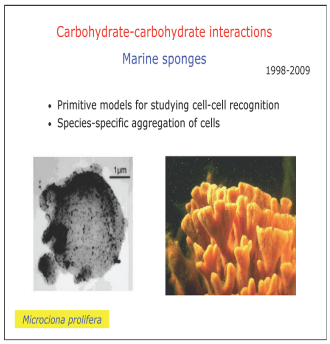


Carbohydrate-Carbohydrate Interactions

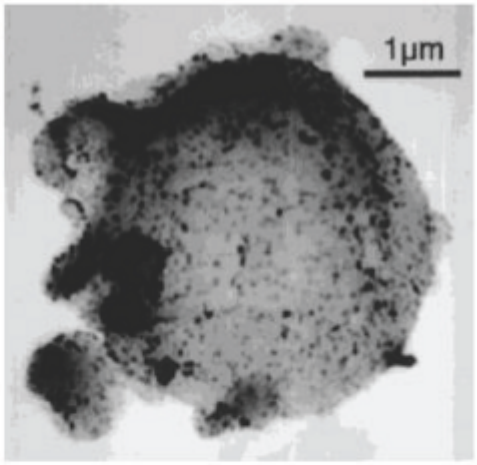
Description

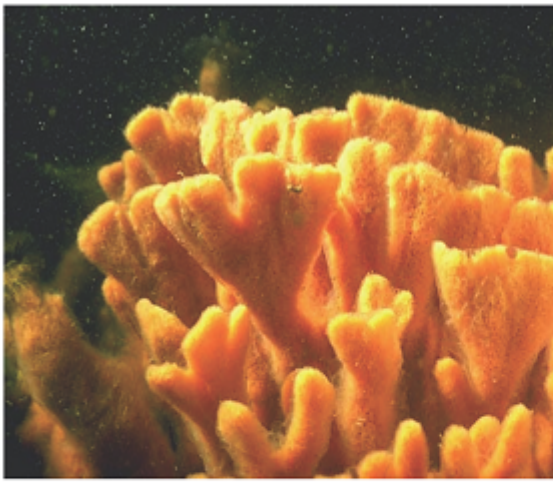
Carbohydrate-carbohydrate interactions

Marine sponges

199

- Primitive models for studying cell-cell recognition
- Species-specific aggregation of cells





Microciona prolifera

- When placed in artificial sea water free of Ca^{2+} ions, complete dissociation of the sponge tissue into a suspension of cells occurs.
- Formation of cell-aggregates by adding Ca^{2+} to the c suspension; completely functional sponges can be th result.
- Cell-surface proteoglycans underlie the Ca^{2+}-depend molecular mechanism of the self-recognition; coding aggregation factors (AF).
- Sponge-species specificity of the aggregation proces colour-specific sponge cell sorting. Can be mimicked different coloured beads, coated with species-specifi AFs.

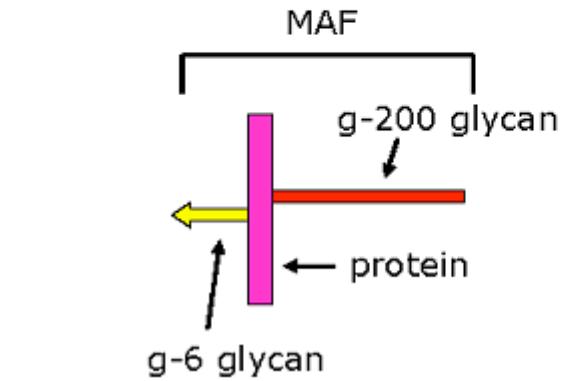
Proposed model for MAF-mediated sponge cell ad

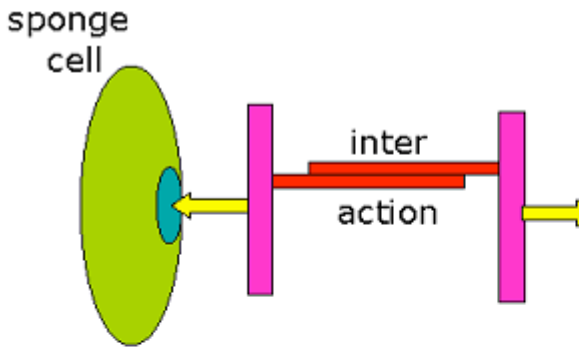
Microciona prolifera

Ca^{2+}-independent adherence of g-6 glycans to cell-surface receptors (carbohydrate-protein interaction).

Ca^{2+}-dependent self-association of g-200 glycans (carbohydrate-carbohydrate interaction).

Other alkaline earth cations, Mg^{2+}, Sr^{2+}, Ba^{2+} could not replace Ca^{2+} as an aggregation-mediating agent. The transition elements Mn^{2+} and Cd^{2+} could partially replace Ca^{2+}.



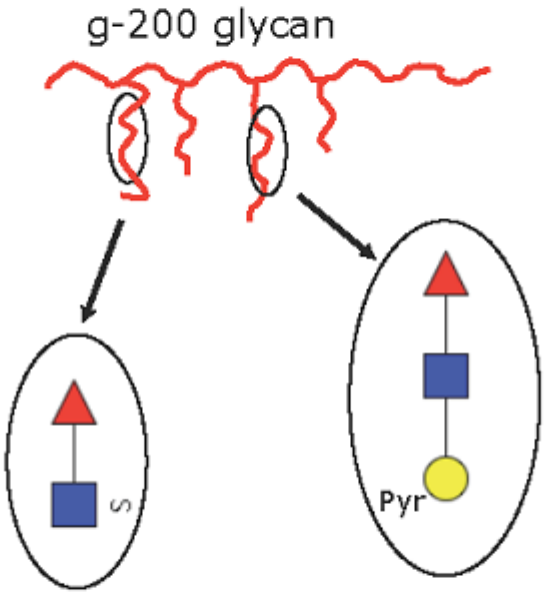


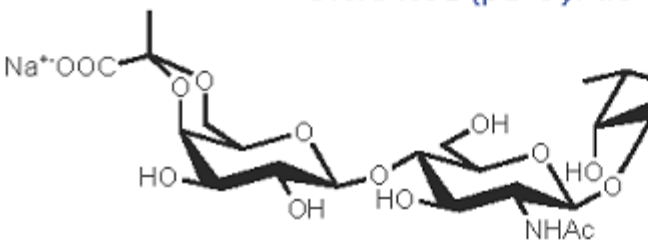
Multivalent interactio

Structural analysis of MAF fragments

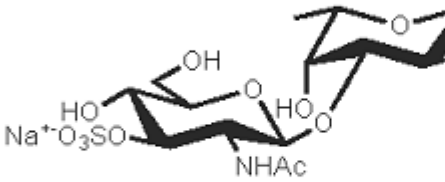
Two oligosaccharide fragments p
from *M. prolifera* MAF g-200 by r
hydrolysis were shown to be epit
the MAF self-recognition (Mab st

- Gal4,6(*R*)Pyr(β1-4)GlcNAc(β
- GlcNAc3*S*(β1-3)Fuc



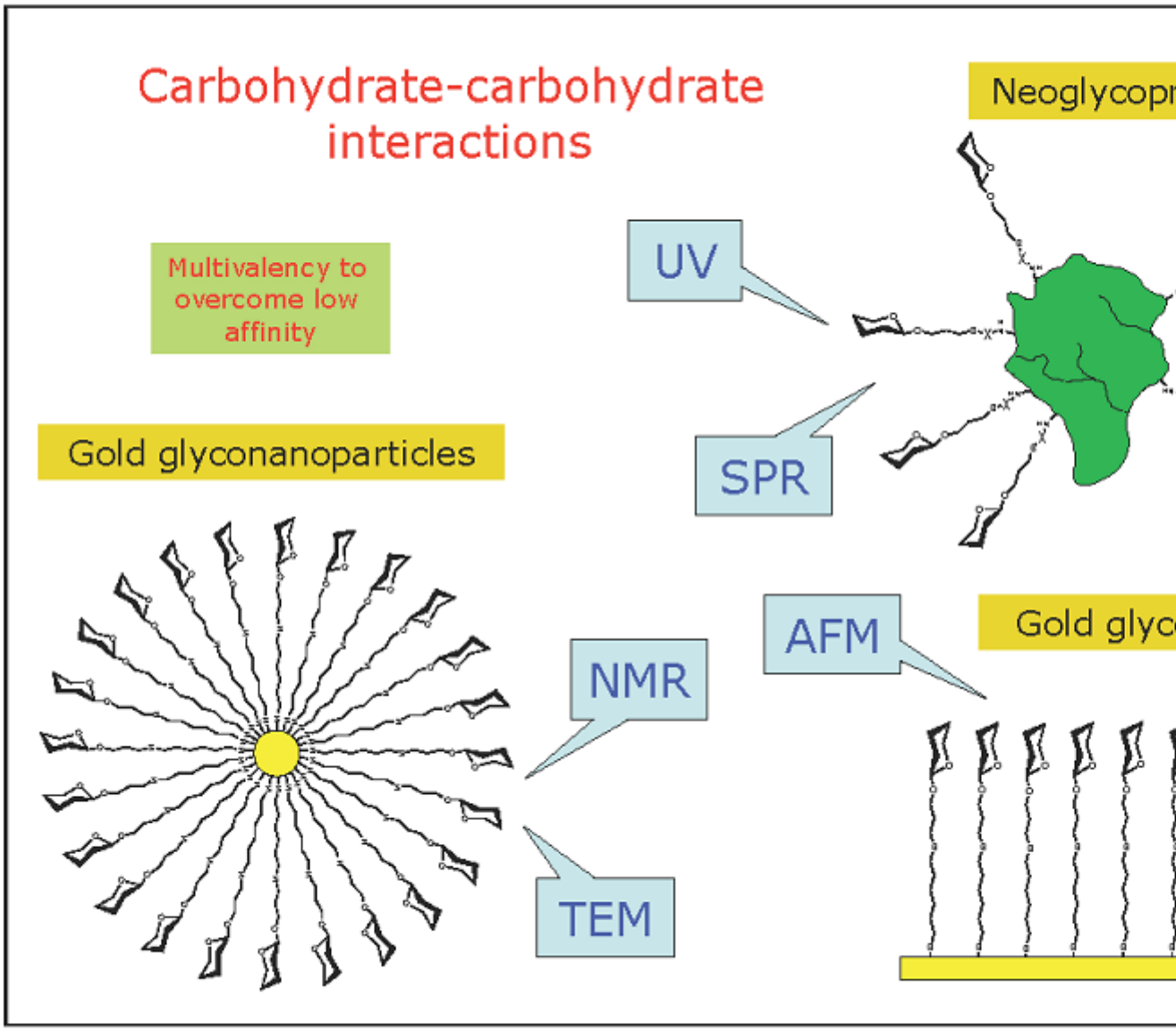


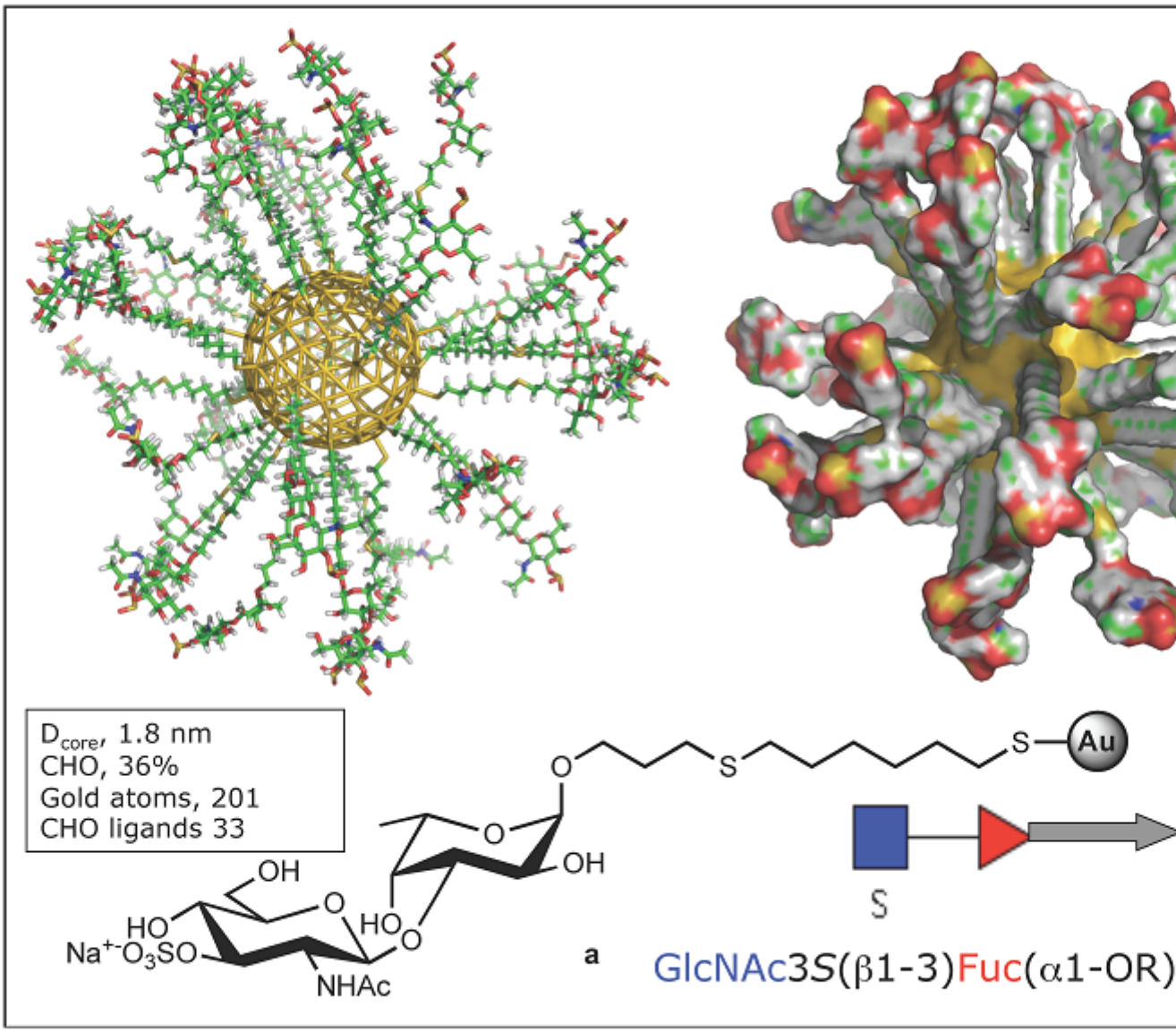
Reactive towards the cell
blocking antibody Block 1



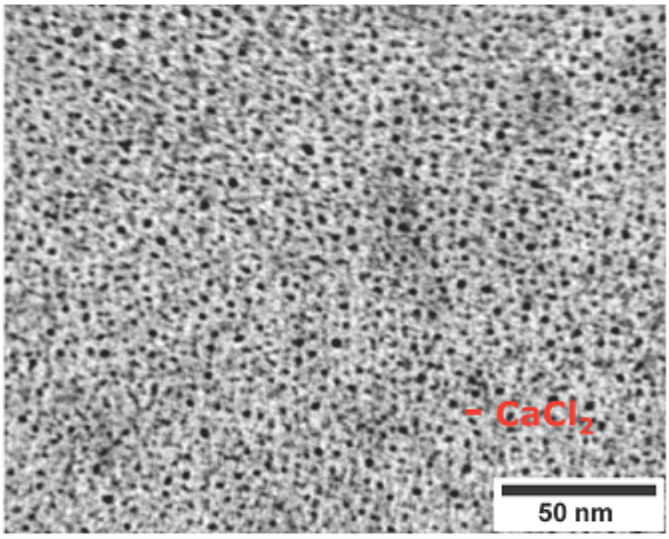
Reactive towards the cell
blocking antibody Block 2

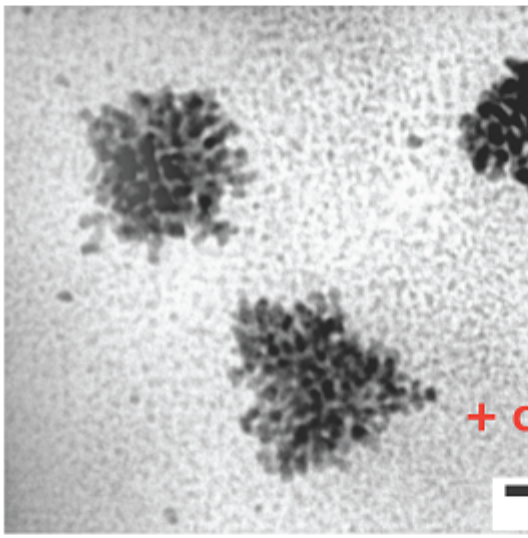
■ = D-GlcNAc ▲ = L-Fuc ● = D-Gal

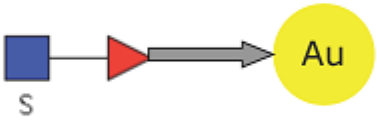

Carbohydrate-carbohydrate interactions
Neoglycopr
Multivalency to overcome low affinity
UV
SPR
Gold glyconanoparticles
AFM
Gold glyc
NMR
TEM

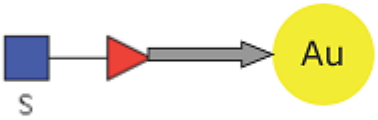

D core, 1.8 nm
CHO, 36%
Gold atoms, 201
CHO ligands 33
OH
HO
Na+-O3SO
O
HO
O
NHAc
O
O
OH
S
S
Au
S
a
GlcNAc3S(β1-3)Fuc(α1-OR)

Transmission Electron Microscopy of gold glyconanoparticles









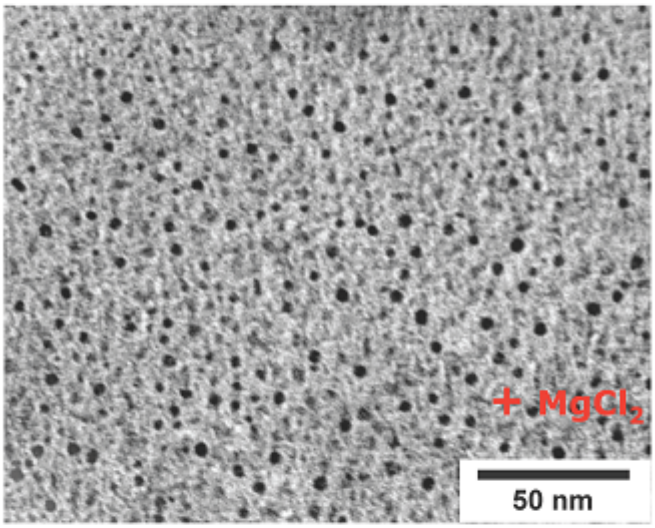
0.1 mg/ml; without calcium ions

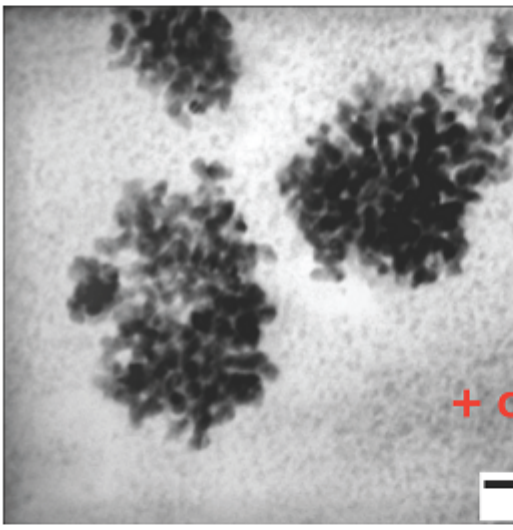
0.1 mg/ml; with calcium ions (10 m

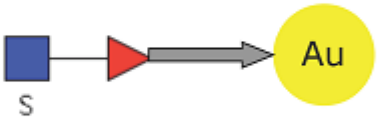
TEM analysis of gold glyconanoparticles

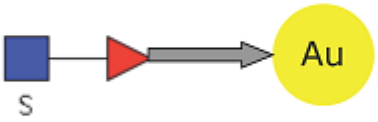
No self-recognition in the presence of $MgCl_2$ and $MnCl_2$.

Weak self-recognition in the presence of $CdCl_2$.









0.1 mg/ml; with magnesium ions (10 mM)

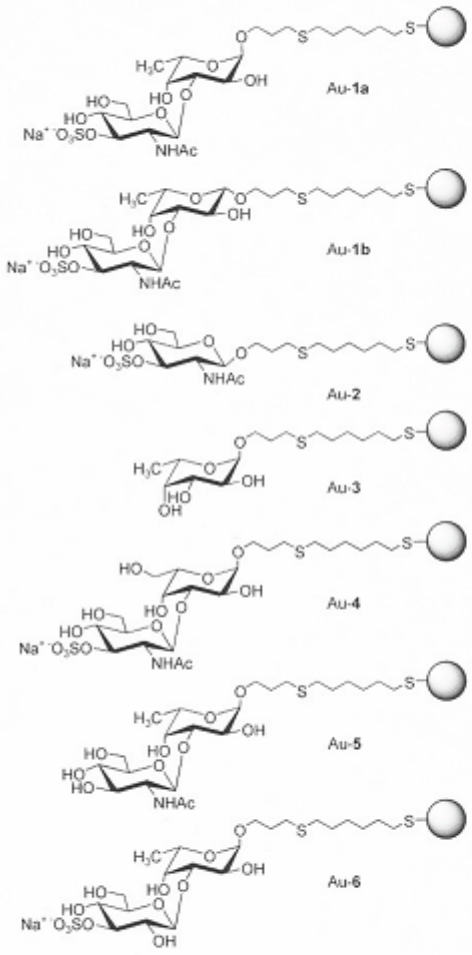
0.1 mg/ml; with calcium ions (10 m

Gold Glyconanoparticles as Probes to Explore the Carbohydrate-Mediated Self-Recognition of Marine Sponge Cells

Adriana Carvalho de Souza,[a] Koen M. Halkes,[a] Johannes D. Meeldijk,[b] Arie J. Verkleij,[b] Johannes F. G. Vliegenthart,[a] and Johannis P. Kamerling*[a]

Cell aggregation in the red-beard marine sponge *Microciona prolifera* is mediated by a 2×10^4 kDa proteoglycan-like macromolecular aggregation factor (MAF), and is based on two highly polyvalent functional properties; a Ca^{2+}-dependent proteoglycan self-interaction and a Ca^{2+}-independent cell-binding activity.[1–3] MAF, the first circular proteoglycan described, is composed of two *N*-glycosylated proteins, MAFp3 and MAFp4, with twenty units of each glycoprotein forming the central ring and the radiating arms, respectively. Each MAFp3 carries one or two copies of a 200 kDa acidic glycan, g-200, whereas each MAFp4 carries about 50 copies of a 6 kDa glycan, g-6.[3] The MAFp4 arms of the sunburst-like proteoglycan are linked to cell-surface binding receptors, while the MAFp3 ring exposes the g-200 glycans so that they can engage in the Ca^{2+}-dependent self-association (for a detailed review, see ref. [4]). By making use of MAF-specific monoclonal antibodies, it could be demonstrated that the self-association of MAF occurs through highly repetitive epitopes on the g-200 glycan.[5,6] One of these epitopes was shown to be the sulfated disaccharide GlcpNAc3*S*(β1–3)Fucp.[7] To gain insight into the role of carbohydrate interactions in MAF self-aggregation, we designed a challenging system for mimicking the g-200 self-association.[8] By using the synthetic sulfated disaccharide, multivalently presented as a bovine serum albumin conjugate, and surface plasmon resonance spectroscopy, it was shown that Ca^{2+}-dependent carbohydrate self-recognition is a major force in the g-200 association phenomenon.

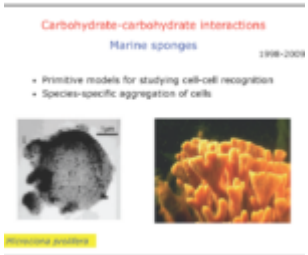
Gold glyconanoparticles have been successfully used as inert multivalent systems to explore either carbohydrate self-interac-

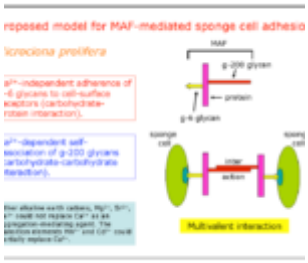


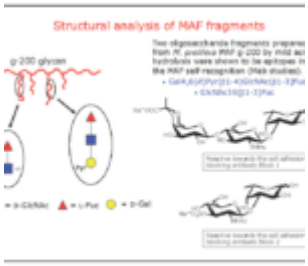
Scheme 1. *Gold glyconanoparticles Au-1a/b to Au-6, related to the MAF sulfated disaccharide epitope.*

Adria
de Sc

ChemB
6 (200







hans36bis.png

Image not found or type unknown

hans37bis.png

Image not found or type unknown

hans38bis.png

Image not found or type unknown

hans39bis.png

Image not found or type unknown

hans40bis.png

Image not found or type unknown

Category

1. News