



Full wwPDB X-ray Structure Validation Report ⓘ

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PDB ID : 4UEG / pdb_00004ueg
Title : Crystal structure of human glycogenin-2 catalytic domain
Authors : Fairhead, M.; Strain-Damerell, C.; Krojer, T.; Froese, D.S.; Kopec, J.; Nowak, R.; Burgess-Brown, N.; von Delft, F.; Arrowsmith, C.; Edwards, A.; Bountra, C.; Yue, W.W.
Deposited on : 2014-12-17
Resolution : 1.93 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 types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

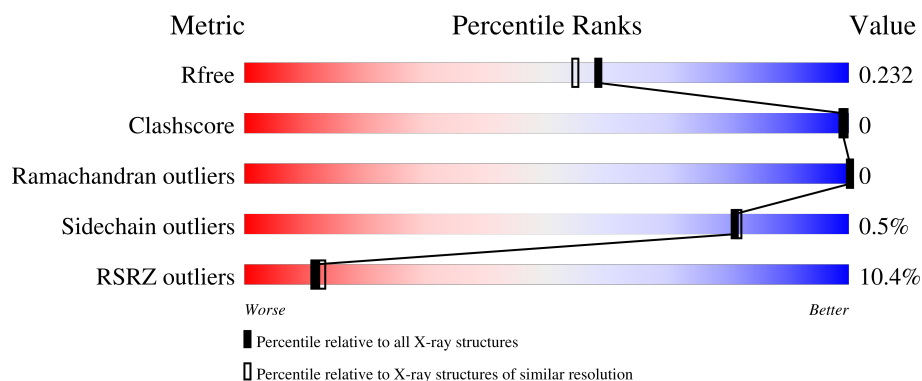
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.93 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}	180053	1452 (1.94-1.94)
Clashscore	190562	1494 (1.94-1.94)
Ramachandran outliers	187476	1479 (1.94-1.94)
Sidechain outliers	187428	1479 (1.94-1.94)
RSRZ outliers	180081	1453 (1.94-1.94)

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 $\leq 5\%$. 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.

Mol	Chain	Length	Quality of chain
1	A	288	8% 83% 16%
1	B	288	10% 84% 14%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4217 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 GLYCOGENIN-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	242	Total	C	N	O	S	0	1	0
			1926	1256	322	342	6			
1	B	249	Total	C	N	O	S	0	3	0
			2034	1319	347	361	7			

There are 50 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	3	MET	-	expression tag	UNP O15488
A	270	GLU	-	expression tag	UNP O15488
A	271	ASN	-	expression tag	UNP O15488
A	272	LEU	-	expression tag	UNP O15488
A	273	TYR	-	expression tag	UNP O15488
A	274	PHE	-	expression tag	UNP O15488
A	275	GLN	-	expression tag	UNP O15488
A	276	SER	-	expression tag	UNP O15488
A	277	HIS	-	expression tag	UNP O15488
A	278	HIS	-	expression tag	UNP O15488
A	279	HIS	-	expression tag	UNP O15488
A	280	HIS	-	expression tag	UNP O15488
A	281	HIS	-	expression tag	UNP O15488
A	282	HIS	-	expression tag	UNP O15488
A	283	ASP	-	expression tag	UNP O15488
A	284	TYR	-	expression tag	UNP O15488
A	285	LYS	-	expression tag	UNP O15488
A	286	ASP	-	expression tag	UNP O15488
A	287	ASP	-	expression tag	UNP O15488
A	288	ASP	-	expression tag	UNP O15488
A	289	ASP	-	expression tag	UNP O15488
A	290	LYS	-	expression tag	UNP O15488
A	47	ASP	SER	engineered mutation	UNP O15488
A	51	ARG	VAL	engineered mutation	UNP O15488
A	239	VAL	ALA	conflict	UNP O15488

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Chain	Residue	Modelled	Actual	Comment	Reference
B	3	MET	-	expression tag	UNP O15488
B	270	GLU	-	expression tag	UNP O15488
B	271	ASN	-	expression tag	UNP O15488
B	272	LEU	-	expression tag	UNP O15488
B	273	TYR	-	expression tag	UNP O15488
B	274	PHE	-	expression tag	UNP O15488
B	275	GLN	-	expression tag	UNP O15488
B	276	SER	-	expression tag	UNP O15488
B	277	HIS	-	expression tag	UNP O15488
B	278	HIS	-	expression tag	UNP O15488
B	279	HIS	-	expression tag	UNP O15488
B	280	HIS	-	expression tag	UNP O15488
B	281	HIS	-	expression tag	UNP O15488
B	282	HIS	-	expression tag	UNP O15488
B	283	ASP	-	expression tag	UNP O15488
B	284	TYR	-	expression tag	UNP O15488
B	285	LYS	-	expression tag	UNP O15488
B	286	ASP	-	expression tag	UNP O15488
B	287	ASP	-	expression tag	UNP O15488
B	288	ASP	-	expression tag	UNP O15488
B	289	ASP	-	expression tag	UNP O15488
B	290	LYS	-	expression tag	UNP O15488
B	47	ASP	SER	engineered mutation	UNP O15488
B	51	ARG	VAL	engineered mutation	UNP O15488
B	239	VAL	ALA	conflict	UNP O15488

- Molecule 2 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

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

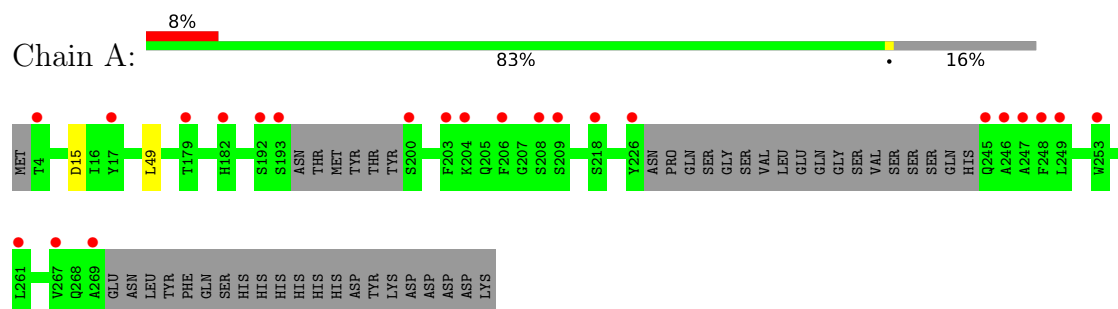
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	122	Total O 122 122	0	0
3	B	133	Total O 133 133	0	0

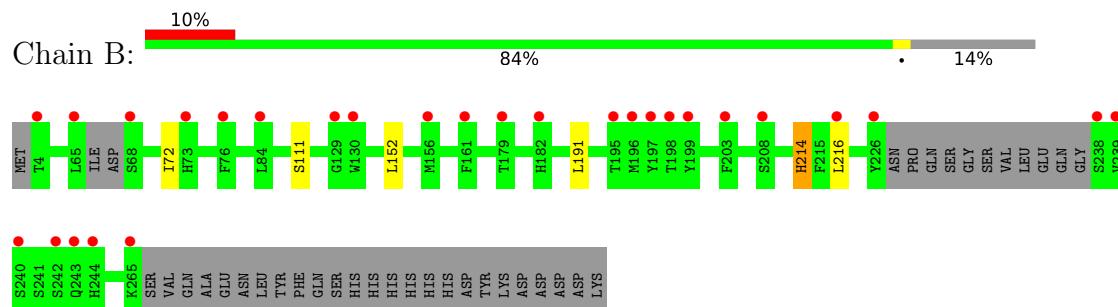
3 Residue-property plots

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 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: GLYCOGENIN-2



• Molecule 1: GLYCOGENIN-2



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	127.11Å 80.54Å 73.68Å 90.00° 118.74° 90.00°	Depositor
Resolution (Å)	64.61 – 1.93 64.61 – 1.93	Depositor EDS
% Data completeness (in resolution range)	96.6 (64.61-1.93) 96.8 (64.61-1.93)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.00 (at 1.92Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.187 , 0.224 0.196 , 0.232	Depositor DCC
R_{free} test set	2256 reflections (4.75%)	wwPDB-VP
Wilson B-factor (Å ²)	33.6	Xtriage
Anisotropy	0.573	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 36.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.008 for -1/2*h+1/2*k+1,1/2*h-1/2*k+1,1/2*h+1/2*k 0.015 for -1/2*h-1/2*k+1,-1/2*h-1/2*k-1,1/2*h-1/2*k	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	4217	wwPDB-VP
Average B, all atoms (Å ²)	44.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.45% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ 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: MG

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	0.38	0/1981	0.60	0/2702
1	B	0.40	1/2093 (0.0%)	0.60	0/2848
All	All	0.39	1/4074 (0.0%)	0.60	0/5550

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	214	HIS	C-O	-5.38	1.18	1.24

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	1926	0	1855	1	0
1	B	2034	0	1979	2	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	122	0	0	0	0
3	B	133	0	0	0	0
All	All	4217	0	3834	3	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 0.

All (3) 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:72[B]:ILE:HA	1:B:152:LEU:HD23	2.02	0.42
1:B:214:HIS:CE1	1:B:216:LEU:HD21	2.54	0.42
1:A:15:ASP:HA	1:A:49:LEU:HD22	2.03	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	237/288 (82%)	228 (96%)	9 (4%)	0	100	100
1	B	246/288 (85%)	241 (98%)	5 (2%)	0	100	100
All	All	483/576 (84%)	469 (97%)	14 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	206/260 (79%)	206 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	224/260 (86%)	222 (99%)	2 (1%)	70	67
All	All	430/520 (83%)	428 (100%)	2 (0%)	81	82

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	111	SER
1	B	191	LEU

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

Mol	Chain	Res	Type
1	A	259	ASN
1	B	158	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

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

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	242/288 (84%)	0.67	23 (9%)	14	15	20, 40, 72, 126	1 (0%)
1	B	249/288 (86%)	0.57	28 (11%)	10	11	20, 41, 67, 87	3 (1%)
All	All	491/576 (85%)	0.62	51 (10%)	11	13	20, 41, 70, 126	4 (0%)

All (51) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	247	ALA	6.9
1	A	245	GLN	6.1
1	B	65	LEU	5.7
1	A	4	THR	5.3
1	B	238	SER	5.2
1	B	196	MET	5.1
1	B	199	TYR	5.1
1	B	226	TYR	5.0
1	A	226	TYR	4.9
1	A	193	SER	4.7
1	A	246	ALA	4.7
1	A	179	THR	4.6
1	B	197	TYR	4.4
1	A	269	ALA	4.3
1	A	17[A]	TYR	4.1
1	A	182	HIS	4.0
1	B	243	GLN	3.8
1	B	68	SER	3.8
1	A	204	LYS	3.6
1	A	203	PHE	3.6
1	A	249	LEU	3.6
1	A	208	SER	3.5
1	B	4	THR	3.5
1	A	253	TRP	3.5

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Mol	Chain	Res	Type	RSRZ
1	B	240	SER	3.4
1	B	76	PHE	3.4
1	B	198	THR	3.4
1	B	179	THR	3.3
1	A	206	PHE	3.2
1	A	192	SER	3.1
1	B	265	LYS	3.0
1	B	242	SER	3.0
1	A	248	PHE	3.0
1	A	200	SER	2.8
1	B	216	LEU	2.7
1	B	129	GLY	2.6
1	B	203	PHE	2.4
1	B	130	TRP	2.4
1	B	182	HIS	2.4
1	B	84	LEU	2.4
1	B	161	PHE	2.4
1	B	195	THR	2.4
1	A	261	LEU	2.3
1	B	208	SER	2.3
1	B	156	MET	2.3
1	A	218	SER	2.3
1	B	239	VAL	2.2
1	A	267	VAL	2.1
1	A	209	SER	2.1
1	B	244	HIS	2.1
1	B	73[A]	HIS	2.1

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 oligosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	MG	A	1270	1/1	0.89	0.11	61,61,61,61	0
2	MG	B	1266	1/1	0.93	0.17	67,67,67,67	0

6.5 Other polymers [i](#)

There are no such residues in this entry.