

# Bibliography

This document lists supportive literature for the efficacy of collagen peptides in human health and nutrition.

*Updated – March 2023*

## Content

- Bioavailability
- Skin beauty
- Joint health
- Bone health
- Sports nutrition
- Digestive Health
- Elderly Nutrition

Articles are marked as follows:

\* Study performed with Peptan®

\*\* Study performed with Peptan® - containing end product

\*\*\* Study performed with Colartix®

^ Article with Rousselot contribution

## Bioavailability

- 1. Hydroxyproline-containing dipeptides and tripeptides quantified at high concentration in human blood after oral administration of gelatine hydrolysate.** Ichikawa S, Morifuji M, Ohara H, Matsumoto H, Takeuchi Y, Sato K (2010)  
International Journal of Food Sciences and Nutrition 61 (1): 52-60  
<https://doi.org/10.3109/09637480903257711>
- 2. Identification of food-derived collagen peptides in human blood after oral ingestion of gelatin hydrolysates.**  
Iwai K, Hasegawa T, Taguchi Y, Morimatsu F, Sato K, Nakamura Y, Higashi A, Kido Y, Nakabo Y, Ohtsuki K (2005)  
Journal of Agricultural and Food Chemistry 53 (16): 6531-6536  
<https://doi.org/10.1021/jf050206p>
- 3. Ingestion of a protein hydrolysate is accompanied by an accelerated in vivo digestion and absorption rate when compared with its intact protein.**  
Koopman R, Crombach N, Gijsen AP, Walrand S, Fauquant J, Kies AK, Lemosquet S, Saris WHM, Boirie Y, van Loon LJC (2009)  
American Journal of Clinical Nutrition 90 (1): 106-115  
<https://doi.org/10.3945/ajcn.2009.27474>
- 4. Dose-dependent changes in the levels of free and peptide forms of hydroxyproline in human plasma after collagen hydrolysate ingestion.**  
Shigemura Y, Kubomura D, Sato Y, Sato K (2014)  
Food Chemistry 159: 328-332  
<https://doi.org/10.1016/j.foodchem.2014.02.091>
- 5. Quantification of hydroxyprolyl-glycine (Hyp-Gly) in human blood after ingestion of collagen hydrolysate.**  
Sugihara F, Inoue N, Kuwamori M, Taniguchi M (2012)  
Journal of Bioscience and Bioengineering 113 (2): 202-203  
<https://doi.org/10.1016/j.jbiosc.2011.09.024>

6. **Changes in composition and content of food-derived peptide in human blood after daily ingestion of collagen hydrolysate for 4 weeks.**

Shigemura Y, Suzuki A, Kurokawa M, Sato Y, Sato K (2018)

Journal of the Science of Food and Agriculture 98(5): 1944-1950

<https://doi.org/10.1002/jsfa.8677>

7. **\*^Non-targeted and targeted analysis of collagen hydrolysates during the course of digestion and absorption.**

Kleinnijenhuis AJ, van Holthoon FL, Maathuis AJH, Vanhoecke B, Prawitt J, Wauquier F, Wittrant Y (2020)

Analytical and Bioanalytical Chemistry 412 (4): 973-982

<https://doi.org/10.1007/s00216-019-02323-x>



## Skin beauty

1. **\*^The effect of oral collagen peptide supplementation on skin moisture and the dermal collagen network: evidence from an *ex vivo* model and randomized, placebo-controlled clinical trials.**  
Asserin J, Lati E, Shioya T, Prawitt J (2015)  
Journal of Cosmetic Dermatology 14 (4): 291-301  
<https://doi.org/10.1111/jocd.12174>
2. **\*\*Effects of collagen-derived bioactive peptides and natural antioxidant compounds on proliferation and matrix protein synthesis by cultured normal human dermal fibroblasts.**  
Edgar S, Hopley B, Genovese L, Sibilla S, Laight D, Shute J (2018)  
Scientific reports 8(1): 10474  
<https://doi.org/10.1038/s41598-018-28492-w>
3. **\*\*Daily consumption of the collagen supplement Pure Gold Collagen® reduces visible signs of aging.**  
Borumand M, Sibilla S (2014)  
Clinical Interventions in Aging 9: 1747-1758  
<https://doi.org/10.2147/CIA.S65939>
4. **An oral supplementation based on hydrolyzed collagen and vitamins improves skin elasticity and dermis echogenicity: a clinical placebo-controlled study.**  
Campos PM, Melo MO, Calixto LS, Fossa MM (2015)  
Clinical Pharmacology & Biopharmaceutics 4 (3): 142  
<https://doi.org/10.4172/2167-065X.1000142>

\* Study performed with Peptan

\*\* Study performed with Peptan-containing end product

5. **Effects of collagen peptide ingestion on UV-B-induced skin damage.**

Tanaka M, Koyama YI, Nomura Y (2009)

Biosciences, Biotechnology and Biochemistry 73 (4): 930-932

<https://doi.org/10.1271/bbb.80649>

6. **Decreased collagen production in chronologically aged skin.**

Varani J, Dame MK, Rittie L, Fligiel S, Kang S, Fisher G, Voorhees JJ (2006)

American Journal of Pathology 168 (6): 1861-1868

<https://doi.org/10.2353/ajpath.2006.051302>

7. **Oral Supplementation with Low-molecular-weight Collagen Peptides Improves Hydration, Facial Lifting, Dermal Density, Skin Desquamation and Nails: A Randomized, Double-blind, Placebo-controlled, and Maintenance of Effect Study.**

Lee SH, Park HK, Lee HJ, Jo AR, Lee EJ, Hwang SH, Chung HC, Jin-Hee Lee JH, Kim DU, Lee J, Moon TK

Journal of Food and Nutrition Research, 2022, Vol. 10, No. 8, 546-559

<https://doi.org/10.1089/jmf.2022.K.0097>

8. **Oral Intake of Enzymatically Decomposed AP Collagen Peptides Improves Skin Moisture and Ceramide and Natural Moisturizing Factor Contents in the Stratum Corneum**

Jung K, Kim SH, Joo KM, Lim SH, Shin JH, Roh J, Kim E, Park CW, Kim W.  
Nutrients. 2021 Dec 6;13(12):4372

<https://doi.org/10.3390/nu10070826>

9. **\* Oral intake of Bioactive Collagen Peptides in the improvement of skin and hair: clinical studies by instrumental measurements.**

Campos PMBGM, Melo MO, Shirata MMF, Leite MG

Biopharmaceutical Sciences, Biomed Biopharm Res., 2022; 19(2):379-496

[10.19277/bbr.19.2.297.en](https://doi.org/10.19277/bbr.19.2.297.en) (alies.pt)



## Joint health

1. **A randomized controlled trial on the efficacy and safety of a food ingredient, collagen hydrolysate, for improving joint comfort.**

Benito-Ruiz P, Camacho-Zambrano MM, Carrillo-Arcentales JN, Mestanza-Peralta MA, Vallejo-Flores CA, Vargas-López SV, Villacís-Tamayo RA, Zurita-Gavilanes LA (2009)

International Journal of Food Sciences and Nutrition 60 (S2): 99-113

<https://doi.org/10.1080/09637480802498820>

2. **Effect of collagen hydrolysate in articular pain: A 6-month randomized, double-blind, placebo controlled study.**

Bruyère O, Zegels B, Leonori L, Rabenda V, Janssen A, Bourges C, Reginster JY (2012)

Complementary Therapies in Medicine 20 (3): 124-30

<https://doi.org/10.1016/j.ctim.2011.12.007>

3. **24-Week study on the use of collagen hydrolysate as a dietary supplement in athletes with activity-related joint pain.**

Clark KL, Sebastianelli W, Flechsenhar KR, Aukermann DF, Meza F, Millard RL, Deitch JR, Sherbondy PS, Albert A (2008)

Current Medical Research and Opinion 24 (5): 1485-1496

<https://doi.org/10.1185/030079908X291967>

4. **\*Daily oral consumption of hydrolyzed type 1 collagen is chondroprotective and anti-inflammatory in murine posttraumatic osteoarthritis**

Dar Q-A, Schott EM, Catheline SE, Maynard RD, Liu Z, Kamal F, Farnsworth CW, Ketz JP, Mooney RA, Hilton MJ, Jonason JH, Prawitt J, Zuscik MJ (2017)

PLoS ONE 12 (4): e0174705

<https://doi.org/10.1371/journal.pone.0174705>

5. **\*Collagen peptides improve knee osteoarthritis in elderly women.**

Jiang JX, Yu S, Huang QR, Zhang XL, Zhang CQ, Zhou JL, Prawitt J (2014)  
Agro Food Industry Hi Tech 25 (2): 19-23

6. **Effects of pro-hyp, a collagen hydrolysate-derived peptide, on hyaluronic acid synthesis using in vitro cultured synovium cells and oral ingestion of collagen hydrolysates in a guinea pig model of osteoarthritis.**

Ohara H, Iida H, Ito K, Takeuchi Y, Nomura Y (2010) Biosciences,  
Biotechnology and Biochemistry 74 (10): 2096-2099  
<https://doi.org/10.1271/bbb.100193>

7. **Efficacy and tolerance of enzymatic hydrolysed collagen (EHC) vs. glucosamine sulphate (GS) in the treatment of knee osteoarthritis (KOA).**

Trč T, Bohmová J (2011)  
International Orthopaedics 35 (3): 341-34  
<https://doi.org/10.1007/s00264-010-1010-z>



8. **\*\*\* ^Development of a mobile application to monitor the effectiveness of a hydrolyzed cartilage matrix supplement on joint discomfort: a real-life study**

Newman C, Adriaens E, Virgilio N, Vleminckx S, de Pelsmaecker S; Prawitt J; Silva CIF  
Accepted for publication in JMIR Formative Research, in press.

9. **^A White Paper on Collagen Hydrolyzates and Ultrahydrolyzates: Potential Supplements to Support Joint Health in Osteoarthritis?**

Current Rheumatology Reports (2021) 23: 78

<https://doi.org/10.1007/s11926-021-01042-6>

10. **Effects of Non-Essential Amino Acids on Knee Joint Conditions in Adults: A Randomised, Double-Blind, Placebo-Controlled Trial**

Nutrients 2022, 14, 3628.

<https://doi.org/10.3390/nu14173628>



## Bone health

1. **^Biological effect of hydrolyzed collagen on bone metabolism.**

Daneault A, Prawitt J, Fabien-Soulé V, Coxam V, Wittrant Y (2017)

Critical Reviews in Food Science and Nutrition 57 (9): 1922-1937

<https://doi.org/10.1080/10408398.2015.1038377>

2. **\*Hydrolyzed collagen contributes to osteoblast differentiation in vitro and subsequent bone health in vivo.**

Daneault A, Coxam V, Fabien-Soulé V, Wittrant Y (2014)

Osteoarthritis and Cartilage 22: S131

<https://doi.org/10.1016/j.joca.2014.02.240>

3. **\* Hydrolyzed peptides improve bone metabolism and biomechanical parameters in ovariectomized mice: an in vitro and in vivo study.**

Guillerminet F, Beaupied H, Fabien-Soulé V, Tomé D, Benhamou CL, Roux C, Blais A (2010)

Bone 46 (3): 827-834

<https://doi.org/10.1016/j.bone.2009.10.035>

4. **\*Hydrolyzed collagen improves bone status and prevents bone loss in ovariectomized C3H/HeN mice.**

Guillerminet F, Fabien-Soulé V, Even PC, Tomé D, Benhamou CL, Roux C, Blais A (2012)  
Osteoporosis International 23 (7): 1909-1919  
<https://doi.org/10.1007/s00198-011-1788-6>

5. **Effects of cod bone gelatin on bone metabolism and bone microarchitecture in ovariectomized rats.**

Han XL, Xu YJ, Wang JB, Pei XR, Yang RY, Li N, Li Y (2009)  
Bone 44 (5): 942-947  
<https://doi.org/10.1016/j.bone.2008.12.005>

6. **Combined oral administration of bovine collagen peptides with Calcium citrate inhibits bone loss in ovariectomized rats.**

Liu JL, Wang YH, Song SJ, Wang XJ, Qin YY, Si SY, Guo YC (2015)  
PLoS ONE 10 (8): e0135019  
<https://doi.org/10.1371/journal.pone.0135019>

7. **\* Hydrolyzed peptides improve bone metabolism and biomechanical parameters in ovariectomized mice: an in vitro and in vivo study.**  
Guillerminet F, Beaupied H, Fabien-Soulé V, Tomé D, Benhamou CL, Roux C, Blais A (2010)  
Bone 46 (3): 827-834  
<https://doi.org/10.1016/j.bone.2009.10.035>
  
8. **\*Hydrolyzed collagen improves bone status and prevents bone loss in ovariectomized C3H/HeN mice.**  
Guillerminet F, Fabien-Soulé V, Even PC, Tomé D, Benhamou CL, Roux C, Blais A (2012)  
Osteoporosis International 23 (7): 1909-1919  
<https://doi.org/10.1007/s00198-011-1788-6>
  
9. **Effects of cod bone gelatin on bone metabolism and bone microarchitecture in ovariectomized rats.**  
Han XL, Xu YJ, Wang JB, Pei XR, Yang RY, Li N, Li Y (2009)  
Bone 44 (5): 942-947  
<https://doi.org/10.1016/j.bone.2008.12.005>
  
10. **Combined oral administration of bovine collagen peptides with Calcium citrate inhibits bone loss in ovariectomized rats.**  
Liu JL, Wang YH, Song SJ, Wang XJ, Qin YY, Si SY, Guo YC (2015)  
PLoS ONE 10 (8): e0135019  
<https://doi.org/10.1371/journal.pone.0135019>

11. **\*^Human Enriched Serum Following Hydrolysed Collagen Absorption Modulates BoneCell Activity: from Bedside to Bench and Vice Versa.**

Wauquier F, Daneault A, Granel H, Prawitt J, Fabien-Soulé V, Berger J, Pereira B, Guicheux J, Rochefort GY, Meunier N, Blot A, Wittrant Y (2019)

Nutrients 11 (6): 1249

<https://doi.org/10.3390/nu11061249>

12. **Dietary Collagen Hydrolysates Retard Estrogen Deficiency-Induced Bone Loss through Blocking Osteoclastic Activation and Enhancing Osteoblastic Matrix Mineralization**

Biomedicines **2022**, 10, 1382.

<https://doi.org/10.3390/biomedicines10061382>



## Sports nutrition

1. **International Society of Sports Nutrition Position Stand: protein and exercise.**

Jäger R, Kerksick CM, Campbell BI, et al.

Journal of the International Society of Sports Nutrition 2017; 14:20

<https://doi.org/10.1186/s12970-017-0177-8>

2. **Protein supplementation augments the adaptive response of skeletal muscle to resistance-type exercise training: a meta-analysis.**

Cermak NM, Res PT, De Groot LCPGM, Saris WHM, van Loon LJC (2012)

American Journal of Clinical Nutrition 96 (6): 1454-1464

<https://doi.org/10.3945/ajcn.112.037556>

3. \* ^**The effects of collagen peptides on muscle damage, inflammation and boneturnover following exercise: a randomized, controlled trial.**

Clifford T, Ventress M, Allerton DM, Stansfield S, Tang JCY, Fraser WD, Vanhoecke B, Prawitt J, Stevenson E (2019)

Amino Acids 51 (4): 691-704

<https://doi.org/10.1007/s00726-019-02706-5>

4. **Effect of protein intake on bone and muscle mass in the elderly.**

De Souza Genaro P, Araujo Martini L (2010)

Nutrition Reviews 68 (10): 616-623

<https://doi.org/10.1111/j.1753-4887.2010.00321.x>

5. **Protein intake and exercise for optimal muscle function with aging:  
Recommendations from the ESPEN Expert Group.**

Deutz NEP, Bauer JM, Barazzoni R, Biolo G, Boirie Y, Bosy-Westphal A, Cederholm T, Cruz-Jentoft A, Krznaric Z, Sreekumaran N, Singer P, Teta D, Tipton K, Calder PC (2014)

Clinical Nutrition 33 (6): 929-936

<https://doi.org/10.1016/j.clnu.2014.04.007>

6. **Effects of whey and fortified collagen hydrolysate protein supplements on nitrogen balance and body composition in older women.**

Hays NP, Kim H, Wells AM, Kajkenova O, Evans WJ (2009)

Journal of the American Dietetic Association 109 (6): 1082-1087

<https://doi.org/10.1016/j.jada.2009.03.003>

7. **IOC consensus statement: dietary supplements and the high-performance athlete.**

Maughan RJ, Burke LM, Dvorak J, Larson-Meyer DE, Peeling P, Phillips SM, ... & Meeusen R (2018)

International Journal of Sport Nutrition and Exercise Metabolism 28 (2): 104-125

<http://dx.doi.org/10.1136/bjsports-2018-099027>

8. **Effect of protein source and quantity on protein metabolism in elderly women.**

Pannemans DLE, Wagenmakers AJM, Westerterp KR, Schafsmaa G, Halliday D (1998)

American Journal of Clinical Nutrition 68 (6): 1228-1265

<https://doi.org/10.1093/ajcn/68.6.1228>



9. **Dietary protein for athletes: From requirements to optimum adaptation.**

Phillips SM, van Loon LJC (2011)

Journal of Sports Sciences 29 (Suppl1): S29-S38

<https://doi.org/10.1080/02640414.2011.619204>

10. \* ^**The effects of collagen peptides on exercise-induced gastrointestinal stress: a randomized, controlled trial**

European Journal of Nutrition 62, 1027-1039 (2023)

<https://doi.org/10.1007/s00394-022-03051-2>

11. **24-Week study on the use of collagen hydrolysate as a dietary supplement in athletes with activity-related joint pain.**

Clark KL, Sebastianelli W, Flechsenhar KR, Aukermann DF, Meza F, Millard RL, Deitch JR, Sherbondy PS, Albert A (2008)

Current Medical Research and Opinion 24 (5): 1485-1496

<https://doi.org/10.1185/030079908X291967>



## Digestive Health

1. \* **^Effect of a Daily Collagen Peptide Supplement on Digestive Symptoms in Healthy Women: 2-Phase Mixed Methods Study**

Abrahams M, O'Grady R, Prawitt J  
JMIR Form Res 2022;6(5):e36339  
<https://doi.org/10.2196/36339>

2. **Jellyfish Collagen Hydrolysate Alleviates Inflammation and Oxidative Stress and Improves Gut Microbe Composition in High-Fat Diet-Fed Mice**

Lv Z, Zhang C, Song W, Chen Q. and Wang Y. Hindawi  
Mediators of Inflammation Volume 2022, Article ID 5628702, 8 pages  
<https://doi.org/10.1155/2022/5628702>

3. \* **^The effects of collagen peptides on exercise-induce gastrointestinal stress: a randomized, controlled trial**

European Journal of Nutrition 62, 1027–1039 (2023)  
<https://doi.org/10.1007/s00394-022-03051-2>



## Elderly Nutrition

1. **Effects of whey and fortified collagen hydrolysate protein supplements on nitrogen balance and body composition in older women.**

Hays NP, Kim H, Wells AM, Kajkenova O, Evans WJ (2009) Journal of the American Dietetic Association 109 (6): 1082-1087

<https://doi.org/10.1016/j.jada.2009.03.003>

2. **Effect of protein source and quantity on protein metabolism in elderly women.**

Pannemans DLE, Wagenmakers AJM, Westerterp KR, Schafsmaa G, Halliday D (1998) American Journal of Clinical Nutrition 68 (6): 1228-1265

<https://doi.org/10.1093/ajcn/68.6.1228>

3. **Effect of protein intake on bone and muscle mass in the elderly.**

De Souza Genaro P, Araujo Martini L (2010) Nutrition Reviews 68 (10): 616-623

<https://doi.org/10.1111/j.1753-4887.2010.00321.x>

4. **Protein intake and exercise for optimal muscle function with aging: Recommendations from the ESPEN Expert Group.**

Deutz NEP, Bauer JM, Barazzoni R, Biolo G, Boirie Y, Bosy-Westphal A, Cederholm T, Cruz- Jentoft A, Krznaric Z, Sreekumaran N, Singer P, Teta D, Tipton K, Calder PC (2014) Clinical Nutrition 33 (6): 929-936

<https://doi.org/10.1016/j.clnu.2014.04.007>

