Chem 431A-L23-F'07 (week 8) admin: quiz (today wed Nov 14) Chapt 7 deadline in Wednesday, Nov 21 No classes on Nov 22-23. Thanksgiving Day	Last lecture: 1) dissacharides 2) glycans

Today: 1) other carbohydrates
2) carbohydrate "code"
3) Intro to lipids.

Schedule: Nov 14(finish CHO, lipids 1 Quiz8) Nov 16(lipids2), Nov 19 (lipids3),	Nov21(lipids,membranes1,Quiz9), Nov 26 (membranes2), Nov 28 (membranes 2,rev)

Lecture:

(1) Other polysaccharides

Let's start with plants. Not all structural polysaccharides are cellulose. There is also *hemicellulose*.

hemicellulose is the term used for the other types of polysaccharides found in plant fibers. Common are xylans. (consisting mostly of Xylβ(1-4)Xyl) and glucomannans. (also involves β(1->4)

another is *chitin* (most common in exoskeleton of invertebrates).

-similar to cellulose (β(1-4) linkages too).

-homopolymer of N-acetyl-β-D-glucosamine.(in C2, instead of OH, have an acetylated amino group, $-NH-(C=O)-CH_3$.

-in exoskeleton of arthropods and mollusks.

Glycosaminoglycans or "mucopolysaccharides"- important in vertebrates

e.g *chondroitin sulfates* and *keratan sulfates* of connective tissue; *dermatan sulfates* of skin and *hyaluronic acid*. Repeating units include either *NAglucosamine*(GlcNAc),*Nagalactosamine*(GalNAc) (note: NA in NAglucosamine means "N-acetyl")

- main purpose of glycosaminoglycans: act as matrix to hold protein components of skin and connective tissue.
- In cartilege for example, proteoglycan complex, filament of haluronic acid, to which proteins are noncovalently attached. Si is present as part of crosslinks. R-O-(Si-OH,OH)-O-R'. Rare presence of Si in living organisms.
- Hyaluronic acid also acts as a viscosity raiser in joint synovial fluid & as lubricant.
- *Hyaluronic acid* also acts as a viscosity raiser in joint synovial fluid and as lubricant.
- *Heparin* is a highly sulfated glucosaminoglycan. Natural anticoagulant in blood.

Oligosaccharides are present in cell surfaces, can act as cell markers.

Glycoproteins = abundant in eukaryotes. Half of all proteins carry attached oligosacchs. A wide variety.

Protein-CHO linkage is N-linked or O-linked.

N-linked: via Asn thru NAglucosamine

O-liked: via Ser or Thr thru . (see Fig 7-31)

Glycoproteins – very widespread among the various kinds of proteins.

Oligosaccharide-protein linkages are via Thr or Ser for O-linkages and Asn for N-linkages).

Carbohydrate "code".

Lectins = proteins that bind to and recognize sugars (highly specific, cell-cell recognition)

Example: Blood Types

Blood group type antigens:

Person Has	makes Ab vs:	Can receive from	Can donate to
A	B	O, A	A, AB
AB	none	O,A, B ,AB	AB
B	A	O, A	B, AB
O	A,B	O	A, B, AB, O

Lipids: introduction.

1) Intro: lipids are the last of the classes of biomolecs we'll cover in biochem. they are nonpolar molecules (oily), are essential components of biomembranes, are

-fats

-fatty acids exist in great abundance not in free form but in complexed form

-composed of carboxyl group (C1) , even number of C's (usually)

-saturated and unsaturated (mono, poly). double bonds are typically cis.

- palmitic acid (16:0), octahexanoic acid

-highly reduced, has lots of energy stored for oxidation.

-nonpolar character

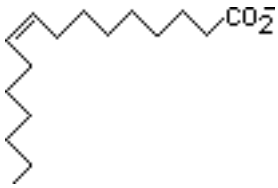
-unbranched hydrocarbon tail.

-HC tail is flexible but straight chain is slightly favored.

palmitoleic acid: (16:1^{9}) or (16:1(9)) or (16:1Δ-9)..

-monounsaturated fa with double bond between C9 & C10.

-cis configuration causes a "kink" and bend with struc consequences.



kinds of fa's (list) ***

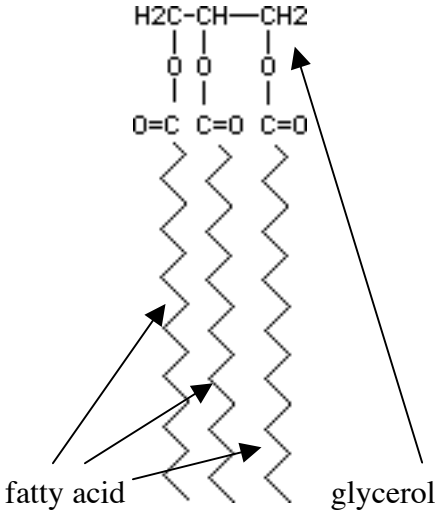
Common name	Systematic name	Abbrev.	Structure	melting point
Lauric	n-dodecanoic acid	12:0	$CH_3(CH_2)_{10}COOH$	44.2
Myristic	n-tetradecanoic a.	14:0	$CH_3(CH_2)_{12}COOH$	53.9
Palmitic	n-hexadecanoic	16:0	$CH_3(CH_2)_{14}COOH$	63.1
Stearic	n-octadecanoic	18:0	$CH_3(CH_2)_{16}COOH$	69.6
Arachidic	n-eicosanoic	20:0	$CH_3(CH_2)_{18}COOH$	76.5
Palmitoleic	cis-9-hexadecenoic	16:1cΔ9	$CH_3(CH_2)_5CH=CH(CH_2)_7COOH$	0°C
Oleic	cis-9-octadecenoic	18:1cΔ9	$CH_3(CH_2)_7CH=CH(CH_2)_7COOH$	16
Linoleic	cis,cis-9,12-octadecadienoic	18:2cΔ9,12		5
a-Linolenic	all cis-9,12,15	18:3xΔ9,12,15		-11
g-Linolenic	all cis-6,9,12	18:3xΔ6, 9,12		

Know esp. saturated: lauric, myristic, palmitic, stearic arachidic; and unsat'd: palmitoleic, oleic, linoleic, α-linolenic, γ-linolenic

essential fa's are those that can't be synthesized by the body but need to be in the diet. (*essential* refers to dietary need) linoleic and γ-linolenic acids are *essential* fatty acids.

triacylglycerols (triglycerides, TG) are the main neutral derivatives and is the form by which fatty acids are stored.
-breakdown releases CO_2 & H_2O

need to be heavy, no water of hydration needed unlike CHO). Doesn't disturb osmolarity of the aqueous environment in cell.



useful for energy: serves for storage in adipose tissue (oil depots)-
note: get 38 kJ/g TG vs 17 kJ/g CHO (and proteins).

simple TG : all three fa's are the same. example tripalmitin.

Note: if only 2 fa's, diglycerides, if only 1, monoglycerides.