Full wwPDB X-ray Structure Validation Report ⓘ

Oct 16, 2021 – 07:42 PM EDT

PDB ID	:	1ON2
Title	:	Bacillus subtilis Manganese Transport Regulator (MntR), D8M Mutant, Bound to Manganese
Authors	:	Glasfeld, A.; Guedon, E.; Helmann, J.D.; Brennan, R.G.
Deposited on	:	2003-02-26
Resolution	:	1.61 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see references ⓘ) were used in the production of this report:

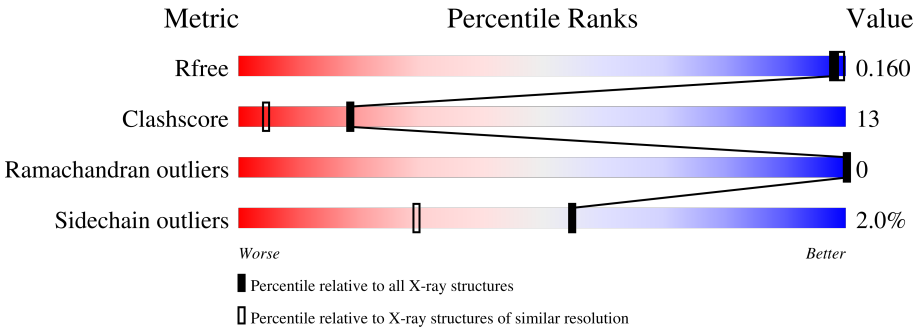
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.23.2
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.23.2

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.61 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	4693 (1.64-1.60)
Clashscore	141614	5002 (1.64-1.60)
Ramachandran outliers	138981	4888 (1.64-1.60)
Sidechain outliers	138945	4887 (1.64-1.60)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5%

Mol	Chain	Length	Quality of chain
1	A	142	73% 21% • 5%
1	B	142	76% 18% • 5%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 2416 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Transcriptional regulator mntR.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	135	Total	C	N	O	S	0	0	0
			1118	714	187	213	4			
1	B	135	Total	C	N	O	S	0	0	0
			1118	714	187	213	4			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	8	MET	ASP	engineered mutation	UNP P54512
A	81	GLU	ASP	SEE REMARK 999	UNP P54512
B	8	MET	ASP	engineered mutation	UNP P54512
B	81	GLU	ASP	SEE REMARK 999	UNP P54512

- Molecule 2 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Mn	0	0
			1	1		
2	B	1	Total	Mn	0	0
			1	1		

- Molecule 3 is water.

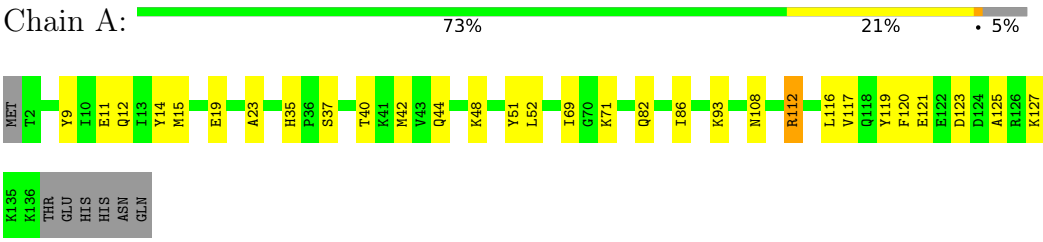
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	72	Total	O	0	0
			72	72		
3	B	106	Total	O	0	0
			106	106		

3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

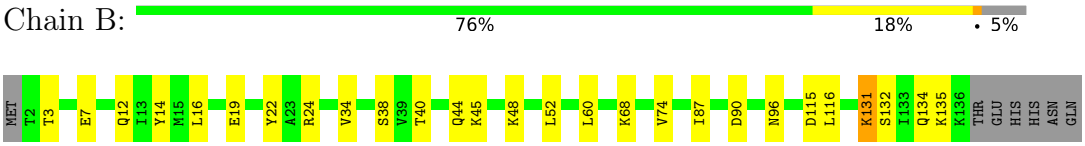
- Molecule 1: Transcriptional regulator mntR

Chain A:



- Molecule 1: Transcriptional regulator mntR

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, α, β, γ	52.50Å 52.50Å 83.10Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	45.60 – 1.61 26.25 – 1.40	Depositor EDS
% Data completeness (in resolution range)	91.6 (45.60-1.61) 69.6 (26.25-1.40)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.07 (at 1.40Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.220 , 0.258 0.155 , 0.160	Depositor DCC
R_{free} test set	3008 reflections (8.55%)	wwPDB-VP
Wilson B-factor (Å^2)	19.4	Xtriage
Anisotropy	0.075	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 33.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.38$, $< L^2 > = 0.21$	Xtriage
Estimated twinning fraction	0.114 for -h,-k,l 0.436 for h,-h-k,-l 0.115 for -k,-h,-l	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	2416	wwPDB-VP
Average B, all atoms (Å^2)	22.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.88% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MN

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\#\|Z\| > 5$	RMSZ	$\#\|Z\| > 5$
1	A	0.30	0/1136	0.53	0/1523
1	B	0.29	0/1136	0.52	0/1523
All	All	0.30	0/2272	0.52	0/3046

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1118	0	1135	38	0
1	B	1118	0	1135	28	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	72	0	0	3	0
3	B	106	0	0	1	0
All	All	2416	0	2270	60	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 13.

All (60) close contacts within the same asymmetric unit are listed below, sorted by their clash

magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:12:GLN:HE21	1:B:16:LEU:CD1	1.88	0.86
1:A:108:ASN:HD21	1:B:90:ASP:H	1.23	0.84
1:B:40:THR:O	1:B:44:GLN:HG3	1.81	0.80
1:B:12:GLN:HE21	1:B:16:LEU:HD11	1.52	0.74
1:B:44:GLN:O	1:B:48:LYS:HG2	1.89	0.72
1:A:12:GLN:HA	1:A:15:MET:CE	2.20	0.71
1:A:12:GLN:HA	1:A:15:MET:HE3	1.74	0.70
1:A:116:LEU:HD21	1:B:116:LEU:HD21	1.73	0.68
1:B:12:GLN:HE21	1:B:16:LEU:HD13	1.59	0.67
1:A:112:ARG:HG3	1:B:87:ILE:O	1.96	0.66
1:A:35:HIS:HD2	1:A:37:SER:H	1.43	0.65
1:A:117:VAL:O	1:A:121:GLU:HG2	1.97	0.64
1:A:35:HIS:CD2	1:A:37:SER:H	2.17	0.61
1:B:45:LYS:HB2	1:B:45:LYS:NZ	2.14	0.61
1:B:52:LEU:HD13	1:B:60:LEU:HD11	1.82	0.60
1:A:48:LYS:NZ	1:A:48:LYS:HB2	2.16	0.60
1:B:132:SER:HA	1:B:135:LYS:HD2	1.82	0.60
1:A:11:GLU:C	1:A:15:MET:HE2	2.23	0.58
1:B:68:LYS:HB2	1:B:68:LYS:NZ	2.19	0.58
1:B:22:TYR:CD1	1:B:24:ARG:HG3	2.40	0.57
1:A:108:ASN:ND2	1:B:90:ASP:H	2.00	0.56
1:B:3:THR:O	1:B:7:GLU:HG3	2.06	0.56
1:B:52:LEU:HD13	1:B:60:LEU:HD21	1.90	0.54
1:A:11:GLU:O	1:A:15:MET:HG3	2.07	0.54
1:A:40:THR:HG22	1:A:44:GLN:HE21	1.73	0.54
1:A:86:ILE:CD1	1:A:117:VAL:HG13	2.39	0.53
1:B:12:GLN:NE2	1:B:16:LEU:CD1	2.66	0.53
1:A:11:GLU:O	1:A:15:MET:HE2	2.09	0.53
1:B:131:LYS:O	1:B:135:LYS:HG3	2.09	0.53
1:A:112:ARG:CG	1:B:87:ILE:O	2.55	0.52
1:A:12:GLN:HA	1:A:15:MET:HE2	1.91	0.52
1:A:11:GLU:HG2	1:A:15:MET:CE	2.40	0.51
1:A:123:ASP:OD1	1:A:125:ALA:HB3	2.10	0.51
1:A:52:LEU:C	1:A:52:LEU:HD12	2.31	0.51
1:A:120:PHE:O	1:A:127:LYS:HE2	2.11	0.51
1:B:45:LYS:HB2	1:B:45:LYS:HZ2	1.77	0.50
1:A:40:THR:O	1:A:44:GLN:HG3	2.12	0.48
1:B:34:VAL:CG1	1:B:38:SER:HB2	2.43	0.48
1:A:82:GLN:HG3	3:A:211:HOH:O	2.14	0.47
1:A:131:LYS:O	1:A:134:GLN:HG2	2.13	0.47
1:B:12:GLN:NE2	1:B:16:LEU:HD11	2.25	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:134:GLN:HB3	1:B:115:ASP:OD2	2.16	0.46
1:A:9:TYR:CD1	1:A:42:MET:HG2	2.52	0.45
1:A:11:GLU:HG2	1:A:15:MET:HE2	1.98	0.44
1:A:14:TYR:OH	1:A:71:LYS:HD3	2.17	0.44
1:B:12:GLN:O	1:B:16:LEU:HD13	2.18	0.43
1:A:9:TYR:CG	1:A:42:MET:HG2	2.53	0.43
1:A:121:GLU:OE2	1:A:121:GLU:HA	2.19	0.43
1:A:48:LYS:HB2	1:A:48:LYS:HZ3	1.83	0.43
1:B:22:TYR:CE1	1:B:24:ARG:HG3	2.54	0.42
1:A:116:LEU:O	1:A:119:TYR:HB3	2.20	0.42
1:A:23:ALA:HA	3:A:163:HOH:O	2.19	0.41
1:B:14:TYR:CD2	1:B:74:VAL:HG21	2.55	0.41
1:B:52:LEU:HB3	1:B:60:LEU:HD11	2.01	0.41
1:A:131:LYS:HA	1:A:134:GLN:OE1	2.19	0.41
1:A:93:LYS:HD3	3:A:180:HOH:O	2.19	0.41
1:A:51:TYR:HE2	1:A:69:ILE:HD12	1.84	0.41
1:A:19:GLU:OE1	1:A:19:GLU:HA	2.21	0.41
1:A:82:GLN:O	1:A:86:ILE:HG13	2.21	0.40
1:B:134:GLN:HB2	3:B:230:HOH:O	2.20	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	133/142 (94%)	131 (98%)	2 (2%)	0	100	100
1	B	133/142 (94%)	131 (98%)	2 (2%)	0	100	100
All	All	266/284 (94%)	262 (98%)	4 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	123/130 (95%)	121 (98%)	2 (2%)	62 40
1	B	123/130 (95%)	120 (98%)	3 (2%)	49 22
All	All	246/260 (95%)	241 (98%)	5 (2%)	55 29

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	112	ARG
1	A	134	GLN
1	B	19	GLU
1	B	96	ASN
1	B	131	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	35	HIS
1	A	44	GLN
1	A	96	ASN
1	A	108	ASN
1	B	12	GLN
1	B	82	GLN
1	B	96	ASN
1	B	103	HIS

5.3.3 RNA (i)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains (i)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 2 ligands modelled in this entry, 2 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

Unable to reproduce the depositors R factor - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

Unable to reproduce the depositors R factor - this section is therefore empty.

6.3 Carbohydrates

Unable to reproduce the depositors R factor - this section is therefore empty.

6.4 Ligands

Unable to reproduce the depositors R factor - this section is therefore empty.

6.5 Other polymers

Unable to reproduce the depositors R factor - this section is therefore empty.