Lipid metabolism ppt pdf

1. ©, 2010, Pearson Education, Inc. 2. © 2010, Pearson Education, Inc. Lipids - A category of compounds that includes triglycerides, sterols and phospholipids, contains carbon, oxygen and hydrogen. © 2010 Pearson Education, Inc. Lipids - Essential functions in the body - Store and provide energy - fats provide 9 kcal per gram - Provide insulation - Help in the production of steroids and bile salts - Play a role in the transportation of fat-soluble nutrients in the blood - Used to produce essential sex hormones - Key to the structure of cell membranes 4. © 2010, Pearson Education, Inc. Fatty Acids - Building blocks for triglycerides and phospholipids - a chain of carbon and hydrogen atoms with carboxyl group on the alpha end and methyl group at the end of omega-5. © 2010 Pearson Education, Inc. Fatty Acids - Higher carbon-to-oxygen ratio than carbohydrates and proteins, 9 kilocalories per gram of fat - 20 different fatty acids of varying lengths, saturation and shape 6. © 2010, Pearson Education, Inc. fatty acids vary in length - Short-headed fatty acids - two to four carbons - Weak attraction - liquid at room temperature - medium chain fatty acids - six to ten carbon 7. © 2010, Pearson Education, Inc. fatty acids vary in length - Long chain of fatty acids - 12 or more carbons - The most common type of fatty acids in foods - Strong attraction - Solid at room temperature 8. © 2010, Pearson Education, Inc. fatty acids vary in saturation - Saturated - All carbons on fatty acids are tied to hydrogen - Solid at room temperature - Higher melting point 9. © 2010 Pearson Education, Inc. fatty acids vary in saturation - Unsaturated - Some carbons on fatty acids form a double bond with each other instead of binding to hydrogen - Mon-unsaturated fatty acids (MUFA) - Has one double bond - Polyunsaturated fatty acids (PUFA) - Has two or more double bonds - liquid at room temperature - Saturated and unsaturated fatty acids help shape food figure 5.3 11. © 2010 Pearson Education, Inc. Fatty Acids Differ in Double Bond Location - Location of the first double bond in unsaturated fatty acids effect of omega-3 fatty acids and omega-6 fatty acids - Omega-3 fatty acids - The first double link between the third and fourth carbon of omega-end - Example: Alpha-linolenic acid - One of the two essential fatty acids. © 2010, Pearson Education, Inc. fatty acids differ in double location - Omega-6 fatty acids - The first double link between the sixth and seventh carbon of the omega-end - Example: Linoleic acid - One of two essential fatty acids 13. Omega fatty Figure 5.4 14. © 2010, Pearson Education, Inc. Figure 5.5 Fatty acids vary in form - Unsaturated fatty acids form two different shapes of 15. © 2010 Pearson Pearson Inc. Fatty Acids and Rancidity - Rancidity: Fat Spoils by Oxidation - More Double Bonds, Therefore, Are More Susceptible to The Oxidation and Ranchlots of PUFA, MUFA qgt; Saturated fatty acids - Increased the stability of fatty acids by reducing progorm acid - Adding antioxidants - Limiting the effects of food on oxygen, heat and light. © 2010 Pearson Education, Inc. - fatty acids - carbon and hydrogen chain, carboxicic acid, methyl group - Major structural units of triglycerides and phospholipids - Differ in the length of the chain, Saturation, Form - Saturated fatty acids: no double bonds - Monounsaturated fatty acids: one double bond - Polyunsaturated fatty acids: two or more double bonds - essential fatty acids - Lenolein - Alpha-linolenic acid - Food © 2010 Pearson Education, Inc. connected to the glycele of the spine 18. © 2010 Pearson Education, Inc. Caution: High blood levels are a risk factor for cardiovascular disease triglycerides - The most common lipids in both food and body - Make up about 95% of the lipids contained in food - Features - Add texture - Makes meat tender - Keeps freshness - Stores fat tissue for energy 19. © 2010 Pearson Education, Inc. - Hydrophilic at one end; hydrophobic, on the other hand, make up the phospholipid biliser in the cell membrane - Lecithin (aka phosphatelcholine) (also known as Lecithin) - the main phospholipid in the cell membrane - Used as an emulsifier in food - is synthesized by the liver Phosfolipids Part figure 5.8 20. The role of phospholipids in cell membranes Figure 5.9 21. © 2010 Pearson Education, Inc. Steriles - More complex than phospholipids or triglycerides - Four connective rings of carbon and hydrogen - Cholesterol is the most famous sterol found in every cell in the body - Helps with numerous processes in the body - Phytosterols - the main plant sterols Figure 5.11 22. ©, 2010, Pearson Education, Inc. Figure 5.12 23. © 2010 Pearson Education, Inc. - Triglycerides found in the body are stored in adipose tissue, the main source of energy - Phospholipids - An important part of the structure of cell membranes - Lecithin - Important for the cell membrane - Used as an emulsifier of food. © 2010 Pearson Education, Inc. What Happens to The Lipids You Eat? Food lipids - fat, phospholipids and sterids, digested into free fatty acids, glycerol and monoglycerides - using the enzyme lipase 25. Figure 5.13 26. Figure 5.13 27. Figure 5.13 28. Figure 5.13 29. © 2010 Pearson Formation, Inc. Most fat is digested and absorbed in the small intestine - fat tends to In chima - fat stimulates the secretion of cholecystokinin (CCK) in duodenal matter - CCK stimulates the gallbladder to release bile acid 30. © 2010 Pearson Formation, Inc. Most fat is digested and absorbed in the small intestine - phospholipids - emulsified bile - disassembled into two free fatty acids and phospholipid residues packed like micella - transported through the intestinal wall 31. © 2010 pearson formation, Inc. Most fat is digested and absorbed in the small intestine - Sterola - Not digested, absorbed intact through the intestinal wall, if undigested and absorbed in the small intestine, bind to fiber and excreted in feces 32. © 2010 Pearson Education, Inc. Chylomicrons Facilitate the absorption of lipids - Lipids are absorbed based on the structure and circulatory system - glycerol and short to medium chain fatty acids - Long chain of fatty acids - combined with phospholipids and cholesterol chylomicrons 33. © 2010 Pearson Education, Inc. Figure 5.15 Chylomicrons Facilitate lipid absorption - Chylomicrons are too large to be absorbed directly into the bloodstream - Travel through lymphatic fluid - enter the flow of blood through the chest duct next to the heart 34. Absorption of Dietary Lipids Figure 5.16 35. © 2010 Pearson Education, Inc. Lipoproteins Transport fat through lymph and blood - lipoproteins - chylomicrons - very low density lipoproteins (VLDL) - low-density lipoproteins (LDL) - high density lipoproteins (HDLs) 36. © 2010 Pearson Education, Inc. Lipoproteins Transport Fat Through Lymph and Blood - VLDLs, LDLs, and HDLs - Molecule Globe with a lipid center surrounded by a plasma membrane - Density determines function - More protein, higher density 37. The protein-to-lipid ratio determines the density of lipoproteins at 5.17 38. © 2010 Pearson Education, Inc. Lipoprotein Transport fat through lymph and blood - Very low density lipoprotein (VLDLs) - Become LDLs - LDLs: Bad Cholesterol - HDLs: Good Cholesterol - HDL and LDL Levels Can Be Used to Determine The Health of Arteries 39. Roles VLDL, LDL and HDL lipoprotein Figure 5.18 40. © 2010, Pearson Education, Inc. Most fats are digested in the small intestine using bile acids and pancreatic lipase - Short- and medium-to-acid fatty acids are absorbed directly into the bloodstream - Longer chain fatty acids and other residues of fatty digestion - packed into lipoprotein carriers of hilomicron cholesterol and other lipids through lymph and blood flow 41. © 2010 Pearson Education, Inc. - VLDLs and HDLs are synthesized in the liver - VLDLs eventually become LDLs after Some fatty acids in the body's cells - LDLs deposit cholesterol in cells and arterial walls - HDLs remove cholesterol from the arteries and deliver it to the liver to be used in bile synthesis or excreted in feces 42. © 2010 Pearson Education, Inc. Uses Fat and Cholesterol - Energy Source - Body Structure Form - Metabolism Regulation - Improving the absorption of fat-soluble vitamins - Providing insulation to help regulate body temperature - Pillow of the main organs 43. © 2010, Pearson Education, Inc. Fat is used as energy - fat - provides a concentrated source of kilocalories - 9 kilocalories per gram - easily available when the body needs energy - the body's main source of energy during day 44. © 2010 Pearson Education, Inc. Fat is used as energy - fat - The body has an unlimited ability to store excess energy as fat in adipocytes - fat cells have the ability to increase by 1000 times their original size - the body has the ability to produce additional fat cells 45. © 2010 Pearson Education, Inc. fat is used as energy and helps absorb lipid compounds - Preferred energy source for the heart, liver and muscles - Can't support life alone - Glucose Needs - Only glycerol can be used for gluconeogenesis - Several essential nutrients require dietary fat to absorb © 2010 Pearson Education, Inc. and also maintains body temperature - fat protects bones and vital organs from injury - Too much fat eliminates the protective benefit of 47. © 2010 Pearson Education, Inc. Essential fatty acids, eicosanoids and cell membranes - Linolemic acid can be elongated and converted into arachidonic acid - Alpha-linolenic acid - Converted into eicosapentaenoic acid (EPA) - EPA lengthens docosahexaenoic acid (DHA) - essential for healthy cell membranes. © 2010 Pearson Education, Inc. Essential fatty acids, eikosanoids, as well as cell membranes and arachidonic acid are used to produce eicosanoids - eicosanoids are hormone-like substances - prostaglandins, thrombocans and leukotrienes - regulate the immune system, blood clots, inflammation and blood pressure 49. © 2010 Pearson Education, Inc. Cholesterol is used to make bile, hormones, and vitamin D - Cholesterol - the structural part of the cell membrane - a precursor to vitamin D - a precursor to bile acid - a precursor to sex hormones such as estrogen and testosterone 50. © 2010 Pearson Education, Inc. - Fat - energy-intensive fuel source - Pillows and protects bones, organs and nerves - Helps maintain body temperature - provides fatty acids acids are precursors of EPA and DHA that produce - Prostaglandins, Trombocoanes - Leukotriena - Regulate the immune system, regulate blood clotting, regulate inflammation and regulate blood pressure 51. © 2010 Pearson Education, Inc. - The main function of cholesterol is part of the cell membrane - it is necessary to make - Vitamin D - bile acid - Sex hormones 52. © 2010 Pearson Education, Inc. How much fat do we need each day? Total fat intake in the U.S. is higher than it should be - Acceptable recommendation of macronutrients (AMDR) - 20-35% of daily kilocalories should come from fat - For heart health - Consume no more than 10% of the total number of kilocalories from saturated fats - Limit trans fats to 1% 53. © 2010 Pearson Education, Inc. Essential Recommendations for Fatty Acids - Adequate Consumption (AI) for Essential Fatty Acids - Alpha-Linolenic Acid - Men 1.6 grams/D - Women 1.1 grams/D - Linole acid - Men 17 grams/d - women 12 grams/d., currently Americans consume only about 0.1-0.2 grams/EPA and DHA 54. © 2010 Pearson Education, Inc. The main recommendations for fatty acids - AMDR for essential fatty acids - 0.6-1.2% of the total number of kilocalories should be alpha-linolenic acid - 5-10% of the total number of kilocalories should be linoleic acid - American Heart Association - Recommendations - People diagnosed with heart disease should consume 1 gram of essential fatty acids per day 55. © 2010 Pearson Education, Inc. Facts about fats, oils and cholesterol - Consumption of trans fats and saturated fats correlates with an increased risk of cardiovascular disease - Stroke - Cancer - Replacing or replacing trans fats and saturated fats with MUFA and PUFA may reduce the risk of 56. © 2010 Pearson Education, Inc. Dietary Cholesterol is not essential - The liver synthesizes the cholesterol needed by the body, the liver synthesizes the synthesis of reducing 900 mg/d - Liver reduction synthesis based on dietary consumption - To reduce the risk of cardiovascular disease, dietary cholesterol should be limited to 300 mg/d 57. © 2010 Pearson Education, Inc. - Dietary lipids are an important part of a healthy diet, especially essential fatty acids and saturated fats, trans fats, and cholesterol intake should be limited - Dietary fat intake per day - Should range from 20 to 35% of the total number of kilocalories 10% kilocalories lino-acid - 0.6-1.2% of kilo Alpha-Linolenic Acid Calorie - Limit saturated fat intake to 10% of total fat intake - limit your intake of trans fats to 1% of total fat intake - limit your cholesterol intake to 300 mg 58. © 2010, Pearson Education, Inc. fats ⏮ 5.20 59. Food Sources Omega-3 Fatty Acids Figure 5.21 60. © 2010 Pearson Education, Inc. - Lean meat and poultry, fish, low-fat or low-fat dairy products and a limited amount Nuts and Cheeses - The best sources of essential fatty acids - Limiting the consumption of saturated and trans fats - Commercially cooked baked goods and snacks - High in kilocalories - high in saturated and trans fats - should be consumed rarely - Use vegetable oils instead of butter 61. © 2010 Pearson Education, Inc. products containing trans fats and cholesterol? Гидрогенизированные жиры используются многими коммерческими производителями продуктов питания, чтобы обеспечить богатую текстуру - Увеличьте срок годности на полке - Снижение частоты прогорклости - Во время процесса гидрогенизации трансжиры образуют - Некоторые трансжиры являются естественными 62. Basic food sources of trans fats for adult Americans Figure 5.23 63. © 2010 Pearson Education, Inc. Trans Fats - Trans fats may actually be worse for heart health than saturated fats - Raising LDL cholesterol - Low HDL cholesterol - THE FDA requires that trans fats be listed on food labels - The food industry is working to find a replacement for trans fats in foods 64. © 2010 Pearson Education, Inc. Nutritional Sources of Cholesterol and Plant Sterols - Cholesterol comes mainly from animal products - cholesterol, Produced in the walls and oils of vegetable cells, so minimal that they are considered cholesterol-free - Phytosterols and Stanols - Lower levels of LDL, competing with cholesterol for absorption - are found in soybean oil, many fruits, vegetables, sesame seeds, sesame seeds, nuts, grains and other plant foods - Food manufacturers strengthen the products with them to help lower cholesterol 65. © 2010 Pearson Education, Inc. - Trans fats are made by heating oil and adding hydrogen gas to saturate carbon fatty acids - Trans fats raise LDL cholesterol and lower HDL cholesterol - Trans fats are found in many commercially prepared foods and should be listed on the food label - Other oils are tested to replace trans fats in foods - cholesterol is found mainly in animal-derived foods. Nuts, legumes, whole grains, fruits and vegetables 66. © 2010 Pearson Education, Inc. Fat Substitutes - Designed to provide the creamy properties of fat for fewer kilocalories - Falling into three categories: Carbohydrate-based: Most fat substitutes - Protein-based: Provide a creamy texture in the mouth - fat-based fat: Give physical fat attributes for fewer kilocalories - Excessive consumption of kilocalories from regular, low-fat foods can lead to weight gain. © 2010 Pearson Education, Inc. - Fat substitutes provide fat properties Fewer kilocalories and grams of fat - Fat substitutes can be carbohydrate, protein or oily - Some substitutes such as olestra passing unabsorbed through the gastrointestinal tract - Reduced fatty and low-fat foods still contain kilocalories and should be eaten in a limited amount of 68. ©, 2010 Education, Inc. Accumulate in the arteries of fat and cholesterol blood flow prevents the arteries narrow - Not enough oxygen to the heart and CHEST PAIN Reducing oxygen and nutrients What is heart disease and what factors increase the risk? Cardiovascular disease is the number one killer of adults (in the United States) 69. Atherosclerosis Figure 5.24 70. New risk factors - C-reactive protein (CRP) - homocysteine, chlamydia pneumonia - lp (a) protein - Metabolic syndrome or syndrome X 71. © 2010 Pearson Education, Inc. - Heart disease is the leading cause of death in the United States - It develops when atherosclerosis causes coronary artery constriction and decreases the flow of oxygen and nutrients to the heart - Elevated LDLs are a major risk factor - Uncontrolled risk factors include age, gender, family history and type 1 diabetes - Managed risk factors include type 2 diabetes, high blood pressure , overweight, low HDLs, elevated LDLs - HDLs can be raised by weight loss, regular exercise, and quit smoking - X syndrome is a group of risk factors of 72. © 2010 Pearson Education, Inc. Lower Blood Cholesterol - Consume Less Saturated and Trans Fats - Consume Less Cholesterol - Make Smart, Conscious Food Choices - Avoid or consume processed foods in moderation - Eat at least two servings of fish a week - Consume more plant-based foods - Consume antioxidants and phytochemicals - Garlic can help lower cholesterol, in moderation, can reduce the risk of heart disease. © 2010 Pearson Education, Inc. Putting It All Together - For optimal long-term health diet should include the proper balance of all nutrients including fats - there are different types of lipids, some necessary and others not required from Food Target - Consume mostly unsaturated fats - Limiting the amount of saturated and trans fats - a plant-based diet, abundant in whole grains, fruits and vegetables, with some low-fat and low-fat , bird, fish and vegetable oil will be high in fiber and lower in saturated fat, trans fat, and dietary cholesterol cholesterol lipid metabolism ppt download. regulation of lipid metabolism ppt. disorders of lipid metabolism ppt. hormonal regulation of lipid metabolism ppt. inborn errors of lipid metabolism ppt. role of liver in lipid metabolism ppt. integration of carbohydrate and lipid metabolism ppt. exogenous pathway of lipid metabolism ppt

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