

Ingestible Beauty

Inner Nutrients For Outer Beauty

Your Complete Skin Supplementing Guide



Essential Nutritional Supplements


Ingestible Beauty Author



Hannah Hanson

BSc, B Com

Hannah Hanson is a copy and content writer in the Health and Wellness space. After completing her degrees in Pharmacology and Commercial Law, Hannah pursued her passion for a happy, healthy and balanced lifestyle through researching and writing. Often her work lends itself towards evidence-backed yet digestible articles and conversations in all niches of health, wellness and beauty. When she's not tapping away, Hannah is skiing, hiking, cooking or enjoying the ocean.

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Ingestible Beauty is the second independently produced whitepaper released by Pro You this year. Visit our website to download our previous paper, **Eat Your Age – your complete guide to eating and living well for each decade of life**, and subscribe to receive future publications. Our next whitepaper, to be released in March 2022, will be on the topic of **Tiny Habits – how small changes can change everything**.

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Welcome

They say healthy skin starts from within.

But how true is this?

Creams and serums aren't the only products you'll find on our beauty shelves. There's a new kid on the block: beauty potions in the forms of powders, tonics, gummies and capsules. Ingestible Beauty, also known as Edible Beauty, embraces a holistic view of internal wellness while targeting skin concerns. Common skin concerns include inflammation, ageing, acne, texture, hydration – as well as hair and nail health. In other words, Ingestible Beauty aims to improve the beauty trifecta – skin, hair and nails. Prepare yourself for a wide array of ingredients in this industry, from the super rare, super weird to the super efficacious. Expect a lot of vitamins, minerals, probiotics and collagen.

As research improves this patchy area of understanding, it's clear that your outer body reflects your inner health. And here is why; an imbalance in nutrition and poor dietary habits causes accelerated skin ageing. We know that we cannot halt the process of ageing (no matter what marketers may claim) – and this shouldn't be the goal. But there's no shame in using scientific know-how to slow this process down – especially if it helps you to feel and look good in your own skin.

This guide will answer common queries, weigh up benefits and limitations as well as shine a light on red and green flags to watch out for. We then focus on key ingredients found in the Ingestible Beauty realm and provide everything you need to know using only evidence-based information backed with credible research. There are touches of biology and biochemistry throughout this paper. To help you navigate these concepts, a glossary is included at the back. Overall, this paper was written to be light-hearted, easily-digestible while covering all bases.

Our intention is to help empower you to make your own informed decisions. Equally important, we hope to help you spot dodgy marketing claims and iffy information. Both of which are so prolific in this industry.

We are thankful to have Hannah Hanson as our feature writer for this white paper. Between Hannah's degree in Pharmacology and Commercial law, her wider interests branch out to the nutrition and skincare space. Her goal was to craft a unique paper for the Pro You community; something not already available to the public. What's more, it had to be a paper that relied on true, credible science – while being entertaining to read. Hannah's care to maintain scientific integrity, her months of research and genuine interest to lift the veil of this often misunderstood and misinformed industry beams through on these coming pages.

Think of this as your complete skin supplementing guide.

Happy glowing,



Anna Thompson-Ford

Pro You Co-founder and CEO



What is Ingestible Beauty?

Welcome to Ingestible Beauty: the realm of beauty supplements that you can eat, drink and swallow. Appearing in many forms such as powders, tonics, gummies, and capsules, Ingestible Beauty builds on the notion – you are what you eat. We have known for a while now that sugar isn't great for the skin while eating a wide variety of fruit and veg is beneficial – Ingestible Beauty takes this knowledge to the next level. So then tell us – what are these skin-serving nutrients? Collagen, vitamins, minerals, plant extracts, probiotics are all popular examples of what you will find in beauty potions. At the same time, growing research is proving and disproving which exact nutrients can help our skin stay in tip-top shape and achieve that goddess-like glow. As the industry grows, so does misinformation. As a result, clouding the space of Ingestible Beauty are many marketing claims – admittedly, some more substantial than others. Because of this, the key to getting the most out of your beauty supplements is to look past the marketing and understand the ingredients. Not to mention the healthy saving on your wallet.

If you're thinking about dipping your toes into the world of Ingestible Beauty – you're in the perfect place.

Although Ingestible Beauty is a new, shiny term, dermatology is already well acquainted with treating skin conditions using ingestible aids.

Supplements used to help treat skin conditions include:

- Eczema or Dermatitis – Probiotics
- Slow wound healing and infection – Zinc and Vitamin C
- Inflammation of the skin – Fish Oil
- Scaly skin caused by essential fatty acid deficiency – Omega 3 and 6 Rich Foods
- Acne and blemish-prone skin – Vitamin A & Zinc
- Osteoarthritis and joint inflammation – Hyaluronic Acid & Collagen
- Psoriasis and acne – Vitamin A

Benefits and Limitations of Ingestible Beauty

The world of Ingestible Beauty is ever-evolving. Science and fads shape this scene as science makes discoveries and fads create monetizable hype. As a result, Ingestible Beauty has both benefits and limitations that are useful to be aware of.

Benefits: Forget being skin deep, Ingestible Beauty dives further. Rather than masking symptoms, Ingestible Beauty provides an avenue to get to the root of your skin concerns. This, in turn, provides long-lasting results. Inflamed skin? Find the cause, cool it, and enjoy the results.

Limitations: Getting results will take time, and like most health treatments, there are no quick fixes. It also takes compliance and consistency; taking a supplement on and off when you feel your skin is turning against you won't deliver results. As a general rule, starting earlier rather than later is better – as prevention beats cure – however, later is better than never! Lastly, patchy knowledge creates room for misinformation and unregulated marketing claims. Keep your eyes peeled for these and ensure brands have their claims backed by quality research. This whitepaper will help you make educated decisions on what's sincere and what's sketchy.

Slather or Slurp? Topical or Ingestible?

Both! Both will work synergistically to take your skin to the next level. Cleansing properly, moisturising, and of course, applying sunscreen every day, every season is still important. An ingestible supplement loaded with antioxidants won't protect you the same way SPF 50+ sunscreen will – but it can provide your skin with extra gusto to protect against free-radical damage. Together? Match made in heaven.

Clues you would benefit from ingestible beauty supplements:

Some signs stand out like a sore thumb. These are clues indicating your skin could benefit from supplementation:

- Cracked, thin or brittle nails
- Excessive hair shedding or breakage
- Slow wound healing
- Inflamed, red skin
- Dull, lack-lustre skin
- Dehydrated skin
- Prematurely aged skin

If you are concerned about your health and wellbeing, it is always advisable to consult your GP. Better to be on the safe side.



Pro Tip

What is GMP? GMP refers to Good Manufacturing Practice regulations set by MedSafe that manufacturers have to follow to ensure their products are consistently safe, effective, and of acceptable quality. GMP regulations were brought in to New Zealand to match that of international standards. These practices specifically apply to the manufacture and distribution of Therapeutic Goods.

Red and Green Flags to Watch Out For

The market is becoming increasingly saturated with Ingestible Beauty brands. To ensure your money is well spent and your body is well looked after, look for brands with transparency around ingredients, manufacturing, and formulation.

Check what ingredients they use, the dose, the source, and what evidence backs their claims. Check the manufacturing conditions; is it made under controlled regulations like GMP (Good Manufacturing Practice)?

Check for fillers, artificial flavours, and sweeteners – if you're consuming this daily, it's wise to limit regular intake of artificial additives where possible. If a brand truly values 'clean, pure' formulations, then they'll leave out the junk. Just think – are they walking the talk?

A big red flag is holding out on information, such as providing clear information on the source of their ingredient. Transparency is generally a tell-tale sign of having less to hide!

Greenwashing is where a company falsely markets itself to be more environmentally friendly than they are. Typical examples are the use of slogans, brand names, power words (like 'organic'), and images that make it appear eco-friendly – but in reality, the company has taken no real steps to support this image.

Red Flags:

- Holding out on information around ingredients, manufacturing, and formulation
- Promises of quick fixes, instant results
- Use of artificial flavours, colourings, sweeteners, and fillers
- Greenwashing claims

Green Flags:

- Transparency around ingredients, manufacture, and formulation
- Uses quality, peer-reviewed research to back up claims
- Social proof from honest reviews or testimonials
- Proof of sustainability claims



Why Free Radical Damage is a Big Deal

When it comes to skin health, beauty, and ageing – free radical damage is the talk of the town.

Why? Free radical damage leads to:

- DNA damage
- Flare up in the inflammatory response
- Increased usage of available antioxidants
- Generation of matrix metalloproteinases (MMPs) that degrade collagen and elastin

Visibly? Free radical damage produces all signs of skin ageing, including:

- Unwanted hyperpigmentation such as age spots
- Wrinkles and skin sagging
- Disrupted skin barrier
- Dehydrated skin
- Dull skin

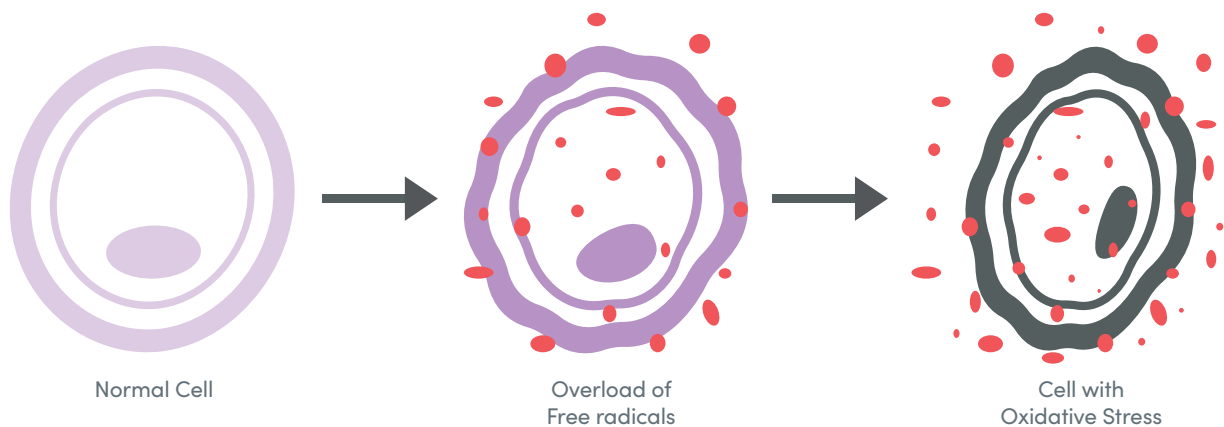
Not to mention an overall increased risk of skin cancers. Truth Bomb: Scientists tend to agree the top reason for accelerated skin ageing is free radical damage.

What causes free radical damage?

- UV ray exposure
- Pollution exposure
- Chemical exposure
- A poor, unvaried diet lacking in antioxidants
- Lifestyle factors like smoking, sleep, and stress

For these reasons, reducing free radical damage is an important part of the beauty and wider skin health industry.

Oxidative Stress



Pro Tip

Don't get too bogged down by the jargon. Free radicals and oxidative stress are all part of the same parcel. Think of it this way: an overload of free radicals causes oxidative stress, which harms cells.



Does Chocolate Give You Pimples?

We thought to include this note in our whitepaper as it's a common question with common misunderstandings. Is this sweet vice to blame for breaking out?

Cacao itself has no reason to kickstart your breakouts; in fact, it has boasting levels of vitamins A, C, and E and zinc, which are beneficial for your skin. Where trouble may spring is the added sugar and dairy in your chocolate bar. Sugar and dairy can make acne conditions worse as they can stimulate the production of hormones that in turn, upregulate sebum production. More sebum means more clogged pores! If you're concerned or see noticeable trends - try swapping out for a dark version (80%+) or cacao nibs! Every person's sensitivities and tolerances are unique, so find what works best for you.

Ingestible Beauty Ingredients

Let's get friendly with key Ingestible Beauty ingredients. We cover what they are and their skin benefits while discussing effective dosages to realise these benefits. Plus, any other tidbits of information that are worth knowing. We hope this can help you make well-informed decisions for when you are next in the market for ingestible beauty products.



Collagen

Collagen is the most abundant protein in our body, it is responsible for giving our skin, joints, tendons, ligaments and hair structure and resilience. Think of it as the scaffolding or the poles holding up a tent - without it, we have a weak structure that stretches, sags, wrinkles and cannot retain moisture effectively. Unfortunately, as we age, our collagen levels progressively decline and this contributes to the signs of ageing.

There are five common types of collagen classified under type I-V. While 90% of our body contains type I collagen, our skin has an abundance of type I and III. Our body makes collagen through cells called fibroblasts. They also produce other skin-serving elements like elastin and hyaluronic acid. Stimulating fibroblasts to 'switch on' increases collagen production. This is one of the goals to control the speed of skin ageing!

How Our Body Absorbs Collagen

Just like if you ate brains (offal, anyone?), it wouldn't make you smarter; when you swallow collagen, it isn't absorbed intact to go on to boost your collagen levels. If only it were that simple.

So how does your body absorb and use ingested collagen? Collagen is too big to be absorbed whole - therefore, collagen first needs to get broken down into smaller collagen peptides called collagen hydrolysates (CH). This is the form that supplement products will often use in their formula. Once ingested, the body breaks it down further into bioactive collagen dipeptides and tripeptides. These can be absorbed into the bloodstream and distributed throughout the body, in particular - to the skin's dermis.

There are three suggested pathways ingested collagen hydrolysates (CH) promote skin health:

1. Stimulates fibroblasts and downregulates Matrix metalloproteinases (MMPs) - resulting in improved collagen
2. Inactivates free radicals - reducing cellular damage and inflammation
3. Inhibits inflammation by regulating inflammation signalling called cytokines

Skin Benefits of Collagen Supplementation:

A systematic study looked at multiple Randomised Controlled Trials (RCTs) using CH, collagen dipeptides, and/or collagen tripeptides and suggested their skin benefits are:

- Improved skin elasticity
- Improved collagen density
- Reduction in collagen breakdown
- Improved skin moisture
- Increased production in procollagen type I and elastin
- Reduction in cellulite (BMI <25)
- Improved wound healing

Are collagen supplements safe? No observations of Adverse Events were recorded across all studies. This suggests collagen supplements are well tolerated with few issues or side effects.



What's the Best Source of Collagen?

Though there are thousands of collagen supplements on the market - they're not all the same.

Collagen can derive from various sources, including cows (bovine collagen), pigs (porcine collagen), and fish (marine collagen). Interestingly, since marine collagen has a comparatively lower molecular weight, it is absorbed approximately 1.5x more efficiently than bovine or porcine sources. Marine collagen is most similar to human collagen structurally, making it the ideal source for nutraceutical use. Each source comprises a different makeup of collagen (between type I, II, and III), each one holding its own benefit.

When choosing a collagen supplement, look for brands that share specific details on their source of collagen. For example, if the source is bovine collagen, where is it sourced, and under what conditions? Grass-fed, hormone-free, sustainable, and kind living conditions? In addition, your diet, religion, and allergy history may also factor into your decision of what source of collagen is best for you. Marine sources are great for people who don't eat beef or pork, pescatarians, or people who minimise their meat consumption. However, if you have a fish allergy, we don't recommend marine collagen.

I

Type I

- Most abundant type of collagen in the body
- Structural components of skin, nails, hair, bones, teeth, vasculature, and connective tissue.
- Found in marine collagen, small amounts of porcine collagen, and some sources of bovine.
- Good for skin, nail, hair, and bone health.

II

Type II

- The structural component in cartilage
- Found in chicken collagen and bovine collagen sourced from cartilage (not hides)
- Good for joint and mobility health

III

Type III

- Second most abundant collagen in the body
- Found in areas that require elasticity such as skin, lungs, muscle, connective tissues, and vasculature.
- Found in porcine collagen and bovine collagen sourced from hides
- Good for skin, nail, and hair health.

Pro Tip

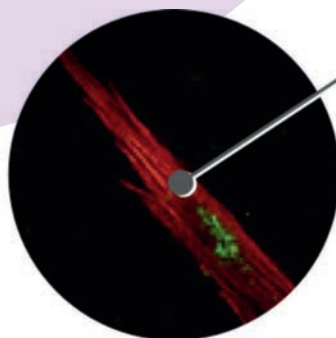
We are keen to let you know what collagen we source for our supplements to be totally transparent.

Pro You uses Marine Verisol® F Bioactive Collagen Peptides. Verisol® F has scientifically proven research showing their collagen peptides:

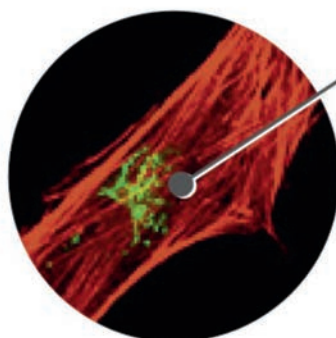
- Increase collagen content in the skin
- Increase skin elasticity
- Reduce periorbital (around the eye) wrinkles
- Increase hair thickness
- Increase nail health (less peeling, cracking) and growth
- Decrease cellulite

These results have been demonstrated in several clinical trials during the last ten years with nearly 500 study participants. The research on Verisol® F is respectable as it uses data collected from peer reviewed RCTs. Their studies also cover multiple ethnicities; this is important to understand the applicability to our entire population and not just a segment of it.

In vitro collagen synthesis



STIMULATION WITHOUT
VERISOL®
Beauty from Within



STIMULATION WITH
VERISOL®
Beauty from Within

Source: <https://www.gelita.com/es/productos-y-marcas/peptidos-de-colageno/verisol>

Can Collagen be Plant-Based?

Riding the collagen wave are many vegan and plant-based brands. But what's the deal with these? Can plants actually provide skin-serving benefits like their animal-based counterparts?

Unlike animal products, plants don't contain collagen; therefore, they aren't a source of collagen. This is because collagen is found in hair, skin, nails, and connective tissue – all of which aren't present in plants. What these plant-friendly supplements bring to the table are ingredients that may help stimulate collagen production. Often termed Collagen Boosters or Collagen Builders, these plant-based supplements supposedly help nourish the body to encourage collagen production without containing collagen itself. All in all, it's best to be wary of any claims of vegan or vegetarian collagen sources. In saying this, vegan and vegetarian collagen is being developed through genetically modified bacteria and yeast. As science and research improves in these areas, it will be worth keeping an eye on!



How Much Collagen Do You Need?

No explicit or defined optimal dose for collagen supplementation currently exists. Research studies on collagen supplements have ranged between 2.5 to 10 grams. These studies looked at various benefits, including skin ageing and wound healing. A systematic review also noted not all collagen supplements are created equal. Collagen supplements can vary vastly – depending on what collagen hydrolysate or peptide is used. Therefore, comparing doses only reveals part of the puzzle. To get the complete picture and make fairer comparisons, the type of collagen hydrolysate or peptide should also be considered.

We recommend looking for a substantiated source of collagen at a minimum of 5 grams per day.

How to compare collagen supplements:

- Check the dosage
- Check the type of collagen (e.g. is it a hydrolysate or a peptide)
- Check for other ingredients that can work synergistically with collagen

Skin, Hair & Nail Benefits: Collagen*

- **Promotes healthy, controlled skin ageing**
 - Stimulates collagen and elastin production
 - Reduces collagen breakdown
 - Improves skin moisture
- **Promotes firm skin appearance**
 - Reduction in cellulite (BMI <25)
 - Improved wound healing
- **Promotes healthy, strong nails**
 - Reduction in breakage and peeling
 - Improved thickness
- **Promotes healthy hair**
 - Improved hair thickness

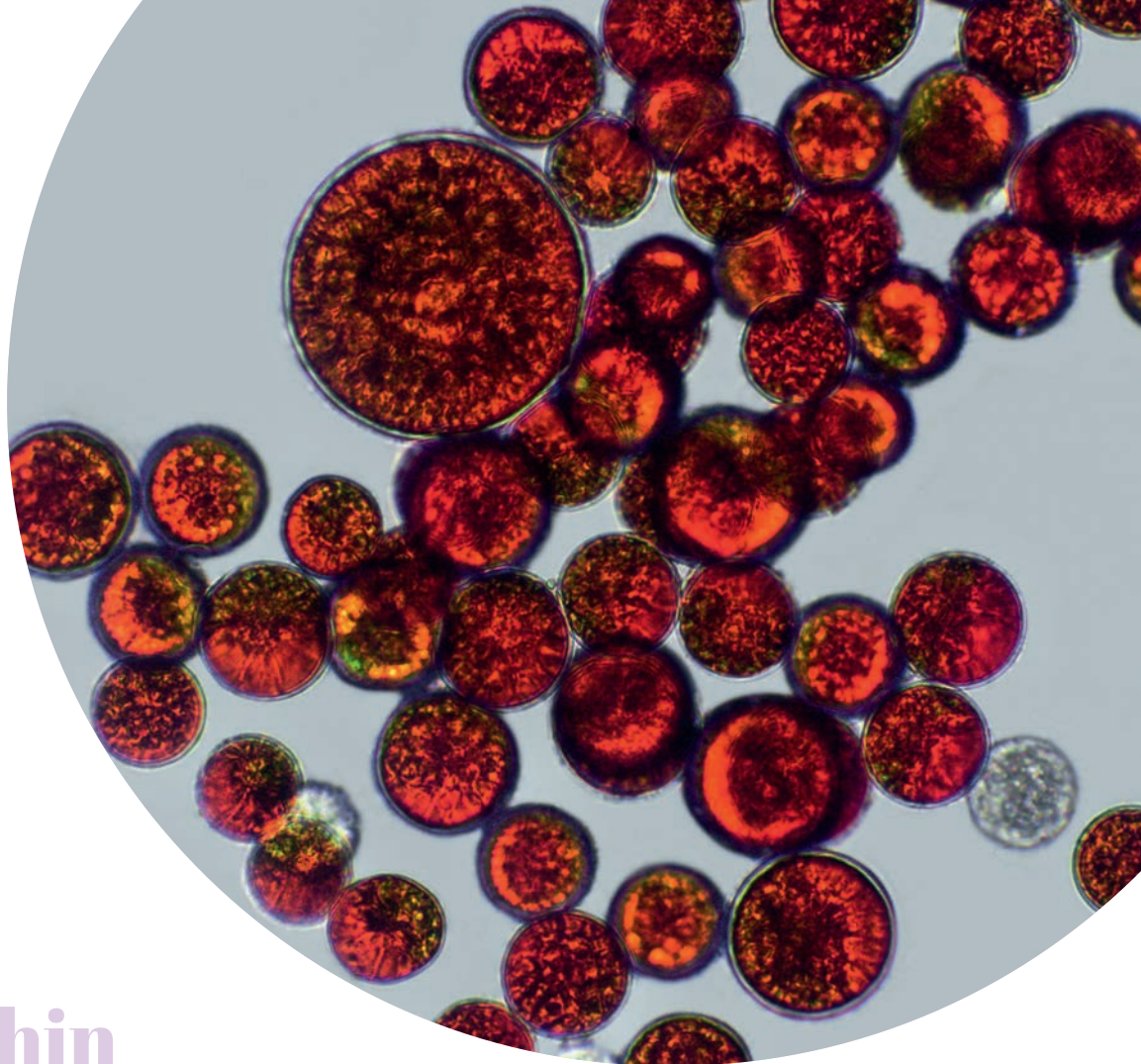
Prevents:

- Sagging skin and wrinkles
- Barrier impairment

Provides:

- Hydrated skin
- Firm, smooth texture
- Skin elasticity
- Strong nails
- Healthy hair

*As suggested by clinical trials. Depending on the source and dose of collagen.



Astaxanthin

A tier above the rest – Astaxanthin, the antioxidant blinking on scientists' radars. Astaxanthin (pronounced asta-zan-thin) is a carotenoid unlike any other; it's a potent, bioactive antioxidant synthesized by microalgae, bacteria, and yeasts. Ubiquitous in nature, especially around our marine life – it's synthesized by microalgae and phytoplankton, which subsequently accumulates in sea life higher up the food chain. Visually, it's a red-orange pigment, responsible for the rustic autumnal leaves we see each year and the colouring of prawns, salmon, and crayfish. Although astaxanthin can be synthesized by plants, bacteria, and microalgae – the chlorophyte alga *Haematococcus pluvialis* has the highest capacity to accumulate astaxanthin. Therefore, it is considered the crème de la crème source for nutraceutical and beauty purposes. In saying this, 95% of commercially available astaxanthin is produced synthetically using petrochemicals due to cost efficiencies in mass manufacturing – this creates significant divisions of quality within the industry.

When we compare astaxanthin to other carotenoids – it's clearly unique. For example, astaxanthin has an

incredibly superior bioactivity and antioxidant capacity (ahem, 40x that of beta-carotene). Furthermore, unlike other carotenoids – it doesn't convert to Vitamin A but stays put in its unique astaxanthin form. This is unusual, as many carotenoids first need to be activated by the body for it to elicit a response.

Skin Benefits of Astaxanthin

Mounting evidence suggests astaxanthin has a purpose beyond its beautiful pigment.

This is most apparent looking at our marine life; astaxanthin has several functions, including offering protection against harmful UV rays and oxidative stress, communication, maintaining a healthy immune response and reproductive capacity, and strong tolerance to stress.

Photoprotective, antioxidant, and anti-inflammatory benefits tee it up to be a powerful skin supplement to help ward off wrinkles, sunspots, and other environmental damage.

Photoprotection:

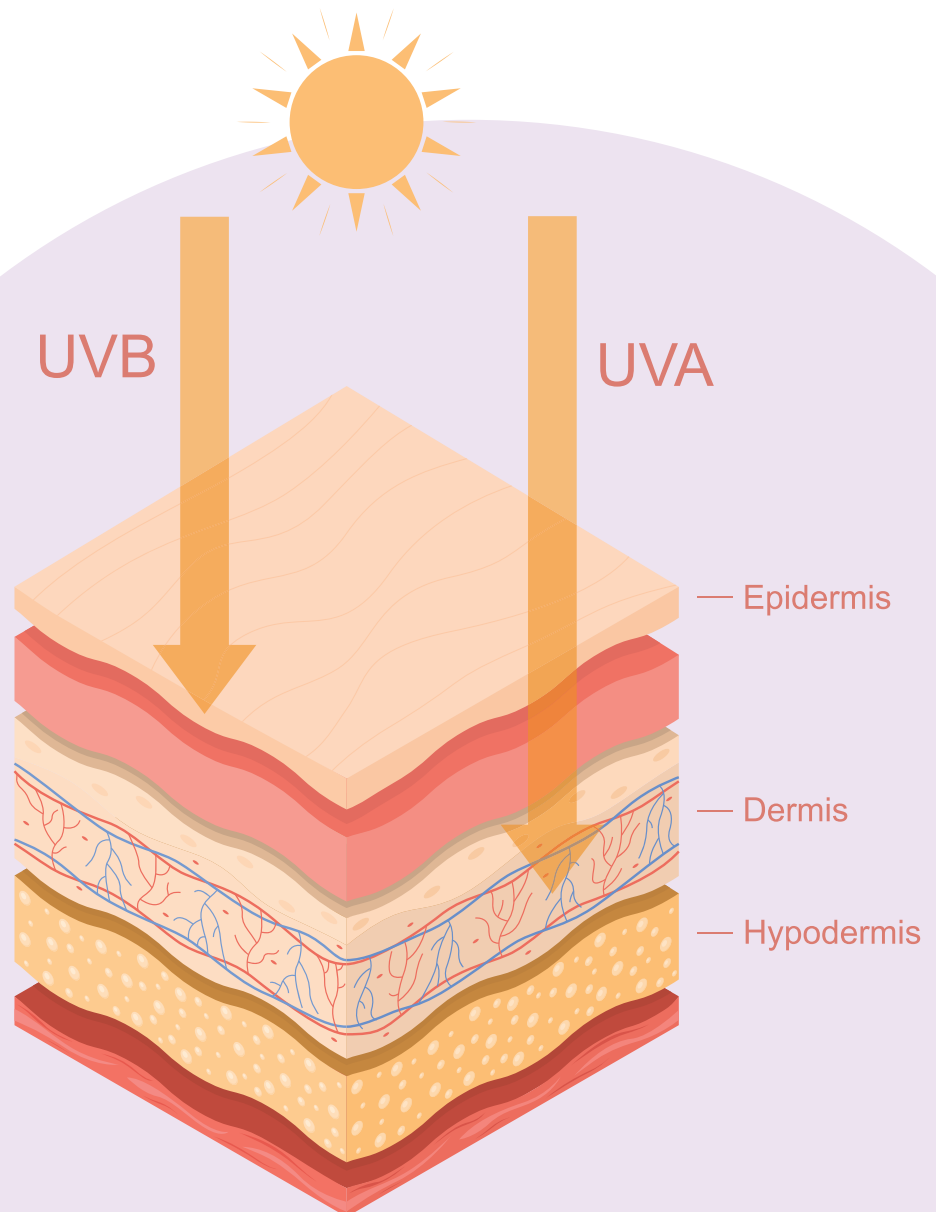
Photoprotection is the ability to protect against the sun's harmful UV rays.



Astaxanthin has been shown to protect against UV-induced cellular damage. Visible effects of UV damage are hyperpigmentation, skin sagging, skin barrier dysfunction (e.g. water loss), and wrinkling. Studies show this visible damage can be prevented through oral and topical use of astaxanthin.

Different Types Of UV Rays

- UVC: For the most part, it is filtered out by atmospheric ozone.
- UVB: "B is for Burning". Affects the epidermis – damages keratinocytes and fibroblasts (cells within the epidermis) along with DNA, protein, and lipids, creates harmful reactive oxygen species and subsequent inflammation.
- UVA: "A is for Ageing". Photo-ages skin by penetrating the deeper dermis and affecting collagen and elastin in dermal layers. Contributes to 95% of UV exposure.





While SPF does give you an indication of its strength to block harmful UVA rays, it does not provide any information about the blockage of UVB rays. To ensure you are getting full coverage – choose a sunscreen that has Broad-Spectrum UV Protection. These sunscreens have undergone further laboratory testing to ensure it protects against both forms of UV ray damage.

Antioxidant protection

As we have mentioned before, oxidative damage plays a large part in our accelerated ageing skin conundrum. Like firefighters, antioxidants help correct and repair this damage and its subsequent inflammation. Studies on astaxanthin show it has superior antioxidant activity compared to other carotenoids. Although structurally similar to b-carotene, it has 40x the antioxidant activity. Clearly, it's the king of carotenoids, which has got scientists buzzing for its use in nutraceuticals and dermatology.

Anti-inflammatory

Stress (namely, oxidative stress) leads to inflammation. Your skin doesn't like inflammation (surprise, surprise); it makes it hot and red while distracting

it from completing important self-care jobs like producing collagen and elastin. Astaxanthin has shown anti-inflammatory properties that downregulate pro-inflammatory mediators through multiple pathways. These properties also make it an essential consideration for inflammatory skin conditions such as psoriasis and atopic dermatitis.

Optimal Daily Dosage Of Astaxanthin For Skin Health

A little goes a long way – following consumption, absorption of astaxanthin is relatively high, indicating you don't have to consume much to reap the benefits. Although an optimal dose has not been defined, a recent systematic study revealed doses between 3-6 mg/day could improve skin health, especially photoaged skin. Thankfully, overdosing doesn't seem to be an issue – astaxanthin is considered safe and well-tolerated, with no adverse side effects recorded for high doses (>12mg/day).

It also plays well with other skin-loving ingredients. Several human studies have indicated that using astaxanthin in conjunction with collagen hydrolysate produces synergistic skin health benefits. Double skin-win!

Skin Benefits: Astaxanthin

- **Promotes healthy, controlled skin ageing**
 - Photoprotection
 - Antioxidant Protection
 - Anti-inflammatory

Prevents:

- Sunspots
- Sagging skin and wrinkles
- Barrier impairment
- Skin cancers

Provides:

- Hydrated skin
- Clear complexion
- Firm texture
- Skin elasticity



Hyaluronic Acid

Your Skin's Hydration Station. Hyaluronic acid (HA), also known as hyaluronan, is the hero hydrator everyone is reaching for. Its main claim to fame? Holding up to 1000x its weight in water. Good news for your skin, as it can soak up moisture and hydrate. That's right, it draws and retains water like there's no tomorrow. Hydrated skin cells are typically fuller and thus reflect light better, giving that plump, healthy, quenched glow. What started as a popular skincare serum is now an edible beauty must-have.

What is Hyaluronic Acid?

Hyaluronic acid, found naturally within your body, are long chains of sugar molecules called glycosaminoglycans (GAGs). As its acronym doesn't suggest, it's a humectant, meaning it has a natural ability to draw and hold water molecules – up to 1000 times its weight. It's naturally abundant throughout our body and functions to keep our cells hydrated and structurally sound. Like magnets, HA holds collagen and elastin fibres in a proper, stable configuration. We can also thank hyaluronic acid for smooth, pain-free movements as it helps to cushion and lubricate our joints. Like collagen, HA levels decline with age. Levels of HA within our skin decrease

from 0.3% between ages 19–47, down to 0.015% for women in their 60's, to 0.007% in women aged 70 years and older.

This likely contributes to the disarrayed network of collagen and elastin fibres – characteristic of aged skin. Visually this contributes to dehydrated, lack-lustre, and wrinkled skin (sigh).

Skin Benefits of Hyaluronic Acid in Ingestible Beauty

From serums to dermal fillers, topical and injectable applications of hyaluronic acid are common and well understood. What about oral hyaluronic acid supplements? Topical hyaluronic acid serums are excellent, but their limitations lie in only hydrating the outer layers of skin. Oral hyaluronic acid offers hydration to the inner layers, which topical serums can't penetrate. Inside-out beauty, literally.

As well as hydrating tissues, it's shown to have anti-inflammatory, antioxidant, wound healing, and even anti-cancer functions. Its hydration and antioxidant effects can help promote skin cell renewal and turnover, revealing fresh, bright skin underneath. Several studies indicate oral hyaluronic acid can decrease wrinkle depth, increase elasticity and decrease skin roughness – all bases covered!

Pro Tip

Struggling with dehydrated skin? Maybe it just needs a drink, literally.

Don't forget one of the most important (and free) skin saviours – water. Drinking plenty of water throughout the day keeps your cells plump and hydrated and your lymphatic system pumping effectively to clear toxins.

Is Hyaluronic Acid the Right Ingredient for You?

Hyaluronic acid is considered a safe, gentle ingredient despite the harsh sound of its name (normally, acid = alarm bells). It's one of the universal ingredients that fits every skin type, from dry and sensitive to oily and acne-prone. Both oral and topical applications of hyaluronic acid are considered safe; they have a good safety profile and a low chance of side effects or toxicity.

Studies have indicated that hyaluronic acid may relieve osteoarthritis pain, joint inflammation and improve muscular knee strength outside of strictly skin benefits. Oral supplements of hyaluronic acid suggested similar, if not better, results in relieving joint pain compared to the current standard treatment – injecting the joint with hyaluronic acid. Other studies have also suggested the benefits of inhibiting bone resorption and cartilage degradation in athletes. We won't say no to that!

How Do Oral Hyaluronic Acid Supplements Work?

Despite its large molecular size, your body can absorb ingested hyaluronic acid. Once swallowed, it is absorbed by the small intestine and transported around the body through the blood and lymphatic circulation. From here, it travels across the body to areas including skin and connective tissue. Here it replenishes existing stores and stimulates fibroblasts to produce more hyaluronic acid and collagen.

Optimal Daily Dosage for Hyaluronic Acid

Currently, there is no defined optimal daily dose for hyaluronic acid. As hyaluronic acid exists in different molecular weights, two hyaluronic acid supplements may have different absorption abilities. This makes pinpointing a singular number tricky at best. Because studies indicate doses upwards of 50mg/day can provide benefits, we recommend this as the minimum to look for.

Skin Benefits: Hyaluronic Acid

- **Promotes hydrated skin**
 - Increased glycosaminoglycans (GAGs)
- **Promotes healthy ageing of the skin**
 - Antioxidant protection
 - Anti-inflammatory benefits
 - Improved wound healing

Prevents:

- Impaired skin barrier
- Dull, lack-lustre skin texture

Provides:

- Hydrated, plump skin
- Glowing skin complexion



Vitamin A

Vitamin A is one of the few ingredients that can claim medical benefits and is available for prescription with proven skin benefits.

It is recognized as not only one of the most effective ingredients to add to your skincare list but also one of the most aggravating. If you have ever gone too hard with Vitamin A – you will know exactly what we are talking about. If you have ever been on Accutane (also known as Roaccutane), you would also understand. Vitamin A is not only an effective topical ingredient; it is effective as an oral supplement. Without realising, we consume it every day in our diet.

What is Vitamin A

Vitamin A is a fat-soluble antioxidant found stored in our liver. It functions to support skin, eye, and reproductive health while maintaining a strong immune system. It's found naturally in common foods and is an essential part of our diet to maintain optimal health.

Two types of Vitamin A exist in our diet:

Retinoids: a preformed Vitamin A
e.g. retinyl acetate, retinol
Previtamins are immediately active and readily usable by the human body.

Carotenoids: a proformed Vitamin A
e.g. beta-carotene
Provitamins (also known as precursors vitamins) aren't biologically active and usable until they are metabolised and converted to their active form.

Carotenoids get converted to retinol by the liver.

Retinol is stored in the liver or transported around the body by your lymphatic system – it is then further converted to retinal and then retinoic acid (the active Vitamin A form).

Foods Highest in Vitamin A

While retinoids are found in animal products, carotenoids are found in plants.



Sources of Provitamin A Carotenoids



Sources of Preformed Vitamin A (retinol)

Foods high in Retinoids:

Animal liver such as beef and lamb, cod liver oil, mackerel, salmon, patè made with liver, bluefin tuna, dairy products such as milk, cheese, and butter.

Foods high in Carotenoids:

Carrots, tomatoes, kumara, leafy greens, mangoes, apricots, and plums.



Eat your carrots to help you see in the dark!

Vitamin A, also known as retinol, helps produce the pigments in the retina. This is where the half-myth stems, as carrots are high in carotenoids, a precursor to Vitamin A! So while it won't give you superhero night time vision, it may help you maintain tip-top eye health and improve low-light vision.

Vitamin A Supplements

Vitamin A supplements are commonly used to boost a weak immune system and improve skin and eye health. It's important to note these supplements are different from prescription oral Vitamin A medication used to treat severe acne. Vegetarian and vegan Vitamin A supplements will only contain carotenoids. Commonly, Vitamin A supplements will include a mixture of both carotenoids and retinoids. On the label, it may provide the retinol activity equivalents (RAE). The RAE is the Vitamin A potential of carotenoids — or how much vitamin A they provide after being converted into active vitamin A in the body.

Skin Benefits of Vitamin A

- Regulates skin cell turnover.
 - Vitamin A stimulates the production of new skin cells. As we age, our skin cell turnover rate decreases from 28 days in your 20-30s to up to 90 days once you're in your 50s. A fast turnover rate helps to reveal fresh, radiant skin cells underneath.
- Stimulates collagen, elastin, and GAGs (hyaluronic acid) production
 - Through stimulating fibroblast cells - thicker skin, reduced wrinkles, improved texture, improved skin strength, hydration, and barrier function.
 - Through decreasing MMPs activity (which breakdown collagen and elastin).
- Regulates melanogenesis process
 - To prevent unwanted hyperpigmentation such as sunspots and post-inflammatory hyperpigmentation (PIH).

Optimal Daily Dosage of Vitamin A

Dosage is an important consideration with Vitamin A, and its supplementation as too little and too much Vitamin A can cause harm.



Too little Vitamin A can cause a condition called hyperkeratosis – where keratin builds up in hair follicles, causing raised bumps on the skin. During pregnancy, Vitamin A deficiency can lead to the child being born with a condition xerophthalmia, characterised by impaired eyesight.

Overdosing in Vitamin A may happen by enjoying a diet overly rich in retinoids, such as eating a lot of liver, pate, or cod liver oil at once. It can also happen if you take multiple supplements that contain Vitamin A. This can lead to hypervitaminosis A – a condition characterised by increased head pressure, dizziness, nausea,

headaches, skin irritation, pain in joints and bones, coma, and other more serious consequences. Overdosing on Vitamin A while being pregnant can also lead to birth malformations. Take care if pregnant; watch your dietary intake of retinoids and don't double up on supplements containing Vitamin A. To be safe, consult your GP or lead maternity carer before starting a new supplement.

It is worth noting a diet high in carotenoids is not associated with Vitamin A overdosing or any of its toxicity profiles. So there's no need to limit your carrot intake for this sake.

New Zealand's RDI for Vitamin A:

	RDI (mcg/day)	RDI (IU/day)
Men	900	3000
Women	700	2334
Pregnant Women	800	2667
Breastfeeding women	1100	3667

Vitamin supplements may use milligrams (mg), micrograms (mcg/ug), or International Units (IU) as a standard of measure for dosing. For Vitamin A, 1 IU = 0.3mcg of Retinol and 0.6mcg of beta-carotene.

Skin Benefits: Vitamin A

- **Promotes healthy ageing of the skin**
 - Increased skin cell turnover
 - Increased production of collagen, elastin, and hyaluronic acid
 - Downregulates pigmentation formation

Prevents:

- Hyperpigmentation
- Sagging skin and wrinkles
- Dull, lack-lustre skin

Provides:

- Firm skin
- Skin elasticity
- Bright, clear complexion



Vitamin C

Vitamin C is a familiar vitamin in the world of supplements, ingestible beauty, and skincare. As children, it's often the first supplement we are introduced to. Fondly remembered as an orange chewable dished out by Mum each morning in her attempts to boost our immune system and ward away winter colds.

Also known as L-ascorbic-acid, Vitamin C is a water-soluble, photosensitive antioxidant.

Vitamin C has several roles in the body:

- Roles in the production of lysine and proline – amino acids used in the production of collagen
- Deactivates free radicals, preventing cellular damage
- Regenerates antioxidants like Vitamin E
- Facilitates the absorption of iron
- Increases the bioavailability of selenium

Safe to say, Vitamin C is a multitasking superstar!

Unlike other animals, we cannot synthesize Vitamin C; therefore, we rely on it through our diet. Without it, we can quickly develop health issues such as scurvy – which affects the skin, wound healing, and hair structure.

What Are the Skin Benefits of Vitamin C?

1. Vitamin C supports collagen synthesis
Thereby promoting healthy skin, hair, bones, muscles, tendons, and ligaments.

How? Its role in the production of amino acids lysine and proline promotes proper folding and stabilisation of collagen within our body.

You may recall the stories about sailors in the 18th Century. They would often die at sea with bleeding gums and wounds that wouldn't heal – typical of the condition, scurvy. It would take only a month of little to no Vitamin C for these effects to begin. The saviour? Packing lemons and other citrus fruit with them on their voyage. Scurvy is characterised by skin fragility, bleeding gums, impaired wound healing, and corkscrew hair.

2. Vitamin C protects against free radical damage

Healthy skin is protected skin. As an antioxidant, Vitamin C has the job of protecting our body from free-radical damage (caused by environmental factors like sun exposure, pollutants, pesticides, and our diet). It's also a team player as it regenerates existing antioxidants in the body like Vitamin E!

Pro Tip

It is worth noting skin UV damage is the top cause of skin ageing.

This is where wearing sunscreen every day, every season (especially here in New Zealand, where our sun is particularly harsh) is key to keeping your skin healthy and youthful. Slip, slop, slap and wrap.

3. Vitamin C inhibits the production of melanin

Melanin is responsible for the pigmentation of our skin. Vitamin C inhibits tyrosinase activity which in turn reduces melanin formation. As a result, this helps the skin maintain an even skin tone and reduces the pigmentation that follows trauma such as scratches, pimples, and burns.

Maintaining Optimal Vitamin C Levels.

Our skin contains naturally high levels of Vitamin C; it accumulates here more than anywhere else in the body. For a good reason, too – high levels of Vitamin C ensures the body has plentiful stores for collagen production and neutralising free radicals before they can cause harm. However, excessive exposure to UV rays or an inadequate diet can deplete these stores.

Restoring your skin's Vitamin C stores can be done in two ways:

- Topical application (through serums and creams)
- Ingesting Vitamin C through diet or supplementation

While topical Vitamin C serums can be great, it highly depends on the formulation of the product and, as a

result, may have limited skin penetration. As Vitamin C is a charged, water-soluble compound, it's naturally repelled by the skin. Therefore, topical formulas require a delivery system (e.g., encapsulation by a liposhepherdic form) to help penetrate skin layers. On top of this, Vitamin C readily degrades when exposed to air and light, so topical applications have to consider this with stabilisers. A golden standard of Vitamin C serums to look out for are ones that combine ferulic acid into their formulation. Ferulic acid is an antioxidant that effectively stabilises Vitamin C in the formulation.

In contrast to topical applications, oral Vitamin C is passed through the bloodstream to the surrounding skin by blood vessels. If the goal is to restore below-par physical stores, ingesting rather than applying Vitamin C will likely produce a better result.

What is the Optimal Dosage of Vitamin C?

New Zealand's Recommended Dietary Intake (RDI) for Vitamin C in healthy adults is 45 mg. Pregnant and breastfeeding women use up their stores more; therefore, they have a higher recommendation of 55–85mg per day. Because Vitamin C is a water-soluble vitamin, it can't accumulate in the body – this means chances of toxicity and overdosing are low.

Skin Benefits: Vitamin C

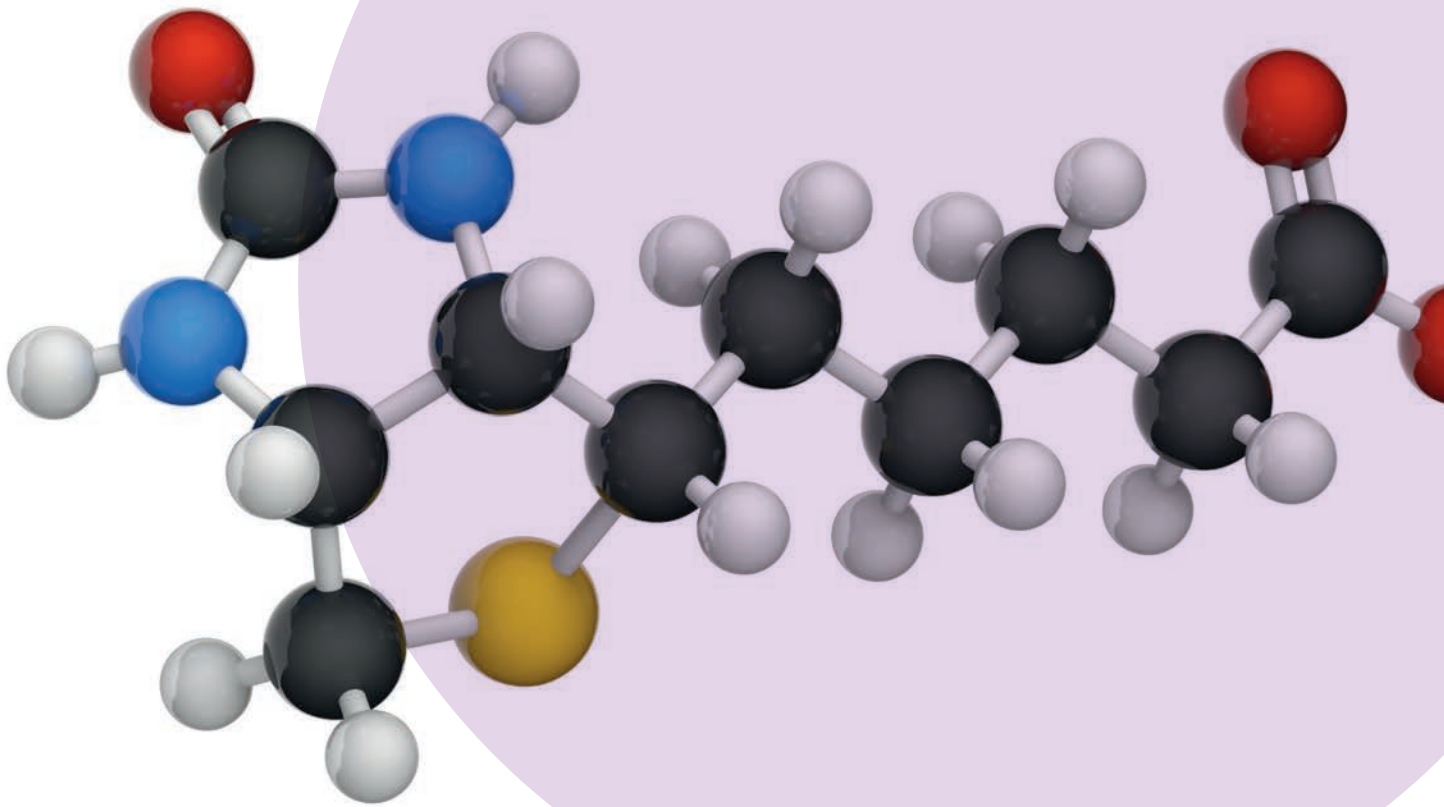
- Promotes healthy ageing of the skin
 - Increased production of collagen
 - Antioxidant protection
 - Downregulates pigmentation formation

Prevents:

- Hyperpigmentation
- Sagging skin and wrinkles

Provides:

- Bright, clear complexion
- Firm and elastic skin



Biotin

The 'it' skin, hair, and nail ingredient.

Biotin is a water-soluble essential vitamin, also known as Vitamin B7 and Vitamin H. Why H? H stands for Haar and Haut - which is Hair and Skin in German.

Biotin is one of the 8 B Complex vitamins specifically known for its handy work in maintaining the beauty trifecta - hair, skin, and nails. The vitamin also has roles in converting carbohydrate, fat, and protein into usable energy. Lastly, biotin has an important function in maintaining a healthy nervous system.

The word biotin comes from the ancient Greek word biotos - meaning 'life' and 'sustenance.'

Biotin Beauty Benefits

1. Thicker nails & healthy, lush hair

Biotin works as a tag team with pantothenic acid (vitamin B5) to strengthen hair and increase nail thickness. Sounds like a match made in heaven. Keratin is a protein found in hair, nails, and skin - in animals; it can also be found in feathers, horns, and wool. Together, they produce amino acids that assist in the production of keratin. In our hair, keratin is crucial for protecting and

providing structure and strength - we can also thank it for taming frizz. Peeling nails? Studies have shown biotin can help firm, thicken and harden weak, brittle nails.

2. Glowing skin

Biotin helps to upregulate important enzymes needed for the formation of fatty acids that help nourish and protect the skin barrier. It has also been shown to help oil glands function as they should - regulating a healthy oil flow. This helps prevent both skin extremes - dry Sahara desert and oily Krispy Kreme glazed doughnut.

3. Blood sugar regulation

Not directly a beauty benefit (although regulating circulating glucose levels could help out hormonal breakouts) - studies have indicated that biotin may help lower blood sugar levels.

Here's the thing: more research is needed around biotin and its potential skin benefits. However, current research indicates that taking biotin in unison with collagen, zinc, and other skin-serving substances will produce a better, synergistic result.

Pro Tip

Getting a blood test? Let your physician know you're on a biotin supplement - as this may affect the results.

Thankfully, only high daily amounts of 10mg or more seem to interfere with results. But to be on the safe side, let your health professional know.

Recommended Daily Intake of Biotin

Like other essential vitamins, we get our daily biotin requirements through our diet. Liver, fish, egg yolks, meat, dairy, nuts, and seeds are all brilliant sources of biotin.

On top of our diet, gut bacteria also can produce biotin. While biotin deficiency is rare in developed countries, pregnant and breastfeeding women use up more biotin and run a higher risk of being deficient. Biotin deficiencies can be seen by thinning hair, brittle nails, scaly, red skin, alopecia, dermatitis, and conjunctivitis.

Now here's the thing, we can't specify an exact amount for the optimal daily biotin intake. Due to insufficient data, New Zealand (and other countries) don't have a defined RDI value for biotin. So

while it's impossible to give an absolute number, we have indications of what amounts are optimal. Instead of an RDI, an Adequate daily Intake (AI) value has been established - 30mcg for men and 25 mcg for women. For pregnant and breastfeeding women, they recommend 30 and 35mcg/daily, respectively. For this reason, you can often find biotin in prenatal and pregnancy supplements.

Biotin is well tolerated and has an excellent safety profile with no toxicity symptoms or upper-intake level established. However, taking too much may imbalance your b-complex vitamins balance, leading to skin issues such as cystic acne (thanks, but no thanks). Therefore, it is best not to overdo it (and it doesn't give you any added benefit!).

Skin, Hair & Nail Benefits: Biotin

- **Promotes healthy, strong nails**
 - Increased nail thickness
- **Promotes healthy hair**
 - Improved hair thickness
 - Increased keratin content
- **Promotes glowing skin**
 - Increased fatty acid production
 - Improved regulation of oil glands

Prevents:

- Brittle, peeling nails
- Weak, break-prone hair

Provides:

- Strong nails
- Healthy hair
- Glowing skin



Zinc

Your body's own underrated essential mineral superstar. Zinc is responsible for being a component of over 200 enzymes and 2000 transcription factors needed to regulate lipid, protein, and gene metabolism and gene transcription. Because zinc assists in cell division, it is crucial during rapid growth and repair times - thus is particularly important in children, teenagers, and pregnant women! Its roles and benefits are far-reaching - we even need it to smell and taste the world around us!

Zinc's benefits aren't limited to our internal body; our skin also reaps the benefits. Its oil-regulating, anti-inflammatory, and anti-bacterial properties are the keys to it being a robust skin supplement.

Zinc Inner-Body and Outer-Skin Benefits

Even though this is a guide on ingestible beauty, the internal health benefits of zinc are too good not to sing about.

Internally, zinc holds many crucial roles in maintaining a healthy, fighting, fit body. Roles include looking after gut, reproductive and immune health. Zinc also helps in the production of hydrochloric acid and neurotransmitters.

Lastly, zinc possesses antioxidant-like properties and is useful in preventing UV-induced cellular damage (the kind that accelerates skin ageing!).

In terms of outer skin benefits, zinc has multiple roles in helping our skin be healthy and blemish-free.

First up, zinc has a crucial role in wound healing. Zinc helps skin cell walls stay intact while also assisting the cells to divide and specialise - so they can close over and heal a wound. Wounds include any type of skin trauma, including burns, abrasions, and popped pimples.

Prone to angry breakouts? Since the 1970s, dermatologists have prescribed oral zinc supplementation to help treat acne. The excellent news, zinc has been shown to have anti-acneic effects. Its anti-inflammatory, anti-bacterial, and oil regulating properties make it an ideal blemish and acne supplement that can help calm redness, reduce acne-causing bacteria and regulate your oil flow.

Are you experiencing other skin issues? It doesn't stop there; studies have suggested other medical skin conditions such as rosacea, psoriasis, seborrheic dermatitis, and alopecia can also be managed with oral supplementation of zinc.

Pro Tip

Are you on an Oral Contraceptive?

Oral Contraceptives are known to deplete the body of essential micronutrients – including zinc. If you are concerned about this, it is best to consult your GP, get your blood levels tested, and adjust your intake as advised.

Summary of Zinc Health and Skin Benefits:

- Role in production of hydrochloric acid
- Role in production of neurotransmitters
- Intestinal barrier function and gut microbiome balance
- Reproductive and immune health
- Protects against harmful UV ray damage
- Assists in wound healing
- Anti-acneic, anti-inflammatory, anti-bacterial and oil-regulating
- Helps to manage other medical skin conditions such as rosacea

Foods Highest in Zinc

Since our bodies cannot synthesise zinc, we rely on obtaining it solely through our diet. The best sources of zinc are from animal products, as animal proteins facilitate the absorption of zinc. Unfortunately, while plant sources like cereals and legumes have good amounts of zinc, they contain phytates that interfere with zinc absorption. As a result, only 20–40% of plant-based zinc is absorbed into the body. Therefore, those following vegetarian or vegan diets are at risk of zinc deficiency and could benefit from a supplemental top-up.

Bluff oyster season? Oysters are the best source of zinc, so if you are partial to a fresh bluffie – help yourself!

Foods Rich in Zinc	Zinc content (mg)
1 raw oyster	1.5
1 cup smoked mussels	4.1
1 grilled beef steak	8
1 grilled chicken breast	1.9
1 wholegrain bread roll	0.8
1 cup chickpeas	1.4
10 peanuts	1.2
1 tbsp pumpkin seeds	1.1
1 cup reduced-fat milk	1
½ cup oats	1.5mg

What is the Optimal Daily Dosage of Zinc?

So, how much zinc per day should we be taking?

New Zealand's RDI for zinc is 14mg for men and 8mg for women daily.

Pregnant and breastfeeding women need a bit more, between 10 and 12 mg per day.

Zinc deficiency

As zinc is not stored in the body for long periods, frequent and consistent dietary top-ups are necessary. Zinc deficiency due to a poor diet may appear as dry, itchy skin, hair loss, reduced ability to taste food, and appetite loss. An inherited zinc deficiency disorder affecting zinc absorption causes a condition called acrodermatitis enteropathica which presents as lesions and rashes across the body.

Surprisingly, zinc deficiency is relatively common – with one-third of the global population currently considered deficient. This is seen in areas like South-East Asia, sub-Saharan Africa, and other developing countries.



Pro Tip

Look through your daily supplements and watch for overlapping ingredients.

Without knowing it, you could be doubling or tripling up on doses and potentially overdosing. If you're unsure, take it to your GP or nutritionist, and they should be able to decipher it for you.

Risk factors for zinc deficiency

- Vegetarians, vegans, or people following a diet that is limited in animal products
- Pregnant or breastfeeding women
- Malnourished or unvaried diet
- People with a digestive disorder
- Women on hormonal contraception

However, more doesn't equal better – too much zinc can deplete your copper stores, disrupt your gut health and weaken your immune system. So, how much zinc is too much? It is recommended not to go over 40mg per day.

As a result, there's a balance that's worth paying attention to.

Skin Benefits: Zinc

- **Promotes healthy, controlled skin ageing**
 - Protects from harmful UV rays
 - Anti-inflammatory

- **Clear complexion**
 - Improved wound healing
 - Targets acne-causing bacteria
 - Regulation of oil flow

Prevents:

- Sagging skin and wrinkles
- Hyperpigmentation

Provides:

- Firm, smooth texture
- Skin elasticity
- Clear, blemish-free skin

Glossary

We cover some new concepts and jargon in this whitepaper. Here is our Ingestible Beauty Glossary to remind you of some of these terms:

AI: Adequate Intake is used when an RDI cannot be defined. It is the average daily nutrient intake value based on studies completed.

Antioxidants: A substance that slows or prevents oxidation by stabilising free radicals.

Bioactive: A substance that has a biological effect.

Collagen: A structural protein found in skin, hair, nails, bones, muscles, and tendons. It is the substance that holds the body together.

Collagen hydrolysate (CH): Also known as hydrolysed collagen – collagen that has been broken down into smaller, more absorbable proteins.

Cytokines: Substances released by immune cells that have an effect (e.g. initiating inflammation) on other cells.

Elastin: A protein with the ability to coil and recoil like a spring – found in connective tissues.

Fat-Soluble Vitamins: Vitamins that do not dissolve in water and are stored in the body.

Fibroblasts: Cells found in connective tissue that produce collagen, elastin and hyaluronic acid.

Free Radicals: An unstable atom that reacts readily with other substances and damages cells by a process called oxidation (stealing an electron).

GAGs: Glycosaminoglycans are long chains of sugar molecules with a number of different roles depending on the structure. One type being hyaluronic acid – used for hydration and lubrication of tissues.

GMP: Good Manufacturing Practice is a regulation set by the government body MedSafe – to ensure consistent safety, efficacy and quality of the manufacture and distribution of therapeutic goods.

Greenwashing: The misleading marketing tactics of a company to convey they are more eco-friendly than they actually are.

Humectant: A substance that can hold and retain moisture.

IU: International Units is an internationally accepted amount of a substance.

MMPS: Matrix Metalloproteinases are enzymes that breakdown proteins like collagen and elastin.

Photosensitive: Having a chemical, electrical or other response to light.

Proteases: Enzymes that cleave and breakdown proteins and peptides.

RDI: Recommended Dietary Intake is the average daily intake value of a nutrient that is likely to meet the nutrient requirements in most people.

RCTs: Randomised Control Trials are a type of study where participants are allocated to each group randomly (e.g. placebo and drug groups).

Sebum: An oily secretion from your sebaceous glands.

Systematic Review: A type of review that has a set question it intends to answer. It uses systematic and reproducible methods to identify, select and critically appraise research studies conducted. For example, a systematic review may review multiple RCTs.

Water-Soluble Vitamins: Vitamins that dissolve in water and cannot be stored in the body.

Topical: A form of application directly onto the skin (e.g. a cream)

Contact & Media Enquiries

Anna Thompson-Ford

CEO & Founder, Pro You

anna@proyou.co.nz

022 426 6211

09 218 2998

Hannah Hanson

Author & Content Creator

hannahljnz@gmail.com

021 234 8439

Disclaimer

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