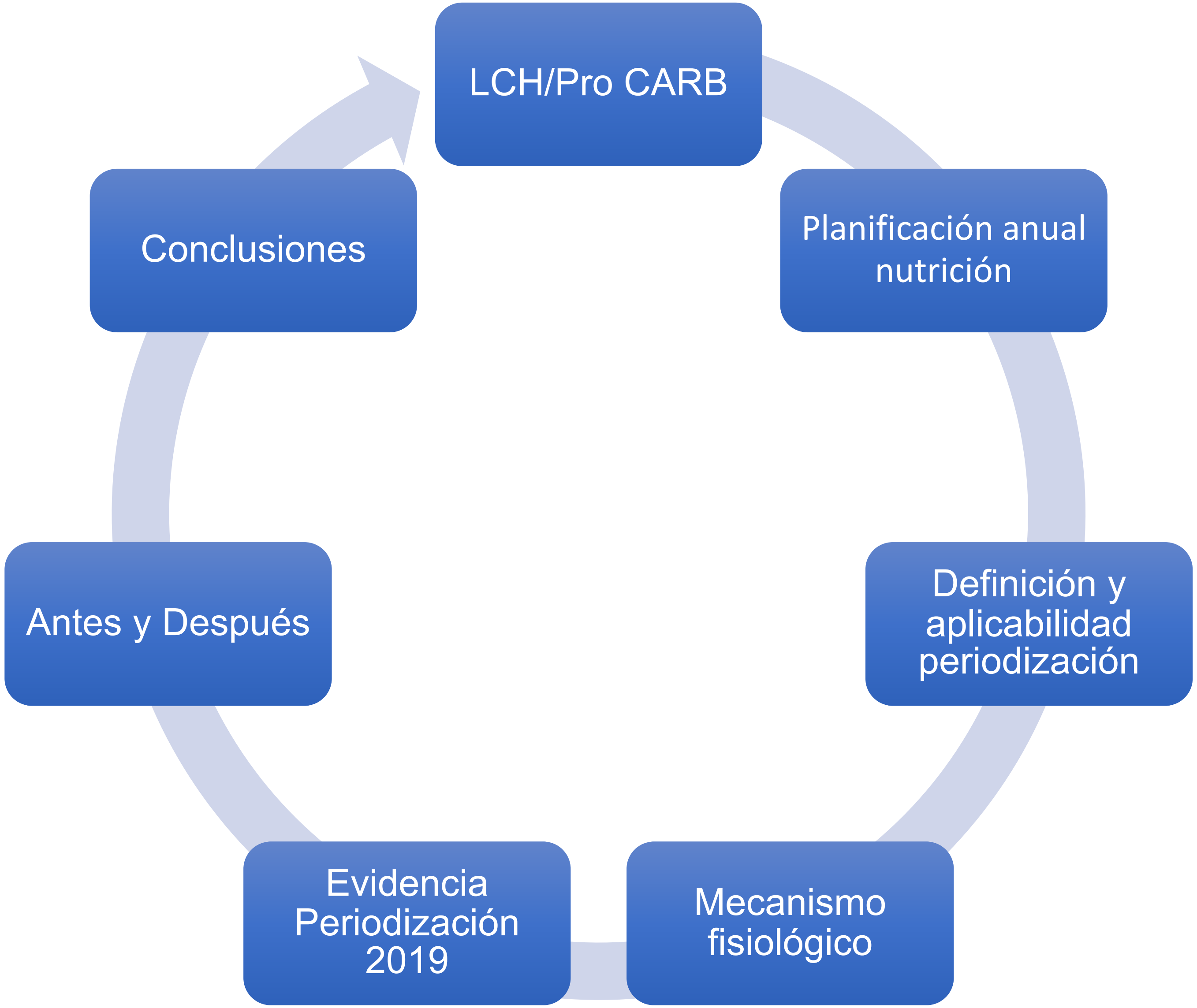
Nutrición e hidratación para triatlón LD

Jornadas Federació Comunitat Valenciana Triatló

Carles tur Carbonell

Introducción:



Contextualización/fisiológica:

From: Jeukendrup, A.

Favor LCHF:

Rethinking fat as a fuel for endurance exercise

Jeff S. Volek, Timothy Noakes & Stephen D. Phinney

To cite this article: Jeff S. Volek, Timothy Noakes & Stephen D. Phinney (2015) Rethinking fat as a fuel for endurance exercise, European Journal of Sport Science, 15:1, 13-20, DOI: 10.1080/17461391.2014.959564

To link to this article: http://dx.doi.org/10.1080/17461391.2014.959564

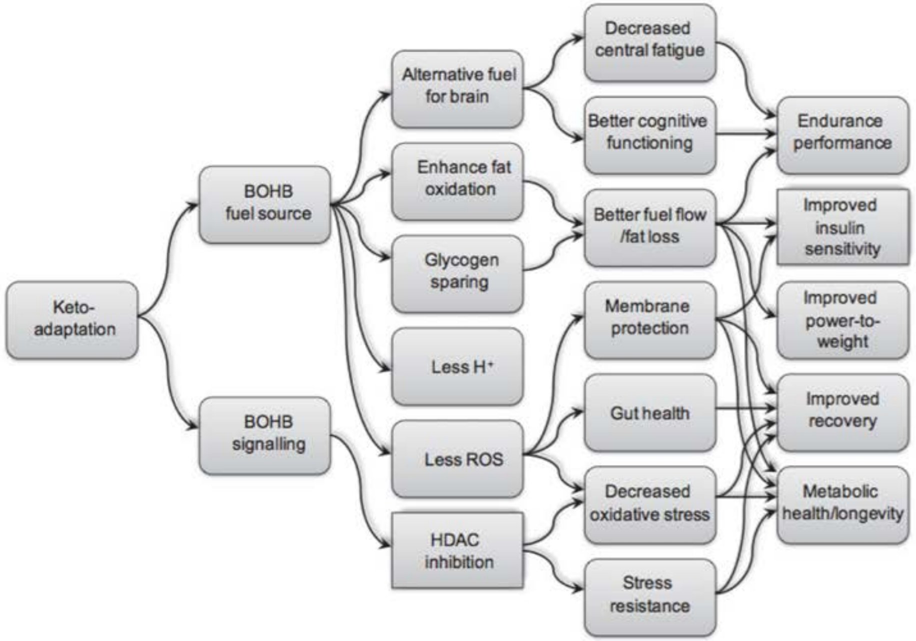


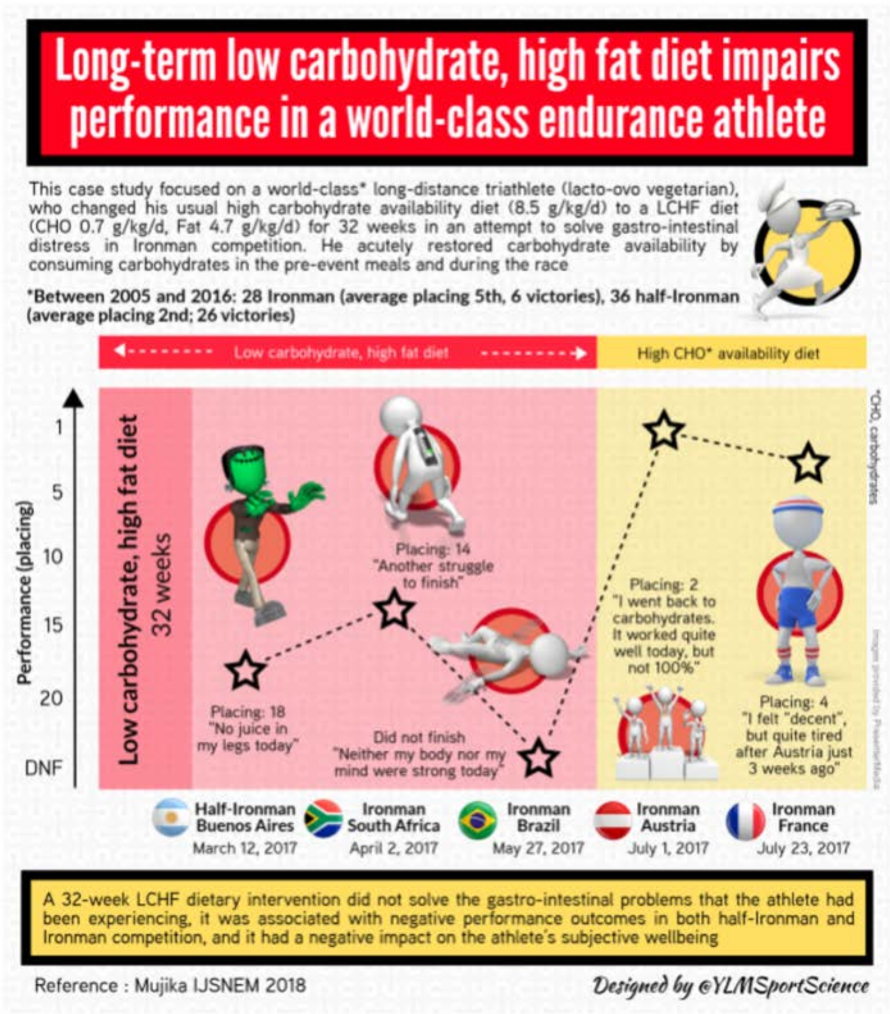
Figure 2. Theoretical paradigm by which ketogenic diets may benefit athletes. Very low-carbohydrate ketogenic diets result in elevated BOHB, which has both energetic effects affecting metabolism and epigenetic effects altering gene expression. The physiologic manifestations of nutritional ketosis may positively impact performance, recovery and health.

Resultados negativos LCHF: Eneko Llanos

Case study: long-term low carbohydrate, high fat diet impairs performance and subjective wellbeing in a world-class vegetarian long-distance triathlete

Iñigo Mujika [1,2]

LONG-TERM LOW CARBOHYDRATE, HIGH FAT DIET IMPAIRS PERFORMANCE IN A WORLD-CLASS ENDURANCE ATHLETE



Resultados positivos LCHF: Amanda Stevens

Case study

Reductions in training load and dietary carbohydrates help restore health and improve performance in an Ironman triathlete

Philip B Maffetone[1] and Paul B Laursen[2,3]

FEDERACIÓ DE TRIATLÓ COMUNITAT VALENCIANA

CarlesTur
TRAINING-PHYSIOTHERAPY & ASSESSMENT

A favor LCHF: Amanda Stevens

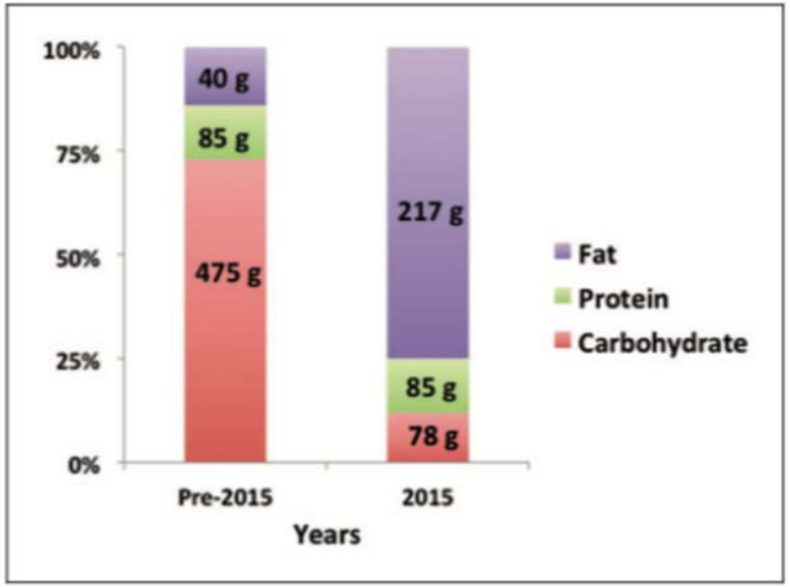


Figure 1. Daily macronutrient intake before and after dietary shift and intervention.

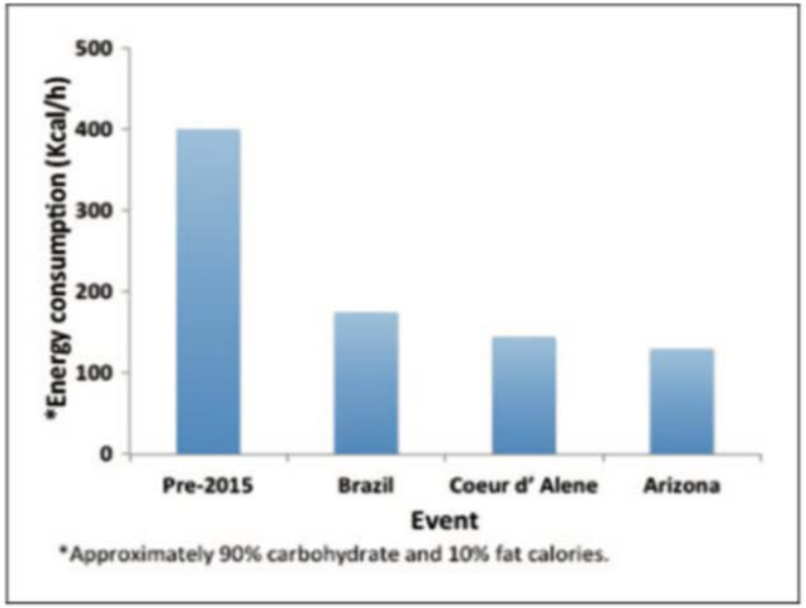


Figure 2. Caloric intake rates during Ironman triathlon event competitions.

Table 1. Ironman event results following the new diet and training approach described herein.

Ironman Event	2015 Date	Finishing time	Finishing place	Notes
Brazil	31 May	9:01:27	Third	Personal best finish time
Coeur d' Alene	28 June	9:40:16	Second	Extreme temperatures (high of 41°C)
Arizona	15 November	8:52:31	Second	Personal best finish time

CarlesTur
TRAINING·PHYSIOTHERAPY & ASSESSMENT

Misma competición: diferentes sustratos

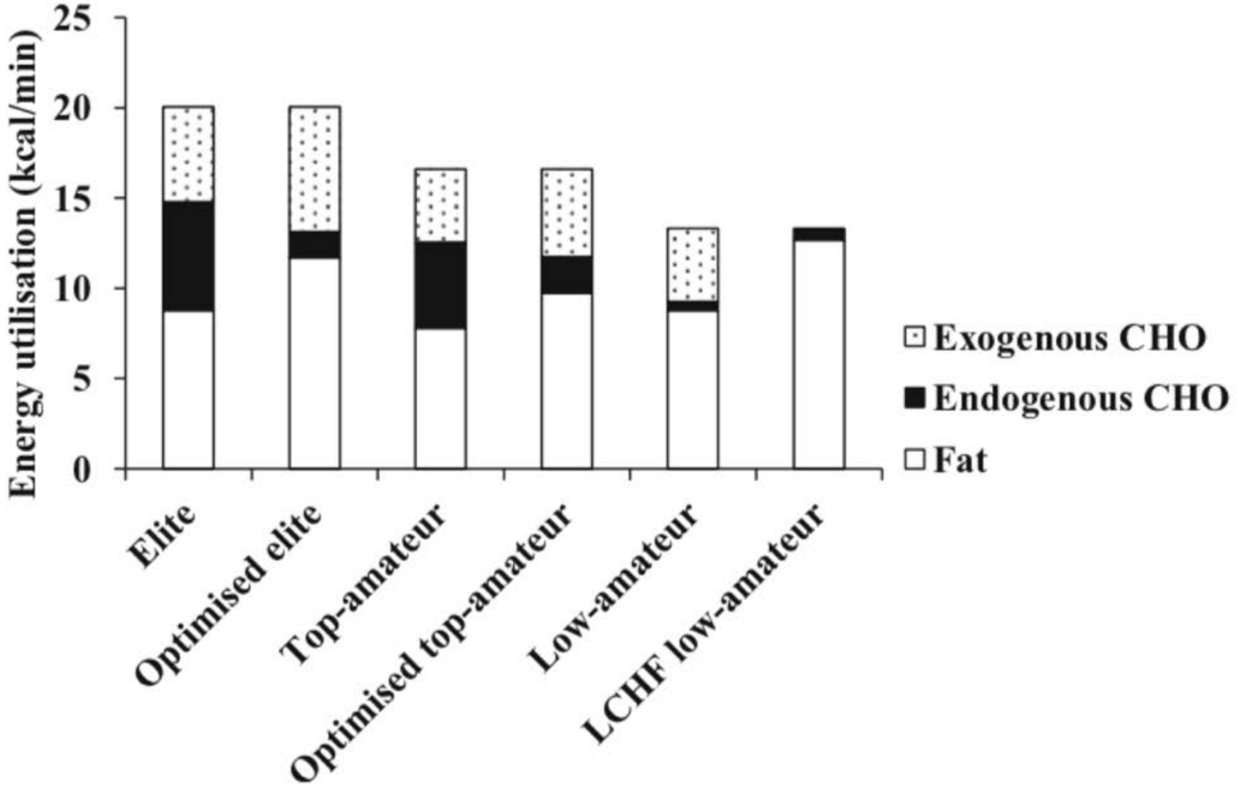
Sports Med
https://doi.org/10.1007/s40279-018-0938-9

CrossMark

CURRENT OPINION

Substrate Metabolism During Ironman Triathlon: Different Horses on the Same Courses

Ed Maunder[1] · Andrew E. Kilding[1] · Daniel J. Plews[1]



Contextualización/fisiológica:

Systematic review: Carbohydrate supplementation on exercise performance or capacity of varying durations[1]

Trent Stellingwerff and Gregory R. Cox

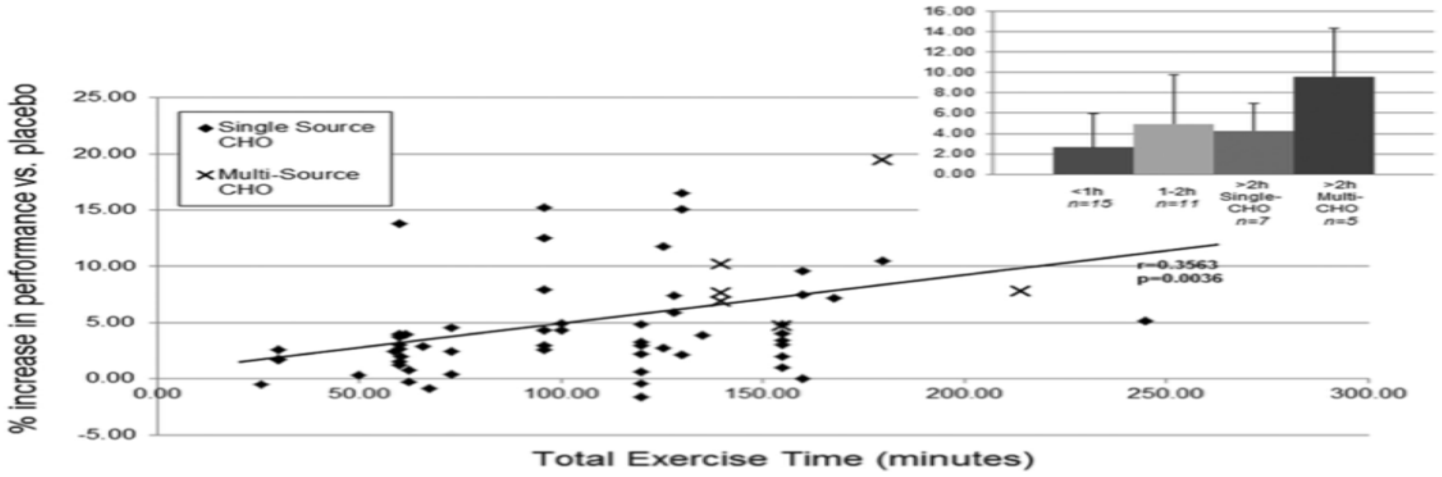


Table 3. CHO intake recommendations based on the duration of sporting event or training bout. Data is summarized from $n = 555$ subjects from 56 different studies.

Event time duration	General amount of CHO required for optimal performance while minimizing negative energy balance and GI issues	Recommended intake	CHO type	Single source CHO (e.g., GLU or maltodextrin)	Multiple transportable CHOs (e.g., GLU:FRU combo)
<1 h	Very small amounts	Mouth rinse to minimal amounts (up to 30 g/h)	Most forms of CHO	●	●
1–2 h	Small to moderate amounts	30 to 60 g/h	Most forms of CHO	●	●
>2 h	Moderate to large amounts	40 to 110 g/h	CHOs that are rapidly oxidized (e.g. GLU or maltodextrin), at intake rates above 60 g/h, use multiple transportable CHOs	○ (if <60 g/h)	●

Contextualización/fisiológica: High Carb

REVIEW — Open Access

Influence of diet on the gut microbiome and implications for human health

Rasnik K. Singh[1], Hsin-Wen Chang[2], Di Yan[2], Kristina M. Lee[2], Derya Ucmak[2], Kirsten Wong[2], Michael Abrouk[3], Benjamin Farahnik[4], Mio Nakamura[2], Tian Hao Zhu[5], Tina Bhutani[2] and Wilson Liao[2*]

Erosive Effect of a New Sports Drink on Dental Enamel during Exercise

MICHELLE C. VENABLES[1], LINDA SHAW[2], ASKER E. JEUKENDRUP[1], A. ROEDIG-PENMAN[3], M. FINKE[3], R. G. NEWCOMBE[4], JASON PARRY[2], and ANTHONY J. SMITH[2]

[1]*Human Performance Laboratory, School of Sport and Exercise Sciences, University of Birmingham, Edgbaston, Birmingham, UNITED KINGDOM;* [2]*School of Dentistry, University of Birmingham, Birmingham, UNITED KINGDOM;* [3]*GlaxoSmithKline Consumer Healthcare, Coleford, Gloucestershire, UNITED KINGDOM; and* [4]*Department of Medical Computing and Statistics, University of Wales College of Medicine, Cardiff, UNITED KINGDOM*

Article

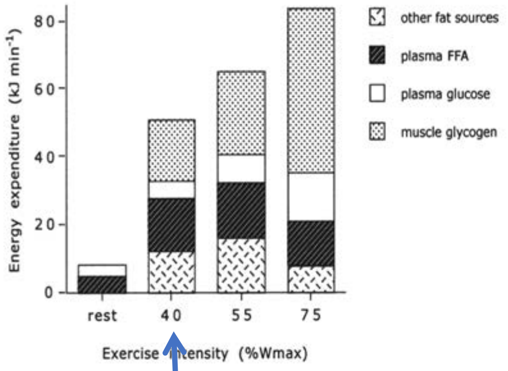
Post-Exercise Carbohydrate-Energy Replacement Attenuates Insulin Sensitivity and Glucose Tolerance the Following Morning in Healthy Adults

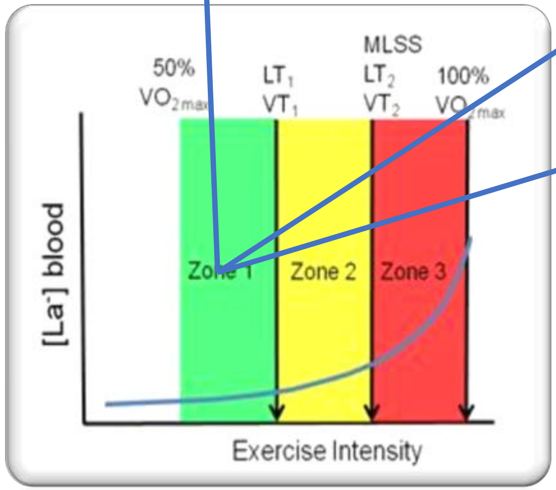
Harry L. Taylor [1], Ching-Lin Wu [2], Yung-Chih Chen [1], Pin-Ging Wang [2], Javier T. Gonzalez [1,*] and James A. Betts [1,*]

Periodización: Carbohidratos

The effects of increasing exercise intensity on muscle fuel utilisation in humans

Luc J. C. van Loon, Paul L. Greenhaff*, D. Constantin-Teodosiu*,
Wim H. M. Saris and Anton J. M. Wagenmakers





Carbohidratos necesarios para baja intensidad?

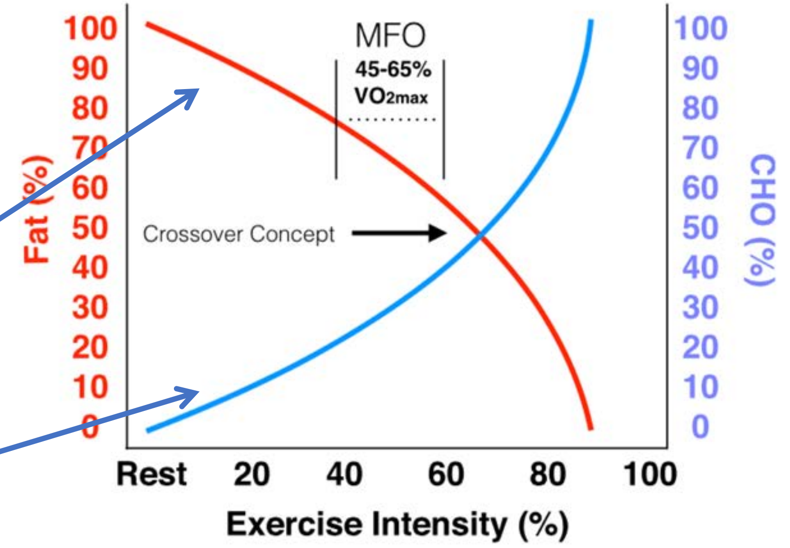


Fig. 2 The crossover concept. The relative decrease in energy derived from lipid (fat) as exercise intensity increases with a corresponding increase in carbohydrate (CHO). The crossover point describes when the CHO contribution to substrate oxidation supersedes that of fat. MFO: maximal fat oxidation. Adapted from Brooks and Mercier, 1994

Periodización: Carbohidratos

Table 2- Sample weekly protocol for training and CHO intake ($g \cdot kg^{-1}$) to achieve different CHO availability around training sessions

	D1			D2 and D3			D4			D5 to D7
	Diet SL	Train	Diet CON	Diet SL	Train	Diet CON	Diet SL	Train	Diet CON	
Before 10 am	Breakfast (2 g)		Breakfast (2 g)			Breakfast (2 g)			Breakfast (2 g)	
					LIT 🚴	Sports Drink (0.5 g)		LIT 🚴	Sports Drink (0.5 g)	
				Breakfast+ Sports Drink (2.5 g)			Breakfast + Sports Drink (2.5 g)			
Midday	Lunch (2 g)		Lunch (2 g)	Lunch+Sport Drink (2.5 g)		Lunch (2 g)				Free LIT : 1 session per day Water during training
	Snack (2 g)			Snack (2 g)						
After 5 pm		HIT 🚴	Sports drink (0.5 g)		HIT D2 🚴 D3 🏃	Sports drink (0.5 g)	Usual diet		Usual diet	Usual diet
			Snack (1 g)			Snack (1 g)				
	Dinner (No CHO)		Dinner (1g)	Dinner (No CHO)		Dinner (1g)				
	Prot Drink (No CHO)		ProtDrink (No CHO)	ProtDrink (No CHO)		ProtDrink (No CHO)				

Total content of meals and snacks for day are identical for the Sleep Low and the Control, but the CHO content ($g \cdot kg^{-1}$) is spread as indicated. HIT, high intensity training sessions, 🚴 cycling: 8x 5 min @ 85% of MAP + 1 min recovery, 🏃 running: 6 x 5 min @ 10 km triathlon speed + 1 min recovery; LIT, Low intensity training session, 🚴 cycling: 1h, 65% of MAP

Table 3 Theoretical overview of the 'fuel for the work required' model

Training Session	CHO Feeding Schedule: Pre-Training Meal	During Training	Post-Training Meal	Evening Meal
Day 1: 4-6 hours high-intensity session consisting of multiple intervals >lactate threshold	HIGH	HIGH	HIGH	LOW
Day 2: 3-5 hours low-intensity steady state session at intensity < lactate threshold	LOW	LOW	HIGH	HIGH
Day 3: 3 hours high-intensity session consisting of multiple intervals > lactate threshold.	HIGH	MEDIUM	HIGH	MEDIUM
Day 4: < 1 hour recovery session at intensity <lactate threshold	LOW	LOW	HIGH	HIGH

Periodización: Definición

Sports Med (2017) 47 (Suppl 1):S51–S63
DOI 10.1007/s40279-017-0694-2

CrossMark

REVIEW ARTICLE

Periodized Nutrition for Athletes

Asker E Jeukendrup[1]

Published online: 22 March 2017

Abstract It is becoming increasingly clear that adaptations, initiated by exercise, can be amplified or reduced by nutrition. Various methods have been discussed to optimize training adaptations and some of these methods have been subject to extensive study. To date, most methods have focused on skeletal muscle, but it is important to note that training effects also include adaptations in other tissues (e.g., brain, vasculature), improvements in the absorptive capacity of the intestine, increases in tolerance to dehydration, and other effects that have received less attention in the literature. The purpose of this review is to define the concept of periodized nutrition (also referred to as nutritional training) and summarize the wide variety of methods available to athletes. The reader is referred to several other recent review articles that have discussed aspects of periodized nutrition in much more detail with primarily a focus on adaptations in the muscle. The purpose of this review is not to discuss the literature in great detail but to clearly define the concept and to give a complete overview of the methods available, with an emphasis on adaptations that are not in the muscle. Whilst there is good evidence for some methods, other proposed methods are mere theories that remain to be tested. 'Periodized nutrition' refers to the strategic combined use of exercise training and nutrition, or nutrition only, with the overall aim to obtain adaptations that support exercise performance. The term nutritional training is sometimes used to describe the same methods and these terms can be used interchangeably. In this review, an overview is given of some of the most common methods of periodized nutrition including 'training low' and 'training high', and training with low- and high-carbohydrate availability, respectively. 'Training low' in particular has received considerable attention and several variations of 'train low' have been proposed. 'Training-low' studies have generally shown beneficial effects in terms of signaling and transcription, but to date, few studies have been able to show any effects on performance. In addition to 'train low' and 'train high', methods have been developed to 'train the gut', train hypohydrated (to reduce the negative effects of dehydration), and train with various supplements that may increase the training adaptations longer term. Which of these methods should be used depends on the specific goals of the individual and there is no method (or diet) that will address all needs of an individual in all situations. Therefore, appropriate practical application lies in the optimal combination of different nutritional training methods. Some of these methods have already found their way into training practices of athletes, even though evidence for their efficacy is sometimes scarce at best. Many pragmatic questions remain unanswered and another goal of this review is to identify some of the remaining questions that may have great practical relevance and should be the focus of future research.

1 Introduction

The adaptive response to exercise training is determined by a combination of factors: the duration, the intensity, and the type of exercise as well as the frequency of training, but also by the quality and quantity of nutrition in the pre- and post-exercise periods. It is becoming increasingly clear that adaptations, initiated by exercise, can be amplified or

✉ Asker E Jeukendrup
a.e.jeukendrup@lboro.ac.uk

[1] School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, Leicestershire LE11 3TU, UK

"Concepto:
Fuel for the work required"

La periodización se refiere a la combinación estratégica de combinar el uso del entrenamiento y la nutrición, o solo la nutrición, con el objetivo final de obtener adaptaciones que den un mayor rendimiento físico.

FEDERACIÓ DE TRIATLÓ COMUNITAT VALENCIANA

¿Cómo debería ser la nutrición de un triatleta LD?:

"A Framework for Periodized Nutrition for Athletics" by Stellingwerff T, Morton JP, Burke LM
International Journal of Sport Nutrition and Exercise Metabolism

---

A framework for periodized nutrition for athletics

Trent Stellingwerff[1,2,3], James P. Morton[4] & Louise M. Burke[5,6]

[1]Canadian Sport Institute Pacific, Victoria, British Columbia, Canada; [2]Athletics Canada – Ottawa, Ontario, Canada; [3]Department of Exercise Science, Physical & Health Education, University of Victoria British Columbia, Canada; [4]Research Institute for Sport and Exercise Sciences, Liverpool John Moores University, Tom Reilly Building, Byrom St. Campus, Liverpool L3 3AF, UK; [5]Australian Institute of Sport, Belconnen ACT 2616, Australia; [6]Mary MacKillop Institute for Health Research, Australian Catholic University, Melbourne 3001, Australia

Running title: Strategic nutrition interventions

Abstract: 228 / 250

Word count: 4,306 / 5,000 words (excludes title page, abstract, acknowledgements, references, figures, tables)

Figure & Tables: 5 / 8 (maximum of 8 Figures and Tables for reviews)

References: 67 (maximum of 75)

Address for correspondence:

Dr. Trent Stellingwerff
Canadian Sport Institute - Pacific
Pacific Institute for Sport Excellence
4371 Interurban Road
Victoria, British Columbia, Canada, V9E 2C5

Telephone: +1 250.220.2584
Mobile: +1 250.208.6674
Email: tstellingwerff@csipacific.ca

¿Cómo debería ser la nutrición de un triatleta LD?:

1) What are the event/sport specific physiological, structural / neuromuscular and psychological determinants of success?

⇩

2) What are the individual athletes gaps to these event/sport specific success determinants?

⇩

3) What are the exercise, training and recovery periodization decisions that are long (Macro; months), medium (Meso; weeks) and short-term (Micro; days / within day) used to address the individual athletes gaps in the context of the event/sport determinants?

⇩

4) What are the associated macro, meso and micro purposefully periodized nutrition interventions that can support the periodized training and recovery stimuli or circumvent the event specific performance determinants?

Examples

	Macro (months)	Meso (weeks)	Micro (days / within day)
CHO	• Daily CHO adjustments to match several month training phase (Inc. in general prep / high volume ; Dec. in competition / low volume).	• Focus of CHO based fueling during race intensity endurance sessions to adapt the GI over several weeks for race day fueling.	• Acute manipulation of CHO availability to enhance recovery (increase) or induce aerobic adaptations (decrease).
PRO	• Adjusting daily protein intake to training demands of a given phase (e.g. ~1.5 g/kg/day vs. ~0.8 g/kg/day in hard vs. recovery blocks)	• Increasing daily protein (~2 g/kg/day) intake over a body composition optimization phase to minimize skeletal muscle mass losses.	• Optimizing within day protein type, amount and timing to enhance acute recovery and long-term adaptation.
Iron	• Adequate dietary iron intake linked to the stress / demands of training and individual athlete iron history and profile.	• Increase in iron intake via a supplement while at several week altitude camp.	• Optimizing acute iron bioavailability by purposeful timing away from hard training, including Vit. C, and excluding calcium.
Creatine	• Use of creatine during a 2 month hypertrophy training block.	• Acute high dose creatine loading phase to enhance a several week anaerobic short interval training block.	• Optimizing acute muscle creatine uptake by taking post-training with CHO.

Periodización: Carbohidratos (Brownlee) 80:20

Alistair Brownlee

Typical training week Feb 2012

steady/aerobic | tempo/hard/interval | S&C/physio

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
80 min steady run 120bpm	Easy Swim	Easy swim	Fast swim	Easy swim	Run session 30 mins hard 160bpm	4 hrs easy bike
Drills S&C	40 min easy run	75 min easy run	60 min easy run	S&C	3.5 hrs easy bike	1hr 40 easy run
Hard Swim	1 hr easy bike	3.5 hr bike	2 hr easy bike 20 min efforts within this	60 min easy run	30 min easy run	
2 hr easy bike	Track 15 mins hard 170bpm			60 min easy bike		

Periodización: Carbohidratos (Brownlee)80:20

Alistair Brownlee

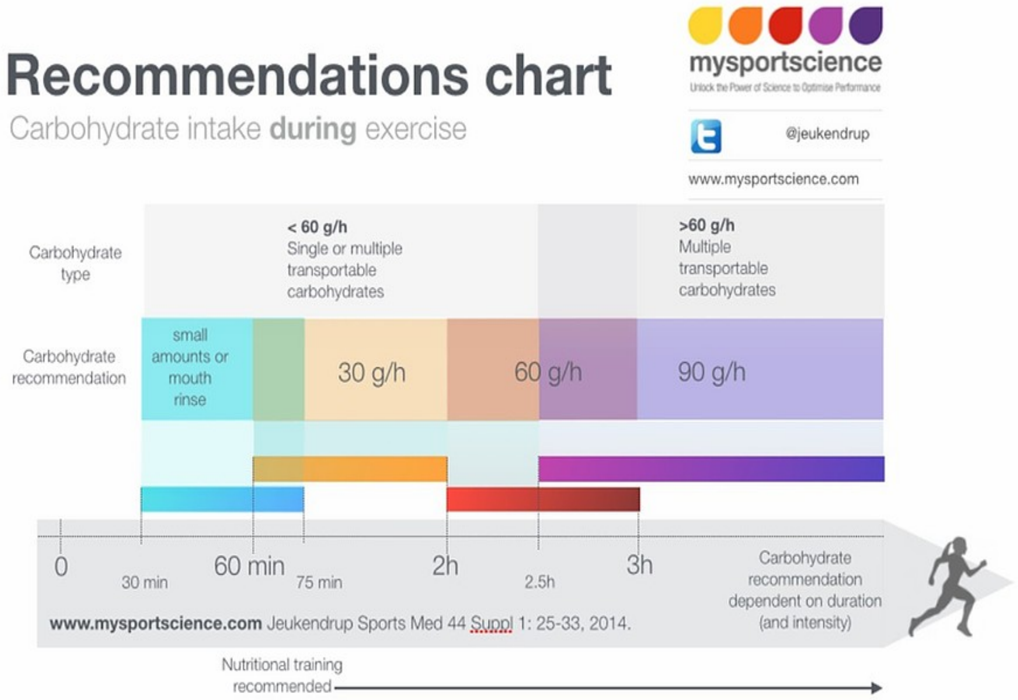
Typical training week Feb 2012

steady/aerobic — tempo/hard/interval — S&C/physio

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
80 min steady run 120bpm	Easy Swim	Easy swim	Fast swim	Easy swim	Run session 30 mins hard 160bpm	4 hrs easy bike
Drills S&C	40 min easy run	75 min easy run	60 min easy run	S&C	3.5 hrs easy bike	1hr 40 easy run
Hard Swim	1 hr easy bike	3.5 hr bike	2 hr easy bike 20 min efforts within this	60 min easy run	30 min easy run	
2 hr easy bike	Track 15 mins hard 170bpm			60 min easy bike		

Carbohidratos en competición:

Event	Carbohydrate required for optimal performance and minimizing negative energy balance	Recommended intake	Carbohydrate type	Glu	Glu+Fru
Super sprint	No CHO required	*	*	*	*
Sprint	Very small amounts	Mouth rinse	Most forms of CHO	●	●
Olympic	Small amounts	Up to 30 g/h	Most forms of CHO	●	●
Ironman 70.3	Moderate amounts	Up to 60 g/h	CHO that are rapidly oxidized (glucose, MD)	○	●
Ironman	Large amounts	Up to 90 g/h	Only multiple transportable CHO		●



Periodización: Carbohidratos

Top 5 Tips for Cycling Performance

Posted 22 September 2015 12:00 AM by Dr James Morton

Team Sky Performance Nutritionist Dr James Morton gives his top 5 nutrition tips to improve your cycling performance.

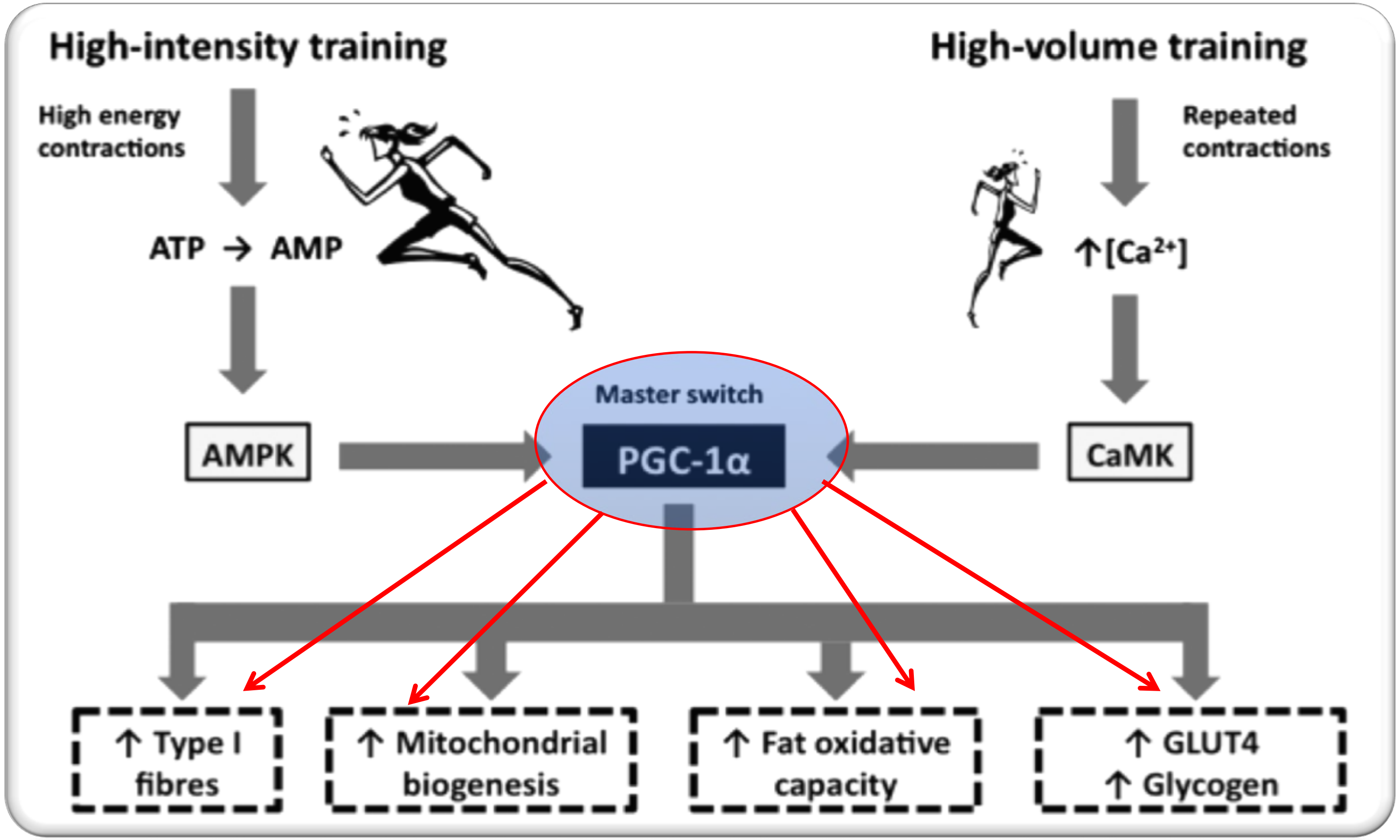
Be Carb Smart

Most cyclists are well aware of the importance of carbohydrate (CHO) to fuel hard training sessions and racing. Typically, endurance athletes are advised to consume CHO at a rate of 30-90 g per hour depending on intensity and duration. However, when the intensity is lower (such as steady-state rides), new evidence suggests that deliberately refraining from CHO intake before and during training (e.g. fasted rides / protein only rides) may actually enhance the aerobic adaptations we are trying to achieve in the first place. As such, the modern day cyclist should be "carb-smart", as achieved by periodising carbohydrates for when we really need them!

FEDERACIÓ DE TRIATLÓ COMUNITAT VALENCIANA

CarlesTur TRAINING·PHYSIOTHERAPY & ASSESSMENT

Periodización: mecanismo fisiológico



(Laursen. 2010)

Periodización: Carbohidratos

nutrients

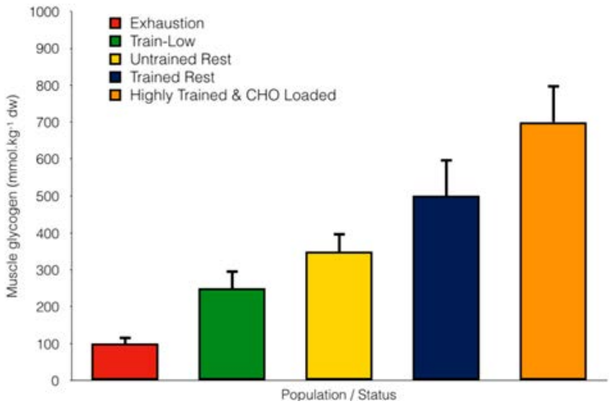
MDPI

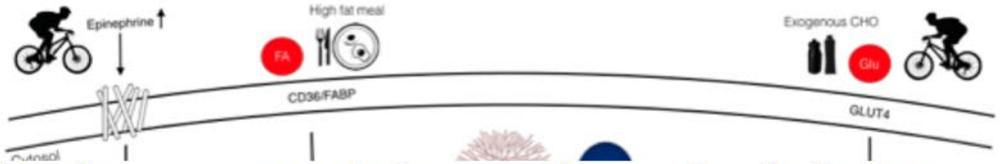
Review

Regulation of Muscle Glycogen Metabolism during Exercise: Implications for Endurance Performance and Training Adaptations

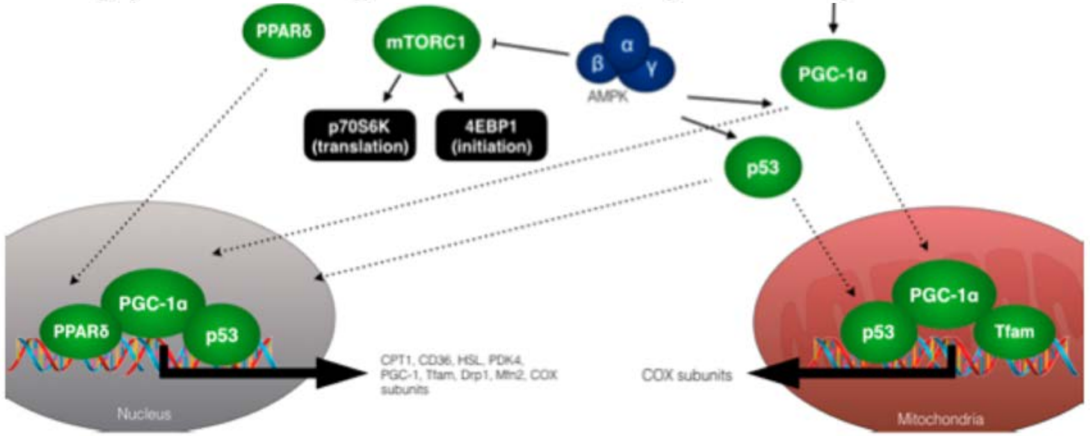
Mark A. Hearris, Kelly M. Hammond, J. Marc Fell and James P. Morton *

Nutrients **2018**, *10*, 298





in recognition that the glycogen granule is more than a simple fuel store, it is now also accepted that glycogen is a potent regulator of the molecular cell signaling pathways that regulate the oxidative phenotype. Accordingly, the concept of deliberately training with low CHO availability has now



Periodización: Carbohidratos

Enhanced Endurance Performance by Periodization of CHO Intake: "Sleep Low" Strategy

Laurie-Anne Marquet[1,2], Jeanick Brisswalter[1,2], Julien Louis[1], Eve Tiollier[1], Louise M. Burke[3,4], John A. Hawley[4,5], and Christophe Hausswirth[1]

Periodización: mecanismo fisiológico

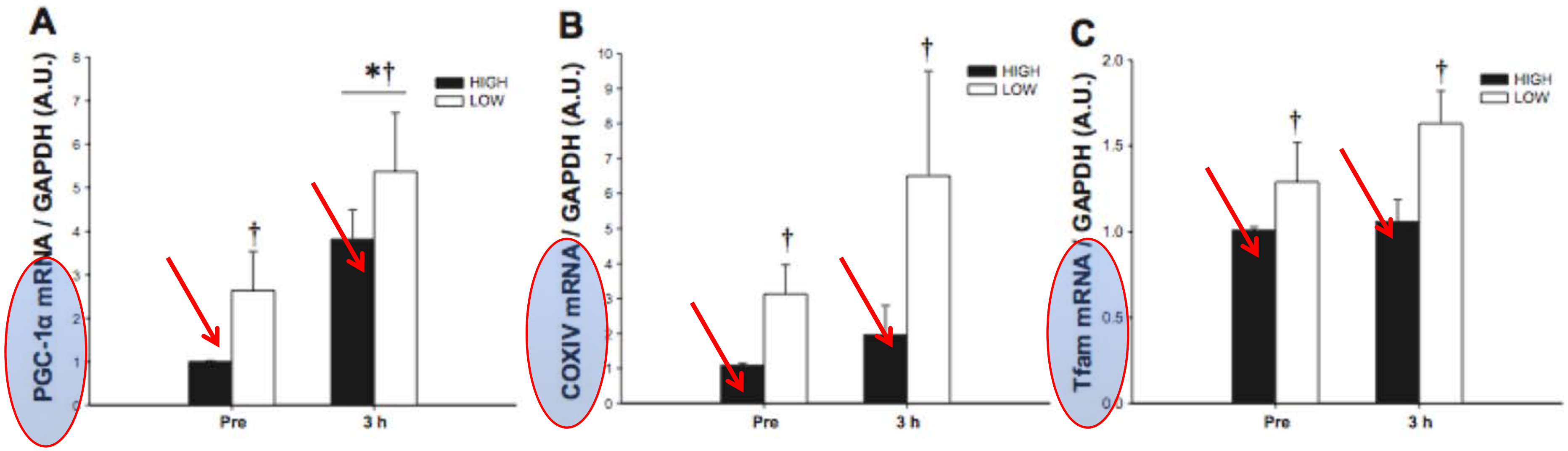
Am J Physiol Regul Integr Comp Physiol 304: R450–R458, 2013.
First published January 30, 2013; doi:10.1152/ajpregu.00498.2012.

Reduced carbohydrate availability enhances exercise-induced p53 signaling in human skeletal muscle: implications for mitochondrial biogenesis

Jonathan D. Bartlett,[1] Jari Louhelainen,[2] Zafar Iqbal,[1] Andrew J. Cochran,[3] Martin J. Gibala,[3] Warren Gregson,[1] Graeme L. Close,[1] Barry Drust,[1] and James P. Morton[1]

[1]*Research Institute for Sport and Exercise Sciences, Liverpool John Moores University, Liverpool, United Kingdom;* [2]*Faculty of Pharmacy and Biomolecular Sciences, Liverpool John Moores University, Liverpool, United Kingdom; and* [3]*Department of Kinesiology, McMaster University, Hamilton, Ontario, Canada*

Submitted 31 October 2012; accepted in final form 21 January 2013



MILLION DOLLAR QUESTION

Periodización: Carbohidratos

Medicine & Science in Sports & Exercise, Publish Ahead of Print
DOI: 10.1249/MSS.0000000000000823

Enhanced Endurance Performance by Periodization of CHO Intake:

"Sleep Low" Strategy

Laurie-Anne Marquet[1,2], Jeanick Brisswalter[1,2], Julien Louis[1], Eve Tiollier[1],
Louise M. Burke[3,4], John A. Hawley[4,5], and Christophe Hausswirth[1]

[1]French National Institute of Sport, Expertise and Performance (INSEP), Laboratory of Sport, Expertise and Performance, Paris, France; [2]University of Nice Sophia-Antipolis, Laboratory of Human Motricity, Education, Sport and Health, Nice, France; [3]Sports Nutrition, Australian Institute of Sport (AIS), Belconnen, Australia; [4]Mary MacKillop Institute for Health Research, Centre for Exercise and Nutrition, Australian Catholic University, Melbourne, Victoria, Australia; [5]Research Institute for Sport and Exercise Sciences, Liverpool John Moores University, Liverpool, United Kingdom

Corresponding author:

Christophe Hausswirth, PhD

French National Institute of Sport, Expertise and Performance

Laboratory of Sport, Expertise and Performance

11, avenue du Tremblay

75012 Paris, FRANCE

Email: christophe.hausswirth@insep.fr

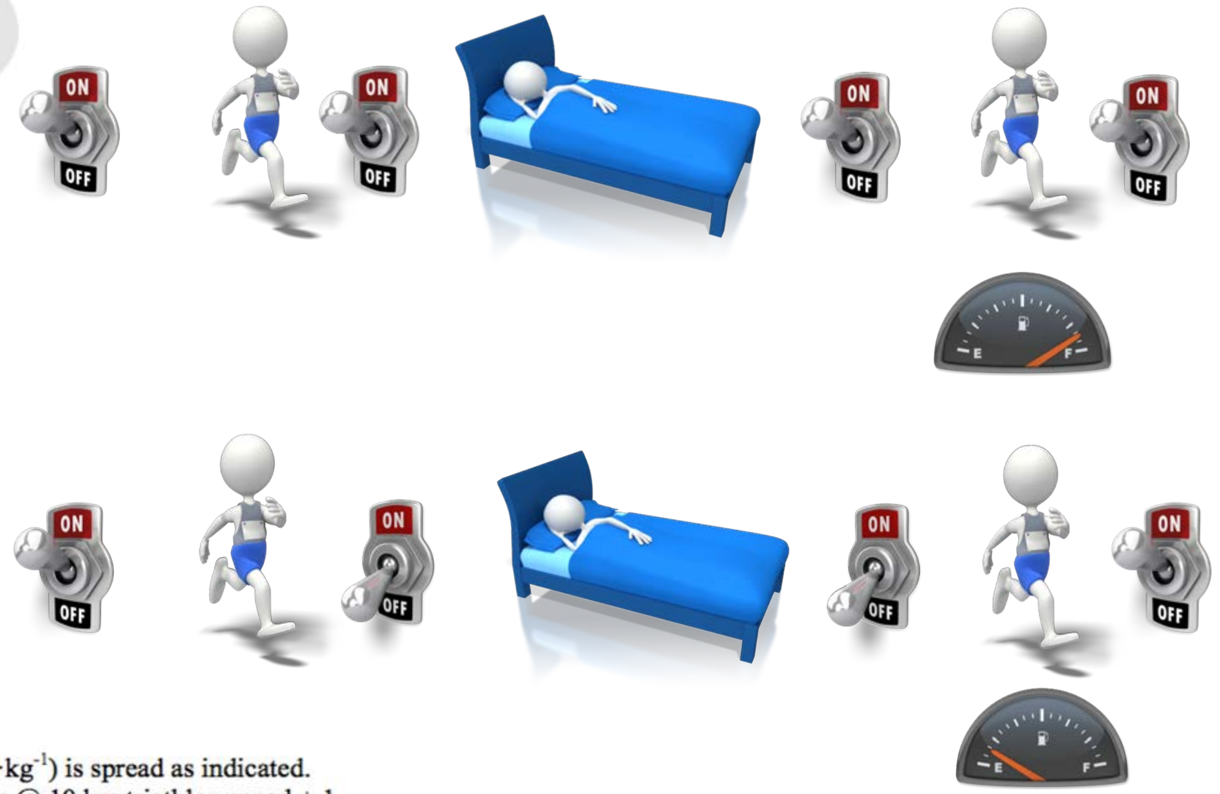
Tel : +33 1 41 74 43 85

Periodización: Carbohidratos

Table 2- Sample weekly protocol for training and CHO intake (g·kg^{-1}) to achieve different CHO availability around training sessions

	D1			D2 and D3			D4			D5 to D7
	Diet SL	**Train**	**Diet CON**	**Diet SL**	**Train**	**Diet CON**	**Diet SL**	**Train**	**Diet CON**	
Before 10 am	Breakfast (2 g)		Breakfast (2 g)			Breakfast (2 g)			Breakfast (2 g)	
					LIT 🚲	Sports Drink (0.5 g)		LIT 🚲	Sports Drink (0.5 g)	
				Breakfast+ Sports Drink (2.5 g)			Breakfast + Sports Drink (2.5 g)			
Midday	Lunch (2 g)		Lunch (2 g)	Lunch+Sport Drink (2.5 g)		Lunch (2 g)				Free LIT : 1 session per day Water during training
	Snack (2 g)			Snack (2 g)						
After 5 pm		HIT 🚲	Sports drink (0.5 g)		HIT D2 🚲 D3 🏃	Sports drink (0.5 g)	Usual diet		Usual diet	Usual diet
			Snack (1 g)			Snack (1 g)				
	Dinner (No CHO)		Dinner (1g)	Dinner (No CHO)		Dinner (1g)				
	Prot Drink (No CHO)		ProtDrink (No CHO)	ProtDrink (No CHO)		ProtDrink (No CHO)				

Total content of meals and snacks for day are identical for the Sleep Low and the Control, but the CHO content (g·kg^{-1}) is spread as indicated. HIT, high intensity training sessions, 🚲 cycling: 8x 5 min @ 85% of MAP + 1 min recovery, 🏃 running: 6 x 5 min @ 10 km triathlon speed + 1 min recovery; LIT, Low intensity training session, 🚲 cycling: 1h, 65% of MAP



FEDERACIÓ DE TRIATLÓ COMUNITAT VALENCIANA

Carles Tur
TRAINING·PHYSIOTHERAPY & ASSESSMENT

Periodización: Carbohidratos

overnight, training sessions with exogenous CHO provision). **Results:** There was a significant improvement in delta efficiency during submaximal cycling for SL versus CON (CON: +1.4 ± 9.3 %, SL: +11 ± 15 %, *P*<0.05). SL also improved supra-maximal cycling to exhaustion at 150% of peak aerobic power (CON: +1.63 ± 12.4 %, SL: +12.5 ± 19.0 %; *P* = 0.06) and 10 km running performance (CON: -0.10 ± 2.03 %, SL: -2.9 ± 2.15 %; *P* < 0.05). Fat mass was decreased in SL (CON: -2.6 ± 7.4; SL: -8.5 ± 7.4 %PRE, *P* < 0.01), but not lean mass (CON: -0.22 ± 1.0; SL: -0.16 ± 1.7 %PRE). Conclusion: Short-term periodization of dietary CHO availability around selected training sessions promoted significant improvements in submaximal cycling economy, as well as supra-maximal cycling capacity and 10 km running time in trained endurance athletes. **Key words:** Dietary manipulation, carbohydrates, triathletes, exercise-

Periodización

Sports Med
https://doi.org/10.1007/s40279-018-08

CrossMark

CURRENT OPINION

Fuel for the Work for Carbohydrate I Hypothesis

Samuel G. Impey[1] · Mark A. H
Julien Louis[1] · Graeme L. Clos

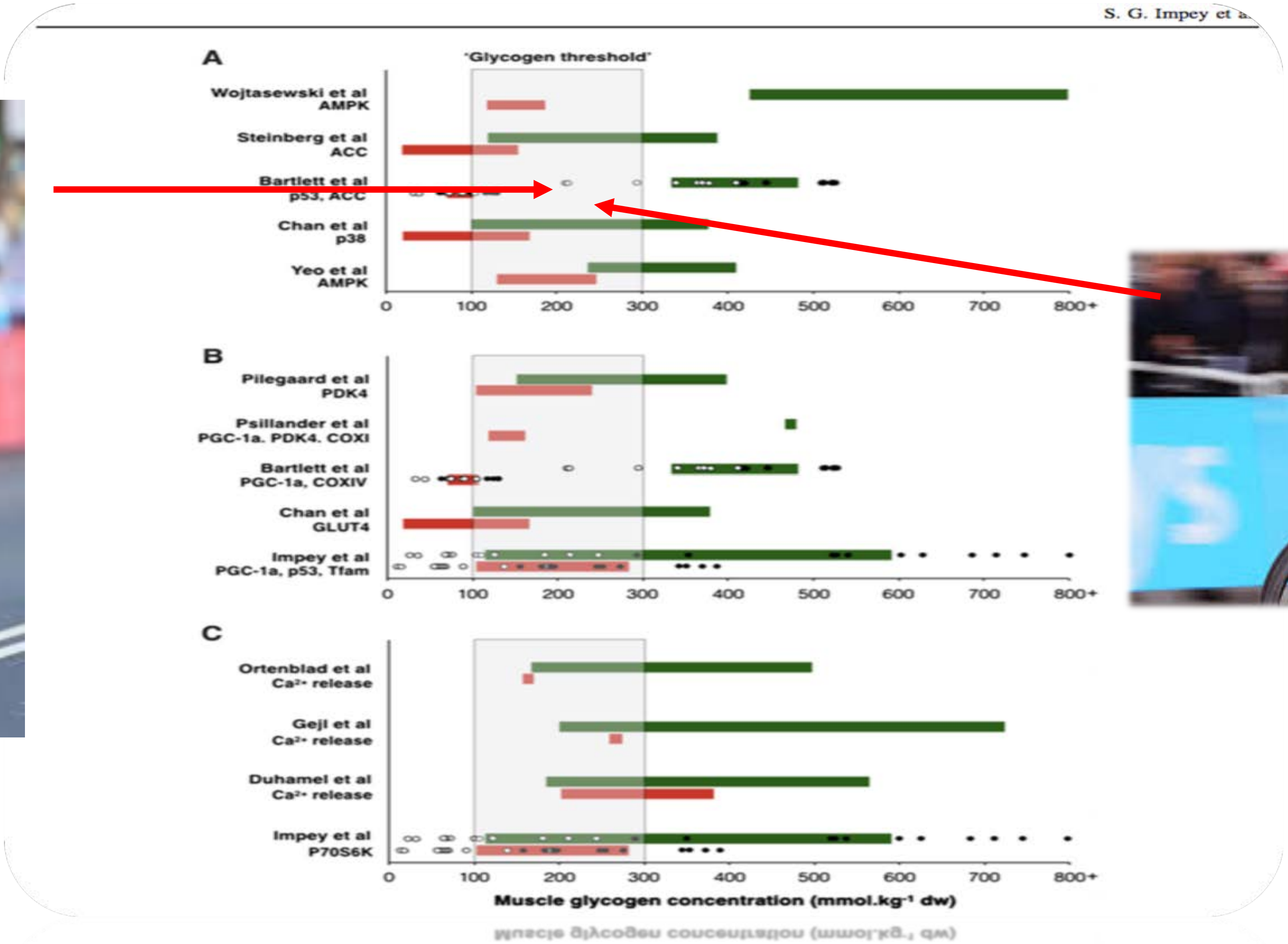
Key Points

Periodically completing endurance training sessions (e.g. 30–50% of training sessions) with reduced carbohydrate (CHO) availability modulates the activation of acute cell signalling pathways (73% of 11 studies), promotes training-induced oxidative adaptations of skeletal muscle (78% of 9 studies) and, in some instances, improves exercise performance (although only 37% of 11 studies demonstrated performance improvements).

We propose the presence of a muscle glycogen threshold whereby exceeding a critical absolute level of glycogen depletion during training is especially potent in modulating the activation of acute and chronic skeletal muscle adaptations associated with 'train low'.

Future research should attempt to quantify the glycogen and CHO cost of endurance athletes' typical training sessions so as to increase our understanding of the exercise conditions that may elicit the proposed glycogen threshold and thereby inform practical application of 'fuel for the work required' paradigm.

Periodización: Carbohidratos



Periodización: Carbohidratos

RESUMEN ESTUDIOS PERIODIZACIÓN NUTRICIONAL RENDIMIENTO Y ADAPTACIONES METABÓLICAS (C.TUR & F.MATA 2018)

Autor Principal	Tipo periodización	Intervención	Duración	Hit	Adaptación Metabólica	Mejora rendimiento
HANSEN	TWICE PER DAY	7 Untrained	10 weeks	STR	SÍ	TTE LEG EXTENSIÓN
COCHRAN	TWICE PER DAY	18 Active	2 weeks	5 X 4 '	SÍ	TTE
MARQUET	SLEEP LOW	21 Triatletas trained	3 weeks	8 X 5 '	NA	10 KM TT Y GE CYCLING
MARQUET	SLEEP LOW	11 Ciclistas trained	1 weeks	8 X 5 '	NA	TT CYCLING 40 KM
IMPEY	PERIODIZED	11 Ciclistas amateur	1 dia	4 X 30"/1	SÍ	SI TTE
YEO	TWICE PER DAY	14 trained	3 weeks	8 X 5´	SÍ	60' TT
MORTON	TWICE PER DAY	23 active	6 weeks	6 X 3´	SÍ	VO2 MAX
HULSTON	TWICE PER DAY	14 ent	3 weks	8 X 5´	SÍ	60' TT
NYBO	TWICE PER DAY	15 unt	8 weeks	3-6 '	SÍ	VO2 MAX/15 MIN TT
VAN PROEYEN	TWICE PER DAY	20 active	6 weeks	60 ´	SÍ	60' TT
BURKE	PERIODIZED	22 elite RW	3 weeks	TYPE OF T	NA	10 KM TT
GELI	PERIODIZED	26 elite male	4 weeks	TYPE OF T	NO	VO2 MAX/ 30´TT

Periodización carbohidratos reflexion: evaluación rendimiento

Periodización: Carbohidratos

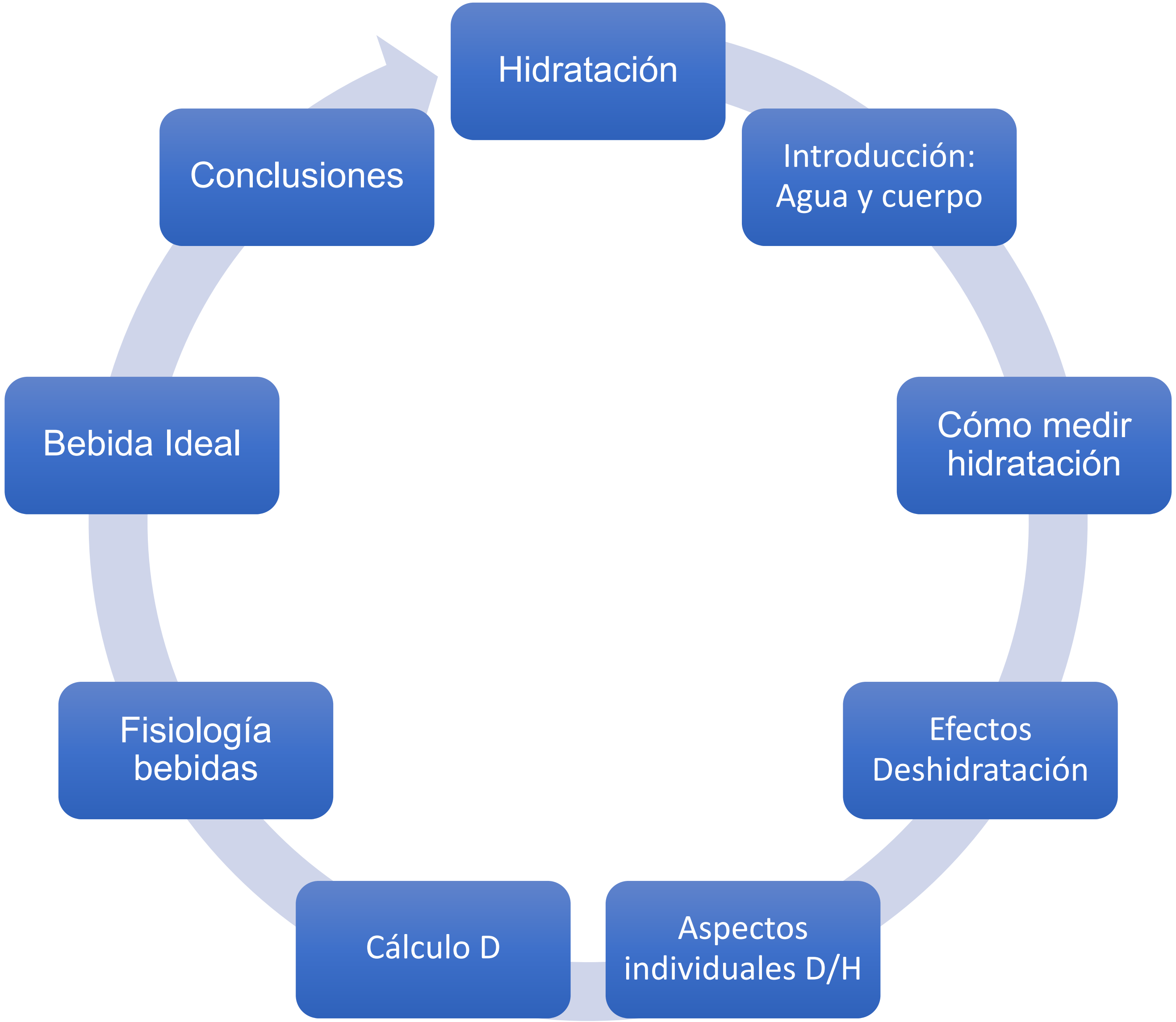
CHO Restriction, Train Low and Training Adaptation

Table 3 Theoretical overview of the 'fuel for the work required' model

Training Session	CHO Feeding Schedule Pre-Training Meal	During Training	Post-Training Meal	Evening Meal
Day 1: 4-6 hours high-intensity session consisting of multiple intervals >lactate threshold	HIGH	HIGH	HIGH	LOW
Day 2: 3-5 hours low-intensity steady state session at intensity < lactate threshold	LOW	LOW	HIGH	HIGH
Day 3: 3 hours high-intensity session consisting of multiple intervals > lactate threshold.	HIGH	MEDIUM	HIGH	MEDIUM
Day 4: < 1 hour recovery session at intensity <lactate threshold	LOW	LOW	HIGH	HIGH

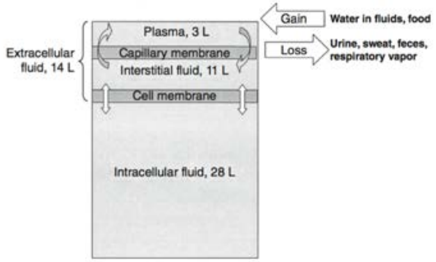
Hidratación:

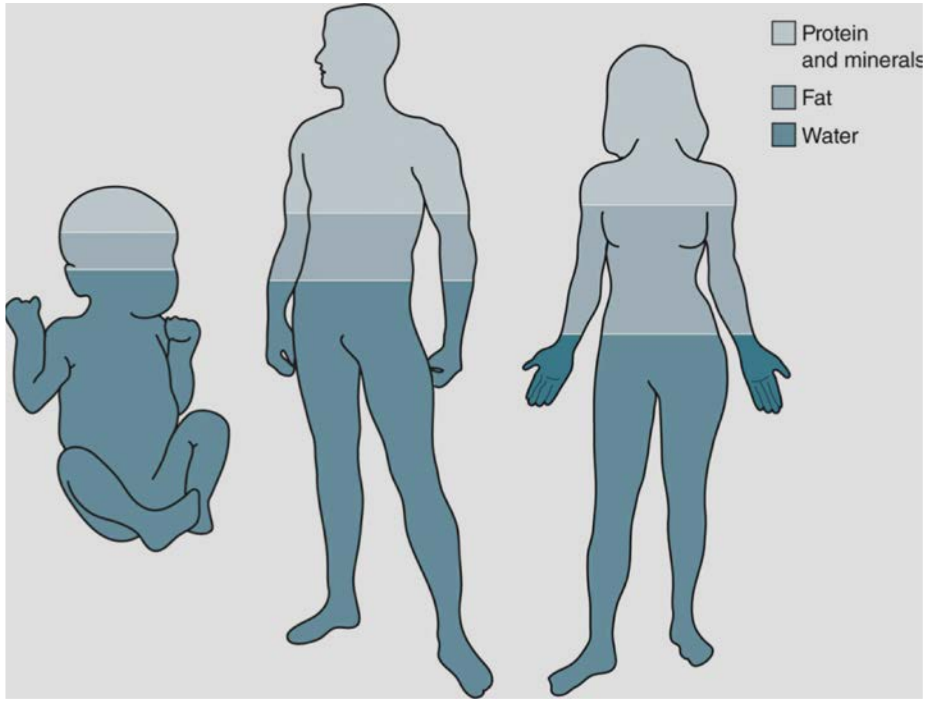
Introducción:



Introducción: agua y cuerpo

- Ser Humano 60-70 % agua
- 2 compartimientos mayormente (intra y extracelular).





Estrategias conocer estado de hidratación

Diagnosing dehydration? Blend evidence with clinical observations

Lawrence E. Armstrong[a], Stavros A. Kavouras[b], Neil P. Walsh[c], and William O. Roberts[d]

Table 1. Comparison of research and clinical techniques to diagnose dehydration, using a single measurement

Hydration assessment techniques	Patient self-evaluation	Cost efficiency	Time efficiency	Simplicity of test	Scientific value[c]
Clinical diagnostic laboratory tests					
Blood urea nitrogen/creatinine ratio		●●●○○	●●●○○	●●●○○	●●●●○
Serum sodium concentration (mEq/l or mmol/l)		●●●○○	●●●○○	●●○○○	●●●○○
Blood osmolality, calculated (mOsm/kg or mmol/kg)		●●●○○	●●●○○	●●○○○	●●●●○
Hematocrit/hemoglobin ratio		●●●○○	●●●○○	●●●○○	●●●○○
Mean corpuscular volume (fl)		●●●○○	●●●○○	●●●○○	●●●○○
Urine specific gravity		●●●●●	●●●●○	●●●●○	●●●●○
Research measurements					
Isotope dilution, total body water (l)		●○○○○	●○○○○	●○○○○	●●●○○
Neutron activation analysis, fluid volumes, and ionic content		●○○○○	●○○○○	●○○○○	●●●○○
Bioelectrical impedance analysis, total body water (l)		●●●●○	●●●●○	●●●●○	●●●○○
Body mass (kg)	✓	●●●●●	●●●●●	●●●●●	●○○○○
Blood osmolality, measured[b] (mOsm/kg or mmol/kg)		●●●○○	●●●○○	●●●○○	●●●●○
Urine osmolality (mOsm/kg or mmol/kg)		●●●●○	●●●●○	●●●●○	●●●●○
Salivary osmolality (mOsm/kg or mmol/kg)		●●●●○	●●●●○	●●●●○	●●●●○
Tear osmolality (mOsm/l or mmol/l)		●●●●○	●●●●○	●●●○○	●●●○○
Intraocular pressure (mmHg)		●●●●○	●●●○○	●●●○○	●●○○○

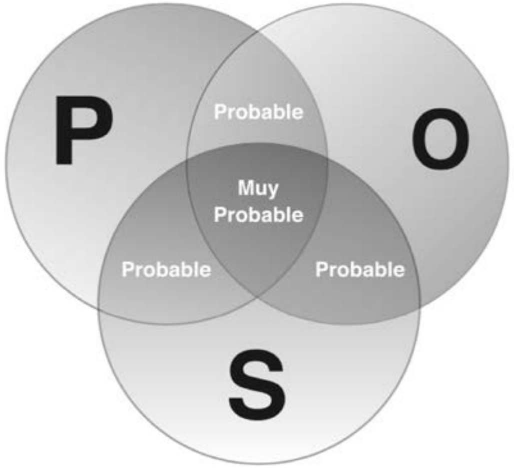
●●●●● = high, ●●●○○ = medium, and ●○○○○ = low.
[a]Lying to sitting, sitting to standing, and lying to standing.
[b]Measured via freezing point depression osmometry.
[c]Considering measurement resolution, reliability, and accuracy.

Estrategias conocer estado de hidratación:

GATORADE SPORTS SCIENCE INSTITUTE

EVALUACIÓN DE LA HIDRATACIÓN EN ATLETAS

Samuel N. Cheuvront, Ph.D. | **Michael N. Sawka, Ph.D. FACSM** | División de Medicina Térmica y de Montañal
Instituto de Investigación de Medicina Ambiental del Ejército de los Estados Unidos | Natick | MA



P: Peso
O: color Orina
S: Sed

FEDERACIÓ DE TRIATLÓ COMUNITAT VALENCIANA

Carles Tur TRAINING-PHYSIOTHERAPHY & ASSESSMENT

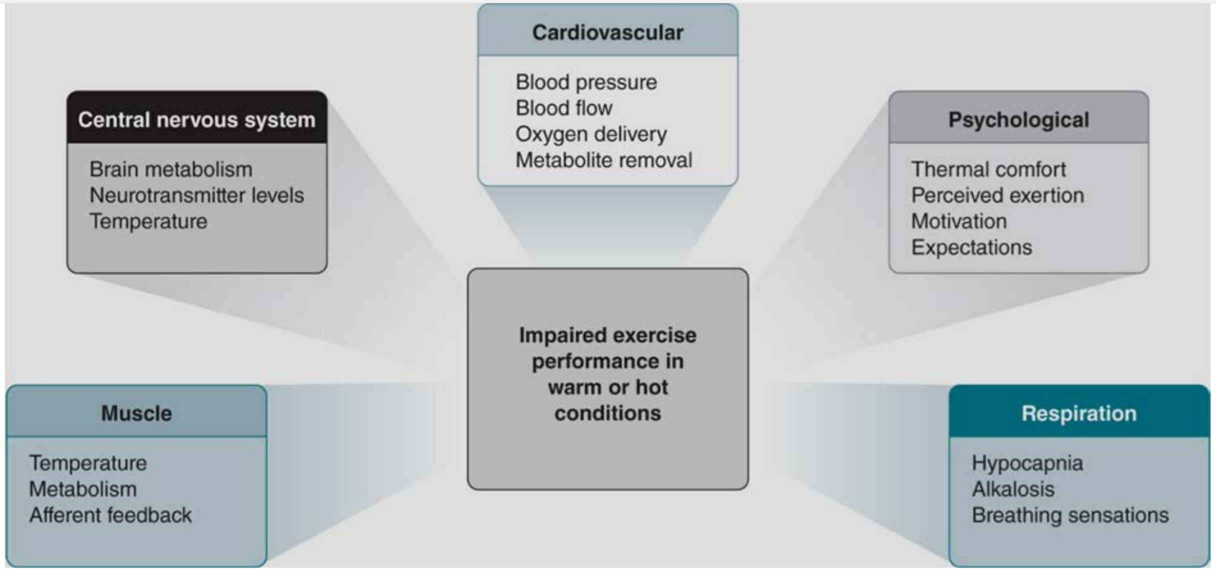
Efectos deshidratación en ambientes calurosos:

Sports Science Exchange (2015) Vol. 28, No. 153, 1-6

GATORADE SPORTS SCIENCE INSTITUTE

ACLIMATACIÓN AL CALOR PARA MEJORAR EL RENDIMIENTO ATLÉTICO EN AMBIENTES CALUROSOS

Michael N. Sawka, PhD | Escuela de Fisiología Aplicada | Instituto de Tecnología de Georgia | Estados Unidos de América | **Julien D. Périard, PhD y Sébastien Racinais, PhD** | Centro de Investigación de Salud y Rendimiento del Atleta | Aspetar, Hospital de Ortopedia y Medicina del Deporte | Qatar



Conocer ambientes calurosos: WBGT

Figure 8 WBGT monitoring tool and flag warning system

Wet Bulb Globe Temperature (WBGT) from Temperature and Relative Humidity

Temperature (°C)

Relative Humidity (%)	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
0	15	16	16	17	18	18	19	19	20	20	21	22	22	23	23	24	24	25	25	26	27	27	28	28	29	29	30	31	31	32	32
5	16	16	17	18	18	19	19	20	21	21	22	22	23	24	24	25	26	26	27	27	28	29	29	30	31	31	32	33	33	34	35
10	16	17	17	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27	28	29	30	30	31	32	32	33	34	35	36	36	37
15	17	17	18	19	19	20	21	21	22	23	23	24	25	26	26	27	28	29	29	30	31	32	33	33	34	35	36	37	38	39	
20	17	18	18	19	20	21	21	22	23	24	24	25	26	27	27	28	29	30	31	32	32	33	34	35	36	37	38	39			
25	18	18	19	20	20	21	22	23	24	24	25	26	27	28	28	29	30	31	32	33	34	35	36	37	38	39					
30	18	19	20	20	21	22	23	23	24	25	26	27	28	29	29	30	31	32	33	34	35	36	37	39							
35	18	19	20	21	22	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39								
40	19	20	21	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39									
45	19	20	21	22	23	24	25	26	27	27	28	29	30	32	33	34	35	36	37	38											
50	20	21	22	23	23	24	25	26	27	28	29	30	31	33	34	35	36	37	39												
55	20	21	22	23	24	25	26	27	28	29	30	31	32	34	35	36	37	38													
60	21	22	23	24	25	26	27	28	29	30	31	32	33	35	36	37	38														
65	21	22	23	24	25	26	27	28	29	31	32	33	34	36	37	38															
70	22	23	24	25	26	27	28	29	30	31	33	34	35	36	38	39															
75	22	23	24	25	26	27	29	30	31	32	33	35	36	37	39																
80	23	24	25	26	27	28	29	30	32	33	34	36	37	38																	
85	23	24	25	26	28	29	30	31	32	34	35	37	38	39																	
90	24	25	26	27	28	29	31	32	33	35	36	37	39																		
95	24	25	26	27	29	30	31	33	34	35	37	38																			
100	24	26	27	28	29	31	32	33	35	36	38	39																			

WBGT > 40

Note: This table is compiled from an approximate formula which only depends on temperature and humidity. The formula is valid for full sunshine and a light wind

Cat 3	Cat 2	Cat 1	Activity Guidelines
< 82.0°F <27.8°C	< 79.7°F <26.5°C	< 76.1°F <24.5°C	Normal Activities – Provide at least three separate rest breaks each hour with a minimum duration of 3 min each during the workout.
82.2 - 86.9°F 27.9-30.5°C	79.9 - 84.6°F 26.6-29.2°C	76.3 - 81.0°F 24.6-27.2°C	Use discretion for intense or prolonged exercise; Provide at least three separate rest breaks each hour with a minimum duration of 4 min each.
87.1 - 90.0°F 30.6-32.2°C	84.7 - 87.6°F 29.3-30.9°C	81.1 - 84.0°F 27.3-28.9°C	Maximum practice time is 2 h. <u>For Football</u>: players are restricted to helmet, shoulder pads, and shorts during practice. If the WBGT rises to this level during practice, players may continue to work out wearing football pants without changing to shorts. <u>For All Sports</u>: Provide at least four separate rest breaks each hour with a minimum duration of 4 min each.
90.1 - 91.9°F 32.2-33.3°C	87.8 - 89.6°F 31.0-32.0°C	84.2 - 86.0°F 29.0-30.0°C	Maximum practice time is 1 h. <u>For Football</u>: No protective equipment may be worn during practice, and there may be no conditioning activities. <u>For All Sports</u>: There must be 20 min of rest breaks distributed throughout the hour of practice.
≥ 92.1°F ≥ 33.4°C	≥ 89.8°F ≥32.1°C	≥ 86.2°F ≥30.1°C	No outdoor workouts. Delay practice until a cooler WBGT is reached.

Grado de deshidratación?

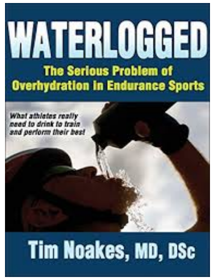
2 % DH= menos rendimiento

3 % no perdida de rendimiento

Evidencia perdida de rendimiento y deshidratación?

AMERICAN COLLEGE OF SPORTS MEDICINE • FOUNDED 1954 •

2007



2007-2012

2018

2019

Individualizar

Efectos deshidratación:

Sports Med (2018) 48 (Suppl 1):S31–S37
https://doi.org/10.1007/s40279-017-0844-6

REVIEW ARTICLE

Drinking Strategies: Planned Drinking Versus Drinking to Thirst

Robert W. Kenefick[1]

Ad libitum: intensidades bajas y trabajos de 1-2 hrs

Planificada: intensidades alta >2 hrs, calor alto.

Efectos deshidratación:

Sports Medicine (2019) 49 (Suppl 2):S103–S114
https://doi.org/10.1007/s40279-019-01188-5

REVIEW ARTICLE

Check for updates

Does Hypohydration Really Impair Endurance Performance? Methodological Considerations for Interpreting Hydration Research

Lewis J. James[1] · Mark P. Funnell[1] · Ruth M. James[2] · Stephen A. Mears[1]

2-3 % deportistas en ambientes calurosos= peor rendimiento

Muchos estudios han utilizado métodos de deshidratación no habituales como: diuréticos, no blindaje, sin ventilador, etc

Estudios blindados en hidratación afectan el rendimiento, pero depende de la persona, a unos sí y otros no, por lo tanto individualizar. Aplicar beber “ad libitum” o bien Planificado en función del deportista.

Individualización: Hidratación/deshidratación

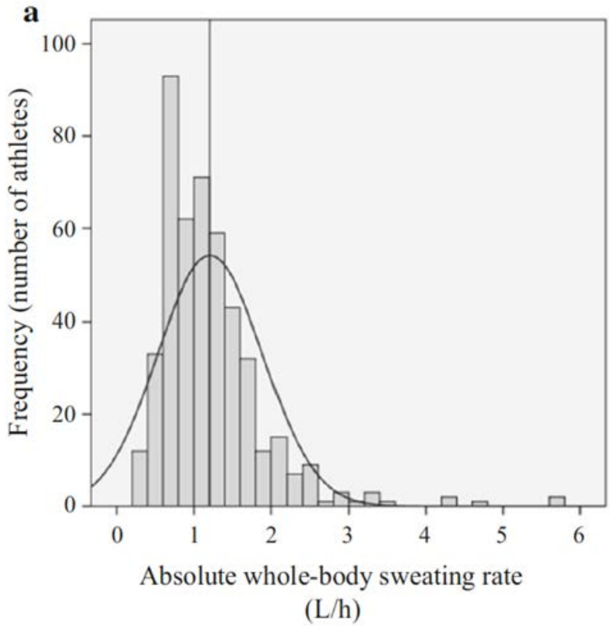
Sports Med (2017) 47 (Suppl 1):S111–S128
DOI 10.1007/s40279-017-0691-5

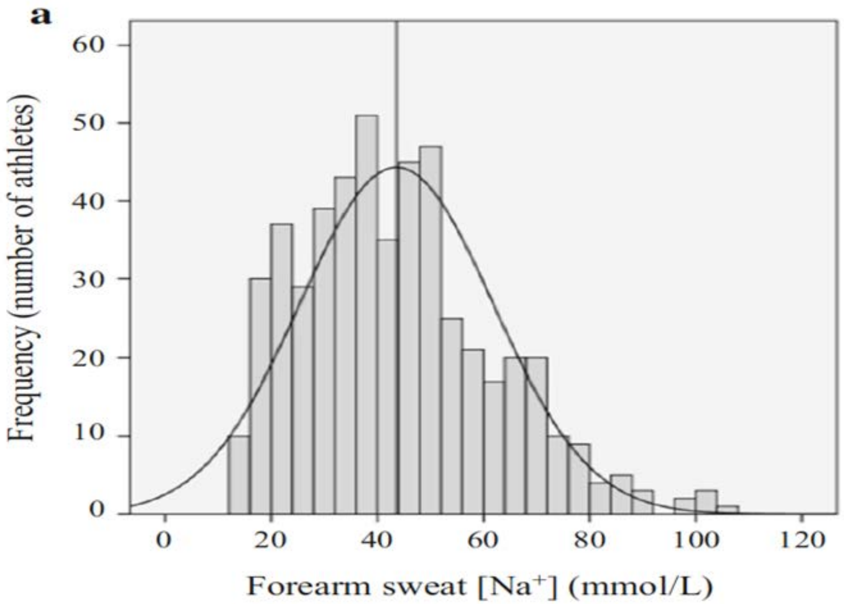
CrossMark

REVIEW ARTICLE

Sweating Rate and Sweat Sodium Concentration in Athletes: A Review of Methodology and Intra/Interindividual Variability

Lindsay B. Baker[1]



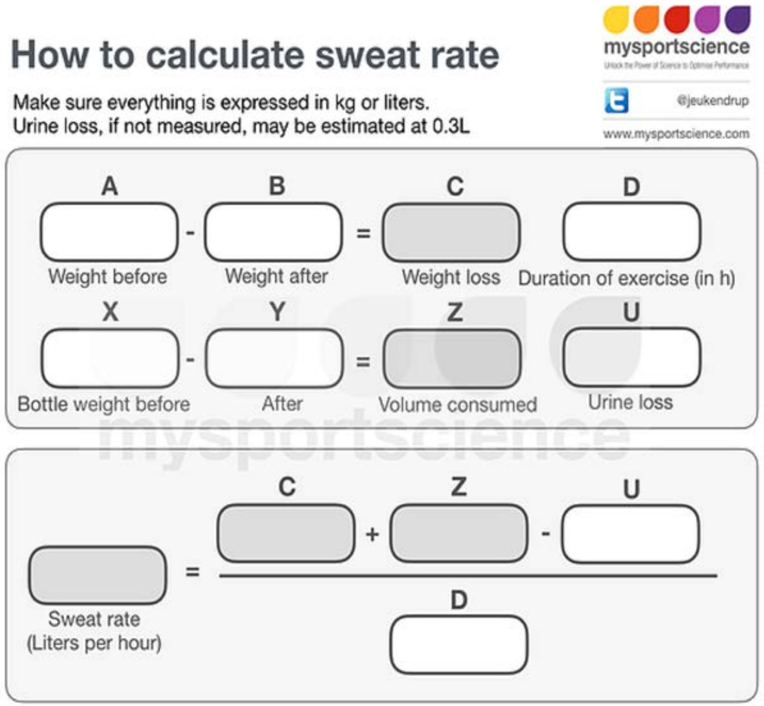


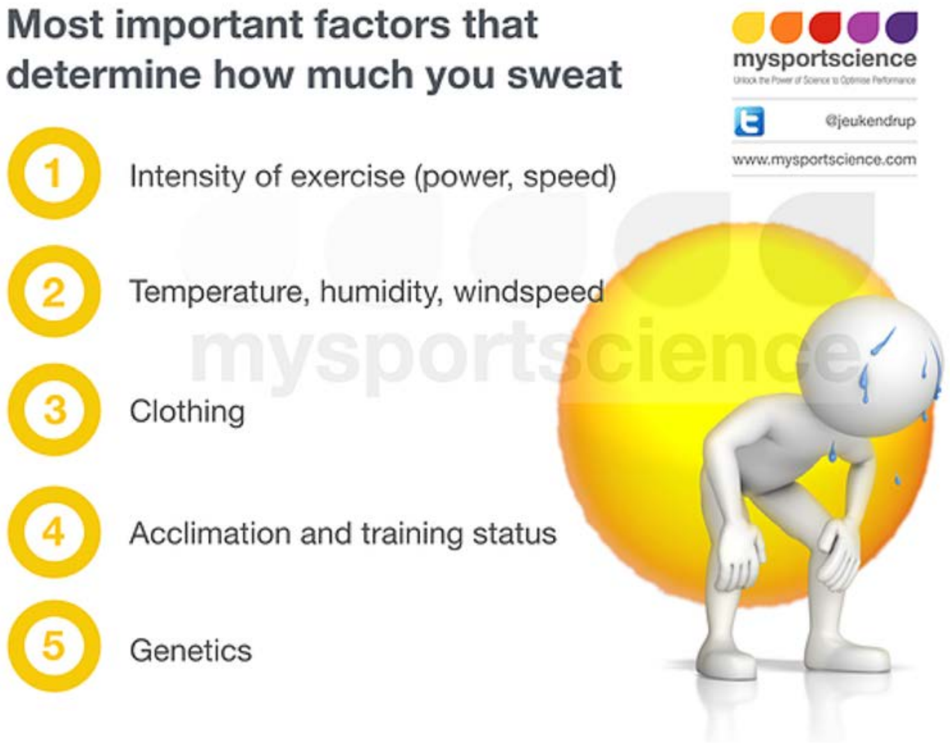
Variación 0,5-2/3 l/h

Variación 4-5 veces mayor IP

IP= 5-15 % en función condiciones ambientales

Cálculo perdidas de hídricas:





Problemas GI

Sports Science Exchange (2013) Vol. 26, No. 114, 1-4

GATORADE SPORTS SCIENCE INSTITUTE

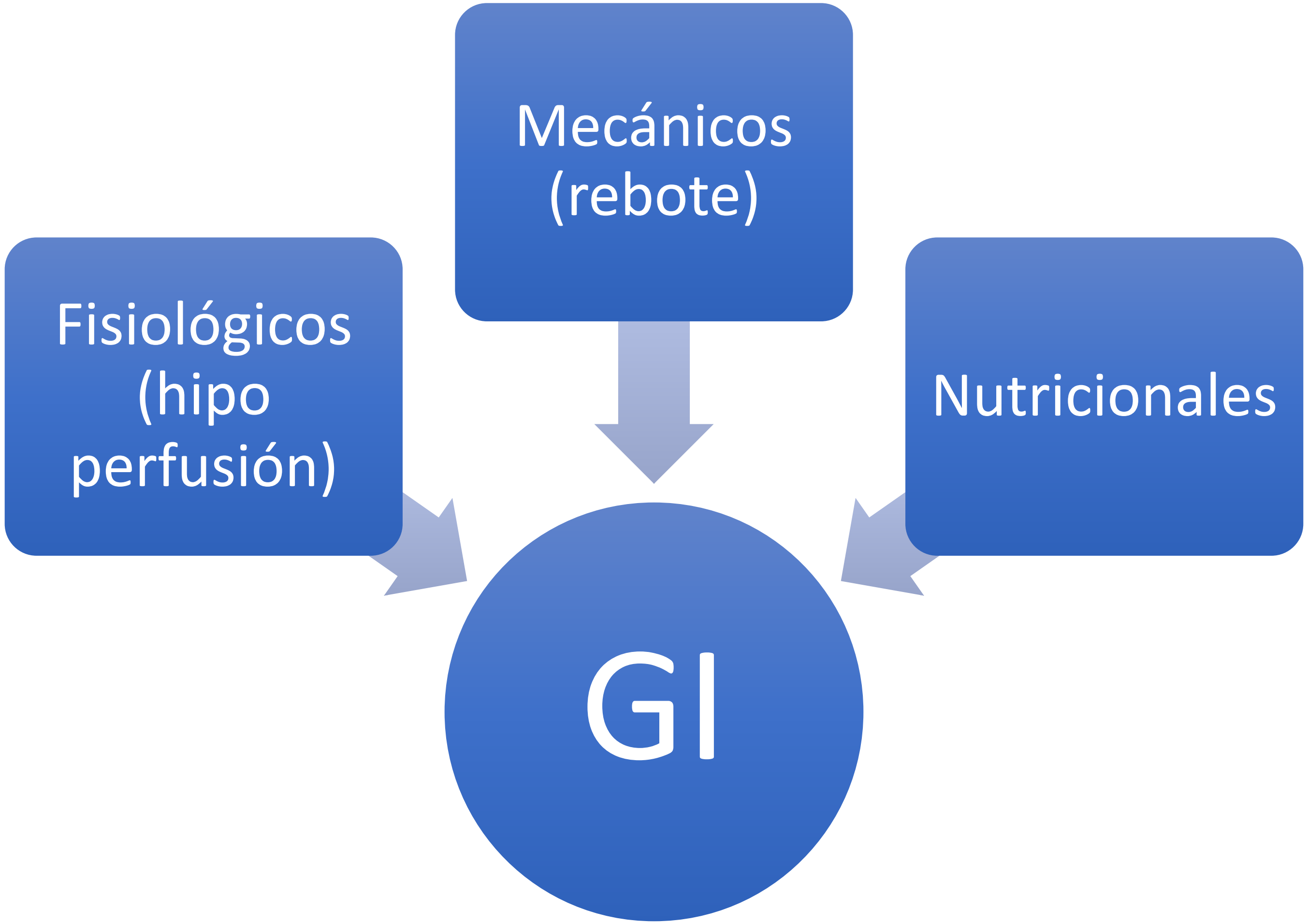
RECOMENDACIONES NUTRICIONALES PARA EVITAR MALESTARES GASTROINTESTINALES DURANTE EL EJERCICIO

Erick Prado de Oliveira | Centro para el Ejercicio | Metabolismo y Nutrición
Universidad Estatal de Sao Paulo | Botucatu | Brasil
Asker Jeukendrup | Instituto Gatorade de Ciencias del Deporte | Barrington (IL)
Estados Unidos de América

Tabla 1

SÍNTOMAS ABDOMINALES ALTOS	SÍNTOMAS ABDOMINALES BAJOS
Reflujo/ardor epigástrico	Cólicos intestinales/ abdominales bajos
Eructos	Dolor en flanco/Punzadas
Distensión	Flatulencias
Dolor abdominal o cólicos abdominales	Urgencia para defecar
Vómito	Diarrea
Náuseas	Sangrado Intestinal

Problemas GI



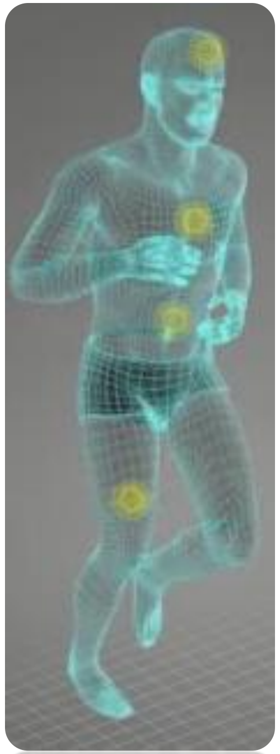
30-50 GI o 30-70 % GI

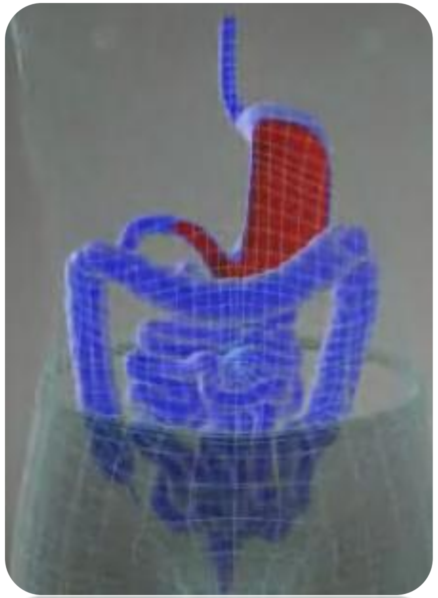
Problemas GI:

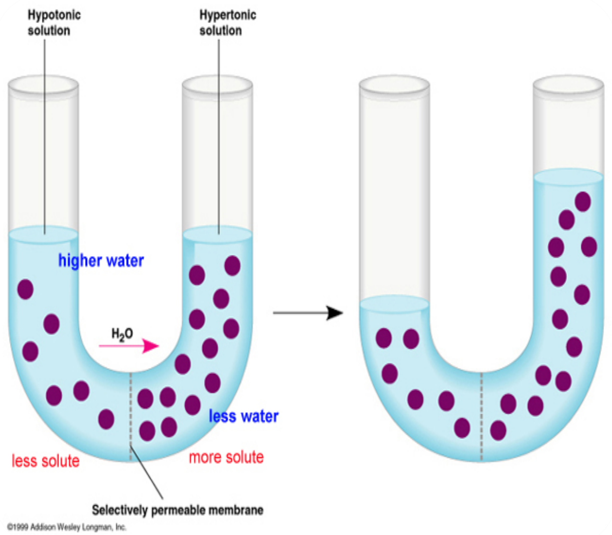
- Prevalencia alta 30-70 %
- Flujo sanguíneo disminuido= GI
- Intestino sometido: hipovolemia, hipertermia, hipoglucemia, hipoxia e isquemia.
- Gran variedad entre deportistas.
- Train the gut
- Evitar medicación (AINES, aspirina).
- Evitar: proteína, fibras, grasas y lácteos.

Problemas GI:

- Concentraciones Osmolares = regulan vacío intestinal







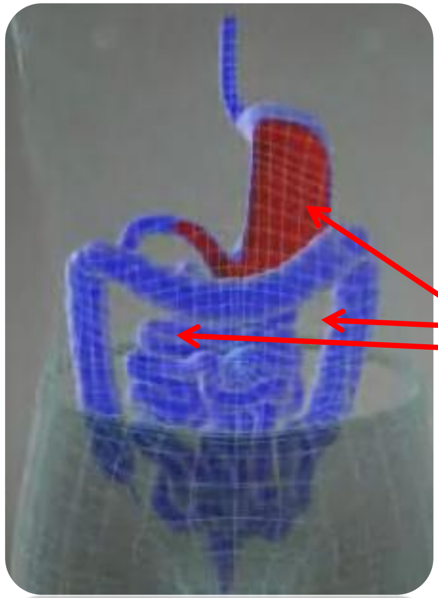
(Péronnet & cols .2001)

Fisiología de las bebidas:

Supplement Article

Fate of ingested fluids: factors affecting gastric emptying and intestinal absorption of beverages in humans

John B. Leiper



3 puntos claves

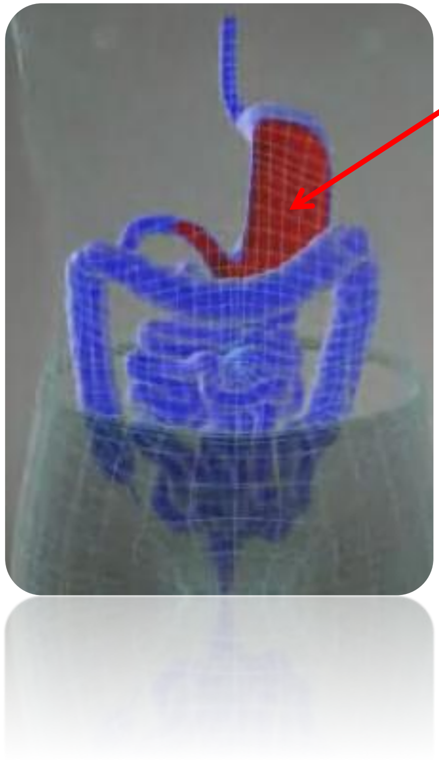
Vaciamiento gástrico → Absorción intestinal → Velocidad con la que el agua entra

Fisiología de las bebidas:

Supplement Article

Fate of ingested fluids: factors affecting gastric emptying and intestinal absorption of beverages in humans

John B. Leiper



Vaciamiento gástrico

Table 1 **Summary of the factors that affect the rate of gastric emptying of ingested beverages**

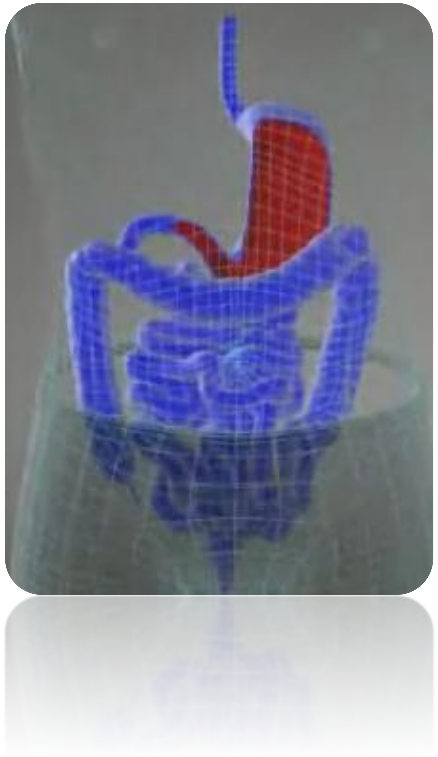
Factor	Effect
Volume	Increased intragastric volume speeds the rate of emptying up to a maximum capacity
Energy density	High energy density of beverages reduces emptying rates
Osmolality	High osmolality of beverages slows emptying rates, but the effect is much less than for energy density
Temperature	Beverage temperature that differs markedly from normothermia has little effect on gastric emptying as intragastric temperatures rapidly equilibrate
pH	Beverage pH has little effect on emptying rates as buffering capacity is normally weak, and the type and concentration of salts in beverages are not sufficient to influence emptying rates
Exercise	Steady-state exercise levels above 70% VO_{2max} and high-intensity intermittent exercise can both slow gastric emptying

Fisiología de las bebidas

Supplement Article

Fate of ingested fluids: factors affecting gastric emptying and intestinal absorption of beverages in humans

John B. Leiper

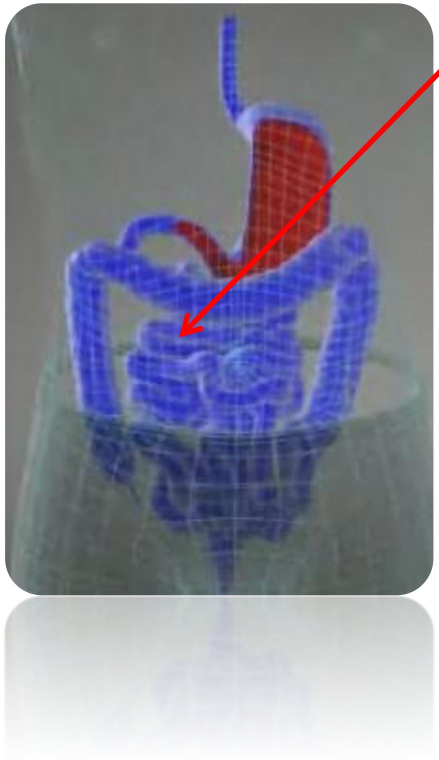


Fisiología de las bebidas

Supplement Article

Fate of ingested fluids: factors affecting gastric emptying and intestinal absorption of beverages in humans

John B. Leiper



Vaciamiento Intestinal

Table 2 **Summary of the factors that affect the rate of intestinal absorption of water from ingested beverages**

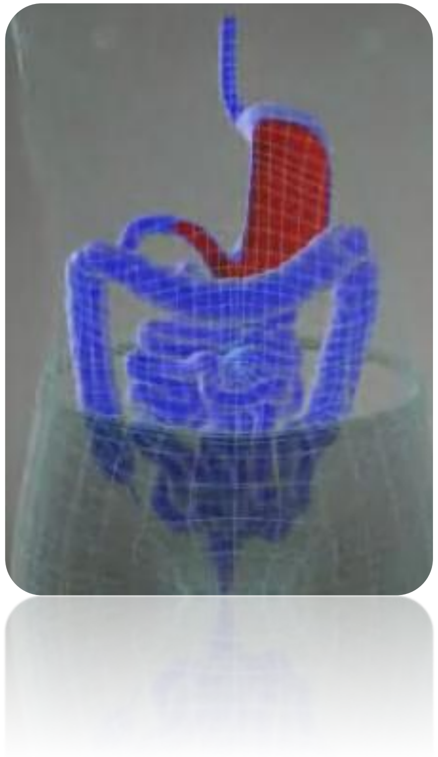
Factor	Effect
Gastric emptying rate	Fast rates of emptying increase intestinal absorption
Osmolality	Water absorption rates are faster from moderately hypotonic beverages (200–260 mosmol/kg), but in the duodenum marked hypotonicity may be more effective; hypertonicity retards water absorption
Carbohydrate content	Active cotransport of glucose and sodium facilitates the absorption of glucose and promotes osmotic gradients that support water absorption; facilitated transport of fructose is slower and is less effective in supporting water uptake; high concentrations of maltodextrins may assist absorption by producing relatively lower beverage osmolality than would occur with the same glucose monomer content
Other actively transported solutes	Actively transported amino acids, peptides, and organic acids that are linked with sodium absorption promote intestinal water uptake
Sodium concentration	Intestinal sodium absorption is closely linked with water transport, but it is not clear if it is required in rehydration beverages, as sodium from the blood rapidly effluxes into lumen; no other ion has been shown to be as crucial for water absorption
pH	It is unlikely that commercial beverage formulations will affect the pH buffering capacity of the intestine; an acidosis appears to enhance water and sodium absorption but not that of glucose
Temperature	Because the stomach rapidly equilibrates the temperature of beverages, it is predicable that the luminal contents are always at body temperature
Exercise	Steady-state exercise levels below 70% VO_{2max} have little effect on intestinal absorption of carbohydrate solutions; however, exercise-induced changes in perfusion of the capillary bed may interfere with isotopic water tracers measured in the blood

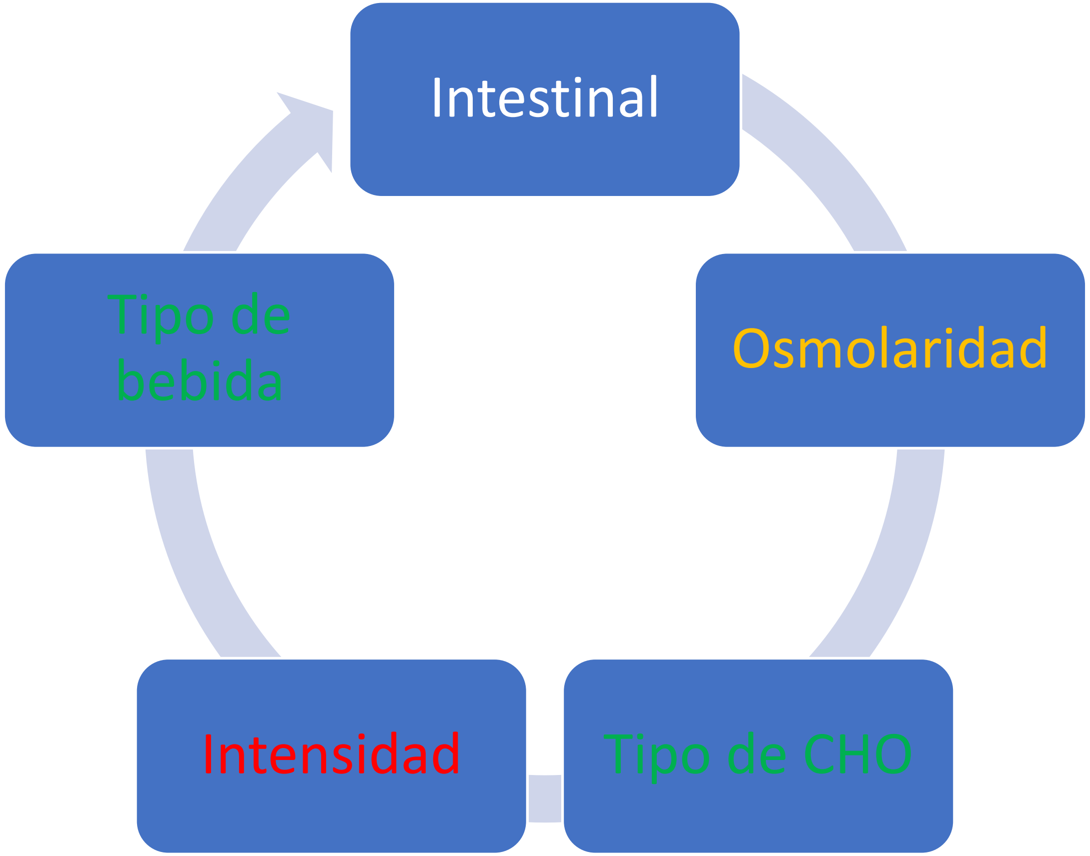
Fisiología de las bebidas

Supplement Article

Fate of ingested fluids: factors affecting gastric emptying and intestinal absorption of beverages in humans

John B. Leiper



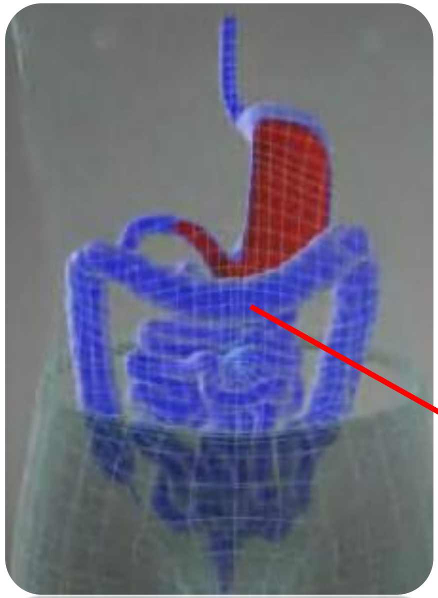


Fisiología de las bebidas:

Supplement Article

Fate of ingested fluids: factors affecting gastric emptying and intestinal absorption of beverages in humans

John B. Leiper



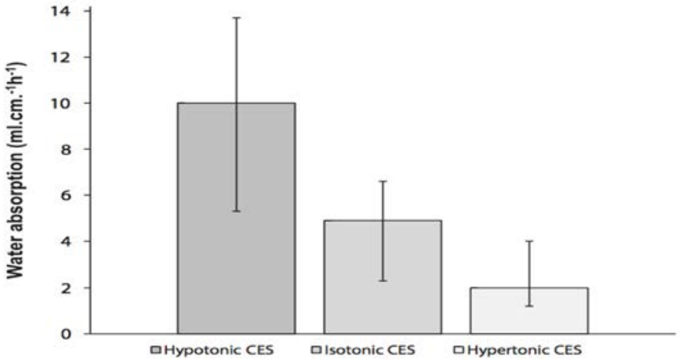


Figure 3 **Net water absorption (median [range] in the 30-cm jejunal test segment from 3 CESs with the same carbohydrate and electrolyte concentrations but differing in osmolality).** Abbreviation: CES, carbohydrate–electrolyte solution. Reproduced from Leiper et al.[96] with permission.

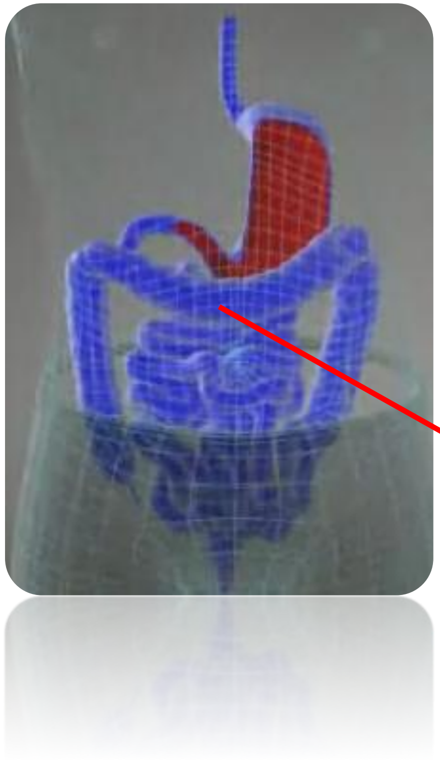
sion solutions were similar, but osmolality differed, net water absorption was about twice as fast from a moderately hypotonic (229 mosmol/kg) solution than from an isotonic (277 mosmol/kg) solution, which was faster than from a moderately hypertonic (352 mosmol/kg) solution[110] (Figure 3).

Fisiología de las bebidas:

Supplement Article

Fate of ingested fluids: factors affecting gastric emptying and intestinal absorption of beverages in humans

John B. Leiper



lar to those from a 4% carbohydrate solution with an osmolality of 260 mosmol/kg.[105]

Most studies have shown that both glucose solutions and nutrient-free solutions with an osmolality of <200 mosmol/kg produce slower rates of water absorption in the jejunum than do similar solutions with an osmolality of between 200 and 260 mosmol/kg.[108,109]

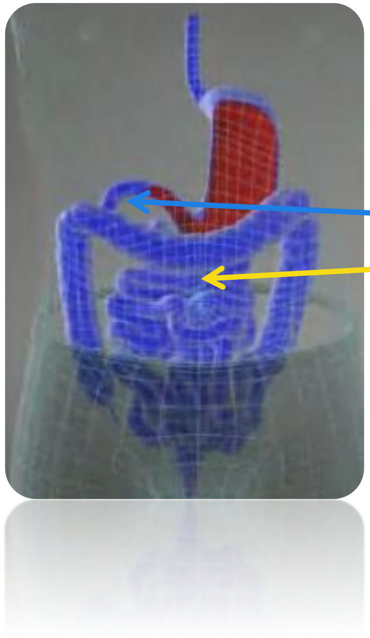
Fisiología de las bebidas:

Research

Open Acc

Effect of beverage glucose and sodium content on fluid delivery

Asker E Jeukendrup*, Kevin Currell, Juliette Clarke, Johnny Cole and Andrew K Blannin



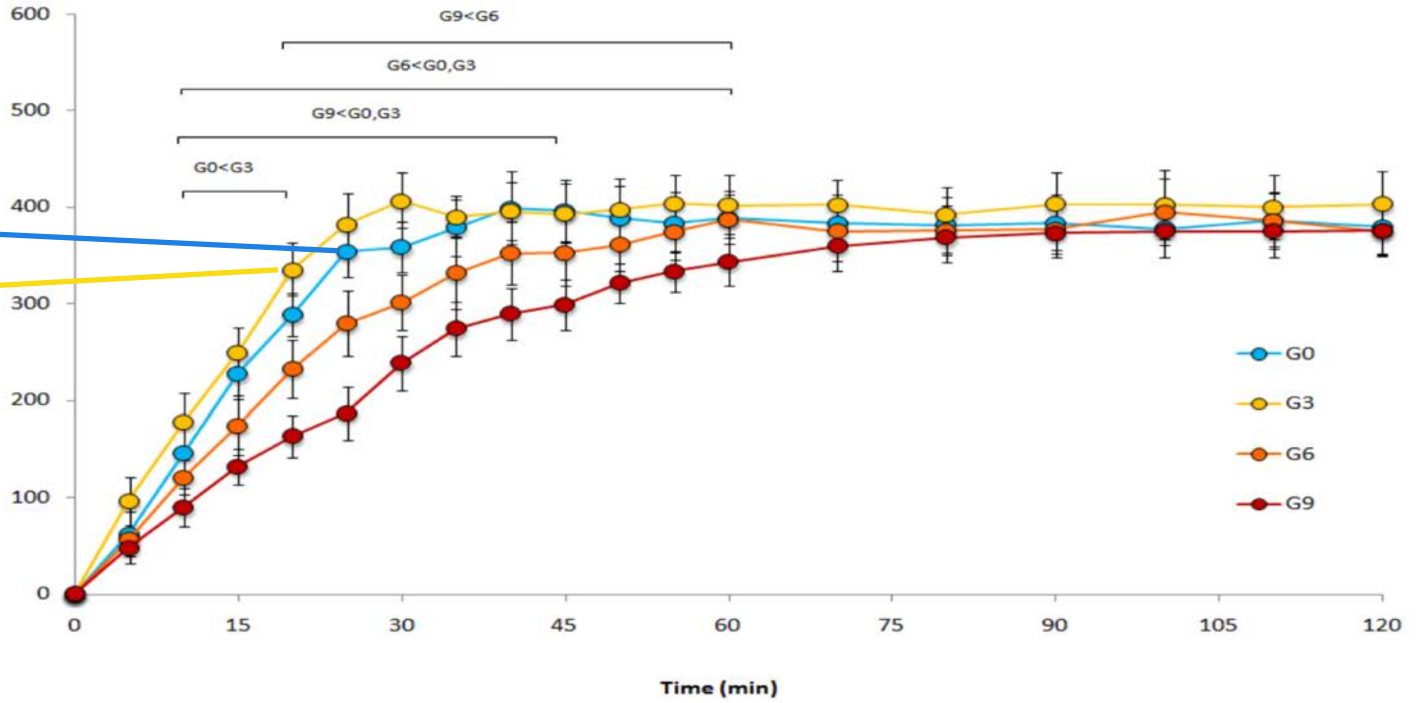
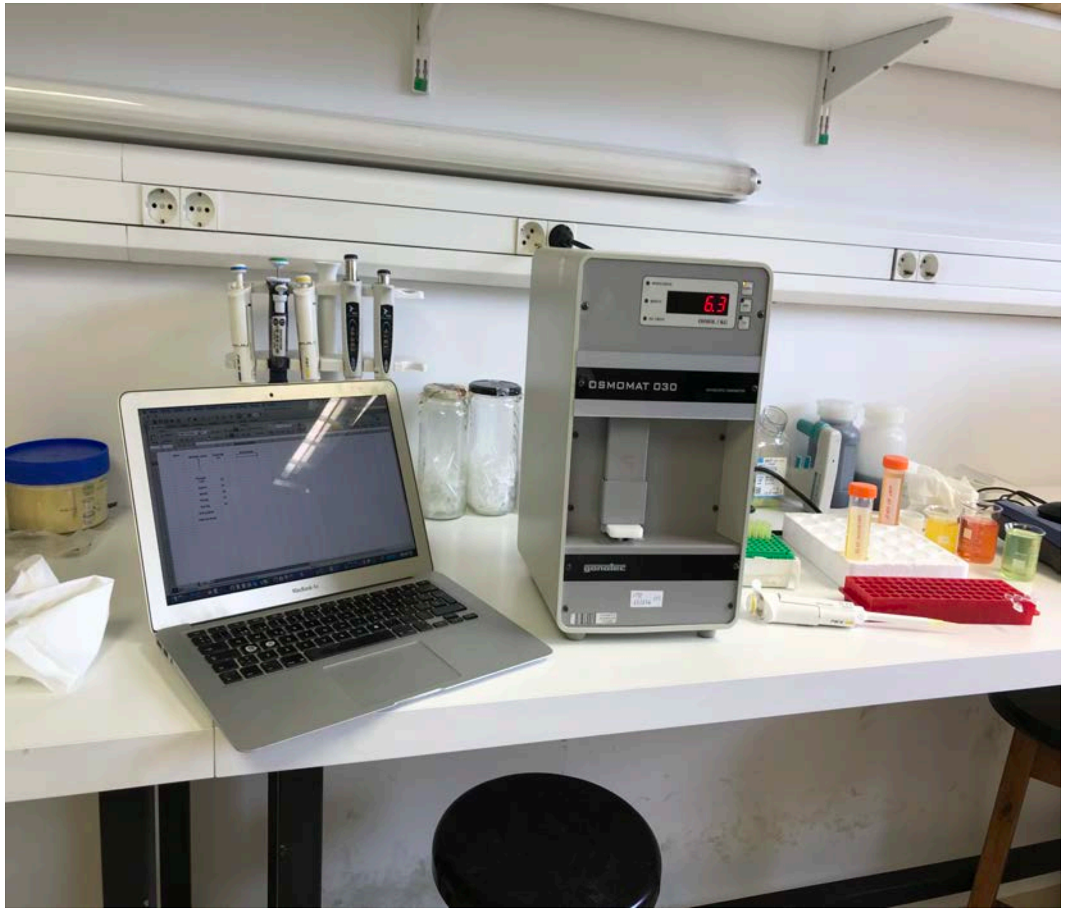


Figure 1
D_2O enrichment over time after ingesting 4 different glucose beverages. Statistical differences ($P < 0.05$) are indicated.

Bebida ideal ?

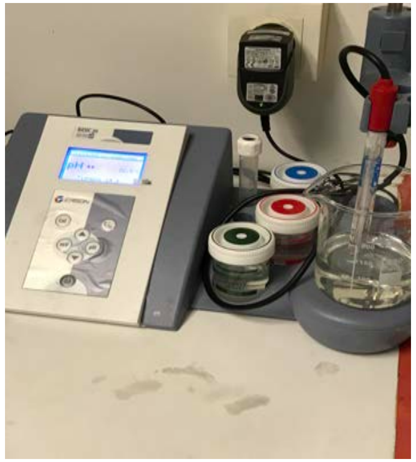
Bebida Ideal:

Laboratorio Farmacia. Dpto fisiología animal. Agradecimientos Dra. Rut Ferrer, Dra Raquel Martin(UB) y Dra. Mari Carmen Ferrer Svoboda (Url)



CarlesTur

Fisiología de las bebidas



FEDERACIÓ DE TRIATLÓ COMUNITAT VALENCIANA

CarlesTur

Fisiología de las bebidas

Análisis bebidas Osmolaridades y pH laboratorio fisiología animal UB (facultad farmacia)

Bebida	10%	8%	6%	4%	pH
Gold drink	362	269	206	131	4,41
Gold drink premium	559	447	335	201	4,01
32 Gi sustained	345	276	207	138	3,63
32 gi Hi	288	230	172	101	4,04
Powerbar iso active	472	377	283	185	4,34
Power bar isomax	415	332	249	150	4,61
Zip vit	173	138	103	58	3,19
Maurten	254	203	207	138	6,4
Fast recovery	346	276	207	138	5,87
Powerade	209	167	125	83	3,7
Aquarius	324	259	194	129	2,92
Red Bull	590	472	354	236	3,55
Monster	674	539	404	269	3,58
Coca Cola	459	367	275	183	2,62

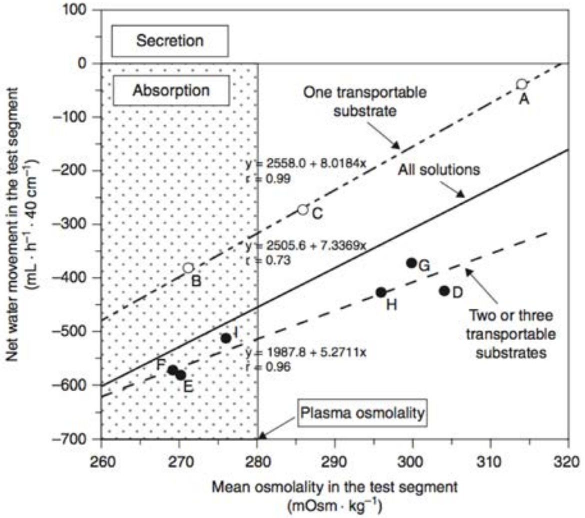
Fisiología de las bebidas:

original investigations

Effects of carbohydrate type and concentration and solution osmolality on water absorption

XIACOAI SHI, ROBERT W. SUMMERS, HAROLD P. SCHEDL, SHAWN W. FLANAGAN, RAYTAI CHANG, and CARL V. GISOLFI

Departments of Exercise Science and Gastroenterology, University of Iowa, Iowa City, IA 52242



Solution	Beverage carbohydrate content	Beverage osmolality	Test segment osmolality
A	8% glucose	470	314
B	6% maltodextrin	165	271
C	8% maltodextrin	208	286
D	4% glucose, 4% fructose	477	304
E	2% glucose, 4% sucrose	285	269
F	3% glucose, 2% sucrose, 1% maltodextrin	298	268
G	3% fructose, 3% glucose, 2% sucrose	431	300
H	8% sucrose	288	296
I	2% glucose, 4% sucrose, 0.4% glycine	335	276

intestine (duodenojejunum). The CHO form and combination of CHO in the solution influence the role of osmolality, solute transport, and net water movement. Solutions with multiple transportable substrates that can stimulate several different solute transport mechanisms produce greater solute and water absorption than solutions with only a single transportable substrate.

Fisiología de las bebidas:

Multiple transportable carbohydrates enhance gastric emptying and fluid delivery

A. E. Jeukendrup, L. Moseley

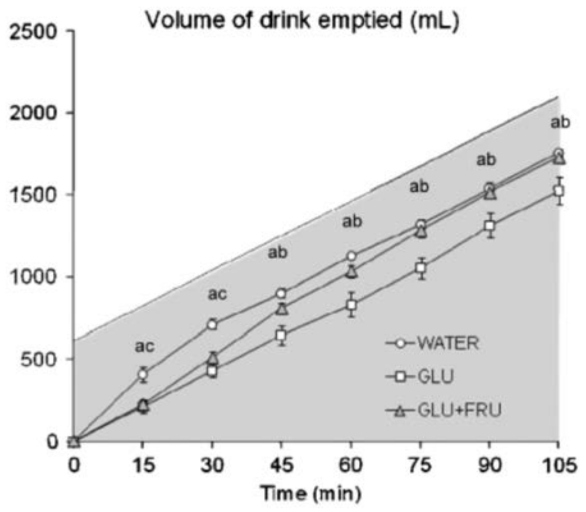


Fig. 2. Cumulative amount emptied (mL). Data is mean SE. a = WATER different from GLU. b = GLU different from GLU+FRU. c = WATER different from GLU+FRU. Glu, glucose; FRU, fructose.

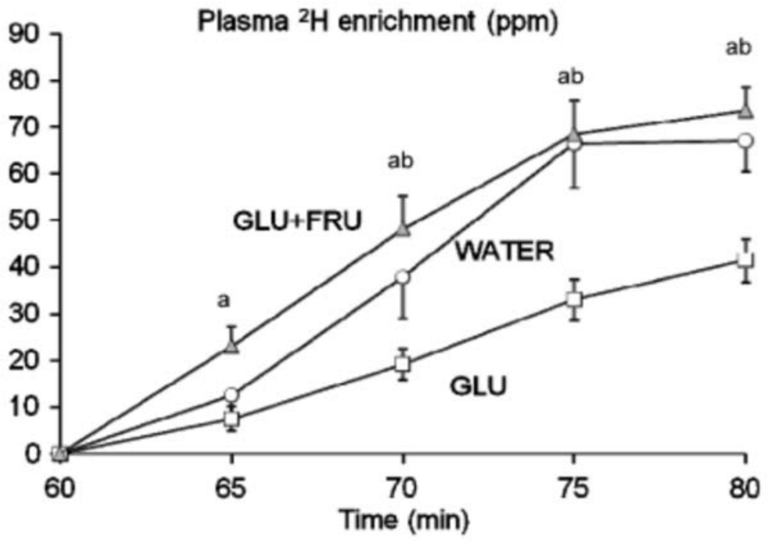


Fig. 4. Plasma ^2H_2O enrichment (p.p.m.) following the ingestion of 5.00 g of ^2H_2O after 60 min of exercise. Data is mean ± SE. a = GLU+FRU greater than GLU. b = WATER greater than GLU. Glu, glucose; FRU, fructose.

Fisiología de las bebidas: Glutamina

Eur J Appl Physiol
DOI 10.1007/s00421-017-3744-4

CrossMark

ORIGINAL ARTICLE

Glutamine supplementation reduces markers of intestinal permeability during running in the heat in a dose-dependent manner

Jamie N. Pugh[1] · Stephen Sage[1] · Mark Hutson[1] · Dominic A. Doran[1] · Simon C. Fleming[2] · Jamie Highton[3] · James P. Morton[1] · Graeme L. Close[1]

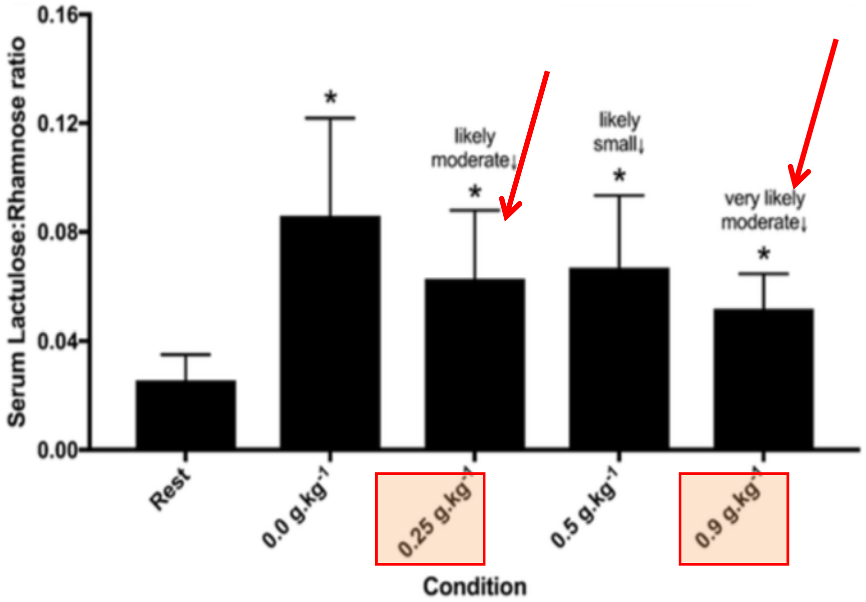


Table 2 GI symptoms post-exercise, rated 0–9

	Placebo	0.25 g kg^{-1}	0.5 g kg^{-1}	0.9 g kg^{-1}
Side stitch	0 (0–0)	0 (0–3)	0 (0–5)	0 (0–1)
Bloating	0 (0–2)	0 (0–2)	0 (0–1)	0 (0–2)
Urge to defecate	1 (0–5)	1.5 (0–5)	0 (0–3)	0.5 (0–4)
Diarrhoea	0 (0–5)	0 (0–5)	0 (0–0)	0 (0–1)
Flatulence	0.5 (0–2)	0 (0–1)	0 (0–2)	0.5 (0–6)
Stomach cramps	0 (0–0)	0 (0–2)	0 (0–1)	0 (0–2)
Stomach upsets	0 (0–1)	0 (0–1)	0 (0–3)	0 (0–2)
Intestinal cramps	0 (0–0)	0 (0–1)	0 (0–2)	0 (0–2)
Urge to burp	1 (0–5)	0.5 (0–3)	1 (0–2)	0 (0–2)
Nausea	0 (0–0)	0 (0–1)	0 (0–5)	0 (0–6)
Urge to vomit	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–5)
Dizziness	0 (0–3)	0.5 (0–5)	0 (0–2)	0 (0–5)
Shivering	0 (0–0)	0 (0–2)	0 (0–0)	0 (0–0)
Heart burn	0 (0–2)	0 (0–0)	0 (0–0)	0 (0–0)

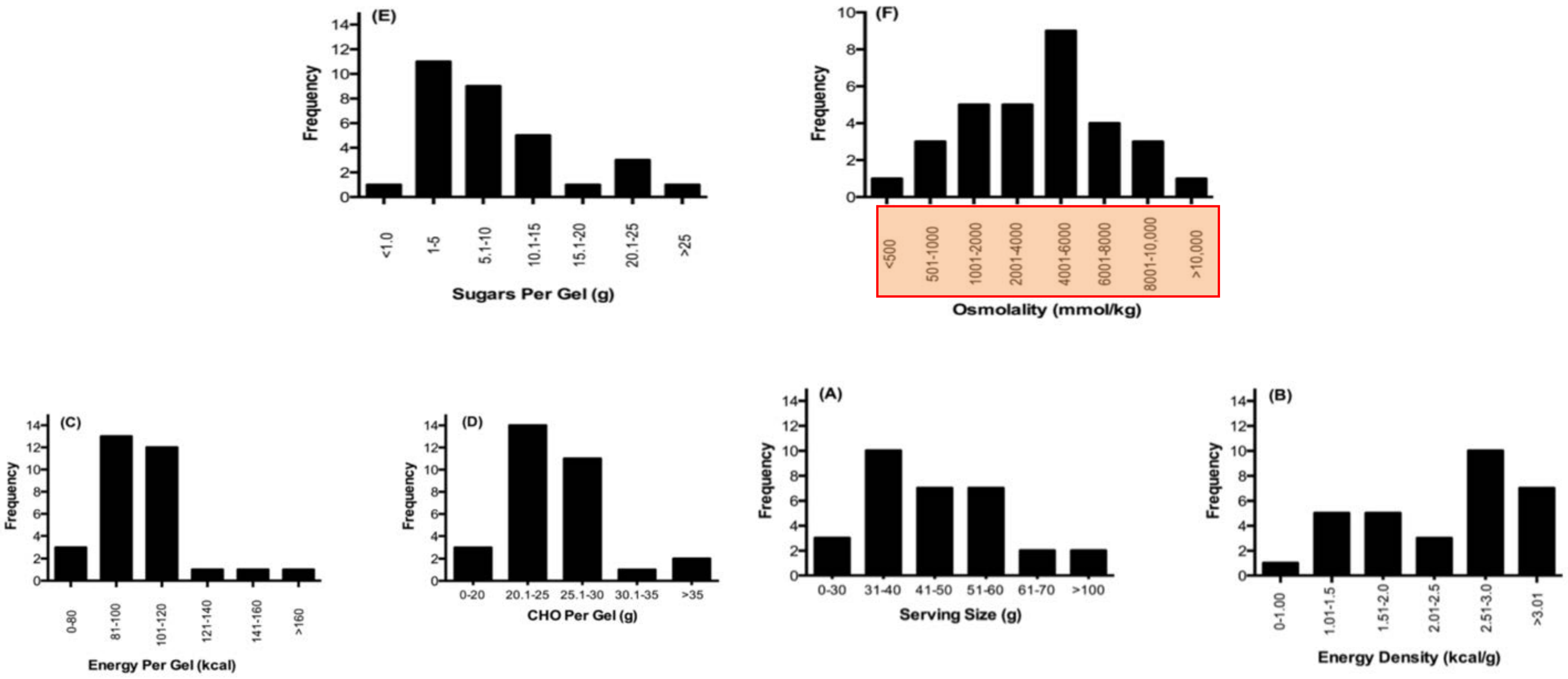
Data are median and range appearing in parenthesis

< Permeabilidad, mejor microbiota > HSP

Fisiología de los geles:

Article Title: Extreme Variation of Nutritional Composition and Osmolality of Commercially Available Carbohydrate Energy Gels

Authors: Xuguang Zhang[1], Niamh O'Kennedy[1], and James P Morton[2]



Carbohidratos: Individualización

Sports Med (2017) 47 (Suppl 1):S51–S63
DOI 10.1007/s40279-017-0694-2

REVIEW ARTICLE

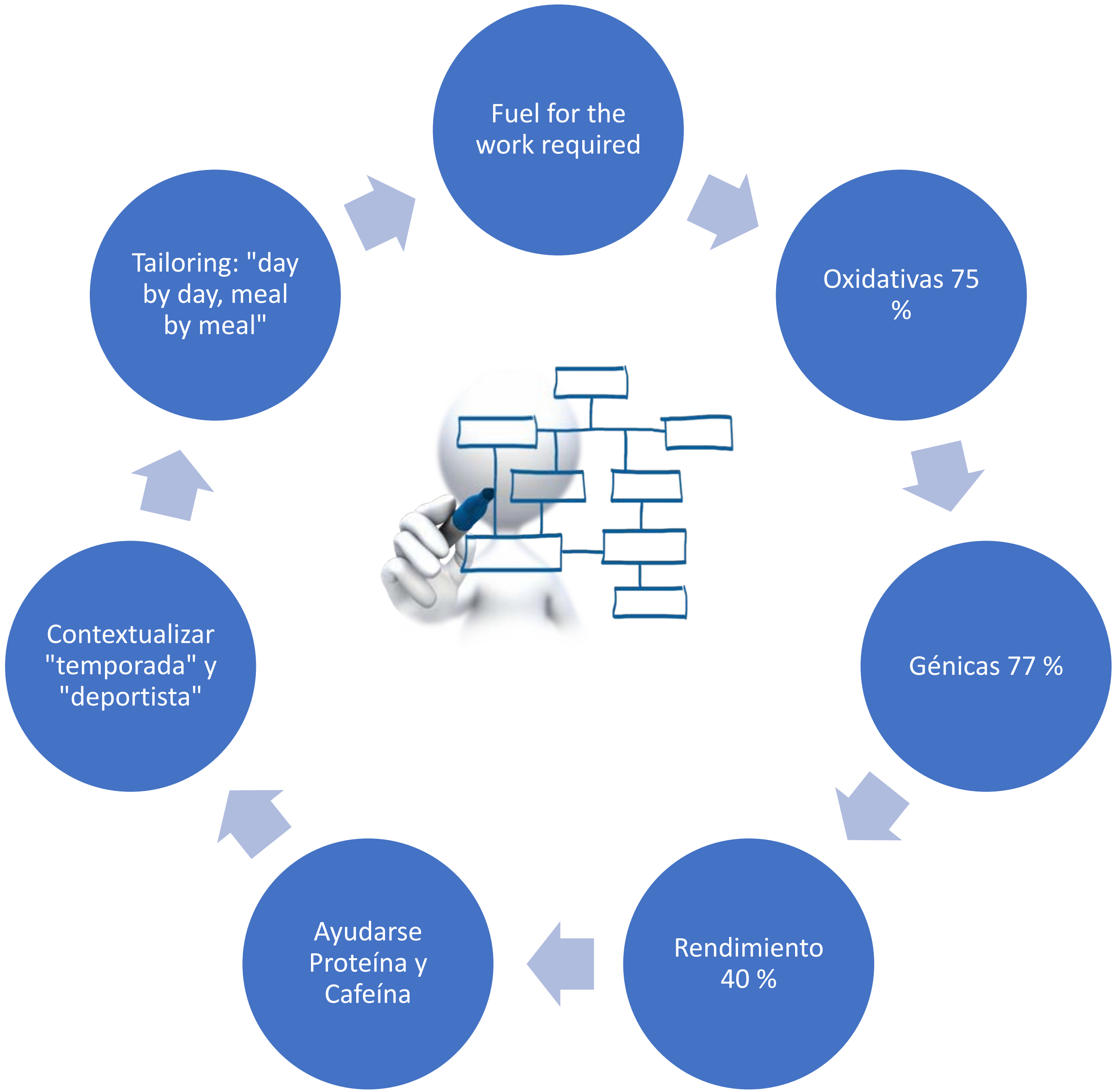
Periodized Nutrition for Athletes

Asker E Jeukendrup[1]

Table 1 Nutritional training methods: while some methods have more supporting evidence than others, these are the potential nutritional training tools that athletes and coaches can use to periodize the athlete's nutrition

Train low	Training twice a day	Limited or no carbohydrate intake between the two sessions. The first training will lower muscle glycogen so that the second training is performed in a low-glycogen state. This may increase the expression of relevant genes
	Training fasted	Training is performed after an overnight fast. Muscle glycogen may be normal or even high but liver glycogen is low
	Training with low exogenous carbohydrate availability	No or very little carbohydrate is ingested during prolonged exercise. This may exaggerate the stress response
	Low-carbohydrate availability during recovery	No or very little carbohydrate is ingested post-exercise. This may prolong the stress response
	Sleep low	Train late in the day and go to bed with carbohydrate intake restricted. Essentially the same idea as low-carbohydrate availability after training but the period post-exercise is extended. Muscle and liver glycogen will be low for several hours during sleep
	Low-carbohydrate high-fat/ketogenic diets	Long-term low-carbohydrate stores
Train high	Training with high muscle and liver glycogen	Carbohydrate intake is high before training when glycogen is important and there is a focus on glycogen restoration post-exercise
	Training with a high-carbohydrate diet	Carbohydrate intake is high on a daily basis independent of training, but may be especially high around training (during and after)
Training the gut	Training of stomach comfort	Increasing volume of intake with or without exercise
	Training gastric emptying	Repeated use of meals to increase/improve gastric emptying of fluids or nutrients (carbohydrate) and reduce stomach discomfort
	Training absorption	Increasing daily carbohydrate intake and/or intake during exercise to improve absorptive capacity of the gut and reduce intestinal discomfort
	Training race nutrition	Training all aspects of a nutrition strategy as on race day
Training dehydrated	Training in a dehydrated state	Training with limited/no fluid intake to allow dehydration
Improving training adaptations with supplements	Supplements	Supplements that may allow more training to be performed (see Table 2)
		Supplements that may initiate or increase protein synthesis and/or increase myofibrillar protein synthesis (see Table 2)
		Supplements with the potential to increase mitochondrial biogenesis (see Table 2)

Conclusiones:



Conclusiones:

Conclusiones:

- Beber ad libitum/Planificado
- Pruebas de rendimiento 2-6 % DH
- Escoger bebida según objetivo Fisiológico
- Analizar WBGT
- Glutamina < GI
- Aclimatación 5-10 días
- Individualizar prueba y deportista

Carles.tur@Gmail.com


Dziękuję
Mauruuru
Спасибо
Dankie
D'Akujem
хвала
Gracias
Obrigado
Merci
Sagolun
Danke
Arigatô
Kiitos
Köszönöm
Rahmat
Kiitos
Thank You
Multumesc
Misaotra
Mercé
Tak
Grazie
Thank You
Gracias
Merci
Arigatô
Xièxie
Matondo
Obrigado
Teşekkür Ederim
Sagolun
Mahalo
Chokrane
Chokrane
Grazie
Efharisto
Danke
Спасибо
Takk
Dank Je
хвала
Toda
Tak
Hvala
Takk
Faleminderit
Terima Kasih

Nutrición e hidratación para triatlón LD

Jornadas Federació Comunitat Valenciana Triatló

Carles tur Carbonell