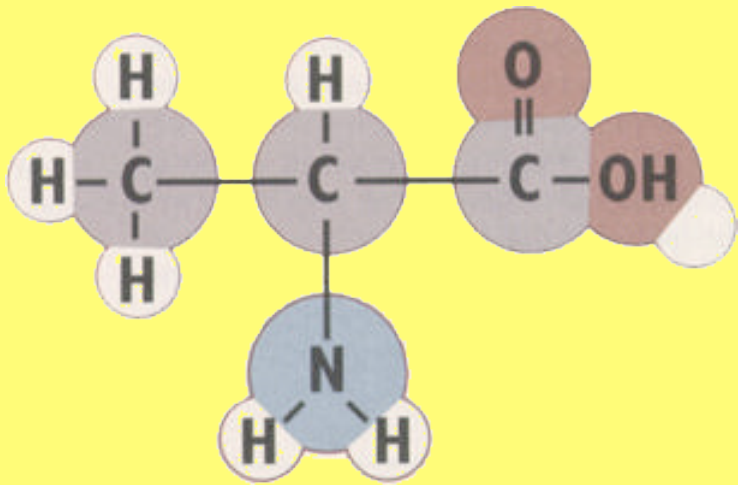


All you ever wanted to know about. . .



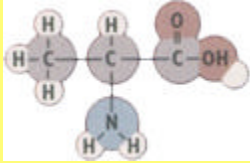
Protein

Presented by

Fred Hardinge, DrPH, RD

It Is Written

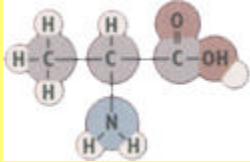
Proteins



“If we could give every individual the right amount of nourishment and exercise, not too little and not too much, we would have found the safest way to health.”

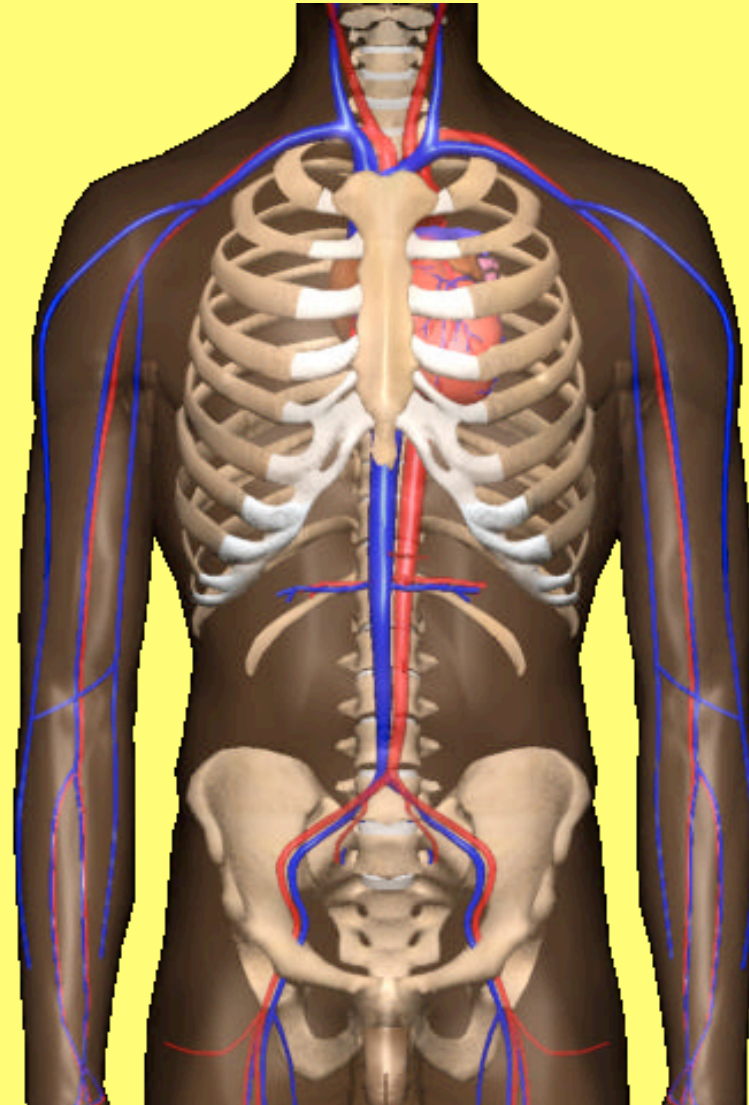
Hippocrates c.460-377 BC

Proteins

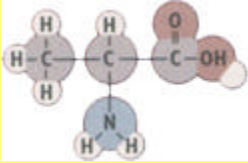


Building Blocks of Life

- Growth
- Repair
- All tissues
 - Organs
 - Muscles
 - Bones
 - Blood
 - Hair
 - Globular proteins



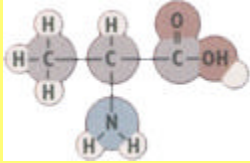
Proteins



What Are They?

- Structural units composed of amino acids joined together by peptide bonds
- Endlessly complex arrays of diverse forms and chemical combinations
- Classifications:
 - Peptide = two amino acids
 - Tripeptide = three amino acids
 - Polypeptide = up to 100 amino acids
 - Protein = 100 or more amino acids
- Single cells contain thousands of proteins
- Body has about 50,000 different proteins

Proteins

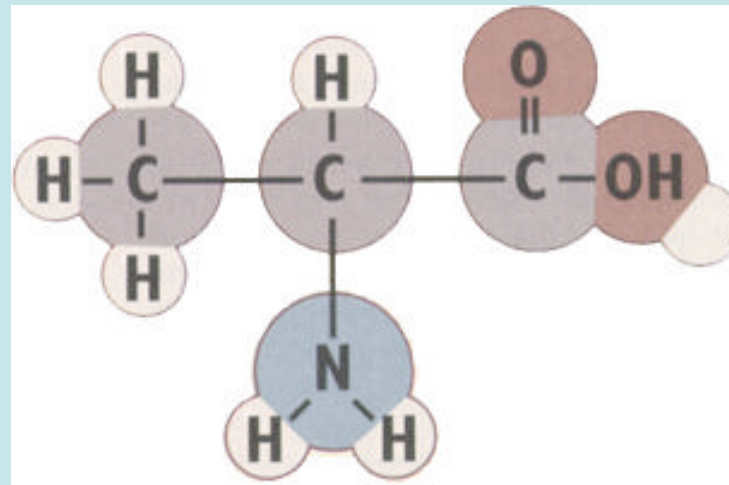


Amino Acids

- Building blocks of protein
- Humans require 20 different amino acids

ALANINE

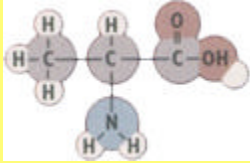
Amino acid
side chain



Organic
acid group

Amino group

Proteins



Amino Acids

- Amino acids are like the 26 letters of the alphabet:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

- When combined in specific order they make meaningful words:

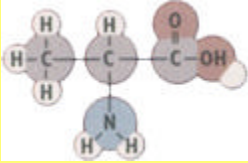
PROTEIN

BOY

SWEETHEART

SUPERCALIFRAGILISTICEXPIALAOODOSCIOUS

Proteins



Placement Gives Meaning

- A single letter can make a huge difference in the meaning:
- Letters can also be combined to make non-sense words :

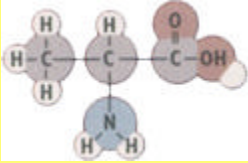
WALK

TALK

ERVBIHPCQZ

Limitless potential: Proteins formed from linking just three amino acids could generate 8000 different proteins!

Proteins



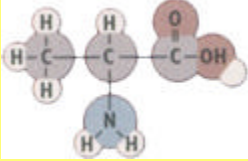
Sequence is Vital

- Sickle cell anemia
- Caused by the transposition of only two amino acids in a chain of more than 200 AA

SUPERCALIFRAGILISTICEXPIALAOOSCIOUS

SUPERCALIFRAGILISTIC**EC**XPIALAOOSCIOUS

Proteins



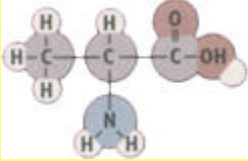
A Fabulous Design!

I praise you
because I am
fearfully and
wonderfully made;
your works are
wonderful, I know
that full well.

Psalm 139:14



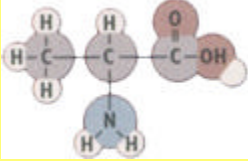
Proteins



Essential vs non-Essential

- Humans cannot synthesize eight amino acids so these must be ingested preformed in foods.
- **Essential amino acids:**
 - isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, & valine
- Children and some older adults cannot manufacture histadine

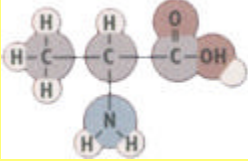
Proteins



Non-essential Amino Acids

- The body manufactures the remaining amino acids
- These are the non-essential amino acids
- Does not mean they are unimportant, just that they are manufactured from other compounds already in the body at a rate adequate to meet daily demands

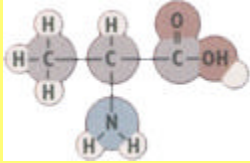
Proteins



Complete vs Incomplete

- Manufacturing a specific protein requires the availability of appropriate amino acids.
- Complete proteins come from foods that have all the essential amino acids
- Incomplete proteins come from foods that have one or more of the essential amino acids missing

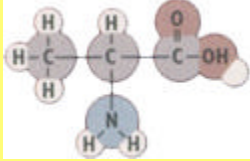
Proteins



Does It Make a Difference?

- **Only in two circumstances:**
 - A diet limited in variety of choices
 - And insufficient in calories
- **By combining two or more “incomplete” food proteins a “complete” protein is made (protein complementarity).**
- **Variety of foods consumed is the insurance of adequate protein nutrition.**

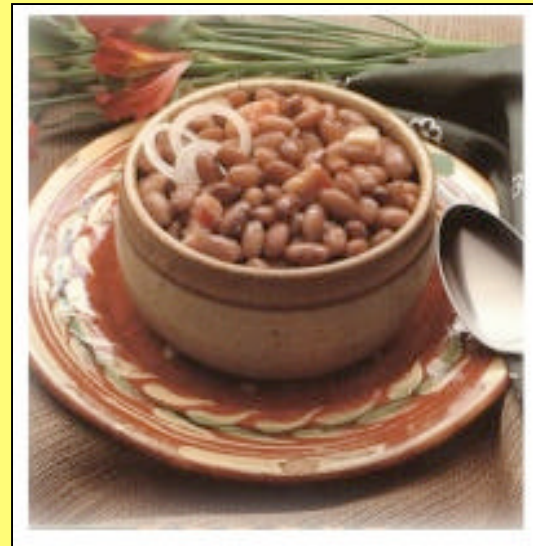
Proteins



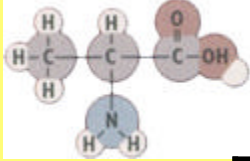
Quality of Proteins

	ILE	LYS	MET	TRY
Legumes				
Grains				
Combined				

ILE	Isoleucine
LYS	Lysine
MET	Methionine
TRY	Tryptophan



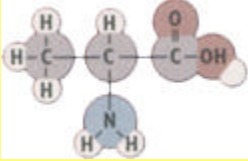
Proteins



Protein Quality

Food	Protein Rating
Eggs	100
Fish	70
Lean beef	69
Cow's milk	60
Brown rice	57
White rice	56
Soybeans	47
Brewer's yeast	45
Whole-grain wheat	44
Peanuts	43
Dry beans	34
White potato	34

Proteins

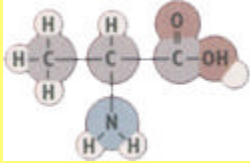


Comparison of Beans and Beef

	Protein	Fiber	Folate	Sat. Fat	Chol.
Beef	24 g	0.0 g	11 mcg	5.5 g	96 mg
Beans	7-9 g	6-8 g	70.150 mcg	1.6 g	0.0 g



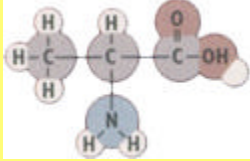
Proteins



Where Does a Vegetarian Get Protein?

- Grains and legumes provide excellent protein when combined to provide the full complement of the essential amino acids
 - Grains low in lysine
 - Legumes low in methionine
- Body has small pools of reserves that span meals
- Soy-protein isolates quality ranks with animal protein

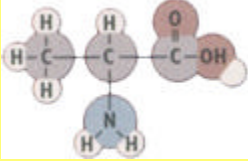
Proteins



Food Sources of Protein

Food	Serving	Protein, g
Plant		
Peanuts	1 oz.	7
Peanut butter	1 Tbsp.	4
Pasta, dry	2 oz.	7
Whole-wheat bread	2 slices	6
Baked beans	1 cup	14
Tofu	3.5 oz.	11
Almonds, dried	12	3
Chick peas	½ cup	20
Lentils	1/2/ cup	9
Dairy		
Milk, skim	8 oz.	8
Cheese	1 slice	8
Animal		
Beef, lean	3 oz.	18

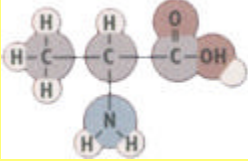
Proteins



Recommended Daily Amounts of Protein

	Men		Women	
Recommended Amount	Adolescent	Adult	Adolescent	Adult
Grams of protein per kg of body weight	0.9	0.9	0.9	0.8
Grams per day based on average weight	59	56	50	44
Average American Consumption		110		96

Proteins



Dangers of Excessive Protein

1. Higher metabolic load
2. Extra workload on the kidneys
3. Increased risk of osteoporosis
4. High protein foods associated with high fat and cholesterol.
5. High protein foods tend to be lower in fiber.

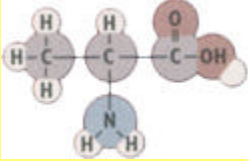
Proteins



Osteoporosis

- **Bone density of 80 year old women as good as 60 yr. old non-vegetarians.** JADA 1980:76:148-51
- **20 year advantage for a vegetarian woman**

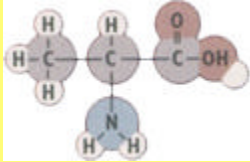
Proteins



Types of Vegetarians

- **Lacto-vegetarian**
- **Ovo-vegetarian**
- **Lacto-ovo-vegetarian**
- **Pure vegetarian**
 - **Hygienic**
 - **Vegan**

Proteins

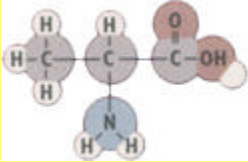


Breakfast



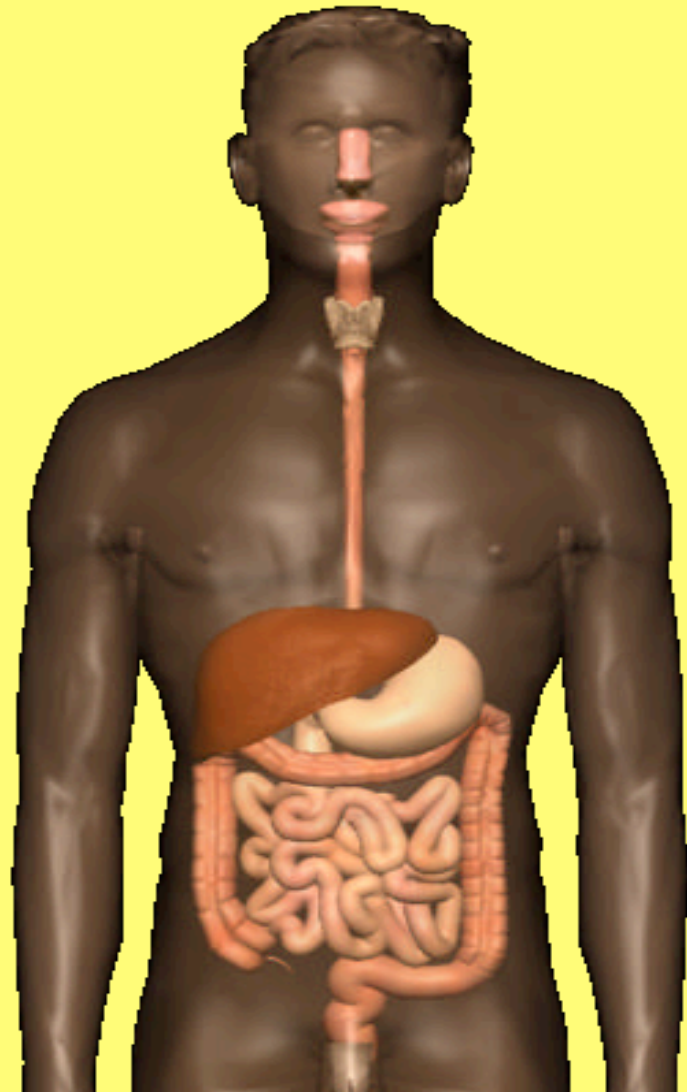
Breakfast	Protein, g
Granola, $\frac{3}{4}$ cup	12
Soy milk, 1 cup	9
Raisins, 1 Tb	0.25
Orange juice, 1 cup	1.75
Banana, 1 med	1
WW toast, 1 slice	3
Peanut butter, 1 Tb	4
Total	31

Proteins

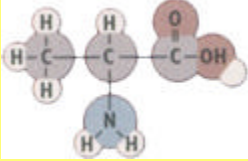


Digestion

- All proteins broken down into their individual amino acids
- Proteases
- Utilized by rebuilding the proteins necessary for growth and repair
- Nitrogen balance



Proteins

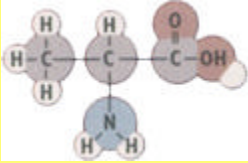


Non-vegetarian vrs. Vegetarian

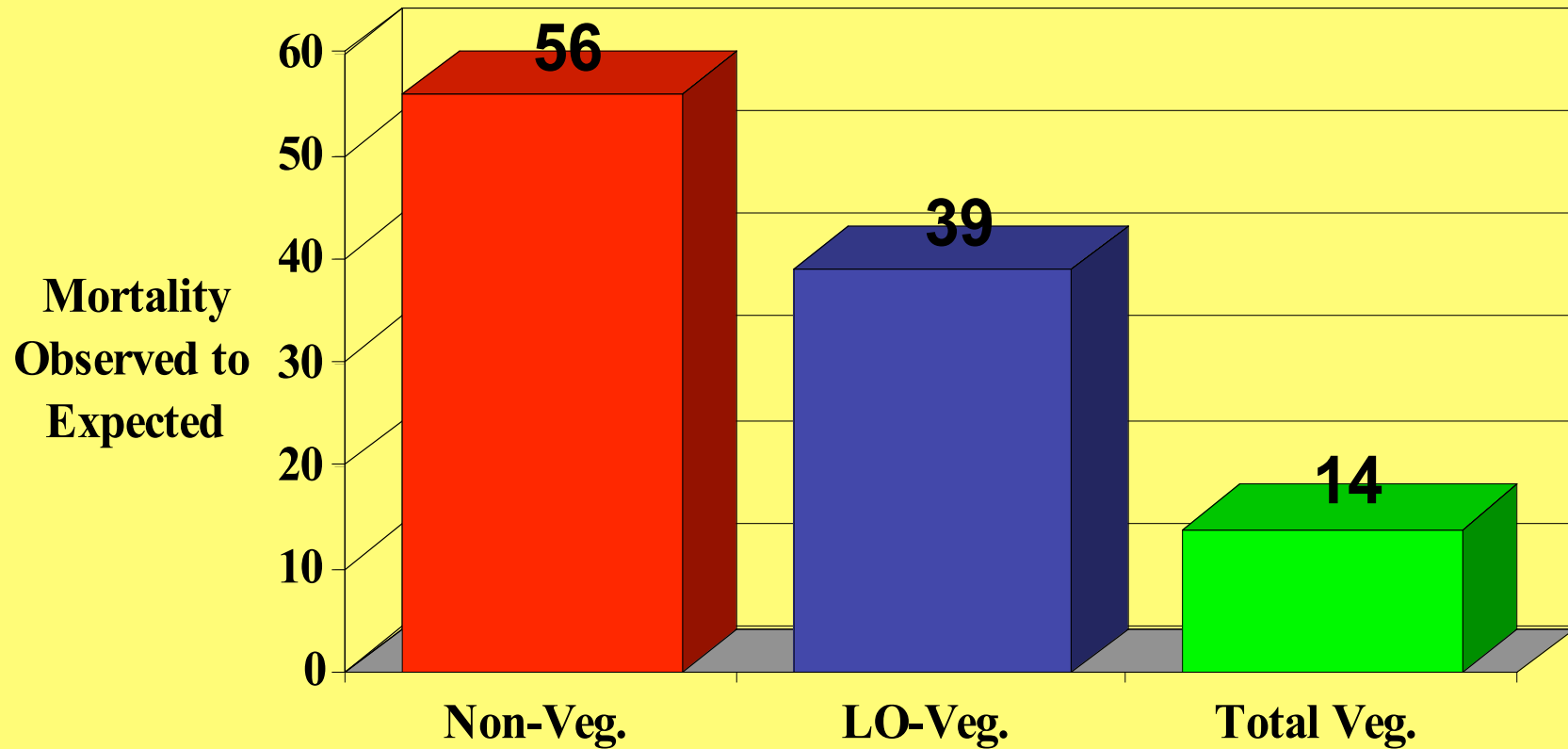
Using Meat 6+ Days a Week

- **CHD**
 - Men, age 40-54
 - Men, age 55+
 - Women, age 55+
- **RATIO**
 - 4x
 - 2x
 - 1.5x
- **Diabetes**
 - 3.8x

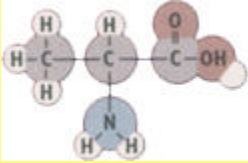
Proteins



CHD and Diet



Proteins

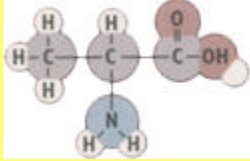


Cancer Risk

Non-vegetarians have

- **41% greater risk of prostate cancer**
Cancer 1989:24:598-606
- **66% higher risk of ovarian cancer**
Environmental Aspects of Cancer, 1993
- **Twice the risk of bladder cancer: Use of beef, poultry or fish more than 3X per week doubled the risk.**
- **Greater colon cancer risk.**
- **Greater risk of lymphoma** JAMA 1996:275:1315-21

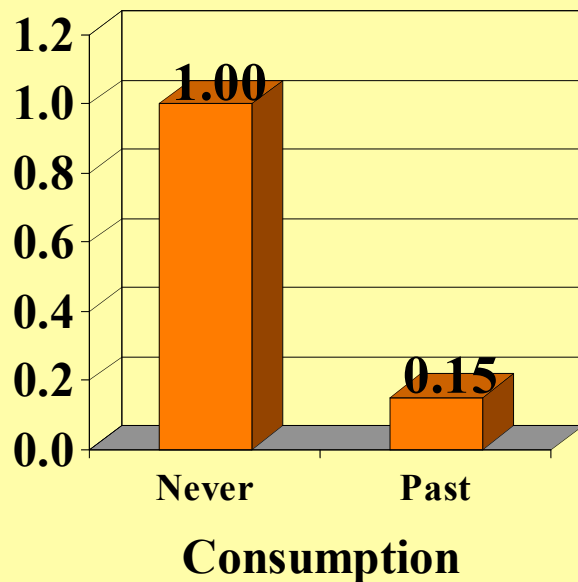
Proteins



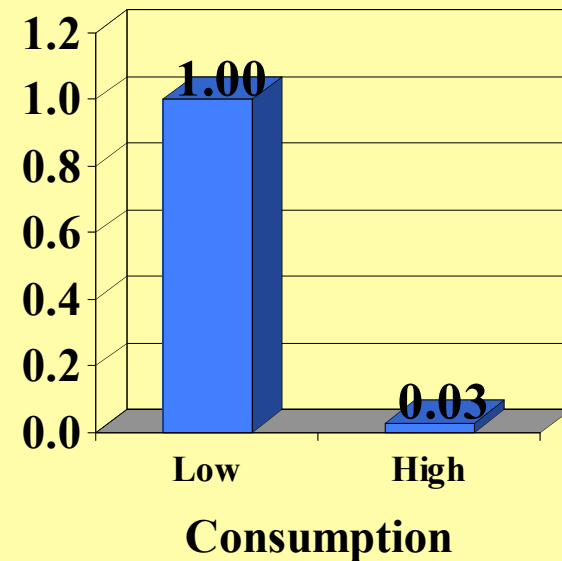
The Bean Food Advantage *against pancreatic cancer*

Relative Risks

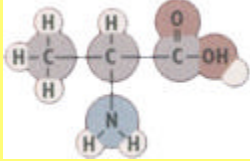
Protein meat substitutes (p<0.05)



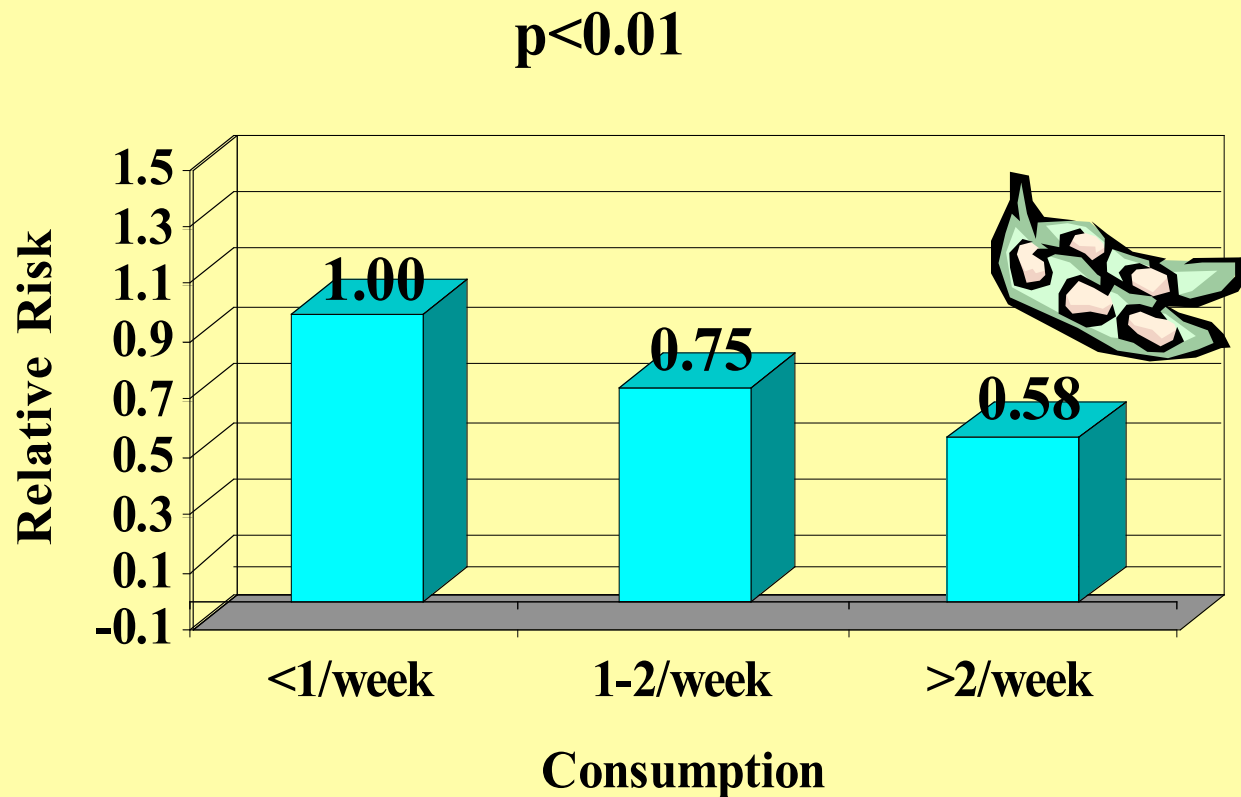
Beans, lentils, peas (p<0.01)



Proteins

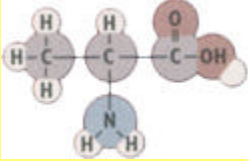


Advantage of Eating Beans, Peas, and Lentils *and the risk of colon cancer*



Adjusted for age, sex, calories and red meat consumption, obesity, and family history of cancer.

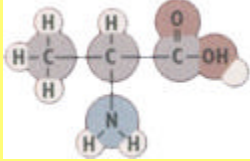
Proteins



Guidelines for Adequacy

- Emphasize unrefined foods
- Include a variety of choices
- Adequate caloric intake
- Low to moderate protein
- Moderate fat
- Lots of vegetables and fruit
- (Limited use of eggs, milk, and cheese)

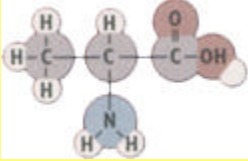
Proteins



From Which Foods Should We Choose?

	Fruit	Veg	Grains	Beans	Nuts	Milk	Eggs	Meat
Cancer	X	X	X	X				
Heart disease	X	X	X	X	X			
Osteoporosis	X	X	X	X		X		
Obesity	X	X	X	X				
Food poison	X	X	X	X				
Cost	X	X	X	X				
Ecology	X	X	X	X				
Endurance	X	X	X	X				

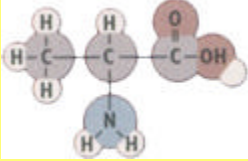
Proteins



Advantages of a Vegetarian Diet

- Vegetarian diets conform more closely to major nutritional recommendations
- Vegetarians do not have to calculate how to lower cholesterol levels
- Automatically increases dietary fiber
- Provides abundance of alpha and beta carotenes
- Will not have to worry about lowering intake of animal fat
- Eliminates the concern of getting too much protein

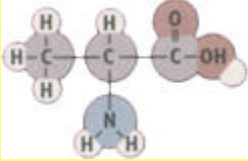
Proteins



Vegetarian Diets

- Provide excellent nutrition
- Tasty and satisfying
- Economical
- Environmentally sound
- Result in reduced disease risk

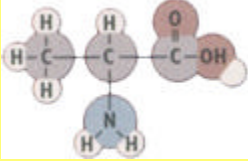
Proteins



Good Dietary Advice for Vegetarian Eating

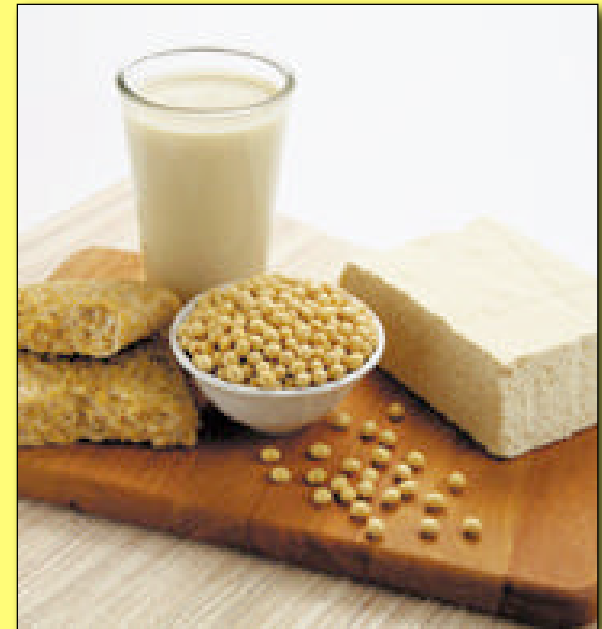
- Consume a variety of plant foods to provide all the essential amino acids
- Supply sufficient calories from various foods to maintain adequate weight

Proteins



Recommended Serving Sizes

- ½ cup of cooked beans or peas (100 grams)
- ½ cup tofu (100 g.)
- ¼ cup soy alternatives (30 g.)
- 1 egg (50 g.)
- 2 egg white (50 g.)
- 1 cup soy milk (commercial)
- ¼ cup miso
- ¼ cup soy flour



Proteins

