble.	Occlusives will create a barrier on top of the skin to reduce TEWL. Occlusives are beneficial for specific conditions and used extensively to enhance topical drug delivery. In daily skin care occlusives can enhance hydration by decreasing TEWL, but due to their properties, in some incidences they can increase permeability of the barrier leading to increased TEWL. Occlusive products can also disrupt NMF synthesis. This is because NMF synthesis is governed by specific water levels in the stratum corneum, fluctuations of water content due to occlusive use can halt production. ¹	Emollient compounds soften and smooth the skin by replacing lipids and enhancing barrier function.
Example	Hyaluronic acid, Glycerine, Honey, Aloe Vera	Argan Oil; Beeswax; Lanolin; Safflower Oil	Fatty acids , Ceramides , Squalene

Core Issues Table 2: Core treatment considerations for Dry skin

Core Treatment Consideration	Potential Extracts ^a Based on plant profiles achieved by Cellular Extraction, verified by 3rd party analytical laboratories, we have identified botanical species with constituents that publicly available research shows may target the core treatment considerations. References are not based on clinical trials of the Cellular Extract. Analytical testing is done on the Glycerine/Water Cellular Extract Concentrate format. <small> ◆ Australian Natives ◆ Australian Oil ◆ Australian Grown ◆ Non-Natives ◆ Non-Australian Oil ◆ Australian Raw Material / Non-Australia Oil </small>		
	Reason to Address Core Consideration	Water-soluble Cellular Extracts	Oil-soluble
Acid mantle	The acid mantle sits on top of the stratum corneum and is an acidic layer (pH 4.5-5.5) comprised of secreted sebum, lactic acid, and fatty acids. Its function is to maintain the homeostasis of skin microbiome, regulate cohesion/desquamation, to protect the skin from pathogens and to support barrier function ¹⁰ . The acid mantle is easily stripped from the stratum corneum during cleansing, leaving the skin feeling tight after washing. It is recommended to consider surfactant choices, soap free options and to assess the final pH of formulations to limit washing away the acid mantle and to protect the stratum corneum lipids below.		
Collagen support	Supporting collagen synthesis and skin structure has been demonstrated to decrease permeability and TEWL of the barrier ¹⁵	<ul style="list-style-type: none"> ◆ Aniseed Myrtle Cellular Extract; Emu Bush Cellular Extract; Flame Tree Cellular Extract; Kakadu Plum Cellular Extract; Kangaroo Paw Flower Cellular Extract; Rosella Cellular Extract; Wattleseed Cellular Extract ◆ Banana Cellular Extract; Gotu Kola Cellular Extract; Olive Leaf Cellular Extract 	
Diet	To maintain hydrated skin adequate water must be consumed daily (2L). Limiting drinks such as coffee, tea, soft drink and alcohol, most of which have a diuretic effect, will aid in preserving hydration ¹⁸ Dietary consumption of fatty acid/oil rich, particularly high in EPA, DHA, ALA and GLA have been associated with improved skin condition ¹⁹⁻²¹	Dietary Water Fatty acid Rich Oils: EPA, DHA, ALA and GLA	
Exfoliation	Exfoliation can be a positive feature of skin care routine. However, over-exfoliation can strip the stratum corneum of the acid mantle and lipids resulting in poor barrier function and increased TEWL. The use of AHA's and BHA's are reported to provide a gentle exfoliation to remove oil, dirt, and dead skin cells ^{13,14} .	<ul style="list-style-type: none"> ◆ Davidson Plum Cellular Extract; Finger Lime Cellular Extract ◆ Sweet Cherry Blossom Cellular Extract; Willow Bark Cellular Extract 	◆ Jojoba Oil
Inflammation	Dehydrated skin can become inflamed as the barrier function is compromised. Sustained inflammation further reduces barrier function creating a harmful cycle often seen in conditions such as atopic dermatitis and psoriasis ²	<ul style="list-style-type: none"> ◆ Desert Lime Cellular Extract; Mountain Pepper Berry Cellular Extract; Strawberry Gum Cellular Extract ◆ Green Tea Cellular Extract; Olive Leaf Cellular Extract; Red Clover Cellular Extract; Willow Bark Cellular Extract; Yuzu Fruit Cellular Extract 	<ul style="list-style-type: none"> ◆ Hemp Seed Oil ◆ Kangaroo Flower Infused In Sunflower Oil; Rosella Flower Infused In Sunflower Oil; Snowflower Oil; Sunshine Gold Oil; Wattleseed Infused in Grapeseed Oil ◆ Grapeseed Oil
Lipid replenishment	Fatty acids make up 15% of the stratum corneum ¹² . Recent research has shown that saturated fatty acids such as stearic, palmitic, lauric and myristic acid are more concentrated in the stratum corneum bilayer, whereas shorter chain fatty acids and unsaturated fatty acids such as oleic, linoleic and palmitoleic acid are found closer to the surface. The difference in locations means that some fatty acids are more exposed to removal by cleansing routines and the external environment resulting in compromised barrier function ⁷		<ul style="list-style-type: none"> ◆ Hemp Seed Oil; Macadamia Oil; Native Sandalwood Seed Oil ◆ Kangaroo Flower Infused In Sunflower Oil; Rosella Flower Infused In Sunflower Oil; Snowflower Oil; Sunshine Gold Oil; Wattleseed Infused in Grapeseed Oil ◆ Grapeseed Oil



Core Treatment Consideration	Potential Extracts *Based on plant profiles achieved by Cellular Extraction, verified by 3rd party analytical laboratories, we have identified botanical species with constituents that publicly available research shows may target the core treatment considerations. References are not based on clinical trials of the Cellular Extract. Analytical testing is done on the Glycerine/Water Cellular Extract Concentrate format. 🟡 Australian Natives 🟠 Australian Oil 🔵 Australian Grown 🟢 Non-Natives 🟣 Non-Australian Oil 🔴 Australian Raw Material / Non-Australia Oil		
	Reason to Address Core Consideration	Water-soluble Cellular Extracts	Oil-soluble
Oxidative damage	Barrier function is vulnerable to oxidative damage resulting from UV radiation, pollution and metabolic pathways ^{6,17} . Protecting barrier function from oxidative damage with antioxidants is a consideration.	🟠 Davidson Plum Cellular Extract; Desert Lime Cellular Extract; Kakadu Plum Cellular Extract; Lemon Myrtle Cellular Extract; Mountain Pepper Berry Cellular Extract 🔵 Aloe Vera Juice ; Ginger Cellular Extract 🟢 Green Tea Cellular Extract	🟠 Native Sandalwood Seed Oil
UV radiation	Repeated exposure of the stratum corneum to UV radiation (from the sun) decreases hyaluronic acid, a molecule that holds water in the stratum corneum ¹⁶ Protecting the skin from radiation will be of benefit to hydration. Applications can support recovery and reduce effects of UV radiation. Major actions to consider include sun protection factor, antioxidation, collagen support and anti-inflammation	🟠 Davidson Plum Cellular Extract; Desert Lime Cellular Extract; Emu Bush Cellular Extract; Mountain Pepper Berry Cellular Extract; Tasmanian Blue Gum Cellular Extract 🔵 Ginger Cellular Extract; Queen Garnet Cellular Extract 🟢 Green Coffee Bean Cellular Extract; Green Tea Cellular Extract; Licorice Cellular Extract; Milk Thistle Cellular Extract; Red Clover Cellular Extract; Yerba Mate Cellular Extract	🟠 Hemp Seed Oil; Macadamia Oil; Native Sandalwood Seed Oil 🔴 Kangaroo Flower Infused in Sunflower Oil; Rosella Flower Infused in Sunflower Oil; Wattleseed Infused in Grapeseed Oil

Phyto-compounds Connected to the Core Treatment Considerations for Dry Skin and Hydration

Based on plant profiles achieved by Cellular Extraction, verified by 3rd party analytical laboratories, the table below summarises phyto-compounds that have supporting research in peer reviewed scientific journals of the core treatment considerations discussed. References are not based on clinical trials of the Cellular Extracts. Cellular Extracts delivers the natural molecules in their entourage, maintaining their integrity as they exist in the cell. Analytical testing is done on the Glycerine/water Cellular Extract concentrate format.

Table 3: Phyto-compounds and relating NE Cellular Extracts for Dry skin

Water-soluble Compound	Compound Action	Cellular Extracts Containing Compound 🟡 Australian Native 🟢 Non-Native 🔵 Australian Grown
AHA: Tartaric acid; Citric acid	Exfoliation: assists in gentle exfoliation to remove oil, dirt and dead skin ⁵⁵	🟠 Davidson Plum Cellular Extract; Finger Lime Caviar Cellular Extract
Anthocyanins	Antioxidant: works to reduce oxidative damage and maintain barrier function ⁶² Anti-inflammatory: shown to down regulate inflammatory pathways ⁶² UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation ⁶³	🟠 Davidson Plum Cellular Extract; Lilli Pilli/Riberry Cellular Extract; Mountain Pepper Berry Cellular Extract; Rosella Cellular Extract 🔵 Blueberry Cellular Extract; Queen Garnet Cellular Extract
Apigenin	Antioxidant: works to reduce oxidative damage and maintain barrier ⁴¹ Anti-inflammatory: inhibits the release of pro-inflammatory cytokines and down regulates inflammatory pathways ⁴² Hydration: demonstrated to maintain hydration of the skin ⁴¹ Collagen support: induces collagen synthesis ³²	🔵 Tasmanian Lavender Cellular Extract 🟢 Chamomile Cellular Extract; Jacaranda Cellular Extract
Ascorbic acid	Antioxidant: works to reduce oxidative damage and fermentation metabolites to maintain barrier function ⁵⁶ Collagen support: induces collagen synthesis ⁵⁷ UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation ⁵⁸	🟠 Kakadu Plum Cellular Extract
BHA: Salicylic acid	Exfoliation: assists in gentle exfoliation to remove oil, dirt and dead skin ⁵⁵	🟢 Willow Bark Cellular Extract
Caffeine	Antioxidant: works to reduce oxidative damage maintain barrier function ⁸³ UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation ⁸⁴	🟢 Green Coffee Bean Cellular Extract; Green Tea Cellular Extract; White Tea Cellular Extract; Yerba Mate Cellular Extract
Catechins-EGCG epicatechin	Antioxidant: works to reduce oxidative damage ⁴⁰ Anti-inflammatory: inhibits the release of pro-inflammatory cytokines ⁴⁶ Hydration: demonstrated to enhance hydration of skin ⁴⁵ UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation ⁴⁷	🟠 Aniseed Myrtle Cellular Extract; Emu apple Cellular Extract; Lemon Myrtle Cellular Extract; White Cypress Cellular Extract 🔵 Grapeseed Cellular Extract; Queen Garnet Cellular Extract 🟢 Green Tea Cellular Extract; White Tea Cellular Extract; Willow Bark Cellular Extract



Phyto-compound	Compound Action	Cellular Extracts Containing Compound <small>🔥 Australian Native 🌿 Non-Native 🇺🇸 Australian Grown</small>
Chlorogenic acid	Antioxidant: works to reduce oxidative and to maintain barrier function ⁶⁴ Anti-inflammatory: down regulates inflammatory markers ⁶⁵	🔥 Emu Bush Cellular Extract; Flannel Flower Cellular Extract; Kangaroo Apple Cellular Extract; Mountain Pepper Berry Cellular Extract; Mountain Pepper Leaf Cellular Extract; Native Orange Pearl Cellular Extract Quandong Cellular Extract; Rosella Cellular Extract 🌿 Gardenia Cellular Extract; Gotu Kola Cellular Extract; Green Coffee Bean Cellular Extract; Witchhazel Cellular Extract; Yerba Mate Cellular Extract
Citral	Antioxidant: works to reduce oxidative damage and maintain barrier function ⁴⁴ Anti-inflammatory: down regulates inflammatory gene expression and signaling pathways ⁴³	🔥 Lemon Myrtle Cellular Extract; Silky Oil Grass Cellular Extract
Ferulic acid	Antioxidant: works to reduce oxidative damage and maintain barrier function ⁵² Anti-inflammatory: down regulates inflammatory markers and oxidative stress in skin ⁵³ Hydration: demonstrated to enhance hydration of skin ⁵¹ UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation ⁵⁴	🔥 Desert Lime Cellular Extract; Emu Bush Cellular Extract 🌿 Ginger Cellular Extract
Gallic acid	Antioxidant: works to reduce oxidative damage and maintain barrier function ⁷⁰ Anti-inflammatory: shown to down regulate inflammatory pathways ⁷¹ Hydration: demonstrated to alleviate dryness of the skin ⁶⁹ UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation ⁷²	🔥 Davidson Plum Cellular Extract; Kakadu Plum Cellular Extract; Lemon Myrtle Cellular Extract; Strawberry Gum Cellular Extract; Tasmanian Blue Gum Cellular Extract 🌿 Manuka Honey Cellular Extract
Gingerols	Antioxidant: works to reduce oxidative damage maintain barrier function ⁷⁹ Anti-inflammatory: shown to down regulate inflammatory pathways ⁸⁰	🌿 Ginger Cellular Extract
Glutamyl-cysteine	Antioxidant: precursor to Glutathione, works to reduce oxidative damage from pollution and maintain barrier function ⁸² Anti-inflammatory: shown to down regulate inflammatory pathways ⁸² Hydration: recorded to enhance skin moisture and condition ⁸¹	🇺🇸 Pineapple Cellular Extract
Hesperidin	Antioxidant: works to reduce oxidative and maintain barrier function ⁷⁶ Anti-inflammatory: shown to down regulate inflammatory pathways ⁷⁸ UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation ⁷⁷	🇺🇸 Australian Lime Caviar Cellular Extract; Kaffir Lime Cellular Extract; Yuzu Fruit Cellular Extract
Leptosperin	Antioxidant: works to reduce oxidative and maintain barrier function ⁵⁰	🌿 Manuka Honey Cellular Extract
Luteolin	Antioxidant: works to reduce oxidative damage and maintain barrier function ³¹ Anti-inflammatory: down regulates inflammatory signaling pathways ³⁰ UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation via antioxidant action ²⁹	🌿 Olive Leaf Cellular Extract
Myricetin	Antioxidant: works to reduce oxidative damage and maintain barrier function ²⁶ Anti-inflammatory: down regulates inflammatory markers and oxidative stress in skin cells ²⁷ Collagen support: slows down collagen breakdown ²⁸	🔥 Flame Tree Cellular Extract; Snake Vine Cellular Extract 🌿 Banana Cellular Extract; Bilberry Cellular Extract; Willow Herb Cellular Extract
Naringin	Antioxidant: works to reduce oxidative damage and maintain barrier function ⁶⁶ Anti-inflammatory: shown to down regulate inflammatory pathways ⁶⁶ UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation ^{67,68}	🔥 Desert Lime Cellular Extract; Finger Lime Caviar Cellular Extract 🌿 Bitter Orange Cellular Extract
Oleuropein	Antioxidant: works to reduce oxidative damage and maintain barrier function ²² Anti-inflammatory: down regulates inflammatory markers and oxidative stress in skin cells ²³	🌿 Olive Leaf Cellular Extract
Phloroglucinol derivatives	Antioxidant: works to reduce oxidative damage and maintain barrier function ⁷³ Anti-inflammatory: shown to down regulate inflammatory pathways ⁷⁴ UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation ⁷⁵	🔥 Lilli Pilli Cellular Extract; Mountain Pepper Berry Cellular Extract; Tasmanian Blue Gum Cellular Extract
Polyhydroxy flavones (common polyhydroxy flavones include- Baicalein, Apigenin, Srutellarein, etc)	Antioxidant: works to reduce oxidative damage and maintain barrier function ³⁵ Anti-inflammatory: down regulates inflammatory signaling pathways ³⁶ Collagen support: induces collagen synthesis and keratinocytes differentiation ^{32,33} UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation via antioxidant activity ³⁴	🔥 Aniseed Myrtle Cellular Extract; Rosella Cellular Extract; Wattleseed Cellular Extract 🇺🇸 Jacaranda Cellular Extract; Tasmanian Lavender Cellular Extract 🌿 Chamomile Cellular Extract



Phyto-compound	Compound Action	Cellular Extracts Containing Compound <small> ◆ Australian Native ◆ Non-Native ◆ Australian Grown </small>
Procyanidins	Antioxidant: works to reduce oxidative damage and maintain barrier function ⁴⁸ Anti-inflammatory: shown to down regulate inflammatory pathways ⁴⁹	◆ Aniseed Myrtle Cellular Extract; Blue Cypress Leaf Cellular Extract; Lemon Myrtle Cellular Extract; Mountain Pepper Leaf Cellular Extract; White Cypress Cellular Extract ◆ Grapeseed Cellular Extract; Starfruit Cellular Extract ◆ Banana Cellular Extract; Willow Bark Cellular Extract
Protocatechuic acid	Antioxidant: works to reduce oxidative damage from pollution and to maintain barrier function ²⁴ Anti-inflammatory: demonstrated to down regulate many different types of inflammation in <i>in-vivo</i> mice studies ²⁵	◆ Mountain Pepper Berry Cellular Extract; Native Orange Pearl Cellular Extract; Native Snowflower Cellular Extract; Snake Vine Cellular Extract; Strawberry Gum Cellular Extract; Waratah Cellular Extract; Wild Orange Cellular Extract ◆ Ginkgo Biloba Cellular Extract; Horsechestnut Cellular Extract; Saw Palmetto Cellular Extract; Turmeric Cellular Extract; Willow Herb Cellular Extract
Quercetin	Antioxidant: works to reduce oxidative and maintain barrier function ⁶⁰ Anti-inflammatory: works to reduce oxidative and maintain barrier function ⁶⁰ UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation ⁶¹	◆ Aniseed Myrtle Cellular Extract; Davidson Plum Cellular Extract; Emu Apple Cellular Extract; Emu Bush Cellular Extract; Mountain Pepper Berry Cellular Extract; Mountain Pepper Leaf Cellular Extract; Native Snowflower Cellular Extract; Rosella Cellular Extract; Snake Vine Cellular Extract; Tasmanian Blue Gum Cellular Extract; Waratah Cellular Extract; Wild Orange Cellular Extract ◆ Queen Garnet Cellular Extract ◆ Bilberry Cellular Extract; Elderflower Cellular Extract; Gotu Kola Cellular Extract; Horsechestnut Cellular Extract; Red Clover Cellular Extract; Rosehip Cellular Extract; White Tea Cellular Extract; Willow Herb Cellular Extract; Witchhazel Cellular Extract; Yerba Mate Cellular Extract
Silymarin	Anti-inflammatory: down regulates inflammatory signaling pathways ³⁷ UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation ³⁸	◆ Milk Thistle Cellular Extract
Verbascoside	Antioxidant: works to reduce oxidative damage and maintain barrier function ⁴⁰ UV protection: demonstrated to protect against the oxidative damaged caused by UV radiation ³⁹	◆ Emu Bush Cellular Extract

Oil-soluble Compounds

Phyto-compound	Compound Action	Oils Containing Compound <small> ◆ Australian Oil ◆ Non-Australian Oil ◆ Australian Raw material / Non-Australia Oil </small>
α-Linolenic acid : Omega 3	Anti-inflammatory: down regulates inflammatory markers and oxidative stress in skin ⁸⁵ Lipid replenishment: demonstrated to improve skin condition and improve barrier function ⁸⁶	◆ Hemp Seed Oil ◆ Grapeseed Oil
γ-Linolenic acid : Omega 6	Anti-inflammatory: down regulates inflammatory markers and oxidative stress in skin ⁸⁵	◆ Hemp Seed Oil
Linoleic acid : Omega 6	Lipid replenishment: demonstrated to improve skin condition and improve barrier function ⁸⁹	◆ Hemp Seed Oil; Macadamia Oil ◆ Kangaroo Flower Infused in Sunflower Oil; Rosella Infused in Sunflower Oil; Sunshine Gold Oil; Wattleseed Infused in Grapeseed Oil ◆ Grapeseed Oil
Oleic acid : Omega 9	Anti-inflammatory: down regulates inflammatory markers and oxidative stress in skin ⁸⁷	◆ Macadamia Oil ◆ Sunshine Gold Oil
Palmitic acid	Antioxidant: works to reduce oxidative damage from inflammation to maintain barrier function ⁹⁰	◆ Macadamia Oil ◆ Kangaroo Flower Infused in Sunflower Oil; Rosella Infused in Sunflower Oil; Sunshine Gold Oil; Wattleseed Infused in Grapeseed Oil
Squalene	UV damage protection: limits oxidative damage from UV exposure to maintain integrity of NMF and barrier function ⁹¹	◆ Macadamia Oil
Ximenynic acid	Antioxidant: works to reduce oxidative damage to maintain barrier function ^{92,93}	◆ Native Sandalwood Seed Oil



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FROM THE NE LAB

REFERENCE

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