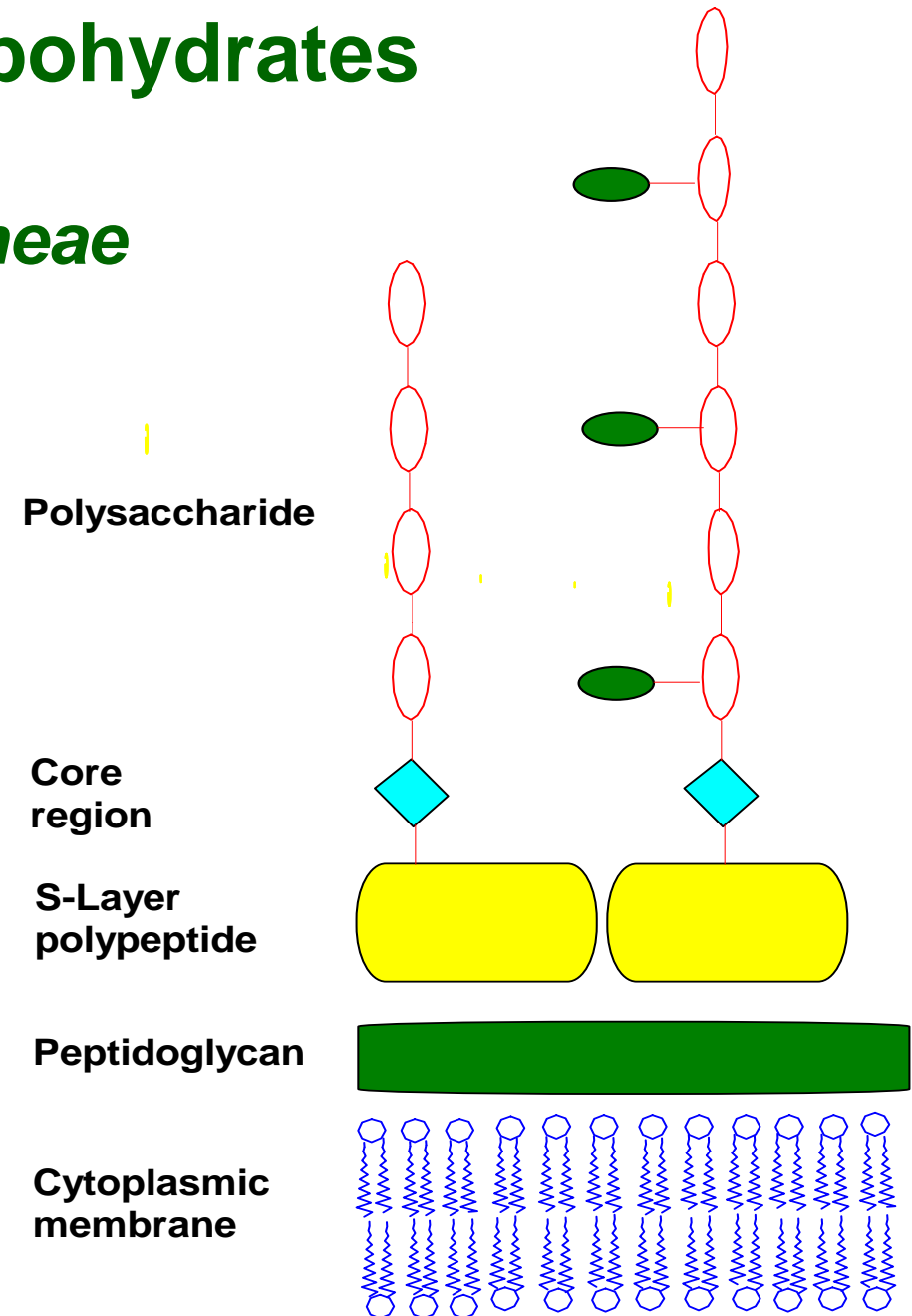
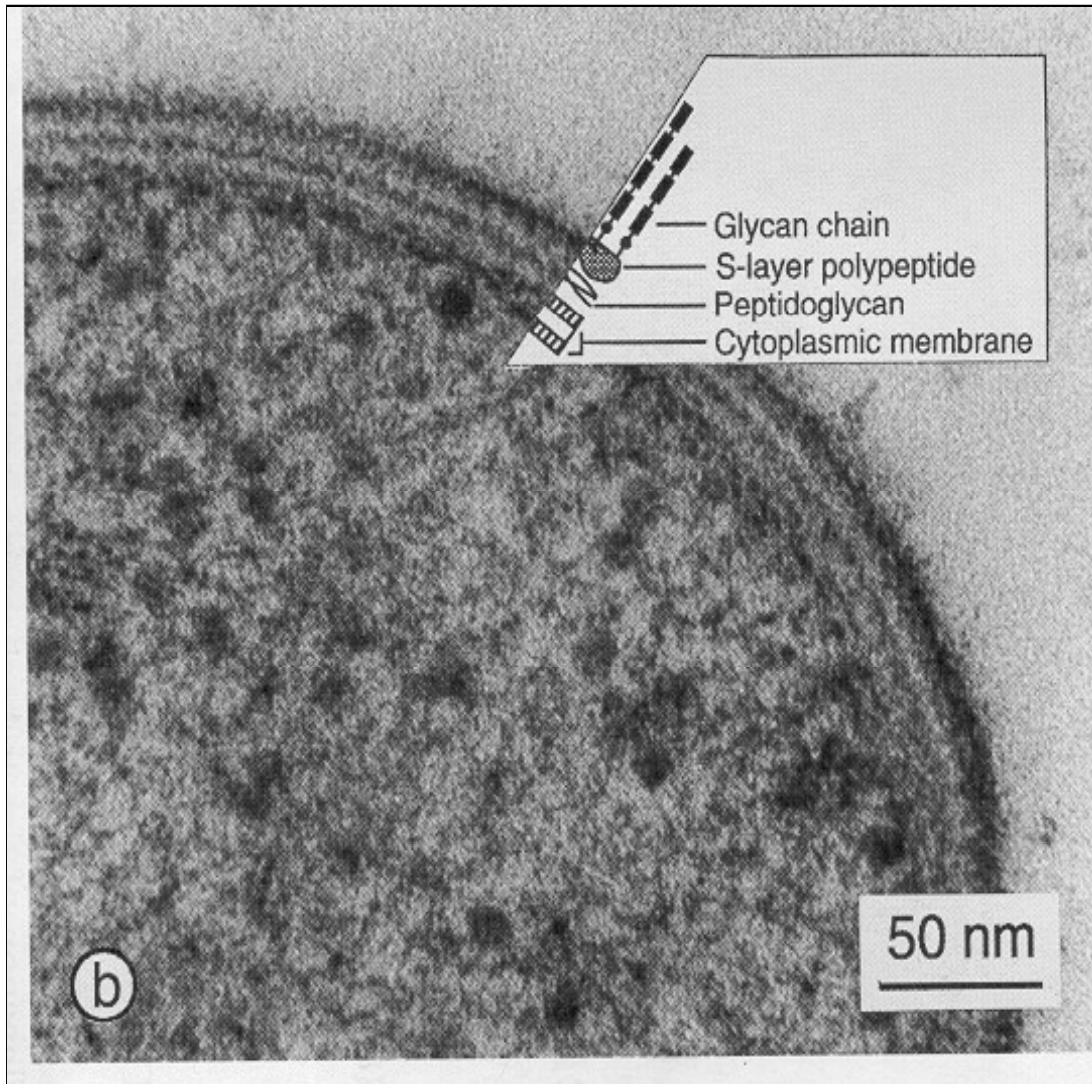


Structure and function of bacterial cell wall polysaccharides

Reaction mechanisms of glycosidases

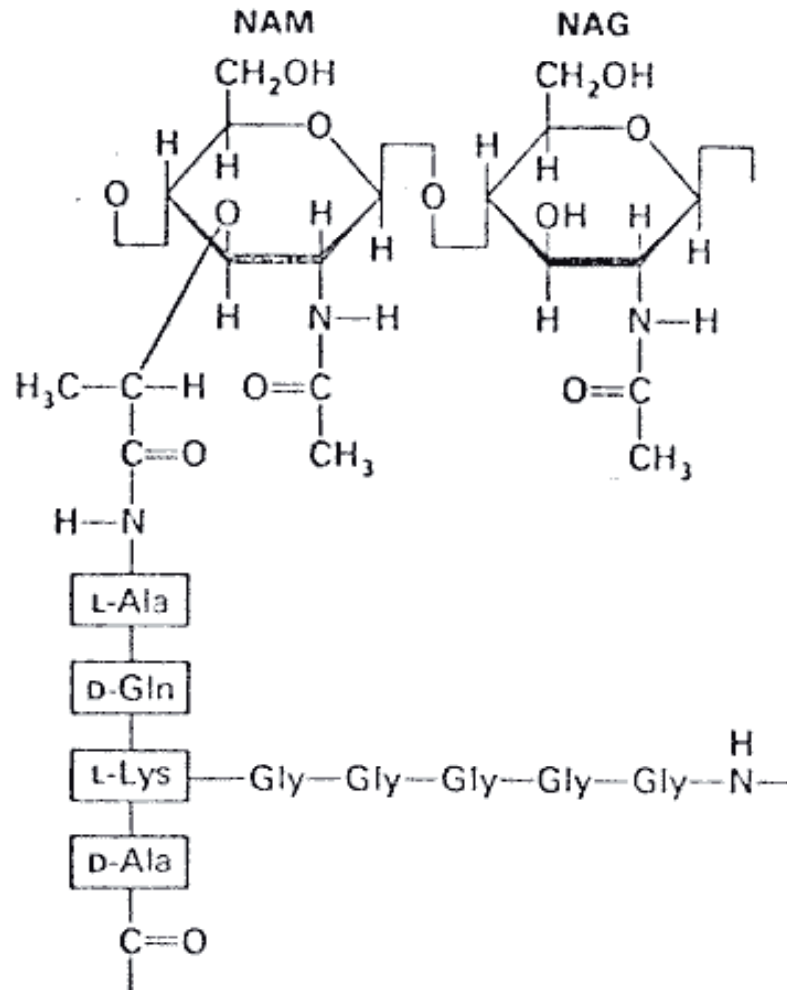
Bacterial cell surface carbohydrates

S-Layer glycoproteins in *Archeae*



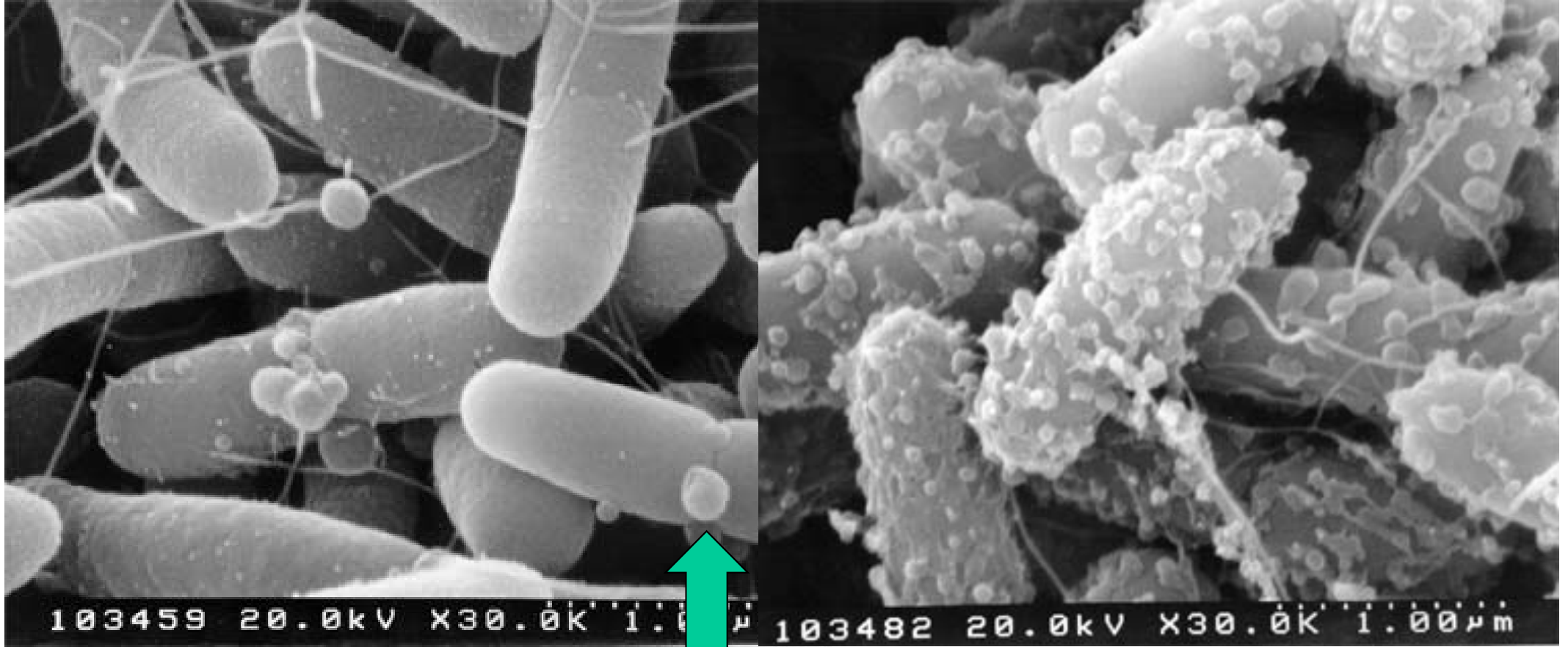
Aneurinibacillus thermoaerophilus DSM 10155

Peptidoglycan



Structure of peptidoglycans

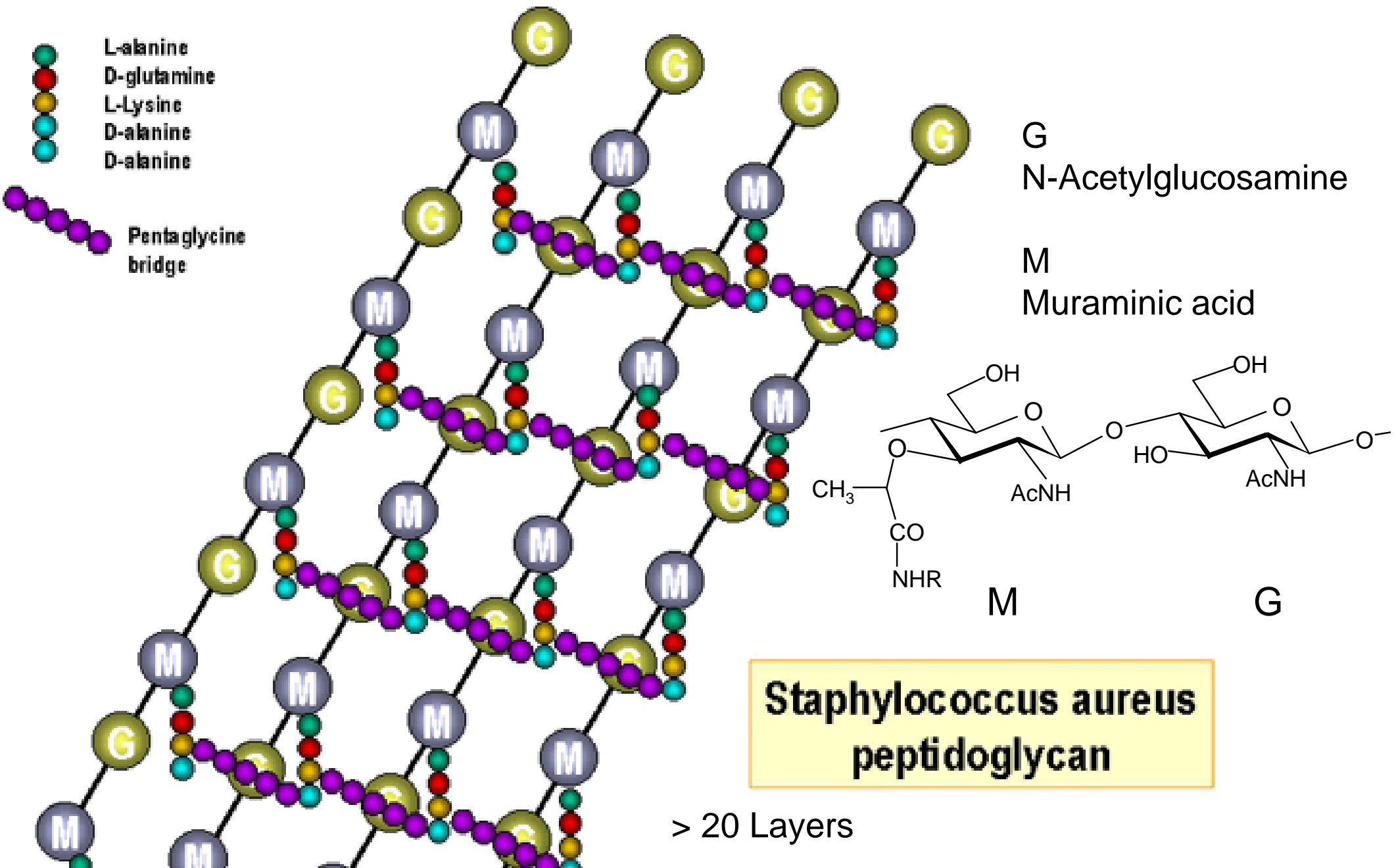
Mureinsacculus
of *Staphylococcus aureus*



Quelle: <http://www.cmdr.ubc.ca>

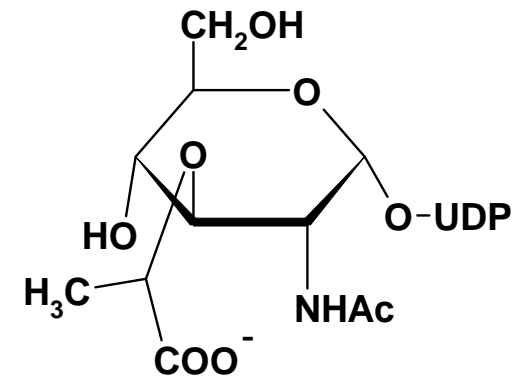
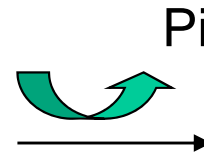
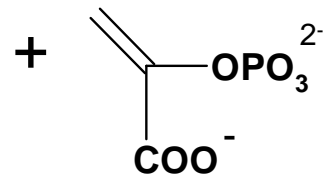
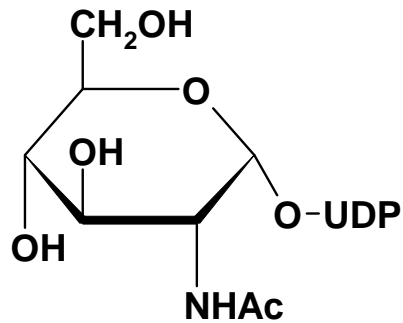
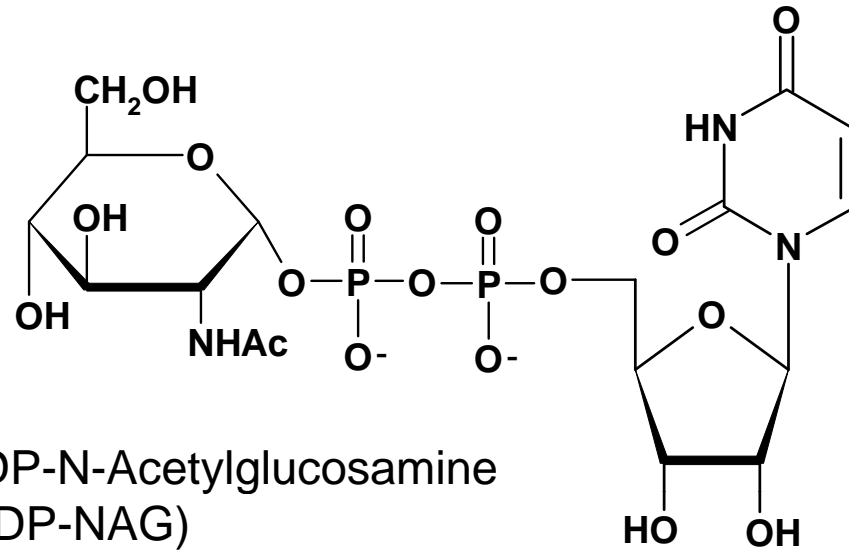
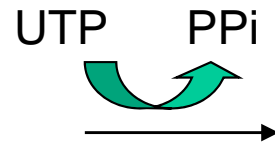
Cell wall lysis of *Escherichia coli* cells
Induced by cationic peptides

Gram-positive bacteria: peptidoglycan



Biosynthesis of peptidoglycan

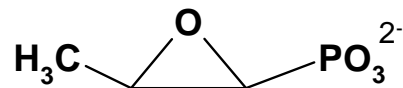
N-Acetylglucosamine
1-phosphate



Phosphoenol pyruvate

UDP-N-Acetylmuraminic acid
(UDP-NAM)

Inhibitor:
Phosphonomycin

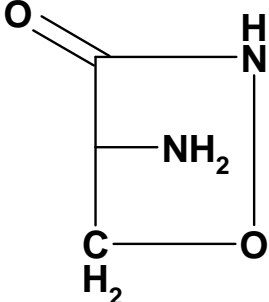
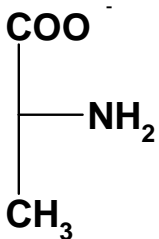


(Lactylether)

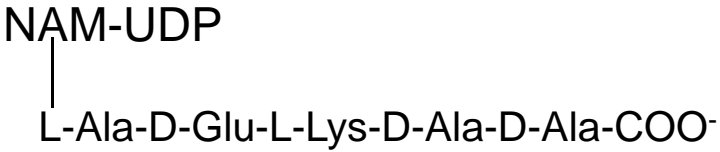
Biosynthesis



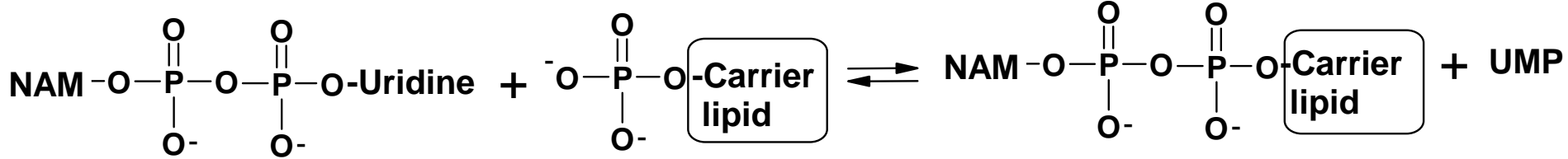
D-Alanin



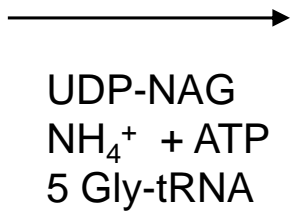
Inhibitor:
Cycloserin



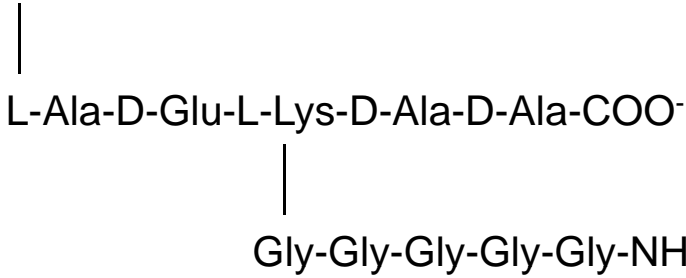
Carrier Lipid: Undecaprenylphosphate



NAM-Carrier lipid



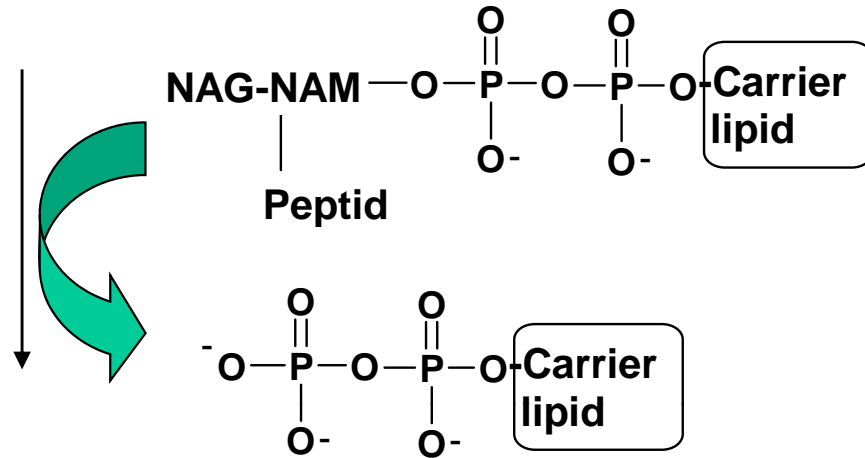
NAG-NAM-Carrier lipid



C-4 End

HO-NAG-NAM-NAG-NAM-

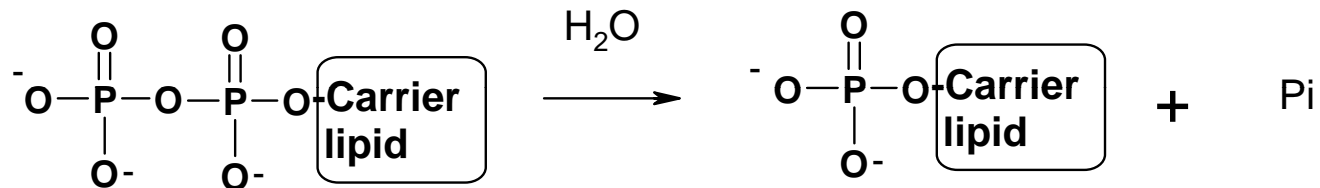
Peptid Peptid



HO-NAG-NAM-NAG-NAM-NAG-NAM-

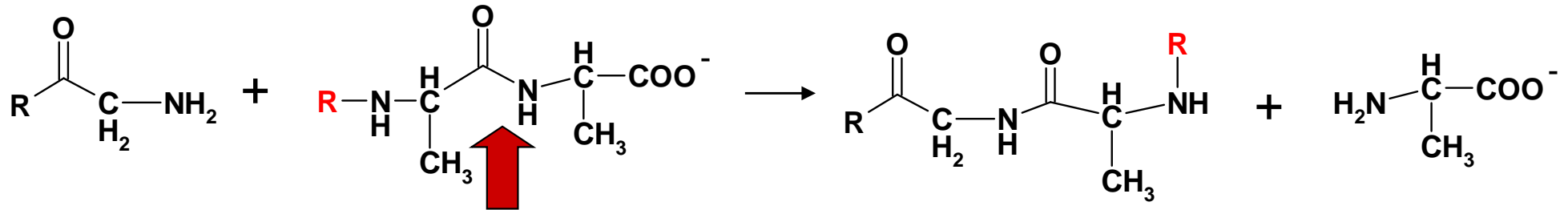
Peptid Peptid Peptid

Cross linking



Crosslinking via a transpeptidase reaction

(Inhibitor: penicillin)

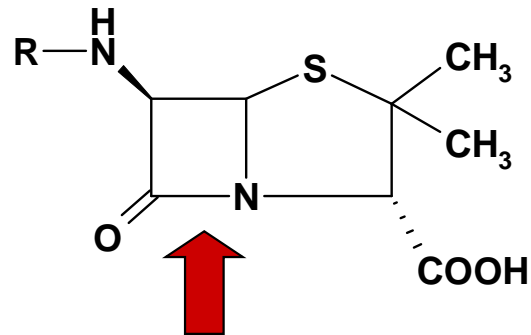


Terminal
Glycine

Terminal Ala-Ala
Dipeptide

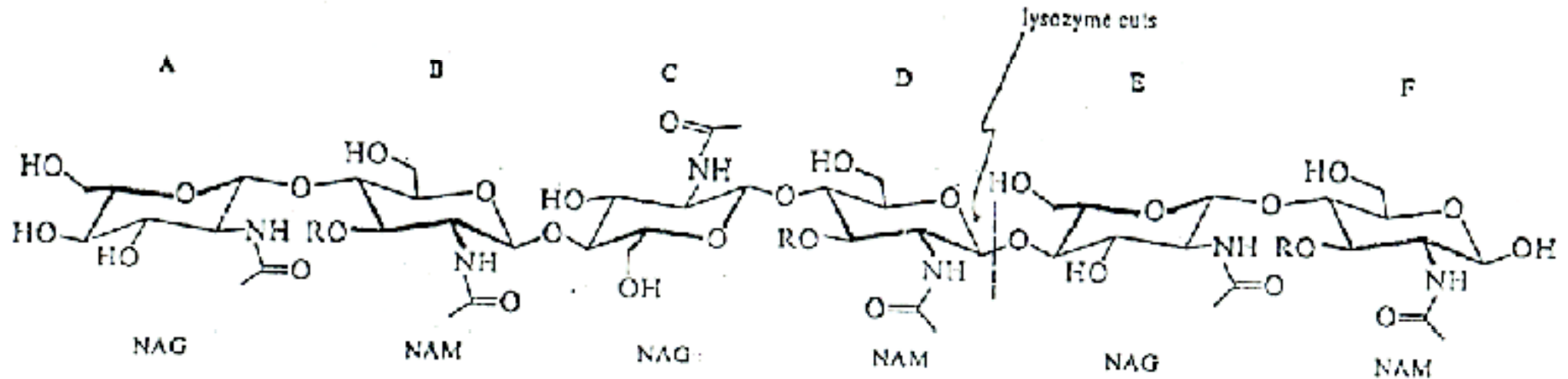
Gly-Ala
Crosslink

D-Ala



Penicillin
β-Lactam

Enzymatic hydrolysis of peptidoglycan Lysozyme



Cleavage between N-Acetylmuraminy- and N-Acetylglucosaminy residues

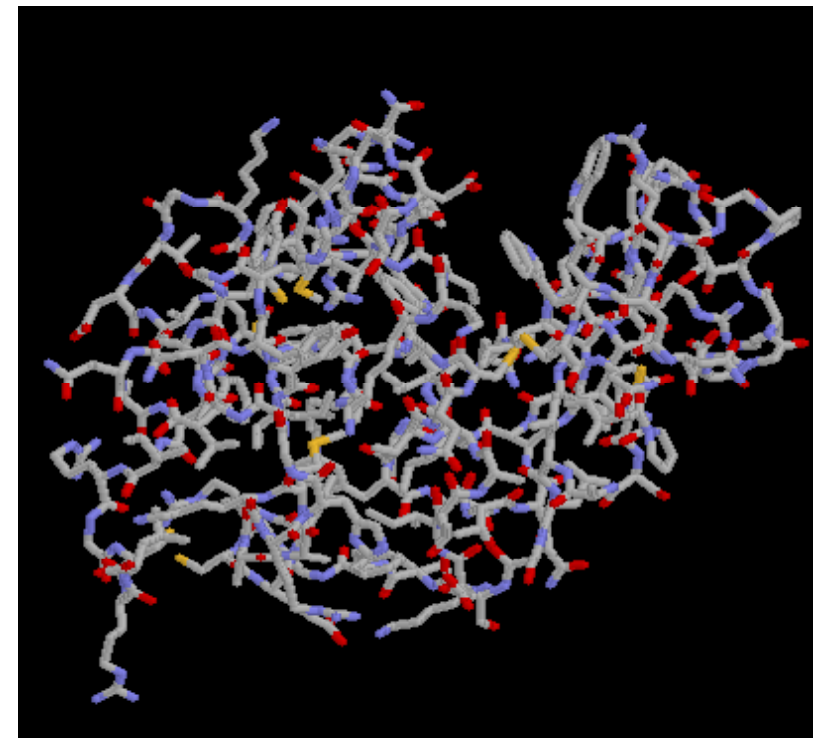
NAG bound in A-F

NAM only in B,D, F domains

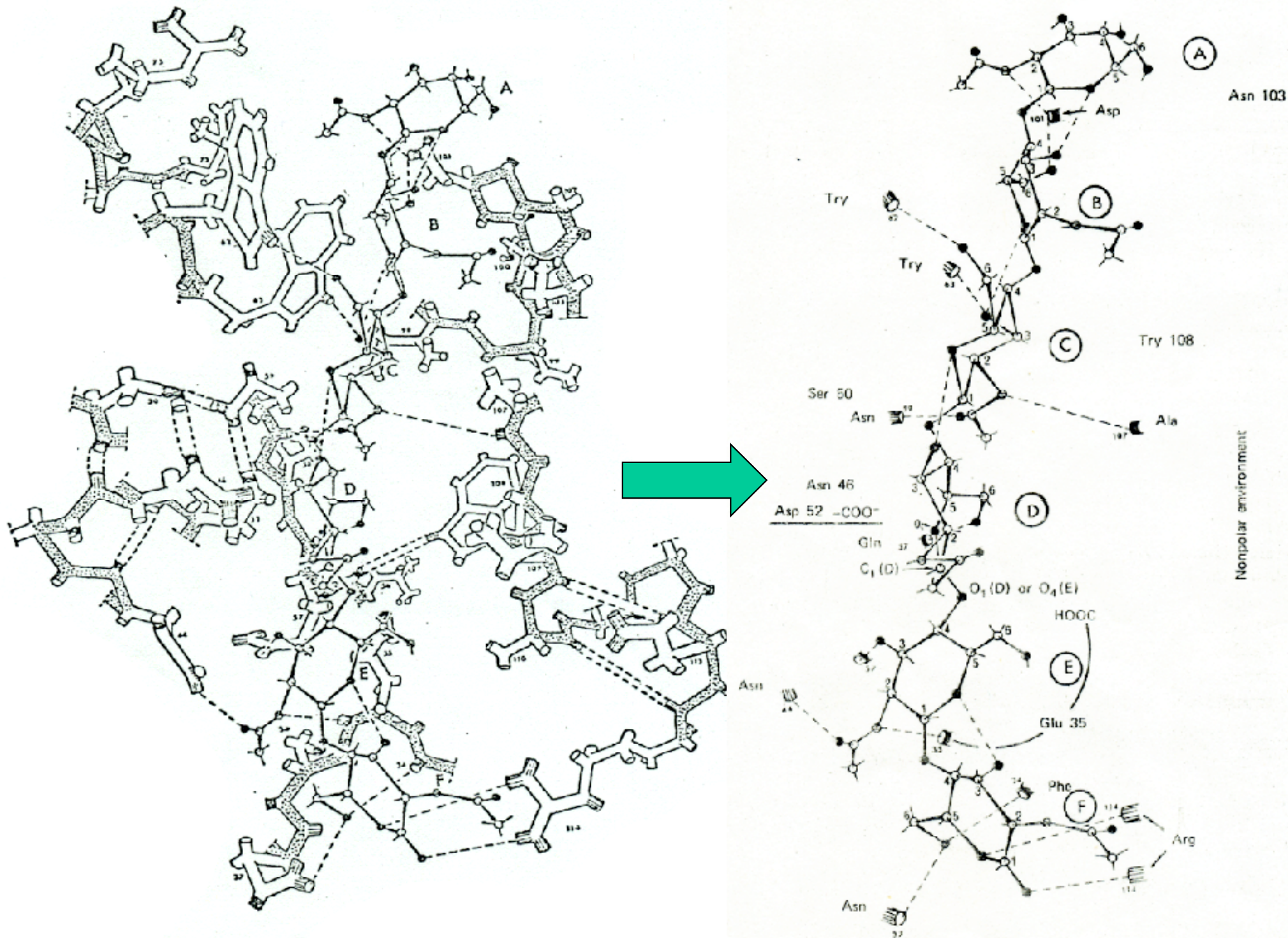
PDB-codes: 1HGM, 1HEW

Hen eggwhite-Lysozym:

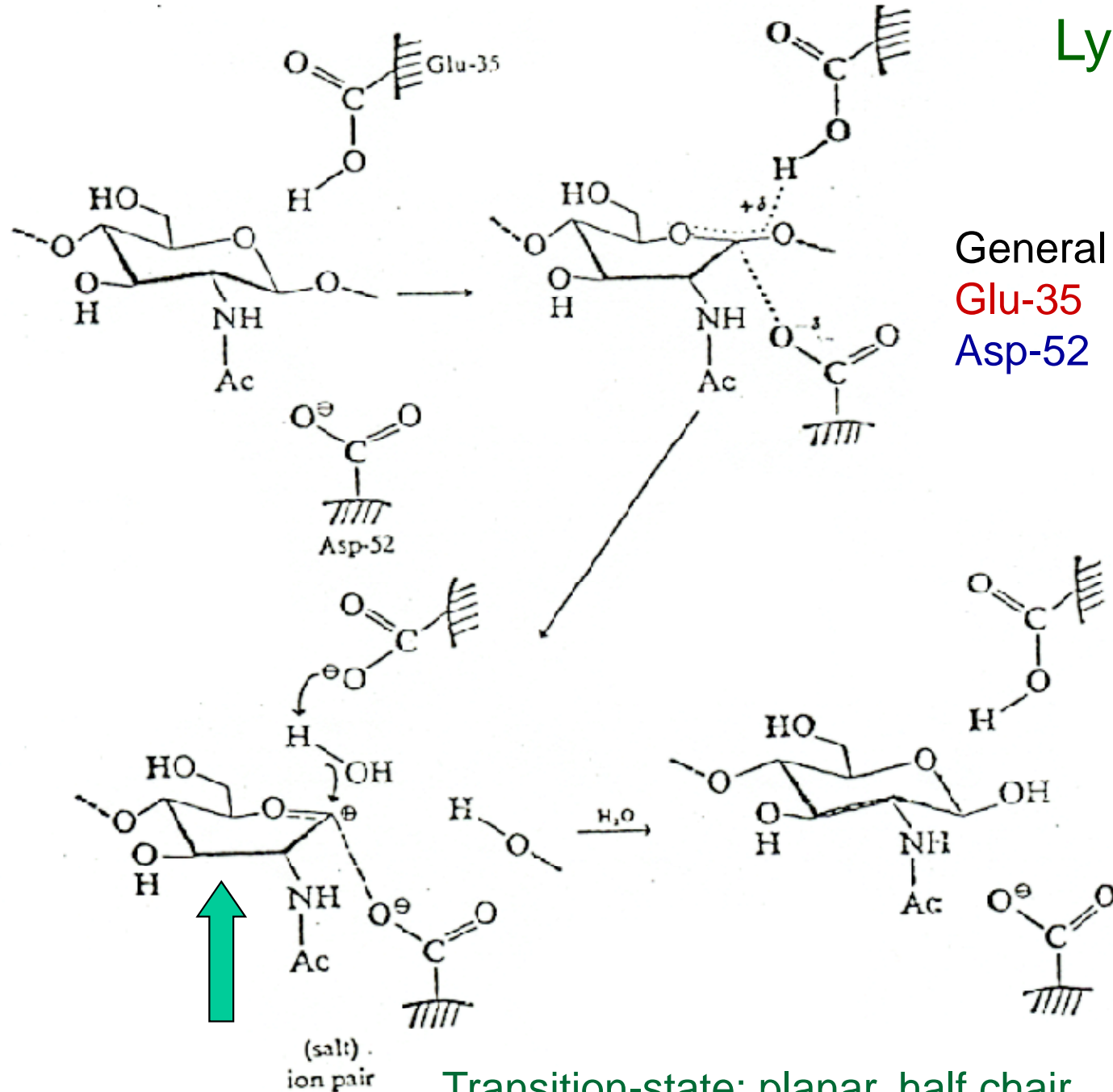
129 AS, 4 disulfide bridges, M: 14600



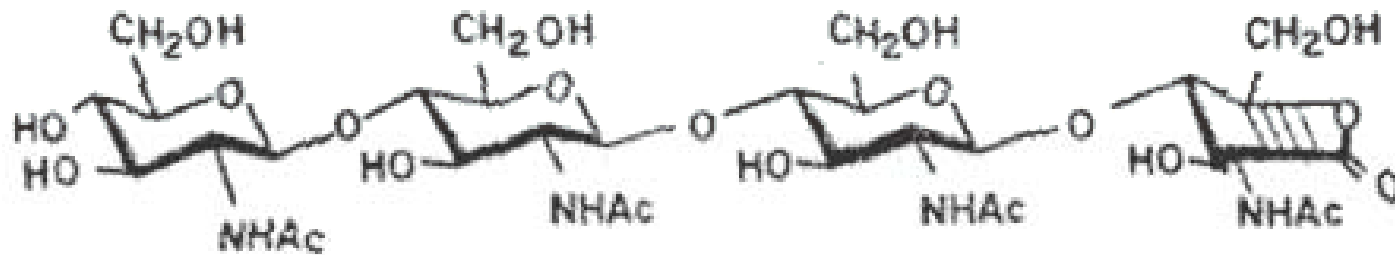
X-ray structure of lysozyme complexed to a hexasaccharide



Mechanism of Lysozyme reaction

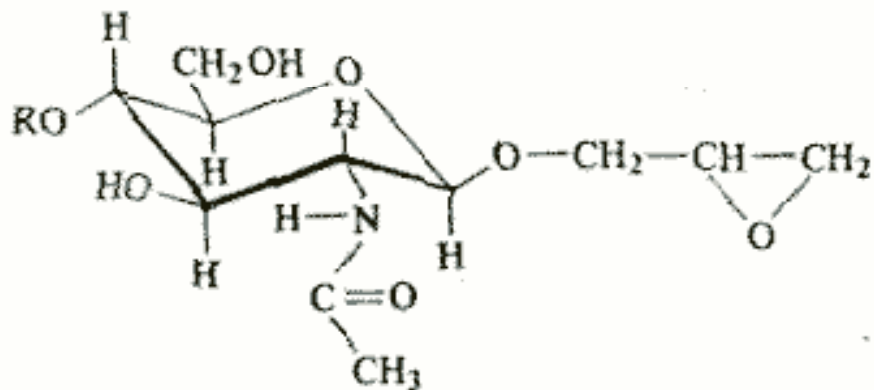
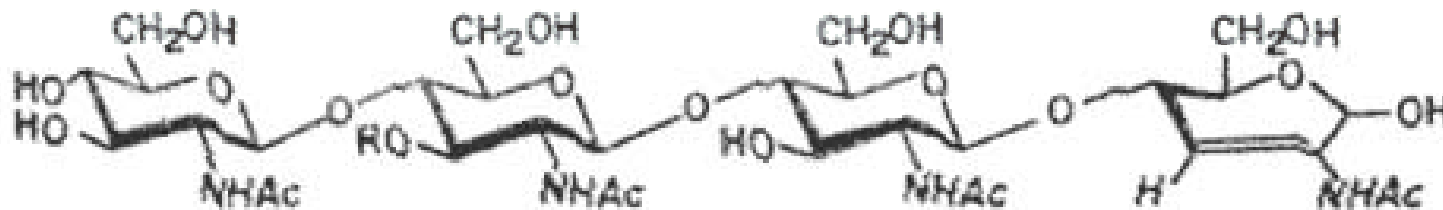


Inhibitors (substrate analogous to transition state)



Planar structure
Analogous to carbenium ion
(sp²)

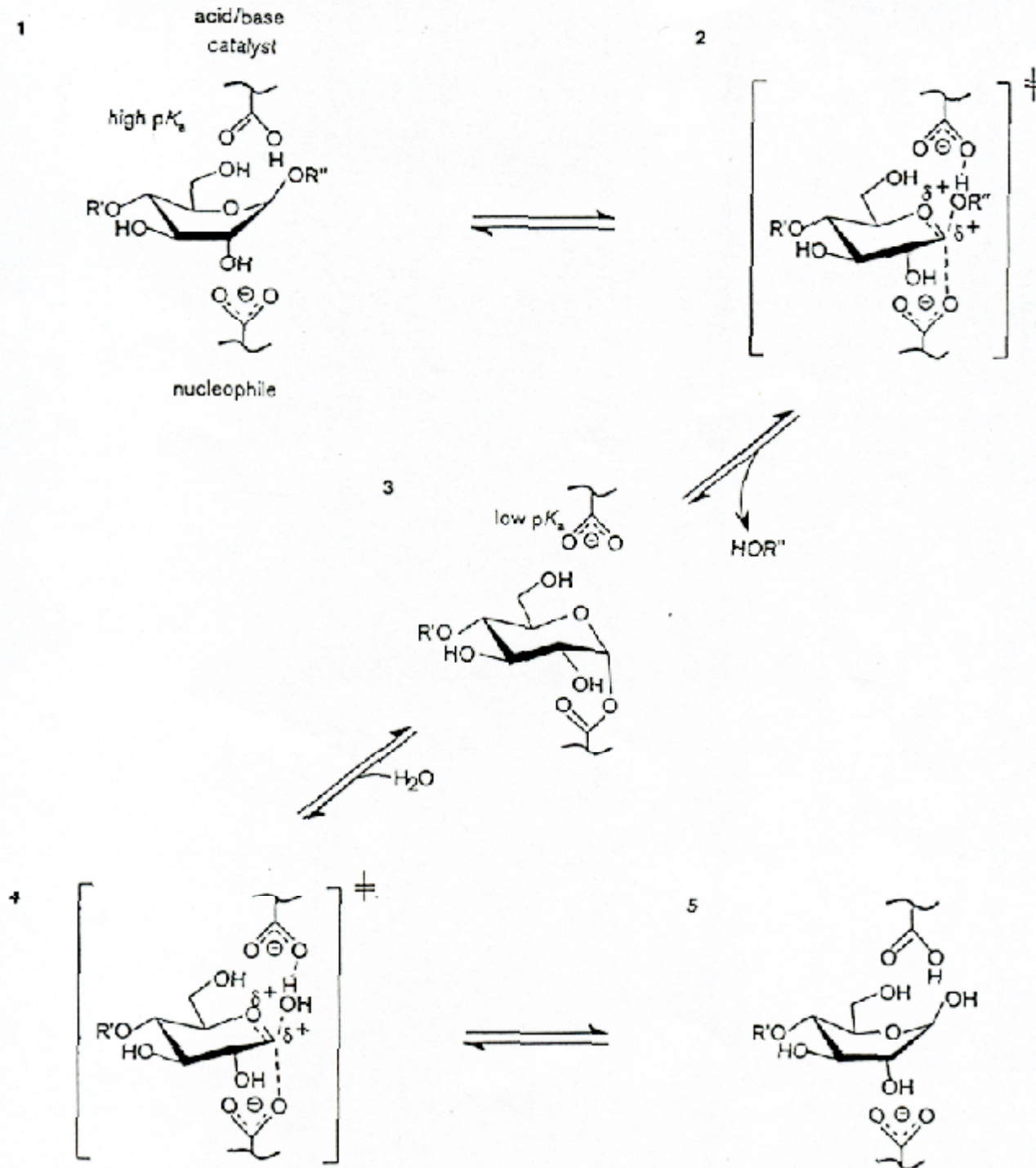
12



Active site directed irreversible
inhibitor

- 1 R = H
- 2 R = GlcNAc
- 3 R = GlcNAc-β-(1→4)-GlcNAc

„Retaining“ Glycosidases



Active site: 9 -11 A

Examples: α -Amylase,
Transglycosylases

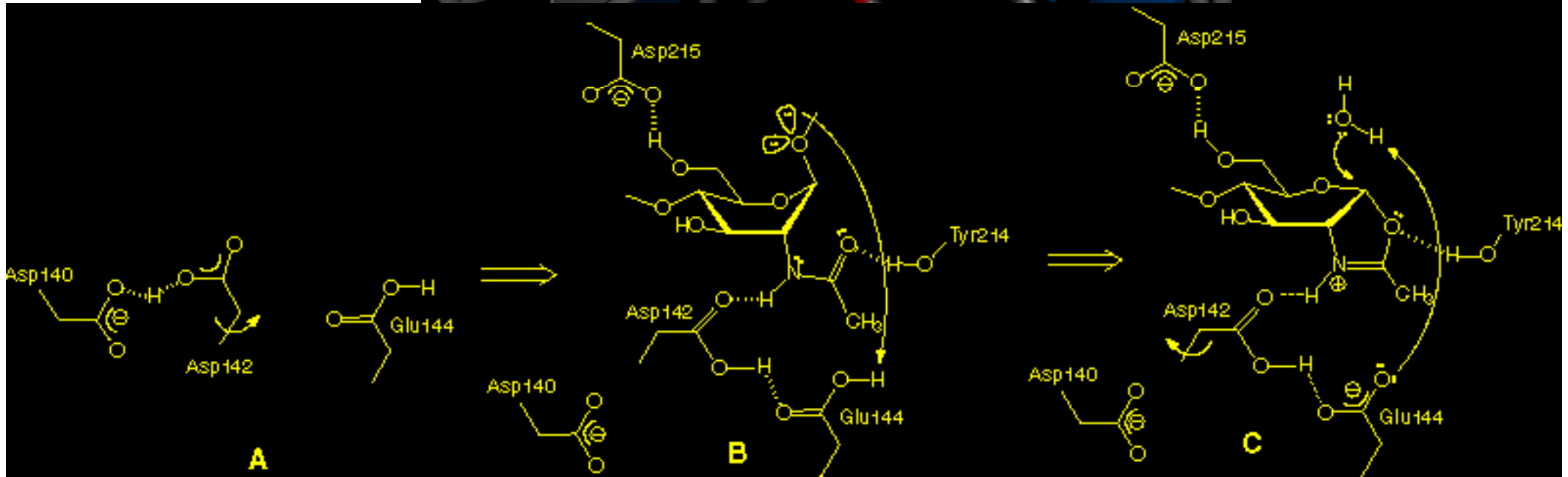
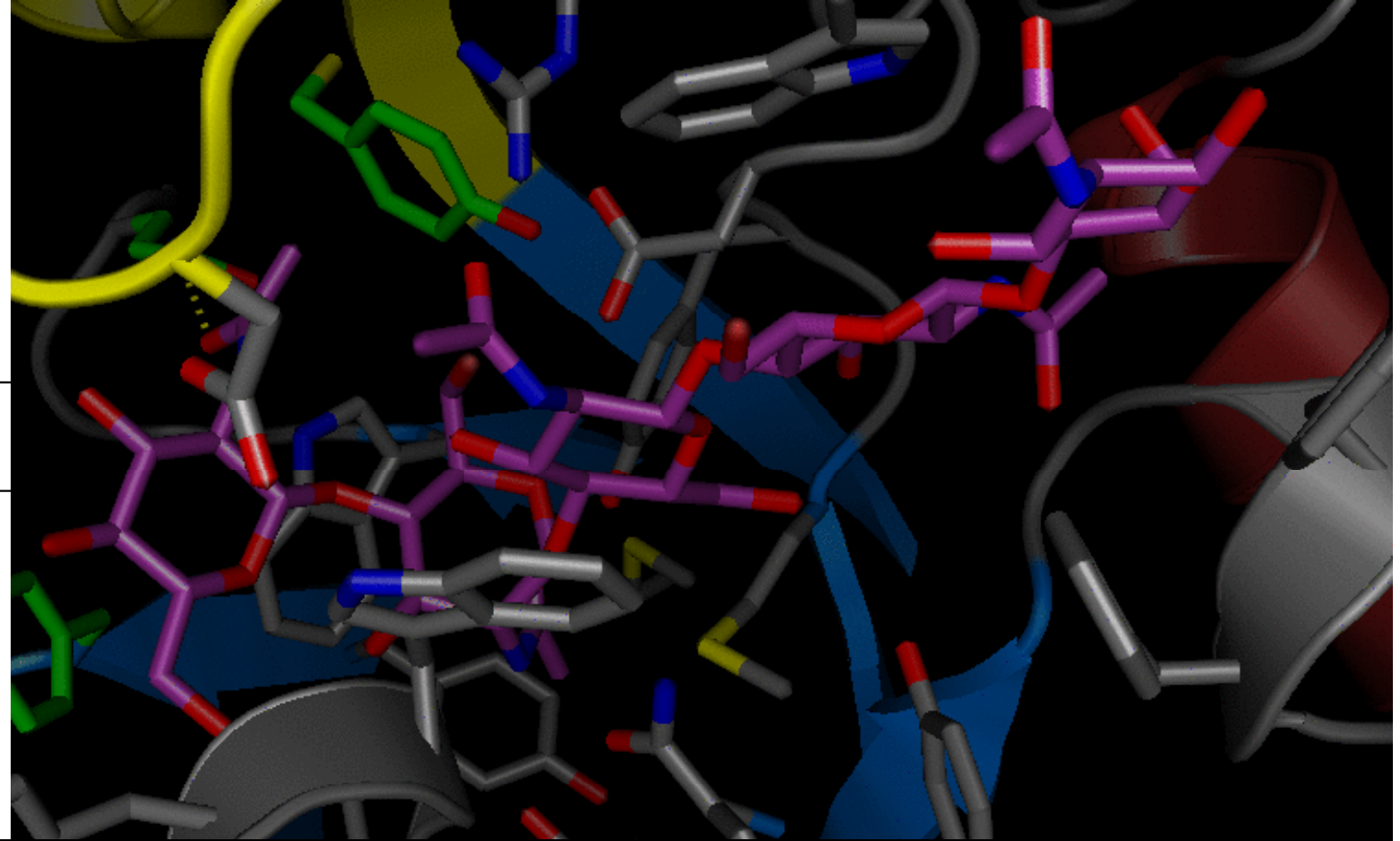
Inverting Glycosidases:
~ 5 -6 A
 β -Amylase

Chitinase

Chitin:

β -1,4-GlcNAc

<http://davapc1.bioch.dundee.ac.uk/talks/ICS2002/>

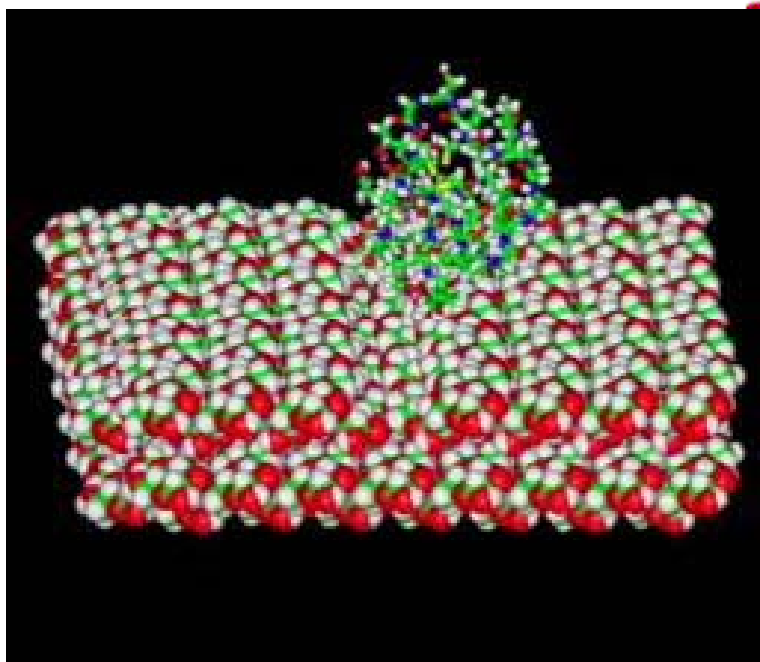
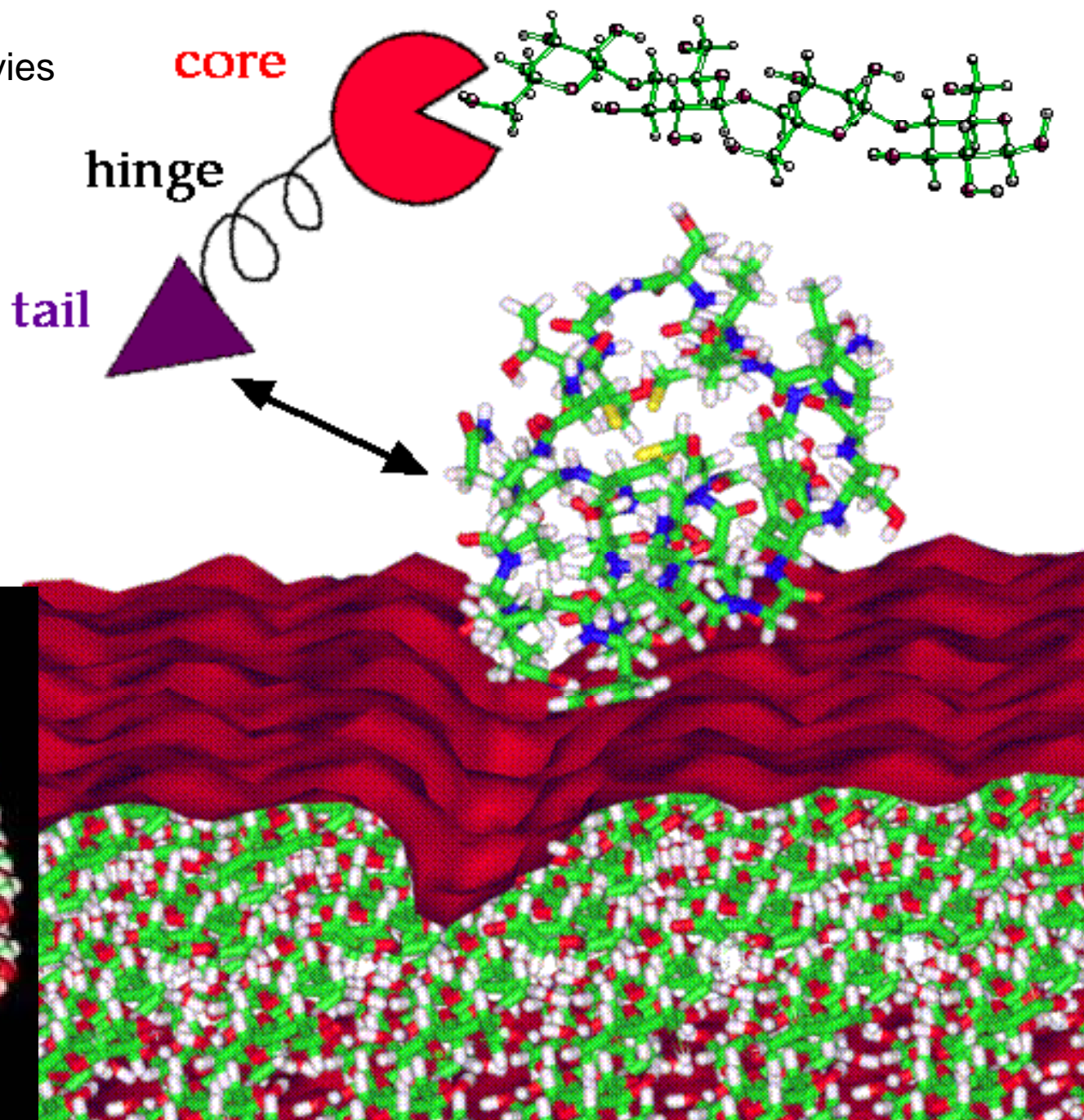


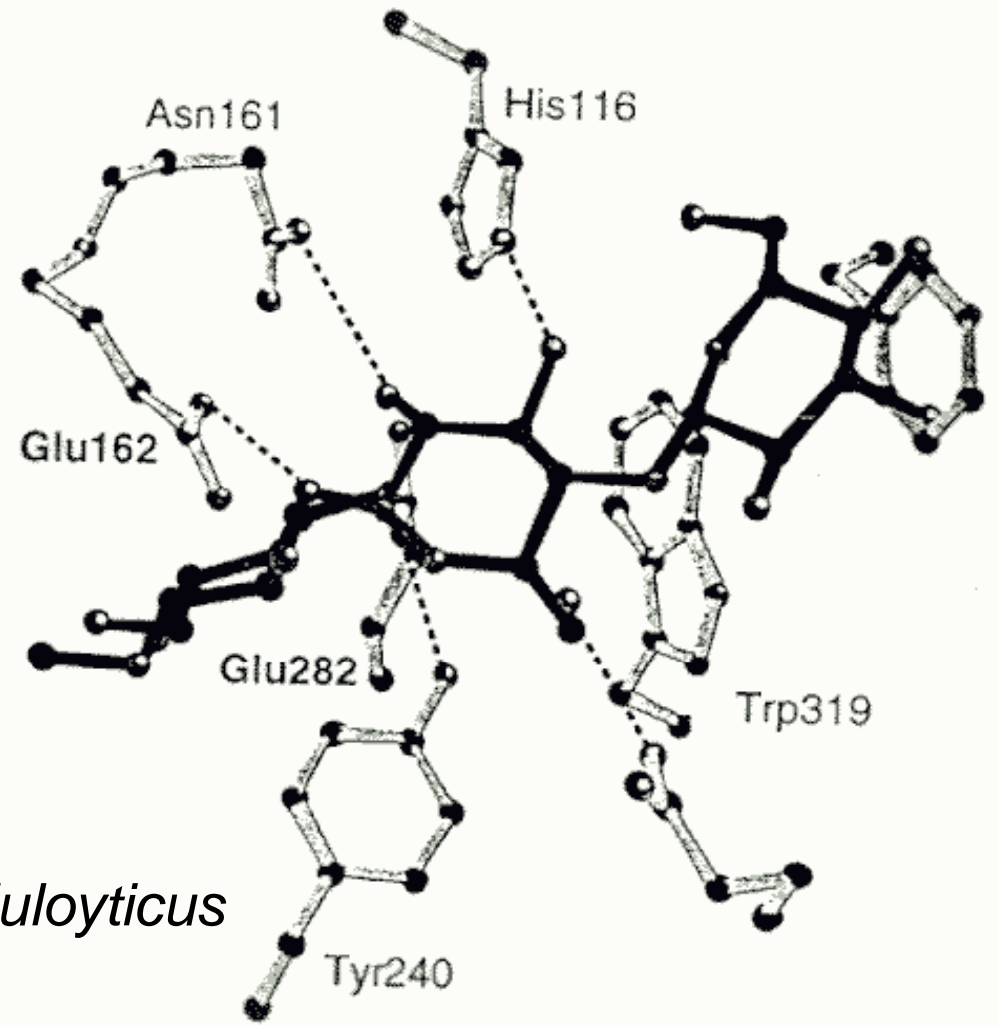
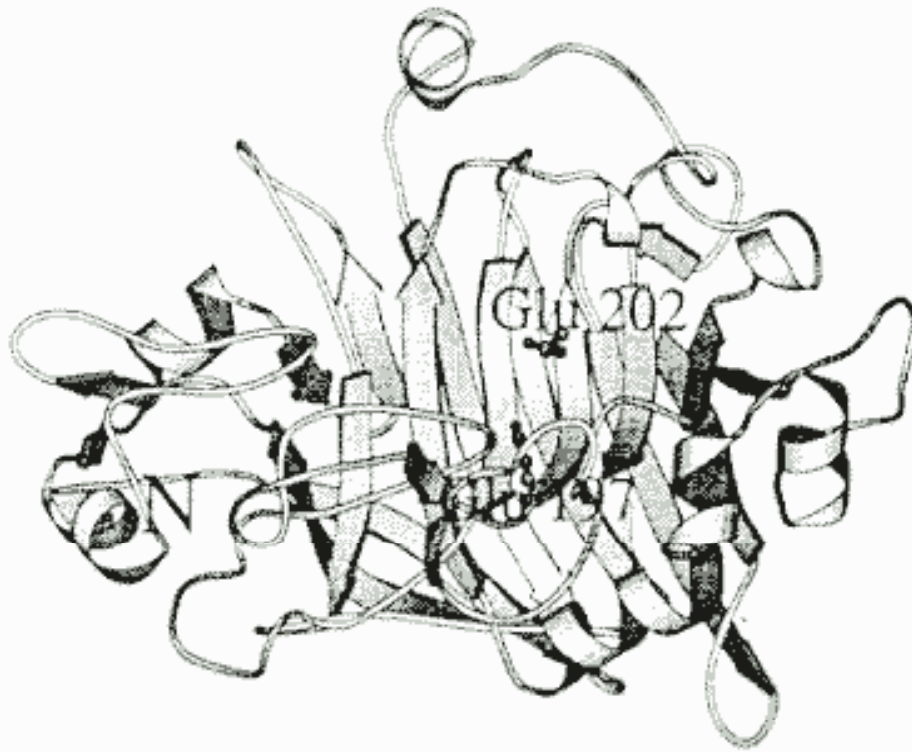
Cellulases

<http://www.csc.fi/lul/chem/movies>

Hydrolysing enzyme (CBH1)

Cellobiohydrolase





Endocellulase from *Acidothermus cellulolyticus*
Complexed to cellotetraose