Characteristics of lipids soluble

Chapter 26: Lipid Summary lipid heterogeneous is a class of natural organic matter grouped together not by the presence of a distinguishing functional group or structural feature, but on the basis of common solubility properties. Lipids are all insoluble in polar solvents like water, but very soluble in non-polar or poorly polar organic solvents, including ether, chloroform, benzene and acetone. In fact, these four solvents are often called lipid-solvents or fatty solvents. Other biomolecules such as amino acids, proteins, carbohydrates and nucleic acids are generally insolule in these solvents. Lipids are widespread in animal and plant systems and perform a wide range of functions. These include energy storage, structural components (e.g. cell membranes), vitamins, metabolism regulators (e.g. steroid hormones), and emulsifying agents. Some common types of lipids discussed here are: fats and oils phosphoruspid prostaglandini terpenes steroids © PhD. Ian Hunt, Lipids Chemistry Department are a large and diverse group of natural organic compounds that are associated with their soluncìance in non-lilar organic solvents (e.g. There is a great structural diversity among lipids, as will be shown in the following sections. 6.1: Introduction to lipidLipid is not defined by the presence of certain functional groups, such as carbohydrates, but by physical property – solum. Compounds isolated from body tissues are classified as lipids if they are more soluous in organic solvents, such as dichloroometan, than in water. Thus, the lipid category includes not only fats and oils, which are esters of trihydroxy alcohol glycerol and fatty acids, but also compounds derived from phosphorus acids, carbohydrates, amino alcohols and steroids.6.2: Fatty acidsFatty acids are carboxyric acids that are structural components of many lipids. They can be saturated or unsaid. Most fatty acids are untreated and contain a total number of carbon atoms. Unsatisfies have lower melting points than saturated fatty acids containing the same number of carbon atoms.6.3: Fats and oilsFati and oils consist of molecules known as triglycerides, which are esters composed of three units of fatty acids associated with the speedboat. Increasing the percentage of fatty acids of a shorter chain and/or unsasected fatty acid lowers the melting point of fat or oil. Hydrolysis of fats and oils in the presence of the base produces soap and is known as saponification. Double bonds present in unsatissed triglycerides can be hydrogenated to convert oil (liquid) into margarine (solid).6.4: Membranes and membrane lipids are important components of biological membranes. These lipids have dual part of the molecule is hydrophilic and part of the molecule is hydrophobic. Membrane lipids can be classified as phospholipids, glycolipids and/or sphincholipids. Proteins are another important component of biological membranes. Integral proteins include lipid bilayer, while peripheral proteins are looser connected to the membrane surface.6.5: SteroidsSteroids have a ring structure with four joined rings and have different functions. Cholesterol is a steroid found in mammals that is needed to create cell membranes, bile acids and several hormones. Bile salts are excreted in the small intestine to help digest fat.6.6: ExerciseProblems and selected solutions for chapter.6.7: Lipids (Summary)To ensure understanding of the material in this chapter, you should review the meanings of bold terms in the following summary and ask yourself how they relate to the topics in the chapter. A substance of biological origin that is soluble in non-lubricant solvents The structure of some common lipids. On top are cholesterol[1] and oleic acid. [2] The middle structure is a triglyceride composed of oleoil, stearoyl and palmitoyl chains attached to the backbone of glycerol. At the bottom is the usual phosphospid phosphatidylcholine. In lipid biology and biochemis, macrobiomolecules are soluble in non-motor solvents. [3] Non-polar solvents are usually hydrocarbons used to dissolve other natural molecules of hydrocarbon lipids that do not dissolve (or dissolve easily) in water, including fatty acids, waxes, sterols, fat-soluble vitamins (such as vitamins A, D, E and K), monoglycerides, diglycerides, triglycerides and phospholipids. Lipid functions include energy storage, signaling and acting as structural components of cell membranes. [4] [5] Lipids have applications in the cosmetic and food industries, as well as in nanotechnology. [6] Scientists sometimes define lipids as hydrophobic or amphiphilic small molecules; the amphiphilic nature of some lipids allows them to form structures such as ice creams, multilamelar/non-comfortable liposomes or membranes in an aquatic environment. Biological lipids originate entirely or partially from two different types of biochemical subunits or building blocks: ketoaquil and isoprene groups. [4] Using this approach, lipids can be divided into eight categories: fatty acids, glycerolipids, glycerophosplipids, sphinxolipids, sucrolipids and polycetides (derived from condensation of ketoacyl subunits); and lipid sterol and lipid prenol (derived from condensation of isoprene subunits). [4] Although the term lipid is sometimes used as a synonym for fats, fats are a subset of lipids called triglycerides. Lipids also include molecules such as fatty acids and their derivatives (including tri-, di-, monoglycerides, and phosphospid), as well as other sterol-containing such as cholesterol. [7] Although humans and other mammals use different biosynthetic pathways to break down and synthesize lipids, some essential lipids cannot be made this way and must be obtained from diet. The history of Lipids can be considered as organic substances relatively insoluble in water, soluble in organic solvents (alcohol, ether, etc.) actually or potentially associated with fatty acids and used in living cells. In 1815, Henri Braconnot classified lipids (graisses) into two categories, suifs (solid fats or loggias) and huile (fluid oils). Since 2010, Michel Eugène Chevreul has developed a more detailed classification, including oils, fats, loggias, waxes, resses, balms and volatile oils (or essential oils). [9] [10] [11] The first successful synthesis of the triglyceride molecule was Théophile-Jules Pelouze in 1844, when it produced a tributary by reacting butyric acid with glycyric acid in the presence of concentrated sulphuric acid. [12] A few years later, Marcellin Berthelot, one of the Pelouse students, synthesized tristearin and tripalmitin by reacting analogue fatty acids with glycycyrin in the presence of gaseous hydrogen chloride at high temperature. [13] In 1827, William Prout recognized fats (fatty alimentary issues), along with proteins (albuminous) and carbohydrates (saccharine), as an important nutrient for humans and animals. [14] [15] For a century, chemists regard fats as just simple lipids of fatty acids and glycerol (glycerides), but new forms are described later. Theodore Gobley (1847) discovered phospholipids in the mammalian brain and hen egg, which he called lecithin. Thudichum discovered in the human brain some phospholipids (cephalolin), glycolipids (cerebroside) and sphingolipids (sphingomyelin). [10] The terms lipoid, lipin, lipid and lipid were used with different meanings from author to author. In 1912, Rosenbloom and Gies proposed replacing lipoid from lipin. In 1920, Bloor introduced a new classification for lipoids: simple lipoids (fats and waxes), complex lipoids (phosphoslipoides and glycolypoids) and derived lipoids (fatty acids, alcohol, sterols). [18] [19] The word lipid, which stems etymologically from Greek lipos (fats), was introduced in 1923 by french pharmacologist Gabriel Bertrand. [20] Bertrandi included not only traditional fats (glycerides) in the concept, but also lipoids, with a complex constitution. [10] Despite the word lipid, it was unanimously approved by the Société de Chimie Biologique International Commission during the plenary session of the 3rd International Commission. The word lipid was later anglicized as lipids because of its pronunciation ('lɪpɪd). In French, the suffix -goes, from ancient Greek -ίδης (meaning 'son' or 'descendant'), is always pronounced (ɪd). 1947, T.P. Hilditch lipids in simple lipids, with fats and wax (real waxes, sterols, alcohols). Categories Lipids are classified into eight categories by the Lipid MAPS Consortium[4] as follows: Fatty acids Main article: Fatty acid I2 - Prostacyline (example of prostaglandin, eicosanoid fatty acids) LTB4 (example leukotriene, Fatty acid eicosanoids) Fatty acids, or fatty acid residues when part of lipids, are a diverse group of molecules synthesized by chain deeds of acetyl-CoA primers with malonyl-CoA or methylmalonil-CoA groups in a process called fatty acid synthesis. [21] [22] They are made of a hydrocarbon chain that ends with a group of carboxylic acid; this arrangement provides a molecule with a polar, hydrophilic end and a non-polar, hydrophobic end that is unsolvable in water. The structure of fatty acids is one of the most basic categories of biological lipids and is usually used as a building block of structurally complex lipids. The carbon chain, usually between four and 24 carbons long,[23] can be saturated or unsatissed, and can be attached to functional groups containing oxygen, halogens, nitrogen and sulfur. If fatty acid contains a double bond, there is a possibility of cis or trans geometric isomerism, which significantly affects the configuration of the molecule. Cis-double bonds cause the fatty acid chain to bend, an effect that is compounded by multiple double bonds in the chain. The three double bonds in 18-carbon linolenic acid, the most prerogated fatty-acute chains of thylacoid plant membranes, make these membranes highly fluid despite low environmental temperatures,[24] and also makes linolenic acid dominate sharp peaks at high resolution of the 13-C NMR spectrum of chloroplasts. This in turn plays an important role in the structure and function of cell membranes. [25] Most natural fatty acids are cis configurations, although the trans form exists in some natural and partially hydrogenated fats and oils. [26] Examples of biologically important fatty acids include eicosanoids, derived primarily from arachidonic acid and eicosapentaenoic acids, which include prostaglandins, leukotriene and thromboboxans. Doxahexaenoic acid is also important in biological systems, especially in terms of vision. [27] [28] Other large lipid classes in the fatty acid category are fatty esers and fatty amidases. Fatty esters include important biochemical intermediates such as wax esters, tioester tioester A derivatives, ACP fatty acid tioester derivatives and fatty acid carcinotin. Fatty in the middle include N-acyl ethanolomin, such as cannabinoid neurotransmitter anandamide. [29] Glycerolipids Example of Unsaid Fatty Triglycerides ($C_{55}H_{98}O_6$). Left part: glycerol; right part, top to bottom: palmitic acid, oleic acid, alpha-linolenic acid. consisting of mono-, di-, and three-substituted glycerole,[30] the most famous are fatty acids of triesters glycerol, called triglycerides. The word triacilglycerol is sometimes used synonymous with triglycerides. In these compounds, three hydroxy groups of glycerol are each esterified, usually by different fatty acids. Because they function as an energy store, these lipids make up the bulk of the fat storage in animal tissues. Hydrolysis of esters' bonds of triglycerides and the release of glycerol and fatty acids from adipose tissue are the initial steps in fat metabolism. [31] Additional glycerol subclasses are glycosylglycholiols, characterised by the presence of one or more sugar residues attached to glycoserol via a glycosid connection. Examples of structures in this category are digalactosyldiacylglycerols found in plant membranes[32] and seminolipid from mammalian sperm. [33] Glycerophophospholipids Main article: Phospholipid phosphatidylethanolamine glycerophospholipids, commonly referred to as phospholipids (although sphingomyelins are also classified as phospholipids), are ubiquitous in nature and key components of lipid bilayer cells,[34] as well as be involved in metabolism and cellular signaling. [35] Neural tissue (including the brain) contains relatively high amounts of glyceronphosplipide, and changes in their composition are implicated in various neurological disorders. [36] Glycerophospholipids can be divided into different classes, based on the nature of the polar headgroup to the sn-3 position of the glycerol foundation in eukaryotes and eubacterial, or sn-1 positions in the case of archebacterial. [37] Examples of glycerophospholipids found in biological membranes are phosphatidylcholine (also known as PC, GPCho or lecithin), phosphatidylethanolamine (PE or GPEtn) and phosphatidilserin (PS or GPSer). In addition to serving as the primary component of cell membranes and vesicular sites for intraelular and intercellular proteins, some glycerophosplipids in eukaryotic cells, such as phosphatidylinositols and phosphatid acids are either precursors or, alone, membrane-derived other messengers. [38] Typically, one or both of these hydroxyl groups are acylated with long-chain fatty acids, but there are also alkyl-related and 1Z-alkenyl-related (plasmalogen) glycerophospholipids, as well as dialkylether variants in archebacteria. [39] Sphingolipids Main article: Sphingolipid Sphingomyelin Sphingolipids are a complicated family of compounds [40] that share a common structural feature, sphingoid baseline that synthesizes de novo from the amino acid serine and long-chain fatty acyl CoA, then converted into ceramides, phosphosphingolipids, glycosifingolipids and other compounds. The main sphingoid base of mammals is commonly referred to as Ceramides (N-acyl-sphingoid bases) are the main subclass of sphinxoid base derivatives with amid-related fatty acids. Fatty acids are usually saturated or mono-unsatisfyed by chain lengths of 16 to 26 carbon atoms. [41] The main phosphosphingolipids of mammals are sphinxomyelines (ceramide phosphococlines),[42] while insects contain mainly ceramide phosphoethanolmines[43] and fungi have phytocelamide phosphoinositoles and mannos containing headgroups. [44] Glycosifingolipids are a diverse family of molecules composed of one or more sugar residues associated with glycoside bonding with a sphingoid base. Examples of this are simple and complex glycosyphingolipids such as cerebrozides and gangliosides. Sterols Chemical structure of cholesterol. Main article: Sterol Sterols, such as cholesterol and its derivatives, are an important component of the lipid membrane,[45] along with glycerofosphospholipids and sphingomyelins. Other examples of sterols are bile acids and their conjugants,[46] which in mammals are oxidized cholesterol derivatives and are synthesized in the liver. Plant equivalents are phytosterols, such as β-sitosterol, stigmasterol and brassicasterol; The latter compound is also used as a biomarker for algae growth. [47] The predominant sterol in fungal cell membranes is ergosterol. [48] Sterols are steroids in which one of the hydrogen atoms is replaced by a hydroxylic group, at position 3 in the carbon chain. They have in common with steroids the same fused four-ring core structure. Steroids have different biological roles as hormones and signaling molecules. Eighteen-carbon (C18) steroids include estrogen family while C19 steroids consist of androgens such as testosterone and androsterone. C21 subclass includes progestogens as well as glucocorticoids and mineralocorticoids. [49] Secosteroids, consisting of different forms of vitamin D, are characterized by the décolleté of the B ring of the core structure. [50] Prenols Prenol lipids (2E-geraniol) Prenol lipids are synthesized from five-carbon precursors isopentenyl diphosphate and dimethylallyl diphosphates produced mainly through mevalonic acid (MVA). [51] Simple isoprenoid (linear alcohols, diphosphates, etc.) are formed by successively adding C5 units and are classified by the number of these terpene units. Structures containing more than 40 carbons are known as polytherpeni. Carotenoids are important simple isoprenoids that function as antioxidants and as precursors of vitamin A.[52] Another biologically important class of molecules is an example of quinoons and hydroquinones, which contain an isoprenoid tail attached to the quinooid nucleus of non-feiferous origin. [53] Vitamin E and vitamin K, as well as ubikinoni, are examples of this class. Prokarioti synthesize polyprenoles bactoprenols) in which the terminal isoprenoid unit attached to oxygen remains unsatissed, while in animal polyprenols (dolichols) the terminal isoprenoid decreases. [54] Sucrolipids The structure of sucrolipid Kdo2-lipid A.[55] Remains of glucosamine in blue, Kdo residues in red, acoustic chains in black and phosphate groups in green. Sucrolipids describe compounds in which fatty acids are associated directly with the sugar backbone, forming structures that are compatible with membrane bilarhydes. In sucrolipids, monosaccharide replaces the backbone of glycerol present in glycerolipids and glycerofosflipids. The most famous sucrolipids are acylated glucosamine precursors lipid a component of lipopolysaccharides in Gram-negative bacteria. Typical lipid molecules are glucosamine disaccharides, which are derived with as many as seven fatty-aquile chains. The minimal lipopolysaccharide needed to grow in E. coli is Kdo2-Lipid A, a hexa-acylated disaccharide glucosamine that is glycationized with two 3-deoxy-D-manno-occulosonic acid (Kdo) residues. [55] Polycetides Polyketides are synthesized by polymerizing acetyl and propionyl subunits with classical enzymes, as well as iterative and multimodular enzymes that share mechanistic features with fatty acid synthases. They consist of many secondary metabolites and natural products from animal, plant, bacterial, fungal and marine sources and have great structural diversity. [56] [57] Many polycetides are cyclic molecules whose spines are often further modified by glycosylation, methylation, hydroxylation, oxidation or other processes. Many of the most commonly used anti-microbial, anti-parasitic and anti-cancer agents are polycetides or derivatives of polycetides, such as erythromycin, tetracyclines, avermectini and anticancer epotillons. [58] The biological functions of the Membrane of the Eukaryotic Cell have compartmentalized membrane-related organs that carry out different biological functions. Glycerosphosphalides are the main structural component of biological membranes, as cell plasma membranes and intracellular organelle membranes; in animal cells, the plasma membrane physically separates intracellular components from the extracellular environment. [quote required] Glycerosphosphalides are amphipathic molecules (containing both hydrophobic and hydrophilic regions) containing the nucleus of glycerol associated with two tails derived from fatty acids by ester bonds and with one group of heads with phosphate ester bonds. [quote required] While glycerophosphipids are a major component of biological membranes, other non-glycerid lipid components such as sphinxomyeline and sterols (mainly cholesterol in animal cell membranes) are also found in biological membranes. [59] In plants and algae, galaktosildiacylglycerols,[60] and which lack a group of phosphates are important components of chloroplast membranes and related organelles and are the most pre-established lipids in photosynthetic tissues, including those of taller plants, algae and certain bacteria. [quote required] Plant membranes of thylacoids have the largest lipid component of non-bilayers forming monogalactosil diglycerides (MGDG) and small phosphlipids; Despite this unique lipid composition, chloroplast thylakoid membranes have been shown to contain a dynamic lipid-bilayer matrix as detected by magnetic resonance imaging and electron microscopic studies. [61] Self-education of phospholipids: spherical liposome, mycelium and lipid bilayer. The biological membrane is a form of the lamelar phase of lipid bilayer. The formation of lipid bilajators is the preferred process when glycerophospies are described above in an aquatic environment. [62] This is known as a hydrophobic effect. In the water system, polar lipid heads align towards the polar, aquatic environment, while hydrophobic tails minimize their contact with water and tend to cluster together, forming a binder; depending on the concentration of lipids, this biophysical interaction may result in the formation of mycelium, liposomes or lipid biojators. Other aggregations are also observed and form part of the polymorphism of amphiphilic (lipid) behavior. Phased behavior is an area of study within biophysics and is the subject of current[when?] academic research. [63] [64] Micelles and bilayers are formed in the polar medium by a process known as hydrophobic effect. [65] When dissolving lipophilic or amphiphilic matter in the polar environment, polar molecules (i.e. water in an aqueous solution) become more ordered around dissolved lipophilic matter, as polar molecules cannot form hydrogen bonds with the lipophilic regions of the amphiphilus. Thus, in the aquatic environment, water molecules form an ordered clatrate cage around the dissolved lipophilic molecule. [66] The formation of lipids in protocell membranes is a key step in models of abiogenesis, the origin of life. [67] Triglycerides for energy storage, stored in adipose tissue, are the main form of energy storage in both animals and plants. They are the main source of energy because carbohydrates have a completely reduced structure. Compared to glycogen, which would contribute only half of the energy by its pure mass, triglyceride carbons are all hydrogen-related, as opposed to carbohydrates. [68] Adipocyte, or fat cells, is designed to continuously synthesize and break down triglycerides in animals, with degradation controlled mainly by activation of hormone-sensitive enzyme lipase. [69] Complete fatty acid oxidation provides a high caloric content, about 38 kJ/g (9 kcal/g), compared to 17 kJ/g (4 kcal/g) for the breakdown of carbohydrates and Migratory birds that have to fly long distances without eating use the stored energy of triglycerides to encourage their flights. [70] Signaling evidence has emerged showing that lipid signaling is a vital part of cell signaling. [71] [72] [73] [74] Lipid signaling may occur by activating G proteins or nuclear receptors, and members of several different lipid categories have been identified as signaling molecules and cell messengers. [75] These include sphingosine-1-phosphate, a ceramide derived sphingolipid that is a potent messenger molecule involved in the regulation of calcium mobilization,[76] cell growth, and apoptosis; [77] diacylglycerol (DAG) and phosphatidylinositol phosphatite (PIP), involved in the activation of calcium-mediated kinase protein C; [78] prostaglandins, which are a type of eicosanoid derived from fatty acids involved in inflammation and immunity; [79] steroid hormones such as estrogen, testosterone and cortisol, which modulate a range of functions such as reproduction, metabolism and blood pressure; and oxysteroles such as 25-hydroxy-cholesterol which are liver receptor agonists X. [80] Phosphatidylserin lipids are known to be involved in signaling phagocytosis of apoptotic cells or cell fragments. They achieve this by exposing them to the extracelltial face of the cell membrane after inactivation of flippases that place them exclusively on the cytosolic side and by activating scramblases, which hijack the orientation of phospholipids. After this happens, other cells recognize phosphatidilserines and phagocytosis cells or cell fragments that put them out there. [81] Other fat-soluble vitamins (A, D, E and K) – which are isopreno-based lipids – are essential nutrients stored in the liver and adipose tissues, with a different range of functions. Acyl-carnitini are involved in the transport and metabolism of fatty acids in and out of mitochondria, where they undergo beta oxidation. [82] Polyprenoli and their phosphorus derivatives also play important transport roles, in this case the transport of oligosaccharides via membranes. Polyprenol phosphate sugars and polyprenol diphosfat sugars function in extra-cytoplastic glycosyl reactions, in extracelltial polysaccharide biosynthesis (for example, peptidoglycan polymerization of bacteria) and in the eukaryotic protein N-glycation. [83] [84] Cardiolipins are a subclass of glycerophospholipids containing four acyl chains and three glycerol groups that are particularly abundant in internal mitochondrial membranes. [85] They are believed to activate enzymes involved in oxidative phosphorilation. [87] Lipids also form the basis of steroid hormones. [88] Metabolism The main dietary lipids for humans and other animals are animal and plant triglycerides, sterols and membrane phospholipids. Lipid metabolism process and breaks down lipid stocks and produces structural and functional lipids characteristic of individual tissues. Biosynthesis In animals, when there is an excessive supply of dietary carbohydrates, excess carbohydrates are converted into triglycerides. These include the synthesis of fatty acids from acetyl-coA and the esterification of fatty acids in the production of triglycerides, a process called lipogenesis. [89] Fatty acids are made of fatty acid synthases that polymerize and then reduce acetyl-CoA units. Acuilles chains in fatty acids are prolonged by a cycle of reactions that add a group of acetyles, reduce it to alcohol, dehydrate it into the alken group, and then reduce it again to the alkanic group. Fatty acid biosynthesis enzymes are divided into two groups, in animals and fungi all these reactions of fatty acid synthases are carried out with one multifunctional protein,[90] while in plant playdoughs and bacteria separate enzymes perform each step along the way. [91] [92] Fatty acids can subsequently be converted into triglycerides that are packed in lipoproteins and excreted from the liver. Synthesis of unsatissed fatty acids involves a desaturation reaction, whereby a double bond is introduced into the fatty acoustic chain. For example, in humans the desaturation of stearic acid stearoyl-CoA desaturase-1 produces oleic acid. Double unsatisfies lyoleic acid fatty acids as well as triply unsatisfished α-linolenic acid cannot be synthesized in mammalian tissues, and therefore fatty acids are essential and must be obtained from the diet. [93] Triglyceride synthesis takes place in endoplasmic reticulum metabolic pathways in which acil groups in fatty acyl-CoAs are transferred to hydroxyl groups of glycyrol-3-phosphate and diacyglierol. Terpenes and isoprenoids, including carotenoids, are made by assembling and modifying isoprene units donated from reactive precursors isopentenyl pyrophosphate and dimethylallyl pyrophosphate. [51] These precursors can be made in different ways. In animals and archaea, the mevanonate pathway produces these compounds from acetyl-CoA,[95] while in plants and bacteria the non-mevanonate pathway uses pyruvate and glyceraldehyde 3-phosphate as substrates. [51] [96] One important reaction that uses these activated isoprene donors is steroid biosynthesis. Here, isoprene units are joined together to make squalene, then folded and formed into a set of rings to make lanosterol. [97] Lanosterol can then be converted into other steroids such as cholesterol and ergosterol. [97] [98] Degradation of Beta oxidation is a metabolic process by which fatty acids are broken down in mitochondria or in peroxisomes to form acetyl-CoA. Basically, fatty acids are oxidized by a mechanism that is similar, but not identical to, reversing the fatty acid process That is, two-carbon fragments are sequentially removed from the carboxylic end of acid after steps of dehydration, hydration and oxidation to form beta-keto acid, which is divided by tiolysis. Acetyl-CoA is then ultimately converted into ATP, CO2 and H2O using citric acid cycles and an electron transport chain. Therefore, the cycle of citric acid can begin at acetyl-CoA when fats are diluted for energy if there is little or no glucose available. The energy yield of complete oxidation of fatty acid palmitates is 106 ATP. [99] Unsatisfies of fatty acids and fatty acids in odd chains require additional enzyme steps for degradation. Nutrition and health Most of the fats found in food are in the form of triglycerides, cholesterol and phosptopides. Some dietary fats are necessary to facilitate the absorption of fat-soluble vitamins (A, D, E, and K) and carotenoids. [100] Humans and other mammals have nutritional needs for certain essential fatty acids, such as lyoleic acid (omega-6 fatty acid) and alpha-linolenic acid (omega-3 fatty acids) because they cannot be synthesized from simple precursors in the diet. [93] Both of these fatty acids are 18-carbon polynesed fatty acids that differ in number and position of double bonds. Most vegetable oils are rich in lyoleic acids (safflower, sunflower and corn oils). Alpha-linolenic acid is found in green leaves of plants, and in selected seeds, nuts and legumes (especially flax, rapeseed, walnut and soybeans). [101] Fish oils are particularly rich in eicosapentaenoic acids (EPA) and docosahexaenoic acid (DHA). [102] Many studies have shown positive health benefits associated with the consumption of omega-3 fatty acids on infant development, cancer, cardiovascular disease, and various mental illnesses, such as depression, hyperactivity disorder and dementia. [103] [104] By contrast, it is now well established that consumption of trans fats, such as those present in partially hydrogenated vegetable oils, is a risk factor for cardiovascular disease. Fats that are good for you can turn into trans fats by overcooting. [105] [106] [107] Several studies have shown that overall intake of dietary fats is associated with an increased risk of obesity[108][109] and diabetes. [110] However, a number of very large studies, including the Women's Health Initiative Dietary Modification Trial, an eight-year study of 49,000 women, the Nurse Health Study and the Healthcare Professionals Monitoring Study, did not reveal such links. [111] [112] None of these studies suggested any link between the percentage of calories from fat and the risk of cancer, heart disease or weight gain. The Source of Nutrition, a website maintained by the Department of Nutrition at the Harvard School of Public Health, compresses current evidence of the impact of dietary fat: from this done at Harvard - shows that the total amount of fat in the diet is not actually associated with weight or disease. [113] See also Solid Lipid Nanocusts – New Drug Delivery System Simple Lipid Emulsion Test Lipid Microdomain Membrane Lipid Fat – Esters Three Fatty Acid Chains and Alcohol Glycerol, one of the three main macronutrients, also known as lipidyd triglycerides that signals the lipidomymic protein-lipid interaction of Phenolic Lipids, a class of natural products composed of long aliphatic chains and phenolic rings that occur in plants, fungi and bacteria References ^ Maitland J Jr (1998). Organic chemistry. W W Norton & Co Inc (Np). P. 139. ISBN 978-0-393-97378-5. ^ Stryer, sur., p. 328. ^ IUPAC, Chemical Terminology Compendium, 2. Online corrected version: (2006–) lipids. doi:10.1351/golden book. L03571 ^ a b c d Fahy E, Subramaniam S, Murphy RC, Nishijima M, Raetz CR, Shimizu T, Spener F, van Meer G, Wakelam MJ, Dennis EA (April 2009). Update lipid maps of the comprehensive lipid classification system. Journal of Lipid Research. 50 Suppl (S1): S9-14. doi:10.1194/jlr. R800095-JLR200. 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Molecular Computer Simulations – Lipid Membrane Modelling, Membranes and Vesicular Trade – Virtual Library of Biochemistry, Molecular Biology and Cellular Biology Nomenclature IUPAC Lipid Nomenclature IUPAC Glossary Input for Lipid Class Lipid Maps Database Molecules – Comprehensive Databases of Lipid and Lipid-Related Genes/Proteins. LipidBank – a Japanese database of lipids and related properties, spectral data and references. General ApolloLipids – Provides information on the prevention and treatment of dyslipidemia and cardiovascular disease, as well as the continuation of the Medical Education Program of the National Lipid Association – Professional Medical Education Organization for healthcare professionals who seek to prevent morbidity and mortality arising from dyslipidemia and other disorders associated with cholesterol. Retrieved from

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