



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 05:59 PM UTC

PDB ID : 1EBP / pdb\_00001ebp  
Title : COMPLEX BETWEEN THE EXTRACELLULAR DOMAIN OF ERYTHROPOIETIN (EPO) RECEPTOR [EBP] AND AN AGONIST PEPTIDE [EMP1]  
Authors : Livnah, O.; Stura, E.A.; Wilson, I.A.  
Deposited on : 1996-05-07  
Resolution : 2.80 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

<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 : 4-5-2 with Phenix2.0  
Xtrriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
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

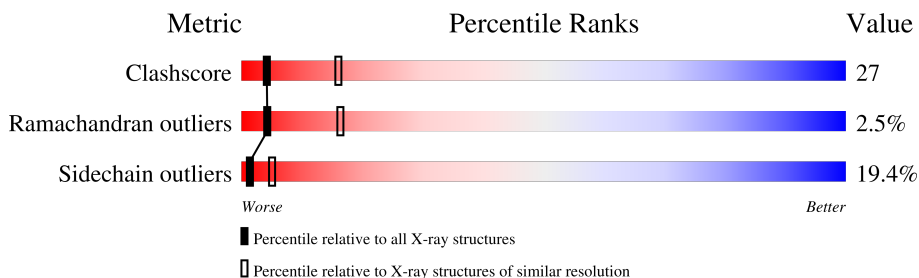
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.80 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	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)

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  $\leq 5\%$ .

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	211	53% (green), 35% (yellow), 10% (orange/red)
1	B	211	41% (green), 40% (yellow), 15% (orange/red)
2	C	20	35% (green), 45% (yellow), 20% (grey)
2	D	20	35% (green), 40% (yellow), 5% (orange/red), 20% (grey)

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3546 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 EPO RECEPTOR.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	211	1643	1044	291	301	7	0	0	0
1	B	211	1643	1044	291	301	7	0	0	0

- Molecule 2 is a protein called EPO MIMETICS PEPTIDE 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	16	130	86	21	21	2	0	0	0
2	D	16	130	86	21	21	2	0	0	0

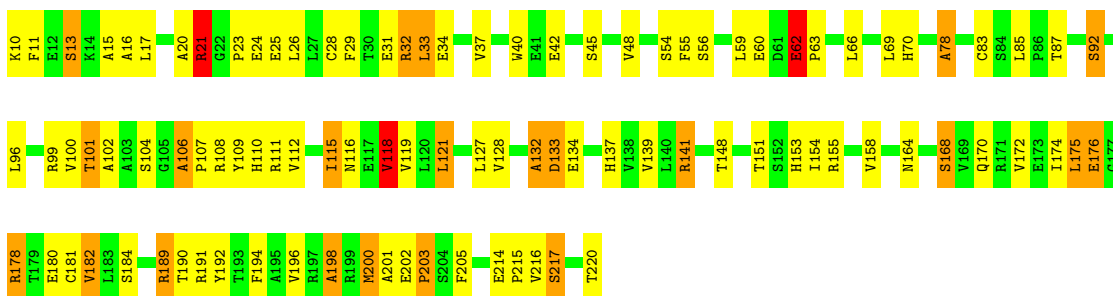
### 3 Residue-property plots [i](#)

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.

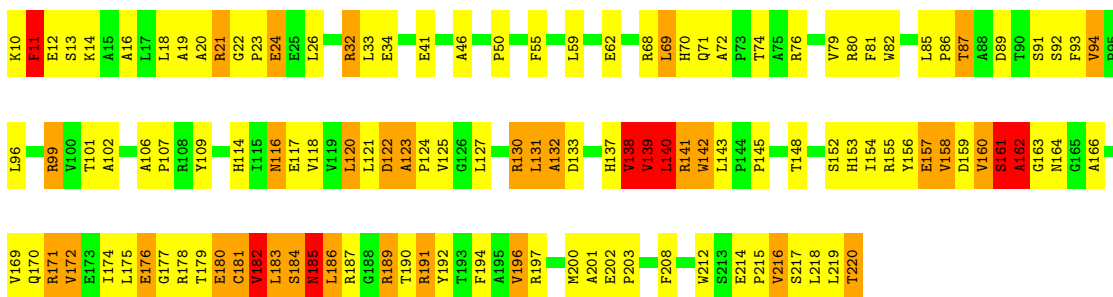
- Molecule 1: EPO RECEPTOR

Chain A:  53% 35% 10%



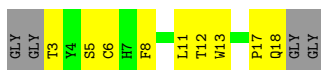
- Molecule 1: EPO RECEPTOR

Chain B:  41% 40% 15%




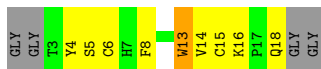
- Molecule 2: EPO MIMETICS PEPTIDE 1

Chain C:  35% 45% 20%



- Molecule 2: EPO MIMETICS PEPTIDE 1

Chain D:  35% 40% 5% 20%



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	59.24Å 75.50Å 132.18Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 2.80	Depositor
% Data completeness (in resolution range)	(Not available) (8.00-2.80)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, $R_{free}$	0.210 , 0.334	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	3546	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	13.0	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	0.96	2/1687 (0.1%)	1.34	19/2300 (0.8%)
1	B	1.20	2/1687 (0.1%)	1.47	33/2300 (1.4%)
2	C	0.87	0/136	1.19	1/186 (0.5%)
2	D	0.85	0/136	1.20	0/186
All	All	1.07	4/3646 (0.1%)	1.39	53/4972 (1.1%)

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	B	0	1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	162	ALA	N-CA	30.76	1.85	1.46
1	B	182	VAL	CA-CB	5.58	1.60	1.53
1	A	23	PRO	C-N	5.41	1.40	1.33
1	A	200	MET	SD-CE	-5.33	1.66	1.79

The worst 5 of 53 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	162	ALA	N-CA-C	-11.83	85.59	110.80
1	A	92	SER	N-CA-C	11.81	127.87	113.23
1	A	32	ARG	N-CA-C	-10.37	95.01	109.95
1	A	62	GLU	N-CA-C	-9.50	96.81	110.40
1	B	122	ASP	N-CA-C	-9.29	98.27	110.53

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	161	SER	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	1643	0	1606	60	0
1	B	1643	0	1606	122	0
2	C	130	0	119	6	0
2	D	130	0	119	8	0
All	All	3546	0	3450	191	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 27.

The worst 5 of 191 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:162:ALA:N	1:B:162:ALA:CA	1.85	1.39
1:B:10:LYS:HA	1:B:13:SER:HB3	1.32	1.12
1:B:155:ARG:NH2	1:B:175:LEU:HG	1.76	1.01
1:A:99:ARG:HG2	1:A:110:HIS:HD2	1.27	0.98
1:B:141:ARG:HE	1:B:180:GLU:HB2	1.28	0.96

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	209/211 (99%)	187 (90%)	17 (8%)	5 (2%)	4	17
1	B	209/211 (99%)	176 (84%)	28 (13%)	5 (2%)	4	17
2	C	14/20 (70%)	14 (100%)	0	0	100	100
2	D	14/20 (70%)	12 (86%)	1 (7%)	1 (7%)	1	2
All	All	446/462 (96%)	389 (87%)	46 (10%)	11 (2%)	4	16

5 of 11 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	162	ALA
1	B	164	ASN
1	A	132	ALA
1	A	164	ASN
2	D	13	TRP

### 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	173/173 (100%)	137 (79%)	36 (21%)	1	4
1	B	173/173 (100%)	138 (80%)	35 (20%)	1	4
2	C	15/15 (100%)	13 (87%)	2 (13%)	4	14
2	D	15/15 (100%)	15 (100%)	0	100	100
All	All	376/376 (100%)	303 (81%)	73 (19%)	1	5

5 of 73 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	157	GLU
2	C	3	THR
1	B	160	VAL
1	B	182	VAL

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Mol	Chain	Res	Type
1	A	175	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	153	HIS
2	D	7	HIS
2	D	18	GLN
1	A	170	GLN
1	B	52	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](#)

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

### 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.