

Fueling the Fighter

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OBJECTIVES

- Overview of basic nutrition
- Calorie requirements for active duty members
- Fluids, Carbohydrate, Protein, Fat
- A Word on dietary supplements
- Weight loss/gain

The average adults needs approximately:

2000 calories per day

\leq 65 grams of fat (30% of calories or less)



Typical Combo Meal

Big Mac	590 cal	34 gm fat
Large fries	540 cal	26 gm fat
<u>20 oz Coke</u>	<u>250 cal</u>	<u>0 gm fat</u>
Total	1380 cal	60 gm fat
% of avg needs	69%	92%



SIX ESSENTIAL NUTRIENTS

- 1. Carbohydrates**
- 2. Protein**
- 3. Fat**
- 4. Vitamins**
- 5. Minerals**
- 6. Water**

CONSUMPTION

Fat	20-30%
Protein	12-15%
Carbohydrates	50-60%

Where does fiber fall?



Caloric Run Down

CARBOHYDRATE	4 CALORIES/GM
PROTEIN	4 CALORIES/GM
FAT	9 CALORIES/GM
ALCOHOL	7 CALORIES/GM



Military Dietary Reference Intakes (MDRIs) for Food Energy

by Activity Level and Gender

Activity Level	Men	Women
Light*	3,000 kcal	2,200 kcal
Moderate**	3,250 kcal	2,300 kcal
Heavy†	3,950 kcal	2,700 kcal
Exceptionally Heavy††	4,600 kcal	3,150 kcal

*Light activity includes slow walking (≤ 2.5 mph) on hard surface, no load; driving a heavy truck; cleaning a rifle; dressing; showering; shooting pool.

** Moderate activity includes walking at moderate speed (3 mph), hard surface, no load; walking at 2.5 mph, hard surface with 66-lb load; marksmanship training, range firing; driving armored vehicle; airplane repair; noncompetitive weightlifting; walking at moderate speed (2.5 mph) on hard surface with 100-lb load; walking at 3.5 mph with no load; obstacle/endurance/confidence course; fast walking, bicycling at moderate speed.



†Heavy activity includes walking at 4 mph on hard surface, no load; foxhole digging; crawling with full pack, regular road march; field assaults, fast uphill walking; walking at moderate speed (3.5 mph) with 66-lb load; emplacement digging; jogging (<11:30 minutes per mile), bicycling (10 mph); canoeing (3-5 mph); downhill skiing, swimming, weight training; fencing, wrestling.

††Vigorous activity includes walking at 3mph with 100-lb load; assault course; forced road march; litter; carrying heavy load (75 to 99lb), boxing (sparring), touch football, snowshoeing, hiking and mountain climbing, orienteering, swimming, basketball; running (8 to 9 minutes per mile), martial arts, canoeing/sculling, cross-country skiing, scuba diving.

§Military personnel doing heavy work or prolonged vigorous physical training have energy requirements that exceed 125% of the MDRI for energy

Source: Power Performance: the Nutrition Connection, Natick, Mass: Military Nutrition Division of the US Army Research Institute of Environmental Medicine; 1994. Modules 1-6.



How many calories should I consume?

Ideal/desired body wt x 10 = Resting Metabolic Rate (RMR)

160 lbs x 10 + 1600 cal (RMR)

BMR x Activity Factor of:

1.3 = Sedentary

1.5 = Light Activity

1.7 = Moderate Activity

2.0 = Heavy Activity

1600 X 1.5 = 2400 CAL PER DAY

FLUID REQUIREMENTS

- Mild to moderate dehydration - ↓ Performance
- 2 – 10L/day depending on temperature, humidity, length & intensity of workout, fitness level
- Consider all food and drink (non-alcoholic and non-caffeinated)
- Electrolyte (sodium & potassium) replacement



FLUID LOSSES

70kg Athlete

	Normal Weather (68°)	Warm Weather (85°)	Exercise in Warm Weather (85°)
Insensible Loss (Skin and Respiratory tract)	350	350	350
	350	250	650
Urine	1,400	1,200	500
Feces	100	100	100
Sweat	100	1,400	5,000
TOTAL	2,300	3,300	6,600

- Muscle Glycogen (Stored Carbohydrate) 300 – 400g or 1200 – 1600 kcals
 - Aerobic condition - ↑ storage 5X
- Liver glycogen – 75 – 100g or 300 – 400 kcals)
- Blood Glucose – 25g or 100 kcals
- Fat – 10 – 13 kg (22 – 29#) of fat – 90,000 – 120,000 kcals



Carbohydrate Recommendations

- Typical diet: 4 – 5g/kg/day
200# (91kg) Male: 364 – 455g of CHO/day
- Athletes: 7 – 10g – 637 – 900g/day
 - 1 hour of training: 6- 7g/kg (546 – 637g)
 - 2 hours of training: 8g/kg – (728g)
 - 3 hours of training: 10g/kg – (900g)
 - 4+ hours of training: 12g/kg – (1092g)



Protein Requirements – what determines needs:

-
- Body Composition
 - Maintenance vs Growth of LBM
 - Activity Level
 - Energy and Carbohydrate adequacy
 - Protein Quality
 - Hormones
 - Illness and Injury

Protein Requirements

- RDAs: 0.8g/kg of body weight
200# (91kg) = 73g of protein/day
- Endurance Exercise: 1.2 –1.4 g/kg
200# = 109 –127g of protein/day
- Resistance Exercise: 1.4 –1.8g/kg
200# = 127- 164g of protein/day
- Maximum usable amounts: 2.0g/kg
200# = 182 g of protein/day

Amino Acids

- Protein  Amino Acids
- Claim: repair and build muscle, ↑ strength
- Facts:
 - Exercise / strength training increases muscle
 - Amount in pills / powders less than food
 - Excess protein stored as fat
- Side Effects: ↑ risk for dehydration,
↑ stress on kidneys



Amino Acids: Supplements vs. Food

	<u>Valine</u>	<u>Leucine</u>	<u>Isoleucine</u>
2 amino acid pills	200	280	175
1 cup macaroni	290	450	250
8 oz skim milk	550	800	500
3 1/2 oz tuna	1300	1920	1200

Function of Dietary Fat

- Energy Source
- Source of Essential Fatty Acids
- Absorption/Transport of fat soluble vitamins
- Insulation of internal organs
- Structural component of cells



FAT REQUIREMENTS

30% OF TOTAL CALORIES OR

CALORIES

FAT (GRAMS)

1500

50

2000

65

2500

83

3000

100

4000

133

Range: 15% (Gymnast) - 40% (Nordic Skiers)

Danger: < 20% of kcalories



Recommended Daily Energy and Energy Nutrient Intake for Athletes and service Members in Physical Training

Food Energy (kcal)	Carbohydrate (g)	Protein (g)	Fat (g)
2,500	344-438	75-94	56-69
3,000	413-525	90-113	67-83
3,500	481-613	105-131	78-97
4,000	550-700	120-150	89-111
5,000	688-875	150-188	111-139
% of Total Calories	55%-70%	12%-15%	20%-25%

Source: Power Performance: the Nutrition Connection, Natick, Mass: Military Nutrition Division of the US Army Research Institute of Environmental Medicine; 1994. Modules 1-6.



Recommended Daily Energy and Energy Nutrient Intake for Athletes and service Members in Physical Training

Nutrient (unit)	Men	Women	Operation Rations
Food energy (kcal)			3,600 ¹
Protein (g)	91 (63-119)	82 (50-93)	91 ²
Fat (g)			140 (maximum) ³
Vitamin A (RE)	1,000	800	1,000
Vitamin D (µg)	5	5	5
Vitamin E (mg TE)	10	8	10
Vitamin K (µg)	80	65	80
Vitamin C (mg)	60	60	60



Recommended Daily Energy and Energy Nutrient Intake

for Athletes and service Members in Physical Training (cont)

Nutrient (unit)	Men	Women	Operation Rations
Thiamin (mg)	1.6	1.2	1.8
Riboflavin (mg)	2.0	1.4	2.2
Niacin (mg NE)	21	15	24
Vitamin B-6 (mg)	2.9	2.3	2.9
Folate (μ g)	250	400	400
Vitamin B-12 (mg)	2.0	2.0	2.0
Calcium (mg) ⁴	1,000	1,000	1,000



Recommended Daily Energy and Energy Nutrient Intake

for Athletes and service Members in Physical Training (cont)

Nutrient (unit)	Men	Women	Operation Rations
Phosphorus (mg) ⁵	700	700	700
Magnesium (mg) ⁶	400	310	400
Iron (mg) ⁷	10	15	15
Zinc (mg)	15	12	15
Sodium (mg) ⁸	5,000 (4,550-5,525)	3,600 (3,220-3,910)	5,040
Iodine (µg)	150	150	150
Selenium (µg)	70	55	70
Fluoride	3.8	3.1	3.8
Potassium (mg)	3,500	3,500	3,500

Values are based on reference measures of military men of 174 lbs (79 kg) and women 136 lbs (62 kg) at moderate activity levels.

Source: Nutrition Standards and Education. Washington, DC: AR 40-25NAVMEDCOMINST 10110.1/AF 44-141. Draft, June 26, 1998.



Recommended Daily Energy and Energy Nutrient Intake

for Athletes and service Members in Physical Training (cont)

¹The average of moderate and heavy activity levels for the reference weight male.

²Based on requirement level during intense activity (0.8 to 1.5 g/kg of body weight)

³Total energy from fat should not normally exceed 35% of total calories.

⁴The MDRI for men or women, 17 to 18 years of age, is 1,300 mg per day.⁵The MDRI for men or women, 17 to 18 years of age, is 1,250 mg per day.

⁶The MDRI for men or women, 31 years or older, is 420 mg per day.

⁷The MDRI for men, 17 to 18 years of age, is 12 mg per day.

⁸The MDRI is based on 1,400-1,700 mg of sodium per 1,000 kcal of food served. May be inadequate in hot weather.

Food Guide Pyramid

A Guide to Daily Food Choices

Fats, Oils, & Sweets
USE SPARINGLY

**Milk, Yogurt, &
Cheese Group**
2-3 SERVINGS

**Vegetable
Group**
3-5 SERVINGS

KEY

● Fat (naturally occurring and added)

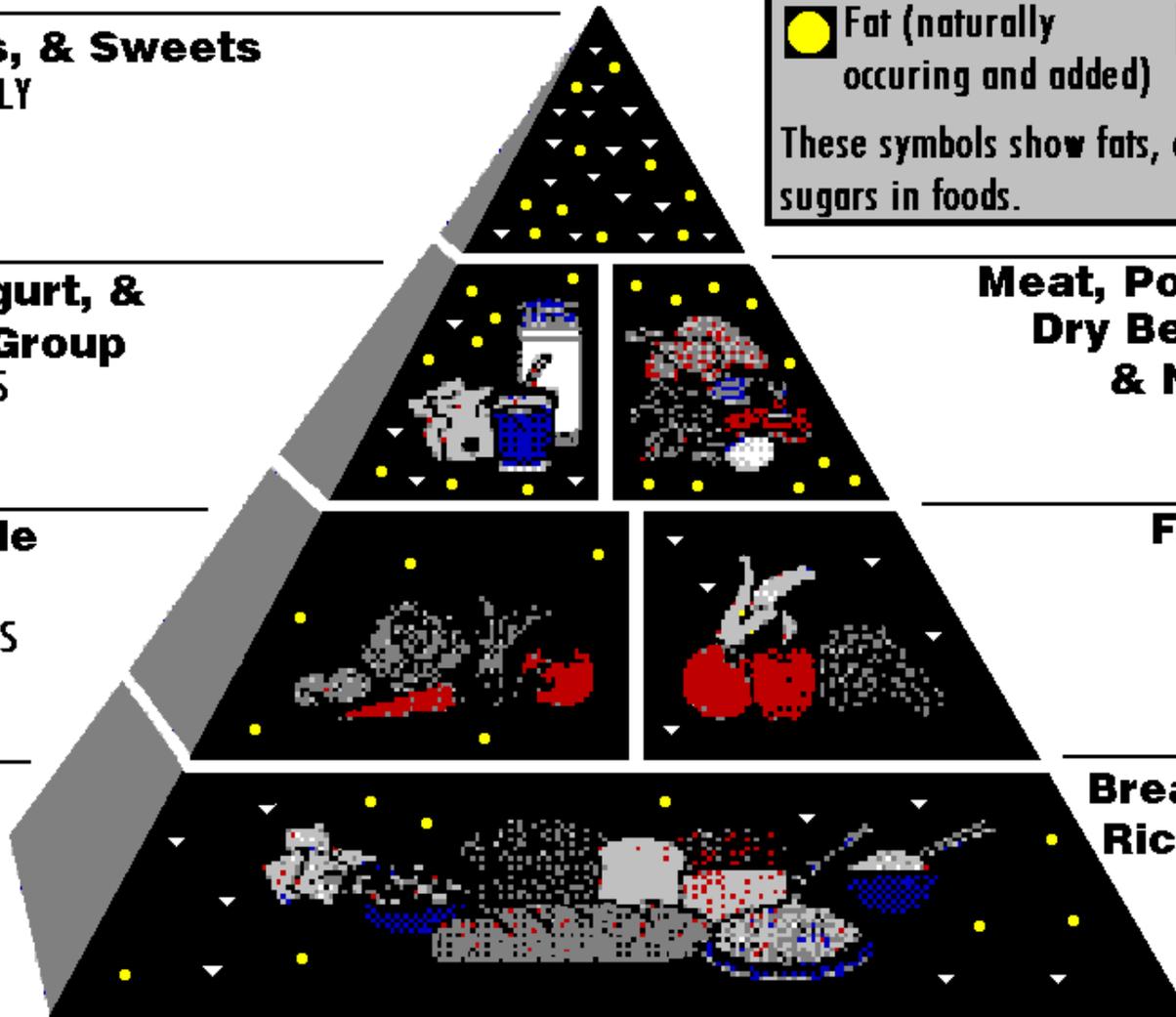
▼ Sugars (added)

These symbols show fats, oils, and added sugars in foods.

**Meat, Poultry, Fish,
Dry Beans, Eggs,
& Nuts Group**
2-3 SERVINGS

Fruit Group
2-4 SERVINGS

**Bread, Cereal,
Rice, & Pasta
Group**
6-11 SERVINGS



SYNERGY

DIETARY SUPPLEMENTS

ERGOGENIC AIDS

50% of elite-level athletes are willing to take a substance that would guarantee them an Olympic gold medal, even if they knew that taking the substance would be fatal within a year.

(The Ergogenics Edge, Melvin Williams, 1998)

BCAAs
OMEGA-3s
CHONDROITIN
GLUCOSAMINE

**MULTI-
VITAMIN/
MINERAL
COMPLEX**

**ANTI-
OXIDANTS***
C & E
LYCOPENE
BETA-CAROTENE
ALA Q₁₀
N-ACETYLCYSTEINE

CREATINE

GLUTAMINE

PROTEIN SUPPLEMENTS
WHEY • CASEIN • SOY

*Only selected antioxidants could be listed here.



Sports Drink Formulation

Ingredients per 8 oz.	Optimal formulation for a sports drink	Gatorade Thirst Quencher	PowerAde
Carbohydrate content (%)	6%	6%	8%
Carbohydrate (g)	14g	14	19
Carbohydrate Type	Sucrose, Glucose, Fructose	Sucrose, Glucose, Fructose	High Fructose Corn Syrup, Glucose Poly?
Calories	50 –60 Calories	50	72
Sodium (mg)	At least 100mg	110mg	53
Potassium (mg)	At least 28mg	30	33
Carbonation	No	No	No
Caffeine	No	No	No



Nutrient Content of Popular Energy Bars

Name and Manufacturer	Size	Flavor*	Calories	Carbs (g)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)
Balance Bar	1.76 oz (50 g)	Toasted Crunch	180	19	14	6	250	3.6
Met-Rx High Protein Food Bar	4.41 oz (125 g)	Choc Roasted peanut	380	57	30	7	1,000	9
PowerBar	2.3 oz (65 g)	Choc	230	45	10	2	300	6.3



Guidelines for Evaluating Sports Supplements

Subjective:

- **What claims are being made for the supplement?**
- **Who is making the claims?**
- **What is the motivation behind the claims?**
- **How is the supplement marketed?**
- **Does the claim make sense?**



Guidelines for Evaluating Sports Supplements (Continued...)

Objective:

- **What are the ingredients and how much of each ingredient is in the supplement?**
- **What is the recommended dosage of the supplement?**
- **What is (are) the physiological role(s) of the ingredients?**
- **Are ingredients legal (not banned or restricted by a sport-governing body)?**
- **Are the ingredients safe and effective?**

Assessment:

- **Based on subjective and objective data, what is your assessment of the supplement's claims??**
- **What is the risk/benefit ratio to the athlete of using the supplement?**
- **Would you recommend the supplement?**



FDA's Dangerous Herbs

- Chaparral: liver disease
- Comfrey: ingestion is toxic
- Yohimbe: paralysis
- Lobelia: possible death
- Willow Bark: Reye syndrome
- Ephedra

Ephedra (Ma Huang)

- A Chinese herb
 - Found in 100's of weight loss/energy products
- Claim: stimulates the CNS, suppresses appetite, acts as a decongestant, asthma reliever, ergogenic aid
- Side Effects: dizziness, jitters, insomnia, heart palpitations, ↑ BP and heart rate

- Warning:
 - Banned by NCAA and several states
 - > 40 deaths and > 800 adverse reactions
 - Dangerous for those with heart conditions, high blood pressure, thyroid condition, history of kidney stones
- FDA warns not to take > 24 mg/day
- Caffeine exacerbates the effects

BATTLE of the FAT-BURNERS

“The Stack” - Advertised as
potent thermogenic fat burner

Ephedra

Caffeine

Aspirin



Ephedra

Guarana

Willow bark

-
- Essential trace mineral needed by body
 - Claim: ↑ muscle mass, ↓ body fat, alternative to steroids, helps maintain normal blood sugar levels
 - Side Effects: megadoses may lead to zinc and iron deficiencies

-
- Food Sources: asparagus, mushrooms, prunes, brewer's yeast, beer, egg yolks, wheat germ
 - Dosage:
 - Estimated Safe and Adequate Daily Dietary Intake (ESADDI): 50 - 200 mcg/day
 - Research suggests supplementation most effective for diabetics or those with deficiency

-
- Natural substance found in fish and meat
 - Made in body and stored in muscles
 - Claim: ↑ energy and muscular strength, burns fat, improves endurance, delays fatigue
 - Side Effects: weight gain, muscle cramping, nausea, diarrhea, kidney problems?

■ Research:

- Improves anaerobic activities
- No effect on aerobic activities
- Excess is excreted
- Vegetarians demonstrate greater uptake
- Not studied long term

■ Dosage

- Rapid loading: 20 - 25 g/day for 5 - 7 days
- Slow loading: 3 g/day for 30 days
- Maintenance: 2 g/day

-
- Anabolic steroid produced by body
 - Claim: ↑ strength, ↑ testosterone levels
 - Side Effects: acne, ↑ aggressiveness, ↑ LDL, ↓ HDL, ↓ sperm production, stroke, heart attack, heart muscle damage, breast enlargement and/or testicular shrinkage in men
 - teens: stunted growth
 - Limited research



FOR WEIGHT LOSS/GAIN

1 POUND OF FAT = 3500 CALORIES

**CALORIE DEFICIT/SURPLUS
OF 500 CALORIES/DAY
FOR A 1 POUND PER
WEEK WEIGHT LOSS/GAIN**



PRINCIPLES OF WEIGHT LOSS

- CONSISTENCY
- CALORIE REDUCTION (DEFICIT)
- PHYSICAL ACTIVITY

Aerobic activity: at least 250 – 300 kcals/workout



PRINCIPLES FOR BUILDING MUSCLE

- **CONSISTENCY**

Eat at least every 3 – 4 hours

- **CALORIE SURPLUS (500 kcals/day)**

- **PHYSICAL ACTIVITY**

Resistance Training

*Excessive protein intake doesn't turn into muscle.
Extra protein calories are burned for energy or
stored as fat.*



PHYSICAL FITNESS

- 60% of Americans are not regularly physically active
- **25% are not active at all**

**1996 Surgeon General's Report
on Physical Activity and Health**



BODY COMPOSITION

- Height and Weight tables
- Waist to Hip Ratio (WHR)
- Body Mass Index (BMI)
- % Body fat to Lean Body Mass (LBM)



Determining Body Fat

Pros vs Cons

- Hydrostatic (underwater) weighing
- Anthropometrics
 - Skinfolds, circumferences, breadths
- Bioelectric Impedance Analysis
- DEXA Scan
- Bod Pod



Percent Body Fat

	Male	Female
Mean	15%	25%
Normal Range	10 – 22%	20 – 32%
Military Standards	$\leq 20\%$ (<30) $\leq 24\%$ (≥ 30)	$\leq 28\%$ (<30) $\leq 32\%$ (≥ 30)
Caution	< 5%	< 12%



BODY MASS INDEX (BMI)

- Unitless
- = $[Wt \text{ (lbs)}/Ht \text{ (in)}^2] \times 704.5$
 - 70" male or female, 160# = 23
 - 70" male or female, 190# = 27.3
 - 70" male or female, 220# = 31.6
- > 25 = Overweight (World Health Org)
- > 30 = Obese (World Health Org)

Risk of Associated Disease According to BMI and Waist Size

BMI		Waist less than or equal to 40 in. (men) or 35 in. (women)	Waist greater than 40 in. (men) or 35 in. (women)
18.5 or less	Underweight	--	N/A
18.5 - 24.9	Normal	--	N/A
25.0 - 29.9	Overweight	Increased	High
30.0 - 34.9	Obese	High	Very High
35.0 - 39.9	Obese	Very High	Very High
40 or greater	Extremely Obese	Extremely High	Extremely High

Waist to Hip Ratio (WHR)

- Body fat distribution
- Apple (android) vs Pear (gynecoid)
- Marker of disease risk
 - CAD, HTN, ↑ Lipids, DM
- Risk increase with ↑ WHR
 - >0.95 for men
 - > 0.8 for women

-
- Basic nutrition requirements
 - Calories, Carbohydrate, Protein, Fat, Fluids*
 - Dietary supplements
 - Buyer Beware. Proceed with caution***
 - Weight loss/gain
 - Calories in vs Calories out*