

FOOD NUTRITION LECTURE #2

Macro Nutrients (Proteins,
Fats and Carbohydrates)

Recognize these values?

Nutrition Facts	
Serving Size 2/3 cup (55g)	
Servings Per Container About 8	
Amount Per Serving	
Calories 230	Calories from Fat 40
% Daily Value*	
Total Fat 8g	12%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 160mg	7%
Total Carbohydrate 37g	12%
Dietary Fiber 4g	16%
Sugars 1g	
Protein 3g	
Vitamin A	10%
Vitamin C	8%
Calcium	20%
Iron	45%
* Percent Daily Values are based on a 2,000 calorie diet. Your daily value may be higher or lower depending on your calorie needs.	
	Calories: 2,000 2,500
Total Fat	Less than 65g 80g
Sat Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g

Nutrition Facts	
8 servings per container	
Serving size	2/3 cup (55g)
Amount per 2/3 cup	
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% DV*	
12%	Total Fat 8g
5%	Saturated Fat 1g
	<i>Trans Fat</i> 0g
0%	Cholesterol 0mg
7%	Sodium 160mg
12%	Total Carbs 37g
14%	Dietary Fiber 4g
	Sugars 1g
	Added Sugars 0g
	Protein 3g
10%	Vitamin D 2mcg
20%	Calcium 260mg
45%	Iron 8mg
5%	Potassium 235mg
* Footnote on Daily Values (DV) and calories reference to be inserted here.	

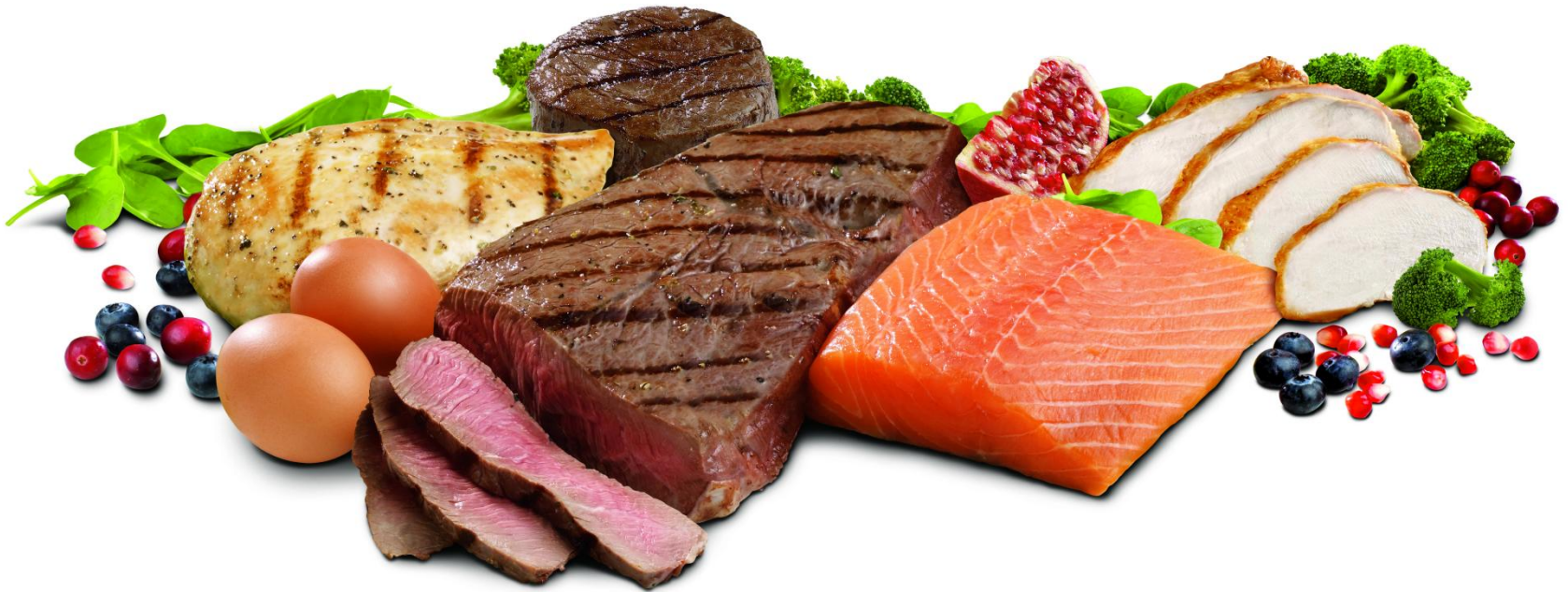
**First things
first...What is a
calorie?**

Answer...

- As defined by MedicalNewsToday:
- **“A calorie is a unit of energy.** In nutrition and everyday language, calories refer to energy consumption through eating and drinking and energy usage through physical activity. For example, an apple may have 80 calories, while a 1 mile walk may use up about 100 calories.”
- 1kCal is the amount of energy required to raise one kilogram of water by one degree Celsius.

PROTEIN AND AMINO ACIDS

Let's start with Protein



Sources: Red Meat, Fish, Poultry, Eggs, bread, rice and pasta
To name a few.

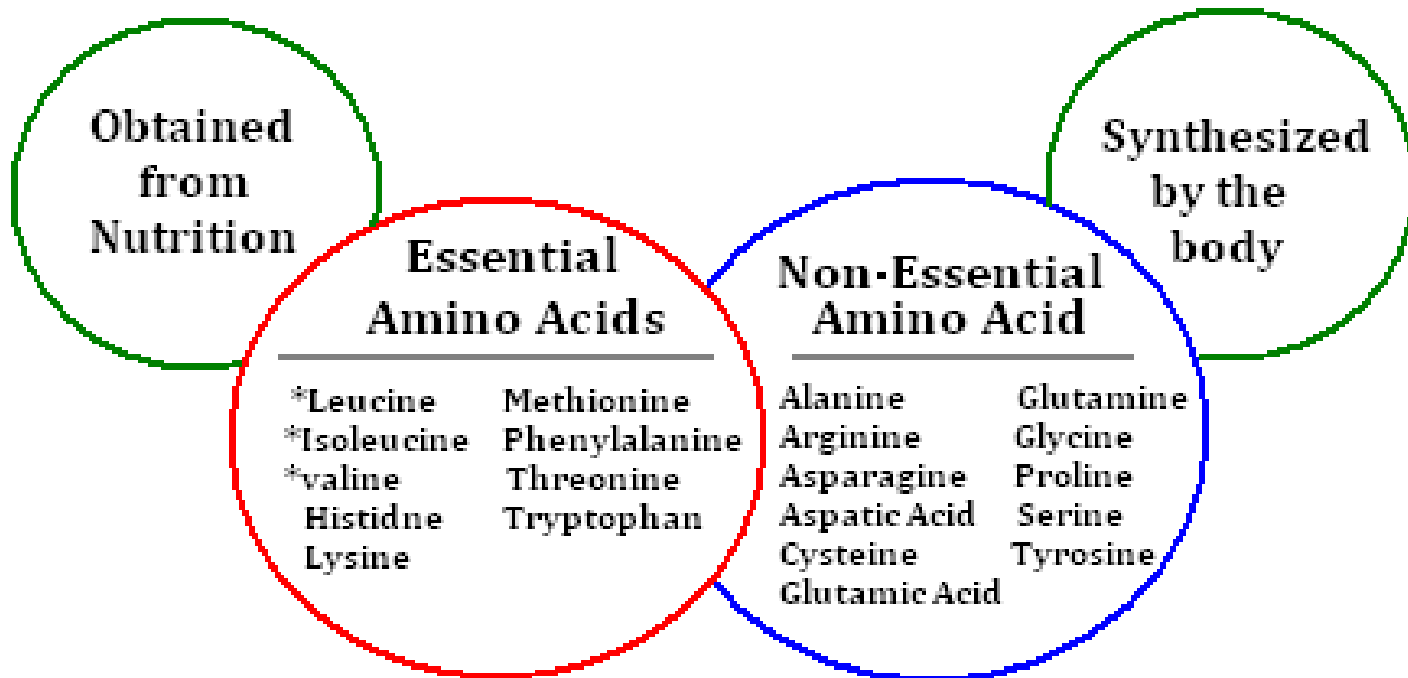
What is Protein

- Protein provide the building blocks for all cells and for life itself.
- They are made from 20 different amino acids, 9 of which are essential (you have to get them in your diet) while 11 are non-essential (your body makes them).
- When protein is broken down in the stomach (recall HCL), amino acids are released (since proteins are comprised of them). Proteins are also absorbed in the stomach via another mechanism.

What they Do

- Think of them as the bricks to making a house. They provide the structure for many different types of cells.
- Key component in repairing damaged tissue or strengthen existing tissue (i.e. keratin: strengthens protective coverings such as hair)
- Make hormones (i.e. insulin)
- Muscle contractions (actin and myosin)

Amino Acids



Amino acid in human body

- **Note:** I do not expect you to memorize any of them. All you need to know is what proteins are made of and what essential and non-essential means.

Protein Synthesis (aka Protein creation)

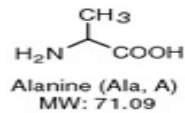
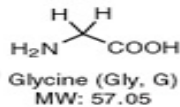
- The synthesis of protein is determined by genetic information
- This genetic information comes from DNA
- DNA provides the code and mRNA is the messenger molecule that brings this DNA to the nucleus (brain of the cell)
- The sequence of amino acids will determine its function.

Chemical Sequence

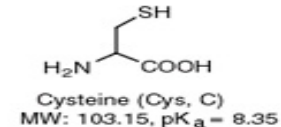
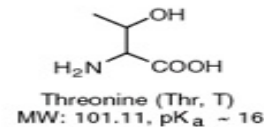
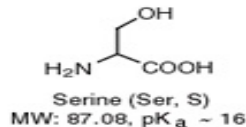
- The following picture depicts different sequences. Note: **Not tested**. Just see how different sequences enable different amino acids.

Name and Example of an amino acid

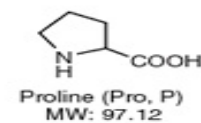
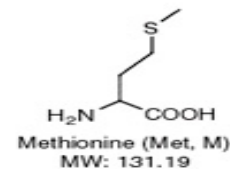
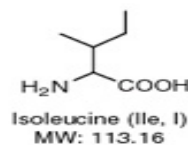
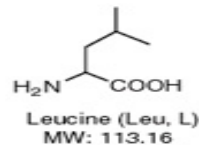
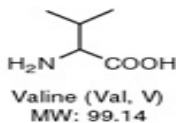
Small



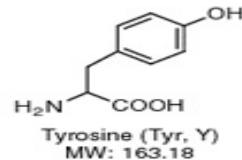
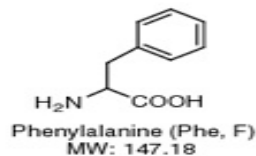
Nucleophilic



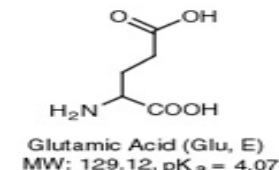
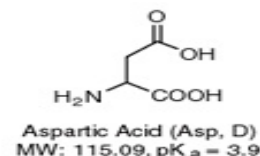
Hydrophobic



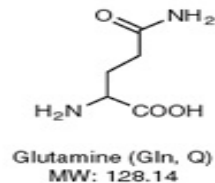
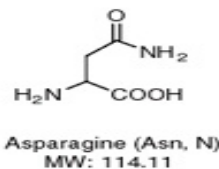
Aromatic



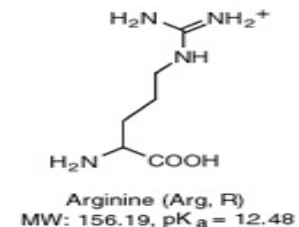
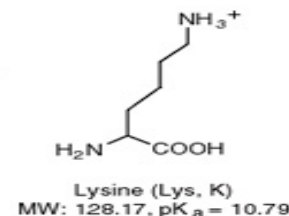
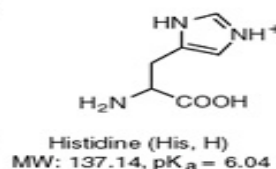
Acidic



Amide



Basic



Breakdown and Turnover

- Protein is constantly being broken down and synthesized in the body (Protein turnover)
- If you are synthesizing more than you are excreting (via urine), then you have low turnover rate.
- If you are breaking down and excreting more than you are synthesizing, you will have a high turnover rate.

Daily Protein Intake

- Different individuals, depending on their activity level, weight and if they are healthy, will have different protein needs.
- On average, the recommended intake distribution is **10-35%** of your calories to come from protein.
- The recommended daily allowance (RDA) is **0.8g/kg/day** (regular people) and **1.2 – 1.7g/kg/day** (athletes, gym rats etc.)

Let's calculate

- So if you weight 150 lbs and you convert that to kg (150 divided by 2.2) you get 68 kg.
- If you are not a regular exerciser, you multiply 68 X 0.8g= 54g of protein per day.
- If you are working out in the gym, 1.2 – 1.7g/kg X 68 kg = 81.6g – 115.6 g of protein/day

Yo Bro, you take protein bro?

- You will come across Individuals who swear by Protein being the reason They are getting muscular “swole or jacked”.



- They believe that regardless of who you are, you should take at least 1g/lb of protein a day! So if you are 150 lbs, you should be at least taking 150 grams per day!

The fate of protein

- Excess protein is not stored like carbohydrates or fats.
- Excess protein is used either for energy or it is excreted via the urine.
- So you can take go full out “broscience” with protein and take in far beyond the needs of your body, but your body will convert it to energy or excrete it. Therefore, no further benefits can be acquired.

Calories from Protein

- You get about 4 calories (kcal) to be precise) from 1 gram of protein.
- So if you are eating 50 g of protein per day, you will be getting about 200 kcal from protein alone.

The Fate of Protein Sealed



FATS AND LIPIDS

Sources of Fats

- Primary sources of Fats include
Margarine, olive oil,
Grapeseed oil,
Butter, Animal fats,
Bacon, nuts and
Many dairy products
To name a few.



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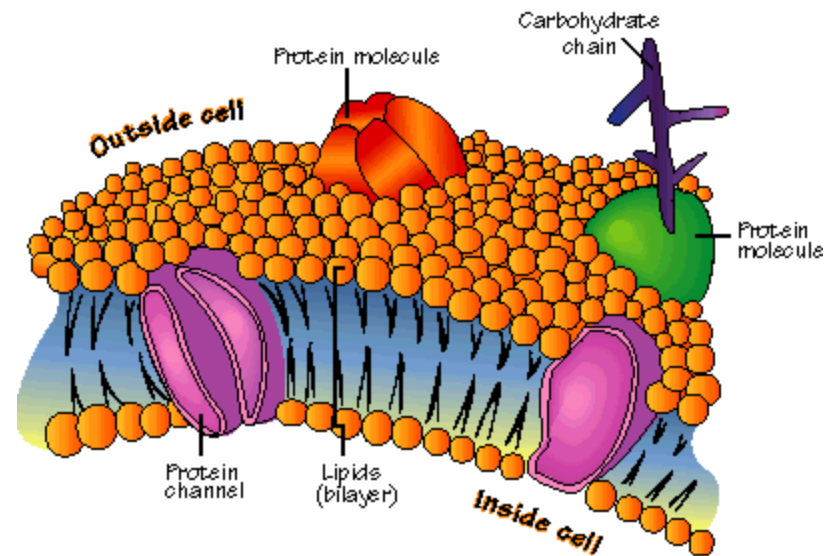
Note: Eating fats does not make you fat!

* Footnote on Daily Values (DV) and calories reference to be inserted here.

The role and function of fats

- If protein are the bricks that make the structure of the cell, fats are the mortar that help connect the bricks together.

- Fats also act as another Source of energy much like Carbohydrates. (Proteins Can be used as energy though They are not as efficient)



- Provide insulation for our organs as well as our bodies as a whole unit.
- They also help create hormones like testosterone.

What are fats comprised of?

- Fats (Lipids) are comprised of fatty acids that come from three main forms of fats:

- Unsaturated:

- 1) Mono

- 2) Poly

- Saturated Fats

- Trans Fats

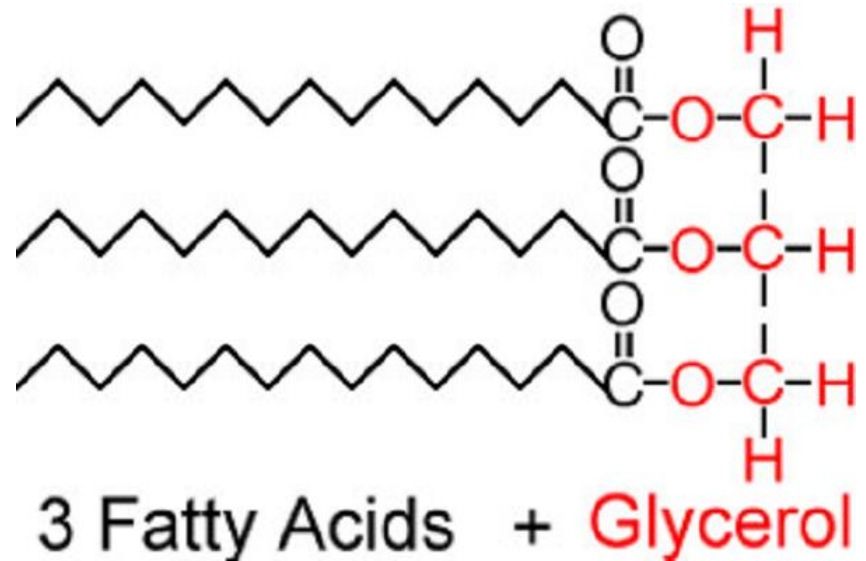
Healthy Fats	
Type of Fat	Major Food Sources
Monounsaturated Fat / Monounsaturates	Olive, canola and peanut oils, avocados, non-hydrogenated margarines, nuts and seeds
Polyunsaturated Fat / Polyunsaturates •Omega-6 Fat •Omega 3 Fat	Safflower, sesame, sunflower and corn oils, non-hydrogenated margarines, nuts and seeds Fattier fish, canola and soybean oils, flax seed, omega-3 eggs, walnuts
Unhealthy Fats	
Type of Fat	Major Food Sources
Saturated Fat / Saturates	In many prepared foods made with hydrogenated oils, as well as fatty meats, full-fat dairy products, butter, lard, coconut oil, palm oil, palm kernel oil and cocoa butter
Trans Fats	In all foods made with shortening or partially hydrogenated vegetable oil, and many snack foods, fast foods and ready-prepared foods

Fat Breakdown and Structure

- All fats are broken down into fatty acids.
- The main structure of fats is called a **triglyceride**.
- A **triglyceride** is comprised of three fatty acids with a glycerol molecule attached. (Tri=three)
- Fatty acids form chains that are either short or long. Short chains have a lower melting point and longer chains have a higher melting point. (More on this in the next few slides)

Fat Breakdown and Structure

- Saturated fats tend to have shorter chains. Whereas unsaturated fats have longer chains.



- If you want to make something more solid at

Room temperature, **hydrogenation** (adding a hydrogen to a fatty acid) will do the trick. Saturated fats are better for cooking because they do not break as easily.

Triglyceride compound

Level of saturation

- You hear terms like saturated and unsaturated fats but what do they mean?
- Saturation refers to how many hydrogen atoms surround each of the fatty acids. The more saturated a triglyceride is, the more solid it is at room temperature. The opposite remains true.



Cholesterol

- Is a combination of a lipid and protein. Thus it belongs to the lipoprotein family.
- Its role is to act as a component to make hormones, but it also allows the surface of a cell (cell membrane) to be more stable and secure.
- Two types of cholesterol in general:
 - LDL: Low-density lipoproteins “bad cholesterol”
 - HDL: High-density lipoproteins “good cholesterol”

Examples of LDL and HDL cholesterol

LDL Source



LDL: Think fast food, fatty meats and butter.

HDL Source

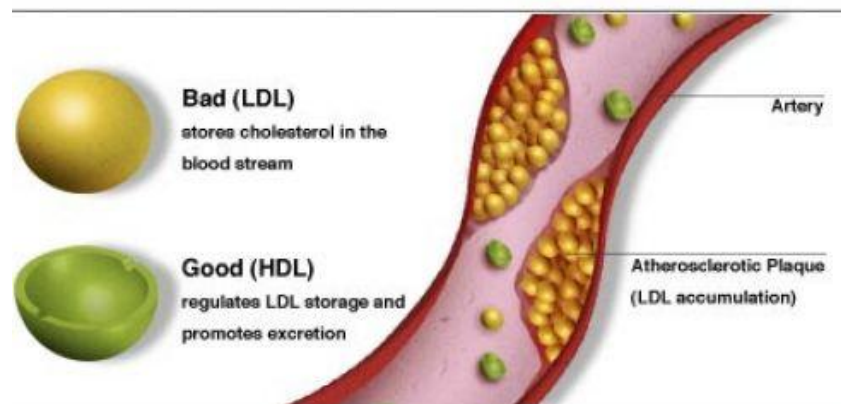


HDL: High quality fish like salmon, avocado and even whole eggs.

Why HDL is important

- HDL cholesterol acts as a janitor in your arteries. Their higher density is a result of having more proteins than fats.
- The HDL picks up the excess cholesterol “usually LDLs” and transports it out of the blood stream.

Bad vs. Good Cholesterol



Essential fatty acids

- If you recall, in the world of nutrition, the term essential means something that your body doesn't make, therefore you need to intake it in your diet.

- Two types of EFAs:

- 1) Omega 3
- 2) Omega 6



- In the North American diet, we have way more Omega 6s than 3s. The cheapest source of omega 3s are canned tuna.

What EFAs do

- EFAs are important in cognitive development (brain development in general)
- Low levels of them have been linked to mood swings, memory loss, hair and skin problems.
- Have a good ratio of omega 3s to 6s as well as consuming a good amount, will also benefit your cardiovascular health (blood pressure, heart rate etc.)

Calories from Fat

- **For 1 gram of fat, you get 9 kcals from it.**
- The reason being is that fat is more dense than carbohydrates though its structure is not as dense as protein (amino acids are more dense than fatty acid chains).
- What makes it higher in kcals is due to being an energy source that is more efficient than protein when it's broken down. Carbs are broken down the quickest but they are not as dense.

The fate of Fats

- Excess calories from fat (and also carbs) is stored as excess body fat.
- Again, if you are eating a high fat diet, but you are within the maintenance of your caloric intake (not gaining or losing weight), you won't have an increase in fatty tissue.
- Theoretically, fat stored as excess tissue acts as an energy reservoir to tap into. (Obese people will survive a famine much longer than a fit and healthy individual).

Recommended Intake

- **The acceptable macronutrient intake for fats falls into a range from 20 – 35% from your total caloric intake.**
- If you are 150 lbs (68 kg) and fat is 9kcal per 1 gram of fat, and your total intake is 2000 kcal, your intake should range from 400 kcal – 700 kcal.
- To convert those values into grams, divide 400 – 700 from 9 kcal and you get = 44g – 77g.

Fat Summary

- Fat is essential to many body functions:
 - Cell membrane structure
 - Nerve cell transmissions (think EFAs)
 - Protection of internal organs
 - Insulation to retain body heat

