Nutrition, Food and Fitness
Chapter 7
"Proteins: The Body's Building Blocks"
Page 110

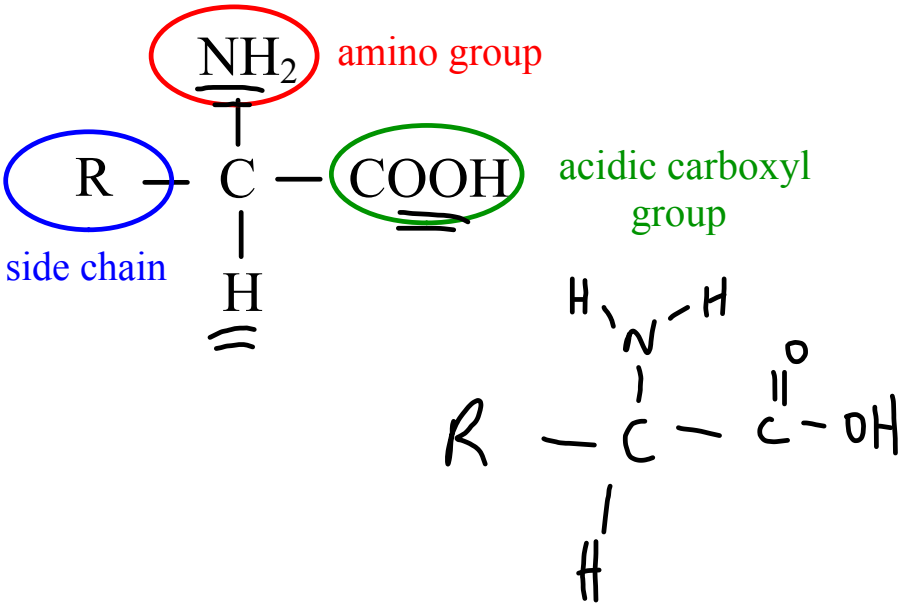
Protein is an energy-yielding nutrient composed of carbon, hydrogen, oxygen and nitrogen. The presence of nitrogen is what makes proteins different from carbohydrates and fats.

Standard_Deviants_School_Human_Nutrition__Macronutrients__Protein.wmv

# Amino Acids

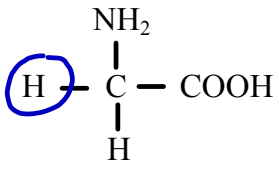
Amino acids are the building blocks of protein molecules. Most proteins are made up of combinations of 20 amino acids which are linked in strands.

Most amino acids have the following basic chemical structure:

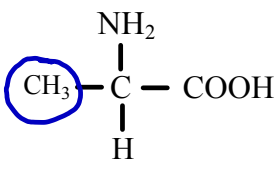



Handout - 20 Amino Acids

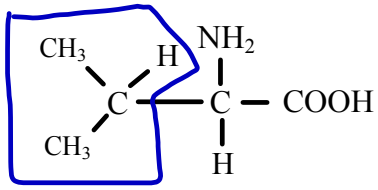
## Examples:




glycine (Gly)




alanine (Ala)




valine (Val)

$NH_2 - CH_2 - COOH$

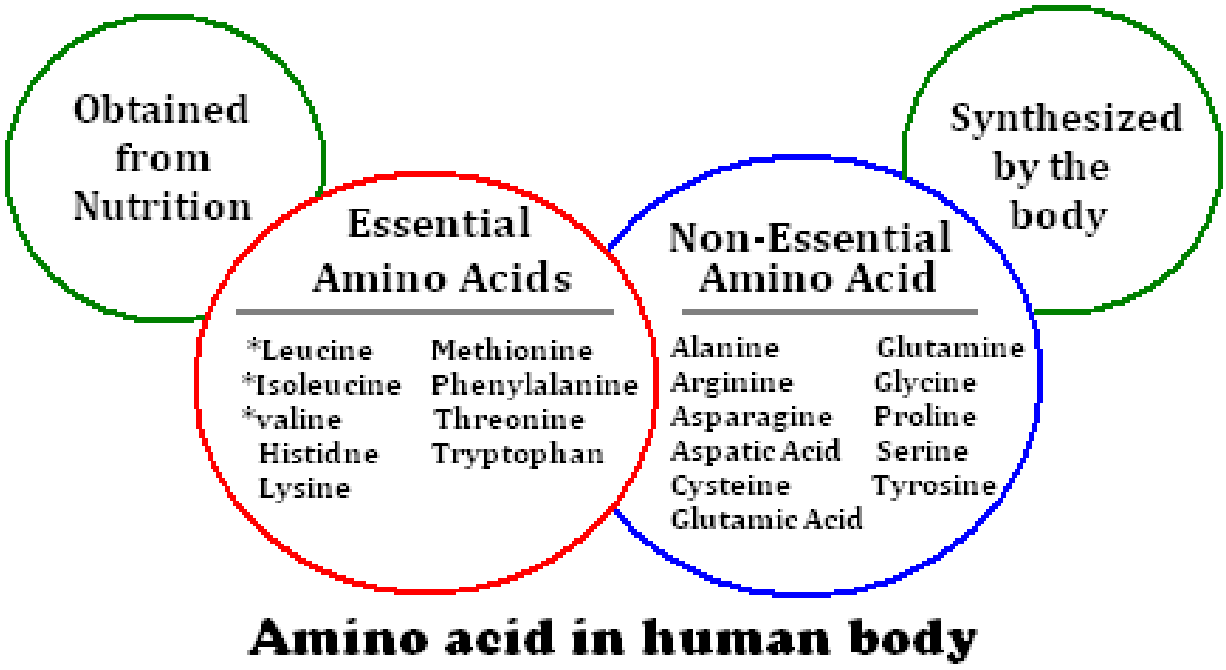
Δ

# Types of Amino Acids

Essential amino acids cannot be made by your body. You must get them from the foods you eat.

Non-essential amino acids are the acids your body can make.

http://www.fitday.com/fitness-articles/nutrition/vitamins-minerals/understanding-non-essential-amino-acid-function.html




**Amino acid in human body**

http://www.onegreenplanet.org/natural-health/need-protein-amino-acids-found-abundantly-in-plants/

| Essential | Conditionally Non-Essential | Non-Essential |
|---|---|---|
| Histidine | Arginine | Alanine |
| Isoleucine | Asparagine | Asparatate |
| Leucine | Glutamine | Cysteine |
| Methionine | Glycine | Glutamate |
| Phenylalanine | Proline | |
| Threonine | Serine | |
| Tryptophan | Tyrosine | |
| Valine | | |
| Lysine | | |

| Essential Amino Acids | Non-Essential Amino Acids |
|---|---|
| Histidine | Alanine |
| Isoleucine* | Arginine** |
| Leucine* | Asparagine |
| Lysine | Aspartic acid |
| Methionine | Cysteine** |
| Phenylalanine | Glutamic acid |
| Threonine | Glutamine** |
| Tryptophan | Glycine** |
| Valine* | Proline** |
| | Selenocysteine** |
| | Serine |
| | Taurine** |
| | Tyrosine** |

**Branched-chain amino acid*

***Conditionally essential amino acid*

# Amino Acids

## Essential Amino Acids

arginine
histidine
isoleucine
leucine
lysine
methionine
phenylalanine
threonine
tryptophan
valine

"PVT TIM HALL"

## Non-Essential Amino Acids

http://www.onegreenplanet.org/natural-health/need-protein-amino-acids-found-abundantly-in-plants/

http://www.fitday.com/fitness-articles/nutrition/vitamins-minerals/foods-rich-in-amino-acids-for-every-meal.html

Foods that are complete proteins- meaning they contain the 9 essential amino acids

- meat
- fish
- dairy products
- eggs
- quinoa*
- buckwheat*
- hemp and chia seed*
- spirulina *

*indicates plant based

http://www.builtlean.com/2012/10/03/complete-vs-incomplete-protein-sources/

Calories from protein

4 calories / gram

Daily requirements

- non-active 0.8 grams per kilogram of body weight
- athletes 1.5 -2.0 grams per kilogram of body weight

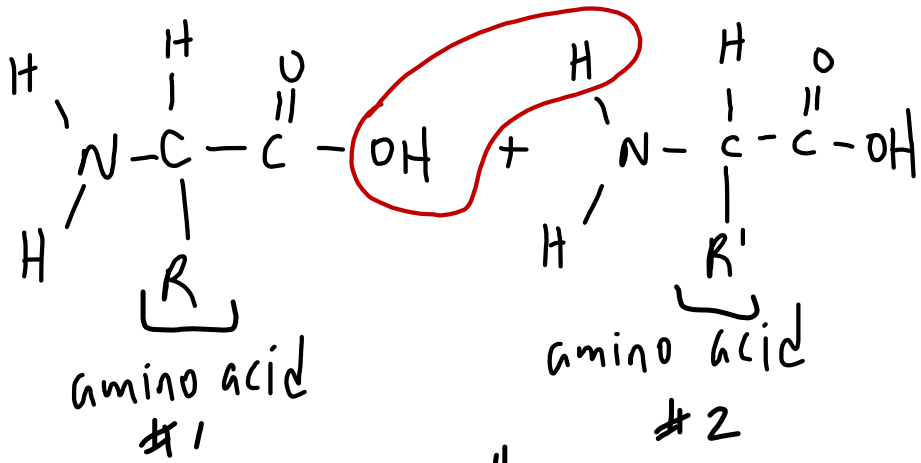
The body has at least 30 000 types of proteins. Each performs a specific job.

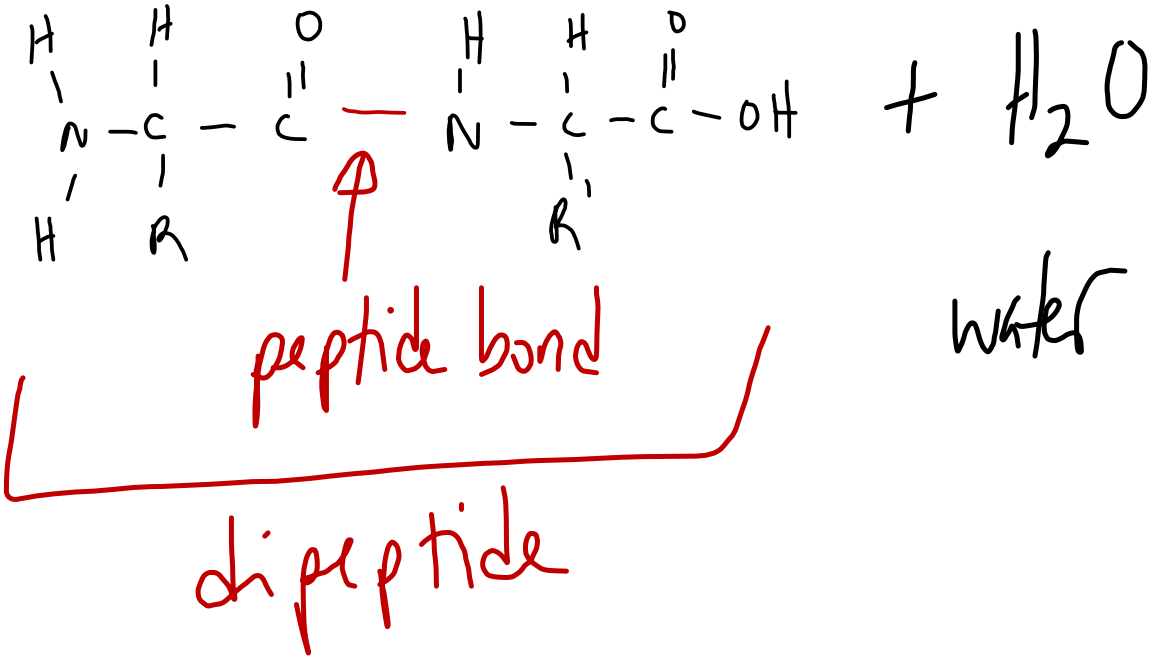
The number of amino acids and the order in which they are linked determine the type of protein.

The amino acids can be arranged in a straight line or stacked up and branched like a tree.

DNA (deoxyribonucleic acid) is found in every nucleus of a cell. It has the instructions for how amino acids will be linked to form the proteins in your body.

# Combining Amino Acids



Protein molecules can change their shape and take on new characteristics. This is called denaturation.

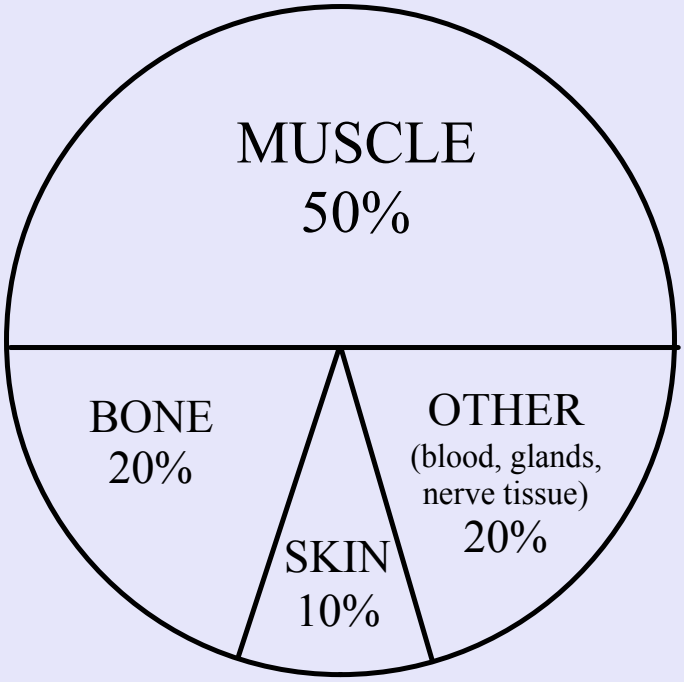
Heat, acids, bases and alcohol are among the factors that can denature proteins.

Once proteins are denatured, they can never return to their original state.

# Protein in the Body

When you eat proteins, stomach acid denatures the proteins. This makes it easier for enzymes in the stomach to begin to break down large protein molecules into smaller pieces. Enzymes in the small intestine break polypeptides into single amino acids. The amino acids are absorbed into the bloodstream. The blood carries the amino acids to the cells that need them.

# Where Proteins are Found



# Functions of Proteins

(Page 112-113)

1. **Build and Maintain Tissue**

2

2. **Make Important Compounds**

3

3. **Regulate Mineral and Fluid Balance**

3

4. **Maintain Acid-Balance**

2

5. **Carry Vital Susbstances**

which ones

6. **Provide Energy**

how much

# Functions of Proteins [6]

(Page 112-113)

1. **Build and Maintain Tissue**
   - Protein makes up about 18 to 20 percent of your body.
   - as your body grows it uses proteins to make new tissues
   -your body has to constantly replace dying cells with new cells
   - muscle growth is only possible after your protein needs for normal growth and repair of tissues is taken care of

2. **Make Important Compounds**
   - Enzymes are proteins that cause specific reactions in the body.
   - Hormones control specific body processes.
   - Antibodies are proteins that defend the body against infection and disease.

3. **Regulate Mineral and Fluid Balance**
   - Proteins help carry sodium and potassium from one side of cell walls to the other.
   - These minerals and proteins control the flow of water through cell membranes.
   - A balance of fluid inside and outside the cell is crucial as it required for the normal functioning of the heart, lungs, brain and every other cell.

http://sciencesummative.wordpress.com/sciences/chemistry/ph-scale/

4. **Maintain Acid-Base Balance**
   - Acid-base balance refers to the maintenance of the correct level of acidity of a body fluid.
   - Proteins act as buffers -> compounds that counteract an excess of acid or base in a fluid.

5. **Carry Vital Susbstances**
   - Lipoproteins transport fats in the bloodstream.
   - Proteins also transport nutrients and oxygen in the blood.

6. **Provide Energy**
   - The body uses proteins as a source of energy if carbohydrates and fats are lacking in the diet or if there is an excess of protein in the diet.
   - Proteins yield 4 calories/gram of energy.

# Protein

fitbit

booster juice

# Functions of proteins

make display on bristol board

*plan it out on sheet provided

*add visuals and extra information

*center titles

* use a ruler if necessary to keep words on a line- not going up or going down

*make it VISUALLY APPEALING

*use attention-getting slogan, logo and layout

Ms. Casey must approve the function you choose to ensure all functions get covered.

| Names: | | |
|---|---|---|
| protein function | | 8 |
| organization | | 4 |
| creativity | | 4 |
| content | | 4 |
| time on task | | 5 |
| Total | | 25 |

# Proteins : The Body's Building blocks

# Food Sources of Proteins

Crossword Puzzle

p. 114 - 117

# Food Sources of Protein

## Animal

beef, pork, veal, lamb, poultry, fish

eggs, milk, yogurt, cheese, ice cream

## Plant

grains, nuts, seeds, legumes

peanuts, black-eyed peas, kidney beans, black beans, lentils, chickpeas, lima beans, soybeans

tofu

Complete proteins are that contain all nine essential amino acids

Incomplete proteins do not have all 9 essential amino acids.

http://livewell.jillianmichaels.com/list-complete-protein-foods-5034.html

# Complete proteins

# Foods

## Meat, Poultry and Fish

- Animal foods, such as red meat, pork, game meats, poultry and fish, all are complete protein foods.
- Eggs and dairy products are also animal-derived complete protein sources that provide all nine essential amino a
- According to MayoClinic.com, cheese, milk and yogurt are complete protein foods
- Soybeans form the basis of many processed soy foods, all of which are complete protein sources, such as soy milk, tempeh, tofu, miso and edamame, or fresh green soybeans

According to the The World's Healthiest Foods, a 1/2-cup serving of cooked soybeans provides 14 grams of protein and 4 ounces or a 1/2-cup of fresh tofu provides 9 to 10 grams of protein

Incomplete proteins

The following foods are examples of incomplete proteins:

- Grains
- Nuts
- Beans
- Seeds
- Peas
- Corn

## Combining Incomplete Proteins to Create Complete Proteins

Examples of combined complementary proteins to create a complete protein in one meal include:

- Grains with Legumes - sample meal: lentils and rice with yellow peppers.
- Nuts with Legumes - sample meal: black bean and peanut salad.
- Grains with Dairy - sample meal: white cheddar and whole wheat pasta.
- Dairy with Seeds - sample meal: yogurt mixed with sesame and flax seeds.
- Legumes with Seeds - sample meal: spinach salad with sesame seed and almond salad dressing.

Meat and dairy products can be quite high in saturated fat.

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The high cost of protein from animal sources often limit the amount of animal protein low income families can buy.

1 ounce top round steak -> 8 grams of protein $0.23
1 ounce cheddar cheese -> 7 grams of protein $0.21

1/2 cup cooked dried beans -> 7 grams of protein $0.06

# Types of Vegetarians

Vegetarianism is the practice of eating a diet consisting entirely or largely of plant foods.

Chart Page 115

## Summarize the types of vegetarians

## 4 types

## Reasons for Being Vegetarian

## (Page 115 - 116)

1. religious reasons
2. health reasons HOMEWORK
3. socioeconomic reasons
4. environmental reasons
5. humanitarian reasons

# Types of Protein

All of the essential amino acids humans need are present in complete proteins. Animal foods are sources of complete proteins.

Incomplete proteins are missing or short in one or more of the essential amino acids. Plants are sources of incomplete proteins.

Complementary proteins are two or more proteins that can be combined to provide all the essential amino acids.

Chart Page 117

In general, combine grains, nuts, or seeds with legumes.

Incomplete proteins foods can be combined with complete protein foods.

# Protein Requirements - General

Protein is not stored. You need it every day.

The amount of protein needed is related to age, gender and body size.

Children and teens have a higher proportional need for protein than people who are no longer growing.

Women who are pregnant or breast-feeding need extra protein.

Illness and injury increase the need for protein.

# Protein Requirements - Specific

14 to 18 year old males: 52 grams/day

14 to 18 year old females: 46 grams/day

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10 to 35% of daily calories should come from protein.

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Nutrition Facts panels give the amount of protein in grams.

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To meet protein needs, follow the Food Guide.

http://www.menshealth.com/mhlists/guide-to-protein/printer.php

.36 g / body weight??

# Nitrogen Balance

Nitrogen balance is a comparison of the nitrogen a person consumes with the nitrogen she/he excretes.

Protein is the only energy nutrient that provides nitrogen.

Most healthy adults are in nitrogen equilibrium. (balance)

| nitrogen in = nitrogen out |
|---|

A person who is building new tissue takes in more protein than he or she excretes. This person is in positive nitrogen balance.

examples: pregnant woman or growing child

greater than

| nitrogen in > nitrogen out |
|---|

A person whose tissues are deteriorating would be losing more nitrogen than he or she consumes. This person is in negative nitrogen balance.

example: person whose body is wasting due to starvation

less than

| nitrogen in < nitrogen out |
|---|

# Protein Deficiency

A deficiency disease is a sickness caused by a lack of an essential nutrient.

Protein-energy malnutrition (PEM) is a condition caused by a lack of calories and proteins in the diet.

1. Kwashiorkor

-> protein-deficiency disease
-> usually strikes a child when the next sibling is born
-> full growth potential is not reached
-> bloated abdomen and skinny arms and legs
-> fluid balance and immune system are affected

2. Marasmus

http://www.youtube.com/watch?v=VWVghcOqecU

-> protein-deficiency disease
-> a wasting disease
-> most often affects infants
-> muscles and tissues waste away
-> children become thin, weak, susceptible to infection and disease
-> children are suffering from starvation

http://www.youtube.com/watch?v=LK9WuEN-7DQ

# Excess Proteins in the Diet

1. Liver and Kidney Problems
   - A high-protein diet produces an excess of nitrogen waste.
   - The liver converts nitrogen waste into urea.
   - The kidneys excrete urea in the urine.
   - Excess protein creates extra work for the liver and kidneys.
   - Stress on these organs can cause them to age prematurely.

2. Calcium Loss
   - High protein diets may contribute to loss of calcium in bones.
   - A loss of calcium weakens bones and leads to other health problems.

3. Excess Body Fat
   - The body cannot store excess amino acids as a protein source.
   - The body can convert excess amino acids into body fat.
   - Excess body fat is associated with a number of health problems.

http://www.youtube.com/watch?v=B_lHIgJN6Rc

## Food Types

One of the factors that can affect protein digestion is what you are eating because it takes longer for the body to digest a whole protein source, such as chicken, than it does to digest a liquid protein source, such as a whey protein shake. For example, it takes a whey protein shake about one hour and 30 minutes for the body to digest. The rate of whey protein digestion is about 10 g per hour, meaning your body will absorb about 15 grams of whey protein during the time it is digested. A larger meal with protein will take longer for the body to digest, meaning your body may absorb more protein during that time. How much protein is absorbed depends on your body and the type of food eaten, as proteins found in beans are less digestible than whey protein.

## The 30-Gram Rule

If you are looking for a potential rule of thumb, the 30 g rule might work. It says that at any given meal, you can absorb about 30 g of protein. This calculation could come from the daily protein intake recommendations, which are about 0.4 g of protein per pound of your body weight. If you weighed 150 lbs., this would be about 60 g of protein per day. However, more active individuals eat about 0.8 g of protein per pound of body weight because they need it for muscle growth and maintenance. For a 150 lb. person, this would be about 120 g of protein. If you ate three meals per day and a snack or two, this would spread out to about 30 g of protein per meal and snack. However, this rule is more of an average, not an absolute. Your body might be able to absorb more or potentially less protein.

http://www.livestrong.com/article/487366-how-many-grams-of-protein-can-body-absorb-in-one-sitting/

# Assignment

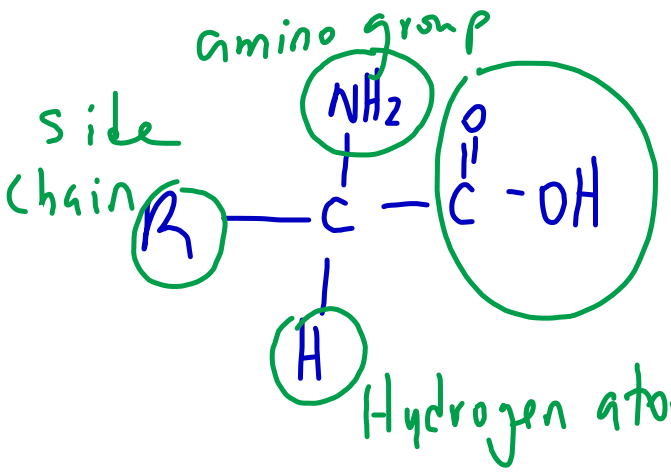
## Protein Balance

## Too Little - Not too much

Topics for Protein Quiz

1. Elements : C, H, O, N

2. General Structure of an amino acid => building blocks of proteins.




-> 20 amino acids

-> essential or non-essential

diet

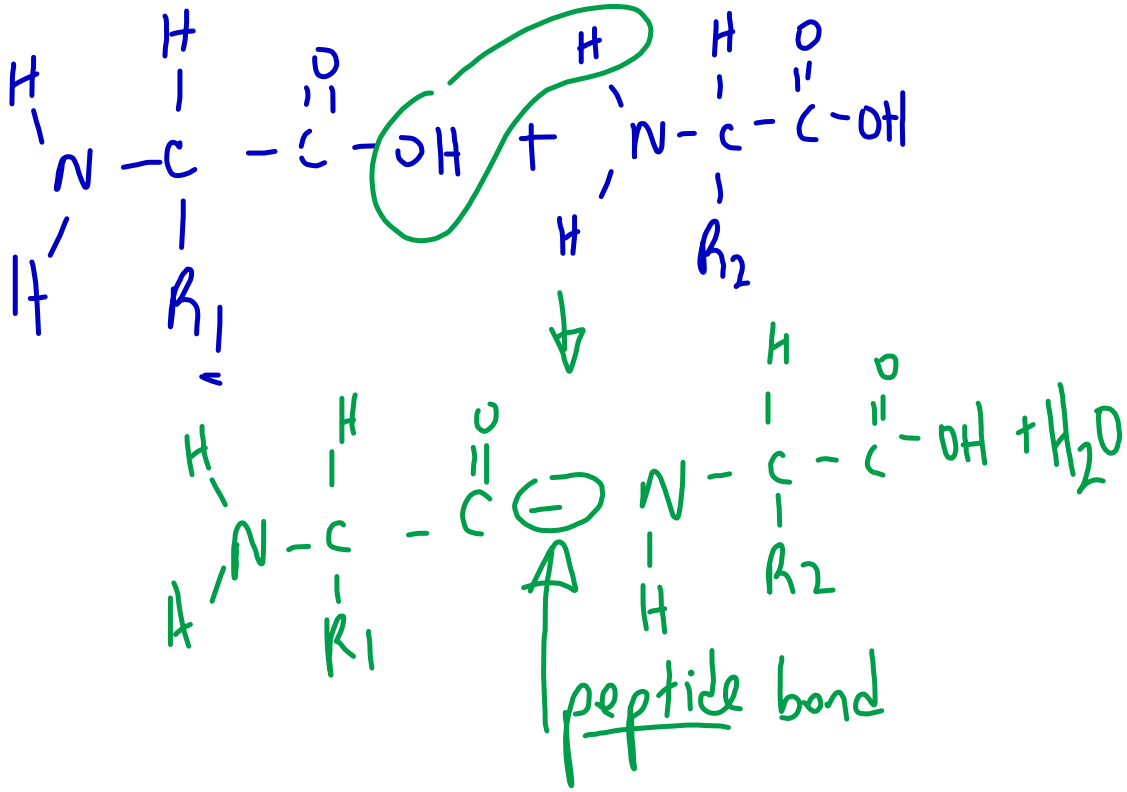
body makes

10

any 4 => 10

[PVT TIM HALL] 2 (semi-essential)

3. Cumbining Amino Acids



4. Denaturation ⇒ process
   - changes the structure of a protein
   - factors: heat, acids, bases, alcohol.

5. Functions of Proteins (6)
   - * enzymes
   - * antibodies
   - * hormones

   Important (pds) compounds ←

6. Food Sources
   - Animals
   - Plants
     - * legumes.

7. Types of Vegetarians

8. Types of Proteins: Complete, incomplete
   - Complementary

9. Requirements:
   - [10% - 35%]

10. Nitrogen balance
    - nitrogen in ↓ nitrogen out
    - equilibrium { =
    - positive { >
    - negative { <

11. Deficiency Diseases
    - PEM → protein-energy malnutrition
      1. Kwashiorkor
      2. marasmus "Starvation"

12. Excess of Proteins
    1. Calcium loss
    2. liver + kidney problems.
    3. excess body fat

## Attachments

Standard_Deviants_School_Human_Nutrition__Macronutrients__Protein.wmv