Peptan
A world of potential

Rousselot
by Darling Ingredients

The **science** behind **collagen** for **sports nutrition** and **active lifestyle**

COLLAGEN PEPTIDES FOR SPORTS NUTRITION
Science Brochure

rousselot.com/health

UP YOUR GAME AND JOIN THE Peptan TEAM!

Picture yourself right after a very intense training session. What a nice feeling! Isn't it? However, your muscles are starting to feel a little sore. Can you feel them? And the day after, it only gets worse… After strenuous exercise our muscles experience some damage, causing us not only pain but also making it harder to reach the same intensity in the following trainings [1].

So, what if we could offer a solution?

Peptan collagen peptides are more than just another protein supplement. **Collagen is present everywhere in our body and is responsible for our body's strength, structure, and flexibility**. As one of the major components of our connective tissue, present in the skin, muscles, bones, joints, tendons, and ligaments, collagen is one of the most important proteins for athletes [2]. Performing sports, especially at high intensity, can damage the connective tissue affecting our performance. But no need to panic. Scientific studies have shown that **dietary collagen peptides can promote our own collagen production** [3, 4]. And there's more! As suggested by Rousselot's scientific studies explained below, **Peptan** could be linked to additional benefits, like **boosting recovery and enhancing performance**.

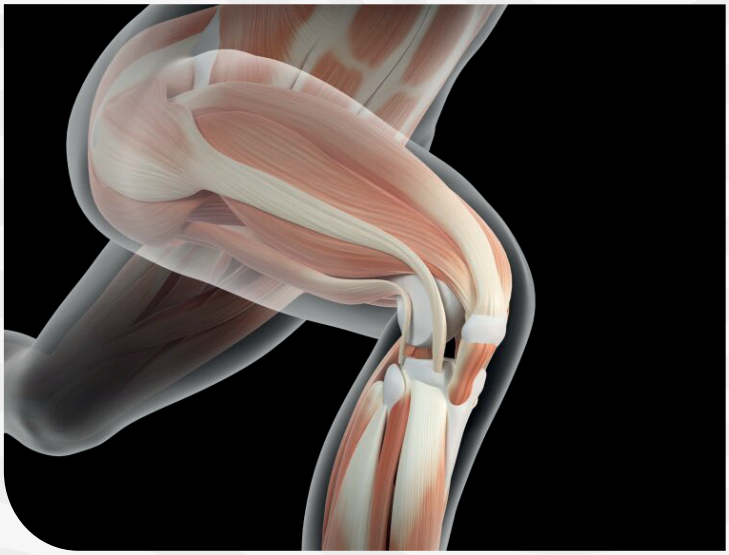
What are you waiting for?

Ready, set, Peptan!

Peptan accelerates recovery and performance

Boost up!

Peptan collagen peptides could reduce muscle soreness after intense exercise, as shown in a scientific, randomized, and controlled study [5]. 24 healthy, recreationally active males took a **daily dose of 2x10 g Peptan** or placebo, together with a drink rich in Vitamin C from 7 days before to 2 days after performing 150 drop jumps. 48 hours after exercise, participants were asked to rate their muscle soreness on a visual analog scale from 0 (no pain) to 200 mm (unbearable pain).



Volunteers who took Peptan scored their muscle soreness at 90.42 while the placebo group rated their soreness at 125.67, indicating that Peptan has a likely beneficial effect on muscle soreness 48 hours after exercise (Figure 1A).

Less muscle pain, great! But there's more. This same study also suggests **accelerated muscle recovery during daily Peptan intake** as shown in Figure 1B. While in the control group muscle power decreased to approximately 80% 48h after the training, the **Peptan group retained approximately 90% of their muscle power**, indicating a faster recovery and showing a significant beneficial effect of Peptan compared to placebo.

Peptan reduces muscle soreness and accelerates recovery

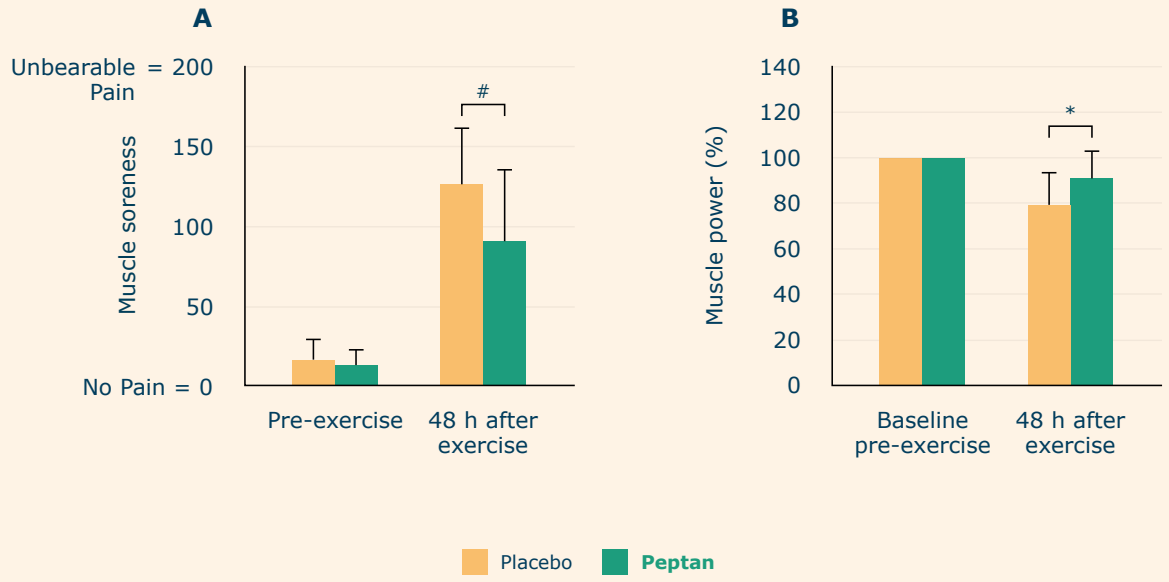
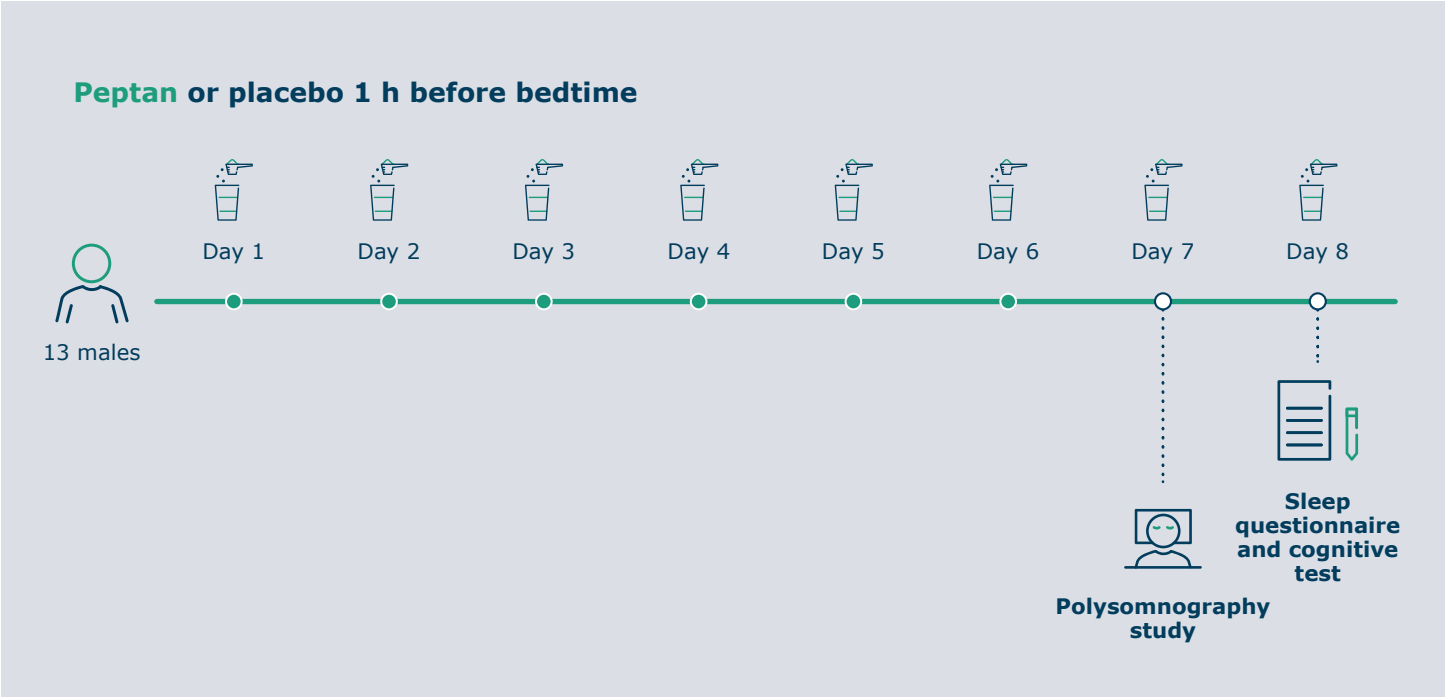


Figure 1. *Effect of daily Peptan intake on A) Muscle soreness reported by the participants before, and 48 h after exercise on a visual analog scale, and B) Muscle power before and 48 h after exercise, expressed as a percentage of the muscle power seen before exercise (baseline).*
*# Indicates that there is a likely beneficial effect of Peptan compared to the placebo group. * Indicates that there is a beneficial effect of Peptan compared to the placebo group, $p < 0.05$.*

Eat-Sleep-Train-Repeat

Recovery is not only about muscles… sleep is essential to keep up with our performance. Every athlete knows that before an important event, a good night's sleep is crucial. However, impaired sleep is a frequent issue among athletes [6]. Yet again… **collagen peptides to the rescue! Rousselot is the first company** to show that **collagen supplementation can improve sleep quality.** Our latest findings from a pioneering study on sleep in an active population demonstrate that **daily supplementation with 15 g of Peptan** 60 minutes before bedtime for one week **enhanced the sleep quality of 13 males** (18-35 years old) with sleep complaints [7].



The randomized, placebo-controlled, crossover study showed a reduction in awakenings, as measured by polysomnography (Figure 2A), a technique that is considered the gold standard in sleep studies. This result was mirrored by the volunteers' subjective experience (Figure 2B) and might be explained by studies suggesting that **collagen peptides are rich in glycine, a nutrient also linked to improved sleep quality in athletes** [8]. What is more, **a good night's sleep is also essential for overnight bone, muscle, and skin regeneration**.

Peptan reduces the number of awakenings

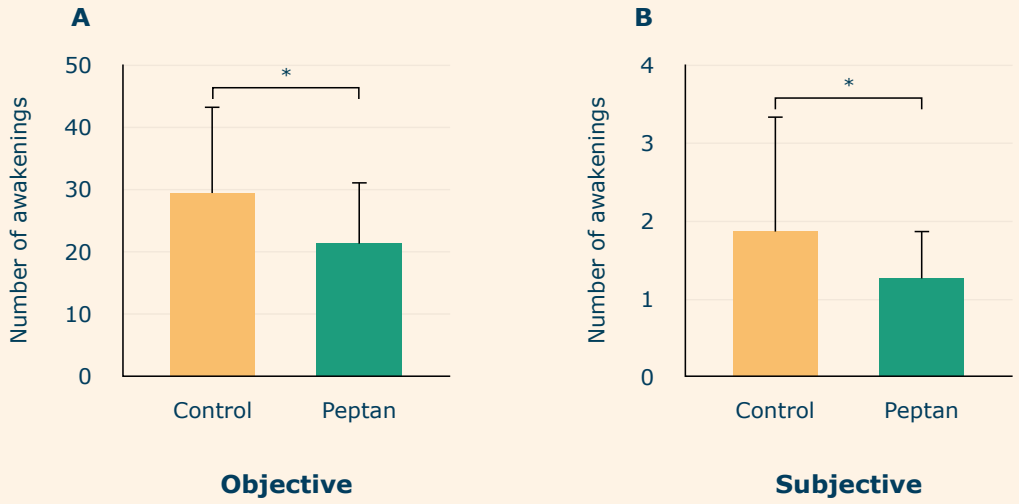


Figure 2. *Total number of awakenings during the night, measured after 7 days of supplementation (A) objectively by polysomnography on the 7th night or B) subjectively by a validated questionnaire the morning of day 8.*
** Indicates a significant difference between the two groups, $p < 0.05$.*

Thinking about your performance? Don't lose sleep over it and join the Peptan Team!

An additional indication of an improved night's sleep was that participants in this study improved their scores in the baseline Stroop Color and Word test, a validated cognitive test measuring response time and accuracy to test if they could process two stimuli at the same time.

Participants are presented with a word (black letters on a white background) describing a color and asked to select the corresponding color by pressing the corresponding key (Figure 3A). **The morning after the sleep trial, participants consuming Peptan scored higher on the test, indicating they improved their response accuracy as a result of better sleep**.

All athletes responded in the same way and everyone benefitted from Peptan

Peptan increases response accuracy in the baseline Stroop cognitive test

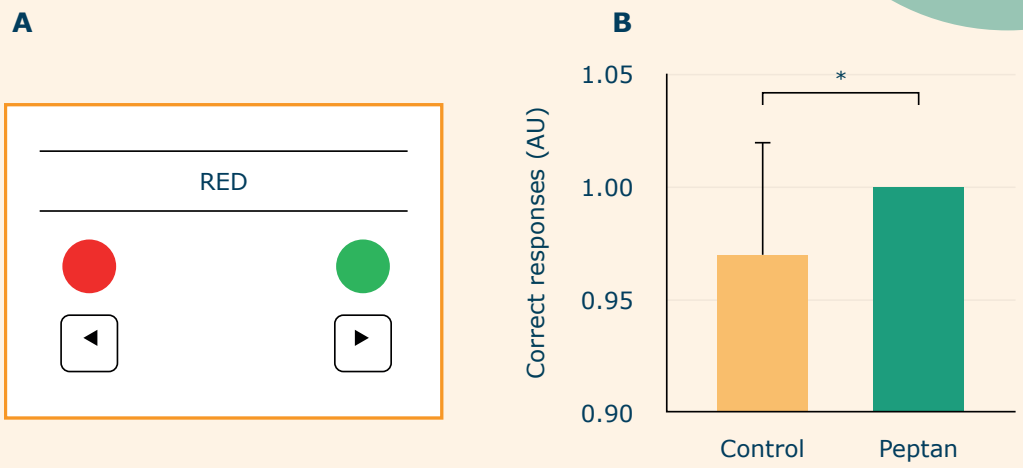


Figure 3. *(A) Visualization of the baseline Stroop cognitive test. (B) Response accuracy, measured as the number of correct responses (arbitrary units) in the baseline Stroop test on the morning after the sleep trial. In the Peptan group, there was no variability in their scores.*

Fueling victory: gut comfort in athletic performance

Strenuous exercise can cause gastrointestinal discomfort because it affects the intestinal barrier function. The tight junctions between intestinal cells that are meant to protect us, can open up due to intense training. This can result in elevated blood endotoxin levels, which causes inflammation, leading to **digestive issues and affecting sports performance** (Figure 4).

Schematic representation of a healthy vs. an inflamed intestinal barrier

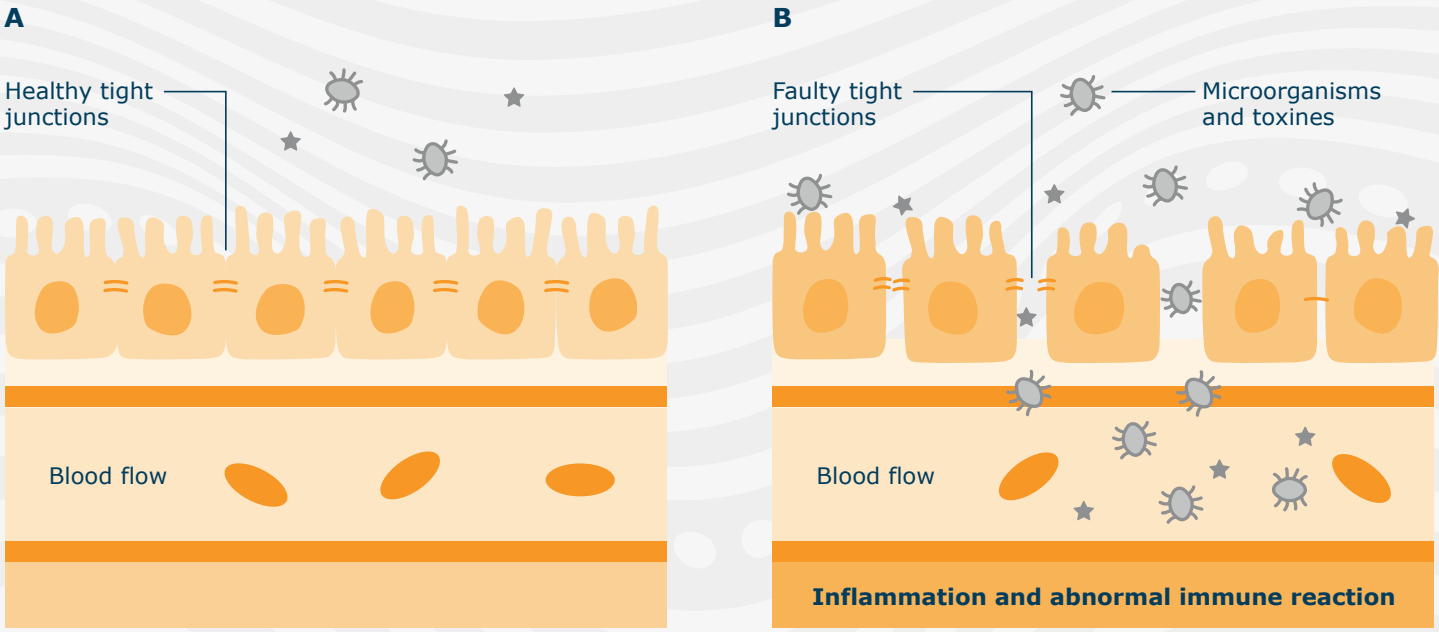
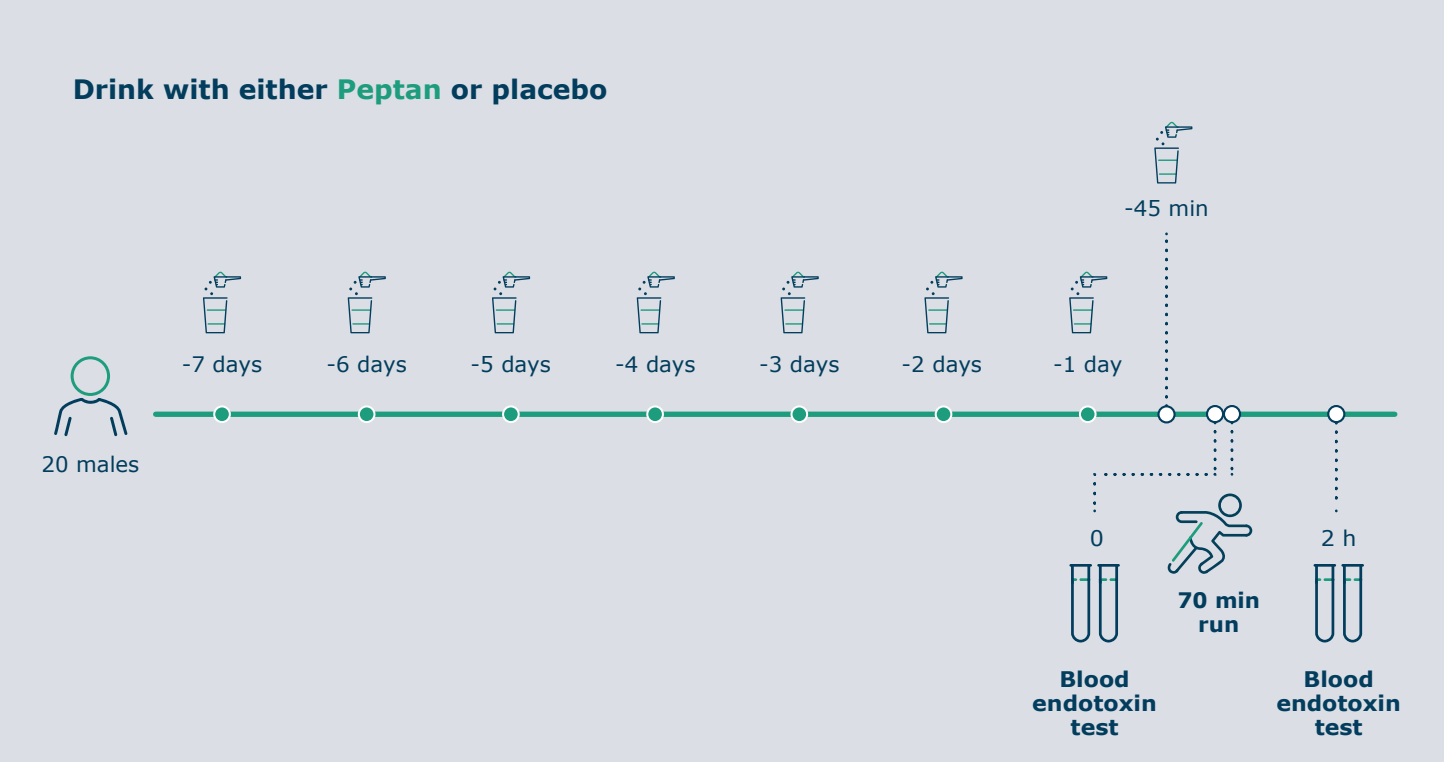


Figure 4. *(A) Healthy intestinal barrier, (B) disturbed intestinal barrier. Strenuous exercise can perturb tight junctions between intestinal cells and increase intestinal permeability to microorganisms and toxins, potentially leading to digestive issues.*

Rousselot showed that supplementation with **10 g of Peptan** collagen peptides 7 days prior to, and 45 min before a 70 min run, could lessen the increase of blood endotoxin levels, a known cause of inflammation, two hours after exercising [9].



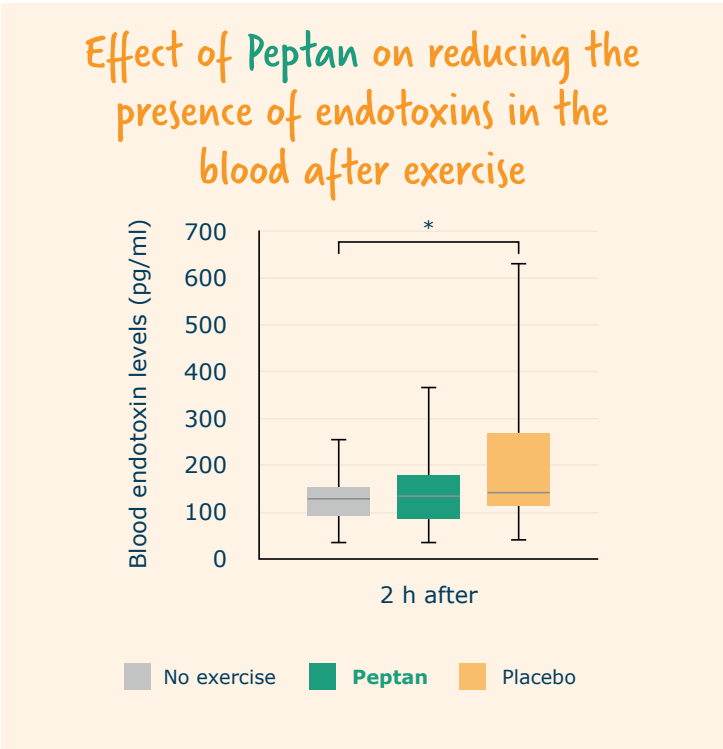


Figure 5. *Blood endotoxin levels measured with no exercise or two hours post-exercise, having ingested Peptan or placebo. Blood endotoxin levels were not significantly different between the non-exercise group and the Peptan group 2 hours after exercise.*
** Indicates a significant difference between the two groups, $p \leq 0.05$.*

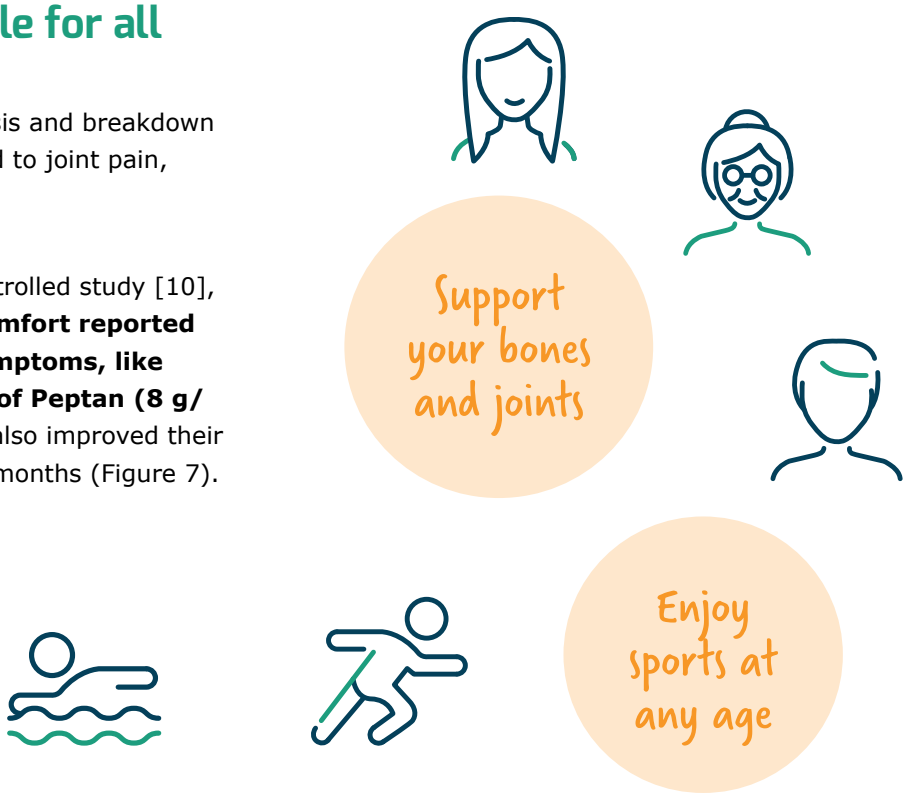
Figure 5 shows the results of this randomized, placebo-controlled, crossover study performed in 20 healthy, recreationally active sporters. When taking Peptan, no difference in blood endotoxin levels was observed before or after exercise, contrary to the significantly elevated levels when drinking flavored water. This suggests that **collagen peptides might be able to support intestinal barrier function thereby reducing the presence of endotoxins in the blood**.

As mentioned above, very intense sports performance is often associated with gastrointestinal symptoms. Although it is known that this discomfort can be intensified by some sports supplements used to promote performance, our study shows that symptoms reported in the Peptan group were comparable to the control (flavored water) [9]. These findings indicate that **Peptan impact on the gut during strenuous exercise is comparable to flavored water.**

Sporty and mobile lifestyle for all

Over time, the balance between synthesis and breakdown of cartilage gets disturbed. This can lead to joint pain, stiffness, and reduced mobility.

In a scientific, randomized, placebo-controlled study [10], **elderly women with mild joint discomfort reported a significant reduction of painful symptoms, like stiffness and pain, after oral intake of Peptan (8 g/ day)** (Figure 6). These positive effects also improved their mobility and joint function within three months (Figure 7).



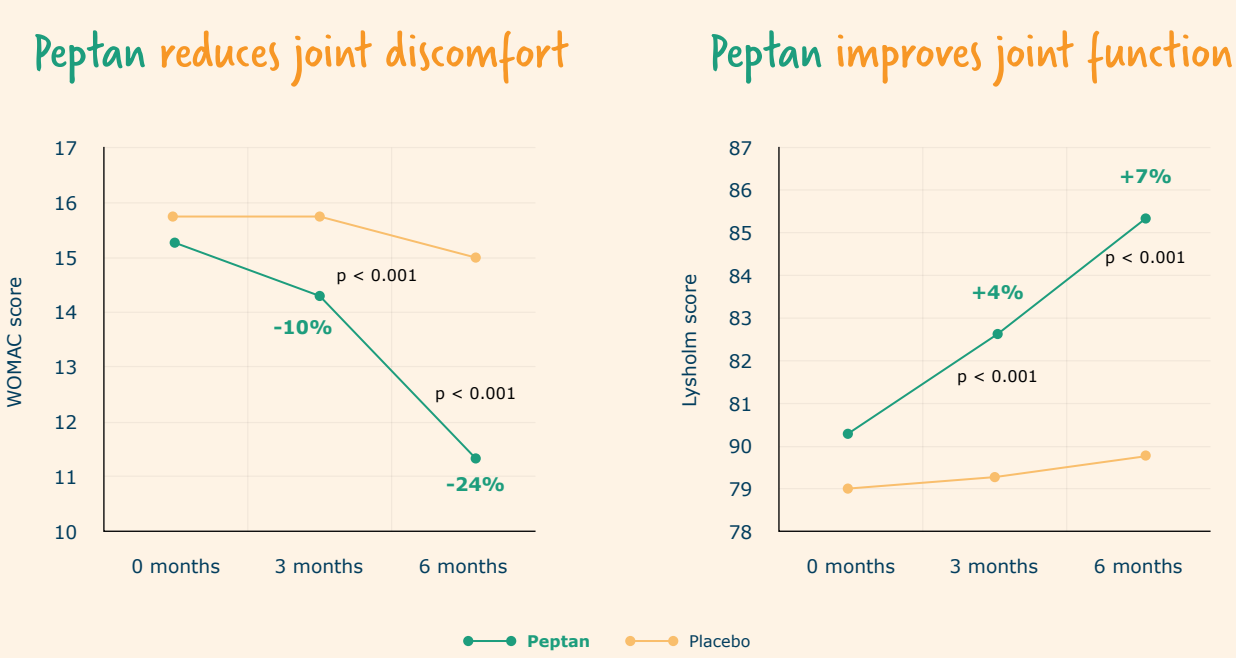


Figure 6. *Symptom-relieving effects of Peptan: development of the WOMAC score assessing joint function discomfort (decreased score = improvement) after the intake of Peptan or placebo over the duration of 6 months (Jiangm 2014).*

Figure 7. *Peptan improves joint functionality: development of the Lyshoim score assessing joint function (increased score = improvement) after the intake of Peptan or placebo over the duration of 6 months (Jiangm 2014).*

More than just another protein

Looking after our bones is key to enjoying an active life whether you are 25 or 75. Bones are living tissues that are constantly renewed in a carefully balanced process of synthesis and breakdown.

Peptan stimulates bone formation cells more than casein. A study performed in mice bone cells shows that the potential for Peptan to improve bone health (balance between cell formation and breakdown) is the result of its collagen peptide composition rather than mere proteins [11].

These *in vitro* experiments demonstrate that the digested and absorbed **collagen peptides stimulate the formation of cells responsible for bone synthesis** (Figure 8A) more than casein (milk protein), **while simultaneously inhibiting the formation of cells that break down bones** (Figure 8B).

Peptan stimulates bone formation cells and inhibits bone breakdown cells more than other proteins

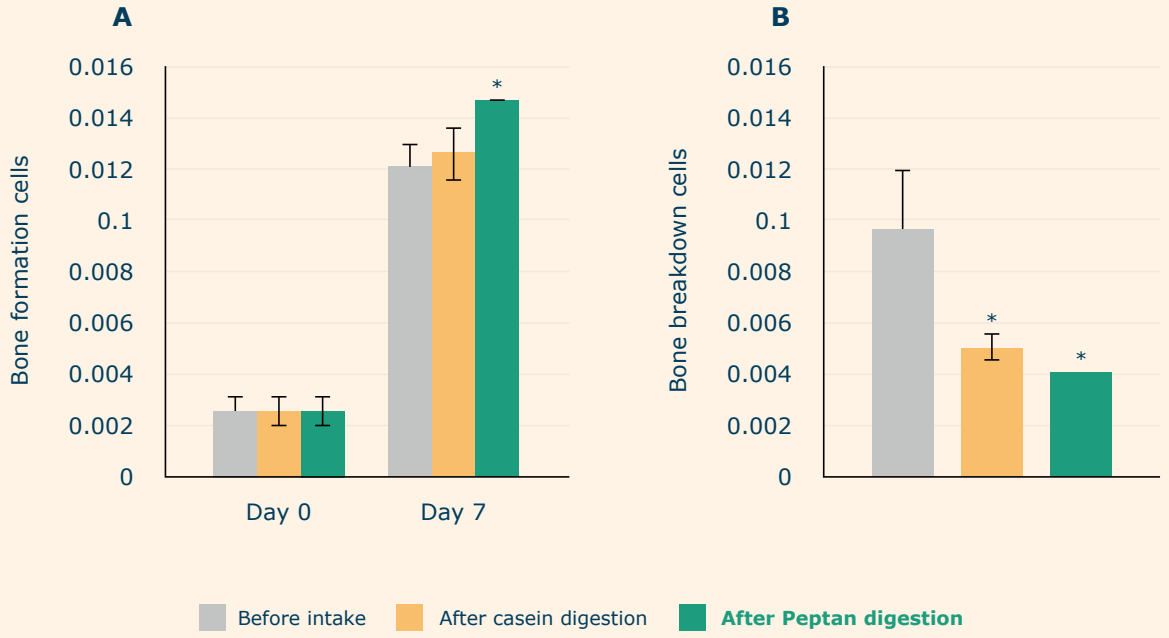


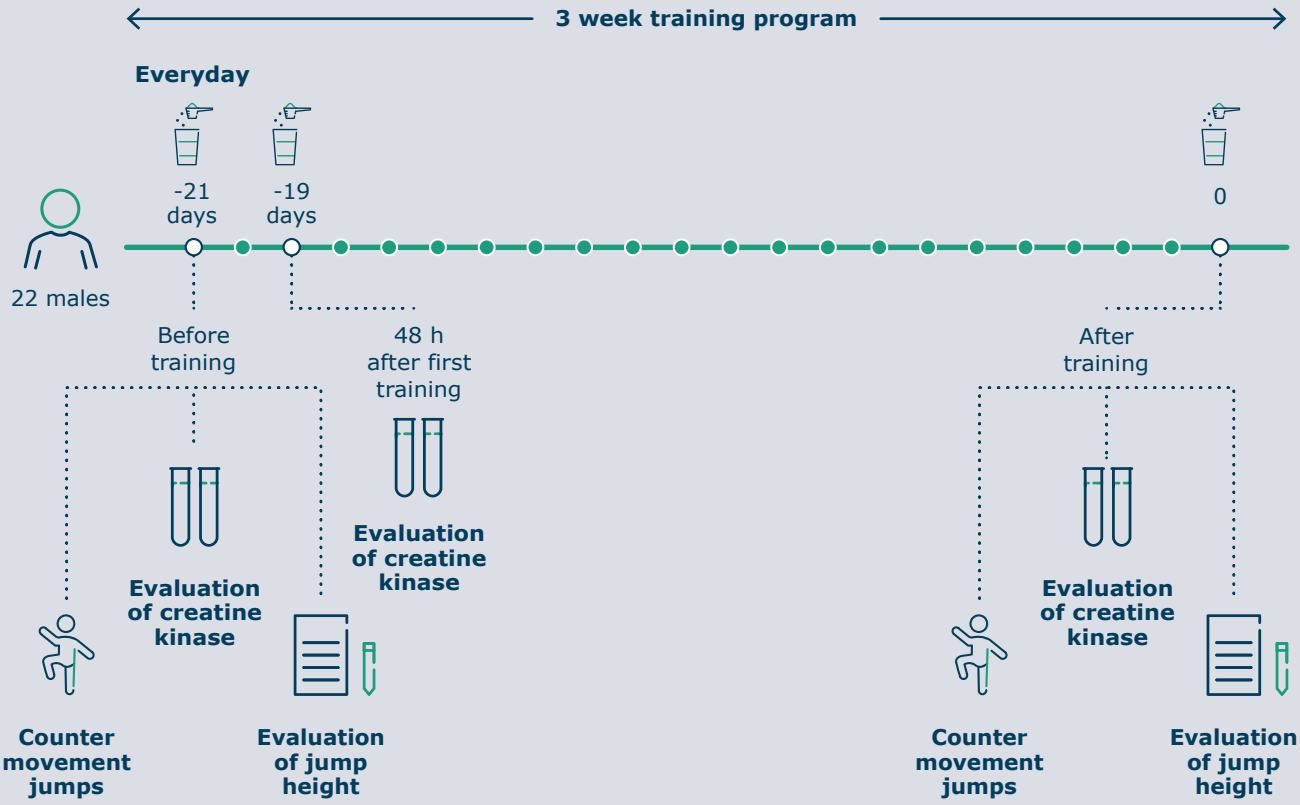
Figure 8. *Influence of digested Peptan on the growth of bone metabolism cells in vitro. (A) Growth of bone formation cells or osteoblasts, (B) growth of bone breakdown cells or osteoclasts.*

Collagen and whey: friends with benefits

Protein supplement usage among athletes, both professional and recreational, is a well-established practice with whey protein being by far the most popular choice. While 45 g consumption of whey protein is currently recognized as the gold standard, blending diverse protein sources might enable to target different components of the musculoskeletal system. Since **collagen peptides are known for their beneficial effects on mobility and recovery after exercise**, why not **merge the established advantages** of **collagen peptides with whey?**

In a double-blind, randomized, parallel-group study, the impact of daily consumption of **20 g of Peptan** and 25 g of whey was compared to the prevailing standard of 45 g/day of whey. In twenty-two healthy, active men, performance was evaluated by measuring the jump height of counter movement jumps before and after a 3-week training program combined with supplementation of either whey (W) or whey with Peptan collagen peptides (WP).

45 g of whey or 20 g of Peptan collagen peptides + 25 g of whey



Both W and WP groups showed similar results as depicted in Figure 9A. Levels of creatine kinase, a marker for muscle damage, were elevated 48 h after the first training but fully recovered after completion of the training program in both groups (Figure 9B). This study indicates that **substituting 44.4% of the daily recommended protein dose for Peptan leads to similar results for both exercise performance and recovery after strenuous exercise [12].**

Since ingestion of dietary supplements can instigate digestive issues, mixing protein sources, such as whey and collagen, could potentially present an effective alternative. Taylor et al. already demonstrated that daily **ingestion of collagen peptides did not alter exercise-induced gastro-intestinal symptoms [9].** By doing so, athletes may stand to **reap the benefits of both proteins while potentially mitigating digestive discomfort.**

Substituting half of the whey supplement with Peptan yields the same results on recovery and performance

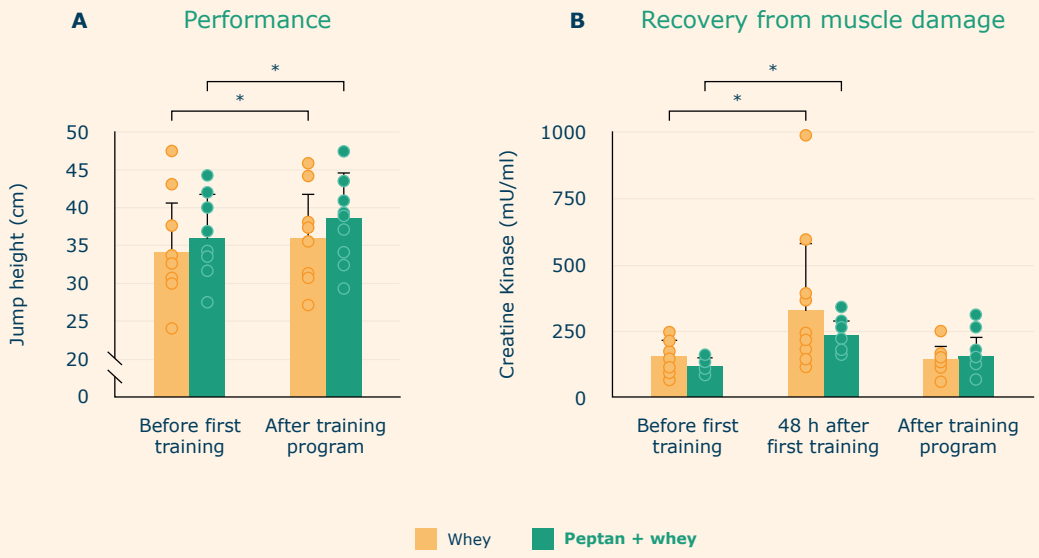


Figure 9. *Evaluation of the impact of daily consumption of a whey protein supplement (45 g) or a whey (25 g) + collagen peptides (20 g) supplement on performance (A), evaluated by measuring jump height of counter movement jumps, and recovery (B), assessed by levels of creatine kinase, a marker of muscle damage, after extensive training in 22 healthy, active men.*
** $p < 0.05$ compared to baseline (before first training).*

Colartix

HEALTHY JOINTS, HEALTHY LIFE

In a real-life study, 201 healthy and physically active adults (18 to 72 years old) recorded their joint pain scores for 12 weeks in a mobile application while keeping their daily habits and taking 1 g per day of either Colartix or placebo [13]. The evolution of joint pain scores (scale of 1 (no pain) to 10 (unimaginable and unspeakable pain)) during the study is shown in Figure 10.

While the average score at the beginning of the study was 5, **Colartix was able to significantly reduce joint discomfort throughout the supplementation period** down to an average score of 2 at the end of the 12 weeks supplementation period.

The reduction of joint discomfort was felt regardless of age, gender, or activity intensity. The placebo group did not report a significant reduction. More importantly, **in the Colartix group, the reported joint pain levels were still significantly lower than in the placebo group 4 weeks after supplementation had stopped**. However, joint pain scores gradually increase again after stopping supplementation highlighting the importance of daily, sustained, supplementation.

For more information visit Colartix

Next to finding a balance between training and rest, athletes need to take good care of their bodies. Performing sports, especially at a high level, can cause damage, particularly to the joints. With this in mind, **Rousselot developed COLARTIX®, a dietary supplement derived from hydrolyzed cartilage matrix and composed of collagen peptides and naturally present chondroitin sulfate.**

Supplementation with Colartix demonstrated a steadily decrease in joint discomfort across gender, age, and sport intensity

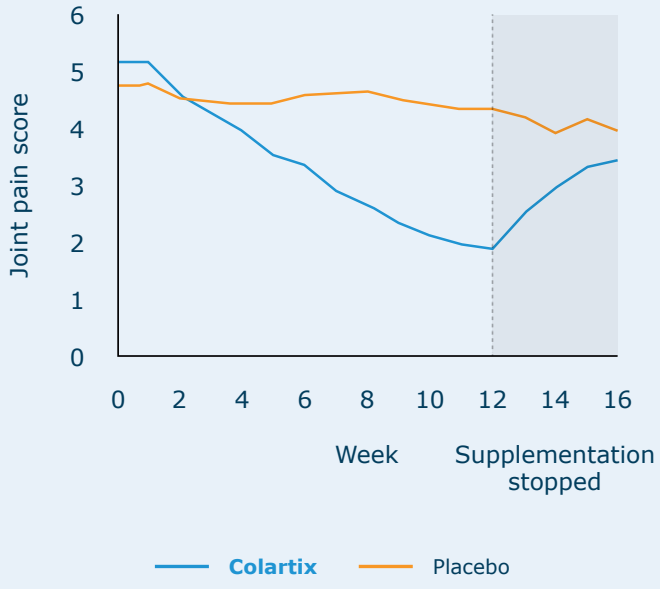


Figure 10. *Joint pain score reduced from very distressing to discomfort after 12 weeks of supplementation with Colartix. 4 weeks after supplementation stopped, pain discomfort in the Colartix group was still significantly lower than in the placebo group.*

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Complete your product brand story with Peptan and Colartix

Peptan collagen peptides are:

- An upcycled ingredient made from natural resources
- Of natural origin, available from fish, bovine, and porcine origin
- Kosher and Halal certified (on demand)
- Highly bioavailable
- Pure and neutral in sensory
- Backed by science
- World-class, safe products
- Convenient and easy to use
- Clean label, with no additived or e-numbers

Rousselot Health & Nutrition can help you with virtually any product requirement or innovation you have in mind, offering:

Transparency

Full traceability

High standards of quality and safety

Committed to the environment and to our clients

Global support and expert advice

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Rousselot Health & Nutrition

As Rousselot's strategic segment dedicated to health and nutrition, we are committed to developing innovative ingredients answering today's demand for solutions offering proven efficacy, full safety, and premium quality. Our customers can rely on best-in-class products, backed by trusted science as well as on our expert support in formulation, product development, and regulatory advice. Building on the success of our flagship brand Peptan, our collagen solutions offer a world of health benefits for a healthier tomorrow. Rousselot Health & Nutrition is one of three strategic markets served by Rousselot. Rousselot is Darling Ingredients' Health Brand.

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