

# Developments in sports nutrition.

## Strategies for post-exercise recovery

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## Nutrition for sport & exercise

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## Recovery of / from what?

- Muscle glycogen restoration
- Muscle protein synthesis
- Hydration fluid balance
- Restore homeostasis
  - eg Reduce temperature

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## Sports drinks

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## What is a sports drink?

• A drink consumed "in association" with exercise.

### Pre-exercise hydration

- Water
- Electrolytes (Na, K)
- CHO

### Hydration during exercise

- Other substances
  - Flavours
  - Colouring
  - Protein & derivatives
  - Caffeine
  - Herbs etc
  - .....

### Post-exercise hydration

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## Milk as a sports drink

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## Outline

- 📌 Muscle protein synthesis
  - 📌 Timing, dose and type of protein
  - 📌 Milk and muscle mass gains
- 📌 Hydration status/fluid balance
  - 📌 Sweat losses in sport/exercise
  - 📌 ACSM position stand
  - 📌 Milk v Water v Sports drink
- 📌 Summary and conclusions

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## For protein and muscle protein synthesis

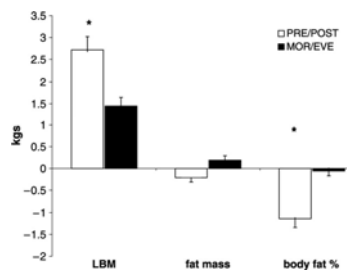
- 📌 Timing of intake
- 📌 Type of protein

📌 More important than total daily quantity

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## TIMING: Consumption of protein in close temporal proximity to exercise is beneficial for hypertrophy

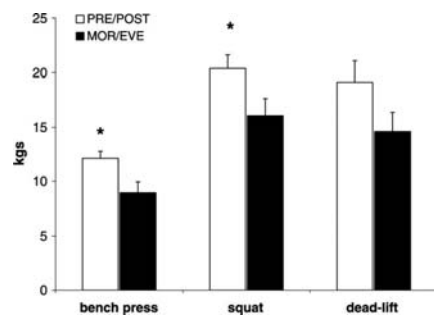
- 📌 10 wks
- 📌 1 g/kg
  - 📌 protein-creatine-glucose
- 📌 Pre/Post
- 📌 Morning/Evening



Cribb & Hayes, Med Sci Sports Exerc, 2006

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## TIMING: Consumption of protein in close temporal proximity to exercise is beneficial for strength gains



Cribb & Hayes, Med Sci Sports Exerc, 2006

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## TYPE: Resistance training & lean mass gains

- 📌 12wks
- 📌 5days/wk resistance ex
- 📌 Drink 500ml
  - 📌 Immediate
  - +
  - 📌 1h after ex

Hartman et al. Am J Clin Nutr 2007

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## TYPE: Resistance training & fat mass loss

Hartman et al. Am J Clin Nutr 2007

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## Why gives superior gains in muscle mass compared to other proteins

Phillips et al, J. Am. Coll. Nutr., 2009

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## Muscle protein synthesis Conclusions

- 📌 In exercise, protein is important for recovery and restoration/repair
- 📌 Timing of protein consumption is more important than quantity
- 📌 Protein quality is important in determining responses to exercise, particularly resistance exercise
- 📌 Dairy proteins result in lean mass gains and body fat losses
- 📌 Whey protein may have a specific role

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## Sweat volume and electrolyte losses

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## Sweat loss of football players

- 📌 3 clubs
- 📌 N= 67 players
- 📌 90 min training sessions

	Temperature (°C)	Relative humidity (%)
Club 1	5 ± 1	81 ± 6
Club 2	27 ± 2	55 ± 6
Club 3	32 ± 3	20 ± 5

Maughan et al (2004), *Int J Sports Nutr Exerc Metab*, 14, 333-346; Maughan et al (2005), *J Sports Sci*, 23, 73-79; Shirreffs et al (2005), *Int J Sports Med*, 26, 90-95.

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## Sweat loss

	Sweat loss (l)	Fluid intake (ml)	% Decrease in body mass
Club 1 (n=17)	1.7 ± 0.4 <b>1.1-2.6</b>	420 ± 220 <b>40-950</b>	1.6 ± 0.6 <b>0.9-2.8</b>
Club 2 (n=24)	2.0 ± 0.4 <b>1.3-2.8</b>	970 ± 300 <b>270-1660</b>	1.4 ± 0.5 <b>0.5-2.6</b>
Club 3 (n=26)	2.2 ± 0.4 <b>1.7-3.1</b>	970 ± 340 <b>240-1720</b>	1.6 ± 0.6 <b>0.7-3.2</b>
<b>Overall (n=67)</b>	<b>2.0 ± 0.4</b> <b>1.1-3.1</b>	<b>830 ± 380</b> <b>40-1720</b>	<b>1.5 ± 0.5</b> <b>0.5-3.2</b>

Maughan et al (2004), *Int J Sports Nutr Exerc Metab*, 14, 333-346; Maughan et al (2005), *J Sports Sci*, 23, 73-79; Shirreffs et al (2005), *Int J Sports Med*, 26, 90-95; Shirreffs et al (2006), *J Sports Sci*, 24, 699-707.

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## Sweat electrolyte (salt) loss

	Sweat sodium conc (mmol/l)	Sweat sodium loss (mmol)	"Salt" loss (g)
Club 1 (n=17)	43 ± 13 <b>16-66</b> <b>10-43</b>	73 ± 31 <b>29-121</b> <b>19-79</b>	4.3 ± 1.8 <b>1.7-7.0</b> <b>1.1-4.5</b>
Club 2 (n=24)	49 ± 12 <b>26-67</b> <b>17-44</b>	99 ± 24 <b>53-133</b> <b>34-86</b>	5.8 ± 1.4 <b>3.1-7.8</b> <b>2.1-5.1</b>
Club 3 (n=7)	30 ± 19 <b>16-66</b> <b>10-43</b>	67 ± 37 <b>26-129</b> <b>17-84</b>	3.9 ± 2.2 <b>1.5-7.6</b> <b>1.0-4.9</b>
Overall (n=48)	44 ± 15 <b>16-67</b> <b>10-44</b>	85 ± 32 <b>26-133</b> <b>17-86</b>	5.0 ± 1.8 <b>1.5-7.8</b> <b>1.0-5.1</b>

Maughan et al (2004). *Int J Sports Nutr Exerc Metab*, 14, 333-346; Maughan et al (2005). *J Sports Sci*, 23, 73-79; Shirreffs et al (2005). *Int J Sports Med*, 26, 90-95; Shirreffs et al (2006). *J Sports Sci*, 24, 699-707.

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## The 2007 ACSM Position Stand on "Exercise and Fluid Replacement"

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## Post-exercise hydration

“After exercise, the goal is to fully replace any fluid and electrolyte deficit. The aggressiveness to be taken depends on the speed that rehydration must be accomplished and the magnitude of the fluid-electrolyte deficit. If recovery time and opportunities permit, consumption of normal meals and snacks with a sufficient volume of plain water will restore euhydration, provided the food contains sufficient sodium to replace sweat losses. If dehydration is substantial with a relatively short recovery period (<12 h) then aggressive rehydration programs may be merited.”



Sawka et al 2007

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## Recovery of fluid and electrolyte balance after exercise

1. Adequate volume must be consumed Shirreffs et al, (1996) MSSE, 28: 1260-1271
2. Sodium concentration must be moderately high in relation to sweat losses Shirreffs & Maughan (1998) AJP, 274: F868-F875
3. The sodium can be obtained from the rehydration drink or from food Maughan et al, (1996) EJAP, 73: 317-325; Ray et al, (1998).

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## Milk as a post-exercise rehydration drink

Shirreffs et al, *Br J Nutr*, 2007

### BACKGROUND

Milk is a potential candidate for an effective post-exercise solution, given its naturally high electrolyte content and the presence of carbohydrate in a concentration similar to many commercially available sports drinks.

### METHODS

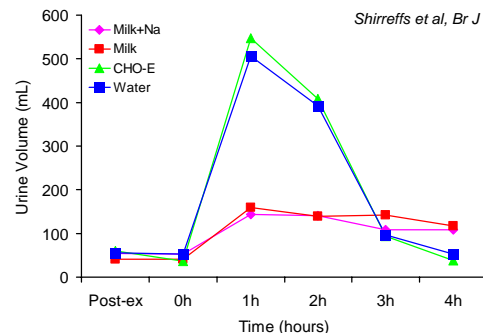
- 11 subjects (5 male, 6 females)
- Intermittent exercise in the heat to lose 1.2±0.3kg (1.8±0.2%) of body mass.
- Rehydrated after exercise by drinking 150% of sweat volume lost ie 1.79±0.42 litres.

<span style="color: blue;">■</span>	Plain water
<span style="color: green;">■</span>	Sports drink (carbohydrate-electrolyte solution)
<span style="color: red;">■</span>	0.1% fat milk
<span style="color: magenta;">■</span>	0.1% fat milk with added NaCl

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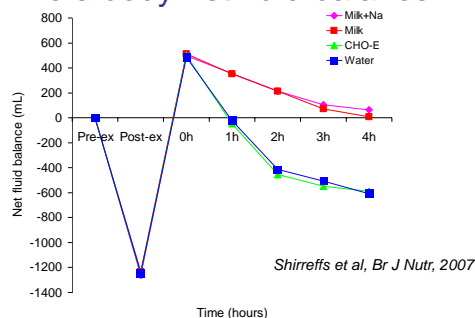
## Urine production during recovery

Shirreffs et al, *Br J Nutr*, 2007



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## Whole body net fluid balance



Shirreffs et al, Br J Nutr, 2007

- Subjects remained in net positive fluid balance or euhydrated throughout the recovery period after drinking the milk drinks but returned to net negative fluid balance 1 h after drinking the other drinks.

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## Milk as a post-exercise rehydration drink

- Milk can restore and maintain hydration status equally as well, or better than, a commercially-available sports drink.
- It can be an effective post-exercise rehydration drink and can be considered for use after exercise by everyone except those who have lactose intolerance.

Shirreffs et al, Br J Nutr, 2007

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## Sports drinks

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## Milk as a sports drinks

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## Milk as a sports recovery drink Conclusions

- When training, muscle adaptations are required:
  - Milk has been demonstrated to effectively provide the proteins required to optimise this.
- In training and competition, dehydration due to sweat loss impairs performance:
  - Milk has been demonstrated to be an effective post-exercise rehydration drink.

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**Thank you !**

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