



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2026 – 12:50 AM UTC

PDB ID : 1D6V / pdb_00001d6v
Title : CONFORMATION EFFECTS IN BIOLOGICAL CATALYSIS INTRODUCED BY OXY-COPE ANTIBODY MATURATION
Authors : Mundorff, E.C.; Hanson, M.A.; Schultz, P.G.; Stevens, R.C.
Deposited on : 1999-10-15
Resolution : 2.00 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

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
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

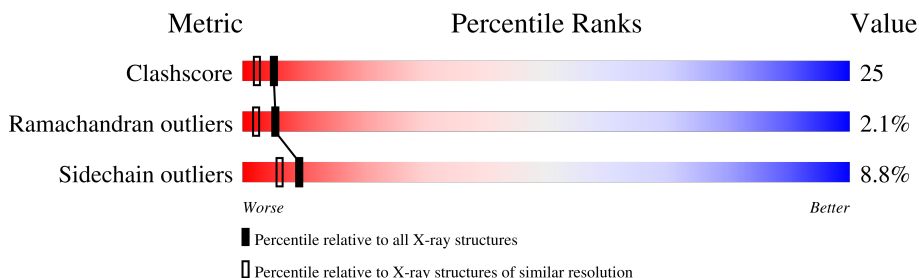
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 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	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (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 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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	L	211	 64% 29% 7%
2	H	221	 53% 34% 11% .

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 3486 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 CHIMERIC GERMLINE PRECURSOR OF OXY-COPE CATALYTIC ANTIBODY AZ-28 (LIGHT CHAIN).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	L	211	Total	C	N	O	S	0	0	0
			1652	1038	272	335	7			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
L	96	TYR	ARG	conflict	UNP Q7TS98
L	100	SER	GLY	conflict	UNP Q7TS98

- Molecule 2 is a protein called CHIMERIC GERMLINE PRECURSOR OF OXY-COPE CATALYTIC ANTIBODY AZ-28 (HEAVY CHAIN).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	H	221	Total	C	N	O	S	0	0	0
			1664	1053	271	334	6			

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
H	1	GLN	-	expression tag	UNP K7T9I5
H	2	VAL	-	expression tag	UNP K7T9I5
H	3	GLN	-	expression tag	UNP K7T9I5
H	4	LEU	-	expression tag	UNP K7T9I5
H	5	GLN	-	expression tag	UNP K7T9I5
H	6	GLN	-	expression tag	UNP K7T9I5
H	7	SER	-	expression tag	UNP K7T9I5
H	8	GLY	-	expression tag	UNP K7T9I5
H	95	GLY	GLU	conflict	UNP K7T9I5
H	96	HIS	VAL	conflict	UNP K7T9I5
H	97	SER	ARG	conflict	UNP K7T9I5
H	98	TYR	ARG	conflict	UNP K7T9I5

Continued on next page...

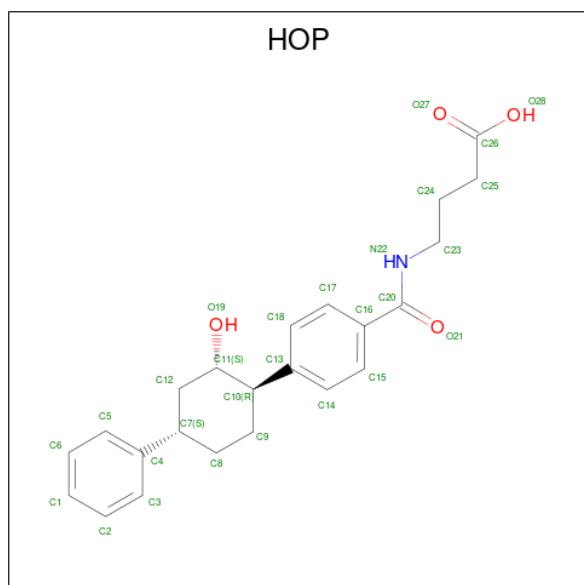
Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
H	99	TYR	ARG	conflict	UNP K7T9I5
H	100	PHE	TYR	conflict	UNP K7T9I5
H	100B	ASP	ALA	conflict	UNP K7T9I5
H	100C	GLY	MET	conflict	UNP K7T9I5

- Molecule 3 is CADMIUM ION (CCD ID: CD) (formula: Cd).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	L	4	Total Cd 4 4	0	0

- Molecule 4 is (1S,2S,5S)2-(4-GLUTARIDYLBENZYL)-5-PHENYL-1-CYCLOHEXANOL (CCD ID: HOP) (formula: C₂₃H₂₇NO₄).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	H	1	Total C N O 28 23 1 4	0	0

- Molecule 5 is water.

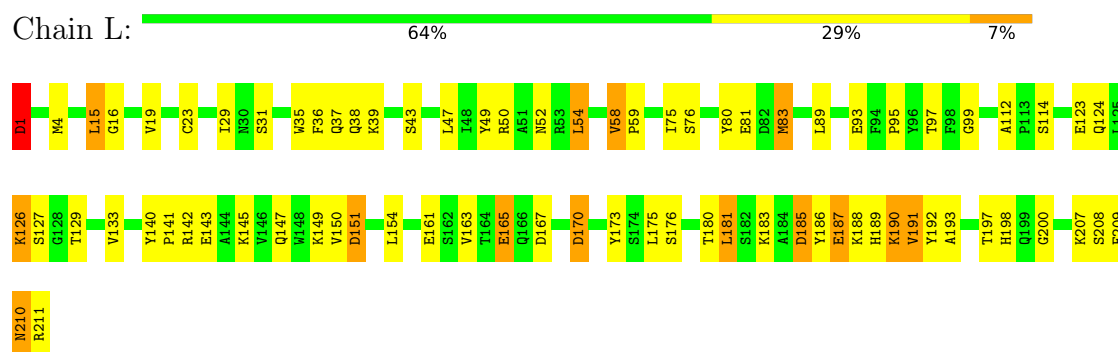
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	L	82	Total O 82 82	0	0
5	H	56	Total O 56 56	0	0

3 Residue-property plots [i](#)

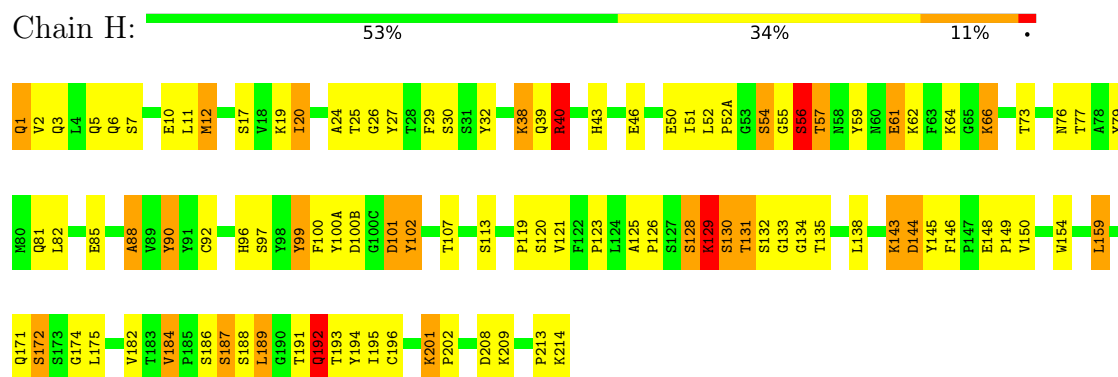
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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.

Note EDS was not executed.

- Molecule 1: CHIMERIC GERMLINE PRECURSOR OF OXY-COPE CATALYTIC ANTI-BODY AZ-28 (LIGHT CHAIN)



- Molecule 2: CHIMERIC GERMLINE PRECURSOR OF OXY-COPE CATALYTIC ANTI-BODY AZ-28 (HEAVY CHAIN)



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	52.72Å 64.45Å 73.87Å 90.00° 99.09° 90.00°	Depositor
Resolution (Å)	9.92 – 2.00	Depositor
% Data completeness (in resolution range)	83.1 (9.92-2.00)	Depositor
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS 0.4	Depositor
R, R_{free}	0.224 , 0.264	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3486	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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

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	L	1.24	3/1688 (0.2%)	1.39	20/2284 (0.9%)
2	H	1.25	2/1709 (0.1%)	1.41	21/2326 (0.9%)
All	All	1.24	5/3397 (0.1%)	1.40	41/4610 (0.9%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	L	0	1
2	H	0	1
All	All	0	2

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	12	MET	SD-CE	-13.32	1.46	1.79
2	H	88	ALA	CA-CB	6.96	1.66	1.53
1	L	19	VAL	CA-CB	6.35	1.62	1.54
1	L	133	VAL	CA-C	-5.85	1.45	1.52
1	L	75	ILE	CA-CB	-5.38	1.47	1.53

The worst 5 of 41 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	57	THR	N-CA-C	11.69	127.97	109.50
2	H	201	LYS	CA-C-N	-9.18	110.19	119.56
2	H	201	LYS	C-N-CA	-9.18	110.19	119.56
1	L	114	SER	N-CA-C	-8.78	95.37	109.76

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	130	SER	N-CA-C	8.62	120.13	108.23

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	H	90	TYR	Sidechain
1	L	173	TYR	Sidechain

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	L	1652	0	1604	59	0
2	H	1664	0	1604	112	0
3	L	4	0	0	0	0
4	H	28	0	27	4	0
5	H	56	0	0	5	0
5	L	82	0	0	7	0
All	All	3486	0	3235	162	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 25.

The worst 5 of 162 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)
2:H:192:GLN:HA	2:H:192:GLN:HE21	1.24	1.00
1:L:4:MET:HE3	1:L:23:CYS:SG	2.02	0.99
2:H:38:LYS:HZ3	2:H:38:LYS:HB2	1.33	0.90
1:L:80:TYR:O	1:L:83:MET:HG2	1.71	0.90
1:L:145:LYS:HZ3	1:L:147:GLN:NE2	1.70	0.89

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	L	209/211 (99%)	202 (97%)	7 (3%)	0	100	100
2	H	219/221 (99%)	195 (89%)	15 (7%)	9 (4%)	2	0
All	All	428/432 (99%)	397 (93%)	22 (5%)	9 (2%)	5	2

5 of 9 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	H	55	GLY
2	H	56	SER
2	H	62	LYS
2	H	131	THR
2	H	132	SER

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	L	189/189 (100%)	173 (92%)	16 (8%)	10	7
2	H	186/186 (100%)	169 (91%)	17 (9%)	9	6
All	All	375/375 (100%)	342 (91%)	33 (9%)	9	6

5 of 33 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	H	159	LEU

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	H	172	SER
2	H	192	GLN
1	L	165	GLU
1	L	163	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 15 such sidechains are listed below:

Mol	Chain	Res	Type
1	L	199	GLN
2	H	192	GLN
2	H	1	GLN
2	H	199	ASN
2	H	58	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 5 ligands modelled in this entry, 4 are monoatomic - leaving 1 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	HOP	H	401	-	30,30,30	2.46	14 (46%)	40,40,40	0.77	1 (2%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	HOP	H	401	-	-	3/19/32/32	0/3/3/3

The worst 5 of 14 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	H	401	HOP	C10-C11	4.52	1.57	1.53
4	H	401	HOP	C9-C10	4.40	1.59	1.53
4	H	401	HOP	C13-C10	4.38	1.58	1.51
4	H	401	HOP	C14-C13	3.59	1.44	1.39
4	H	401	HOP	C5-C4	3.50	1.44	1.39

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	H	401	HOP	C23-N22-C20	2.90	128.67	122.11

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	H	401	HOP	N22-C23-C24-C25
4	H	401	HOP	C24-C25-C26-O28
4	H	401	HOP	C24-C25-C26-O27

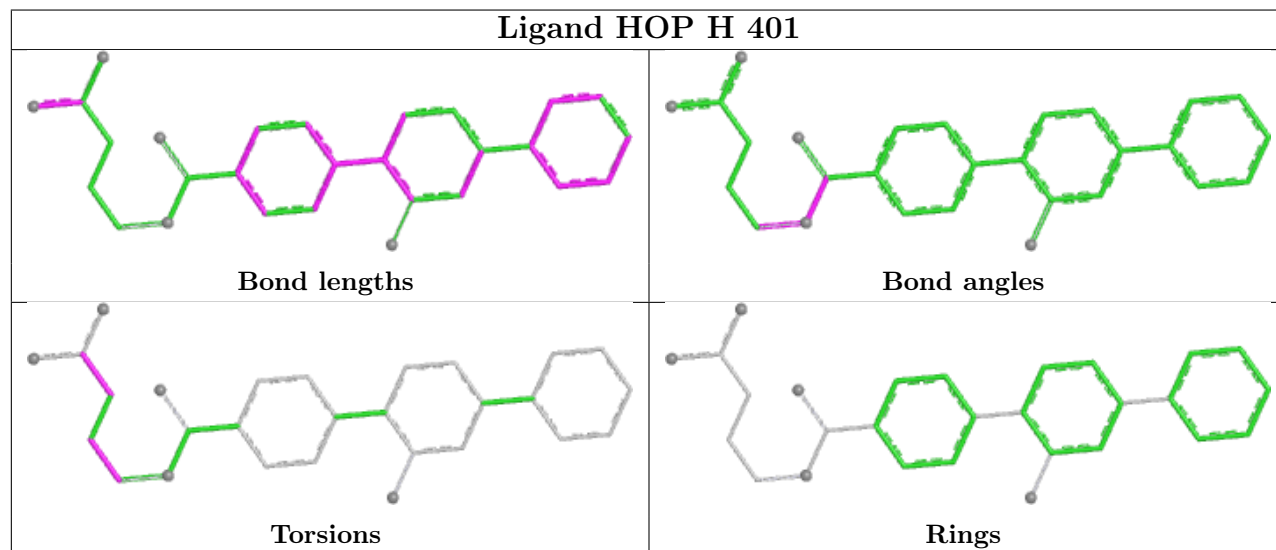
There are no ring outliers.

1 monomer is involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	H	401	HOP	4	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



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 is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.