Full wwPDB X-ray Structure Validation Report (i)

May 15, 2020 – 01:13 pm BST

PDB ID	:	2YO2
Title	:	Salmonella enterica SadA 255-358 fused to GCN4 adaptors (SadAK12)
Authors	:	Hartmann, M.D.; Hernandez Alvarez, B.; Lupas, A.N.
Deposited on	:	2012-10-20
Resolution	:	2.00 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 (i) symbol.

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

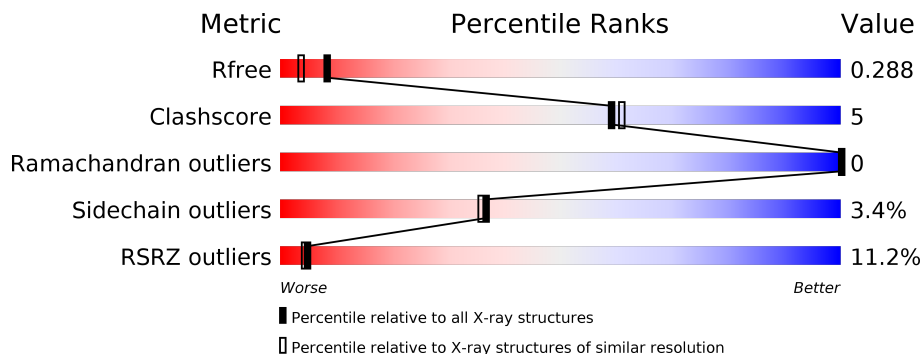|		
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

1 Overall quality at a glance ⓘ

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

The reported resolution of this entry is 2.00 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	Percentile Ranks	Value
Rfree		0.288
Clashscore		5
Ramachandran outliers		0
Sidechain outliers		3.4%
RSRZ outliers		11.2%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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 on 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% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	170	11% 88% 6% · 6%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 1289 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 GENERAL CONTROL PROTEIN GCN4, PUTATIVE INNER MEMBRANE PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	160	1188	748	196	243	1	0	5	0

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	229	ILE	LEU	engineered mutation	UNP Q8ZL64
A	233	ILE	VAL	engineered mutation	UNP Q8ZL64
A	236	ILE	LEU	engineered mutation	UNP Q8ZL64
A	240	ILE	ASN	engineered mutation	UNP Q8ZL64
A	243	ILE	LEU	engineered mutation	UNP Q8ZL64
A	247	ILE	VAL	engineered mutation	UNP Q8ZL64
A	250	ILE	LEU	engineered mutation	UNP Q8ZL64
A	254	ILE	VAL	engineered mutation	UNP Q8ZL64
A	362	ILE	LEU	engineered mutation	UNP P03069
A	366	ILE	VAL	engineered mutation	UNP P03069
A	369	ILE	LEU	engineered mutation	UNP P03069
A	373	ILE	ASN	engineered mutation	UNP P03069
A	376	ILE	LEU	engineered mutation	UNP P03069
A	380	ILE	VAL	engineered mutation	UNP P03069
A	383	ILE	LEU	engineered mutation	UNP P03069
A	387	ILE	VAL	engineered mutation	UNP P03069
A	388	LYS	-	expression tag	UNP Q8ZL64
A	389	LEU	-	expression tag	UNP Q8ZL64
A	390	HIS	-	expression tag	UNP Q8ZL64
A	391	HIS	-	expression tag	UNP Q8ZL64
A	392	HIS	-	expression tag	UNP Q8ZL64
A	393	HIS	-	expression tag	UNP Q8ZL64
A	394	HIS	-	expression tag	UNP Q8ZL64
A	395	HIS	-	expression tag	UNP Q8ZL64

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	101	Total 101	O 101	0	0

3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA 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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). 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: GENERAL CONTROL PROTEIN GCN4, PUTATIVE INNER MEMBRANE PRO-TEIN
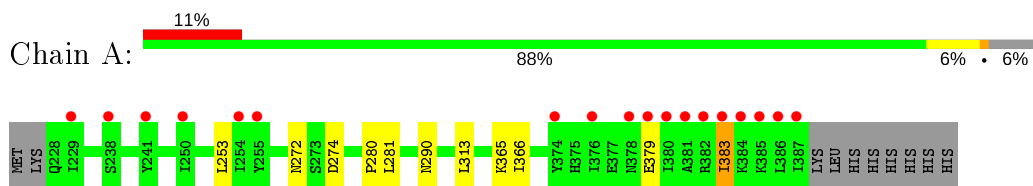
4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 63 2 2	Depositor
Cell constants a, b, c, α, β, γ	48.63Å 48.63Å 366.00Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	38.26 – 2.00 36.50 – 2.00	Depositor EDS
% Data completeness (in resolution range)	99.5 (38.26-2.00) 99.6 (36.50-2.00)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.96 (at 2.00Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.242 , 0.284 0.240 , 0.288	Depositor DCC
R_{free} test set	945 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å^2)	27.5	Xtriage
Anisotropy	0.029	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.31 , 48.1	EDS
L-test for twinning[2]	$< |L| > = 0.44$, $< L^2 > = 0.27$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.92	EDS
Total number of atoms	1289	wwPDB-VP
Average B, all atoms (Å^2)	48.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.30% 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 (i)

5.1 Standard geometry (i)

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	0.71	0/1215	0.65	0/1652

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 (i)

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	1188	0	1176	11	0
2	A	101	0	0	2	0
All	All	1289	0	1176	11	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 5.

All (11) 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:A:281[B]:LEU:HD12	1:A:290[B]:ASN:OD1	1.66	0.95
1:A:281[B]:LEU:CD1	1:A:290[B]:ASN:OD1	2.17	0.92
1:A:281[A]:LEU:HD12	2:A:2007:HOH:O	1.89	0.71
1:A:281[B]:LEU:HD11	1:A:290[B]:ASN:OD1	1.93	0.68

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:280:PRO:O	1:A:281[B]:LEU:HD13	1.99	0.62
1:A:379:GLU:O	1:A:383:ILE:HG23	2.02	0.59
1:A:280:PRO:C	1:A:281[B]:LEU:HD13	2.28	0.54
1:A:281[A]:LEU:CD1	2:A:2007:HOH:O	2.50	0.53
1:A:280:PRO:O	1:A:281[B]:LEU:CD1	2.56	0.53
1:A:272:ASN:HD22	1:A:274:ASP:H	1.65	0.44
1:A:313:LEU:HD23	1:A:313:LEU:HA	1.91	0.42

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	163/170 (96%)	162 (99%)	1 (1%)	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	124/140 (89%)	119 (96%)	5 (4%)	31 29

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

Mol	Chain	Res	Type
1	A	253	LEU
1	A	365	LYS
1	A	366[A]	ILE
1	A	366[B]	ILE
1	A	383	ILE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	272	ASN

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 carbohydrates in this entry.

5.6 Ligand geometry (i)

There are no ligands in this entry.

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 (i)

6.1 Protein, DNA and RNA chains (i)

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	160/170 (94%)	0.15	18 (11%)	5	4	12, 30, 109, 149	0

All (18) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	386	LEU	9.9
1	A	385	LYS	5.8
1	A	241	TYR	4.6
1	A	384	LYS	4.3
1	A	255[A]	TYR	4.1
1	A	382	ARG	3.9
1	A	380	ILE	3.5
1	A	374	TYR	3.3
1	A	378	ASN	3.3
1	A	379	GLU	3.1
1	A	387	ILE	3.0
1	A	383	ILE	2.7
1	A	376	ILE	2.4
1	A	254	ILE	2.4
1	A	238	SER	2.3
1	A	250	ILE	2.1
1	A	229	ILE	2.1
1	A	381	ALA	2.0

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

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

6.3 Carbohydrates (i)

There are no carbohydrates in this entry.

6.4 Ligands (i)

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.