ARMY HEALTH AND PHYSICAL PERFORMANCE RESEARCH

ENHANCING RESILIENCE WITH NUTRITION

ADAPTATION TO TRAINING

RECOVERY FROM ARDUOUS EXERCISE

INJURY PREVENTION
Protein intake is important for promoting training adaptations and recovery from arduous activity.

Men and women may have different protein requirements due to differences in muscle mass and hormonal profiles.

The protein requirements of women are unknown and the RDA for protein is unlikely to be adequate for military personnel.

Increasing protein intake during arduous military training may be effective for attenuating muscle protein breakdown and preserving muscle mass / function.
ADAPTATION TO TRAINING

Sex Differences in Protein Dose Requirements to Optimise Muscle Protein Synthesis

15 g whey protein
- Women (n=8)
- Men (n=8)

30 g whey protein
- Women (n=8)
- Men (n=8)

60 g whey protein
- Women (n=8)
- Men (n=8)
SEX DIFFERENCES IN PROTEIN DOSE REQUIREMENTS

Figure 1

-24h -22h 0h +4h +8h +24h

S/B S/B S/B S/B S/B

Basal Measurement Phase I

Acute Post Ex Measurement Phase I

Acute Post Ex Measurement Phase II

Cumulative Measurement Phase III

DXA

Single bolus of Deuterium Oxide (D2O) tracer: 0.5-1 litre (consumed in 100ml boluses)

DXA: Determination of fat and lean body masses

Saliva/blood sample for determination of body water deuterium enrichment (essential for D2O derived MPS) and key sex and anabolic hormones

S/B

Single muscle biopsy to determine MPS, signalling proteins

Single RET bout

Whey protein drink (15, 30 or 60g bolus)
**RECOVERY FROM ARDUOUS EXERCISE**

**SEX DIFFERENCES IN PROTEIN TURNOVER**

<table>
<thead>
<tr>
<th>CON-W</th>
<th>CON-M</th>
<th>PRO-M</th>
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<tbody>
<tr>
<td>Women (n=15)</td>
<td>Men (n=15)</td>
<td>Men (n=15)</td>
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<tr>
<td>No intervention</td>
<td>No intervention</td>
<td>Twice daily protein supplement during arduous exercise and recovery</td>
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**EFFECT OF PROTEIN PROVISION ON PROTEIN TURNOVER**
<table>
<thead>
<tr>
<th></th>
<th>EX LONGREACH</th>
<th>ACADEMY WEEKEND</th>
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<tr>
<td><strong>Day</strong></td>
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<tr>
<td><strong>Measurements</strong></td>
<td>Body mass</td>
<td>Height</td>
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ARMY HEALTH AND PHYSICAL PERFORMANCE RESEARCH

TECHNIQUES FOR EVALUATING NUTRIENT REQUIREMENTS
Adequate energy intake is important for female health and performance.

Two main consequences of energy deficit are compromised bone health and a loss of menstrual function.

Energy requirements of a combat solider in training exceed 4500 kcal/d.

The consequences of negative energy balance may be more severe in women than men.
How to use gelatin to promote collagen synthesis

To treat injuries

Consuming 15 grams of gelatin one hour before 6 minutes of jump rope resulted in a 2-fold greater increase in collagen synthesis than intermittent exercise for 6 minutes on its own.

Gelatin: a food source with similar amino acids found in collagen.

Ingest gelatin 1 hour before 5-6 minute protective session
At least 6 hours before or after other training

Jumping rope for 6 min with gelatin resulted in 2-fold greater increase in collagen synthesis than jumping only.
• Iron requirements are greater in women compared to men due to iron loss during menstruation.

• Iron levels decrease during basic military training (McClung et al., 2009).

• The decrease in iron during military training may be due to an inflammation-induced increase in hepcidin (Karl et al., 2010; McClung et al., 2013).

• Providing an iron supplement attenuated the decrease in iron levels during military training and maintained physical and cognitive performance compared to non-supplement controls (McClung et al., 2009).
Female military trainees are at increased risk of stress fracture injuries compared to male military trainees.

Calcium and Vitamin D are important nutrients for bone health.

Higher circulating 25(OH)D levels may be required in women compared to men to reduce the risk of stress fracture injuries (McClung & Gaffney-Stomberg, 2016).

Female Navy recruits consuming supplemental calcium and vitamin D had a 20% reduction in stress fracture injury risk than those taking a placebo supplement (Lappe et al., 2008).
• Women may have different nutrient requirements to men, some of which are exacerbated by arduous military training.

• Nutrition can be used to enhance resilience of servicewomen (and men) by supporting:
  • Adaptation to training
  • Recovery from arduous exercise
  • Injury prevention

• Defence are closing the gender data gap by conducting research on both men and women to better understand sex-specific requirements.

• The ProtectHER, TrainHER and FeedHER work packages aim to identify optimal preventative, training and feeding strategies / treatments to prepare women for the demands of combat employment and reduce injury risk.
ARMY HEALTH AND PHYSICAL PERFORMANCE RESEARCH

QUESTIONS