

**ipdj**  
INSTITUTO PORTUGUÊS  
DO DESPORTO  
E JUVENTUDE, I.P.

V CONGRESSO INTERNACIONAL  
DA CORRIDA

**Suplementação e  
Recursos Ergogénicos**  
Lisboa 6 Dezembro 2014

Dietista : Marco Pereira

FEDERAÇÃO PORTUGUESA DE ATLETISMO

**SUPLEMENTAÇÃO / EFEITO ERGOGÉNICO**

Suplementos => os géneros alimentícios que se destinam a complementar e ou suplementar o regime alimentar normal..  
[DECRETO-LEI Nº 136/2003 DE 28 DE JUNHO](#)

Ergogénico => qualquer técnica (treino, alimentar, psicológica) utilizada com objectivo de melhorar a capacidade de realizar exercício ou favorecer os processos de recuperação (efeito ergogénico)  
[International Society Of Sports Nutrition](#)

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**EFEITO ERGOGÉNICO**

- Glicídios (durante)
- Proteína (pós treino)
- Água (durante e pós)

- Creatina
- Cafeína
- Bicarbonato
- B-alanina
- Nitratos

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Glicídios	Proteína	Água
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Glicídios	Proteína	Água
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**Table 1 Recommendations for carbohydrate (CHO) intake during different endurance events.**

Event	CHO required for optimal performance and preventing negative energy balance	Recommended intake	CHO test	Single carbohydrate (e.g. glucose)	Mixture carbohydrate (e.g. glucose/fructose)
< 90 min	None required	-	-	-	-
90-110 min	Very small amounts	Minimal intake	Small intake of CHO	•	•
1-2 h	Small amounts	1.5 to 30 g · h <sup>-1</sup>	Small intake of CHO	•	•
2-3 h	Medium amounts	1.5 to 60 g · h <sup>-1</sup>	Stress of CHO due to rapidly oxidized glycogen, metabolic by-products, and dehydration	•	•
> 3 h	Large amounts	1.5 to 100 g · h <sup>-1</sup>	High multiple carbohydrate CHO	•	•

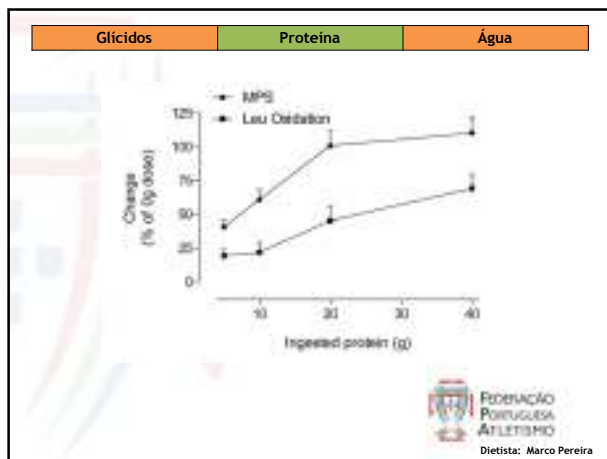
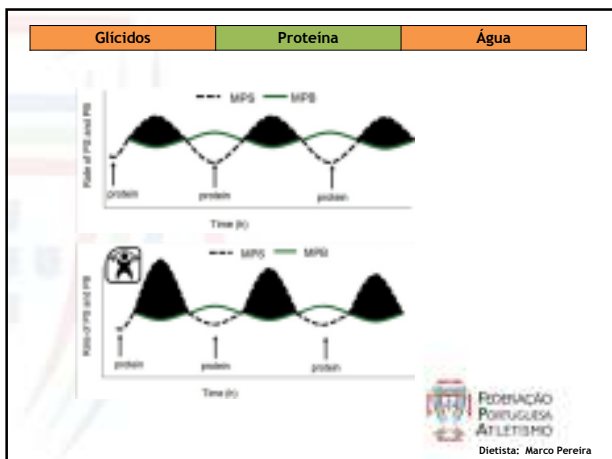
*Note: • indicates CHO, but perhaps not optimal. When guidelines are provided for various reasons, starting as a reasonable amount (>4 kcal · min<sup>-1</sup>). If the tolerance capacity remains to be determined, the figure for carbohydrate intake should be adjusted downwards.*

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Glicídios	Proteína	Água
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3. Glucose, fructose, sucrose and other high-glycemic CHO sources are easily digested, but **rapid** consumption should be minimized as it is absorbed at a slower rate and increases the likelihood of gastrointestinal problems.

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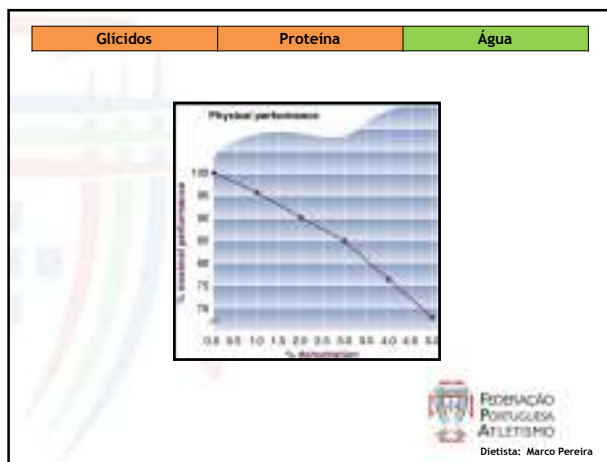
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**PROTEÍNA=AA ESSENCIAIS=BCAA's=LEUCINA**

Recomendações para atletas no pós-treino:  
 20g Proteína = 20g aa essenciais = 4g BCAA's = 2g Leucina

	Quantidade	Glúten	Lactose	Proteínas	Leucina	BCAA's
<b>ALIMENTOS</b>						
Carne (Lombo)	100g	1,1g	14,1g	16,2g	107mg	204mg
Carne (Coxão mole)	100g	0,8g	1,9g	20,1g	104mg	218mg
Carne (Bife à portuguesa)	75g	1,2g	13,2g	16,6g	108mg	219mg
Peixe (Branco)	100g	0,4g	13,4g	20,1g	108mg	224mg
Tubo de leite (1 ano)	100g	4,4g	1,2g	2,0g	20,8mg	44,0mg
<b>PRODUTOS LACTEÍCOS</b>						
Whey Protein Isolate	30g	0,0g	0,0g	18,0g	100mg	200mg
Caseína (Whey)	30g	0,0g	0,0g	18,0g	100mg	200mg
Proteína	30g	0,0g	0,0g	18,0g	100mg	200mg
<b>MISCELÂNEAS</b>						
Ovos	3	0,0g	0,0g	18,0g	100mg	200mg
Amendoim	30g	0,0g	0,0g	18,0g	100mg	200mg
Queijo	30g	0,0g	0,0g	18,0g	100mg	200mg

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Faixa de hidratação - inverno

Temperatura	Atividade	Tempo	Consumo	Perda	Reserva	Reposição
10-15°C	Leve	1h	1,0L	0,5L	0,5L	0,5L
10-15°C	Moderada	2h	2,0L	1,0L	1,0L	1,0L
10-15°C	Intensa	3h	3,0L	1,5L	1,5L	1,5L
10-15°C	Muito Intensa	4h	4,0L	2,0L	2,0L	2,0L

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**Glicídios** | **Proteína** | **Água**

✓ De acordo com as necessidades individuais

Ingerir 150% do peso perdido em líquidos  
 2 x 1,5 = 3 litros de líquidos

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Creatina	Cafeína	Bicarbonato	B-Alanina	Nitratos
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- ✓ + de 90% da creatina sérica destina-se ao músculo Esquelético
- ✓ 65% intracelular, sob a forma fosforilada (fosfocreatina) e os restantes 35% como creatina livre.
- ✓ As sua [músculo] = 130mmol/kg
- ✓ Suplementação] = 160 mmol/kg.

**Ergogénico:** desportos inferiores a 30 seg

**Protocolo:**

- ✓ Norma 3-5g/dia
- ✓ Recomendado:
- ✓ 5 dias Iniciais - 20g/dia
- ✓ Subsequentes: 5-10g/dia

Kreider et al. Mol Cell Biochem 2003;244:89-94  
Volk et al. Nutrition 2004;20:699-814  
Branch et al. Int J Sport Nutr Exerc Metab 2003;13:198-226  
Nissen et al. J Appl Physiol 2000;94:607-609  
Bemben et al. Sport Medicine 2005;35:107-125  
Tipton et al. Essays Biochem 2008;44:95-98  
Lopez et al. J Athl Train 2009;44:215-223

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Creatina	Cafeína	Bicarbonato	B-Alanina	Nitratos
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- ✓ Efeito ao nível do SNC, retardando a percepção à fadiga
- ✓ a cafeína é rapidamente absorvida
- ✓ As [séricas] aumentam de 15-45 minutos após a sua toma
- ✓ [ ] máxima aos 60 minutos
- ✓ valores diminuem de 50 a 75% ao fim de 3-6 horas

**Ergogénico:**  
Desportos de Endurance (corrida, ciclismo, ski de fundo)

**Protocolo:**

- ✓ 2-3mg/kg => 15-45 pré competição

Burke LM. Appl Physiol Nutr Exerc Metab 2007;17:595-607  
Davis et al. Sports Med 2009;39:813-832  
Ganio et al. J Strength Cond Res 2009;23:315-324  
Tamopcsky MA. Appl Physiol Nutr Exerc Metab 2006;31:1264-1269

**FEDERAÇÃO PORTUGUESA ATLETISMO**  
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Creatina	Cafeína	Bicarbonato	B-Alanina	Nitratos
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- ✓ suplementação com o bicarbonato de sódio resulta num aumento do pH (alcalose).
- ✓ possibilidade de ocorrência de problemas gastro intestinais

**Ergogénico:** desportos inferiores a 30 seg

**Protocolo:**

- ✓ 120-150min ao evento em períodos de 30min
- ✓ 300mg/kg (NaHCO<sub>3</sub>) + 7ml (H<sub>2</sub>O)/kg + 1,5g Glicidos/Kg
- ✓ Capsula

Carr et al. Int J Sport Nutr Exerc Metab 2011;21:189-194  
Joyce et al. Eur J Appl Physiol 2012;112:461-469  
Cameron et al. Int J Sport Nutr Exerc Metab 2010;20:307-321  
Wu et al. J Int Soc Sports Nutr 2010;7:33  
Siegler et al. J Strength Cond. Res 2010;24:100-108

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Creatina	Cafeína	Bicarbonato	B-Alanina	Nitratos
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- ✓ Aminoácido Não essencial
- ✓ Precursor da carnosina
- ✓ ↑ [organismo] em condições normais
- ✓ Suplementação β-alanina => ↑ [carnosina]

**Ergogénico:** desportos até a 60 seg

**Protocolo:**

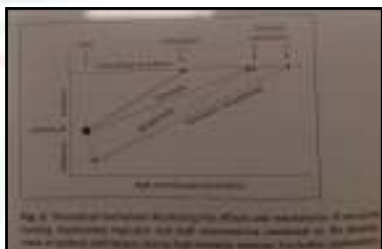
- ✓ Duração => 20-40 dias (5g/dia) => ↑ [carnosina] 20-30%



Arlotti et al. Med Sci Sports Exerc 2010;42:1163-1173  
Stout JR et al. Amino Acids 2007;32:381-386  
Harris RC et al. Amino Acids 2006;30:279-289

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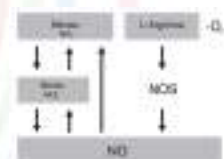


Seki C et al. Med Sci Sports Exerc 2011;43:1973-1979  
Bellinger PM et al. Med Sci Sports Exerc 2012;44:1545-1551

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- ✓ Via = Nitrato (NO<sub>3</sub>) ↔ Nitrito (NO<sub>2</sub>) ↔ Óxido Nítrico (NO) ↔ L-Arginina
- ✓ Modulação do músculo Esquelético:
  - ✓ Pressão arterial
  - ✓ Homeostasia glicose e cálcio
  - ✓ Biogénese e respiração mitocondrial
- ✓ NO<sub>2</sub>: Apresenta forte correlação com tolerância ao exercício



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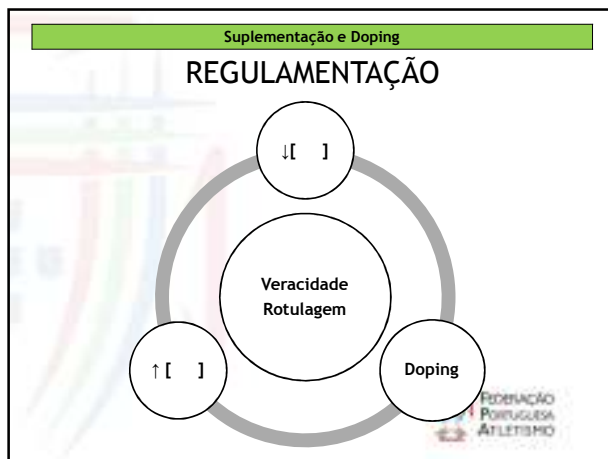
**Creatina**   **Cafeína**   **Bicarbonato**   **B-Alanina**   **Nitratos**

**Ergogénico:** Desportos de endurance  
**Protocolo:**  
 ✓ 2-3 horas previas ao exercício/competição  
 ✓ 0,1mmol/kg de NO<sub>3</sub><sup>-</sup> => ↑[NO<sub>2</sub><sup>-</sup>]  
 ✓ 500ml de sumo de beterraba = 5-6mmol de NO<sub>3</sub><sup>-</sup>  
 ✓ recomendado a forma + natural



Rassaf T et al, Br J Sports Med 2007;41:669-673  
 Dreisigacker U et al, Nitric Oxide 2010;23:128-135  
 Bailey SJ et al, J Appl Physiol 2010;109:135-148  
 Lansley KE et al, J Appl Physiol 2011;110:91-100

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**Suplementação e Doping**

**Analysis of Non-Hormonal Nutritional Supplements for Anabolic-Androgenic Steroids - Results of an Interventional Study**

Table 3 (caption): Nutritional supplements containing prohormones, in relation to the total number of supplements purchased in different countries.

Country	No. of products	No. of positives	Percentage of positives
Netherlands	31	8	25.8%
Austria	22	5	22.7%
UK	37	7	18.9%
USA	240	45	18.8%
Italy	35	5	14.3%
Spain	29	4	13.8%
Germany	129	15	11.6%
Belgium	30	2	6.7%
France	30	2	6.7%
Norway	30	1	3.3%
Switzerland	13	-	-
Sweden	6	-	-
Hungary	2	-	-
Total	634	94	14.8%

**Suplementação e Doping**

**Nutritional supplements cross-contaminated and laced with doping substances**

Table 4 (caption): Nutritional supplements from the German and Spanish market cross-contaminated with steroid prohormones.

Product	Market	Entry date	Take	Cross-contaminations
Vitamin C	Germany	July 2003	Table 1	Methandrostenolone (M) 10 µg/g
Librium	Germany	July 2003	Table 2	Negative
Magnesium + Vitamin C	Germany	January 2006	Table 3	Negative
Multivitamin	Spain	July 2006	Table 4	Negative
Magnesium	Spain	January 2007	Table 5	Hexamethylsiloxane (H) 10 µg/g
			Table 6	Hexamethylsiloxane (H) 10 µg/g
			Table 7	Hexamethylsiloxane (H) 10 µg/g
			Table 8	Hexamethylsiloxane (H) 10 µg/g
			Table 9	Hexamethylsiloxane (H) 10 µg/g
			Table 10	Hexamethylsiloxane (H) 10 µg/g

Recently several slimming products adulterated with the anorectic drug **sibutramine** appeared on the market. Only since 2006 sibutramine is on the list of prohibited substances of the World Anti-Doping Agency. In at least three cases, sibutramine was detected in 'pure herbal' Chinese slimming capsules.<sup>17-19</sup> Additionally, the same compound was also

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**Suplementação e Doping**

**Nutritional supplements cross-contaminated and laced with doping substances**

**USP** (United States Pharmacopeia) logo and **NSF** (National Supplement Factories) logo.

**BSCG** logo.

**Background**  
 Before you consider taking a supplement to the athlete's diet, it is important to purchase a supplement from a reputable source. Athlete foods should be supplemented with dietary supplements for a number of reasons. Athlete foods have greater nutritional content than their peers, or provide them with more energy. In many cases, the vitamins and minerals in food products are lower absorbed than those found in

### Suplementação e Doping

The World Anti-Doping Agency (WADA) was established in November 1999.<sup>23</sup> Four years later, at the 2003 World Conference on Doping in Sport, all major sports federations and nearly 80 countries supported a resolution that accepts the WADA Code as the basis for their stance against doping in sports. The Code provides a framework for antidoping policies and rules and regulations for sport organizations and public authorities to level the global playing field. Athletes are held to a code of "strict liability," which means they are ultimately and solely responsible for any prohibited substance or method identified during testing. It is the athlete's responsibility to know which substances are banned and which substances can result in a doping violation. This Code acts as the

### SUPLEMENTAÇÃO EM JOVENS



Young athletes using a wide range of health (HAA) and need to use (DMS) supplements, including the use of energy drinks that contain high amounts of caffeine and are not suitable for young athletes. Athletes and coaches should be aware that supplements do not provide a short cut to success.



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## CONCLUSÃO

“A Investigação orienta a pratica, mas a pratica também orienta a investigação”

(Haag et al, Sport Sci Ver 1994;3:1-10)



Obrigado

marcopereira@fpattelismo.pt

