



wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 09:03 AM GMT

PDB ID : 3H0B
Title : Discovery of aminoheterocycles as a novel beta-secretase inhibitor class
Authors : Allison, T.J.
Deposited on : 2009-04-08
Resolution : 2.70 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 ⓘ 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) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

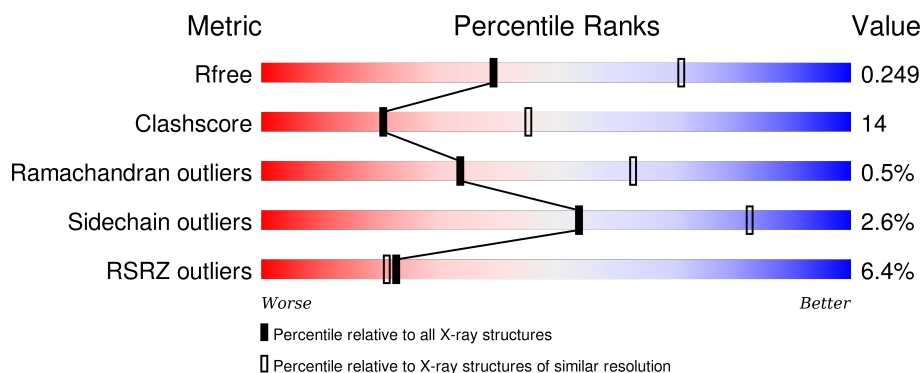
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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}	91344	2103 (2.70-2.70)
Clashscore	102246	2422 (2.70-2.70)
Ramachandran outliers	100387	2382 (2.70-2.70)
Sidechain outliers	100360	2382 (2.70-2.70)
RSRZ outliers	91569	2107 (2.70-2.70)

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.

Mol	Chain	Length	Quality of chain
1	A	405	
1	B	405	
1	C	405	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 9057 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.

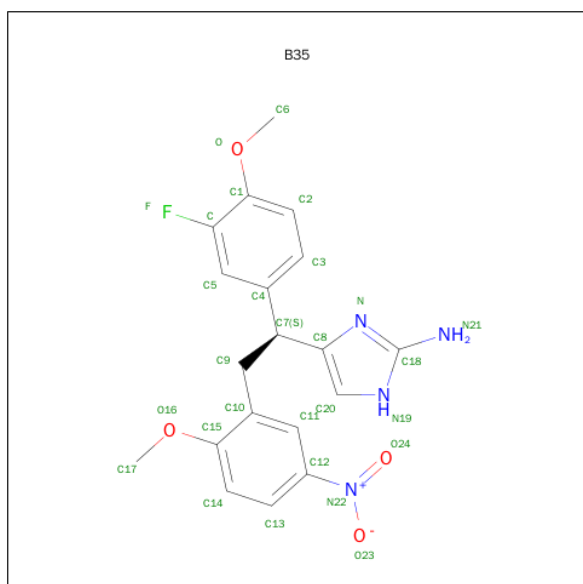
- Molecule 1 is a protein called Beta-secretase 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	372	Total	C	N	O	S	0	0	0
			2931	1877	488	552	14			
1	B	373	Total	C	N	O	S	0	0	0
			2935	1879	489	553	14			
1	C	373	Total	C	N	O	S	0	0	0
			2935	1879	489	553	14			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	429	MET	-	EXPRESSION TAG	UNP P56817
B	429	MET	-	EXPRESSION TAG	UNP P56817
C	429	MET	-	EXPRESSION TAG	UNP P56817

- Molecule 2 is 4-[(1S)-1-(3-FLUORO-4-METHOXYPHENYL)-2-(2-METHOXY-5-NITROPHENYL)ETHYL]-1H-IMIDAZOL-2-AMINE (three-letter code: B35) (formula: C₁₉H₁₉FN₄O₄).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	F	N	O	0	0
			28	19	1	4	4		
2	B	1	Total	C	F	N	O	0	0
			28	19	1	4	4		
2	C	1	Total	C	F	N	O	0	0
			28	19	1	4	4		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	60	Total	O	0	0
			60	60		
3	B	77	Total	O	0	0
			77	77		
3	C	35	Total	O	0	0
			35	35		

VAL	ALA	THR	Q315	Q316	F322	A323	I324	S325	Q326	S327	T331	F341	Y342	I352	S357	H360	T376	L377	D378	K379	D381	N385																																	
K214	M215	D216	C217	K218	E219	Y220	N221	Y222	D223	K224	S225	R235	K238	E242	A243	A244	I248	K249	S253	T254	F257	F261	W262	L263	G264	E265	Q266	L267	Y268	Q271	A272	N278	Y286	G289	T292	N293	Q294	R297	I298	L301	P302	V309	GLU	ASP											
W115	E116	G117	I118	L119	A122	Y123	A124	E125	I126	A127	R128	P129	D130	D131	S132	L133	L140	V141	K142	Q143	T144	H145	L149	F150	G156	A157	GLY	PHE	PRO	LEU	ASN	GLN	SER	GLU	VAL	LEU	ALA	S169	V170	I179	D180	H181	S182	R195	E196	W197	Y198	Y199	V204	R205	L213				
Y52	Q53	R54	Q55	L56	S57	S58	T59	Y60	R61	D62	L63	R64	K65	G66	V67	Y68	P69	Y71	T72	Q73	G74	K75	W76	E77	L80	G81	T82	D83	L84	V85	P88	H89	G90	P91	N92	Y93	T94	V95	R96	A97	I98	I99	A100	A101	I102	T103	D106	K107	F108	F109	I110	N111	G112	S113	N114
MET	LEU	PRO	ARG	GLU	THR	ASP	GLU	GLU	PRO	GLU	PRO	GLY	ARG	ARG	G445	V448	E1	M2	V3	D4	E7	Q12	G13	E17	V20	G21	P22	P23	L27	N28	I29	L30	V31	D32	S35	S36	N37	F38	A39	V40	G41	A42	A43	P44	H45	P46	F47	L48	H49	R50	Y51				

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	221.18Å 107.44Å 65.08Å 90.00° 99.47° 90.00°	Depositor
Resolution (Å)	47.25 – 2.70 47.25 – 2.70	Depositor EDS
% Data completeness (in resolution range)	99.8 (47.25-2.70) 99.8 (47.25-2.70)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.65 (at 2.69Å)	Xtriage
Refinement program	REFMAC 5.5.0066	Depositor
R, R_{free}	0.220 , 0.251 0.219 , 0.249	Depositor DCC
R_{free} test set	2072 reflections (5.29%)	DCC
Wilson B-factor (Å ²)	52.9	Xtriage
Anisotropy	0.121	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 41.4	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 41215 reflections	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	9057	wwPDB-VP
Average B, all atoms (Å ²)	53.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.27% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: B35

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	0.28	0/3005	0.46	0/4080
1	B	0.29	0/3009	0.47	0/4085
1	C	0.28	0/3009	0.46	0/4085
All	All	0.28	0/9023	0.46	0/12250

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

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	2931	0	2843	61	0
1	B	2935	0	2846	87	0
1	C	2935	0	2846	116	0
2	A	28	0	19	0	0
2	B	28	0	19	1	0
2	C	28	0	19	4	0
3	A	60	0	0	2	0
3	B	77	0	0	6	0
3	C	35	0	0	6	0
All	All	9057	0	8592	253	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 14.

The worst 5 of 253 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:238:LYS:HG3	1:C:326:GLN:OE1	1.41	1.20
1:B:96:ARG:HG2	1:C:448:VAL:HG23	1.37	1.03
1:B:72:THR:O	1:B:73:GLN:HB3	1.65	0.94
1:C:261:PHE:CD1	1:C:268:VAL:HG23	2.06	0.90
1:B:64:ARG:HD2	3:C:477:HOH:O	1.76	0.86

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	366/405 (90%)	350 (96%)	16 (4%)	0	100	100
1	B	367/405 (91%)	348 (95%)	18 (5%)	1 (0%)	46	75
1	C	367/405 (91%)	341 (93%)	22 (6%)	4 (1%)	17	42
All	All	1100/1215 (90%)	1039 (94%)	56 (5%)	5 (0%)	34	63

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	73	GLN
1	C	72	THR
1	C	265	GLU
1	C	114	ASN
1	C	44	PRO

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	A	318/346 (92%)	312 (98%)	6 (2%)	65	88
1	B	318/346 (92%)	309 (97%)	9 (3%)	51	81
1	C	318/346 (92%)	308 (97%)	10 (3%)	47	78
All	All	954/1038 (92%)	929 (97%)	25 (3%)	54	83

5 of 25 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	197	TRP
1	B	271	GLN
1	C	254	THR
1	B	254	THR
1	B	292	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	211	GLN
1	B	278	ASN
1	C	73	GLN

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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

3 ligands are 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$
2	B35	A	449	-	26,30,30	1.86	3 (11%)	35,42,42	1.19	5 (14%)
2	B35	B	449	-	26,30,30	1.84	3 (11%)	35,42,42	1.14	5 (14%)
2	B35	C	449	-	26,30,30	1.84	3 (11%)	35,42,42	1.07	4 (11%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	B35	A	449	-	-	0/17/20/20	0/3/3/3
2	B35	B	449	-	-	0/17/20/20	0/3/3/3
2	B35	C	449	-	-	0/17/20/20	0/3/3/3

The worst 5 of 9 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	449	B35	O16-C15	-2.38	1.33	1.37
2	C	449	B35	O16-C15	-2.28	1.33	1.37
2	A	449	B35	O-C1	-2.27	1.33	1.37
2	C	449	B35	O-C1	-2.16	1.33	1.37
2	B	449	B35	O-C1	-2.10	1.33	1.37

The worst 5 of 14 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
2	A	449	B35	C10-C9-C7	-3.08	109.48	114.98
2	B	449	B35	C10-C9-C7	-2.95	109.71	114.98
2	A	449	B35	C20-C8-C7	2.07	133.12	128.57
2	B	449	B35	C20-C8-C7	2.07	133.14	128.57
2	B	449	B35	C20-N19-C18	2.09	108.99	105.18

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	449	B35	1	0
2	C	449	B35	4	0

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, 95th 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 ²)	Q<0.9
1	A	372/405 (91%)	0.10	9 (2%) 62 62	36, 51, 72, 92	0
1	B	373/405 (92%)	0.19	4 (1%) 82 83	36, 51, 72, 92	0
1	C	373/405 (92%)	0.59	58 (15%) 3 2	36, 52, 72, 92	0
All	All	1118/1215 (92%)	0.29	71 (6%) 23 21	36, 52, 72, 92	0

The worst 5 of 71 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	63	LEU	4.9
1	C	64	ARG	4.2
1	C	52	TYR	4.2
1	C	84	LEU	4.0
1	C	101	ALA	4.0

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 carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95th 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	LLDF	B-factors(\AA^2)	Q<0.9
2	B35	C	449	28/28	0.92	0.19	-0.09	71,73,74,74	0
2	B35	A	449	28/28	0.94	0.17	-1.00	37,39,44,44	0
2	B35	B	449	28/28	0.96	0.15	-1.43	41,42,45,45	0

6.5 Other polymers [i](#)

There are no such residues in this entry.