

good morning everyone ah i welcome  
you in second lecture of biomolecules first i will like to ah give a recap of  
ah first  
lecture in first lecture we discuss about ah we discussed about the  
biomolecules classification  
of sugars and classification of monosaccharides and we talked about ah dl ah  
configuration  
systems ah of the monosaccharides in the same line ah today i will discuss  
about the  
configuration of aldoses eldo tetros have two ah asymmetric centers and hence  
ah there  
are four possible stereoisomers and these four possible stereo isomers will be  
from two  
from the d sugars and two from the l sugars  
so aldo tetros have two asymmetric centers hence according to our  
stereochemistry rule there will  
be four stereo isomers possible four is two isomers here two stereoisomer comes  
from the d sugar and  
other two stereo isomers come from the l sugars these are the two now i  
will go towards the you know fine detail i mean there is structure there is  
structure structure  
of the d sugars particularly ah and the l sugar first i will draw d sugar  
structure  
and the name of ah the aldo tetros commonly known as are also known as throws  
this and three hoses now i have introduced these two  
terminology erythrosis and theosis what are these erythrosis and threoses ah i  
will like to explain  
here erythrosis are ah having the hydroxyl group on the same side of ah of the  
carbon chain on the  
same side of the carbon chain erythrosis had the hydroxyl group whereas in the  
case of threoz the  
hydroxyl group are on opposite side to make it more clear i will like to draw  
the structure  
let me write here the erythro and threo pairs  
so first i am writing the  
erythropair as i mentioned that hydroxyl group will be on the  
same side  
so this is d erythrose now i will write l derived one this is l erythrose and  
the next one is d three o's as i mentioned in the case of d three o's  
three os where the hydroxyl group will be on the opposite side of the carbon  
chain as you can see here  
so this is d three o's and finally l3os  
so these are the four possible aldo  
tetros is you know stereoisomer here you can see that one pair is coming from  
the  
d d sugar and another pair is coming from the l sugar these all together  
making the four  
stereo isomers of eldo tetros similarly if eldo pentose has three stereo  
center in that  
case again eight stereoisomers are possible and in the case of aldo hexoses  
where the four stereo  
isomers are ah four stereo centers are there ah you know sixteen stereo  
isomers are possible  
eight stereoisomers from the d sugar and ah eight is two isomer from the ah l

sugar now ah i will like to explain you the configuration of um you know d aldosis

so let us talk about the configuration of t l doses here again i will start from the

d glyceraldehyde which is the having which which has one chiral center

so let me draw first d glyceraldehyde with the one chiral center if you remember in last class

i have already discussed the structure of d glyceraldehyde and l glyceraldehyde i

will not go in detail

so d glyceraldehyde in the d glyceraldehyde

hydroxyl group always lie on the right side of the carbon chain

from the d glyceraldehyde i will go see it this is aldo

trios i will go to the eldo tetros in case of aldo tetros it has

four carbon atom four carbon chain number of carbon is increasing and same time stereo centers are also

increasing you can see here one stereo center has increased from

the d glyceraldehyde in the case of you know eldo tetros and now one more thing is

going to be here is it is it throws are theos since the hydroxyl groups are in the

same site

so it becomes d erythro d erie throws now i will draw d three o's where hydroxyl groups are in opposite side the new stereo center will come first while

drying i mean next to the you know ld hydric group

so this becomes d three use now d erythros and d3os ah from this d d

sugar family i will next go to the you know aldo pentoses aldo pentoses

means the sugar which has five carbon chain

so let me draw aldo pentoses in

case of eldopentosis first i will like to write let me put it here just to make you understand

that this is the d erythros and d threos which are aldo tetros and these eldo tetros from

these elder tetros i am going to the eldo pentos

so please pay attention on their stereochemistry

from the d throws i am going to the eldo pentose here this sugar will have three chiral center and all together five carbon chain one two

three four five and this is known as d ribose now the second one where again the hydroxyl group

the incoming hydroxyl group will have the opposite configuration and rest of hydroxyl group will be the same as in the

case of d erythros

so this becomes d arabinose one thing to remember here that here we are

discussing all the d sugars d arribino's now from the d3os from the d3o's again i will draw

the other two possible you know aldo pentoses

so as i mentioned that it will have five carbon chain and stereo chemistry of the possible three stereo center will have both possibility erythro and threo

so first i am drawing erythro possibility since we started from the d3o's you can see here

the first hydroxyl group is on the left side and that is what you know here in the left side the

incoming one is since from the this is the erythro series  
 so it will have you know ah right hand side  
 hydroxyl group this sugar is known as d xylose now i will draw the threos one  
 so again the first incoming  
 stereo center will get changed this is d lyxose all right  
 so in case of aldopentose synthesis has  
 three chiral center the possible stereoisomers are eight four from the d  
 sugars and four from  
 the l sugars here i have written the possible d stereoisomers this register  
 isomers  
 now i will go to the aldo hexoses for the pa every possible d series  
 aldopentoses  
 so again these four will generate another eight  
 stereoisomers let me draw the structure of aldo hexoses in case of aldo hexoses  
 there  
 will be four stereo center four stereo centers and from the d ribose it will  
 give dlose where all the hydroxyl  
 group are on the same side of carbon chain again dlose arises ah from the you  
 know ah d ribose where the incoming new stereo center has the hydroxyl group  
 on  
 the right side and the other possibility is where the incoming hydroxyl group  
 is on the  
 left side  
 so let me draw that possibility it is very easy to draw the structure of these  
 sugars if you know  
 the concept you can see here i have i have drawn here d l trues now i will take  
 the dear ambiose  
 you know i have already drawn the d ribose the possible dlose and d l trues now  
 i will  
 draw d arabinose d arabinose possible pairs  
 so d arabinose let me write here d arabinose possible pairs first i will have  
 all the three stereo centers same from the d  
 arbinos and the you know ah incoming stereo center i will put in the  
 erythroform and then further  
 so this becomes you know structure of d glucose the another possibility where  
 hydroxyl group will be on the left side and rest of the stereo  
 centers will be same as in the case of d arabinose this becomes d mannose d  
 mannose  
 so i have completed here structure of  
 d ribose and d arbinos now i will write the other two eldo pentoses possible  
 stereoisomers d  
 xylose and d lyxose  
 so i will take d xylose first i will draw the erythroform and rest of the  
 stereo centers will be same as in the case of d xylose  
 so this becomes d glucose d glucose and the other where the hydroxyl group will  
 be on the left side of the carbon chain and rest  
 of the stereo centers are same this is d idose now i will draw the final one  
 d lyxose possible aldo hexoses  
 so here again i will take the i show this structure and include  
 the incoming chiral center and rest of the chiral centers are same this becomes  
 d galactose and the last one of the this series where the hydroxyl group lies  
 on the left side and rest of the stereo centers are same d talose  
 so here you saw that how you know from eldo trios  
 i have derived all the possible stereo isomer of the d sugars we started with

the one chiral center in the case of aldo trioses and then we move to the aldo tetroses where the two chiral centers are there and then the possible is two isomers are four and two from the d sugar two from the l sugar and i draw here and you know um two d sugars and i mean um stereoisomers and then and i at the same time introduce the concept of you know an erythro pair and threo pair here and d erythros and d threos in the case of erythrose the hydroxyl group lies on the same side same side of the carbon chain whereas in the case of threos hydroxyl group lies on the opposite side of the carbon chain so d d threos and d threos and similarly if you consider the l series sugars then that completes the four stereoisomers then i move to the from the aldo tetros to the aldo pentoses and here you can see i am slowly slowly you know replacing here in the case of d erythros and we are having two chiral center then in aldopentosis we are having you know three chiral center and a five carbon chain here you can see that again i am putting the incoming chiral center in the erythro form and then threo form that generates the you know d arabinose and similarly and for the d's and i am having first the erythro form and then the threo form that generates the you know erythro form generates the d xylose and d lyxose theopharm so how from the same you know um series we are generating the different stereoisomers of carbohydrates and from this an aldo pentose i have generated the aldo hexoses you can see here in the from the aldo pentose here you know and i have drawn the aldo hexoseries structure you can see here that how from the five carbon and i have gone to the six carbon carbohydrates and where the stereo centers are varying in the threo erythro and threo form and that generates the possible from the d ribose d's and d altrus what is different over here from the d ribose you can see here the incoming new chiral center where in one case right side in the d's right side the hydroxyl and in the other and you know threos possibility it is on the left side and rest of the these you know and three stereocenters are same as in the case of d ribose in the both the you know possible stereoisomers of aldo hexoses same way in the case of d arabinose i have you know put the three stereo center same as in the case of d arabinos and the incoming and new chiral center having in one case and right hand side and other case it has the left hand side and similarly we have also drawn the structure

of you know other

aldo hexoses derived from the d xylose and d lysos the important thing here to remember

is monosaccharides that differ that differ in configuration at only one stereo center are asymmetric center are called epimers now i have introduced one new terminology epimers

so monosaccharides that differ in configuration at only one asymmetric center are called

epimers let me define epimers now i will draw two stereo isomers of you know aldopentoses here i am drawing a structure of aldo pentose and this is d ribose and another one i am writing d arabinose if you look over this structure these two centers are having same stereo center these two chiral center are having the same stereo

chemistry in both the sugars

so this is d ribose and this is d arabinose

so these two chiral center are having same stereo chemistry only at first one second one stereochemistry is different in one case it is hydroxyl group is right side to the you know carbon chain in other case it is left side to the carbon chain and hence since the stereochemistry is changing at the

two position these two becomes c two epimers c two epimers now i will give you another example of c three epimers where the stereochemistry will change at the three position

so let me draw the two stereoisomers where stereochemistry of the chiral center changes at the three position here i have taken example from the aldo hexoses

so this is d idose and the other one is d tylose

so this is d talose if you look over these two structures what is different the stereochemistry of c three position is opposite to each other and we have already defined that monosaccharides that differ in configuration at one chiral center are called epimers again i

am rephrasing the monosaccharides that differ in stereochemistry at one chiral center are called

epimers here i have shown you know two examples you know for the c two pairs and this one

is one two three this is c three epimers c three epimers now i will take some practice problem to make you understand in a better way

so let us have some problem now i am raising a question r d irre throws and l it throws enantiomer are diastomers let me write the structure

of both l erythrose and d erythrose

so first i will draw a erythrose

so this is allerythrose and here i am writing d edith throws let me explain this problem before

going into the detail of this problem i will again like to remind you that the classification of sugars we started through the d and l ah you know convention

so for

the aldo trioses we started that ok if a hydroxyl group is on the right side so that will like you

know if it is similar to the d glyceraldehyde then it will become the d sugar and if it is similar

to ah to the you know ah l glyceraldehyde where hydroxyl group lies on the you know left side

then it is l sugar

so that that is very clear from the eldo trios now we are going to the eldo tetros

so here i have you know erythrose as i mentioned in the case of erythros the another

incoming you know chiral center where the hydroxyl group lies on the same side what already available

in the you know um i mean sugar

so here you can see in the case of erythrose these two hydroxyl groups are on the same side and in the case of d erythros again these two hydroxyl group are the

same sides and if you look where philly carefully these two are basically mirror images of

each other since both the compounds are since both the compounds are mirror image hence both are enhanced humors both are noninsumers now i will take another problem r l erythrose and l three o's enantiomers are diastereomers let me draw the structure of um early throws we have already drawn it in the first problem

so al erythros and o's as i mentioned that this is three o's then you know hydroxyl group will be on the opposite side of the carbon chain this is l threes

so erythros where the hydroxyl group on the same side of the carbon chain and three rows where the hydroxyl groups are opposite side of the

carbon chain now look over these two stereo mers since the one chiral center is same in

the both in allery throws and l throws whereas the other chiral center is opposite hence it becomes diastereomer i would like to recap again ah in

so far what we have discussed in the eldoses i mean configuration of eldoses all the you know aldo tetroses eldo pentoses and aldo hexoses we discuss the d

series and similarly the ah l series can be drawn now i will talk about the configuration of ketosis configuration of ketosis

configuration of the d ketosis d ketosis first i will draw the structure of dihydroxyacetone dihydroxyacetone as ketosis will have the carbonyl group ketone group in its framework and the you know hydroxyl containing ah carbons attached to it

so here ah the very first member of d ketosis is you know i mean ketosis is dihydroxyacetone then i will go to the another ah possible member

of this series which has one stereo center

so this is d eryth through lows d irre through flows it has one chiral center and ketonic group and the two hydroxyl containing ah carbon now i will go to the five carbon containing ketosis

so from d it through lows i will increase one chiral center again the way we draw in the case of eldoses

so this is the new chiral center and the remaining from the d elite through lows

so now it has one two three four five five

carbon and two chiral center this is d ribulose in aldosis we were pronouncing it as a ribose but

here ullos you know in all these cases you will you know have the suffix ulos the other possible where the new chiral center will have you know opposite stereochemistry and this becomes d zyllum lows now ah i will go to the keto hexoses ketohexoses

so it will have six carbon d ribou lows from this one i will introduce the another stereo center and this will give you the six carbon chain this is the new stereo center new chiral center and this one is known as d c cos the other possibility where the hydroxyl group will be on the left side the new is

chiral center will have opposite stereochemistry and this is known as d fructose and the other two possible stereoisomer of the ketohexoses from the g d xylo lows

so in first case it will have hydroxyl group on the right side and the other two

chiral center will be the same from the desyl lows and this is known as d sarbose the last one of ketohexoses sorry this will be where the hydroxyl group on the left side and other chiral centers

are same from the d xylulose and this is known as d tagatos d tagatos

so d fructose d serbos d tagatoes now i would like to discuss the structural formulas of monosaccharides that how to ah draw the structure of formulas i have already

introduced the ah structures of aldo hexoses and ketosis there we saw that how ah in

the case of eldoses we saw aldo trioses eldo tetroses eldopentoses aldo hexoses and

in the case of ketosis we saw ah keto ah tetrosis ketopentoses and ketohexoses now i would like to emphasize on the

structures that you know how to represent structural formulas for monosaccharides now i will like to discuss the structural formula for monosaccharides emil fisher introduced a format for representing the structures of sugars

so fisher represented the structure of d glucose in two dimensional format with the cross formulation this type of formulation is now called a fisher projection this type of formulation is called fischer projection let me draw the structure of d glucose in fisher projection

so in two dimensional format and as i mentioned that cross formulation glucose is aldose

so i have put aldehyde group and the other you know hydroxyl group on the carbon chain in the cross formulation

so this is the fischer projection formula formula of d glucose now i will draw waste line dashed based formula in the wasteland dashed waste formula the solid line project towards us and the dotted line projects away from us

so the same fisher projection formula i am writing in as i mentioned that dotted line indicates that you know that functional group lies away from us and the solid line indicates that the functional groups attached

to the carbon are projecting towards us

so this is ways line dashed base formula

so this is the fisher projection formula where you know functional groups are available in the class formulation and ah in the

ways line dashed based  
formula where the dotted line indicates that functional group is lying away  
from us whereas  
the solid line indicates that functional group is projecting towards us  
so these two aldehyde and  
CH<sub>2</sub>OH is lying away from us and other hydroxyl and hydrogen are projecting  
towards us now i will stop  
here ah let me ah recap ah the all the discussion of this lecture ah we have  
discussed structure of  
aldose configuration of Fischer configuration of ketose we have also  
discussed erythro  
and threo ah we have ah started discussing now Fischer projection of formula  
and  
in the next class i will start with the other type of formula like Haworth  
projection  
formula thank you very much for the attention you