



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 30, 2023 – 07:53 AM EDT

PDB ID : 3NCC  
Title : A human Prolactin receptor antagonist in complex with the mutant extracellular domain H188A of the human prolactin receptor  
Authors : Kulkarni, M.V.; Tettamanzi, M.C.; Murphy, J.W.; Keeler, C.; Myszka, D.G.; Chayen, N.E.; Lolis, E.J.; Hodsdon, M.E.  
Deposited on : 2010-06-04  
Resolution : 2.50 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](mailto: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>.

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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 : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.35  
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) : 2.35

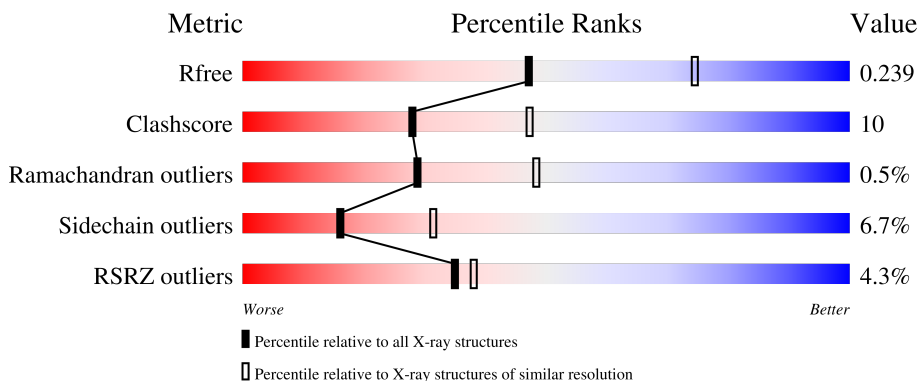
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

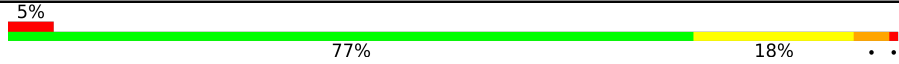
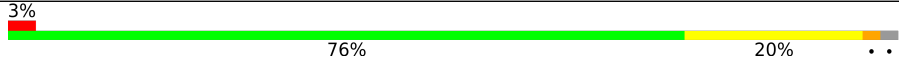
The reported resolution of this entry is 2.50 Å.

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	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (2.50-2.50)

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  $\geq 3$ , 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	186	 5% 77% 18% ..
2	B	210	 3% 76% 20% ..

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 3463 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 Prolactin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	186	1541	968	271	292	10	0	3	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	14	MET	-	initiating methionine	UNP P01236
A	129	ARG	GLY	engineered mutation	UNP P01236

- Molecule 2 is a protein called Prolactin receptor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	206	1685	1098	273	303	11	0	1	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	1	MET	-	initiating methionine	UNP P16471
B	188	ALA	HIS	engineered mutation	UNP P16471

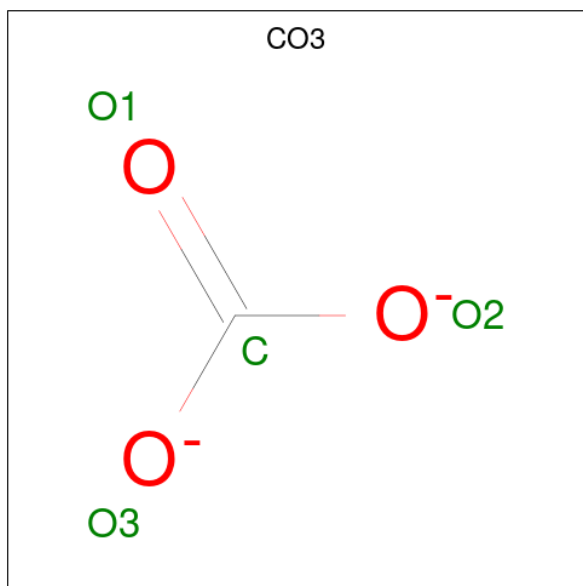
- Molecule 3 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	3	Total	Na	0	0
			3	3		

- Molecule 4 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	1	Total	Cl	0	0
			1	1		

- Molecule 5 is CARBONATE ION (three-letter code: CO3) (formula: CO<sub>3</sub>).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	B	1	Total	C O	0	0
			4	1 3		

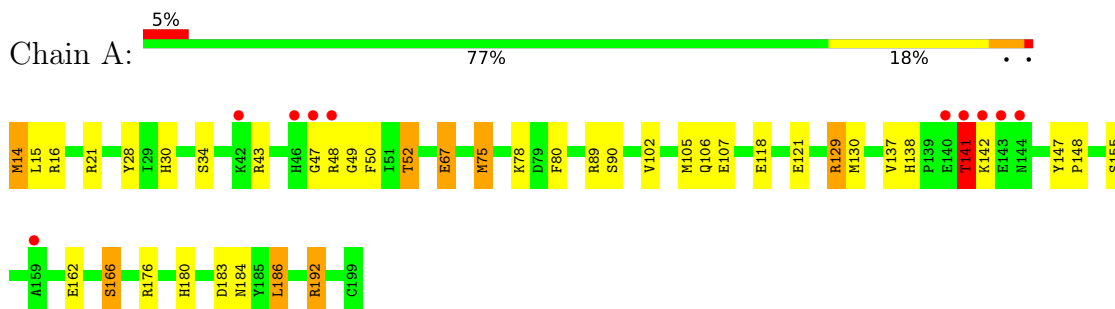
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	93	Total	O	0	0
			93	93		
6	B	136	Total	O	0	0
			136	136		

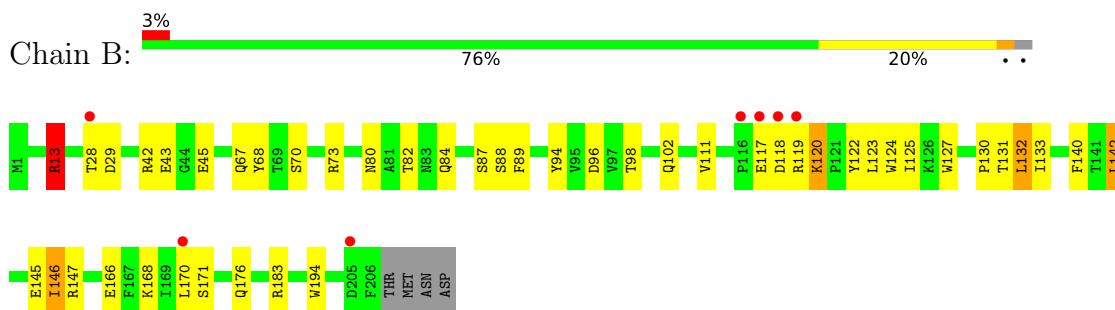
### 3 Residue-property plots [i](#)

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 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: Prolactin



- Molecule 2: Prolactin receptor



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 65	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	123.41Å 123.41Å 73.15Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	32.03 – 2.50 32.03 – 2.50	Depositor EDS
% Data completeness (in resolution range)	100.0 (32.03-2.50) 100.0 (32.03-2.50)	Depositor EDS
$R_{merge}$	0.12	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	6.37 (at 2.51Å)	Xtrriage
Refinement program	REFMAC 5.5.0109	Depositor
R, $R_{free}$	0.178 , 0.241 0.174 , 0.239	Depositor DCC
$R_{free}$ test set	1114 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	34.0	Xtrriage
Anisotropy	0.942	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 45.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.035 for h,-h-k,-l	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	3463	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	40.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.11% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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 i

### 5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: CO3, NA, CL

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	1.00	1/1580 (0.1%)	0.98	7/2131 (0.3%)
2	B	1.06	1/1750 (0.1%)	0.99	5/2389 (0.2%)
All	All	1.03	2/3330 (0.1%)	0.99	12/4520 (0.3%)

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	A	0	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	145	GLU	CB-CG	-5.64	1.41	1.52
1	A	121	GLU	CB-CG	5.21	1.62	1.52

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	13	ARG	NE-CZ-NH1	-7.60	116.50	120.30
2	B	13	ARG	NE-CZ-NH2	6.86	123.73	120.30
1	A	129	ARG	NE-CZ-NH1	6.25	123.42	120.30
1	A	186	LEU	CB-CG-CD1	-5.65	101.39	111.00
1	A	89	ARG	NE-CZ-NH2	-5.61	117.50	120.30
2	B	132	LEU	CA-CB-CG	5.37	127.65	115.30
1	A	192	ARG	CB-CG-CD	-5.21	98.06	111.60
2	B	146	ILE	CG1-CB-CG2	-5.20	99.97	111.40
2	B	170	LEU	CA-CB-CG	5.16	127.16	115.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	176	ARG	NE-CZ-NH2	-5.14	117.73	120.30
1	A	183	ASP	CB-CG-OD2	-5.08	113.73	118.30
1	A	16	ARG	NE-CZ-NH2	-5.01	117.80	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	141	THR	Peptide

## 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	1541	0	1526	32	0
2	B	1685	0	1624	33	0
3	B	3	0	0	0	0
4	B	1	0	0	0	0
5	B	4	0	0	0	0
6	A	93	0	0	1	0
6	B	136	0	0	3	0
All	All	3463	0	3150	63	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 10.

All (63) 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:B:42[B]:ARG:NH2	6:B:277:HOH:O	1.64	1.23
2:B:131:THR:O	2:B:132:LEU:HB2	1.73	0.87
1:A:155:SER:HB2	6:A:270:HOH:O	1.73	0.86
1:A:48:ARG:HG3	1:A:49:GLY:H	1.50	0.75
1:A:21:ARG:HE	1:A:129:ARG:HH12	1.37	0.72
1:A:28:TYR:OH	1:A:118[B]:GLU:OE2	2.07	0.72

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:120:LYS:HD3	2:B:120:LYS:H	1.53	0.72
2:B:132:LEU:HD12	6:B:321:HOH:O	1.93	0.68
1:A:48:ARG:HB3	1:A:50:PHE:CE2	2.28	0.68
1:A:21:ARG:CG	1:A:129:ARG:HH11	2.07	0.67
2:B:45:GLU:OE2	2:B:73:ARG:NH2	2.30	0.65
1:A:21:ARG:HG3	1:A:129:ARG:HH11	1.63	0.64
1:A:78:LYS:NZ	1:A:141:THR:HG22	2.13	0.63
2:B:82:THR:HG22	2:B:87:SER:HB2	1.81	0.62
1:A:48:ARG:HB3	1:A:50:PHE:CD2	2.35	0.62
2:B:147:ARG:HG2	2:B:194:TRP:CZ3	2.36	0.60
2:B:120:LYS:HD3	2:B:120:LYS:N	2.17	0.59
1:A:14:MET:O	1:A:14:MET:HG3	2.03	0.59
1:A:47:GLY:O	1:A:48:ARG:HB2	2.02	0.59
1:A:137:VAL:HG12	1:A:138:HIS:CE1	2.39	0.57
2:B:131:THR:O	2:B:132:LEU:CB	2.48	0.56
2:B:80:ASN:HB3	2:B:89:PHE:CE2	2.40	0.56
1:A:48:ARG:HG3	1:A:49:GLY:N	2.21	0.56
1:A:75:MET:O	1:A:192:ARG:NH2	2.36	0.56
2:B:42[A]:ARG:NH2	6:B:302:HOH:O	2.38	0.55
2:B:140:PHE:CE1	2:B:142:LEU:HD13	2.41	0.55
2:B:140:PHE:HE1	2:B:142:LEU:HD13	1.71	0.55
2:B:124:TRP:CZ3	2:B:168:LYS:HE3	2.42	0.55
1:A:130:MET:SD	1:A:186:LEU:HD21	2.48	0.53
2:B:130:PRO:HG2	2:B:133:ILE:HD12	1.90	0.53
1:A:67:GLU:HG2	2:B:70:SER:HB2	1.91	0.52
1:A:21:ARG:CG	1:A:129:ARG:NH1	2.73	0.52
1:A:50:PHE:HD1	1:A:166:SER:HB2	1.74	0.52
1:A:48:ARG:CG	1:A:49:GLY:H	2.22	0.52
1:A:78:LYS:HZ1	1:A:141:THR:HG22	1.74	0.50
1:A:21:ARG:HG2	1:A:129:ARG:HH11	1.77	0.50
2:B:117:GLU:O	2:B:119:ARG:N	2.45	0.50
1:A:147:TYR:HB2	1:A:148:PRO:HD2	1.94	0.49
2:B:147:ARG:HG2	2:B:194:TRP:CH2	2.49	0.48
1:A:21:ARG:HE	1:A:129:ARG:NH1	2.10	0.47
2:B:127:TRP:CZ3	2:B:146:ILE:HD11	2.50	0.47
2:B:80:ASN:HB3	2:B:89:PHE:CD2	2.49	0.46
2:B:127:TRP:CH2	2:B:146:ILE:HD11	2.52	0.45
2:B:82:THR:HG22	2:B:87:SER:CB	2.47	0.44
1:A:30:HIS:CE1	1:A:180:HIS:HB2	2.52	0.44
2:B:122:TYR:CE1	2:B:124:TRP:HB2	2.53	0.44
1:A:78:LYS:HZ3	1:A:141:THR:HG22	1.81	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:176:GLN:OE1	2:B:176:GLN:HA	2.18	0.43
1:A:50:PHE:CD1	1:A:166:SER:HB2	2.51	0.43
1:A:90:SER:HA	1:A:147:TYR:CD1	2.53	0.43
2:B:125:ILE:O	2:B:166:GLU:HA	2.19	0.42
2:B:13:ARG:HD2	2:B:102:GLN:HB3	2.02	0.42
2:B:120:LYS:H	2:B:120:LYS:CD	2.27	0.42
2:B:111:VAL:CG1	2:B:123:LEU:HD11	2.50	0.42
1:A:52:THR:HB	2:B:94:TYR:OH	2.21	0.41
1:A:102:VAL:O	1:A:105:MET:HB2	2.21	0.41
2:B:42[B]:ARG:HD2	2:B:73:ARG:CZ	2.51	0.41
1:A:21:ARG:HG3	1:A:129:ARG:NH1	2.32	0.40
2:B:117:GLU:C	2:B:119:ARG:H	2.24	0.40
2:B:183:ARG:HG2	2:B:194:TRP:CZ3	2.55	0.40
1:A:14:MET:O	1:A:14:MET:CG	2.69	0.40
2:B:67:GLN:HG2	2:B:68:TYR:CE2	2.56	0.40
1:A:15:LEU:HA	1:A:15:LEU:HD23	1.56	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	187/186 (100%)	178 (95%)	8 (4%)	1 (0%)	29	48
2	B	205/210 (98%)	191 (93%)	13 (6%)	1 (0%)	29	48
All	All	392/396 (99%)	369 (94%)	21 (5%)	2 (0%)	29	48

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	142	LYS
2	B	118	ASP

### 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	176/173 (102%)	163 (93%)	13 (7%)	13	27
2	B	184/189 (97%)	173 (94%)	11 (6%)	19	37
All	All	360/362 (99%)	336 (93%)	24 (7%)	16	31

All (24) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	14	MET
1	A	34	SER
1	A	43	ARG
1	A	52	THR
1	A	67	GLU
1	A	75	MET
1	A	80	PHE
1	A	106	GLN
1	A	107	GLU
1	A	141	THR
1	A	162	GLU
1	A	166	SER
1	A	184	ASN
2	B	13	ARG
2	B	28	THR
2	B	29	ASP
2	B	43	GLU
2	B	84	GLN
2	B	88	SER
2	B	96	ASP
2	B	98	THR
2	B	120	LYS
2	B	142	LEU
2	B	171	SER

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	138	HIS
2	B	159	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 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	$\# Z  > 2$
5	CO3	B	215	-	2,3,3	0.26	0	2,3,3	0.51	0

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 [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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	186/186 (100%)	-0.04	10 (5%) 25 27	21, 38, 76, 88	1 (0%)
2	B	206/210 (98%)	-0.38	7 (3%) 45 48	20, 35, 63, 80	0
All	All	392/396 (98%)	-0.22	17 (4%) 35 38	20, 37, 71, 88	1 (0%)

All (17) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	47	GLY	5.5
2	B	116	PRO	3.9
2	B	205	ASP	3.8
1	A	142	LYS	3.7
1	A	159	ALA	3.1
1	A	48	ARG	2.8
1	A	144	ASN	2.5
1	A	46	HIS	2.3
2	B	28	THR	2.2
2	B	119	ARG	2.2
2	B	170	LEU	2.2
2	B	118	ASP	2.2
1	A	42	LYS	2.1
1	A	141	THR	2.1
1	A	143	GLU	2.1
2	B	117	GLU	2.1
1	A	140	GLU	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 monosaccharides 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, 95<sup>th</sup> 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(Å <sup>2</sup> )	Q<0.9
3	NA	B	214	1/1	0.93	0.11	38,38,38,38	0
5	CO3	B	215	4/4	0.93	0.16	65,66,66,66	0
3	NA	B	212	1/1	0.98	0.04	28,28,28,28	0
4	CL	B	213	1/1	0.99	0.07	36,36,36,36	0
3	NA	B	211	1/1	0.99	0.15	22,22,22,22	0

### 6.5 Other polymers [i](#)

There are no such residues in this entry.