wwPDB X-ray Structure Validation Summary Report (i)

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PDB ID	:	1ES7
Title	:	COMPLEX BETWEEN BMP-2 AND TWO BMP RECEPTOR IA ECTODOMAINS
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Deposited on	:	2000-04-07
Resolution	:	2.90 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
http://wwpdb.org/validation/2016/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:

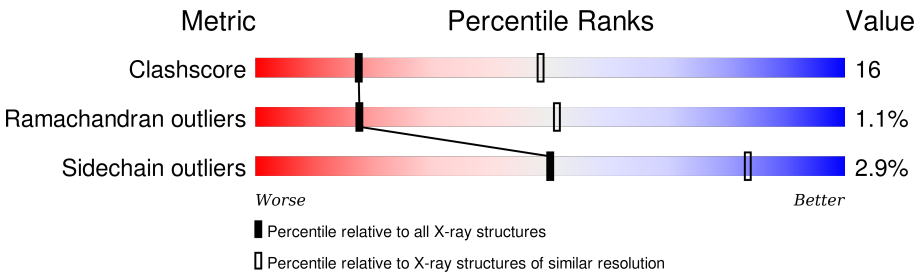
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)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

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.90 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	1668 (2.90-2.90)
Ramachandran outliers	100387	1630 (2.90-2.90)
Sidechain outliers	100360	1632 (2.90-2.90)

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. 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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	116	59% 28% • 10%
1	C	116	59% 27% • 10%
2	B	89	71% 22% 7%
2	D	89	79% 18% •

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 3012 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 BONE MORPHOGENETIC PROTEIN-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	104	813	516	137	151	9	0	0	0
1	C	104	813	516	137	151	9	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	MET	-	INSERTION	UNP P12643
A	0	ALA	-	INSERTION	UNP P12643
C	499	MET	-	INSERTION	UNP P12643
C	500	ALA	-	INSERTION	UNP P12643

- Molecule 2 is a protein called BONE MORPHOGENETIC PROTEIN RECEPTOR IA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	83	641	394	109	127	11	0	0	0
2	D	86	663	410	112	130	11	0	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	25	25	25	0	0
3	B	15	15	15	0	0
3	C	27	27	27	0	0
3	D	15	15	15	0	0

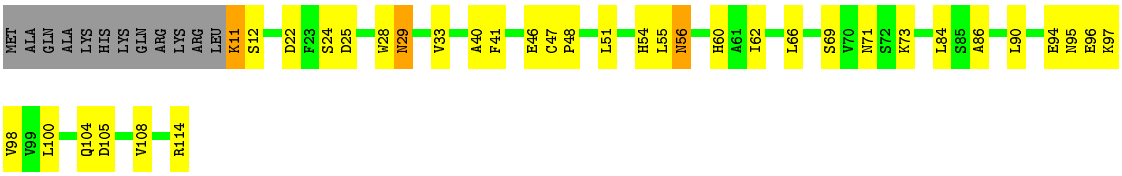
3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

Note EDS was not executed.

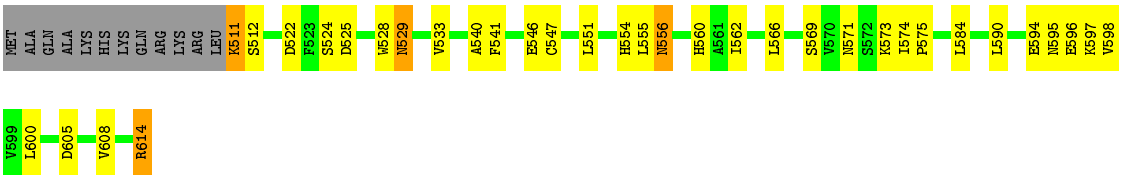
• Molecule 1: BONE MORPHOGENETIC PROTEIN-2

Chain A:



• Molecule 1: BONE MORPHOGENETIC PROTEIN-2

Chain C:



• Molecule 2: BONE MORPHOGENETIC PROTEIN RECEPTOR IA

Chain B:

• Molecule 2: BONE MORPHOGENETIC PROTEIN RECEPTOR IA

Chain D:

4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	P 65	Depositor
Cell constants a, b, c, α, β, γ	109.33Å 109.33Å 101.91Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	100.00 – 2.90	Depositor
% Data completeness (in resolution range)	9.9 (100.00-2.90)	Depositor
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS 0.9	Depositor
R, R_{free}	0.191 , 0.229	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3012	wwPDB-VP
Average B, all atoms (Å^2)	39.0	wwPDB-VP

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	0.36	0/836	0.59	0/1140
1	C	0.35	0/836	0.58	0/1140
2	B	0.39	0/653	0.66	0/884
2	D	0.39	0/675	0.66	0/915
All	All	0.37	0/3000	0.62	0/4079

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	813	0	774	35	0
1	C	813	0	774	35	0
2	B	641	0	600	17	0
2	D	663	0	629	14	0
3	A	25	0	0	2	0
3	B	15	0	0	2	0
3	C	27	0	0	2	0
3	D	15	0	0	4	0
All	All	3012	0	2777	91	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 16.

The worst 5 of 91 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:C:551:LEU:HD12	1:C:562:ILE:HD13	1.51	0.91
1:A:51:LEU:HD12	1:A:62:ILE:HD13	1.59	0.85
2:B:238:CYS:HB3	2:B:308:ASN:ND2	1.92	0.84
2:B:238:CYS:HB3	2:B:308:ASN:HD22	1.42	0.83
2:D:738:CYS:HB3	2:D:808:ASN:HD22	1.44	0.82

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	102/116 (88%)	97 (95%)	4 (4%)	1 (1%)	19	54
1	C	102/116 (88%)	97 (95%)	4 (4%)	1 (1%)	19	54
2	B	79/89 (89%)	74 (94%)	4 (5%)	1 (1%)	15	46
2	D	82/89 (92%)	77 (94%)	4 (5%)	1 (1%)	16	48
All	All	365/410 (89%)	345 (94%)	16 (4%)	4 (1%)	17	51

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	309	GLN
2	D	809	GLN
1	C	556	ASN
1	A	56	ASN

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	93/103 (90%)	89 (96%)	4 (4%)	35	71
1	C	93/103 (90%)	89 (96%)	4 (4%)	35	71
2	B	75/80 (94%)	73 (97%)	2 (3%)	52	84
2	D	78/80 (98%)	78 (100%)	0	100	100
All	All	339/366 (93%)	329 (97%)	10 (3%)	50	83

5 of 10 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	273	LEU
2	B	284	ASP
1	C	529	ASN
1	A	94	GLU
1	C	511	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 12 such sidechains are listed below:

Mol	Chain	Res	Type
2	B	309	GLN
1	C	517	HIS
1	C	595	ASN
2	B	308	ASN
1	C	554	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 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)

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

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

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

6.3 Carbohydrates (i)

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

6.4 Ligands (i)

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

6.5 Other polymers (i)

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