

Protein Denaturation Affects shape and Function

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Page 18 of 50

- **Denaturation.** The process by which proteins uncoil and lose their shape and function when they are exposed to heat, acids, bases, heavy metals, alcohol, and other damaging substances.
- Protein function is lost when a protein is denatured:
 - High fever
 - Blood pH out of normal range
 - During digestion



Stiffening egg whites adds air through the beating action, which denatures some of the proteins within them.

Protein Quality

Methods for estimating protein quality

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Page 27 of 50

- **Chemical score:** A method used to estimate a food's protein quality; it is a comparison of the amount of the limiting amino acid in a food to the amount of the same amino acid in a reference food.
- **Protein digestibility corrected amino acid score (PDCAAS):** A measurement of protein quality that considers the balance of amino acids as well as the digestibility of the protein in the food. Proteins with higher digestibility are more complete.
 - Animal protein sources, such as meat and dairy products, are highly digestible, as are many soy products; we can absorb more than 90% of these protein sources.
 - Legumes are also highly digestible (about 70% to 80%).
 - Grains and many vegetable proteins are less digestible, with PDCAAS values ranging from 60% to 90%.

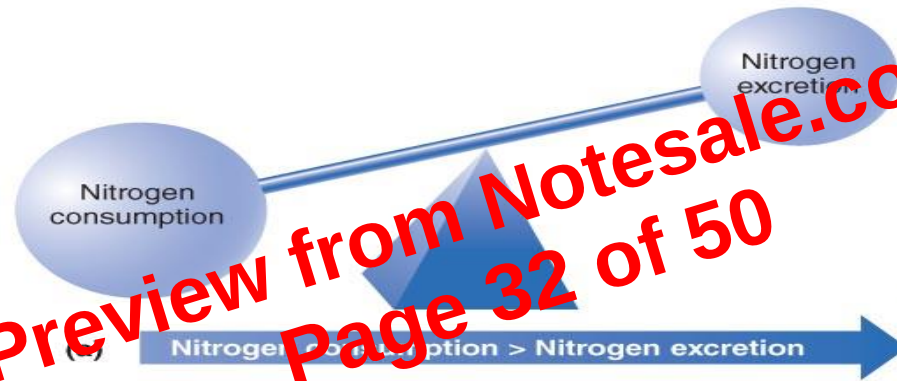
Protein Adequacy

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Page 31 of 50

- Nitrogen balance determines protein needs
 - **Positive nitrogen balance:** consuming more nitrogen than is excreted
 - Growth
 - Pregnancy
 - Recovery from illness or protein deficiency
 - **Negative nitrogen balance:** excreting more nitrogen than is consumed
 - Starvation or low-energy diets
 - **In nitrogen balance:** intake equals excretion

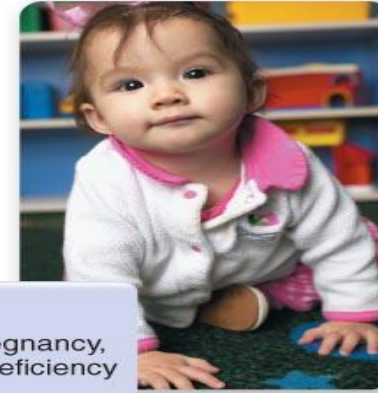
Protein Adequacy

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Page 32 of 50



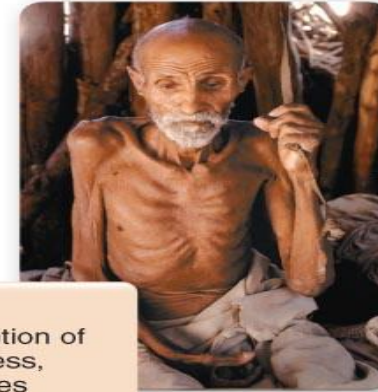
Positive Nitrogen Balance

Needed for periods of growth, pregnancy, recovery from illness, or protein deficiency



Negative Nitrogen Balance

Results from starvation, consumption of very-low-energy diets, severe illness, infections, serious burns, or injuries



Nitrogen Balance

Found in healthy adults who are not pregnant

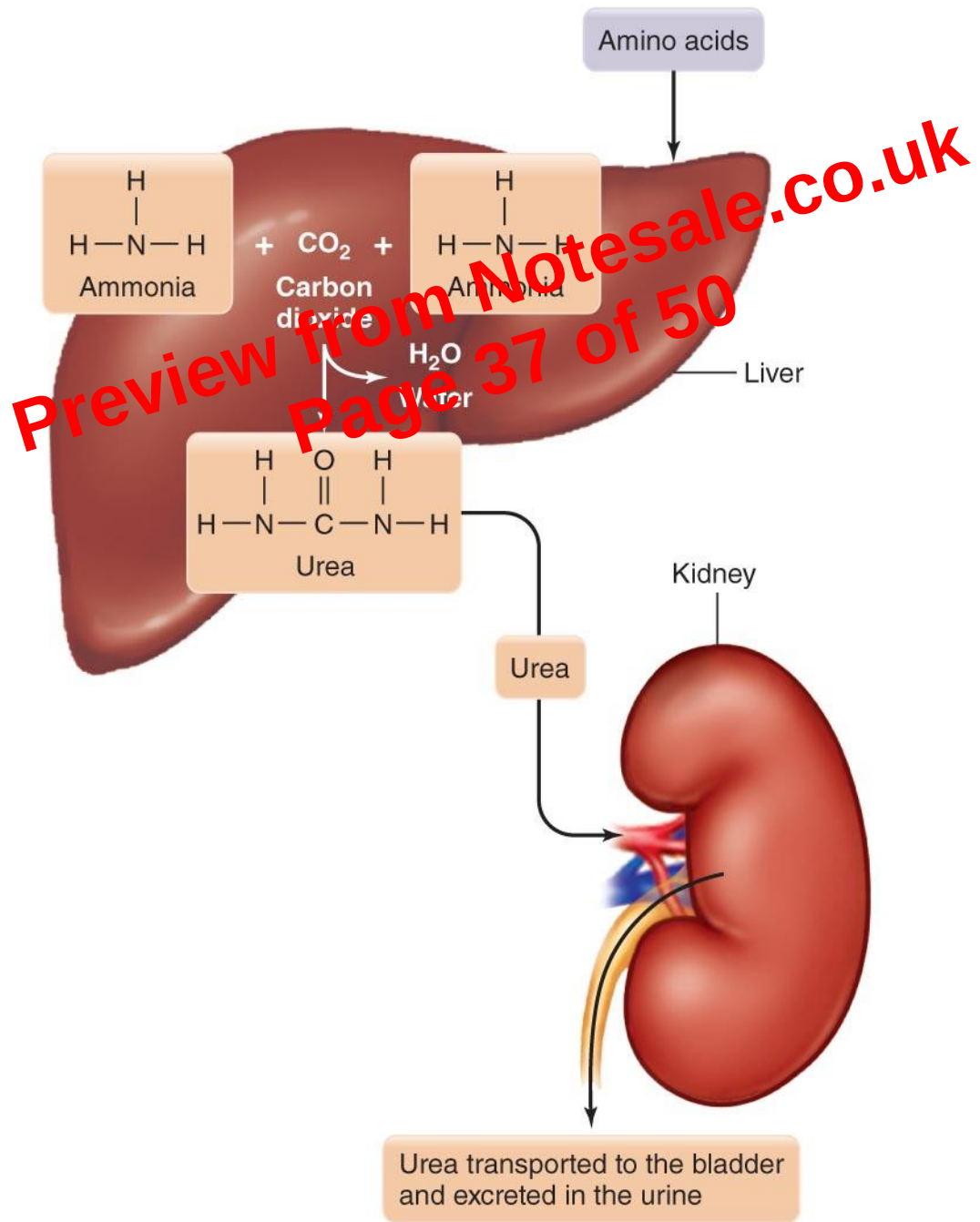


Too Much Protein Can Be Harmful

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Page 36 of 50

■ Kidney disease

- High protein diets can increase risk of kidney diseases in susceptible people
- Maximum of 2 g of protein per kilogram body weight each day is safe for healthy people
- Important to drink more water with higher protein intake
 - . Increases urea production
 - . Fluid needed to flush excess urea from kidneys



Protein Sources

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Page 38 of 50

- Meats
- Dairy products
- Eggs
- Legumes (including soy)
- Whole grains
- Nuts
- "New foods" (quinoa which provides 8 g of protein in a 1-cup serving.)

Kwashiorkor

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Page 48 of 50

- Disease resulting from low protein intake
- Kwashiorkor symptoms include:
 - Some weight loss and muscle wasting
 - Retarded growth and development
 - Edema resulting in distention of the belly
 - Fatty degeneration of the liver
 - Loss of appetite, sadness, irritability, apathy
 - Skin problems and hair loss