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Nutrition Basics

FOR FITNESS PROFESSIONALS

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What is Nutrition?

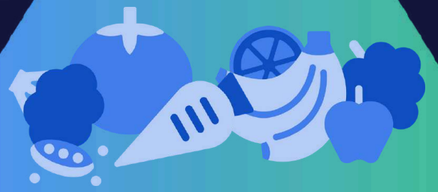
"The science of **food, the nutrients and the substances** therein, their **action, interaction, and balance** in relation to health and disease, and the process by which the organism **ingests, digests, absorbs, transports, utilizes, and excretes food substances**" [1]

What Does Nutrition Mean?

6 categories of nutrients[2]

Macronutrients

Carbohydrates
Proteins
Fats



Micronutrients

Vitamins
Minerals

Water

Healthy eating patterns support getting key nutrients at adequate amounts at an appropriate calorie level

Macronutrients

Carbohydrates
Proteins
Fats

What are macronutrients and what are their function?

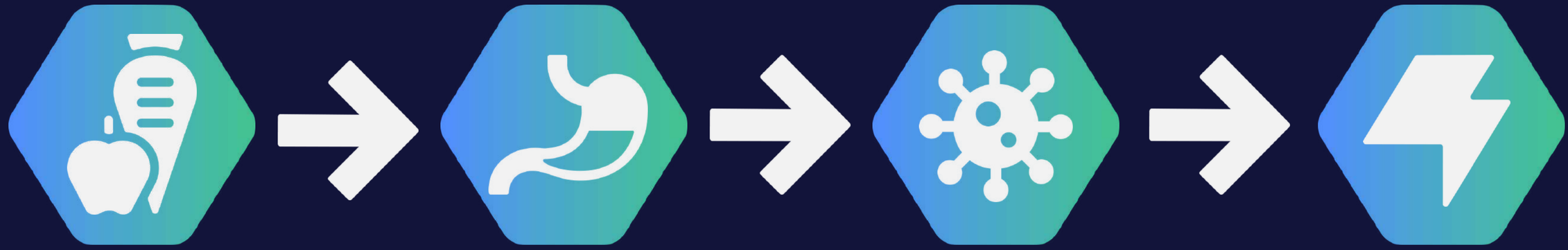
Macronutrients include three key nutrients (carbohydrates, proteins, and fats) which are found in foods and beverages and help to provide energy and are involved in building and repairing tissues.[3]

Why are they called macronutrients?

Macronutrients get their name because we need these particular nutrients in large (macro) gram amounts.[3]

The Food We Eat Gets Digested to Provide Energy

Enzymes in your digestive tract help to break down food into nutrients your body can absorb and use



FOOD

CARBOHYDRATES, PROTEINS, FATS

GLUCOSE
(Carbohydrates)

AMINO ACIDS
(Proteins)

FATTY ACID CHAINS
(Fats)

PHYSICAL ENERGY

Cell & tissue synthesis

Muscle contraction

Nerve signal transmission

Calories are How We Measure the Energy Our Bodies Use as Fuel

Energy IN

Macronutrients serve as the main sources of energy for your body. The amount of calories in each gram of macronutrient are:[4]

Carbohydrates: 4 calories
Protein: 4 calories
Fat: 9 calories

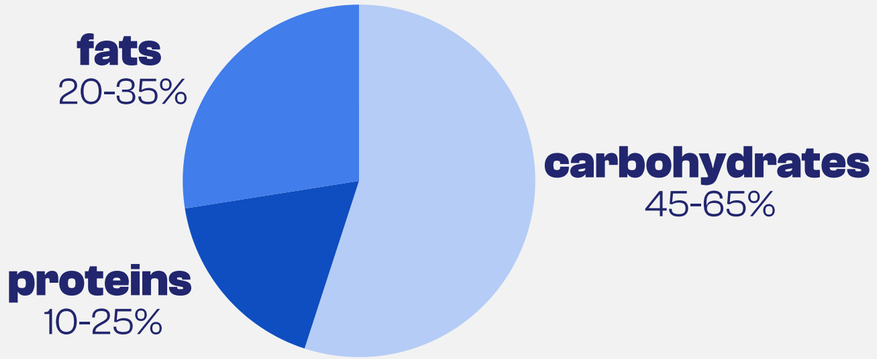
While **alcohol** is not a macronutrient, it also provides energy with **7 calories / g**

Energy OUT

You use calories by expending energy through both normal body functions & physical activities.

If you don't use up all of the energy or calories you take in, your body will store them as fat for later use, leading to weight gain.[5,6]

Recommended calorie distribution range[7]



CARBOHYDRATES

COMPOSITION [8, 9]

Carbohydrates are made up of glucose (or units of sugar) in varying levels of complexity:

- **Monosaccharide** - simple sugars that are the most basic unit of carbohydrates
- **Disaccharides** - compound sugars made of two monosaccharides
- **Oligosaccharide** - medium chains of 3-10 monosaccharides
- **Polysaccharides** - long chains of 10+ monosaccharides

ENERGY PROVIDED [4, 7]

- 4 calories per gram
- 45-65% of total calories each day should come from carbohydrates

FOOD SOURCES [9]

breads, pastas, vegetables, and fruits

Different Types of Carbohydrates [8, 9]

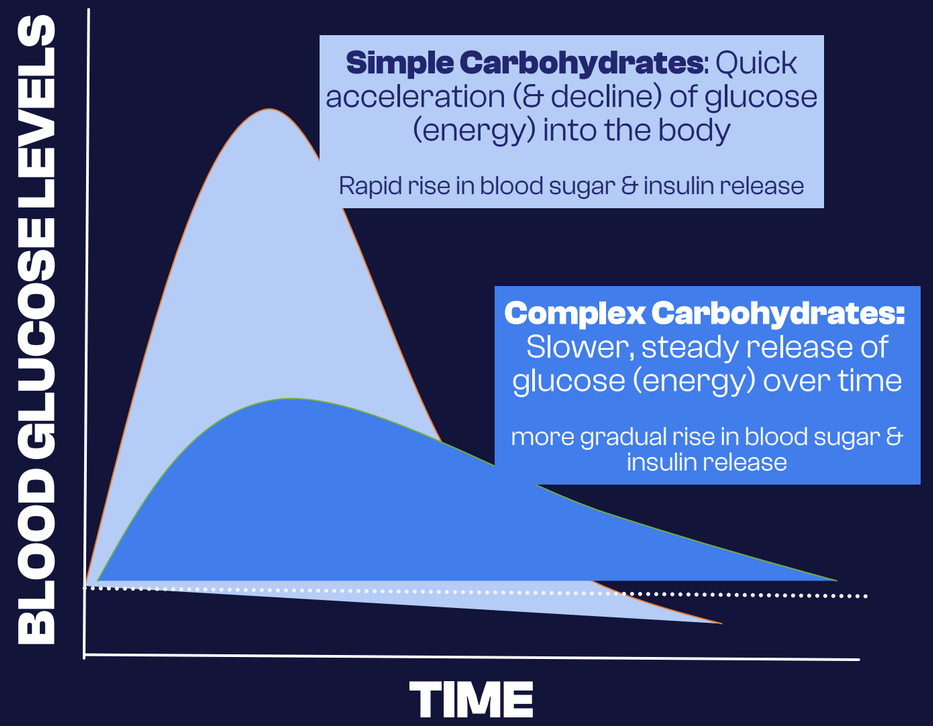
The speed at which we obtain energy from carbohydrates, in the form of glucose released into the blood, depends on the complexity of their structure and how quickly they are digested.

SIMPLE Carbohydrates (sugar)

one or two sugars (monosaccharides or disaccharides) combined in a simple structure

Easily utilized for energy
- Glucose molecules are more readily available to be absorbed into the blood quickly.

Food sources: candy, fruit juice, honey, table sugar



COMPLEX Carbohydrates (starch, fiber)

three or more sugars (oligosaccharides or polysaccharides) bonded together in a more complex structure

More complex structure requires additional digestion to break down
- Not absorbed as quickly as a readily available simple carbohydrate.

Food sources: fruits, vegetables, beans / legumes, whole grains

Overall, there should be a balance of complex and simple carbohydrates eaten throughout the day. [8]

Note: High intake of simple carbohydrates can lead to high glucose levels after a meal, which may be associated with greater risk of obesity, diabetes, and/or cardiovascular disease due to increased demand for insulin production to control high glucose levels.

Different Types of Complex Carbohydrates

STARCHES

complex carbohydrates that contain a large amount of glucose molecules (polysaccharides) primarily produced by plant foods

Foods: potatoes, chickpeas, pasta, wheat

FIBER

complex carbohydrates that cannot be digested in the body

encourages healthy bacterial growth in colon
acts as a bulking agent for stool to promote normal digestive function
promotes fullness (satiety)

Total Dietary Fiber = Soluble fiber + Insoluble fiber

SOLUBLE fiber		INSOLUBLE fiber
Dissolves in water to form thick gel-like substance in the stomach, which is broken down by bacteria in the large intestine	**Description**	Does not dissolve in water and may pass through the gut relatively intact
beans, oats, brussels sprouts, oranges, flax seed	**Food Sources**	wheat bran, brown rice fruit and vegetable skins, nuts & seeds

Functions & Benefits of Carbohydrates[8, 9]

Provides energy

Carbohydrates are broken down into glucose, which act as the primary source of fuel for the body.

The brain and nerve cells only use glucose for energy.

Spares protein & fat

When your body needs fuel, it first breaks down carbohydrates before turning to protein and fat (sparing them for other functions).

Promotes digestive health

Dietary fiber adds bulk to the stool and promotes GI tract motility & bowl movement regularity.

Regulates metabolism

Carbohydrates participate in metabolism & breakdown of fat and cholesterol for use in the body.

Complex carbohydrates help control blood glucose levels & insulin release.

PROTEIN

FUNCTION [12]

- Major functional and structural component of all cells in the body
- Act as building blocks to:
  - Build & repair muscles & tissues
  - Create enzymes & other facilitators that promote normal body functions

ENERGY PROVIDED [4, 7, 11]

- 4 calories per gram
- 10-30% of total calories should come from protein
- The Recommended Daily Allowance (RDA) for protein is 0.8 grams of protein per kilogram of body weight but research suggests active individuals should consume more than this [22]

FOOD SOURCES [12]

animal sources (meat, eggs, & milk) or plant sources (soy, nuts, legumes)

PROTEIN: The Major Functional & Structural Component of All Cells in the Body[13]

Dietary Protein

Proteins are made up of amino acids

- The specific sequence of amino acids determines the protein function

20 Amino Acid Types

- 9 essential amino acids - must come from the diet
- 11 non-essential amino acids - can be made in the body

Building Blocks for Muscles, Tissues, & Enzymes

The body produces proteins it needs for different functions in the body when it has all the specific amino acids required

Protein Sources Matter

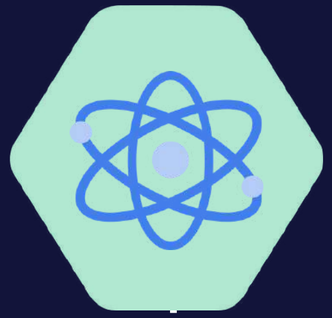
Dietary protein sources can vary in quality depending on both ease of digestibility and whether they provide all of the essential amino acids we need in the ratio that our body needs it. [14, 15]

LOWER Quality Protein

Considered "incomplete" proteins because they lack one or more of the essential amino acids needed (and they may be harder to digest and absorb)

HIGHER Quality Protein

Considered "complete" proteins because they contain all of the essential amino acids (and they are usually easier to digest and absorb)



Collagen

essential amino acid usually missing: tryptophan

Nuts & Seeds

essential amino acid usually missing: lysine

Grains

wheat / wheat flour, oats, rice, etc.

essential amino acid usually missing: lysine

Legumes

peas, beans, etc.

essential amino acid usually missing: methionine

Plant protein powders

pea, soybean or other concentrates / isolates

essential amino acid usually missing: methionine

Animal products & by products

meat, eggs, milk / whey, casein

only complete protein sources

Complementary Foods to Provide High Quality Protein[16]

If you're not consuming high quality proteins (e.g., animal proteins or soy) each day, it is important to eat a variety of foods with proteins that complement each other to get all of the essential amino acids you need in a day.

RICE

Low quality protein
Missing **Isoleucine & Lysine** amino acids
Provides **Methionine & Tryptophan** amino acids

RICE & BEANS

High quality protein
they each provide the amino acid the other is missing

BEANS

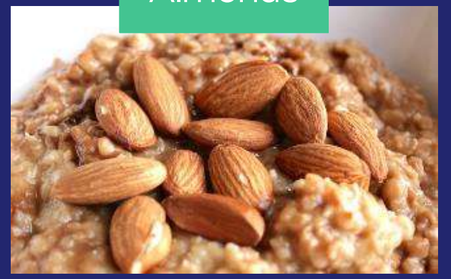
Low quality protein
Provides **Isoleucine & Lysine** amino acids
Missing **Methionine & Tryptophan** amino acids

Other Complementary Protein Examples

Hummus & Pita Bread

Peanut Butter & Wheat Bread

Oatmeal & Almonds



FAT

OVERVIEW [17,18]

- Consist of chains of fatty acids bound together by glycerol
- Type of fat is determined by length of fatty acid chain and level of saturation. Main types include:
  - Saturated
  - Unsaturated (Monounsaturated, Polyunsaturated)
- Dietary fat is important for many functions in the body
  - The body can make all fatty acids except two - omega-6 (linoleic acid) and omega-3 (linolenic acid), which are considered essential fatty acids because they must come from the diet

ENERGY PROVIDED [4,7,17]

- 9 calories per gram
- 25-35% of total calories should come from fat

FOOD SOURCES [17]

fatty meats / fishes, nuts / seeds, oil, dairy / butter

Functions & Benefits of Dietary Fat [19]

Helps insulate the body to keep it warm

Helps keep skin and hair healthy

Helps absorption of fat-soluble* vitamins (A, D, E, K)

*Requires dietary fat to be absorbed and used by the body

Provides essential* fatty acids (ALA, EPA, & DHA)

*Can't be produced in the body so must be provided by food

Provides physical energy
(9 calories / g)

Different Types of Dietary Fat [19]

Current dietary guidelines recommend reducing saturated & trans fat intake, replacing them with unsaturated fats in the diet. [11]

OVERVIEW

UNSATURATED FAT

LIQUID AT ROOM TEMPERATURE

HEALTH IMPACTS
Lowers LDL (bad) & raises HDL (good) cholesterol

Higher intake of omega-3 compared to omega-6 fats may reduce heart disease risk and inflammation

SATURATED / TRANS FAT

SOLID AT ROOM TEMPERATURE

HEALTH IMPACTS
Raises LDL and total cholesterol

High intake levels may increase risk of heart disease, stroke, and diabetes

FOOD SOURCES

MONO-UNSATURATED FAT

AVOCADOS
OLIVES
CERTAIN OILS (OLIVE, CANOLA, SAFFLOWER)

SATURATED FAT

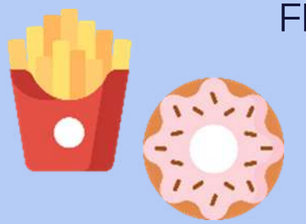
RED MEAT
DAIRY (CHEESE, MILK, BUTTER)
COCONUT OIL

POLY-UNSATURATED FAT

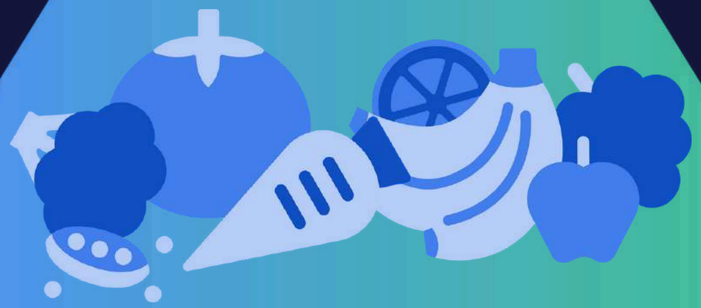
OMEGA-3 (ALA, DHA, EPA):
SALMON / TUNA
CHIA/FLAX SEEDS
WALNUTS

OMEGA-6 (LINOLEIC ACID):
NUTS / SEEDS
VEGETABLE OIL

TRANS FAT



FROZEN / REFRIGERATED DOUGH
COMMERCIAL BAKED GOODS
MARGARINE
SHORTENING
FRIED FOODS



Micronutrients

Vitamins
Minerals

Vitamins & minerals are often referred to as micronutrients because we only need them in small amounts in our diet.

However, making sure we eat the recommended amounts is vital to our well-being, with micronutrients often playing a major role in development, growth, and disease prevention.[20]

Vitamins VS Minerals

VITAMINS [21, 22]

Vitamin A, C, D, E, K, & B Vitamins (thiamin, riboflavin, niacin, B6, B12, pantothenic acid, biotin, folate)

ORGANIC
Found naturally in living sources (plants & animals)

UNSTABLE
Can be broken down by heat, air, or acid

MINERALS [21, 23]

Calcium, chloride, chromium, copper, iodine, iron, magnesium, manganese, molybdenum, selenium, sodium, phosphorus, potassium, selenium, zinc

INORGANIC
Found naturally in non-living sources (soil & water)

STABLE
Hold their chemical structure

Different Types of VITAMINS

	WATER SOLUBLE Vitamins [21, 22, 24]	FAT SOLUBLE Vitamins [21, 22, 25]
INCLUDES	C, B Complex	A, D, E, K
FUNCTIONS	Energy metabolism & production Building proteins, cells, & tissue	Build bones Protect vision Act as antioxidants
TRANSPORT / STORAGE	Circulate freely & easily excreted	Requires dietary fat to also be consumed for absorption & use in the body
ADDITIONAL NOTES	Easily destroyed by certain cooking methods (high heat & long cook times such as boiling)	Higher risk of toxicity

Different Types of MINERALS

MAJOR Minerals [21, 23, 26]

calcium, chloride, magnesium, phosphorus, potassium, sodium

REQUIRED IN LARGER AMOUNTS
(>100 mg/day)

FUNCTIONS
Maintains body's water balance
Structure for bones, hair, skin, nails

TRACE Minerals [21, 23, 26]

copper, chromium, iodine, iron, fluoride, manganese, molybdenum, selenium, zinc

REQUIRED IN SMALLER AMOUNTS
(<100 mg/day)

FUNCTIONS
Carrying oxygen in the blood
Forming / enhancing key enzymes

VITAMINS & MINERALS

FUNCTIONS & SOURCES [21-23]

BRAIN and memory

Vitamins: B (B6, B12, folic acid)
Minerals: choline

Top foods: beans & peas, green leafy vegetables, eggs, fortified grains, seafood

VISION and eye function

Vitamins: A, C, E
Minerals: zinc

Top foods: green leafy vegetables, red peppers, cantaloupe, fortified cereals

DIGESTIVE health

Vitamins: A, B (niacin), C, D
Minerals: chloride, magnesium

Top foods: whole & enriched grains, green leafy vegetables, cantaloupe, peppers, salmon

HEART and blood

Vitamins: B (B6, B12, folic acid), D, K
Minerals: calcium, iron, magnesium, potassium

Top foods: whole & enriched grains, green vegetables, low / non fat dairy, seafood, beans & peas, nuts & seeds

REPRODUCTIVE health

Vitamins: B (folic acid), D
Minerals: iron, selenium, zinc

Top foods: whole & enriched grains, spinach, seafood, eggs, beans & peas, nuts & seeds, organ meats (liver), orange juice

MUSCULAR system

Vitamins: B, C, D, E
Minerals: calcium, magnesium, potassium

Top foods: orange juice, low / non fat dairy, whole & enriched grains, green vegetables

BONE strength

Vitamins: D, K
Minerals: calcium, magnesium, phosphorus

Top foods: green vegetables, whole & enriched grains, fortified cereals & juices, low / non fat dairy, nuts & seeds

ENERGY production

Vitamins: B12
Minerals: magnesium, iron

Top foods: whole & enriched grains, green vegetables, low / non fat dairy, legumes, nuts & seeds

IMMUNE system

Vitamins: A, C, D, E
Minerals: zinc, selenium

Top foods: whole & enriched grains, broccoli, spinach, orange juice, nuts & seeds, seafood

HAIR, SKIN, & NAILS

Vitamins: A, B (biotin), C
Minerals: copper, zinc

Top foods: whole & enriched grains, green vegetables, cantaloupe, red peppers, shellfish, legumes, nuts & seeds

Nutrients of Public Health Concern

Certain nutrients are under consumed by the US population and are identified as public health concerns with low intakes potentially leading to adverse health outcomes.[11] The 5 priority nutrients of concern include:

	CALCIUM[26]	POTASSIUM[27]	VITAMIN D[28]	FIBER[29]	IRON[30]
Function in the Body	• Build and maintain bones • Muscle and nerve function • Blood flow • Hormone release	• Kidney and heart function • Muscle contraction • Nerve transmission	• Healthy immune function • Muscle and nerve function • Builds strong bones (through assisting calcium absorption)	• Digestive health • Heart health • Weight management	• Growth and development • Red blood cell formation (carries oxygen from lungs to the body) • Hormone creation
Recommended Daily Intake for adults age 18-70	**1,000 mg**	**4,700 mg**	**15 mcg (600 IU)**	**28 g**	**18 mg**
Top Sources (& amount per serving)	• **Yogurt, plain, nonfa**t (8 oz) – 488 mg (49% DV) • **Tofu** (1/2 cup) – 434 mg (43% DV) • **Almond milk** (fortified) (1 cup) – 442 mg (44% DV)	• **Lima beans** (1 cup) – 955 mg (20% DV) • **Prune juice**, 100% - 707 mg (15% DV) • **Yogurt, plain, nonfa**t (8 oz) – 625 mg (13% DV) • **Clams** (3 oz) – 534 mg (11%)	• **Salmon** (3 oz) – 383-570 IU (60% DV) • **Low-fat milk or yogurt** (1 cup) – 116 IU (15% DV) • **Orange juice** (fortified) (1 cup) – 100 IU (13% DV)	• **Whole grain / high fiber cereal** (1/2 cup) – 6.5-14 g (27-50% DV) • **Lima beans** (1 cup) – 13.2 g (47% DV) • **Blackberries / raspberries** (1 cup) - 8 g (28% DV)	• **Fortified, whole grain cereal** (1/2 cup) – 16.2 mg (90% DV) • **Oyster** (3 oysters) – 6.9 mg (38% DV) • **Spinach**, cooked (1 cup) – 6.4 mg (36% DV)

Powerful Foods to Meet Priority Nutrient Needs

Below are examples of a common food within each food group that is a good source (i.e. provides at least 10% of the recommended daily value, or DV, amount) of 2 or more of the nutrients of public health concern: [26-30]

DAIRY
Yogurt
8 oz - plain, non or low fat

Calcium - 488 mg (49% DV)
Potassium - 625 mg (13% DV)
Vitamin D - 116 IU (15% DV)

PROTEIN
Salmon
3 oz

Calcium - 181 mg (18% DV)
Potassium - 408 mg (10% DV)
Vitamin D - 477 IU (60% DV)

LEGUMES
Lima Beans
1 cup - cooked

Potassium - 625 mg (13% DV)
Dietary Fiber - 13.2 g (47% DV)
Iron - 6.4 mg (36% DV)

VEGETABLES
Spinach
1 cup - cooked

Calcium - 245 mg (25% DV)
Potassium - 839 mg (18% DV)
Dietary Fiber - 4.3 g (15% DV)
Iron - 6.4 mg (36% DV)

FRUIT
Orange Juice
1 cup - 100% juice, fortified

Calcium - 349 mg (35% DV)
Potassium - 496 mg (11% DV)
Vitamin D - 100 IU (13% DV)

GRAINS
Whole-Grain Ready to Eat Cereal
1/2 cup

Dietary Fiber - 7.5 g (27% DV)
Iron - 16.2 mg (90% DV)

Mineral Spotlight: SODIUM

FUNCTIONS [31, 32]

- Regulated by your kidneys and helps to control body's fluid balance
- Helps send nerve impulses
- Affects muscle function

DIETARY RECOMMENDATIONS [33]

- The average American consumes 3,400 mg of sodium per day
- The American Heart Association recommends no more than 2,300 mg sodium per day and getting closer to the ideal limit of no more than 1,500 mg of sodium per day for most adults

HEALTH IMPLICATIONS

- 9 out of 10 Americans consume too much sodium.
  - Excess sodium intake can lead to risk of many adverse health conditions, including heart disease.[33]
- When there's extra sodium in your bloodstream:
  - It pulls water into your blood vessels, increasing the total amount (volume) of blood inside your vessels.
  - Blood pressure increases, which puts an extra burden on your heart and could lead to high blood pressure.[34]

NOTE

Individuals who are physically active may require more sodium to restore their fluid-electrolyte balance by replacing sodium loss with sweat.[32]

- Sodium is the main electrolyte lost with sweat, with losses ranging from 230-2070 mg/L depending on a variety of factors (activity, duration, environment, etc.). [35]

Water

You Are What You Drink

Water accounts for nearly

60% of adult body weight[36]

Water is an essential nutrient[37]

It plays a role in many important functions in the body, including:

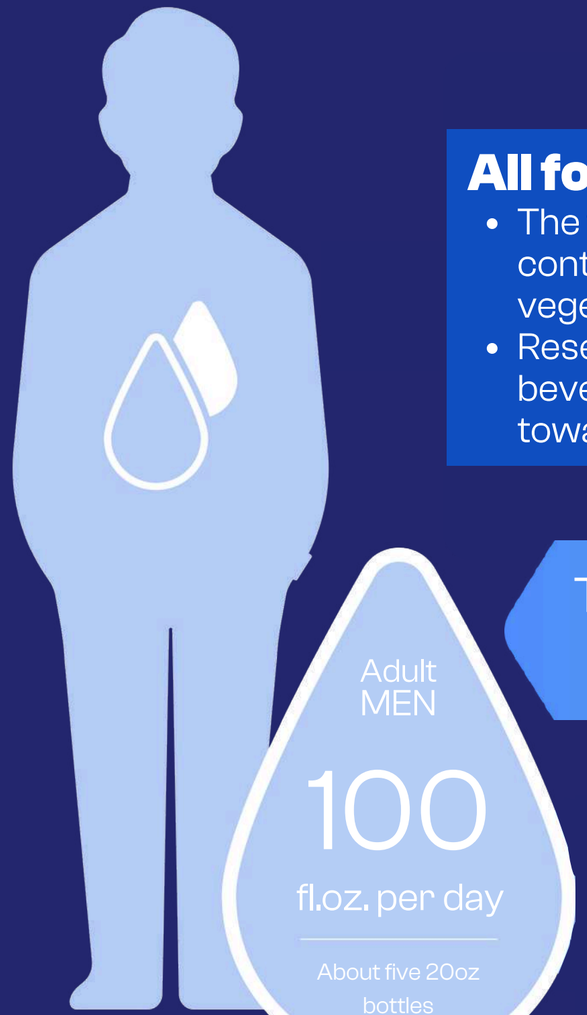
structure & cushioning of tissues & organs , temperature regulation, cardiovascular function, metabolism, & digestion.

Hydration

Do You Drink Enough?

All food & beverages count towards hydration

- The food we eat can add 20-30% to our total fluid intake, with water content of food varying from 45% in breads to 85% in fruits & vegetables.[36]
- Research suggests moderate intake of caffeine-containing beverages does not lead to dehydration and can therefore count toward your daily fluid intake.[38]



Adult MEN

100

fl.oz. per day

About five 20oz bottles

The recommended intake of fluids coming from beverages varies by age & gender.[36]

Warning Signs of Dehydration[36]

Low output and/or dark color urine
Dry mouth / cracked lips
Headache
Increased body temperature,
Fatigue
Dizziness & lightheadedness and/or
Loss of appetite

Adult WOMEN

70

fl.oz. per day

About three and a half 20oz bottles

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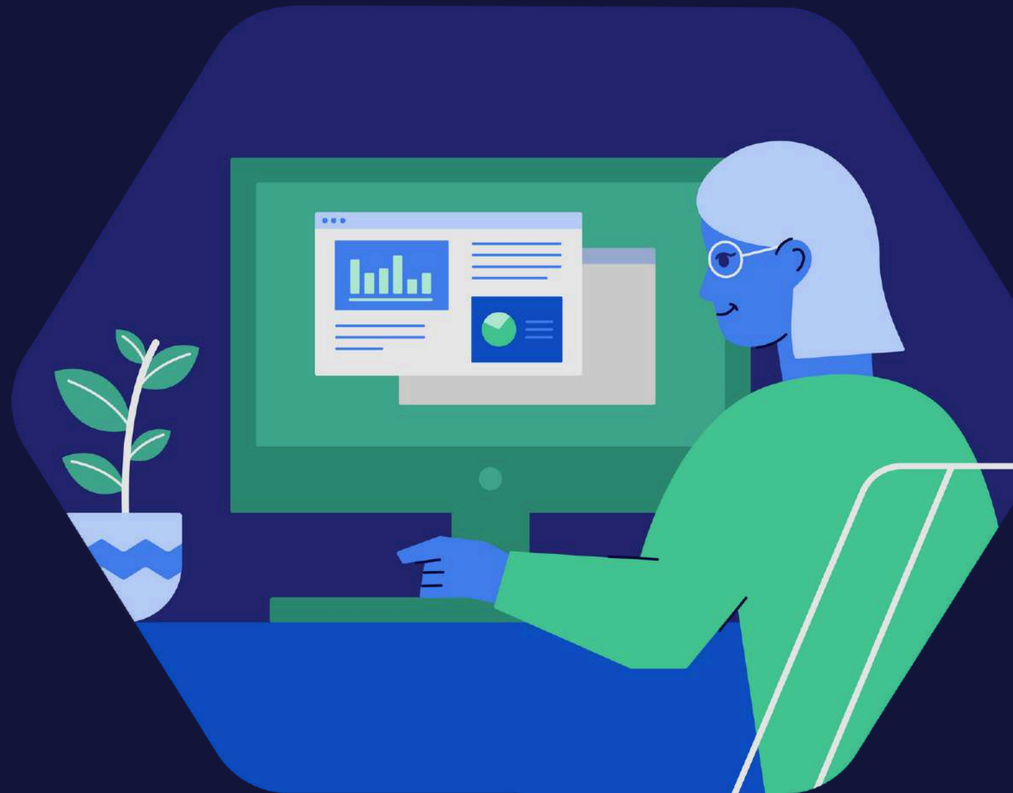

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