

# Understanding Macronutrients

## Understanding Macronutrients

Key nutrients that provide energy and the building blocks for growth, repair, and daily function.

### 1. Overview

| Macro? nutrient | Primary Function                                                                                                           | Typical Energy Yield* |
|-----------------|----------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Carbohydrates   | Quick source of fuel; supports brain and nervous?system activity                                                           | 4 kcal/g              |
| Proteins        | Building blocks for muscles, enzymes, hormones, antibodies; can be used for energy when needed                             | 4 kcal/g              |
| Fats (Lipids)   | Concentrated energy storage; essential for cell?membrane structure, hormone production, absorption of fat?soluble vitamins | 9 kcal/g              |

\*Energy values are average values used for nutrition labeling.

### 2. Carbohydrates

#### 2.1 Types

| Category                                          | Examples                            | Digestibility    | Typical Uses                  |
|---------------------------------------------------|-------------------------------------|------------------|-------------------------------|
| Simple sugars (monosaccharides, disaccharides)    | Glucose, fructose, sucrose, lactose | Rapidly absorbed | Quick energy, recovery drinks |
| Complex carbs (oligosaccharides, polysaccharides) | Starch, dietary fiber, glycogen     | Slower digestion | Sustained energy, gut health  |

#### 2.2 Glycemic Index (GI)

- **Low GI (?55):** Slow rise in blood glucose (e.g., lentils, oats).
- **Medium GI (56?69):** Moderate effect (e.g., brown rice).
- **High GI (?70):** Fast spike (e.g., white bread, candy).

Choosing lower?GI carbs helps maintain stable energy and supports metabolic health.

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## 2.3 Recommended Intake

- **General guideline:** 45-65% of total daily calories.
  - **Athletes / high-intensity training:** Toward the upper end of the range.
  - **Weight-loss or insulin-sensitive plans:** May aim for the lower end, emphasizing fiber-rich sources.
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## 3. Proteins

### 3.1 Essential vs. Non-essential Amino Acids

- **Essential (9):** Histidine, Isoleucine, Leucine, Lysine, Methionine, Phenylalanine, Threonine, Tryptophan, Valine – must be obtained from food.
- **Non-essential:** Can be synthesized by the body (e.g., alanine, asparagine).

### 3.2 Complete vs. Incomplete Proteins

| Category          | Sources                                          | Completeness                            |
|-------------------|--------------------------------------------------|-----------------------------------------|
| <b>Complete</b>   | Animal products (meat, dairy, eggs), soy, quinoa | Contains all essential amino acids      |
| <b>Incomplete</b> | Most plant foods (beans, grains, nuts)           | Lacks one or more essential amino acids |

*Combining complementary plant proteins (e.g., beans + rice) yields a complete amino acid profile.*

### 3.3 Functions Beyond Muscle

- Enzyme and hormone synthesis (e.g., insulin, neurotransmitters)
- Immune response (antibodies)
- Transport & storage (hemoglobin, ferritin)

### 3.4 Recommended Intake

- **RDA:** 0.8g protein/kg body weight/day<sup>1</sup> (56g for a 70kg adult).
- **Active individuals / strength training:** 1.2-2.2g/kg/day<sup>1</sup>.

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- Older adults: