Heterocyclen

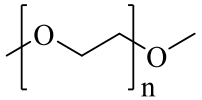
Wichtige Heterocyclen

Ethylenoxid
Oxiran

Substanzgruppe:
Epoxide

Darstellung:
Alken+Persäure

Polyethylenglycol (PEG):



Thiiran

Substanzgruppe:
Episulfide

Aziridin

Substanzgruppe:
Aziridine

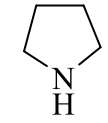
Tetrahydrofuran
THF

Furan

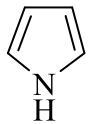
Substanzgruppe:
Furane

Thiophen

Substanzgruppe:
Thiophene

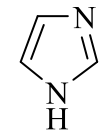


Pyrollidin

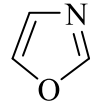


Pyrrol

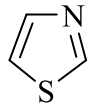
Substanzgruppe:
Pyrrole



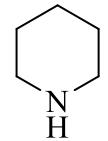
Imidazol



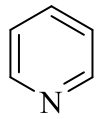
Oxazol



Thiazol

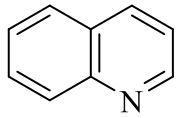


Piperidin

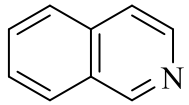


Pyridin

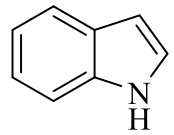
Substanzgruppe:
Piperidine



Chinolin

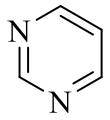


Isochinolin

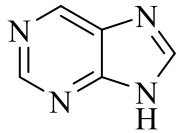


Indol

Bestandteil von
Tryptophan



Pyrimidin

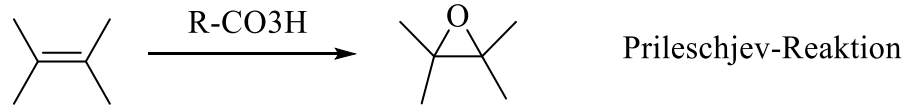


Purin

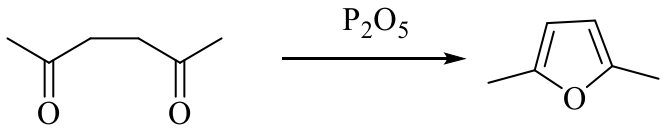
Bestandteil
von DNA

Heterocyclen

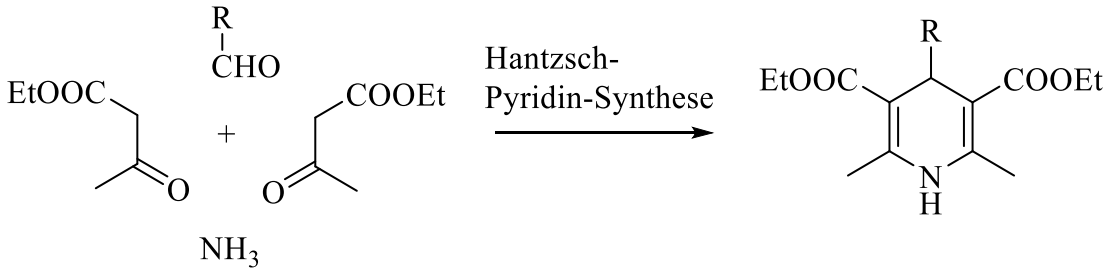
Einige wichtige Synthesen

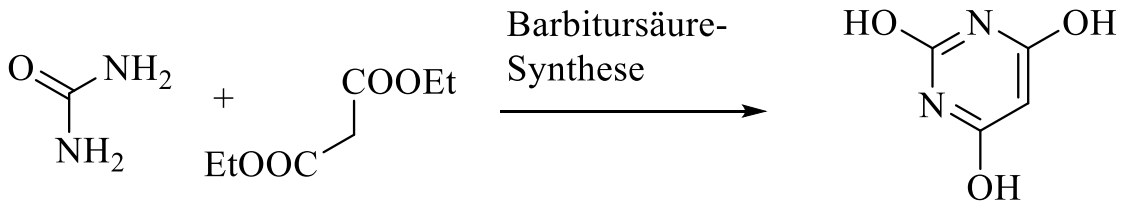


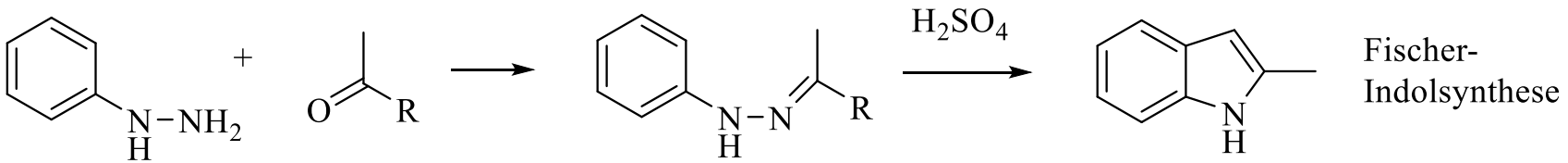
Prileschjev-Reaktion



Paal-
Knorr-Synthese



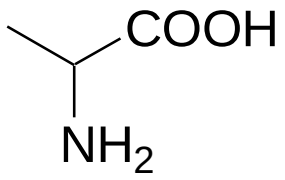




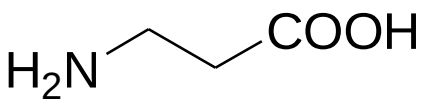
Fischer-
Indolsynthese

Naturstoffe

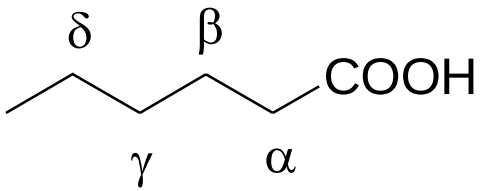
Aminosäuren



α-Alanin (chiral)

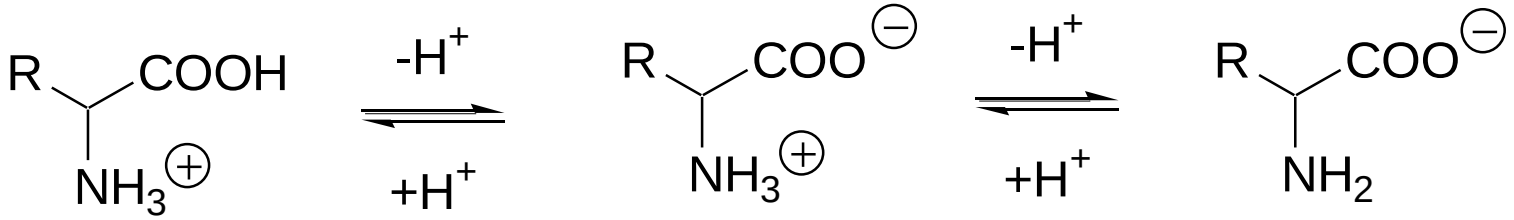


β-Alanin (achiral)



Chemische Eigenschaften

Aminosäuren sind meist kristalline Feststoffe und liegen als Zwitterionen vor. Den pH-Wert, bei dem eine Aminosäure in der (nach außen ungeladenen) zwitterionischen Form vorliegt wird Isoelektrischer Punkt (IP) genannt. Der IP ist für jede Aminosäure charakeristisch.



im Sauren

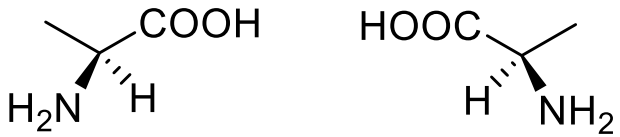
"neutral"
pH = IP

im Basischen

Aminosäuren

Einteilung der Aminosäuren:

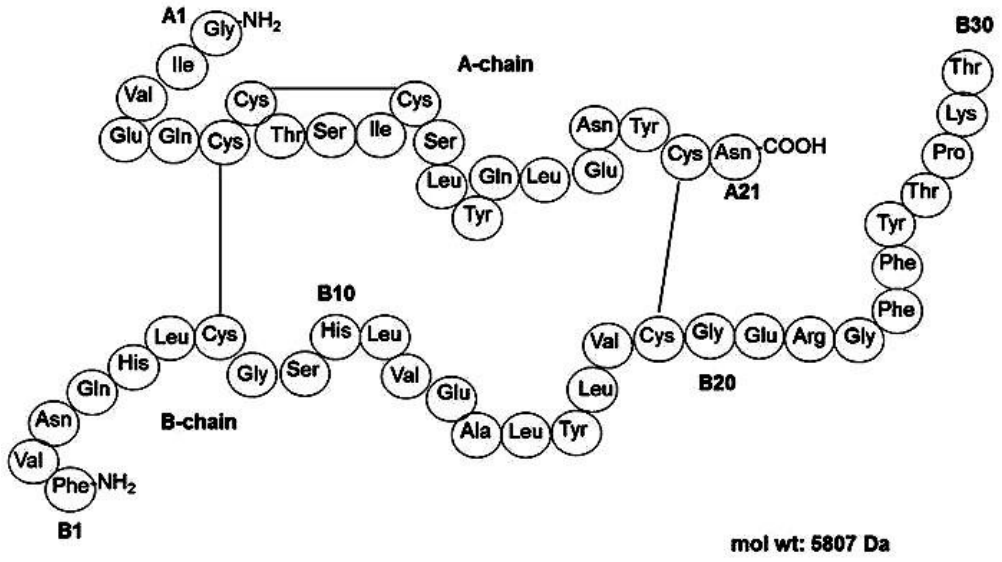
Chiralität:
In der Natur fast ausschließlich L-AS



L-Alanin
(S)-Alanin

D-Alanin
(R)-Alanin

Proteinogene Aminosäuren:
Aminosäuren,die in Proteine eingebaut werden.

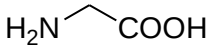


Essentielle Aminosäuren: Aminosäuren, die mit der Nahrung aufgenommen werden müssen (Mensch).

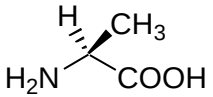
L-Valin, L-Leucin, L-Isoleucin, L-Phenylalanin, L-Threonin, L-Methionin, L-Tryptophan, L-Lysin

Proteinogene Aminosäuren

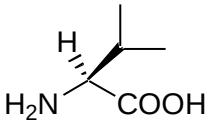
a) AS mit unpolarem Rest:



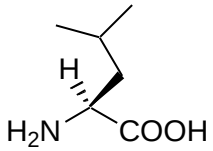
L-Glycin (Gly)



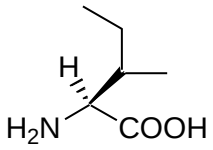
L-Alanin (Ala)



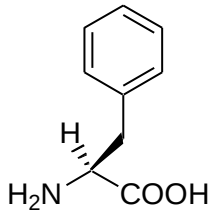
L-Valin (Val)



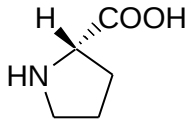
L-Leucin (Leu)



L-Isoleucin (Ile)

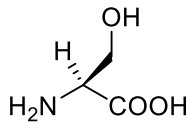


L-Phenylalanin (Phe)

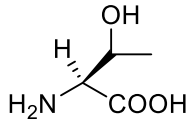


L-Prolin (Pro)

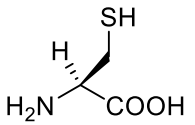
b) AS mit polarem, nicht ionisierbarem Rest:



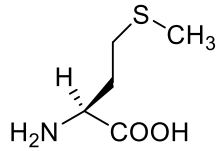
L-Serin (Ser)



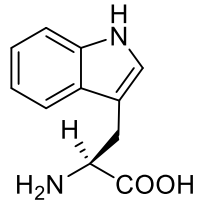
L-Threonin (Thr)



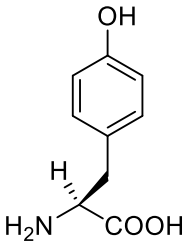
L-Cystein (Cys)



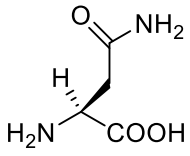
L-Methionin (Met)



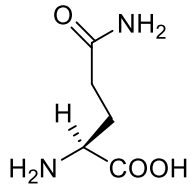
L-Tryptophan (Trp)



L-Tyrosin (Tyr)

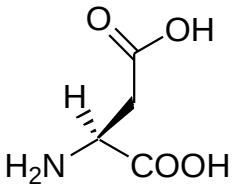


L-Asparagin (Asn)

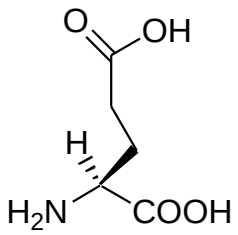


L-Glutamin (Gln)

c) polare <u>saure</u> AS mit ionisierbarem Rest:

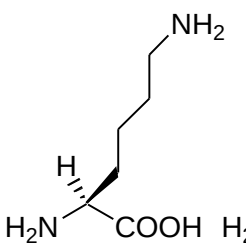


L-Asparaginsäure (Asp)

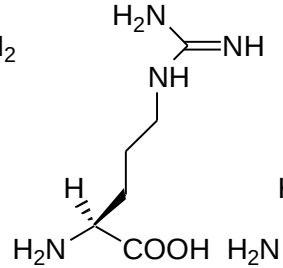


L-Glutaminsäure (Glu)

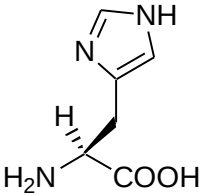
d) polare <u>basische</u> AS mit ionisierbarem Rest:



L-Lysin (Lys)



L-Arginin (Arg)



L-Histidin (His)

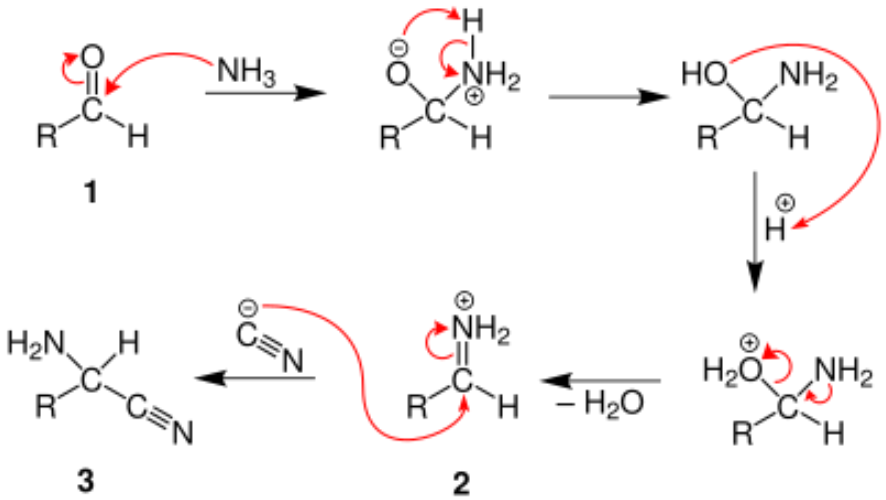
Aminosäuresynthesen

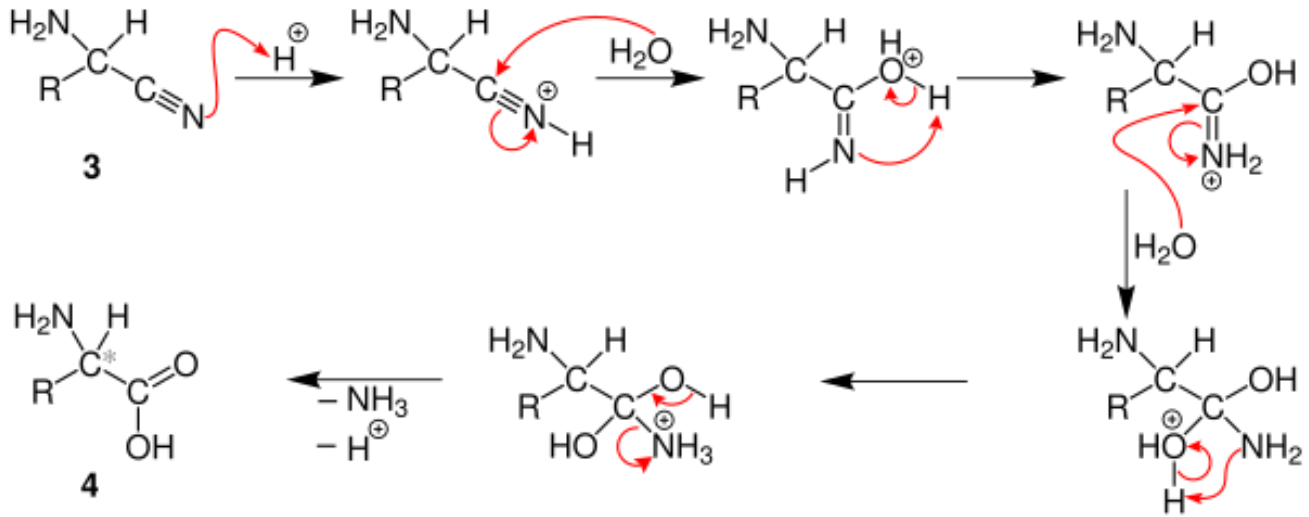
Bedarf an Aminosäuren
- Jahresproduktion ca. 1,6 Millionen Tonnen
- Glutaminsäure: 650 000 Tonnen
- D,L-Methionin: 450 000 Tonnen
- L-Lysin: 450 000 Tonnen
- L-Threonin: 30 000 Tonnen

Verwendung:
- Lebensmittelindustrie: Geschmacksverstärker, Süßstoffe (Glu, Gly, Cys)
- Futtermittelindustrie: Tierernährung (Met, Lys, Trp, Thr)
- Pharmaindustrie: Medikamente, Infusionslösungen (Acetyl-Cys, L-DOPA)
- Kosmetika, Pflanzenschutzmittel, Stabilisatoren für PVC, Dispersionshilfen, Hilfsmittel in der Galvanotechnik

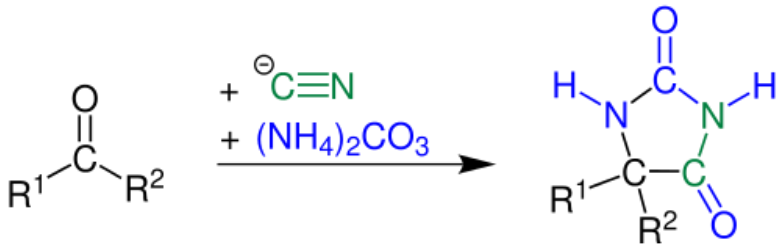
Herstellungsmethoden
- Extraktionsmethode (Cystein Tyrosin Prolin aus Kollagen)
- Enzymatische Methoden (L-Leucin, L-Methionin)
- Fermentationsmethode (L-Glutaminsäure aus D-Glucose)
- Chemische Synthesen

Strecker-Synthese

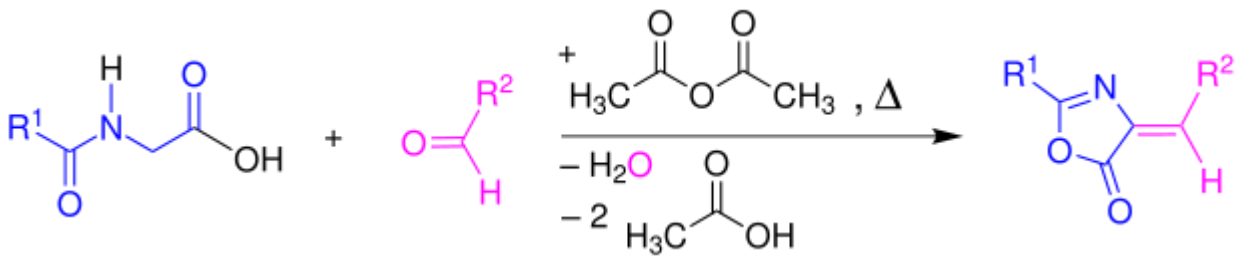


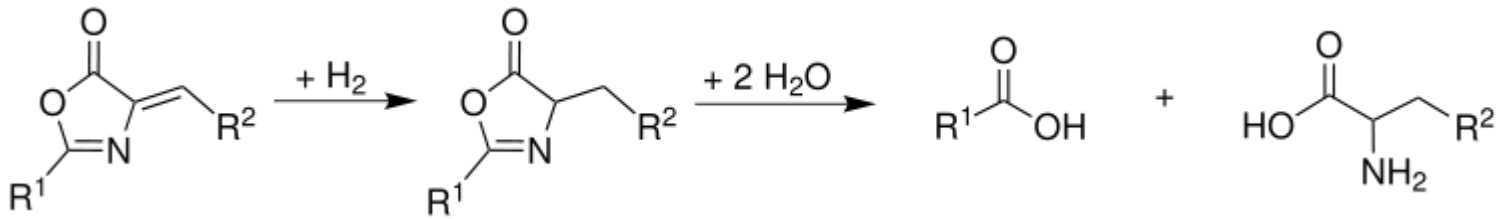


Bucherer-Bergs-Synthese

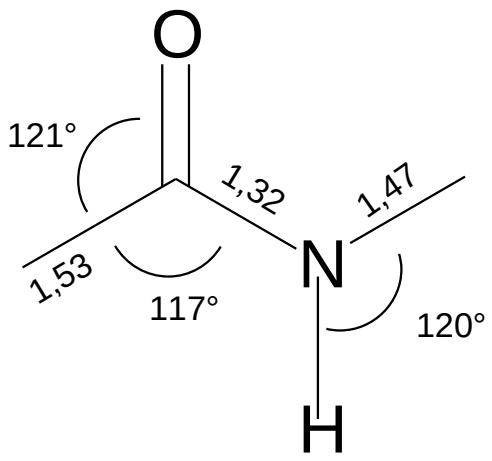


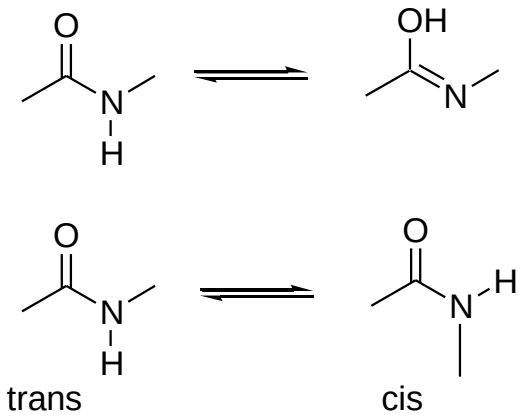
Erlenmeyer-Synthese (Azlacton-Synthese)

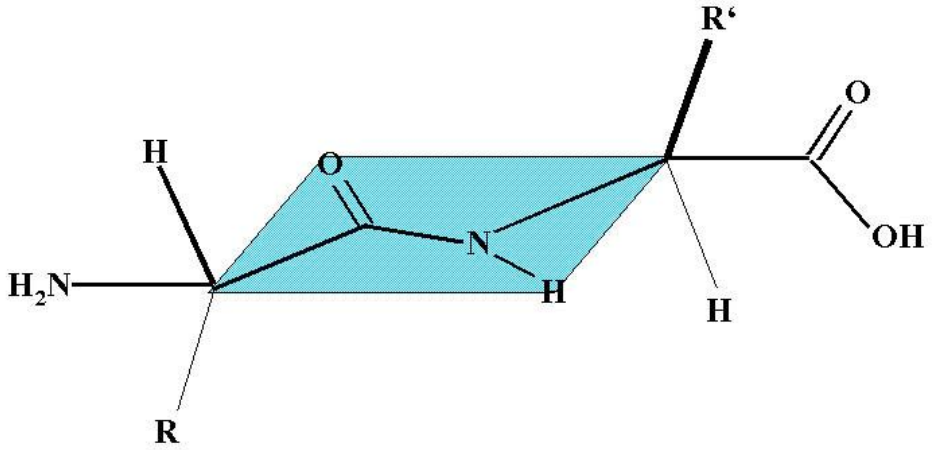




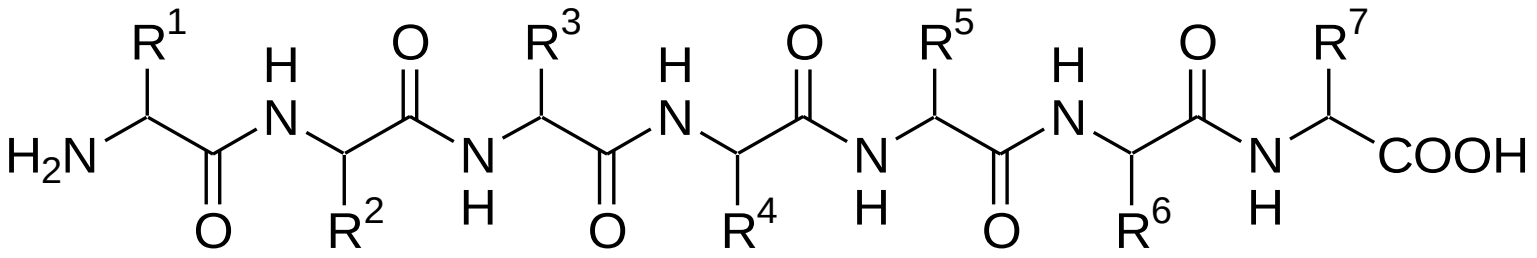
Eigenschaften, Basizität, Konformation, Bildung und Hydrolyse







Peptidbindung: Peptide sind Amide aus zwei und mehr Aminosäuren



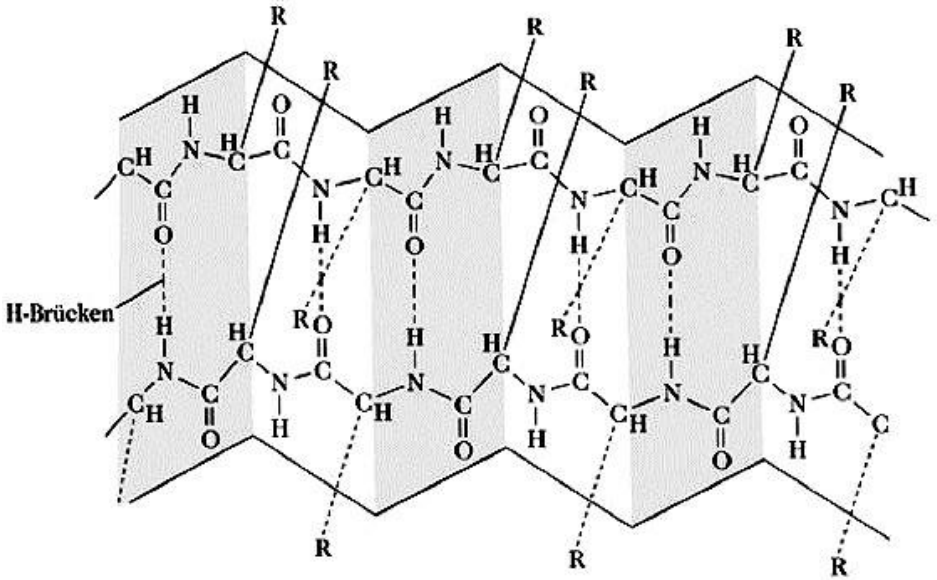
Strukturen von Proteinen:

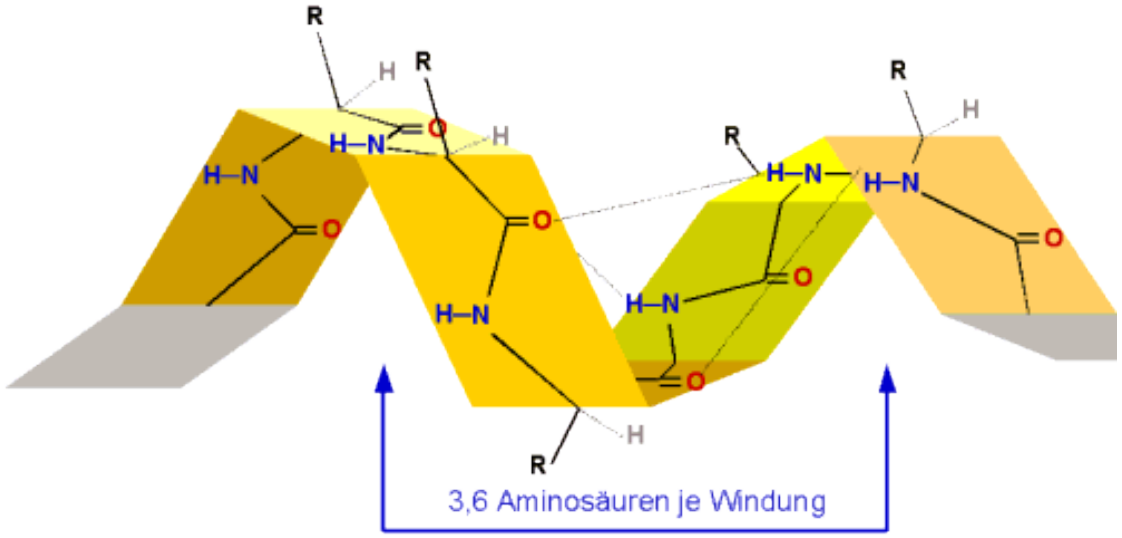
1. Primärstruktur: Aminosäuresequenz

2. Sekundärstruktur: räumliche Anordnung der Kette (Flatblatt, Helix)
   nur peptidisches Rückgrat, nicht räuml.
   Anordnung der AS Seitenketten

3. Tertiärstruktur: Gestalt des Proteins (räuml. Anordnung aller Atome)

4. Quartärstruktur:Aggregate aus mehreren Proteinen (Dimere, Trimere, etc.)

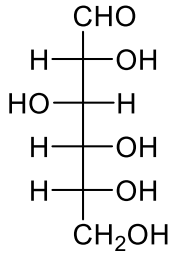




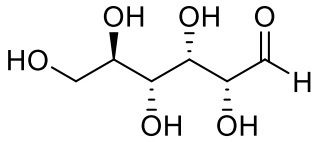
Kohlenhydrate

Triosen, Tetrosen, Pentosen, Hexosen,
Aldosen, Ketosen,
Pyranosen, Furanosen,
Aminozucker, Anomere, Onsäuren, Uronsäuren,

Schreibweisen: Fischer, Haworth, sterische Schreibweise,
Konformation

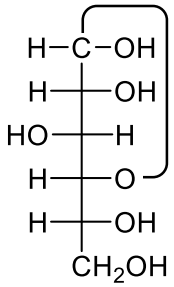


Fischer

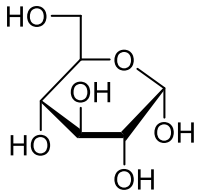


(2*R*,3*S*,4*R*,5*R*)-2,3,4,5,6-Pentahydroxyhexanal

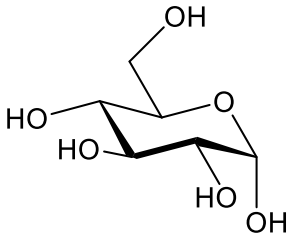
sterische Schreibweise



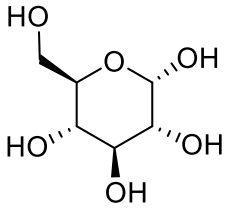
Fischer (Halbacetal)

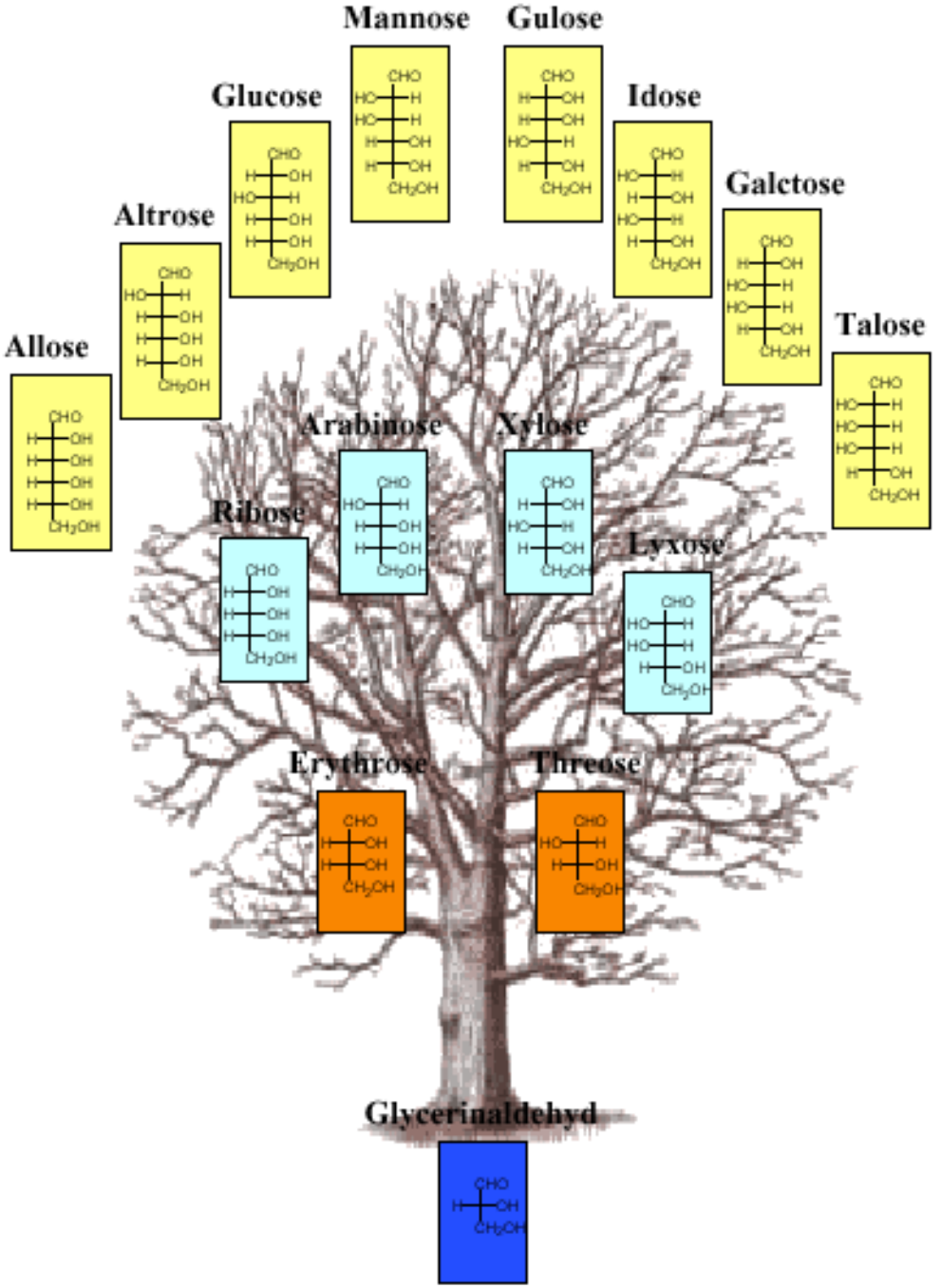


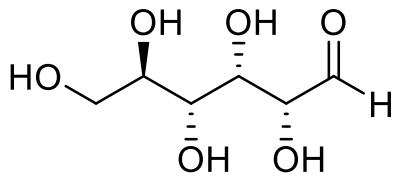
Haworth



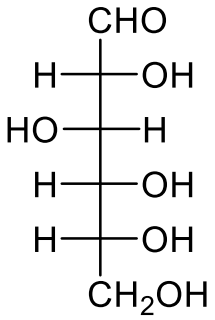
sterische Schreibweise



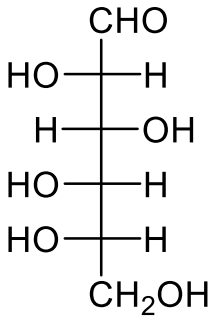




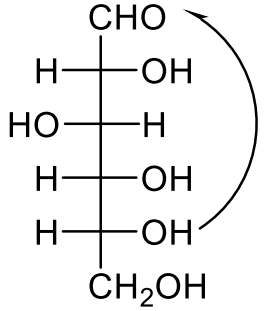
(2*R*,3*S*,4*R*,5*R*)-2,3,4,5,6-Pentahydroxyhexanal

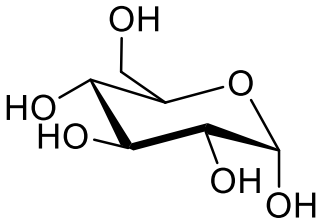


D-Glucose

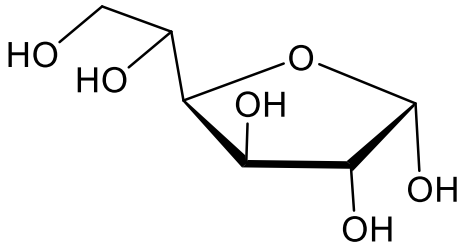


L-Glucose

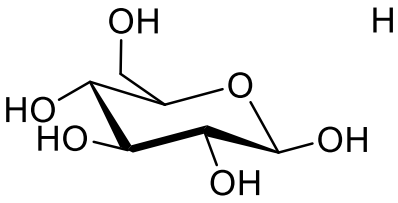




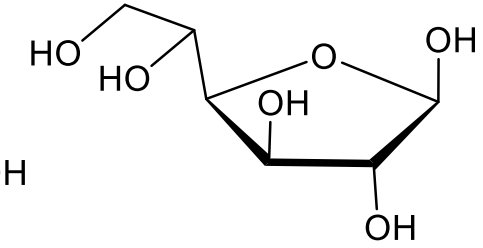
α-D-Glucopyranose



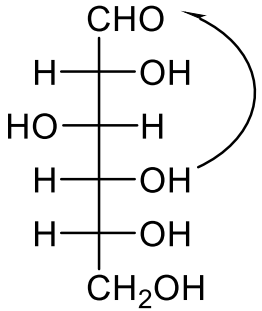
α-D-Glucofuranose



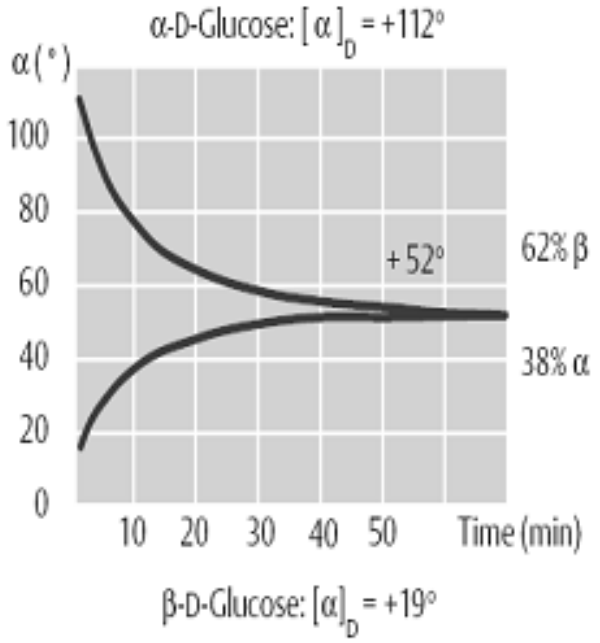
β-D-Glucopyranose

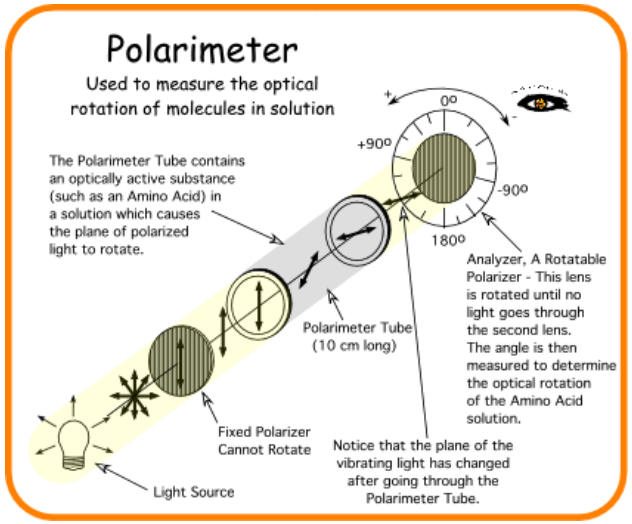


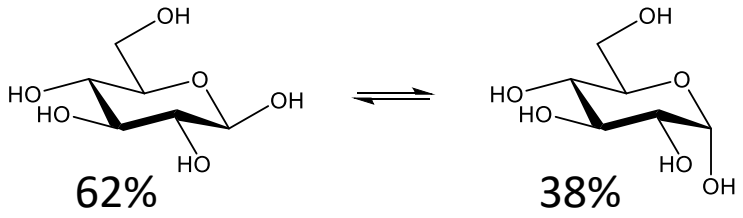
β-D-Glucofuranose

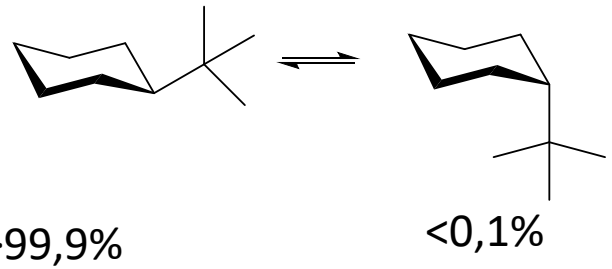


Mutarotation



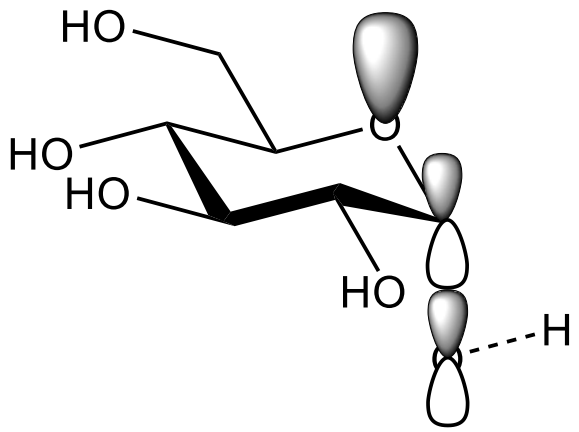






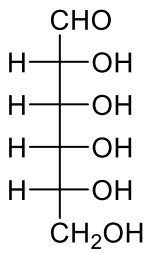
Anomerer Effekt

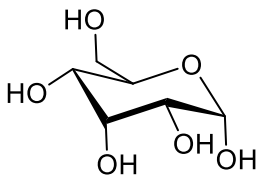
Elektronegative Substituenten an C1 Stabilisieren das α-Anomer



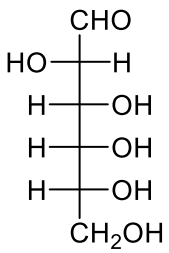
Hexosen / Pyranosen

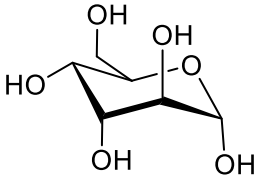
D-Allose



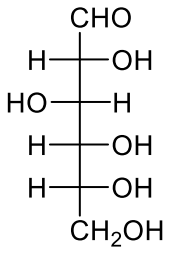


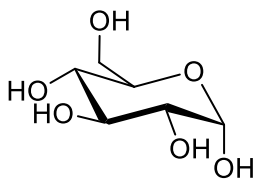
D-Altrose



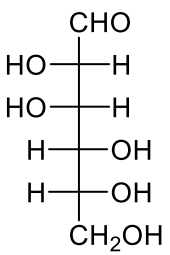


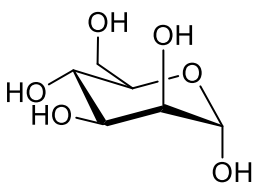
D-Glucose



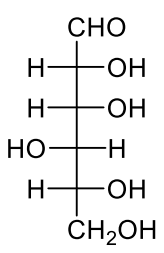


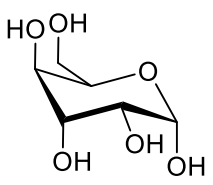
D-Mannose



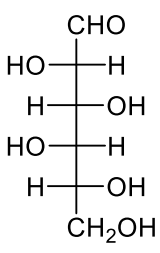


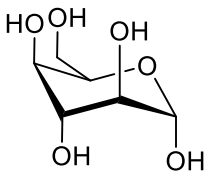
D-Gulose



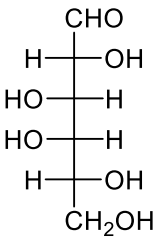


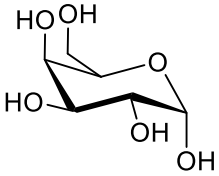
D-Idose



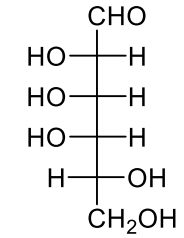


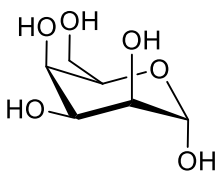
D-Galactose



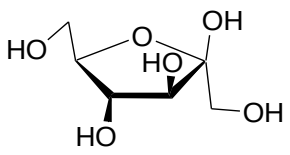


D-Talose

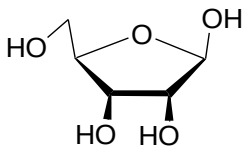




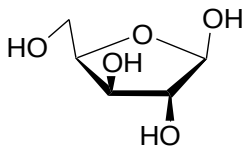
Furanosen



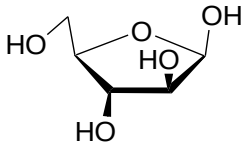
Fructose



Ribose



Xylose

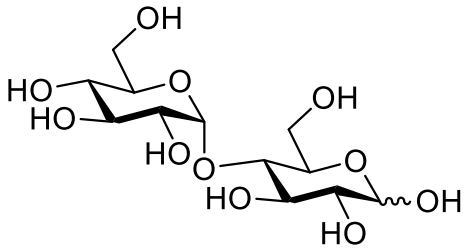


Arabinose

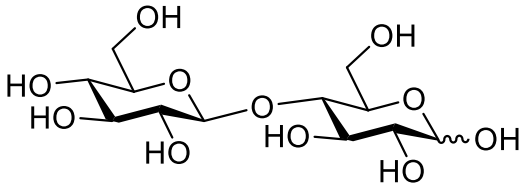
Saccharide, Glycoside

1,4-, 1,6-Verknüpfung, Saccharose, Lactose, Maltose, Isomaltose, Cyclodextrine, Bildung und Hydrolyse von Sacchariden

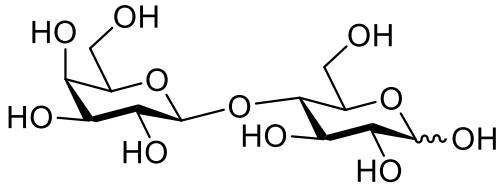
Maltose
4-O-(α-D-Glucopyranosyl)-D-glucopyranose



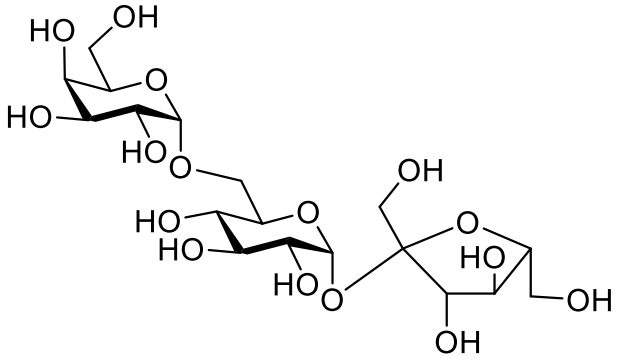
Cellobiose
4-O-(β-D-Glucopyranosyl)-D-glucopyranose



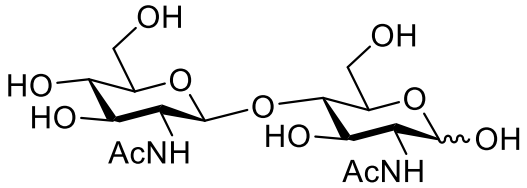
Lactose (Milchzucker)
4-O-(β-D-Galactopyranosyl)-D-glucopyranose



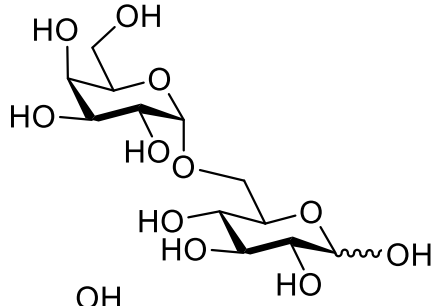
Raffinose (Rübenzucker)



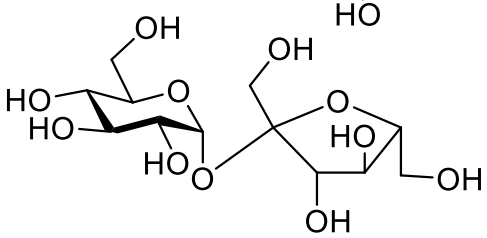
Chitobiose (Chitin)



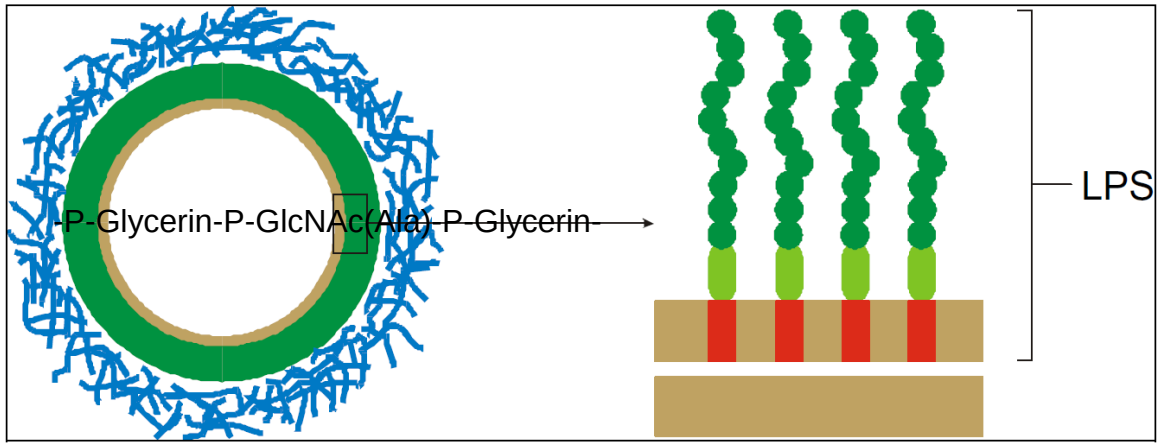
Melibiose



Saccharose (Rohrzucker)

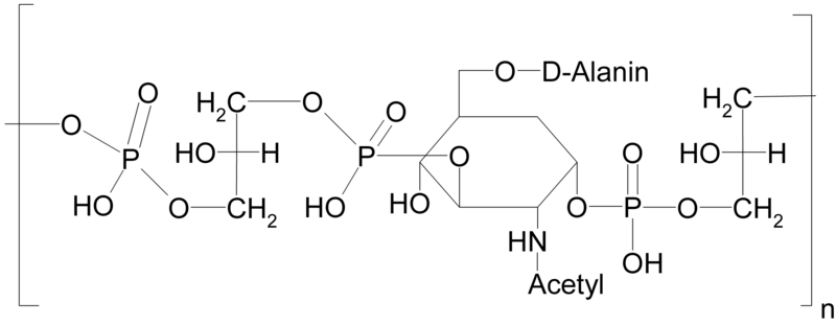


Bakterienoberfläche

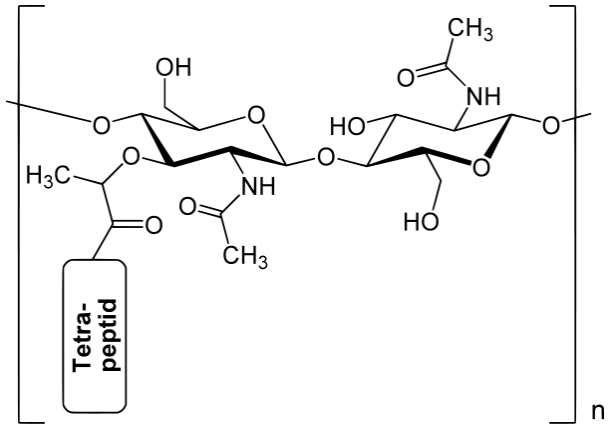


Schematische Darstellung der bakteriellen Polysaccharide
äußere Membran (braun), Lipopolysaccharid LPS (grün), Exopolysaccharid EPS (blau) Lipid A (rot), core Polysaccharid (hellgrün) und O-Antigen (dunkelgrün). EPS ist sowohl in Gram-negativen wie auch Gram-positiven Bakterien anzutreffen.

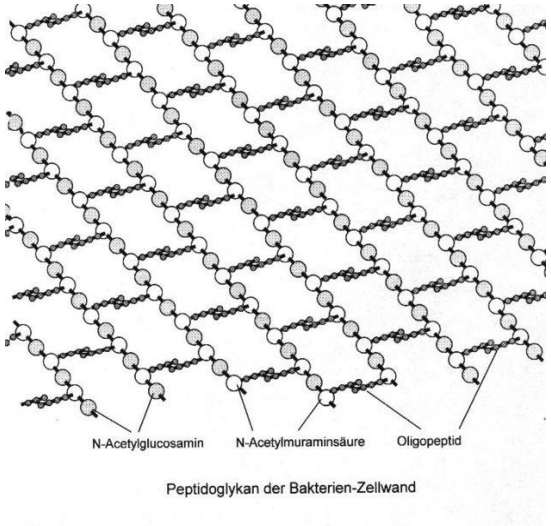
Teichonsäure

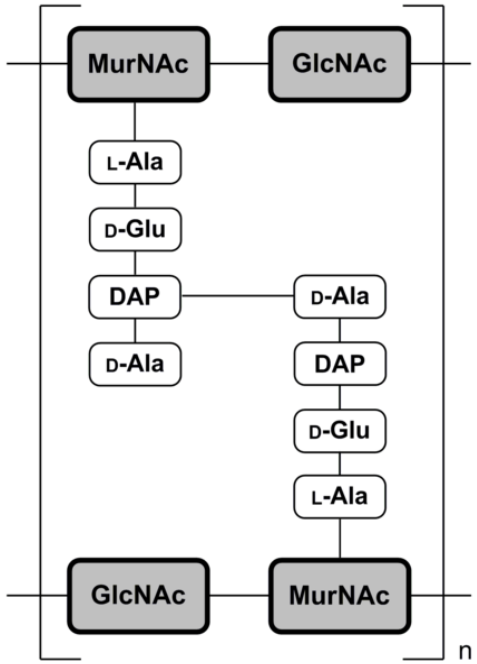


Murein



NAc-Muraminsäure GlcNAc





Reaktionen der Zucker