White Paper: Collagen

HYDROLYSED COLLAGEN

Collagen accounts for as much as 30% of the body's total protein, especially connective tissue. The amino acid and peptide compositions of dietary collagens are very similar to those in human collagens, making dietary collagen peptides ideal for supporting body collagen turnover and renewal. Compared to other proteins, collagen has a unique amino acid composition and a distinct role in human anatomy. Collagen proteins are rich in the modified amino acid hydroxyproline (12%), and they have an unusually high content of glycine and proline (approx. 22% and 13% respectively). While other dietary proteins can provide these, collagen is a more concentrated source and as such may be a more effective choice when the clinical goal is related to collagen as a structural protein, such as supporting the strength of bone, tendons, muscles and cartilage, as well as the health and appearance of skin.

THE GELITA® DIFFERENCE

GELITA® Bioactive Collagen Peptides (BCPs) are food compounds that directly stimulate the metabolism and target connective cells to produce specific benefits, they do this via cell signalling and by contributing to bodily essential amino acids requirements.

The mode of action of BCPs is related to their unique molecular weight fingerprint, they bind to specific receptors found on the surface of each cell type, stimulating the metabolism of the target cells. The specific molecular weight and structure of gelita peptides allows for optimal cell interaction and elicits long lasting activation and stimulation of the target cells. Each of the various GELITA® BCPs stimulate different cell types; FORTIBONE® supports bone health via stimulating osteoblast and osteoclast function, VERISOL® supports skin health via stimulating fibroblast function, FORTIGEL® supports joint health via supporting chondrocytes and BODYBALANCE® supports body composition via stimulating muscle cells and TENDOFORTE® supports tendon health by stimulating type I, II, IV collagen, proteoglycan, and elastin synthesis.

BIOACTIVE COLLAGEN PEPTIDES® UNIQUE COMPOSITION AND STRUCTURE

GELITA® uses an enzymatic hydrolysis process to produce BCPs from the parent collagen protein. This process is similar to human digestion, however specific, so to consistently obtain the precise bioactive sequences. The BCPs by GELITA include a range of specific polypeptides of optimal molecular weight, containing circa 20-50 amino acid residues, which corresponds to 2-5kDa in size.

BIOACTIVE COLLAGEN PEPTIDE® ABSORPTION

Small yet physiologically significant quantities of polypeptides, ranging in chain length from 3 to 51 amino acids, or even small proteins of nearly 200 amino acids, can be absorbed intact through the adult gut and produce biological effects at the tissue level.

Although the exact mechanism of intact absorption is not completely understood, it appears that paracellular transport seems to be the preferred route due to the narrower shape of BCPs.

Paracellular transport refers to the passage of small peptides through the gut wall. The tight junctions which are the areas in between the gut cells, form pores that allow the diffusion of small peptides (<600Da) to pass through.

When collagen is denatured to produce BCPs, the single helix structure of the collagen type is maintained. The unique structure formed by frequent Proline-Hydroxyproline-Glycine repeats, is more extended and narrower than a normal alpha-helix, so that it provides the favourable folding and stability that facilitates gut absorption.

Proline in particular, is the only cyclic amino acid and it forms kinks in the collagen polypeptide chain that are difficult to accommodate in typical globular proteins. This gives BCPs a functional drill shape that is also resistant to hydrolysis.

Such unique characteristics differentiate BCPs from other polypeptides. Polypeptides generally lack the correct folding and have a low and variable gut permeability, which is the case for the vast majority of polypeptides occurring in normal alpha-helix shape, as well as beta sheets and random coils.

BIOACTIVE COLLAGEN PEPTIDE® BIOAVAILABILITY

BCPs exhibit a true digestibility of 98.4%. The amino acids are important cofactors of peptide digestion, as they are the protein building blocks of new connective tissue, once the target cells have been directly stimulated by the bioactive peptide fractions.

Approximately 10% of the BCPs stay intact during digestion and are available for direct target tissue cell stimulation.

FORTIBONE®
Collagen Matrix Stimulation

The specific peptides of FORTIBONE® stimulate bone cells to increase the synthesis of bone components such as collagen. They have a kind of 'signaling effect' on osteoblasts to counterbalance the collagen degradation in the extracellular bone matrix, which is the essential framework for bone mineralization. In addition FORTIBONE® influences degenerative processes in bones by reducing osteoclast activity. The result is a considerably higher synthesis of collagenous bone matrix.

FORTIBONE® RESEARCH

Clinical, pre-clinical and in vitro research is accumulating to support the benefits of BCPs for bone health.[45] This is complementary to the classical approach of ensuring adequate status for bone-supportive nutrients such as calcium, magnesium, silicon and vitamin D, K1 and K2.

In a study of menopausal women with osteopenia or osteoporosis, compared to placebo, supplementation with 5g per day of FORTIBONE® resulted in an improvement in bone mineral density (BMD) by 6.4% in the femoral neck and 5.5% in the spine, as well as increased markers of bone formation (PINP), with no change in markers of bone breakdown (CTX 1).[28] The placebo group experienced no changes in BMD and PINP but showed no increase in CTX 1.

Another study showed that post-menopausal women who supplemented with 10g of collagen peptide blend (previous version of FORTIBONE®) for 3 years reported a fracture rate of just 9%, compared to 42% in a group treated only with calcium.[53] Another study supplemented a 10g dose of collagen peptides in conjunction with calcitonin and reported a higher reduction in bone resorption than in the intervention group with calcitonin alone.[29]

Animal studies have also demonstrated benefits of collagen peptide supplementation, including reduced fracture risk, increased BMD, organic mass and collagen content of bone, accelerated fracture healing and improved markers of bone turnover in ovariectomized rates and bone development during growth.[30-33,36,45]

Based on evidence presented above, supplementation with FORTIBONE® demonstrates the potential to improve both essential components of bone – the minerals and the organic content, with emphasis on the collagen related matrix. Both of these aspects contribute to the demonstrated reduction of fracture rate.[54]

FORTIGEL®
The Joint Health Revolution

Optimized specific BCPs of FORTIGEL® have been proven to activate the growth of new cartilage by stimulating cells, helping to ease joint discomfort and make the joints smooth and mobile.

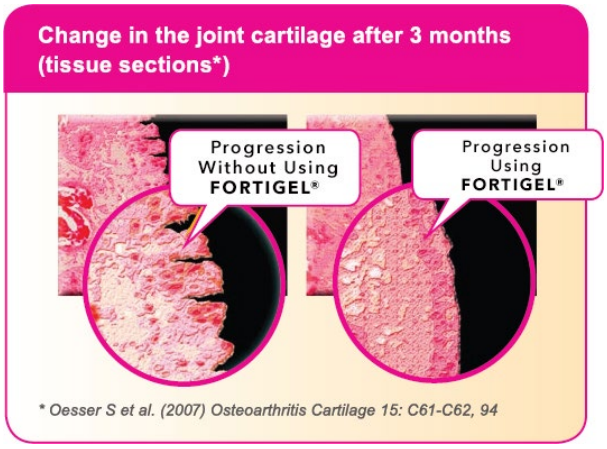
FORTIGEL® BCPs have been shown to improve collagen production in joints, resulting in improved cartilage structure (increased glycosaminoglycans content as evidenced by MRI and joint space by X-ray), reduced osteoarthritis symptoms (pain, stiffness), improved joint function, reduced post-exercise joint pain in young athletes and improved ankle stability.[16-26,47,48] Most athletic injuries occur at tendon sites, likely because the tendon is often the weakest link in the chain of transmitting mechanical force. Since the tendon is composed of 60-80% collagen, collagen peptide supplementation has potential to support improved tendon strength and elasticity.

FORTIGEL® RESEARCH

A study held at Penn State University (2008) with 147 athletes who experienced activity related joint pain. Subjects were divided into 2 groups, one taking 10g of FORTIGEL® collagen peptide per day and the other group taking placebo. The study was prospective, randomized, double-blind and placebo controlled. The study ran over a 24 week period. Both groups were assessed for several parameters referring to pain, mobility and inflammation.

Results showed significant changes with those taking the FORTIGEL® supplement across the following parameters when compared to placebo; reduced joint pain at rest (p=0.001), reduced joint pain when walking (p=0.003), reduced joint pain when standing (p=0.011), reduced joint pain when carrying objects (p=0.014), and reduced joint pain when lifting (p=0.018)

The results suggest that active people consuming FORTIGEL® can reduce parameters such as pain that has a negative effect on physical activity.[55]

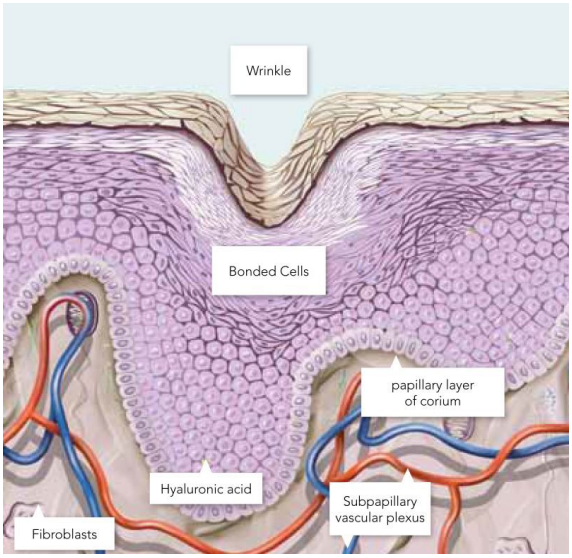


VERISOL®
Beauty from Within

VERISOL® consists of special BCPs – which are important components for supporting healthy skin. Administered orally, VERISOL® influences the skin's collagen metabolism directly from the inside. It increases the skin moisture and delays the formation of wrinkles.[15]

VERISOL® collagen peptide blend has been shown to upregulate synthesis of collagen, elastin and glycosaminoglycans in the dermal layer of facial skin, resulting in reduced wrinkles, improved skin elasticity and hydration.[14,15]

The BCPs of VERISOL® are recognized by the fibroblast cells in the dermal layer of the skin as collagen fragments like those resulting from catabolic activities. The fibroblast cells they are stimulated to increase their collagen metabolism to counterbalance the pretended collagen degradation in the dermis. The result is a considerably higher production of dermal collagen.



VERISOL® RESEARCH

VERISOL® has also demonstrated the ability to improve cellulite appearance by increasing dermal thickness and elasticity.[38] These benefits may also be used in counteracting age-related skin thinning, manifested as 'crepe' like appearance.

Another study shows VERISOL® to reduce inflammatory processes in the skin, with potential for alleviating various clinical inflammatory conditions manifested in epithelial tissues.[7,8] Various collagen peptides have been shown to speed healing of bed sores in the elderly,[43] support healing of stomach ulcerations[40,41] and to have anti-inflammatory healing effects in colitis.[39]

Women aged between 35 and 55 years revealed that VERISOL® leads to significantly higher skin elasticity – up to 15 % – compared to placebo treatment. This effect could be measured after just 4 weeks of treatment and persisted after 8 weeks of oral VERISOL® administration.

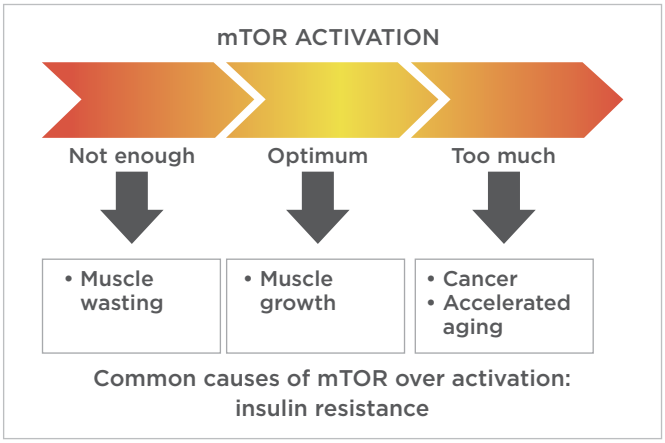
Another 4 weeks after the last intake of VERISOL® still showed higher skin elasticity levels than in the placebo treated group.

BODYBALANCE® collagen peptide has shown to decrease fat mass, increase lean body mass and to provide more muscle strength in combination with resistance training.

BODYBALANCE® specifically works on two main components of the human body; Lean body mass and fat mass via stimulation of 2 specific pathways – mTOR and AMPK.

The mTOR pathway is essential for protein metabolism, which ensures a balance between protein synthesis and protein degradation (remembering more synthesis than degradation indicates an anabolic state that builds lean tissues and a higher breakdown than synthesis indicates a catabolic state, resulting in a decrease in lean tissue).

BODYBALANCE® also influences fat metabolism via stimulation of AMPK, leading to an increase in fatty acid metabolism and an increase in energy for cells resulting in a reduction of fat mass.



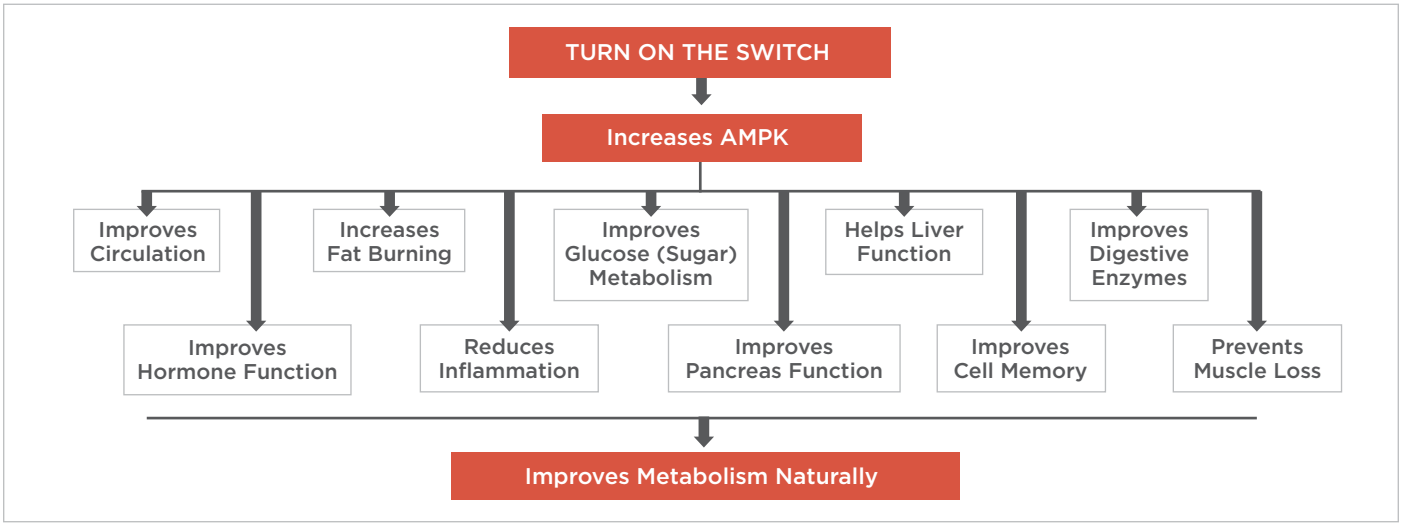
BODYBALANCE® RESEARCH

Several randomised, placebo controlled, double blinded studies have demonstrated the efficacy of BODYBALANCE® collagen peptide when combined with resistance training. The results showed an increase in fat free mass, muscle strength, and a higher reduction in fat mass.

In 2019 Zdzieblik et al studied the effect of BODYBALANCE® BCP and its effects on sarcopenia.[53] Male subjects with age related decline in muscle mass, subjects were given a 15g serve of BODYBALANCE® post exercise, 3 sessions a week over a period of 12 weeks. Results showed a greater increase in fat free mass 4.22 kg versus 2.9kg, a greater decrease in fat mass – 5.45kg versus 3.51kg, and a greater increase in muscle strength 16.12nm versus 7.38nm. This study also reported a reduction of fat mass of 5.4kg which was likely due to an increase in metabolic rate.[50]

Studies have also shown an increase in fat free mass and decrease in body fat percentage in premenopausal women while taking 15g of BODYBALANCE® along with resistance training 3 times a week. Suggesting collagen peptides in combination with resistance training improves body composition and muscle strength in premenopausal women.[49]

References supplied on request.



TENDOFORTE®
For Connective Strength

TENDOFORTE® is unique blend of BCPs that have been formulated to support the health of the body's connective tissue such as tendons and ligaments. It has been shown to increase the expression of extracellular matrix molecules resulting in an increase in the production of collagen types I and III, proteoglycans and elastin. This results in increases in connective tissue firmness. Administration of TENDOFORTE® may also result in a reduction in the enzymatic or activity – induced upregulation of inflammatory compounds.[55]

TENDOFORTE® can positively affect the functional and mechanical properties of connective tissues including proteoglycans and elastin in ligaments and tendons. TENDOFORTE® supplementation (along with well-structured strengthening exercises and back-to-fitness plans) increases the tensile strength of ligaments and tendons, helping to alleviate an existing injury, stabilise the injured joint, improve joint function and prevent re-injury.[55,56]

TENDOFORTE® RESEARCH

TENDOFORTE® has been clinically trialled on two occasions, both trials showing an increase in the tensile strength of tendinous tissues.

Dressler (2018)[55] conducted a randomised, double-blind, placebo-controlled clinical trial looking at the effects of 5g daily TENDOFORTE® supplementation on chronic ankle instability in active people. The results of the study showed improvements in tensile load, stiffness and strength of the affected connective tissue, as well as the perception of joint stability in the treated subjects who felt that the joint was less likely to "give way" during physical activity. These results were not experienced by the placebo group.

The German version of the Foot and Ankle Ability Measure (FAAM-G) and the Cumberland Ankle Instability Toll (CAIT) were used for objective measurements of connective tissue health and function. Subjective ankle stability was improved in both the CAIT ($p < 0.001$) and the FAAM-G ($p < 0.001$) following TENDOFORTE® supplementation compared with placebo.

3-month follow-up analysis showed a decrease in relapsing injury rates in comparison to the placebo group suggesting superior tissue repair and injury prevention outcomes over placebo.

Praet (2019)[56] studied the effects of TENDOFORTE® on symptoms and tendon vascularisation in patients with chronic mid-portion Achilles Tendinopathy in a double-blind placebo-controlled cross-over clinical trial. Treatment included a 5gm daily dose of TENDOFORTE® in combination with a structured exercise program. Study duration was 6 months with a 3 month cross over point.

Victorian Institute of Sport Assessment – Achilles (VISA-A) questionnaires and microvascularity measurements using contrast enhanced ultrasonography were used as outcome measurement tools. Both groups experienced improvements in VISA-A scores and reductions in microvascularity of the tendon during the active treatment phase of the study.

The authors concluded that TENDOFORTE® supplementation may expedite the benefits of exercised based programs in patients with Achilles tendinopathy.

References supplied on request.