GERMAN TOP ATHLETES TESTED THE TASTE AND EFFECTIVENESS OF PEPTOPRO®[1]

Introduction Usually, protein drinks give a thick suspension and a full stomach-feeling. Professional athletes are often unable to consume these drinks around their exercise time, because they could lead to bloated feeling and side effects like belching, diarrhea, and gas production. Intact protein has to be digested before it can be absorbed, which needs time and cost energy. Protein hydrolysates are predigested proteins, which are much easier and faster absorbed than intact protein. Disadvantage is that they often taste very bitter, which limits their use in sports drinks. PeptoPro® is a specific casein hydrolysate containing mostly di-and tri-peptides, which makes it well soluble in water and its taste well acceptable. Acceptance of PeptoPro® was tested in 50 German top athletes.

Study design

Fifty well-trained athletes, selected from the pool of athletes supported by the German Olympic Support Centre (Olympia Stützpunkt Rhein Ruhr, Essen), participated in the experiment.
Sports performed by the athletes, 26 males and 24 females, were badminton (n=4), hockey (n=4), athletics (n=11), rowing (n=10), swimming (n=10), and tennis (n=11). Their age was between 17 and 39 years.
After a demanding exercise the athletes drank 4 cans of the "Multipower recharge drink" (330 ml), each containing 28 g of CHO and 14 g protein (as PeptoPro®), or 4 cans of a placebo drink (330 ml) each containing 28 g of CHO.
The first drink was consumed immediately after the exercise, the others 30, 60, and 120 min later. After 4 h, the athletes performed again exercise. At the end of this bout of exercise they were asked questions about the taste of the drinks and their feelings about the drinking.

Results (see Figure)

- All athletes rated the taste of PeptoPro® as good, although the CHO-drink was rated better.
- Athletes felt no side effects of any of the drinks.

Conclusion

PeptoPro® recovery drinks were very well tolerated after heavy exercise and caused none of the often recognized feelings after intact protein consumption.
The consumption of 56g of protein (as PeptoPro®) after the first and before the second bout of exercise did not cause bad feelings and was well tolerated.

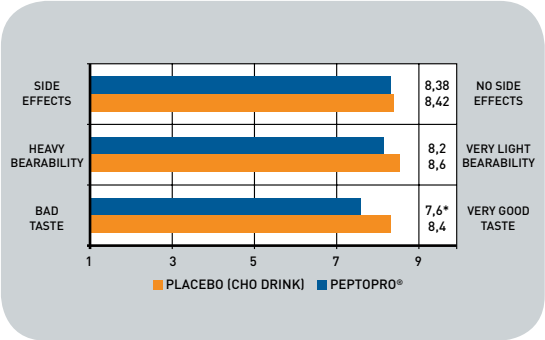

Figure: Results of the questionnaire scoring taste and feeling after performance conducted after a recovery period in which CHO or CHO + PeptoPro® were consumed.

[1] This experiment was performed at the German Olympic Support Centre (Olympiastützpunkt Rhein Ruhr), Sports and exercise medicine department, 45131 Essen, Germany, by drs. D. Alf, J. Broja, A. Butt, and D. Kocak.

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PEPTOPRO® IS VERY WELL TOLERATED BY PROFESSIONAL ATHLETES[1]

Introduction Protein is a complex molecule, is difficult to solve in water and has to be digested into small peptides or free amino acids before it can be absorbed. Intact proteins reduce the rate of stomach emptying, which can cause an unpleasant full feeling for many people, especially for athletes, if its consumed shortly before, during or immediately after exercise. PeptoPro® is a casein hydrolysate which contains mostly di- and tri-peptides. These small peptides require no further digestion and can readily be absorbed by the athlete's intestine.

Study Design	**Subjects:**	12 endurance trained athletes	
	Design:	Double blind, placebo controlled, crossover design	
	Exercise:	2-hour cycling exercise trial (55% Wmax)	
		3.5-hour post-exercise recovery, supine rest	
	Dietary intervention:	CHO:	0.8 g/kg/h CHO (plus bitter flavor)
		CHO+PRO:	0.8 g/kg/h CHO+0.4 g protein/kg/h (as PeptoPro®)
		CHO+PRO+Leu:	0.8 g/kg/h CHO+0.4 g protein/kg/h (as PeptPro®) +0.1 g/kg/h leucine
	Measurements:	Standard Questionnaire about possible side effects	

All subject used the same standardized diet before each of the three trails for 2 days to prevent the modulating effects of diet on glycogen content, insulin sensitivity, glucose disposal and/or glycogen synthesis. After an overnight fast, athletes performed a 2h exercise program on an ergometer at 55% Wmax, to deplete muscle glycogen stores. Directly after exercise and then after each 30 min for 3 hours, the athletes consumed 330 ml of one of the three drinks. Tests were separated by two weeks at least.

Results

For none of the questions differences were observed between treatments (Table). Co-ingestion of the casein hydrolysate, with or without addition of extra leucine, with the carbohydrates did not result in a "bad feeling" in the athletes.

Conclusions

Consumption 2 L of a sports drink containing 90 g PeptoPro®, within 3h after extensive exercise, did not cause more feelings of digestive disorders than consumption of a sports drink containing carbohydrates alone.

Table. Results of the questionnaire.

Questionnaire about taste and side effects after consumption of 6 drinks of 330 ml volume.

	CHO			CHO-Peptopro®			CHO-Peptopro®-Leu		
Complaint	**0**	**90**	**180**	**0**	**90**	**180**	**0**	**90**	**180**
Nausea	1.4 ± 0.4	1.9 + 0.7	1.9 ± 0.6	1.6 ± 0.4	1.4 ± 0.3	2.1 ± 0.7	1.5 ± 0.3	1.6 ± 0.3	2.8 ± 1.0
Bloated feeling	1.9 ± 0.7	1.9 ± 0.5	2.0 ± 0.6	2.4 ± 0.7	2.0 ± 0.5	3.0 ± 0.5	2.0 ± 0.5	2.4 ± 0.6	3.3 ± 1.0
Belching	1.6 ± 0.7	2.2 ± 0.8	2.1 ± 0.6	2.2 ± 0.9	2.4 ± 0.6	2.9 ± 0.7	1.8 ± 0.4	2.8 ± 0.9	3.7 ± 1.1
GI cramping	1.4 ± 0.2	1.2 ± 0.2	1.6 ± 0.4	1.6 ± 0.4	1.2 ± 0.2	1.1 ± 0.2	1.5 ± 0.3	1.3 ± 0.2	1.6 ± 0.6
Vomiting	1.0 ± 0.0	1.3 ± 0.3	1.4 ± 0.3	1.4 ± 0.4	1.1 ± 0.1	1.6 ± 0.7	1.1 ± 0.1	1.1 ± 0.1	2.2 ± 0.8
Diarrhea	1.1 ± 0.0	1.1 ± 0.2	1.1 ± 0.1	1.1 ± 0.1	1.0 ± 0.0	1.0 ± 0.0	1.1 ± 0.1	1.1 ± 0.1	1.1 ± 0.1
Urge to urinate	1.1 ± 0.1	1.4 ± 0.3	1.4 ± 0.2	1.1 ± 0.1	1.1 ± 0.1	1.1 ± 0.1	1.4 ± 0.3	1.3 ± 0.2	1.4 ± 0.3
Urge to defecate	2.5 ± 0.8	5.1 ± 1.2	5.1 ± 1.3	2.7 ± 0.8	3.0 ± 1.0	5.1 ± 0.9	2.3 ± 0.5	3.1 ± 0.7	3.1 ± 0.7
Headache	2.5 ± 0.9	1.9 ± 0.6	2.6 ± 2.1	1.4 ± 0.2	1.3 ± 0.2	1.6 ± 0.3	2.0 ± 0.5	1.6 ± 0.4	2.2 ± 0.6
Dizziness	2.3 ± 0.8	1.6 ± 0.5	1.5 ± 0.4	2.0 ± 0.5	1.4 ± 0.3	1.3 ± 0.2	2.2 ± 0.6	1.6 ± 0.3	1.6 ± 0.4
Taste	5.1 ± 0.7	5.1 ± 0.8	4.9 ± 2.2	5.7 ± 0.8	5.7±0.8	5.2 ± 0.8	5.7 ± 0.8	5.3 ± 0.7	4.4 ± 0.8

Questionnaire outcome regarding gastro-intestinal (GI) complaints after ingestion of the first bolus of test drink (t=0), after 90 min (t=90) and after ingestion of the last bolus of test-drink (t=180) during recovery in the CHO, CHO-PRO and CHO-PRO-LEU trial, respectively. The presence of complaints like nausea, bloated feeling, belching, stomach problems/GI cramping, vomiting, diarrhea, the urge to urinate and/or defecate, headache and dizziness were scored on a 10-point scale (1=not at all present, 10=very much present). One question regarding the taste of the test drink was also conducted (1=horrible, 10=very tasty). Values are expressed as means±SEM; No significant differences between trials (P>0.05).

[1] Kaastra, B., R.J.F. Manders, E. van Breda, A. Kies, A.E. Jeukendrup, H.A. Keizer, H. Kuipers, and L.J.C. van Loon Effects of increasing insulin secretion on acute post-exercise blood glucose disposal. Med. Sci. Sports Exerc., 2006 (in press).

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PEPTOPRO® RAISES INSULIN AND DECREASES BLOOD GLUCOSE AFTER EXERCISE[1]

Introduction Protein is known to increase insulin secretion when it is consumed together with carbohydrates. Insulin is an anabolic hormone, which stimulates muscle glycogen recovery and protein synthesis. Higher insulin levels lead to lower blood glucose levels and a faster and higher glycogen production (Ivy, 2002[2]) In this study the effect of co-ingestion of carbohydrates with the casein hydrolysate PeptoPro®, with or without addition of extra leucine, on plasma insulin and glucose levels was investigated after exhaustive exercise.

Study Design	**Subjects:**	12 endurance trained athletes	
	Design:	Double blind, placebo controlled, crossover design	
	Exercise:	2-hour cycling exercise trial (55% Wmax)	
		3.5-hour post-exercise recovery, supine rest	
	Dietary intervention:	CHO:	0.8 g/kg/h CHO
		CHO+PRO:	0.8 g/kg/h CHO+0.4 g protein/kg/h (as PeptoPro®)
		CHO+PRO+Leu:	0.8 g/kg/h CHO+0.4 g protein/kg/h (as PeptPro®) +0.1 g/kg/h leucine
	Measurements:	Plasma glucose and insulin response	

All subject used the same standardized diet before each of the three trails for 2 days to prevent the modulating effects of diet on glycogen content, insulin sensitivity, glucose disposal and/or glycogen synthesis. After an overnight fast, athletes performed a 2h exercise program on an ergometer at 55% Wmax, to deplete muscle glycogen stores. Directly after exercise and then after each 30 min for 3 hours, the athletes consumed 330 ml of one of the three drinks. Blood samples were taken immediately after exercise and then every 15 or 30 min. Tests were separated by two weeks at least.

Results

Results of current experiment are expressed as "Area Under the Curve" of the 3-h plasma insulin and glucose response to the treatments. With CHO+PRO, post-exercise insulin level was about 110% higher than with CHO, and glucose response was about 35% lower. Extra addition of leucine to the protein hydrolysate increased the response compared to CHO+PRO, though not significantly (Figure 1).

Conclusions

Co-ingestion of carbohydrates with PeptoPro® showed a large additional increase (~110%) in post-exercise insulin response compared to ingestion of carbohydrates alone. Plasma glucose response during recovery reduced (~35%), probably resulting in increased muscle glycogen synthesis. Extra addition of leucine increased this effect, although not significantly.

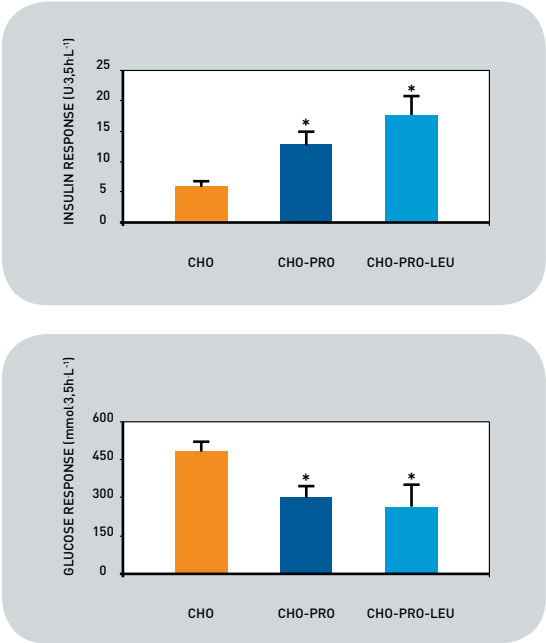

Figure 1. Plasma insulin and glucose response (as Area Under the Curve) during a 3-h recovery period in athletes after a 2-h exercise bout at 55% of Wmax.

[1] Kaastra, B., R.J.F. Manders, E. van Breda, A. Kies, A.E. Jeukendrup, H.A. Keizer, H. Kuipers, and L.J.C. van Loon. Effects of increasing insulin secretion on acute post-exercise blood glucose disposal. Med. Sci. Sports Exerc., 2006 (in press).
[2] Ivy, J.L., H.W. Goforth, B.M. Damon, T.R. McCauley, E.C. Parsons, and T.B. Price, 2002. Early postexercise muscle glycogen recovery is enhanced with a carbohydrate-protein supplement. J. Appl. Physiol. 93:1337-1344.

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PEPTOPRO® INCREASES PERFORMANCE AFTER EXHAUSTIVE EXERCISE[1]

Introduction Protein supplementation after exercise may reduce the time required to recover glycogen stores (Ivy, 2002[2]). Intact proteins, however, often have a slow stomach passage, and protein hydrolysates have a very bad taste. Using specific enzymes, a casein hydrolysate (PeptoPro®) was produced having a good taste, and containing peptides that are readily absorbed. The objective of present study was to compare the effect of a carbohydrate drink, additionally or not containing PeptoPro®, on post-recovery performance in well-trained male volunteers.

Study design
In a randomized, double-blind, cross over designed experiment, 12 well-trained athletes participated in 2 experimental trials in which a carbohydrate rich drink (CHO) or a carbohydrate rich drink + PeptoPro® (CHO+PRO) was tested. The tests were separated by at least two weeks. After an overnight fast (8 hours) subjects reported to the laboratory. The study comprised three united phases:

Phase 1 – Glycogen depletion
To induce muscular glycogen depletion the athletes underwent an "all out" interval protocol until exertion.

Phase 2 – Glycogen repletion period (recovery phase)
During 5 hours athletes were in supine rest. In this period, they consumed 350 ml of the test drink each 30', starting at t=0, and were blood samples taken every 15'.

Phase 3 – Time trial
At the end of the repletion period a time trial was performed as performance outcome parameter. This time trial consists of 20 minutes of cycling at the highest speed possible.

Results
Eleven athletes completed the time trial. Their performance was 5% higher after ingestion of PeptoPro® drink (P = 0.14) than after consuming the CHO-drink. When results of one athlete, showing a very large difference between test periods, was excluded, the effect was 2.3% (P = 0.21; Figure 1).

Conclusions
Post-recovery performance in a 20-minutes time trial was 2.1% higher after consuming the PeptoPro® containing CHO+PRO drink, than after consuming the CHO-drink.

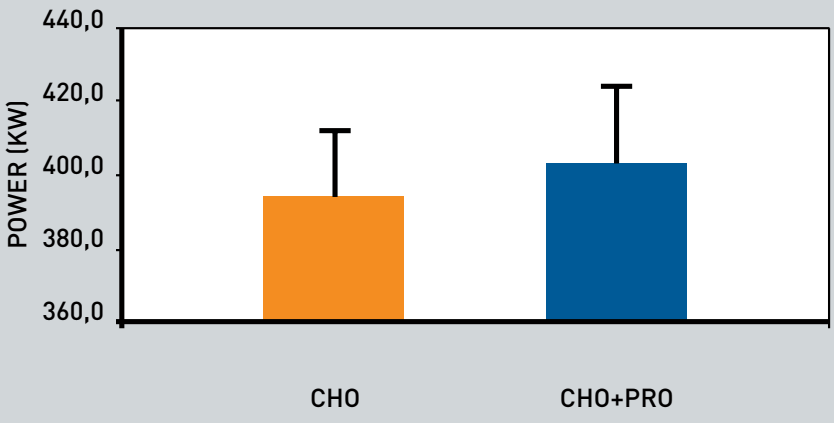

Figure 1. Performance of the athletes in the post-recovery 20-min time trial. Indicated is power generated (kW; means ± SEM; n=10).

[1] This experiment was performed in 2003 at the Maastricht University, Department Movement Sciences, by Eric van Breda, Hans Keizer, (NUTRIM) University of Maastricht.
[2] Ivy, J.L., H.W. Goforth, B.M. Damon, T.R. McCauley, E.C. Parsons, and T.B. Price, 2002. Early postexercise muscle glycogen recovery is enhanced with a carbohydrate-protein supplement. J. Appl. Physiol. 93:1337-1344.

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PEPTOPRO® IMPROVES SUBSEQUENT PERFORMANCE IN TOP ATHLETES[1]

Introduction A commercial PeptoPro® recovery drink (Multipower recharge drink) was compared with another commercial carbohydrate sports drink. Both drinks contained the same amount of carbohydrates and were consumed during the post-exercise recovery period after a performance test. Performance in an exercise bout after consuming the test drinks was investigated.

Subjects

Fifty well-trained athletes, selected from the pool of athletes supported by the German Olympic Support Centre (Olympia Stützpunkt Rhein Ruhr, Essen), participated in the experiment.
Sports performed by the athletes, 26 males and 24 females, were badminton (n=4), hockey (n=4), athletics (n=11), rowing (n=10), swimming (n=10), and tennis (n=11).
Their age was between 17 and 39 years.

Protocol

The athletes refrained from rigorous physical exercise the day prior to the experimental day. Following an overnight fast, subjects arrived at the laboratory at 07.30 am by car or public transportation.
The subjects performed an exercise protocol until their estimated lactate level was 4 mmol/l.
In this protocol, subjects cycle for 3 min at increasing power, starting at 50 W and increasing with 50 W each step, until the indicated lactate level was reached.
The individual blood lactate levels were tested prior to and during the experiment in samples taken from the earlobe.
Directly after the exercise terminated (defined as t=0 min), subjects entered a 240 min recovery period, and consumed the first test drink.
At t= 30, 60, and 120 min subsequent drinks were consumed.
During the recovery period (t=0 through 240), subjects remained inactive in a supine position.
At the end of the recovery period, a second exercise was performed with similar conditions to the first exercise.
The experiment was repeated after one week, with the second drink. Drinks were provided in a double blind fashion.

Beverages

During post-exercise recovery, subjects received four times 330 ml of a carbohydrate (CHO) or a carbohydrate plus PeptoPro® (CHO+PRO) containing drink. Mean intake over the 4-h period was about 0.36 $g.kg^{-1}.h^{-1}$ carbohydrates with or without 0.18 $g.kg^{-1}.h^{-1}$ casein hydrolysate.
CHO-drink contained 8.2g CHO per 100 ml, CHO-PeptoPro® drink 8.2g CHO + 4.2g protein (as PeptoPro®) per 100 ml.

Results

Mean performance of the first exercise bout did not differ between the two experimental periods. Also, no effect of sex of the athlete, type of sport performed, weight, and age were observed (results not shown). These results indicate that results were not affected by the period, and that a simple t-test was the appropriate method to test the effect of both drinks on the differences between pre- and post recovery exercise performance.

- All athletes performed less well during the second bout of exercise than during the first bout.
- 39 out of the 50 athletes performed better in the second bout after drinking CHO+PRO ($P<0.001$), 2 performed equally, and 9 performed less well.
- Mean exercise performance decreased from 4.67 to 4.30 $kW.kg^{-1}$ BW in the CHO-group, and from 4.67 to 4.40 $kW.kg^{-1}$ BW in the CHO+PRO group. The differences were 0.37±0.03 and 0.28±0.03 $kW.kg^{-1}$ BW for CHO and CHO+PRO, respectively (Table 1). Performance was 0.10±0.02 $kW.kg^{-1}$ BW less reduced in the CHO+PRO group ($P<0.001$; Figure 1).
  This is 2.1% of pre-recovery exercise performance at the CHO-group (Figure 2).

[1] This experiment was performed at the German Olympic Support Centre (Olympiastützpunkt Rhein Ruhr), Sports and exercise medicine department, 45131 Essen, Germany, by Dietmar Alf, J. Broja, A. Butt, and D. Kocak.

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	CHO	CHO+PRO
First exercise	4.67 ± 0.056	4.67 ± 0.060
Second exercise	4.30 ± 0.059	4.40 ± 0.063
Decrease	0.37 ± 0.029	0.28 ± 0.026

Table 1. Exercise performance before and after a 4-h recovery period, during which 4 drinks (330 ml each) containing CHO or CHO+PRO (PeptoPro®) were consumed. Values in $kW.kg^{-1}$ BW (means ± SEM, n=50).

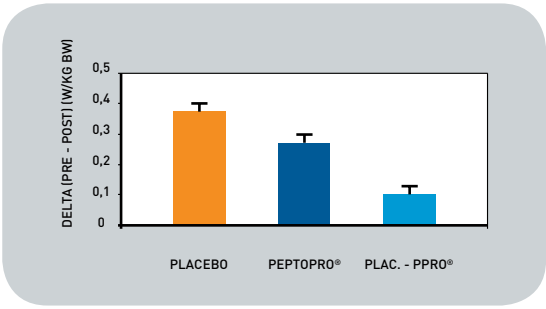

Figure 1. Difference between pre- and post recovery performance differences when athletes consumed drinks containing CHO or CHO+PRO (PeptoPro®). Also the difference between the two drinks is indicated. Values are means ± SEM, n=50.

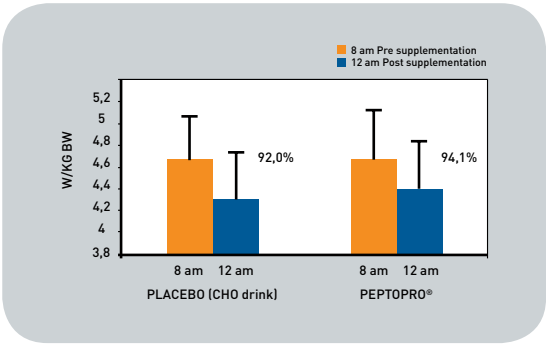

Figure 2. Pre- and pos-recovery performance of athletes consuming CHO or CHO+PRO drinks.

Conclusion

Of the 50 tested top athletes, 39 showed an improved performance by the nutritional intervention. Performance generated after the 4-h recovery period in which the drink containing PeptoPro® was consumed, was 2.1% higher (significant) than when only a carbohydrate-drink was consumed. This makes PeptoPro® a useful tool for athletes to improve their performance in subsequent exercise and during regular and intermittent training

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PEPTOPRO® REDUCES EXERCISE INDUCED MUSCLE PAIN[1]

Introduction Heavy exercise and training often leads to muscle and joint damage and pain, which limits and reduces physical performance. Joints and muscles are built from proteins and have a higher need for certain amino acids as building blocks to prepare and protect their entire structure. In a previous study, it was shown that the consumption of a protein hydrolysate reduced joint pains in top athletes (Alf and Flechsenhar, 2005[2]). Other studies have shown that the consumption of milk proteins can reduce muscle damage (Saunders et al., 2004[3]). In present study the effect of PeptoPro®, a specific casein hydrolysate, on exercise induced joint and muscle pain was investigated in top athletes.

Subjects
Fifty well-trained athletes, selected from the pool of athletes supported by the German Olympic Support Centre (Olympia Stützpunkt Rhein Ruhr, Essen), participated in the experiment. Sports performed by the athletes, 26 males and 24 females, were badminton (n=4), hockey (n=4), athletics (n=11), rowing (n=10), swimming (n=10), and tennis (n=11). Their age was between 17 and 39 years.

Protocol
Multipower recharge drink, a commercially available drink containing 4.2% protein from PeptoPro®, and a carbohydrate sports drink were used in present experiment. Both drinks contained 8.2% carbohydrates and were consumed during the post-exercise recovery period. Exercise was a performance test following an overnight fast. Subjects performed a protocol with increasing power requirement, until their estimated lactate level was 4 mmol/l. The individual blood lactate levels were tested prior to and during the experiment in samples taken from the earlobe. Directly after the exercise terminated (defined as t=0 min), subjects entered a 240 min recovery period. At t= 0, 30, 60, and 120 min a drink (330 ml each) was consumed. At the end of the recovery period, a second bout of exercise was performed. The experiment was repeated after about one week, with the second treatment. The athletes ranked their feeling of muscle pain on a scale from 1-10 (1= bad feeling, high pain, 10 = no pain at all, feeling good).

Results (see Figure)
Muscle and joint soreness was scored better after drinking the recovery drink containing casein hydrolysate (P<0.01).

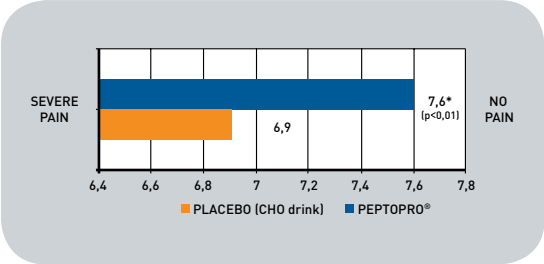

Figure: Rating of exercise-induce muscle- and joint pain after consumption of a carbohydrate containing placebo drink, or a drink containing carbohydrates and PeptoPro®.

Conclusion
The use of PeptoPro® recovery drinks can reduce exercise-induced pain after heavy exercise.

[1] This experiment was performed at the German Olympic Support Centre (Olympiastützpunkt Rhein Ruhr), Sports and exercise medicine department, 45131 Essen, Germany, by drs. D. Alf, J. Broja, A. Butt, and D. Kocak.
[2] Alf, D. & Flechsenhar, K. Ergebnisse einer Anwendungsbeobachtung zur Kollagen hydrolysate CH-alpha Othopädische Praxis 41 Heft 9, 486-494 September 2005.
[3] Saunders, M.J., M.D. Kane & M.K. Todd, 2004. Med. Sci. Sports Exerc., 36(7):1233-1238.

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