Disaccharide binding to galectin-1: free energy calculations and the molecular recognition mechanism.

Supporting information for publication

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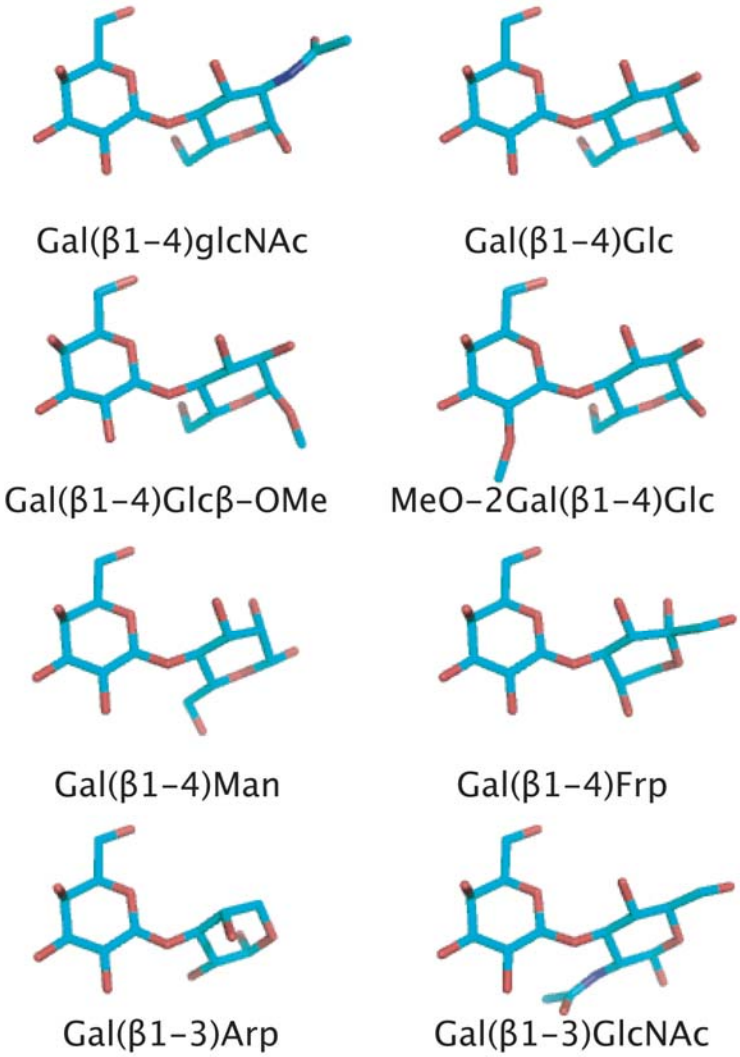
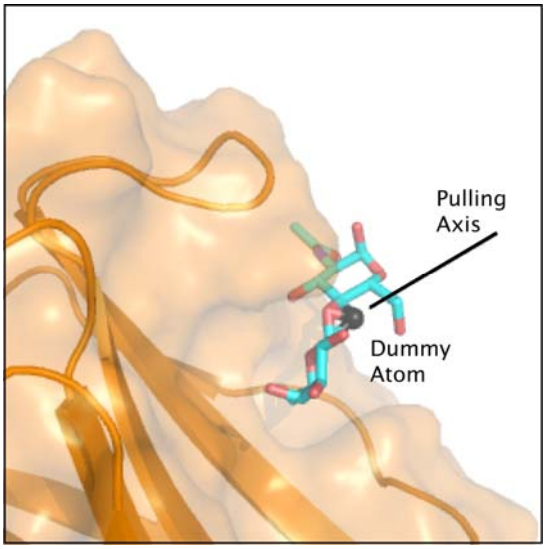
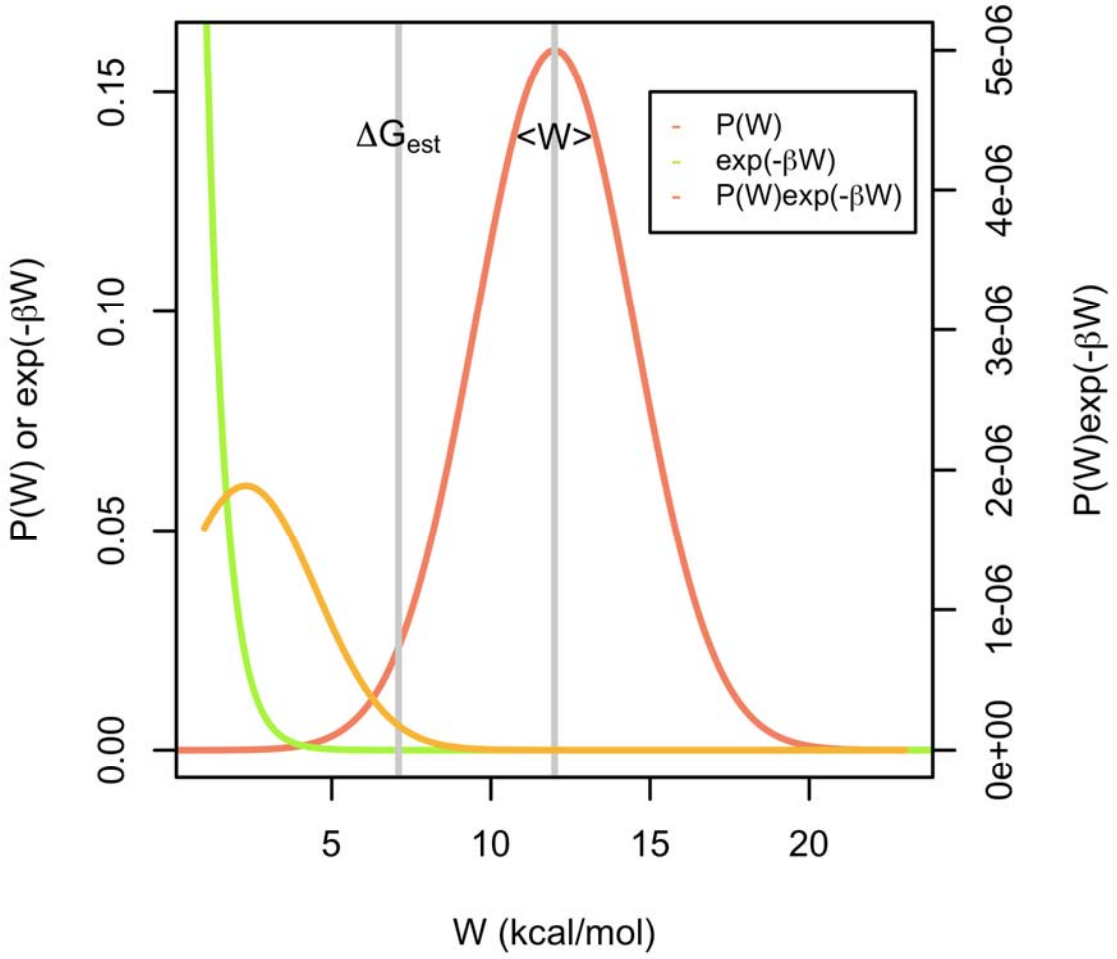


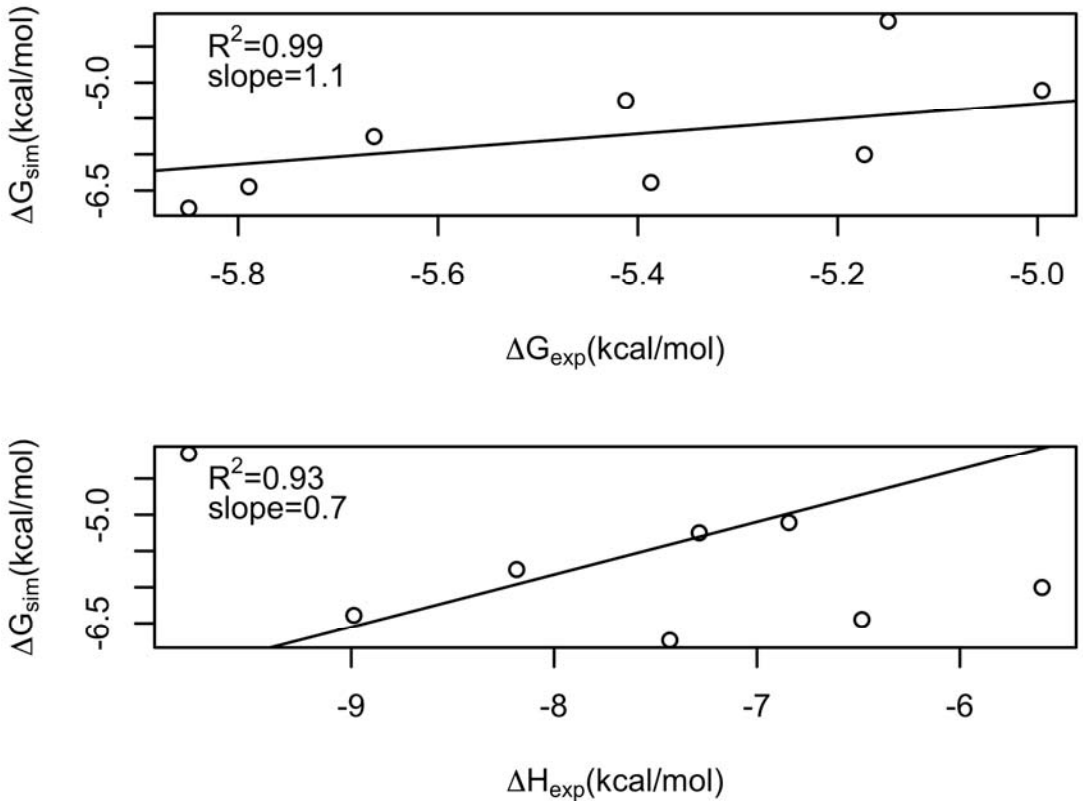
Supplemental figure S.1: Disaccharides used for the simulations. Line-representation of the 8 disaccharides used in the simulations.



Supplemental figure S.2: Dummy atom locations and pulling axis. The figure shows the binding site for the disaccharide. The dummy atom, which is located in the center of mass of the sugar, is shown as a grey sphere. The pulling axis (second moment of inertia) is also highlighted in grey. The right hand side of the line is the final position of the dummy atom (8 Å from the initial position).



Supplemental figure S.3: Jarzynski average of the exponential work values. Both the work probability distribution and exponential work values are shown. Jarzynski's equality heavily weights the low tail of the work distribution. Vertical lines represent the average work and the estimated free energy (ΔG_{est}).



Supplemental figure S.4: Correlation between experimental and simulations free energy and enthalpy values. Top: Correlation between experimental ΔG_{exp} and simulations estimated ΔG_{sim} for all disaccharides. The slope and R^2 of the linear fit is presented. Bottom: Correlation between experimental ΔH_{exp} and simulations estimated ΔG_{sim} for all disaccharides. The slope and R^2 of the linear fit is presented. A better correlation is obtained for free energy values, showing how simulations capture a combination of enthalpy and entropy change.

Supplemetal table S.1: Hydrogen bonds between galectin-1 and ligand with occupancies > 15%. Shaded in grey are hydrogen bonds formed with the galactose unit.

Acceptor	Donor	Galβ1,4GlcNAc	MeO-2Galβ1,4Glc	Galβ1,3GlcNAc	Galβ1,4Man	Galβ1,4Fru	Galβ1,4Glc	Galβ1,3Arp	Galb1,4Glcβ-OMe
Gal-O4	44-Hsp-HE2	70.4	70.0	69.3	73.1	83.4	71.0	85.4	75.5
Gal-O4	48-Arg-HH21	84.9	83.8	85.8	81.2	83.3	82.4	56.1	89.3
Gal-O5	48-Arg-HH22	99.3	99.4	93.3	99.6	99.8	99.4	96.0	99.7
Gal-06	61-Asn-HD22	97.2	95.3	90.8	99.2	98.9	98.9	64.1	98.6
71-Glu-OE2	Gal-HO6	64.1	64.0	59.6	73.4	58.1	67.1	21.7	70.7
Glc-O2	73-Arg-HH22	-	72.9	-	-	-	74.8	-	74.0
Glc-O3	48-Arg-H11	100.0	100.0	58.8	-	-	64.3	-	100.0
Glc-O3	48-Arg-H22	59.1	70.3	-	-	-	100.0	-	67.9
71-Glu-OE2	Glu-O3	74.9	74.5	-	-	-	78.8	-	77.9
Glc-O3	73-Arg-H22	47.5	84.8	-	-	-	83.0	-	84.0
Glc-O4	48-Arg-H11	-	-	99.6	-	-	-	-	-
Glc-O4	48-Arg-H22	59.2	55.7	63.4	-	-	52.5	-	45.4
71-Glu-OE2	Glc-O4	-	-	85.6	-	-	-	-	-
Glc-O4	73-Arg-HH21	-	-	53.5	-	-	-	-	-
71-Glu-OE1	Man-O2	-	-	-	88.7	-	-	-	-
Man-O3	48-Arg-H11	-	-	-	100.0	-	-	-	-
Man-O3	48-Arg-H22	-	-	-	50.3	-	-	-	-
71-Glu-OE1	Man-O3	-	-	-	57.4	-	-	-	-
Man-O3	73-Arg-H22	-	-	-	88.7	-	-	-	-
Man-O4	48-Arg-H22	-	-	-	47.1	-	-	-	-
71-Glu-OE1	Frp-O2	-	-	-	-	32.7	-	-	-
Frp-O3	48-Arg-H11	-	-	-	-	99.8	-	-	-
Frp-O3	48-Arg-H22	-	-	-	-	33.3	-	-	-
71-Glu-OE2	Frp-O3	-	-	-	-	81.7	-	-	-
Frp-O3	73-Arg-HH22	-	-	-	-	86.9	-	-	-
Frp-O4	48-Arg-HH22	-	-	-	-	71.3	-	-	-
Arp-O3	48-Arg-H22	-	-	-	-	-	-	85.6	-
Arp-O4	48-Arg-H22	-	-	-	-	-	-	33.6	-
Arp-O4	48-Arg-H11	-	-	-	-	-	-	96.3	-
Arp-O4	73-Arg-H22	-	-	-	-	-	-	18.1	-