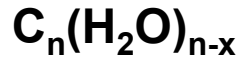


OLIGOSACCARIDI

Formula generale:



x = 1: DISACCARIDE (2 unità monosaccaridiche)

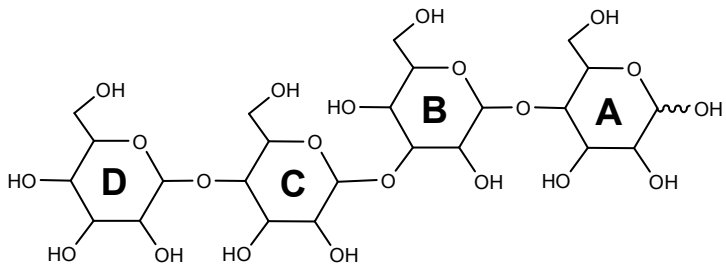
x = 2: TRISACCARIDE (3 unità monosaccaridiche)

x = 3: TETRASACCARIDE (4 unità monosaccaridiche)

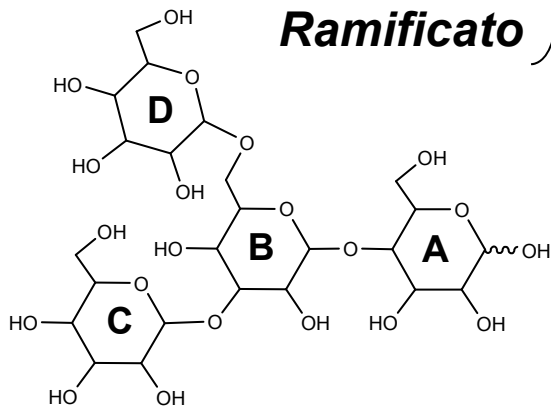
.....

x > ~20: POLISACCARIDE

Lineare

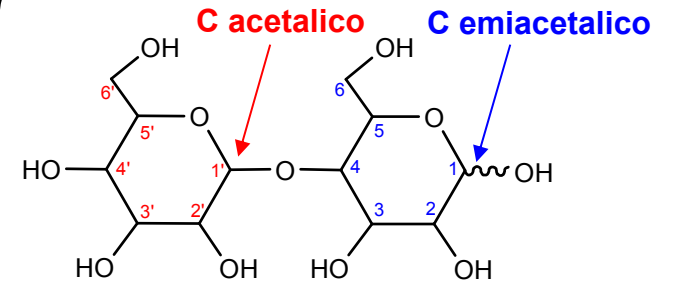


Ramificato



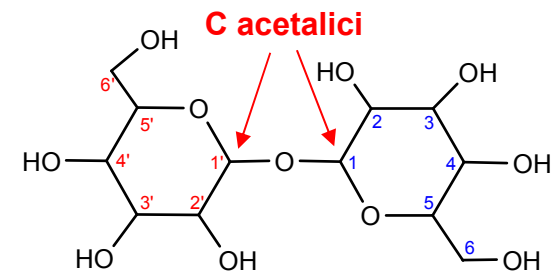
OLIGO SACCARIDE

Riducente



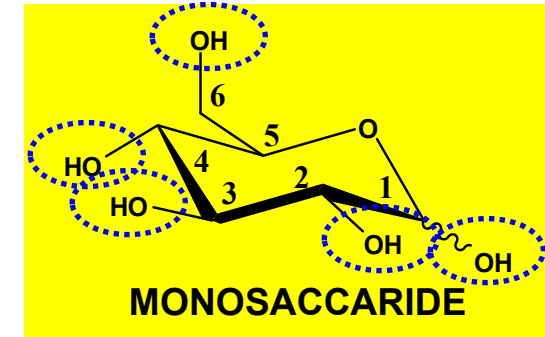
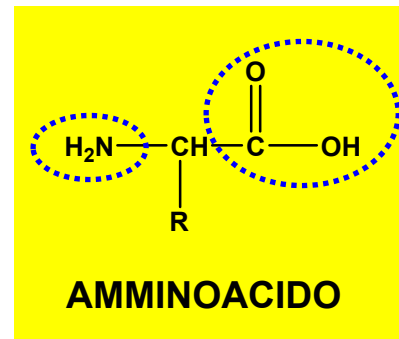
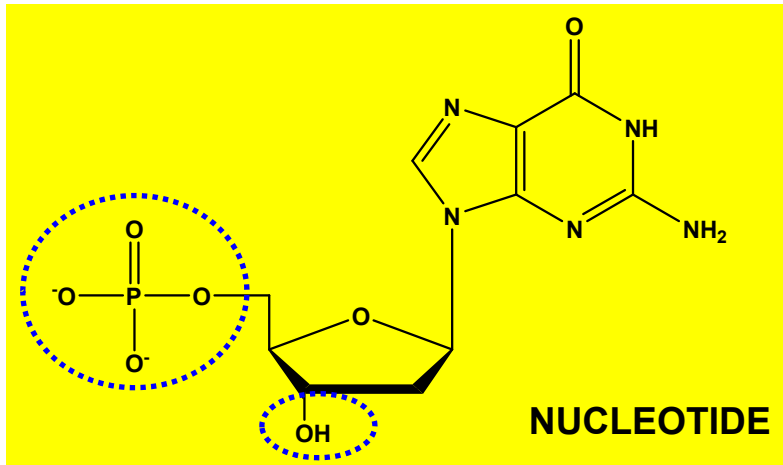
legame 1→4 glicosidico

Non Riducente



legame 1→1 glicosidico

OLIGOSACCARIDI vs. OLIGONUCLEOTIDI e OLIGOPEPTIDI

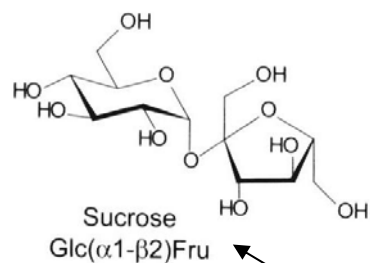


Numbers of different oligomers

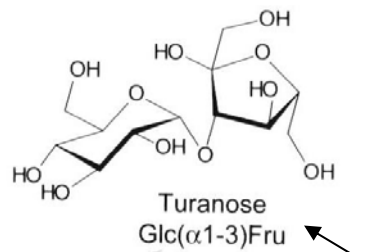
Oligomer size	Nucleotides	Peptides	Carbohydrates
1	4	20	20
2	16	400	1,360
3	64	8,000	126,080
4	256	160,000	13,495,040
5	1,024	3,200,000	1,569,745,920
6	4,096	64,000,000	192,780,943,360

The numbers for the carbohydrates are based on the "10 mammalian" monosaccharide units. Branching is also taken into account

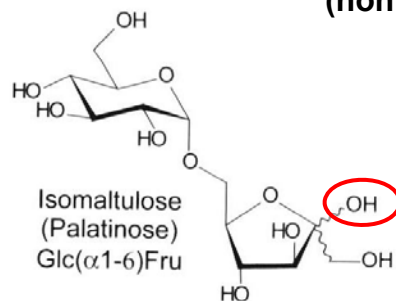
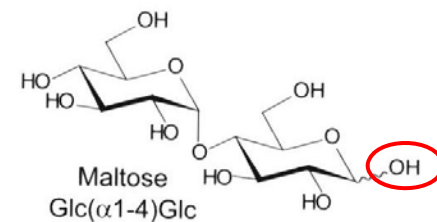
DISACCARIDI



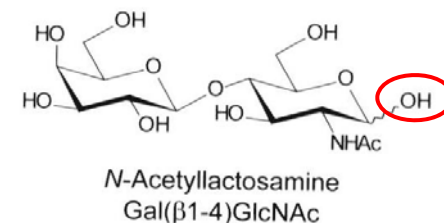
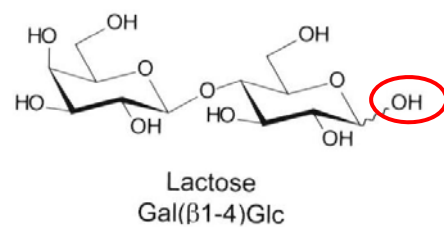
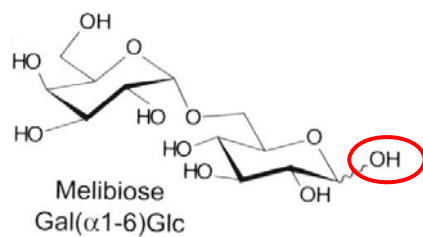
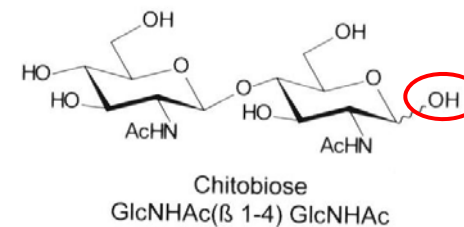
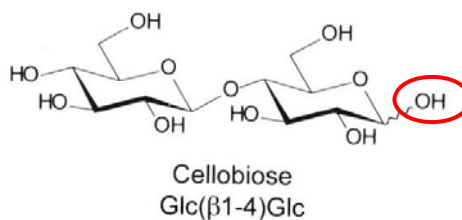
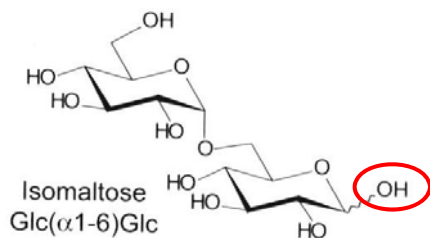
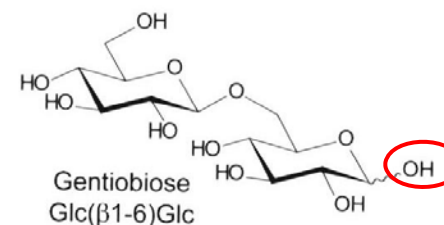
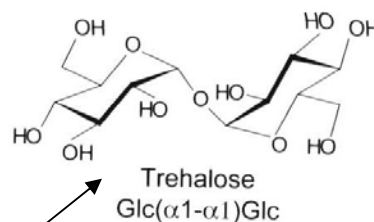
(non riducente)



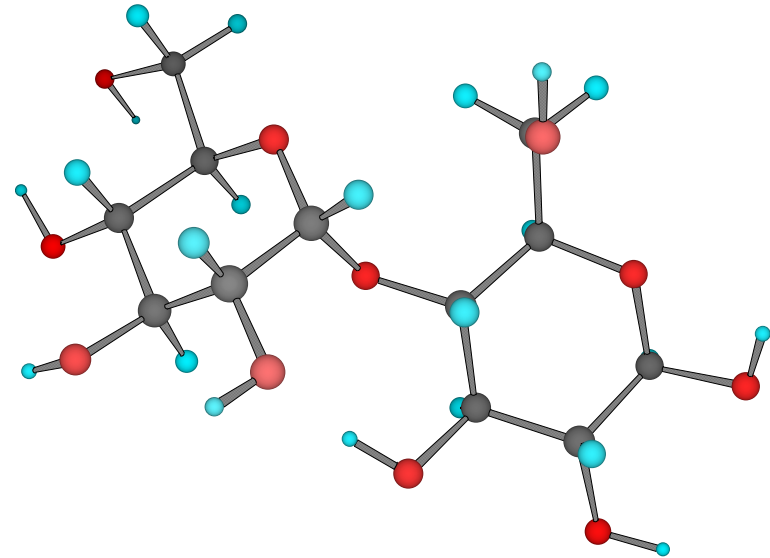
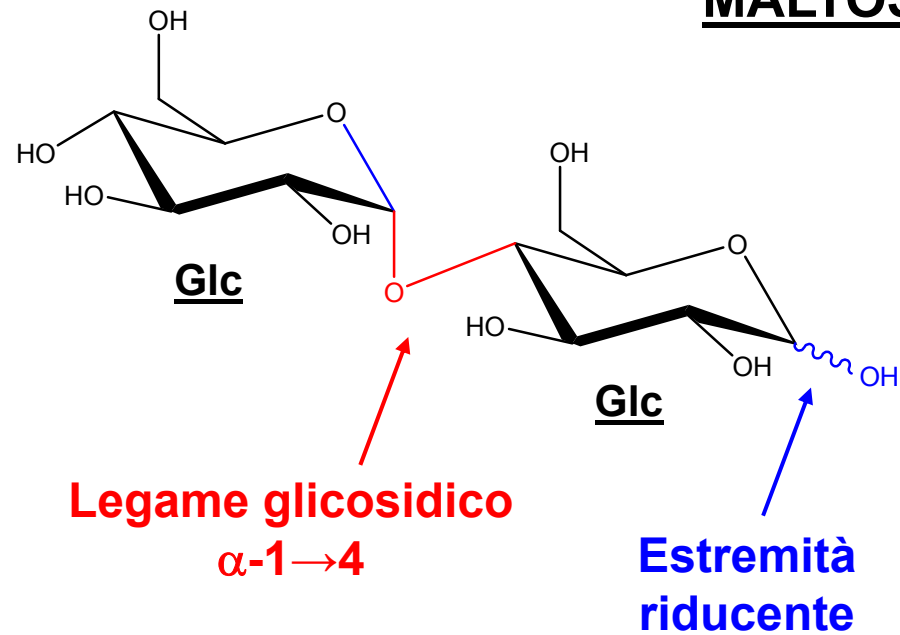
(non riducente)



(non riducente)

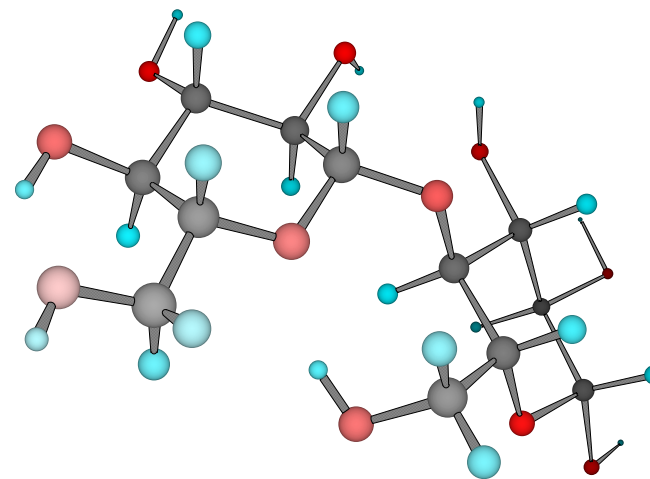
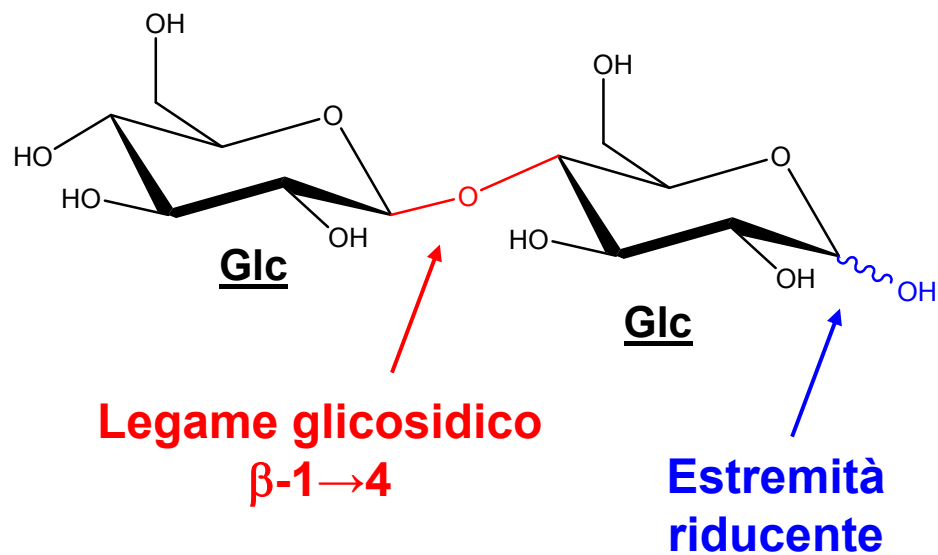


MALTOSIO



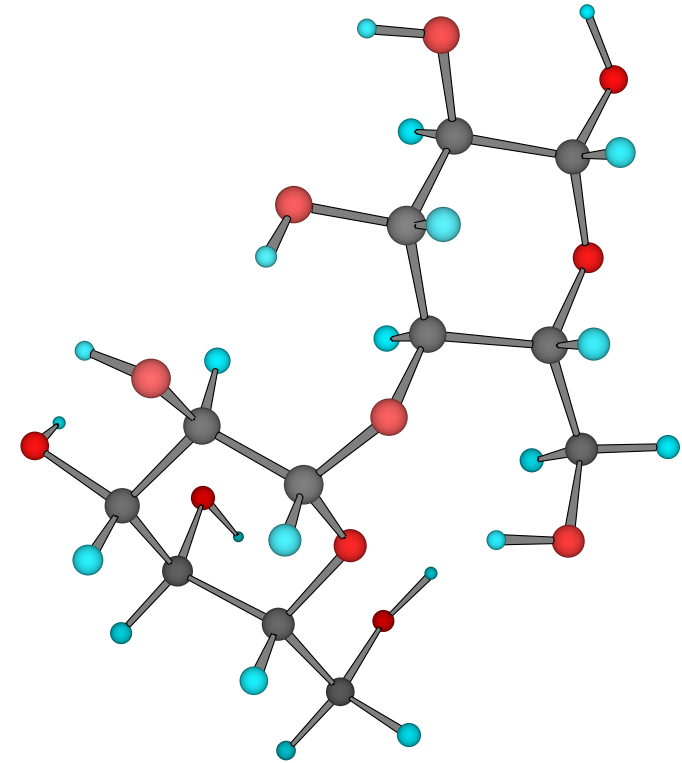
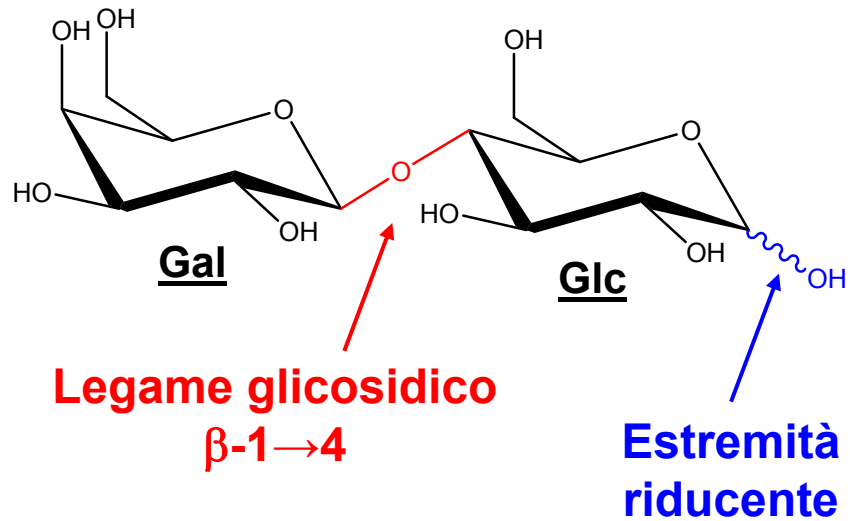
- ❖ α -D-glucopiranosil-(1 \rightarrow 4)-D-glucopiranoside
- ❖ Prodotto dall'amido ad opera dell'amilasi maltogenica

CELLOBIOSIO



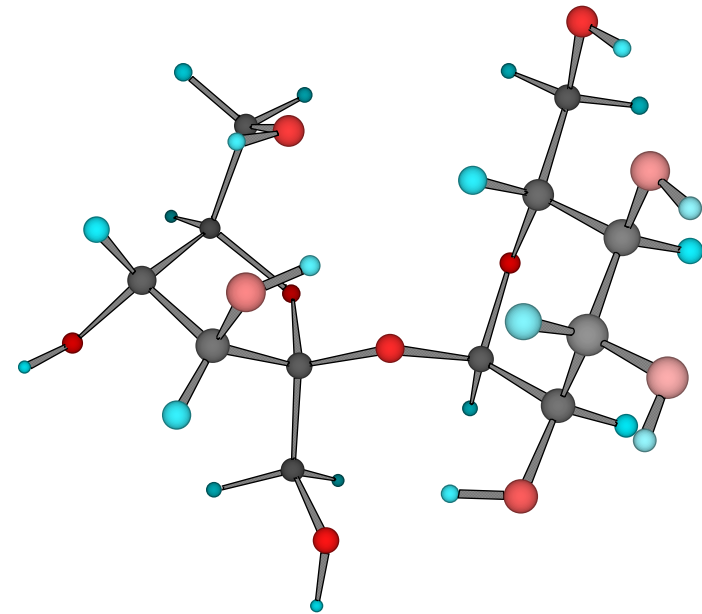
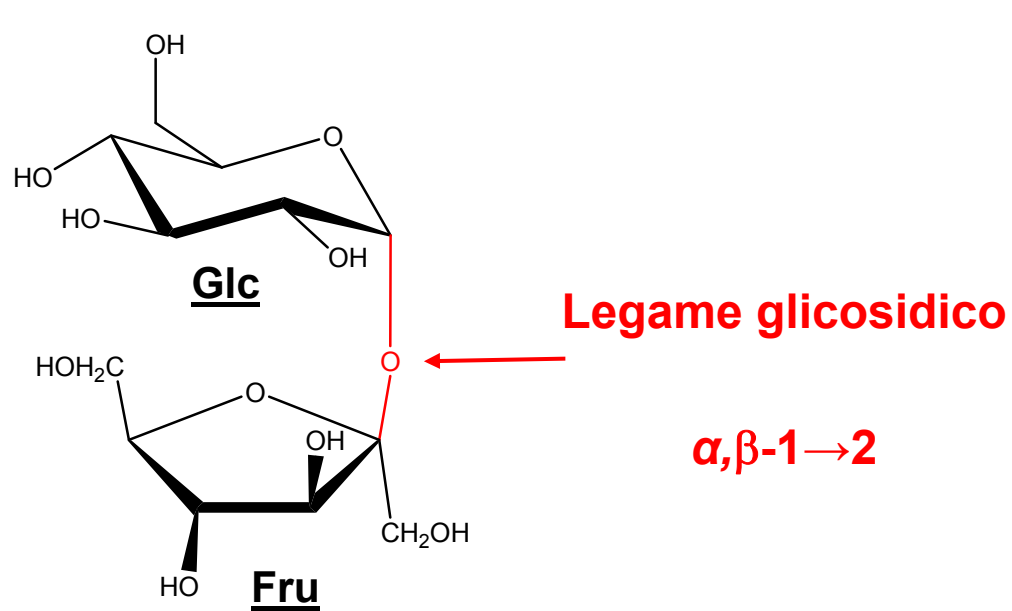
❖ β -D-glucopiranosil-(1 \rightarrow 4)-D-glucopiranoside

LATTOSIO



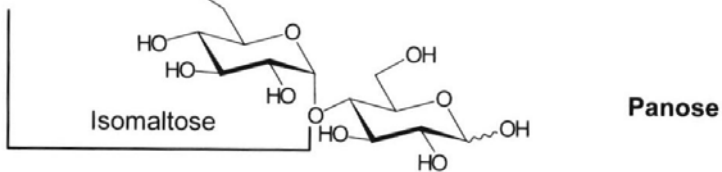
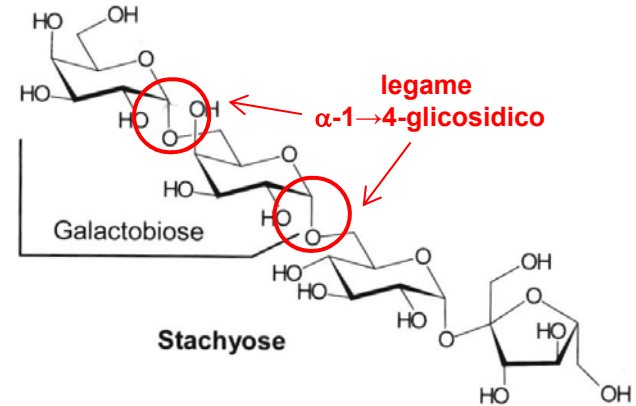
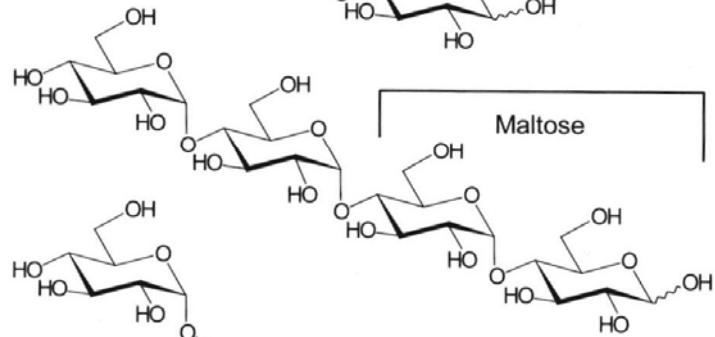
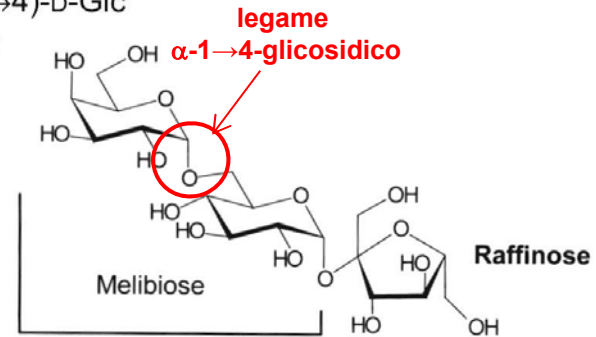
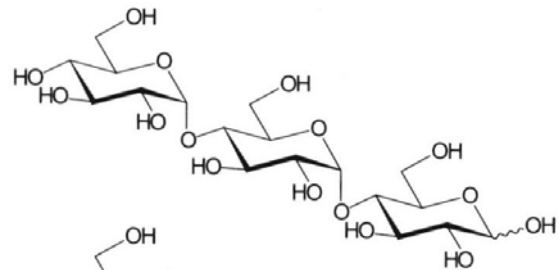
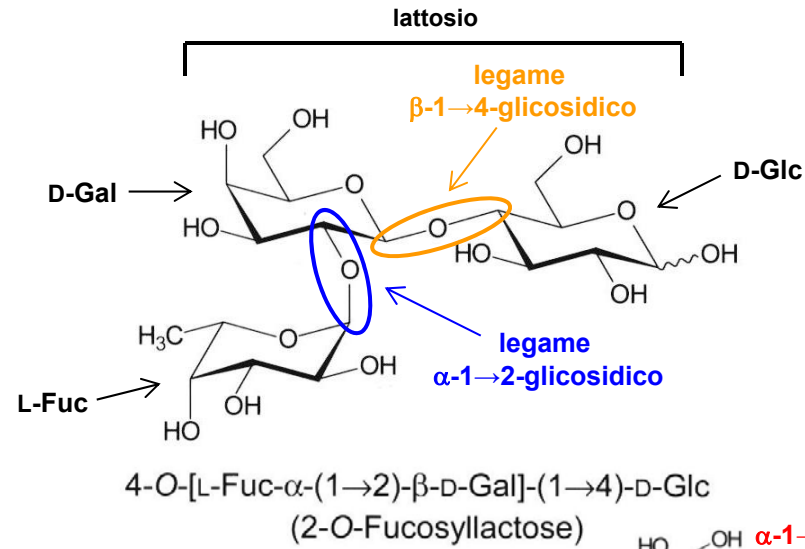
- ❖ β -D-galattopiranosil-(1 \rightarrow 4)-D-glucopiranoside
- ❖ Disaccaride presente nel latte
- ❖ Spesso causa di intolleranza alimentare

SACCAROSIO



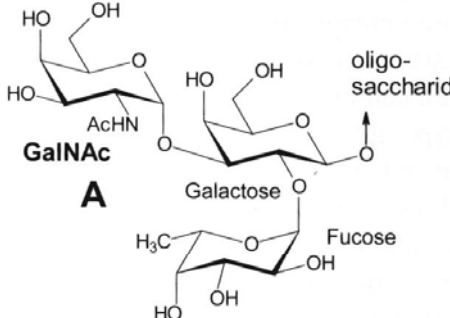
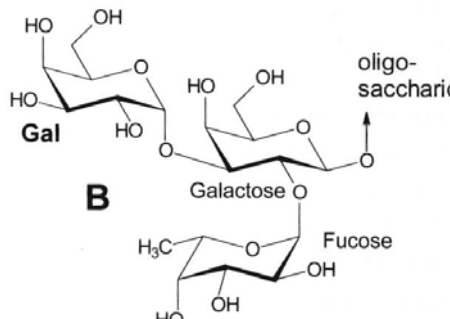
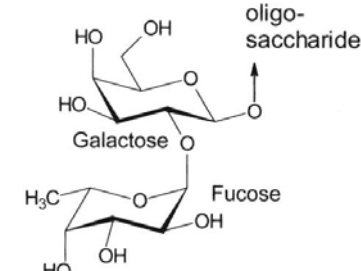
- ❖ α -D-glucopiranosil- β -D-fruttofuranoside o β -D-fruttofuranosil- α -D-glucopiranoside
- ❖ Non è un disaccaride riducente
- ❖ L'idrolisi si segue al polarimetro: da $+66^\circ$ a valori negativi da cui "zucchero invertito"
- ❖ Largamente usato come dolcificante

TRI- & TETRASACCARIDI



OLIGOSACCARIDI ANTIGENICI DEI GRUPPI SANGUIGNI

Table 7-1. The ABO blood group system.

Phenotype of red cells	Minimal determinant saccharide (blood group antigen)	Antibodies found in plasma	Glycosyltransferases expressed
A	 <p>GalNAc A</p>	anti-B	α -1,3-GalNAc transferase
B	 <p>Gal B</p>	anti-A	α -1,3-Gal transferase
AB	A and B	—	α -1,3-GalNAc transferase and α -1,3-Gal transferase
O	 <p>H</p>	anti-A and anti-B	

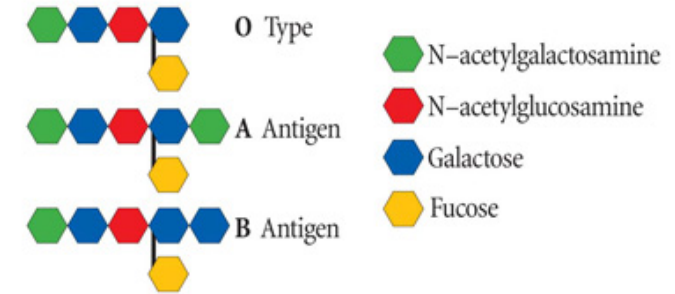


Figure 1. ABO antigen specificity. The ABO antigens differ by just one sugar at the antigen terminus. Only the carbohydrate portion of the antigen is illustrated.

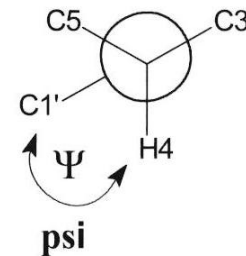
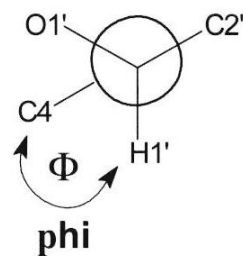
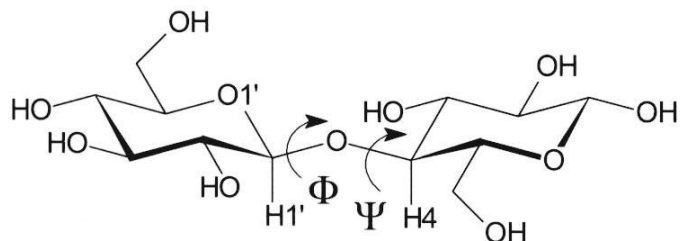
Donatore universale di globuli rossi è il gruppo O, può riceverlo solo da un donatore O.

Il gruppo AB può donarlo solo ad un AB, ma può riceverlo da tutti

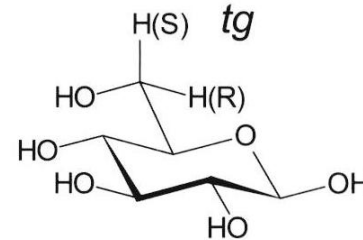
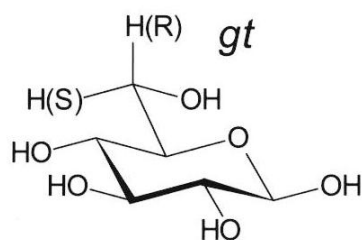
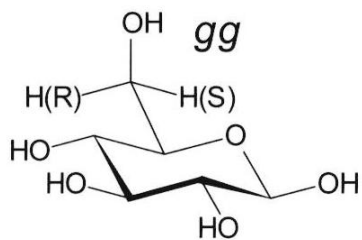
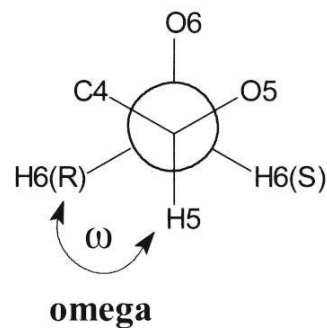
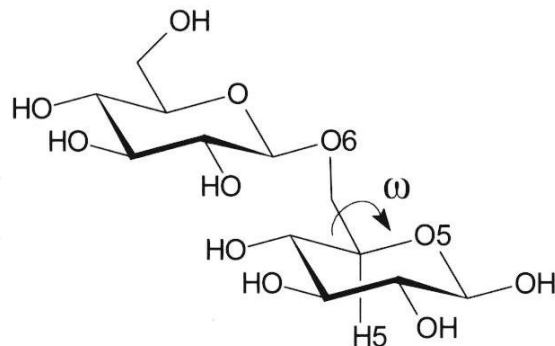
N.B.: In realtà sono stati identificati anche altri gruppi sanguigni molto rari o rarissimi (molti di questi in India)

ANALISI CONFORMAZIONALE DI OLIGOSACCARIDI

- Legami 1→1, 1→2, 1→3, 1→4 e 1→6 glicosidici:



- Legami 1→6 glicosidici:



OLIGOSACCARIDI CICLICI

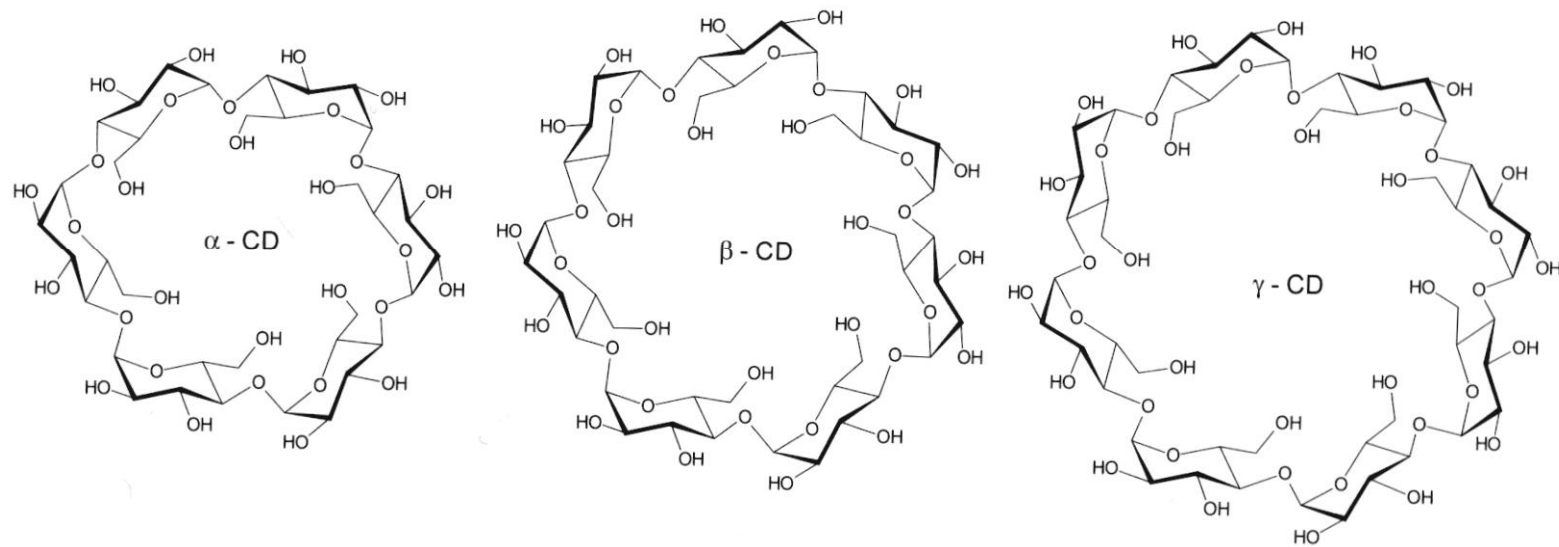
Ciclodestrine: - molecole coniche con cavità di dimensioni ben definite

- cavità idrofobica e parte esterna idrofila

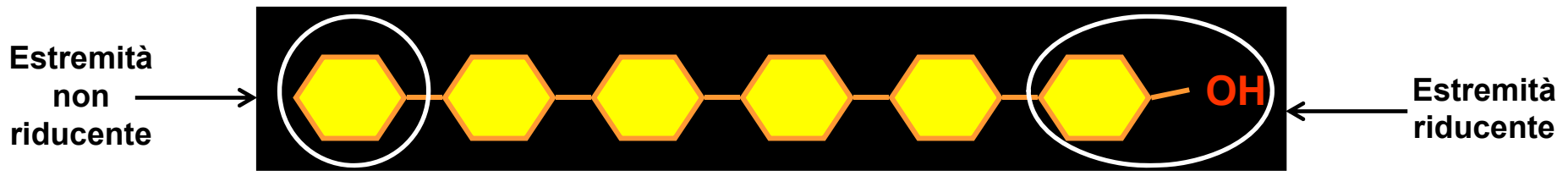
- preparabili in vasta scala dall'amido

- vettori di sostanze idrofobiche in acqua attraverso la formazione di complessi d'inclusione

- applicazioni nel campo del drug delivery



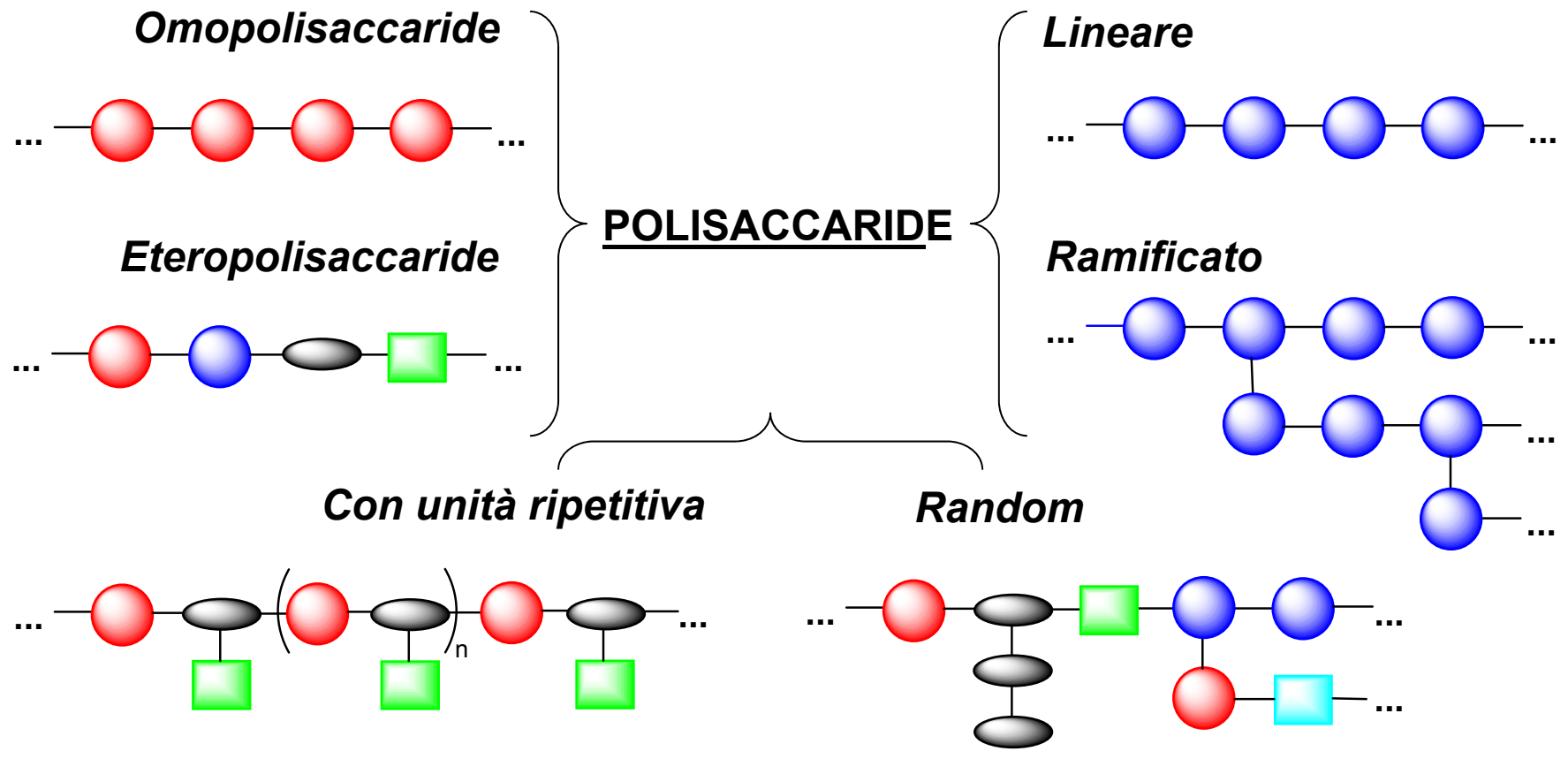
POLISACCARIDI



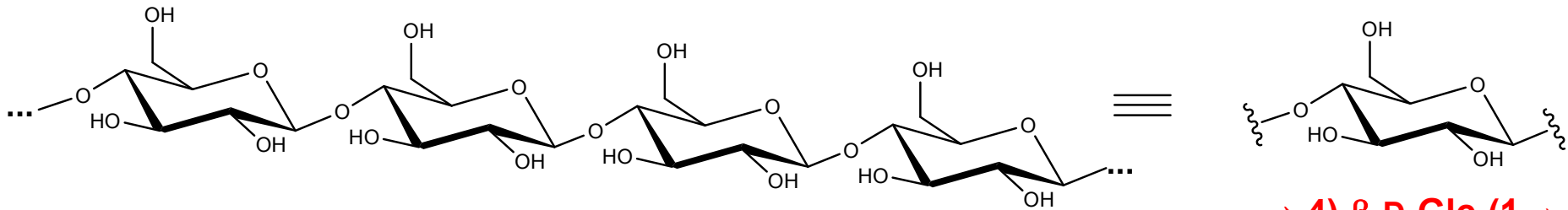
$P_M \sim 5 \cdot 10^3 - 1 \cdot 10^8$ dalton (Da)

d.p. = degree of polymerization = numero di monosaccaridi costituenti

I = indice di polidispersione = indice di distribuzione dei pesi molecolari

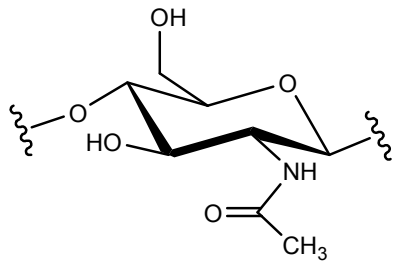


CELLULOSA



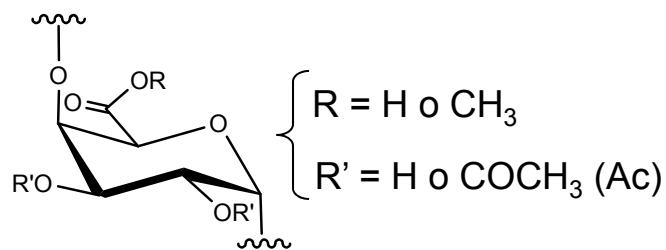
→ 4)- β -D-Glc-(1→

CHITINA



→ 4)- β -D-GlcNAc-(1→

PECTINA



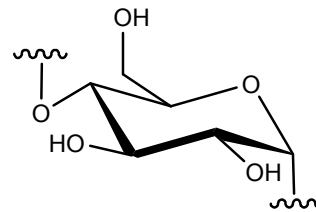
→ 4)- α -D-GalA-(1→

AMIDO

~ 10-20%

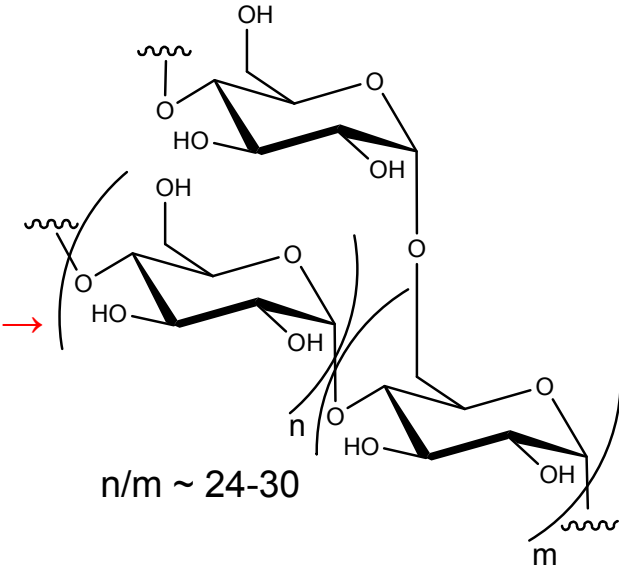
~ 80-90%

AMILOSIO

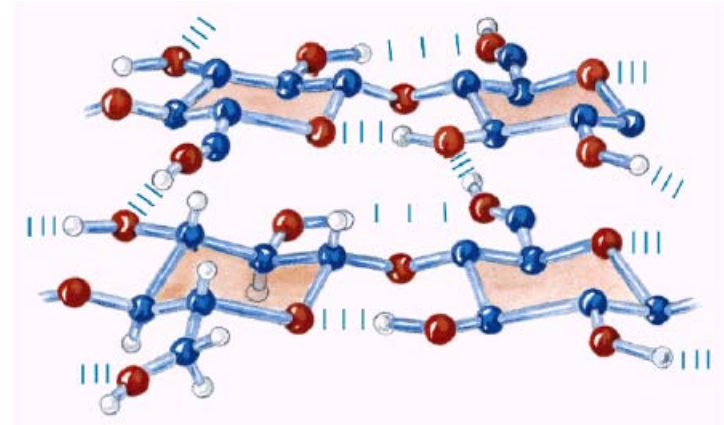
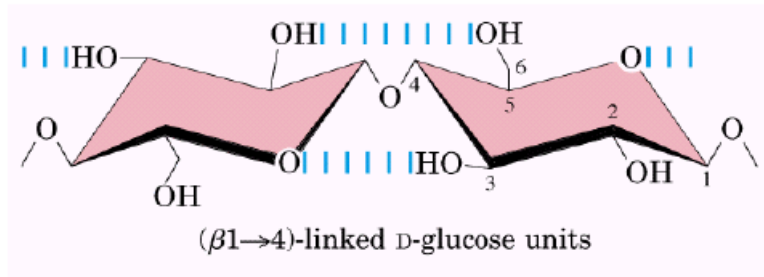


→ 4)- α -D-Glc-(1→

AMILOPECTINA

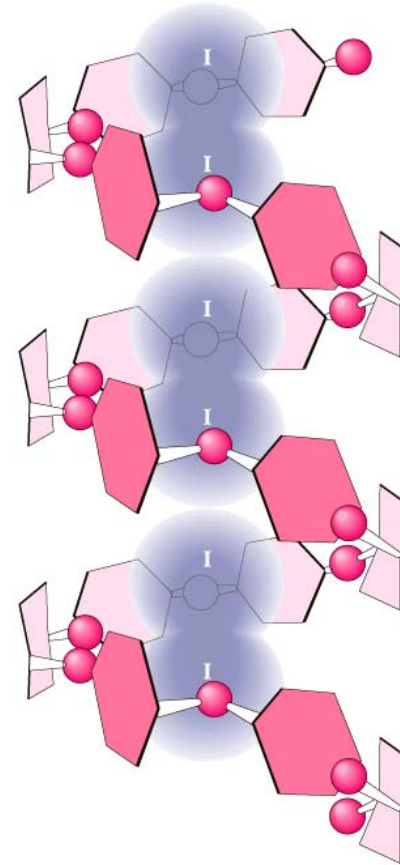
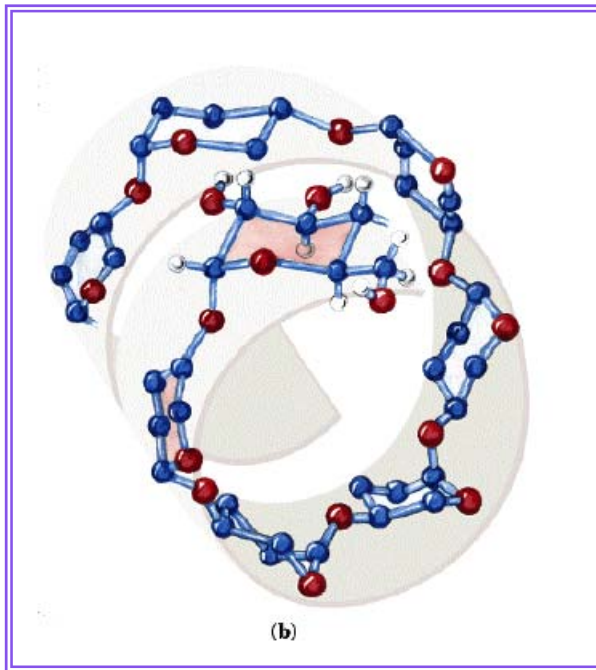


CELLULOSA



- ✚ Polisaccaride lineare costituito da un'unità ripetitiva di β-D-glucopiranosio 1→4 legato
- ✚ **Funzione di sostegno nelle piante**
- ✚ Il legno è costituito per circa il 50% da cellulosa
- ✚ **La fibra di cotone è costituita per circa il 90% da cellulosa**
- ✚ Struttura tridimensionale lineare stabilizzata da legami idrogeno
- ✚ **Insolubile in H₂O**
- ✚ **Non digeribile**

AMIDO



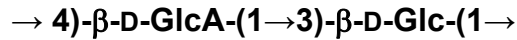
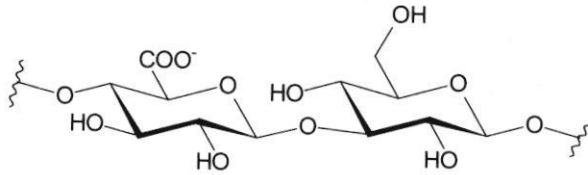
- ✚ Polisaccaride costituito da α -D-glucopiranosio organizzato per ~10-20% in strutture lineari tipo amilosio e per ~80-90% in strutture ramificate tipo amilopectina
- ✚ Contiene fino ad un milione di unità di glucosio ($P_M \sim 10^8$ Da), il che lo rende tra le molecole a più alto peso molecolare esistenti in Natura
- ✚ Funzione di riserva energetica nelle piante
- ✚ L'amido è poco solubile in acqua e forma delle sospensioni di tipo micellare
- ✚ Ogni catena assume una struttura tridimensionale ad elica

GLICOGENO

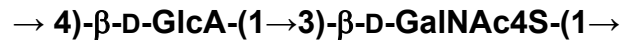
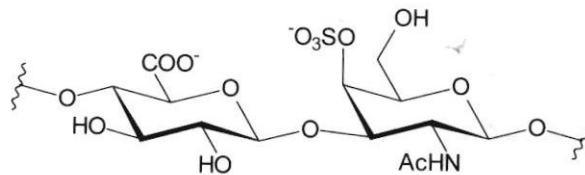
- ✚ Polisaccaride costituito da α -D-glucopiranosio
- ✚ **Struttura simile all'amilopectina**
 - ✚ **Le ramificazioni in 6 sono più frequenti (ogni ~8-12 unità di Glc contro le ~24-30 dell'amilopectina nell'amido)**
- ✚ **Struttura tridimensionale molto compatta**
- ✚ **Funzione di riserva energetica negli animali - tra cui l'uomo - presente in tutte le cellule con prevalenza nei muscoli scheletrici e nel fegato (alta concentrazione di glucosio libero non compatibile con la vita della cellula: shock osmotico)**
- ✚ **Per uso metabolico il glicogeno è degradato dall'unità non riducente ad opera della glicogeno fosforilasi che libera unità di glucosio-1-fosfato, a sua volta convertito dalla fosfoglucomutasi in glucosio-6-fosfato (→glicolisi, →gluconeogenesi)**

GLICOSAMMINOGLICANI (GAG)

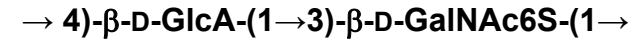
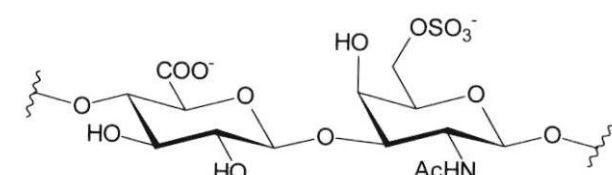
ACIDO IALURONICO



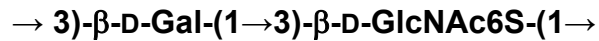
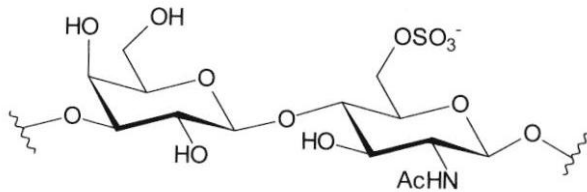
CONDROITINA 4-SOLFATO



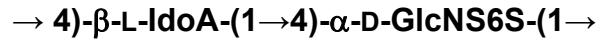
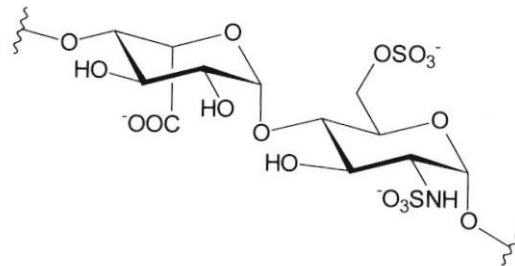
CONDROITINA 6-SOLFATO



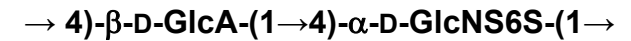
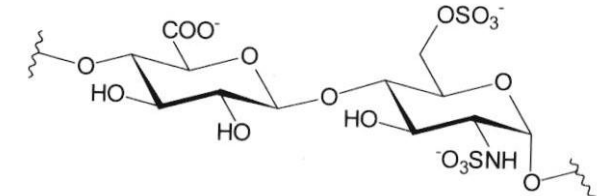
KERATAN SOLFATO



EPARINA



EPARAN SOLFATO



Tutti i glicosamminoglicani (tranne l'acido ialuronico) presentano eterogeneità nelle posizioni di solfatazione e/o nella presenza di altri componenti monosaccaridici minoritari