



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 31, 2016 – 06:47 PM GMT

PDB ID : 1CHO
Title : CRYSTAL AND MOLECULAR STRUCTURES OF THE COMPLEX OF
ALPHA-*CHYMOTRYPSIN WITH ITS INHIBITOR TURKEY OVOMU-
COID THIRD DOMAIN AT 1.8 ANGSTROMS RESOLUTION
Authors : Fujinaga, M.; Sielecki, A.R.; Read, R.J.; Ardel, W.; Laskowskijunior, M.;
James, M.N.G.
Deposited on : 1988-03-04
Resolution : 1.80 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
A user guide is available at
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) 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

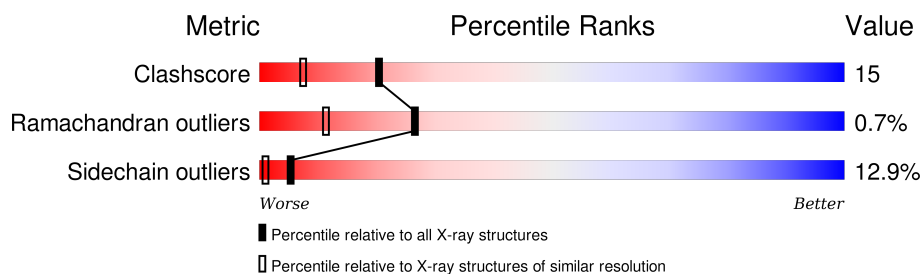
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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	102246	5383 (1.80-1.80)
Ramachandran outliers	100387	5320 (1.80-1.80)
Sidechain outliers	100360	5319 (1.80-1.80)

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 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 $\leq 5\%$. 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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	E	13	
2	F	131	
3	G	97	
4	I	56	

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 2371 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-CHYMOTRYPSIN A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	E	10	Total	C	N	O	S	0	0	0
			68	45	11	11	1			

- Molecule 2 is a protein called ALPHA-CHYMOTRYPSIN A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	F	131	Total	C	N	O	S	0	0	0
			980	618	162	196	4			

- Molecule 3 is a protein called ALPHA-CHYMOTRYPSIN A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	G	97	Total	C	N	O	S	0	0	0
			702	436	123	136	7			

- Molecule 4 is a protein called TURKEY OVOMUCOID THIRD DOMAIN (OMTKY3).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	I	53	Total	C	N	O	S	0	0	0
			400	246	67	81	6			

- Molecule 5 is water.

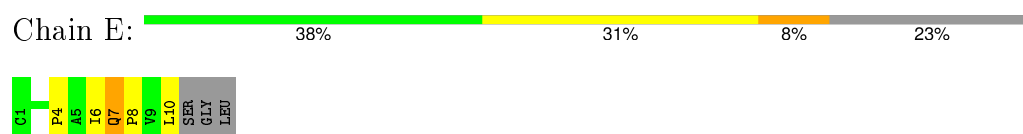
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	E	8	Total	O	0	0
			8	8		
5	F	101	Total	O	0	0
			101	101		
5	G	68	Total	O	0	0
			68	68		
5	I	44	Total	O	0	0
			44	44		

3 Residue-property plots [i](#)

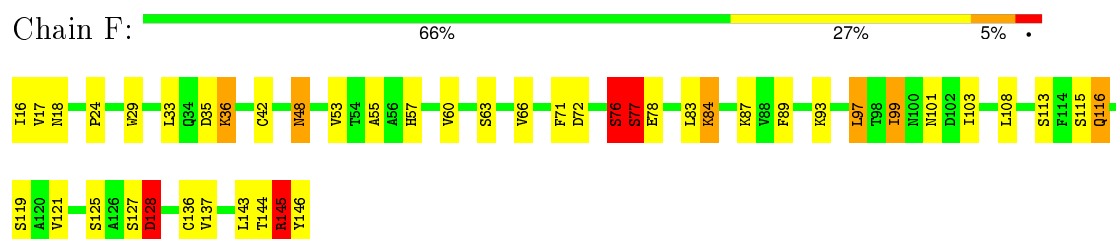
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according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

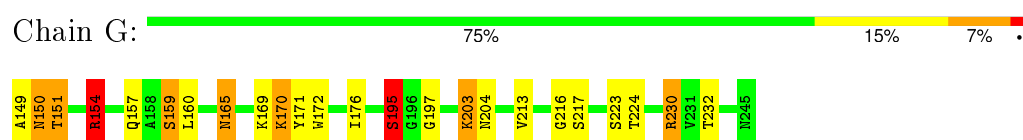
• Molecule 1: ALPHA-CHYMOTRYPSIN A



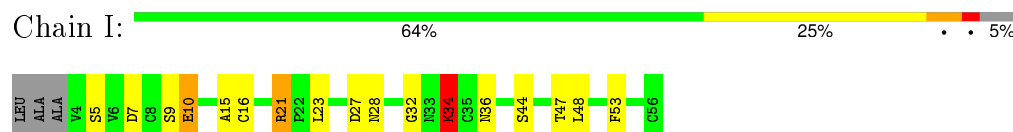
• Molecule 2: ALPHA-CHYMOTRYPSIN A



• Molecule 3: ALPHA-CHYMOTRYPSIN A



• Molecule 4: TURKEY OVOMUCOID THIRD DOMAIN (OMTKY3)



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	44.92Å 54.52Å 57.18Å 90.00° 103.90° 90.00°	Depositor
Resolution (Å)	8.00 – 1.80	Depositor
% Data completeness (in resolution range)	(Not available) (8.00-1.80)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	PROLSQ	Depositor
R, R_{free}	0.168 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2371	wwPDB-VP
Average B, all atoms (Å ²)	19.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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	0.88	0/69	1.55	0/95
2	F	0.97	0/1000	1.72	17/1361 (1.2%)
3	G	1.02	0/715	1.69	7/973 (0.7%)
4	I	0.97	0/408	1.97	9/551 (1.6%)
All	All	0.99	0/2192	1.75	33/2980 (1.1%)

There are no bond length outliers.

All (33) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	I	21	ARG	NE-CZ-NH2	16.07	128.33	120.30
4	I	21	ARG	CD-NE-CZ	12.71	141.39	123.60
4	I	21	ARG	NE-CZ-NH1	-10.74	114.93	120.30
2	F	48	ASN	CA-CB-CG	10.63	136.78	113.40
4	I	27	ASP	CB-CG-OD2	-8.14	110.97	118.30
3	G	230	ARG	NE-CZ-NH1	7.52	124.06	120.30
2	F	35	ASP	CB-CG-OD2	7.01	124.61	118.30
2	F	128	ASP	CA-CB-CG	-6.87	98.28	113.40
2	F	77	SER	C-N-CA	6.80	138.69	121.70
3	G	216	GLY	O-C-N	6.33	132.83	122.70
2	F	137	VAL	O-C-N	6.23	132.67	122.70
4	I	15	ALA	N-CA-CB	-6.22	101.40	110.10
2	F	145	ARG	NE-CZ-NH2	6.17	123.39	120.30
2	F	42	CYS	CA-CB-SG	6.03	124.86	114.00
2	F	145	ARG	CD-NE-CZ	5.92	131.89	123.60
2	F	97	LEU	CB-CA-C	5.84	121.30	110.20
2	F	48	ASN	N-CA-CB	5.80	121.04	110.60
2	F	127	SER	CB-CA-C	-5.70	99.27	110.10
4	I	34	LYS	N-CA-CB	5.63	120.73	110.60
3	G	230	ARG	O-C-N	5.61	131.68	122.70
3	G	213	VAL	CA-CB-CG1	5.61	119.31	110.90
3	G	195	SER	O-C-N	5.60	132.72	123.20
4	I	27	ASP	CB-CG-OD1	5.48	123.23	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	G	171	TYR	CB-CG-CD1	-5.46	117.72	121.00
2	F	128	ASP	CB-CG-OD2	-5.44	113.40	118.30
3	G	154	ARG	NE-CZ-NH1	5.38	122.99	120.30
4	I	48	LEU	O-C-N	5.33	131.22	122.70
2	F	55	ALA	N-CA-CB	-5.31	102.66	110.10
2	F	76	SER	C-N-CA	5.29	134.93	121.70
2	F	119	SER	N-CA-CB	5.17	118.25	110.50
2	F	145	ARG	NH1-CZ-NH2	-5.16	113.72	119.40
2	F	145	ARG	NE-CZ-NH1	5.09	122.84	120.30
4	I	16	CYS	O-C-N	5.03	130.74	122.70

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	E	68	0	76	5	0
2	F	980	0	951	27	0
3	G	702	0	698	27	0
4	I	400	0	372	10	0
5	E	8	0	0	0	0
5	F	101	0	0	5	0
5	G	68	0	0	3	0
5	I	44	0	0	3	0
All	All	2371	0	2097	62	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 15.

All (62) 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)
3:G:154:ARG:HH21	3:G:154:ARG:HG3	1.08	1.15
1:E:10:LEU:HD23	3:G:157:GLN:NE2	1.78	0.99

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:I:44:SER:HB2	4:I:47:THR:HG22	1.48	0.93
3:G:149:ALA:HB3	3:G:151:THR:HG23	1.52	0.90
3:G:154:ARG:HG3	3:G:154:ARG:NH2	1.80	0.89
3:G:149:ALA:CB	3:G:151:THR:CG2	2.54	0.86
3:G:149:ALA:HB1	3:G:151:THR:HG22	1.57	0.83
2:F:84:LYS:HD2	5:F:148:HOH:O	1.79	0.83
2:F:145:ARG:HE	2:F:146:TYR:H	1.35	0.75
4:I:44:SER:HB2	4:I:47:THR:CG2	2.17	0.75
3:G:165:ASN:O	3:G:169:LYS:HG3	1.87	0.74
4:I:44:SER:CB	4:I:47:THR:HG22	2.19	0.73
3:G:149:ALA:HB3	3:G:151:THR:CG2	2.14	0.72
3:G:172:TRP:HB2	3:G:176:ILE:HD11	1.76	0.67
2:F:145:ARG:HE	2:F:145:ARG:HA	1.61	0.66
1:E:10:LEU:HD23	3:G:157:GLN:CD	2.20	0.61
2:F:63:SER:OG	5:F:176:HOH:O	2.17	0.58
3:G:149:ALA:CB	3:G:151:THR:HG22	2.20	0.58
3:G:154:ARG:CG	3:G:154:ARG:HH21	2.00	0.56
4:I:23:LEU:N	4:I:23:LEU:HD12	2.21	0.55
2:F:16:ILE:O	2:F:144:THR:HA	2.06	0.55
4:I:10:GLU:HA	5:I:88:HOH:O	2.07	0.55
2:F:143:LEU:HA	3:G:150:ASN:O	2.07	0.55
4:I:44:SER:O	4:I:47:THR:HG22	2.08	0.54
2:F:83:LEU:HD13	2:F:108:LEU:HD13	1.88	0.54
3:G:149:ALA:HB1	3:G:151:THR:CG2	2.23	0.54
4:I:32:GLY:H	4:I:36:ASN:HD22	1.53	0.54
3:G:172:TRP:CB	3:G:176:ILE:HD11	2.38	0.53
3:G:165:ASN:ND2	5:G:254:HOH:O	2.38	0.52
1:E:10:LEU:CD2	3:G:157:GLN:CD	2.78	0.51
2:F:36:LYS:O	2:F:36:LYS:HD3	2.11	0.50
4:I:28:ASN:ND2	5:I:85:HOH:O	2.43	0.50
2:F:145:ARG:NE	2:F:145:ARG:HA	2.25	0.50
2:F:128:ASP:CB	5:F:168:HOH:O	2.59	0.50
2:F:33:LEU:CD2	2:F:66:VAL:HG22	2.42	0.50
2:F:145:ARG:NE	2:F:146:TYR:H	2.07	0.49
2:F:24:PRO:HG3	2:F:71:PHE:CE2	2.47	0.49
3:G:150:ASN:N	3:G:150:ASN:OD1	2.45	0.49
3:G:170:LYS:HA	3:G:170:LYS:HE3	1.95	0.48
3:G:232:THR:HG23	5:G:249:HOH:O	2.13	0.48
2:F:29:TRP:CG	2:F:121:VAL:HB	2.49	0.47
1:E:4:PRO:HB2	1:E:6:ILE:O	2.15	0.47
4:I:34:LYS:HD2	5:I:64:HOH:O	2.16	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:F:136:CYS:O	3:G:159:SER:HA	2.16	0.46
1:E:7:GLN:HA	1:E:8:PRO:HD3	1.73	0.46
2:F:57:HIS:CE1	3:G:195:SER:HG	2.33	0.46
4:I:53:PHE:N	4:I:53:PHE:CD2	2.82	0.46
2:F:72:ASP:HB2	3:G:154:ARG:HG2	1.99	0.45
2:F:36:LYS:HA	2:F:36:LYS:HD3	1.41	0.45
2:F:99:ILE:HG22	2:F:99:ILE:O	2.19	0.43
3:G:203:LYS:O	3:G:204:ASN:HB2	2.17	0.43
3:G:170:LYS:HD2	5:G:299:HOH:O	2.19	0.43
2:F:128:ASP:CG	5:F:168:HOH:O	2.57	0.42
2:F:87:LYS:HG2	2:F:89:PHE:CE1	2.54	0.42
2:F:53:VAL:HG21	2:F:103:ILE:HD11	2.01	0.42
2:F:17:VAL:O	2:F:18:ASN:HB2	2.19	0.42
2:F:93:LYS:HB3	2:F:101:ASN:ND2	2.35	0.42
2:F:33:LEU:HD13	2:F:60:VAL:HG21	2.02	0.41
2:F:76:SER:O	2:F:77:SER:HB2	2.19	0.41
5:F:149:HOH:O	3:G:197:GLY:HA3	2.20	0.40
2:F:115:SER:HB2	2:F:116:GLN:H	1.64	0.40
3:G:230:ARG:HD3	3:G:230:ARG:HH21	1.66	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	E	8/13 (62%)	8 (100%)	0	0	100	100
2	F	129/131 (98%)	124 (96%)	3 (2%)	2 (2%)	12	3
3	G	95/97 (98%)	93 (98%)	2 (2%)	0	100	100
4	I	51/56 (91%)	49 (96%)	2 (4%)	0	100	100
All	All	283/297 (95%)	274 (97%)	7 (2%)	2 (1%)	26	11

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	F	77	SER
2	F	99	ILE

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	8/10 (80%)	7 (88%)	1 (12%)	6	1
2	F	109/109 (100%)	97 (89%)	12 (11%)	8	1
3	G	77/77 (100%)	65 (84%)	12 (16%)	3	0
4	I	47/48 (98%)	41 (87%)	6 (13%)	5	1
All	All	241/244 (99%)	210 (87%)	31 (13%)	5	1

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	7	GLN
2	F	36	LYS
2	F	48	ASN
2	F	76	SER
2	F	77	SER
2	F	78	GLU
2	F	84	LYS
2	F	97	LEU
2	F	113	SER
2	F	116	GLN
2	F	125	SER
2	F	128	ASP
2	F	145	ARG
3	G	150	ASN
3	G	151	THR
3	G	154	ARG
3	G	159	SER
3	G	160	LEU

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Mol	Chain	Res	Type
3	G	165	ASN
3	G	170	LYS
3	G	195	SER
3	G	203	LYS
3	G	217	SER
3	G	223	SER
3	G	224	THR
4	I	5	SER
4	I	7	ASP
4	I	9	SER
4	I	10	GLU
4	I	21	ARG
4	I	34	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
2	F	18	ASN
2	F	48	ASN
3	G	165	ASN
3	G	204	ASN
4	I	28	ASN
4	I	36	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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

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 [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.