Full wwPDB X-ray Structure Validation Report (i)

Nov 7, 2023 – 03:05 AM EST

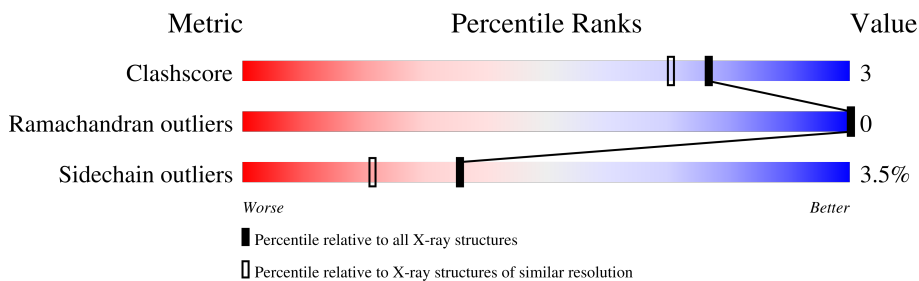|		
PDB ID	:	1P11
Title	:	CRYSTAL STRUCTURES OF ALPHA-LYTIC PROTEASE COMPLEXES WITH IRREVERSIBLY BOUND PHOSPHONATE ESTERS
Authors	:	Bone, R.; Agard, D.A.
Deposited on	:	1990-10-26
Resolution	:	1.93 Å(reported)

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	Percentile Ranks	Value
Clashscore		3
Ramachandran outliers		0
Sidechain outliers		3.5%

Worse   *Better*

▮ Percentile relative to all X-ray structures
▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	1023 (1.94-1.94)
Ramachandran outliers	138981	1007 (1.94-1.94)
Sidechain outliers	138945	1007 (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 <=5%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	E	198	82% 16% ··
2	P	7	71% 29%
3	I	5	100%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 1717 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 ALPHA-LYTIC PROTEASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	E	198	Total 1448	C 876	N 275	O 288	S 9	0	8	0

- Molecule 2 is a protein called PHOSPHONATE ESTER INHIBITOR A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	P	7	Total 42	C 26	N 5	O 10	P 1	0	7	0

- Molecule 3 is a protein called PHOSPHONATE ESTER INHIBITOR B(TRANSITION STATE).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	I	5	Total 32	C 20	N 4	O 7	P 1	0	5	0

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O_4S).
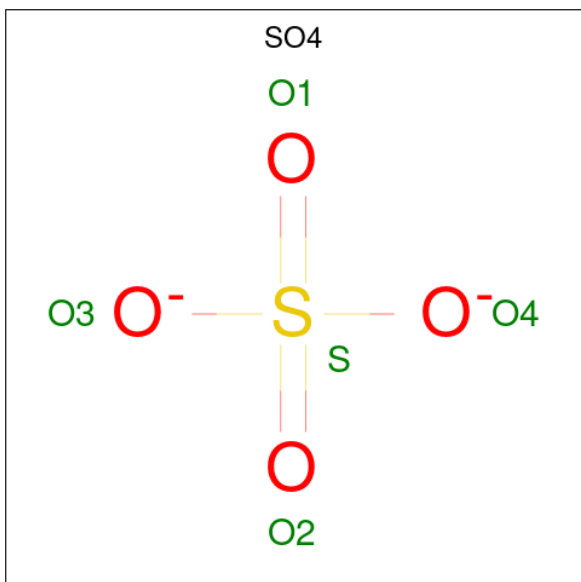
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	E	1	Total O S 5 4 1			0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	E	184	Total O 184 184		0	0
5	P	6	Total O 6 6		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. 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 r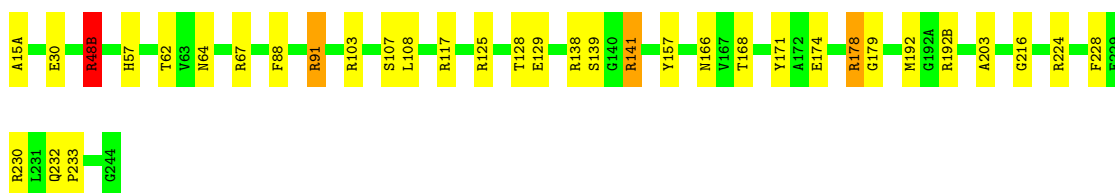esidues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

Note EDS was not executed.

- Molecule 1: ALPHA-LYTIC PROTEASE

Chain E:

- Molecule 2: PHOSPHONATE ESTER INHIBITOR A

Chain P:

- Molecule 3: PHOSPHONATE ESTER INHIBITOR B(TRANSITION STATE)

Chain I:

There are no outlier residues recorded for this chain.

4 Data and refinement statistics ⓘ

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

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α, β, γ	66.57Å 66.57Å 80.08Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	(Not available) – 1.93	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-1.93)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	PROLSQ	Depositor
R, R_{free}	0.128 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1717	wwPDB-VP
Average B, all atoms (Å^2)	12.0	wwPDB-VP

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: SO4, BOC, LAC, PVA

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	E	1.07	0/1467	2.36	31/1986 (1.6%)
2	P	0.83	0/22	1.66	0/27
3	I	0.73	0/17	1.34	0/23
All	All	1.07	0/1506	2.34	31/2036 (1.5%)

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	E	0	2
2	P	1	0
All	All	1	2

There are no bond length outliers.

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	E	48(B)	ARG	NE-CZ-NH1	42.16	141.38	120.30
1	E	48(B)	ARG	NE-CZ-NH2	-36.98	101.81	120.30
1	E	67	ARG	NE-CZ-NH1	21.45	131.03	120.30
1	E	67	ARG	NE-CZ-NH2	-15.84	112.38	120.30
1	E	230	ARG	NE-CZ-NH1	13.34	126.97	120.30
1	E	129	GLU	OE1-CD-OE2	10.00	135.30	123.30
1	E	91	ARG	NE-CZ-NH2	-9.79	115.40	120.30
1	E	91	ARG	NE-CZ-NH1	8.79	124.69	120.30
1	E	103	ARG	NE-CZ-NH1	8.76	124.68	120.30
1	E	157	TYR	CB-CG-CD1	-8.47	115.92	121.00
1	E	171	TYR	CB-CG-CD2	-7.91	116.25	121.00

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	224	ARG	NE-CZ-NH2	-7.63	116.49	120.30
1	E	230	ARG	NE-CZ-NH2	-7.26	116.67	120.30
1	E	107	SER	N-CA-CB	6.87	120.80	110.50
1	E	30	GLU	OE1-CD-OE2	-6.80	115.14	123.30
1	E	203	ALA	N-CA-CB	6.47	119.16	110.10
1	E	64	ASN	CB-CG-ND2	6.34	131.92	116.70
1	E	141	ARG	NE-CZ-NH1	-6.14	117.23	120.30
1	E	171	TYR	CB-CG-CD1	6.06	124.64	121.00
1	E	216	GLY	O-C-N	6.05	132.39	122.70
1	E	125	ARG	NE-CZ-NH2	-6.04	117.28	120.30
1	E	192(B)	ARG	NE-CZ-NH2	-5.77	117.42	120.30
1	E	129	GLU	CG-CD-OE2	-5.76	106.77	118.30
1	E	62	THR	CA-CB-CG2	-5.72	104.39	112.40
1	E	108	LEU	N-CA-CB	-5.64	99.11	110.40
1	E	117	ARG	NE-CZ-NH2	5.45	123.02	120.30
1	E	107	SER	CA-CB-OG	-5.44	96.51	111.20
1	E	228	PHE	O-C-N	5.20	131.01	122.70
1	E	174	GLU	CG-CD-OE1	5.18	128.66	118.30
1	E	88	PHE	CA-C-O	-5.08	109.43	120.10
1	E	139	SER	N-CA-CB	-5.07	102.89	110.50

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	P	-1[A]	LAC	CA

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	E	138	ARG	Sidechain
1	E	48(B)	ARG	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	E	1448	0	1400	8	1

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	P	42	0	30	1	1
3	I	32	0	24	0	0
4	E	5	0	0	0	0
5	E	184	0	0	5	0
5	P	6	0	0	0	0
All	All	1717	0	1454	9	1

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 3.

All (9) 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:E:232:GLN:HG2	5:E:421:HOH:O	1.94	0.67
1:E:166:ASN:HD22	1:E:179:GLY:HA2	1.66	0.58
1:E:48(B):ARG:HD2	5:E:350:HOH:O	2.03	0.58
1:E:57[A]:HIS:HE1	5:E:385:HOH:O	1.91	0.54
1:E:168:THR:HG23	1:E:178[A]:ARG:HG2	1.88	0.54
1:E:48(B):ARG:NE	5:E:375:HOH:O	2.41	0.53
1:E:15(A):ALA:N	5:E:342:HOH:O	2.46	0.48
1:E:232:GLN:N	1:E:233:PRO:HD2	2.32	0.44
2:P:5[A]:BOC:O1	2:P:5[A]:BOC:H23	2.19	0.43

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:128:THR:OG1	2:P:-2[A]:ALA:O[5_665]	1.94	0.26

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	E	204/198 (103%)	196 (96%)	8 (4%)	0	100	100
2	P	3/7 (43%)	3 (100%)	0	0	100	100
3	I	3/5 (60%)	3 (100%)	0	0	100	100
All	All	210/210 (100%)	202 (96%)	8 (4%)	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	E	149/142 (105%)	143 (96%)	6 (4%)	31	16
2	P	1/1 (100%)	1 (100%)	0	100	100
3	I	1/1 (100%)	1 (100%)	0	100	100
All	All	151/144 (105%)	145 (96%)	6 (4%)	36	16

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	48(B)	ARG
1	E	91	ARG
1	E	141	ARG
1	E	178[A]	ARG
1	E	178[B]	ARG
1	E	192	MET

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

Mol	Chain	Res	Type
1	E	101	ASN
1	E	166	ASN

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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

1 ligand is modelled in this entry.

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	SO4	E	1	-	4,4,4	0.61	0	6,6,6	1.16	1 (16%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	E	1	SO4	O4-S-O3	-2.48	98.49	109.06

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 ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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.