



# wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 31, 2016 – 11:39 PM GMT

PDB ID : 1Y67  
Title : Crystal Structure of Manganese Superoxide Dismutase from *Deinococcus radiodurans*  
Authors : Chan, S.; Tanaka, S.; Sawaya, M.R.; Perry, L.J.  
Deposited on : 2004-12-03  
Resolution : 1.85 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.  
We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)  
A user guide is available at  
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>  
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467  
Mogul : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

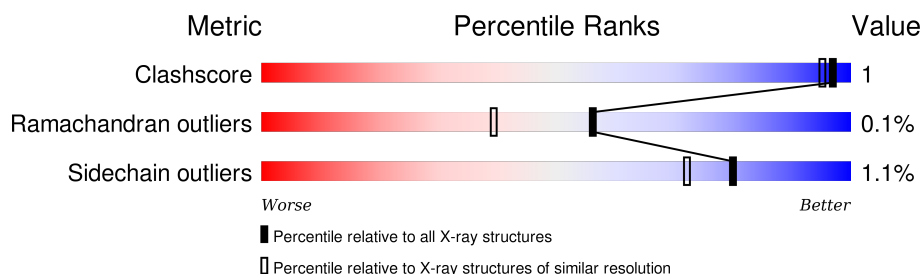
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.85 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))
Clashscore	102246	1898 (1.86-1.86)
Ramachandran outliers	100387	1875 (1.86-1.86)
Sidechain outliers	100360	1875 (1.86-1.86)

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  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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  $\leq 5\%$ . 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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	229	 87% 5% 8%
1	B	229	 86% • 11%
1	C	229	 85% • 11%
1	D	229	 89% • • 7%

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 6965 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 Manganese Superoxide dismutase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	210	Total	C	N	O	S	0	0	0
			1651	1048	289	310	4			
1	B	204	Total	C	N	O	S	0	0	0
			1614	1025	282	303	4			
1	C	204	Total	C	N	O	S	0	0	0
			1615	1028	281	302	4			
1	D	214	Total	C	N	O	S	0	0	0
			1685	1067	298	316	4			

There are 76 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	EXPRESSION TAG	UNP Q9RUV2
A	1	ALA	-	EXPRESSION TAG	UNP Q9RUV2
A	212	LEU	-	EXPRESSION TAG	UNP Q9RUV2
A	213	VAL	-	EXPRESSION TAG	UNP Q9RUV2
A	214	PRO	-	EXPRESSION TAG	UNP Q9RUV2
A	215	ARG	-	EXPRESSION TAG	UNP Q9RUV2
A	216	GLY	-	EXPRESSION TAG	UNP Q9RUV2
A	217	SER	-	EXPRESSION TAG	UNP Q9RUV2
A	218	ALA	-	EXPRESSION TAG	UNP Q9RUV2
A	219	ALA	-	EXPRESSION TAG	UNP Q9RUV2
A	220	ALA	-	EXPRESSION TAG	UNP Q9RUV2
A	221	LEU	-	EXPRESSION TAG	UNP Q9RUV2
A	222	GLU	-	EXPRESSION TAG	UNP Q9RUV2
A	223	HIS	-	EXPRESSION TAG	UNP Q9RUV2
A	224	HIS	-	EXPRESSION TAG	UNP Q9RUV2
A	225	HIS	-	EXPRESSION TAG	UNP Q9RUV2
A	226	HIS	-	EXPRESSION TAG	UNP Q9RUV2
A	227	HIS	-	EXPRESSION TAG	UNP Q9RUV2
A	228	HIS	-	EXPRESSION TAG	UNP Q9RUV2
B	0	MET	-	EXPRESSION TAG	UNP Q9RUV2
B	1	ALA	-	EXPRESSION TAG	UNP Q9RUV2

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Chain	Residue	Modelled	Actual	Comment	Reference
B	212	LEU	-	EXPRESSION TAG	UNP Q9RUV2
B	213	VAL	-	EXPRESSION TAG	UNP Q9RUV2
B	214	PRO	-	EXPRESSION TAG	UNP Q9RUV2
B	215	ARG	-	EXPRESSION TAG	UNP Q9RUV2
B	216	GLY	-	EXPRESSION TAG	UNP Q9RUV2
B	217	SER	-	EXPRESSION TAG	UNP Q9RUV2
B	218	ALA	-	EXPRESSION TAG	UNP Q9RUV2
B	219	ALA	-	EXPRESSION TAG	UNP Q9RUV2
B	220	ALA	-	EXPRESSION TAG	UNP Q9RUV2
B	221	LEU	-	EXPRESSION TAG	UNP Q9RUV2
B	222	GLU	-	EXPRESSION TAG	UNP Q9RUV2
B	223	HIS	-	EXPRESSION TAG	UNP Q9RUV2
B	224	HIS	-	EXPRESSION TAG	UNP Q9RUV2
B	225	HIS	-	EXPRESSION TAG	UNP Q9RUV2
B	226	HIS	-	EXPRESSION TAG	UNP Q9RUV2
B	227	HIS	-	EXPRESSION TAG	UNP Q9RUV2
B	228	HIS	-	EXPRESSION TAG	UNP Q9RUV2
C	0	MET	-	EXPRESSION TAG	UNP Q9RUV2
C	1	ALA	-	EXPRESSION TAG	UNP Q9RUV2
C	212	LEU	-	EXPRESSION TAG	UNP Q9RUV2
C	213	VAL	-	EXPRESSION TAG	UNP Q9RUV2
C	214	PRO	-	EXPRESSION TAG	UNP Q9RUV2
C	215	ARG	-	EXPRESSION TAG	UNP Q9RUV2
C	216	GLY	-	EXPRESSION TAG	UNP Q9RUV2
C	217	SER	-	EXPRESSION TAG	UNP Q9RUV2
C	218	ALA	-	EXPRESSION TAG	UNP Q9RUV2
C	219	ALA	-	EXPRESSION TAG	UNP Q9RUV2
C	220	ALA	-	EXPRESSION TAG	UNP Q9RUV2
C	221	LEU	-	EXPRESSION TAG	UNP Q9RUV2
C	222	GLU	-	EXPRESSION TAG	UNP Q9RUV2
C	223	HIS	-	EXPRESSION TAG	UNP Q9RUV2
C	224	HIS	-	EXPRESSION TAG	UNP Q9RUV2
C	225	HIS	-	EXPRESSION TAG	UNP Q9RUV2
C	226	HIS	-	EXPRESSION TAG	UNP Q9RUV2
C	227	HIS	-	EXPRESSION TAG	UNP Q9RUV2
C	228	HIS	-	EXPRESSION TAG	UNP Q9RUV2
D	0	MET	-	EXPRESSION TAG	UNP Q9RUV2
D	1	ALA	-	EXPRESSION TAG	UNP Q9RUV2
D	212	LEU	-	EXPRESSION TAG	UNP Q9RUV2
D	213	VAL	-	EXPRESSION TAG	UNP Q9RUV2
D	214	PRO	-	EXPRESSION TAG	UNP Q9RUV2
D	215	ARG	-	EXPRESSION TAG	UNP Q9RUV2

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Chain	Residue	Modelled	Actual	Comment	Reference
D	216	GLY	-	EXPRESSION TAG	UNP Q9RUV2
D	217	SER	-	EXPRESSION TAG	UNP Q9RUV2
D	218	ALA	-	EXPRESSION TAG	UNP Q9RUV2
D	219	ALA	-	EXPRESSION TAG	UNP Q9RUV2
D	220	ALA	-	EXPRESSION TAG	UNP Q9RUV2
D	221	LEU	-	EXPRESSION TAG	UNP Q9RUV2
D	222	GLU	-	EXPRESSION TAG	UNP Q9RUV2
D	223	HIS	-	EXPRESSION TAG	UNP Q9RUV2
D	224	HIS	-	EXPRESSION TAG	UNP Q9RUV2
D	225	HIS	-	EXPRESSION TAG	UNP Q9RUV2
D	226	HIS	-	EXPRESSION TAG	UNP Q9RUV2
D	227	HIS	-	EXPRESSION TAG	UNP Q9RUV2
D	228	HIS	-	EXPRESSION TAG	UNP Q9RUV2

- Molecule 2 is FE (III) ION (three-letter code: FE) (formula: Fe).

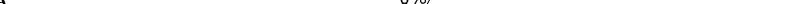
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	B	1	Total Fe 1 1	0	0
2	A	1	Total Fe 1 1	0	0
2	D	1	Total Fe 1 1	0	0
2	C	1	Total Fe 1 1	0	0

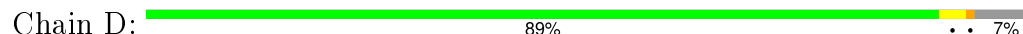
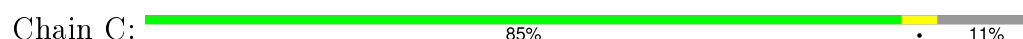
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	116	Total O 116 116	0	0
3	B	89	Total O 89 89	1	0
3	C	94	Total O 94 94	0	0
3	D	97	Total O 97 97	1	0



Note EDS was not executed.

- Chain A:  87% 5% 8%



## 4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	43.80 Å 87.92 Å 116.20 Å 90.00° 91.14° 90.00°	Depositor
Resolution (Å)	119.52 – 1.85	Depositor
% Data completeness (in resolution range)	99.6 (119.52-1.85)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.07	Depositor
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.184 , 0.205	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	6965	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	31.0	wwPDB-VP

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

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

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	0.48	0/1695	0.53	0/2305
1	B	0.43	0/1658	0.51	0/2255
1	C	0.43	0/1659	0.52	0/2257
1	D	0.52	3/1731 (0.2%)	0.54	0/2355
All	All	0.47	3/6743 (0.0%)	0.53	0/9172

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	44	GLU	C-O	5.91	1.34	1.23
1	D	44	GLU	CB-CG	5.55	1.62	1.52
1	D	44	GLU	C-N	5.47	1.42	1.33

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	1651	0	1571	5	0
1	B	1614	0	1532	4	0
1	C	1615	0	1536	5	0
1	D	1685	0	1601	5	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	116	0	0	0	0
3	B	89	0	0	0	0
3	C	94	0	0	0	0
3	D	97	0	0	0	0
All	All	6965	0	6240	17	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 1.

The worst 5 of 17 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:D:214:PRO:O	1:D:215:ARG:HB2	1.92	0.69
1:A:59:GLN:OE1	1:A:62:ARG:NH1	2.33	0.58
1:D:50:ASP:N	1:D:50:ASP:OD1	2.37	0.56
1:A:71:LEU:O	1:A:75:ALA:HB3	2.10	0.51
1:B:209:ALA:HB1	1:C:212:LEU:HD13	1.92	0.51

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	206/229 (90%)	202 (98%)	4 (2%)	0	100	100
1	B	200/229 (87%)	195 (98%)	5 (2%)	0	100	100
1	C	200/229 (87%)	197 (98%)	3 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	D	212/229 (93%)	206 (97%)	5 (2%)	1 (0%)	34	17
All	All	818/916 (89%)	800 (98%)	17 (2%)	1 (0%)	56	39

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	95	ASN

### 5.3.2 Protein sidechains ⓘ

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	166/180 (92%)	165 (99%)	1 (1%)	90	87
1	B	163/180 (91%)	161 (99%)	2 (1%)	78	69
1	C	164/180 (91%)	162 (99%)	2 (1%)	78	69
1	D	170/180 (94%)	168 (99%)	2 (1%)	78	69
All	All	663/720 (92%)	656 (99%)	7 (1%)	80	72

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	8	LEU
1	D	95	ASN
1	C	99	GLN
1	B	124	ASP
1	D	50	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	99	GLN
1	D	95	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](#)

Of 4 ligands modelled in this entry, 4 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 ⓘ

EDS was not executed - this section will therefore be empty.

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

EDS was not executed - this section will therefore be empty.

### 6.3 Carbohydrates ⓘ

EDS was not executed - this section will therefore be empty.

### 6.4 Ligands ⓘ

EDS was not executed - this section will therefore be empty.

### 6.5 Other polymers ⓘ

EDS was not executed - this section will therefore be empty.