Skin food

Dr Johanna Ward on the benefits of oral collagen

The skin is the largest organ in the body and is highly proliferative and dynamic. It has a constant physiological turnover and exists in a state of continual replenishment with a huge need for micronutritional support.

We know that what we eat has a direct impact on the skin, with micronutrient deficits affecting its quality, hydration and appearance. We also know that topical skin creams can only do so much and that they cannot possibly substitute for what the blood supply can bring to the skin in terms of vitamins, minerals and fatty acids. But can collagen, specifically oral collagen, be helpful to the skin and this constant renewal process? This article will examine new evidence for oral collagen supplementation and see how it can be used to benefit skin health. We will look at how oral collagen is prepared, how it is absorbed and how it can positively impact the skin.

COLLAGEN

Collagen is the major insoluble fibrous protein found in the extracellular matrix of the skin, together with elastin and hyaluronic acid. The collagen family consist of 28 different types of collagen that account for 25-35% of the total protein mass of humans.

The important types of collagen for the skin are:

- **Collagen I**: This is the commonest form of collagen in the human body and accounts for 90% of human collagen. Type I is considered the key matrix building protein in our skin which gives it structure and firmness. It is also the end product when skin heals and repairs.
- **Collagen III**: Babies and children have a lot of this type of collagen. It is also found in fast growing tissue, especially in early stages of wound healing. It's replaced later by Type I.
- **Collagen V and VI**: Both are typically found alongside Type I.
- **Collagen VII**: Is crucial for skin integrity even though it's present at very low amounts (0.001%.) **Collagen VII** is a component of the anchoring fibrils (acts as an anchor) between the layers of the dermal-epidermal junction.

Collagen plays a pivotal role in the structure and integrity of the skin. As we age we lose our ability to produce collagen and experience a decline in collagen due to fibroblast ageing and reduced collagen synthesis.[1] This results in skin sagging, wrinkles and loss of firmness. Research indicates that by the age of 40 the body's ability to produce collagen decreases by 25%. By age 60, it has decreased by over 50%. So being able to replace our collagen loss, or at the very least being able to support its native production, would be a great thing in terms of anti-ageing and skin health.

Abundant and healthy collagen is important for virtually every tissue in our body; the hair, skin, nails, joints, bone, cartilage and blood vessels all depend on collagen for their structure and integrity. Type I collagen is fundamental to the health of all of these tissues.

In recent years many commercial collagen products have come onto the market. Due to the internet and the anonymity that it provides for sellers, all kinds of collagen and pseudo-collagen products have appeared on the market. It is becomingly increasingly difficult for the consumer to know which brands can be trusted. Many consumer reviews for example may not even be reviewing genuine products but may be reviewing counterfeit or poorly manufactured products.

SKIN CREAMS

Collagen in skin creams is poorly regarded by the scientific community because collagen is too large a molecule to penetrate into the skin and therefore cannot have an impact on the skin's actual

collagen integrity. What collagen skin creams can do is moisturise and hydrate the skin (by reducing water loss or by binding water) and they seem to do this well. But there is no scientific evidence to show that they have any effect on actual collagen quality or quantity.

ORAL COLLAGEN

Many oral collagen products have come on to the market recently. The important thing to consider with collagen supplements is quality. As with all things poor manufacturing techniques will affect end results and outcomes.

Oral collagen supplements need to be dose appropriate, prepared properly (hydrolysed) and well manufactured to have positive benefits on the skin. Below I will outline how oral collagen supplements work and the latest clinical evidence for supplementation with collagen for anti-ageing and skin health.

WHAT IS 'HYDROLYSED' COLLAGEN?

Hydrolysis is the process where collagen is processed and broken down into small chain peptides or amino acids that the body can then utilise. Hydrolysed collagen consists of small peptides with low molecular weight (0.3 - 8 kDa) enriched in specific amino acids: glycine, proline and hydroxyproline taken from native collagen of animals – generally fish, cows and pigs. The quality of hydrolysed collagen is largely dependent on its molecular size, which can vary greatly due to the hydrolysis methodology used.

The process of hydrolysis makes it highly digestible and means the body can effectively utilise it. Hydrolysed collagen is thought to be the only kind of collagen that can impact the skin positively and is what the clinical trails and data to date support.

HOW DO ORAL SUPPLEMENTS WORK?

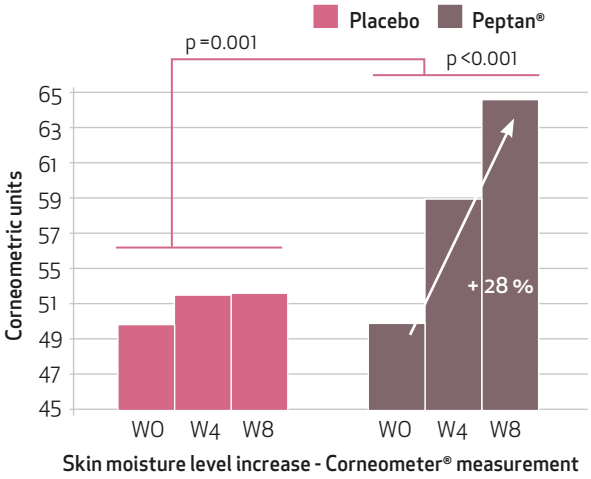
In order to be active in the deeper layer of the skin, hydrolysed collagen must cross the intestinal barrier and be absorbed into the blood stream. Studies by Osser et Al, Iwai et al and Ohara et al have all shown that collagen peptides are absorbed through intestinal membrane epithelial cells and into the blood stream.[2,3,4] They are absorbed in the form of small collagen peptides and free amino acids.[5] They then travel all around the body to the various target tissues, which in the case of collagen is everything including the skin, hair, nails, joints, bones and blood vessels.

Watanabe and Kamiyama have conducted in vivo studies on the distribution of collagen in the body and have shown that 14C labelled proline or collagen peptides have activity in the skin as quickly as two hours after ingestion and this remains high for up to 14 days.[6]

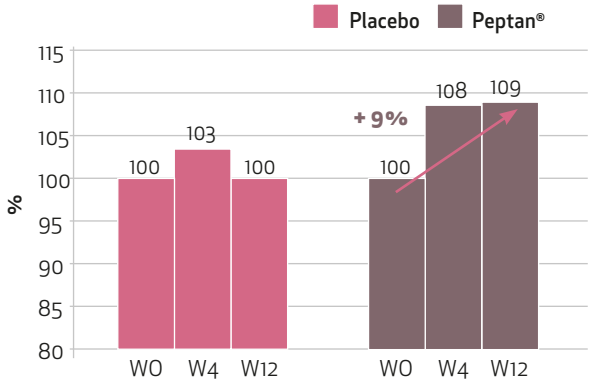
Once it reaches the dermis the hydrolysed collagen peptides and amino acids have a dual action. Firstly, the free amino acids provide building blocks for the formation of new collagen fibres , and secondly the collagen peptides act as ligands and bind to fibroblast receptors to stimulate the production of new collagen, elastin (minor effect) and hyaluronic acid. The following actions of collagen peptides have been evidenced in clinical trials:

1) Stimulation and proliferation of fibroblasts
2) Increase in collagen fibre density and diameter in the dermis
3) Increase in dermal hyaluronic acid production
4) Increase in GAG percentage
5) Activate protection against UV radiation

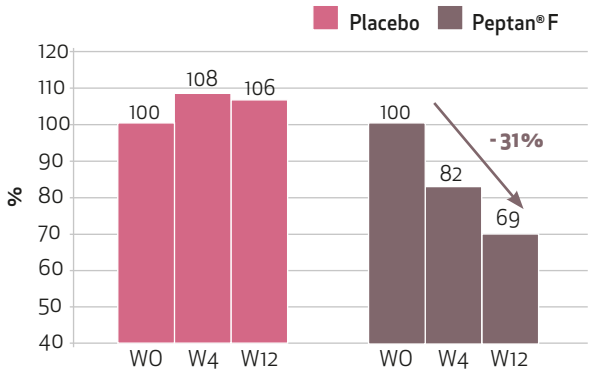
In 2015 a double-blind, randomised, placebo-controlled clinical trial was carried out in Japan on 33 women aged 40-59 years with normal to dry skin. The results showed a 28% >



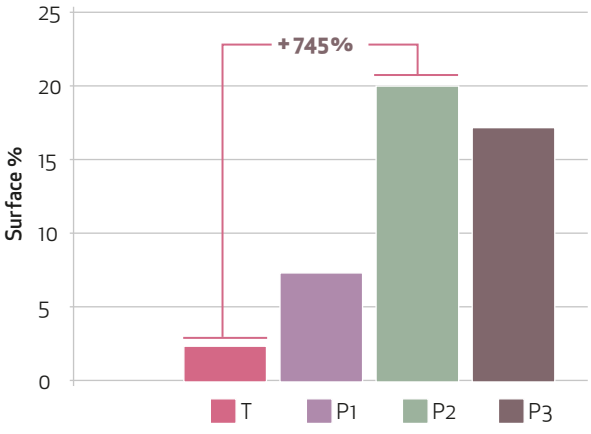
Skin moisture level increase - Corneometer® measurement



Collagen density (relative change) assessed by echography, at week 0, 4, and 12



Collagen fragmentation (relative change) assessed by confocal laser after intake of Peptan®F at week 0,4 and 12



increase in skin hydration by taking 10g of hydrolysed Peptan collagen. (Peptan is the world's leading collagen manufacturer.)

In another study a double-blind, randomised, placebo-controlled clinical trial was carried out in France on 47 women aged 35-55 years with normal to dry skin. They were given oral collagen. The positive outcome group showed a 30% decrease in the formation of deep wrinkles, after supplementation of 10g of hydrolysed collagen for 12 weeks. Collagen density of the dermis was measured by high-frequency real-time ultrasound of the skin with a Dermcup® device and the fragmentation of collagen in the reticular dermis was assessed by reflectance confocal microscopy using a Vivascope3000® device.[7] Collagen fragmentation in the deep dermis was also studied and found to be reduced by 31% after 12 weeks of ingestion of oral collagen.

An ex vivo study[8] examining glycosaminoglycans (GAGs) showed that oral collagen significantly increased the amount of acidic GAGs present in the epidermis by up to 745% in a dose dependent manner, which represents hyaluronic acid increase. The study's conclusion was that collagen helps increase the skin's moisture by increasing the amount of water binding hyaluronic acid in the epidermis.

HOW MUCH?

Daily doses vary from 400mg to 10,000mg per day depending on the brand of collagen used. Most studies suggest a dose of 4,000-10,000mg is the ideal dose for skin health & anti-ageing, brand dependent.

LIQUID, CAPSULES OR POWDER?

It really is a matter of preference and knowing what daily dose you want to achieve. Capsules are designed to break apart and release their powder in the small intestine where absorption takes place. Powders and liquids have the benefit of not needing to go through this process and generally deliver higher doses than capsules.

SIDE EFFECTS

There are few reported problems with high quality collagen supplementation. Very high doses can potentially cause hypercalcaemia due to accumulation of the amino acid hydroxyproline, so patients with a complex medical history are advised to check with their doctor before starting supplementation. But the FDA, WHO and European Commission for Health and Consumer Protection have all confirmed that oral collagen is safe.

SUMMARY

There is increasing clinical data to suggest that supplementation with hydrolysed collagen can indeed have a positive impact on the skin. Collagen fragmentation rates, skin hydration and wrinkle depth can all be positively affected with supplementation of high strength, well manufactured hydrolysed collagen. The clinical studies and trials have small numbers, so ideally more studies will be conducted in the future. The consumer needs to be aware that not all collagens are created equal and that positive results are dose and brand dependent. **AM**

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