DEPARTMENT OF THE ARMY

HEADQUARTERS, 10th MOUNTAIN DIVISION, (LIGHT INFANTRY) AND FORT DRUM

FORT DRUM, NEW YORK 13602-5000

INSTRUCTION FOR LEADER

During training, you will read the script directly and complete an AAR. The script includes learning activities to help Soldiers understand and retain information from the lesson.

PREPARATION

1. Print and review this leader guide to ensure subject familiarity.
2. Print enough handouts for number of Soldiers in training.

OBJECTIVE

1. Soldiers will be able to verbalize the stages of the fueling timeline. Soldiers will be able to verbalize the goals of each fueling stage.

SCRIPT TO BE READ DIRECTLY

1. **INTRODUCTION TO THE FUELING TIMELINE:**

   Ask: Where does the energy used to exercise come from?

   Answer: Carbohydrates stored in the body! The storage form of carbohydrate (carbs) is known as glycogen.

   Carbs are stored in two places–the muscle and the liver. Muscle glycogen acts as the main source of energy for the muscle during exercise, fueling both power and speed. Second to that, the glycogen stored in the liver supports the central nervous system, helping you to stay alert and agile. Together, muscle and liver glycogen fuel both the brain and the body.

   Eating carbohydrates is the *only* way to store glycogen. If the body uses up carb stores, it will resort to breaking down the muscle proteins for energy. In the Army, time constraints, worry of getting an upset stomach, and a lack of resources can get in the way of proper fueling before PT. But, if you haven't fueled properly before exercise, reaction time, agility, power output, and endurance will all suffer.

   Ask: What is the goal of daily PT?

   Answers include: To sustain, to maintain, to improve performance, to build muscle, to get stronger, practice good stress, etc.

Picture a Lego set. Each time you play with the set, you can either add Legos or lose them in the building process. Now imagine your muscle is the Lego tower. Each time you exercise, you can either build bigger, stronger muscles, or you could break them down to fuel your workouts.

In this case, dietary carbs and protein are your Lego blocks. Fueling effectively before your workout will ensure that you 'build a bigger tower' every opportunity you get.

Fueling the right way before, during, and after your workouts will ensure that you are building muscle, not losing it, during daily PT. The attached fueling timeline breaks down the process into three stages: Pre-fuel, Intra (During), and Post-training (Recovery). Each stage has different nutrition goals for calories, protein, carbohydrates, and fluids. The guide also provides event-specific nutrition advice for strength/power events, endurance events, and intermittent training.

2. **PRE-FUELING:**

The purpose of pre-fueling is to top off energy-stores and to hydrate. Consuming caffeine before exercise has also been shown to improve power output for some athletes but there are some best practices to remember.

a) **Hydration**: It is not uncommon for Soldiers to arrive to PT already dehydrated before they even start sweating! The best way to check hydration status is to assess urine color. Before exercising, urine should be light yellow, like yellow Gatorade. If it is dark in color, drink more fluid prior to exercising.

b) **Carbohydrates**: Carbs are the body's powerhouse fuel and without it Soldiers will experience lower power output, lower stamina, and earlier onset of muscle fatigue. Carbohydrates are also the first line of defense before the body resorts to breaking down muscle or fat for energy. Our goal is to consume about 30g of carbohydrate about 30 minutes before exercise to maintain intensity throughout the workout.

Rules for Pre-PT snacks:

1. Starchy foods (about 30g carbs)
2. Low in fiber (<3g fiber/serving)
3. Low in fat (<5g fat/serving)
4. Low in protein (<10g protein/serving)
5. Electrolyte-rich fluids (8-12 oz of water, sports drink, unsweetened coconut water, or electrolyte tablets)

Examples of pre-fuel snacks include fresh fruit, toast with jam, salted pretzels, a Chewy Quaker granola bar, low-fat greek yogurt with granola, sports drinks (Gatorade, Pedialyte, Body Armour, Propel, etc.), instant oatmeal packet

c) **Caffeine**: Research shows that caffeine can enhance exercise performance, especially stamina, but only up to doses of 200mg. Beyond 200mg, there is no compounding effect of caffeine, meaning more isn't necessarily better. The effect of caffeine takes about 45

minutes to kick in, so it's smart to consume your coffee, third-party tested pre-workout, or energy drink approximately 45 minutes before exercising.

3. **INTRA-FUELING:**

Fueling during your workout can delay fatigue, improve reaction time, improve endurance, and, most importantly, prevent muscle breakdown. Consuming carbohydrates during exercise and maintaining hydration supports both the muscles and nervous system.

Your fueling needs will depend on how long and how hard you're exercising.

For shorter bouts of exercise (lasting less than 60 minutes), water or a zero-calorie sports drink support will be enough to maintain hydration. You can consider using the swish and spit method to improve higher-intensity performance.

> Swish-and-Spit Technique: Simply swish a sports drink in your mouth for 5-10 seconds and then spit it out. This method can provide performance advantages during intense events and activities lasting under an hour, comparable to consuming carbohydrates, but without swallowing the drink. The receptors in your mouth stimulate brain centers associated with pleasure and reward, tricking your brain into feeling fueled and helping you maintain your performance.

For exercise lasting longer than 60 minutes, you'll need to replace electrolytes, fluid, and carbohydrates. The longer the bout of exercise, the more important carbohydrates are in maintaining performance. For bouts of exercise lasting 2.5 hours or more, Soldiers should consume a blend of carbohydrates consisting of a 2:1 ratio of glucose to fructose.

Examples of intra-exercise fuel can include sports drinks, sports gels or wafers, fruit purees, gummy candies, salted pretzels, rice crispies, or fruit.

4. **POST-WORKOUT FUEL/RECOVERY:**

The goal of post-workout fuel is to replenish the fuel that you used during your workout. This includes calories, carbohydrates, protein, fluids, and electrolytes. The recommended fueling ratio is 3g of carbs to 1g of protein.

a) **Calories**: A Soldier's Total Daily Energy Expenditure will vary based on age, sex, activity level, and body composition.
    1) If your goal is weight loss, be sure that your net calorie deficit does not exceed 500kcals per day. You must include calories burned during exercise when estimating calorie needs.
    2) If your goal is weight maintenance, it is important to be sure that you are accounting for activity when estimating your energy needs.
    3) If you are aiming to build muscle, aim to add at least 250 calories (mostly carbohydrates and protein) to your daily energy needs.

b) **Fluids and Electrolytes:** Remember, weight loss during exercise is primarily due to fluid lost through sweat, not fat loss. Replenishing lost fluids and electrolytes is essential to prepare the body for the next day's workout. Rehydrating after a workout can enhance your readiness for the next session, so aim to consume 20-24 oz of fluid with sodium for every pound lost during exercise.
    1) Tip: Follow up with your Brigade H2F Team to learn how to calculate your sweat rate.

c) **Protein**: Protein is the building block of the muscle. During each workout, you're breaking it down in hopes that it will grow back stronger. Eating protein post-training aids muscle repair and growth. Aim to consume between 20-40g of protein shortly after exercising to promote the synthesis of new muscle.

    But remember, if you're not reaching your net daily calorie and protein needs, consuming a ton of protein right after your workout won't be enough to overcome the energy deficit. When the body is lacking in calories, it will resort to muscle stores to create energy.

d) **Carbohydrates**: Since the brain and body prefer to use carbs for energy, carbohydrate stores are usually depleted after a heavy workout, ruck, or training event. Replenishing carbohydrate stores as soon as possible after your workout is the number one way to preserve and build muscle, support rehydration, and ensure that you are recovered and ready for your next workout.

    If you have less than 8 hours between training sessions, aim to consume 1.0-1.2 g/kg of carbohydrate every hour for 4 hours. If you have more than 8 hours between sessions, follow the Athlete's Plate: Heavy Training Day diagram. If a Soldier doesn't consume enough carbohydrates to refuel the muscle, the body will resort to breaking down the muscle to create energy.

SUMMARY

1. Proper fueling will support muscle growth and maintenance.
2. Aim to consume 30g of carbohydrate 30 minutes before exercise.
3. Consuming up to 200mg of caffeine 45 minutes before exercise can help to improve performance however there is no compounding effect after 200mg of caffeine.
4. A ratio of 3g carbohydrates to 1g protein is ideal for a recovery snack after a workout.

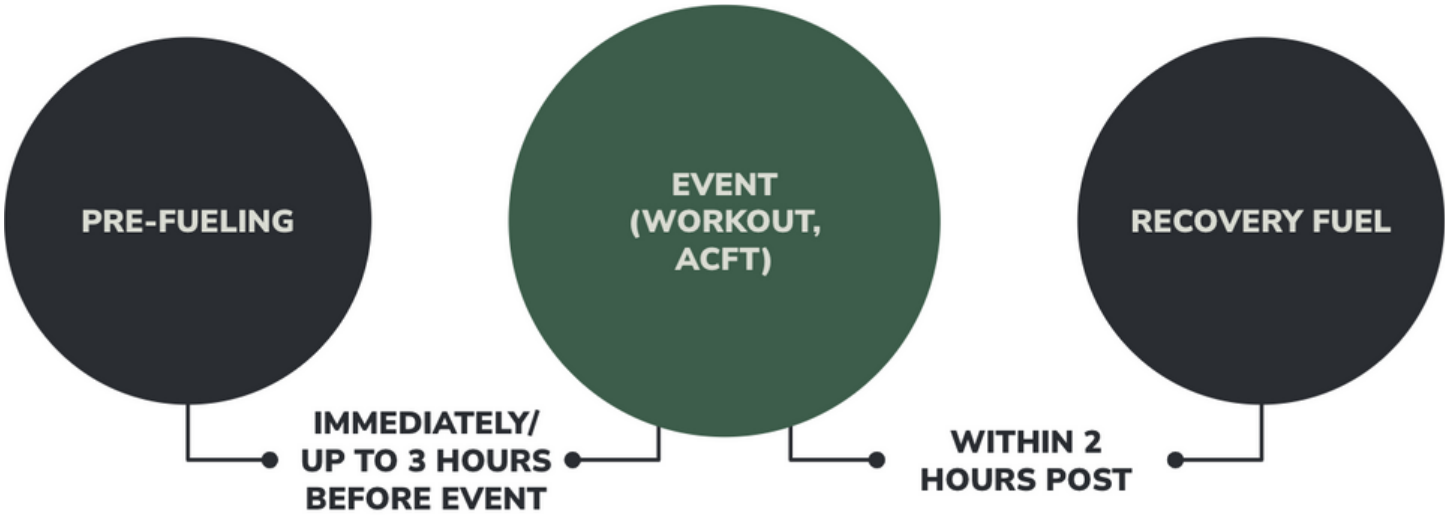
AAR

1. What were the benefits of pre-fueling?
2. How do you estimate your sweat rate?
3. How do fueling needs differ pre, intra, and post-training?

SUPPORTING RESOURCES

1. Warfighter Nutrition Guide, Chapter 11. Warfighter Nutrition Guide | HPRC (hprc-online.org)
2. FM 7-22
3. 10th MTN dietitians

FUELING TIMELINE



PRE-FUEL

PURPOSE

1. Top-off energy stores
2. Quick/usable fuel
3. Prevent muscle breakdown
4. Delay fatigue/improve stamina

GOALS

1. Calories: Depends on timing
2. Protein: Low Protein
3. Carbohydrate: 30g 30min before
4. Fluids: 10-15oz 30min before

FUELING RATIO:
4g carbs:1g Protein, Low-fat/fiber

EXAMPLES

1. <1hr before: 2 pkt flavored oatmeal OR 2 rice crispy bars
2. <2hr before: 2 bagels + jam
3. <3hr before: 2 large pancakes/waffles, syrup + OJ

DURING

PURPOSE

1. Delay fatigue
2. Improve reaction time
3. Improve endurance
4. Prevent muscle breakdown

GOALS

1. Calories: Depends on intensity
2. Protein: NONE
3. Carbohydrate: 30g w/in 1 hour; 30-60g/hour after first hour
4. Fluids: 16-24 oz/hr

PRIORITIZE REPLACING CARBS, ELECTROLYTES, AND FLUID

EXAMPLES

1. Sports drinks
2. Sports gels/wafers
3. Fruit puree/apple sauce
4. Gummy candy
5. Banana, clementine, etc.

RECOVERY

PURPOSE

1. Replenish energy stores
2. Prevent continued muscle breakdown
3. Support muscular growth

GOALS

1. Calories: 300-500kcal
2. Protein: 20-30g
3. Carbohydrate: 60-75g
4. Fluids: 16-24 oz/lb lost

FUELING RATIO:
3g Carb:1g Protein

EXAMPLES

1. 2-3 egg vegetable omelet, 2 slices toast, and 8oz OJ
2. Chocolate milk & PB&J
3. Pasta, 4 oz chicken breast, spaghetti sauce (NaCl)
4. Smoothie (6-8 oz greek yogurt, 1 cup fruit, spinach)

PRE-FUELING BREAKDOWN

2-3 HOURS	2 HOURS	1-2 HOURS	15-30 MIN	IMMEDIATELY
300-400 kcal	Up to 300 kcal	Up to 200 kcal	Up to 100 kcal	Up to 60 kcal
Mixed Meal	Mixed Meal	CHO (up to 50 g)	CHO (≤25 g)	CHO (≤15 g)
12-20 oz Fluid	12-20 oz Fluid	10-20 oz Fluid	7-10 oz Fluid	Up to 10 oz Fluid

Developed by Kyala Clegg, MS, RDN, CSCS, CES | Registered Dietitian Nutritionist, Holistic Health and Fitness | 10th Mtn. Div

EVENT-SPECIFIC

STRENGTH/ POWER

PRE-FUEL

- Light/moderate effort: Consume 15g carb immediately before effort OR 25g carb & 10g protein 15-30 min before IF training before breakfast
- High effort: 35-85g carb & 10-15g protein 2-3hr before effort OR up to 35g carb/10-15g protein <1hr before

DURING EFFORT

1. Light/moderate effort: Sports drink suggested (option to swish/spit)
2. High effort: 10-20g carb/hr for smaller athletes; 20-60g carb/hr for larger athletes

RECOVERY FUEL

1. Low/moderate effort: snack of 0.7-1 g/kg carb & 0.1-0.2g/kg protein
2. High effort: snack of 1-1.2g/kg carb & 0.1-0.2g/kg protein within 15 minutes; AND mixed meal within 2 hours

ENDURANCE

PRE-FUEL

1. Light/moderate effort: Consume 15g carb immediately before effort OR 25g carb 15-30 min before
2. High effort: Up to 50g carb 1-2hr before OR follow above.

DURING EFFORT

1. Light effort: No snack
2. >60 min: 30-60g/hr carbs
3. High effort: Up to 100g/hr carbs (if tolerated)
4. Fluids: 16-24 oz/hr OR calculate sweat rate

RECOVERY FUEL

1. Low effort: snack of 0.7-1 g/kg carb & 0.1-0.2g/kg protein
2. High effort: snack of 1-1.5g/kg carb & 0.1-0.2g/kg protein within 15 minutes; AND mixed meal within 2 hours

INTERMITTENT TRAINING

PRE-FUEL

***SEE BREAKDOWN ABOVE.**

DURING EFFORT

1. Light effort: No snack
2. 60-75 min: 15-30g mixed carbs
3. >90 min: 30-45 g mixed carbs
4. High effort: 30-60g/hr carbs
5. Fluids: 16-24 oz/hr

RECOVERY FUEL

1. Low effort: snack of 0.7-1 g/kg carb & 0.1-0.2g/kg protein
2. High effort: snack of 1-1.5g/kg carb & 0.1-0.2g/kg protein within 15 minutes; AND mixed meal within 2 hours

SAMPLE OF FUELING FOR STRENGTH

TIME	MEAL/SNACK	GOAL	CARBOHYDRATE (g)	PROTEIN (g)	FAT (g)
0600	SNACK	PREFUEL FOR PT	35 g	10-15 g	0-5 g
0630-0800	DURING PT-FUEL	DURING TRAINING	20-60 g	0 g	0 g
0830	BREAKFAST	RECOVERY FUEL	110 g	35-45 g	25-30 g
1200	LUNCH	NUTRITION	110 g	35-45 g	25-30 g
1500	SNACK	NUTRITION	50-75 g	20-25 g	Up to 20 g
*1700	*SNACK IF 2ND TRAINING SESSION	*IMMEDIATE PREFUEL	15-30 g	0-10 g	0 g
1830	DINNER	NUTRITION	75 g	50 g	25-30 g
2000	DESSERT	RECOVERY	30 g	10-20 g	Up to 20 g

Developed by Kyala Clegg, MS, RDN, CSCS, CES | Registered Dietitian Nutritionist, Holistic Health and Fitness | 10th Mtn. Div