



wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 31, 2016 – 09:06 PM GMT

PDB ID : 1NJJ
Title : Crystal structure determination of T. brucei ornithine decarboxylase bound to D-ornithine and to G418
Authors : Jackson, L.K.; Goldsmith, E.J.; Phillips, M.A.
Deposited on : 2002-12-31
Resolution : 2.45 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

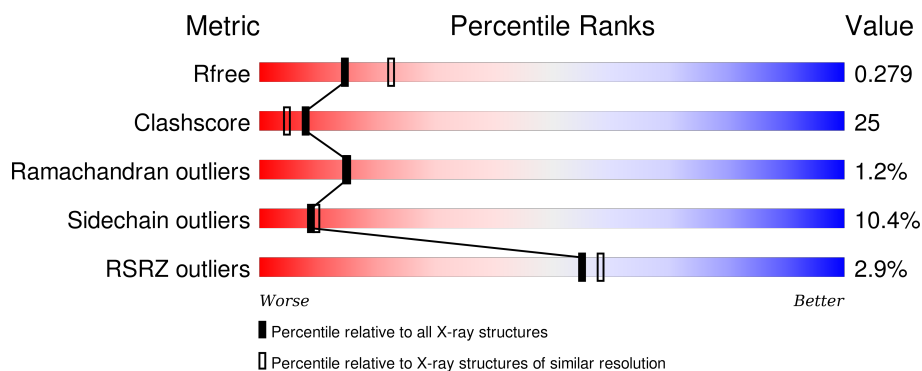
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.45 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	4776 (2.50-2.42)
Clashscore	102246	1030 (2.48-2.44)
Ramachandran outliers	100387	1024 (2.48-2.44)
Sidechain outliers	100360	1024 (2.48-2.44)
RSRZ outliers	91569	4787 (2.50-2.42)

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	425	<div> <div>2%</div> <div> <div></div> <div>46%</div> <div>31%</div> <div>5%</div> <div>18%</div> </div> </div>
1	B	425	<div> <div>2%</div> <div> <div></div> <div>46%</div> <div>31%</div> <div>• •</div> <div>18%</div> </div> </div>
1	C	425	<div> <div>3%</div> <div> <div></div> <div>51%</div> <div>28%</div> <div>•</div> <div>17%</div> </div> </div>
1	D	425	<div> <div>3%</div> <div> <div></div> <div>48%</div> <div>31%</div> <div>• •</div> <div>17%</div> </div> </div>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit crite-

ria:

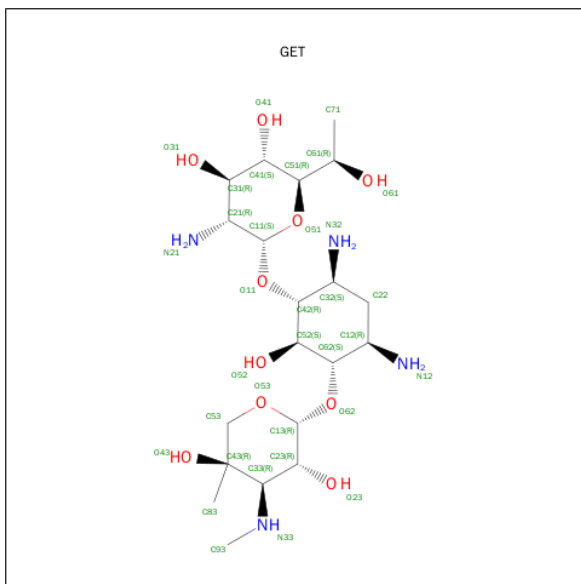
Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	GET	A	601	X	-	-	-
2	GET	B	602	X	-	-	-
2	GET	C	603	X	-	-	-
3	ORX	D	426	X	-	-	X

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 ornithine decarboxylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	349	Total 2734	C 1756	N 456	O 506	S 16	0	0	0
1	B	349	Total 2738	C 1760	N 457	O 505	S 16	0	0	0
1	C	352	Total 2770	C 1784	N 462	O 508	S 16	0	0	0
1	D	354	Total 2777	C 1784	N 464	O 513	S 16	12	0	0

- Molecule 2 is GENETICIN (three-letter code: GET) (formula: $\text{C}_{20}\text{H}_{40}\text{N}_4\text{O}_{10}$).



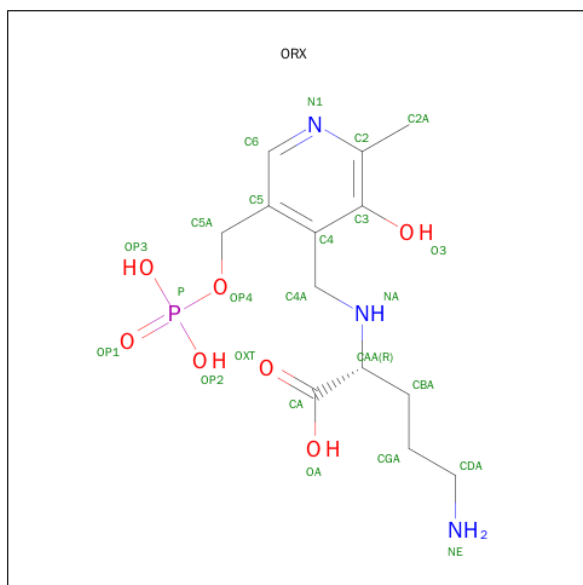
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total 34	C 20	N 4	O 10	0	0
2	B	1	Total 34	C 20	N 4	O 10	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	C	1	Total	C	N	O	0	0
			34	20	4	10		

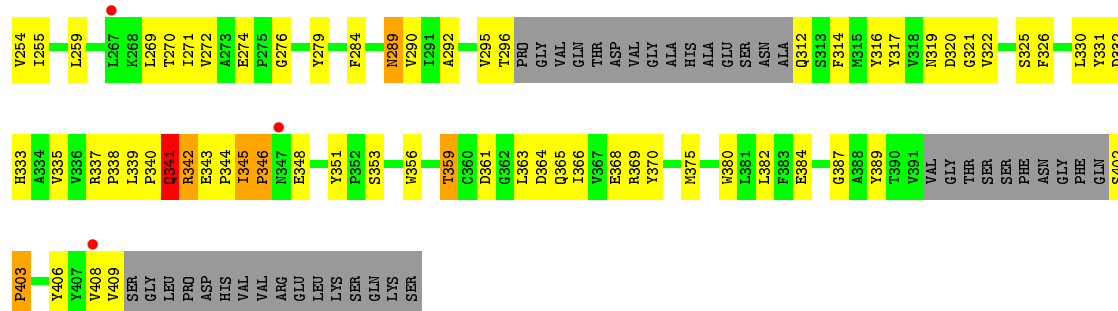
- Molecule 3 is N 2 -({3-HYDROXY-2-METHYL-5-[(PHOSPHONOOXY)METHYL]PYRIDIN-4-YL}METHYL)-D-ORNITHINE (three-letter code: ORX) (formula: C₁₃H₂₂N₃O₇P).



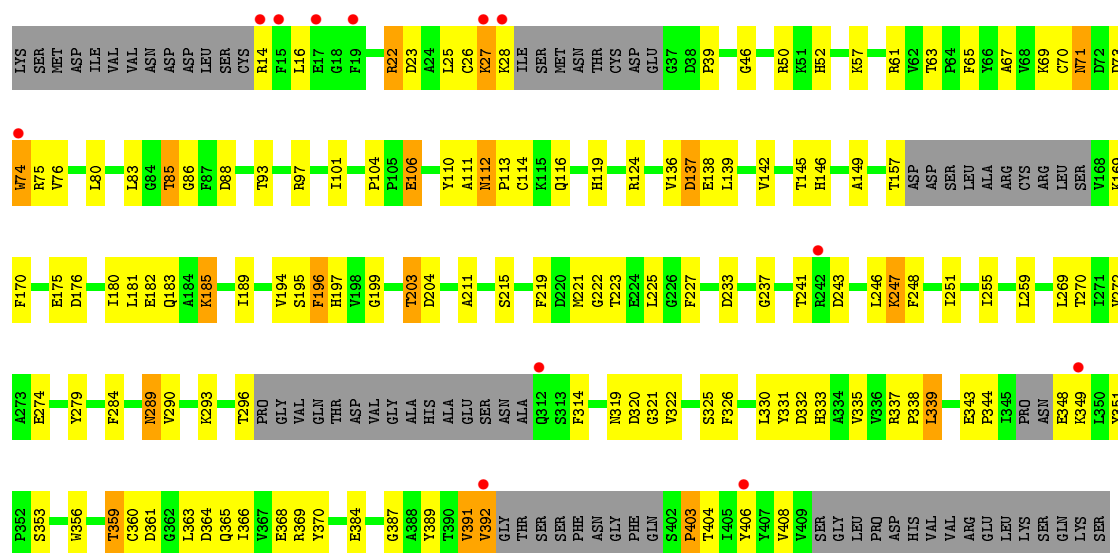
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			24	13	3	7	1		
3	B	1	Total	C	N	O	P	0	0
			24	13	3	7	1		
3	C	1	Total	C	N	O	P	0	0
			24	13	3	7	1		
3	D	1	Total	C	N	O	P	0	0
			24	13	3	7	1		

- Molecule 4 is water.

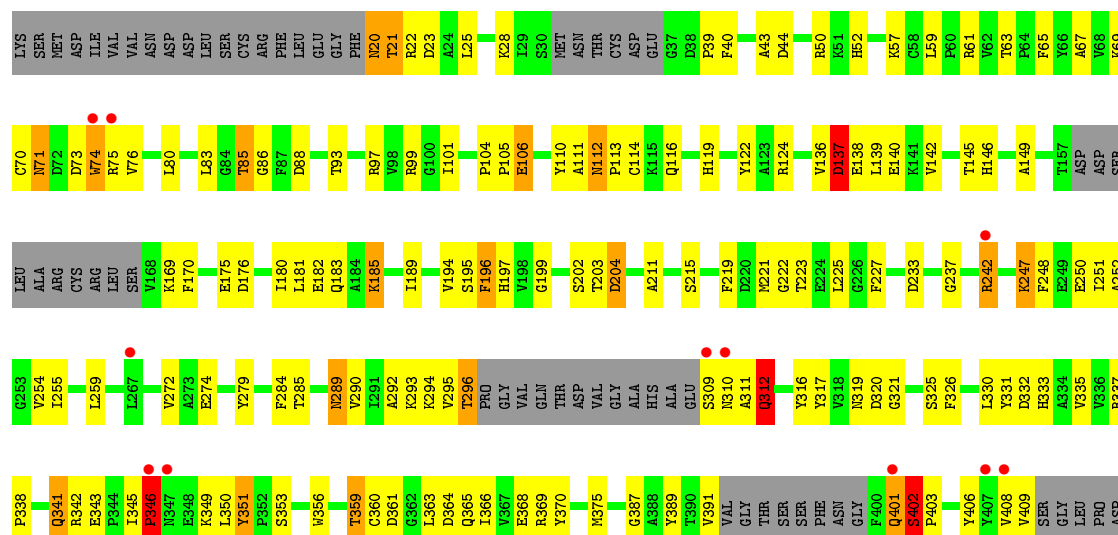
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	51	Total	O	0	0
			51	51		
4	B	48	Total	O	0	0
			48	48		
4	C	59	Total	O	0	0
			59	59		
4	D	49	Total	O	0	0
			49	49		



• Molecule 1: ornithine decarboxylase



• Molecule 1: ornithine decarboxylase



HIS
VAL
VAL
ARG
GLU
LEU
LYS
SER
GLN
LYS
SER

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	67.82Å 88.54Å 150.44Å 90.00° 90.03° 90.00°	Depositor
Resolution (Å)	35.00 – 2.45 33.91 – 2.45	Depositor EDS
% Data completeness (in resolution range)	87.6 (35.00-2.45) 87.5 (33.91-2.45)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.19 (at 2.45Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.260 , 0.283 0.259 , 0.279	Depositor DCC
R_{free} test set	5757 reflections (10.02%)	DCC
Wilson B-factor (Å ²)	42.0	Xtriage
Anisotropy	0.730	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 19.5	EDS
Estimated twinning fraction	0.138 for h,-k,-l	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 63350 reflections	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	11424	wwPDB-VP
Average B, all atoms (Å ²)	44.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.55% 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 [i](#)

5.1 Standard geometry [i](#)

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

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	0.43	1/2797 (0.0%)	0.90	11/3790 (0.3%)
1	B	0.51	2/2802 (0.1%)	0.89	14/3799 (0.4%)
1	C	0.39	0/2834	0.76	5/3838 (0.1%)
1	D	0.43	0/2842	0.81	13/3853 (0.3%)
All	All	0.44	3/11275 (0.0%)	0.84	43/15280 (0.3%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	204	ASP	CG-OD2	-5.89	1.11	1.25
1	A	204	ASP	CG-OD2	-5.51	1.12	1.25
1	B	27	LYS	CA-C	5.07	1.66	1.52

The worst 5 of 43 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	61	ARG	NE-CZ-NH2	-16.88	111.86	120.30
1	A	61	ARG	NE-CZ-NH1	15.88	128.24	120.30
1	D	337	ARG	NE-CZ-NH2	-14.63	112.98	120.30
1	B	337	ARG	NE-CZ-NH2	-14.24	113.18	120.30
1	D	337	ARG	NE-CZ-NH1	14.16	127.38	120.30

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	2734	0	2701	144	0
1	B	2738	0	2712	162	0
1	C	2770	0	2742	132	0
1	D	2777	0	2745	139	0
2	A	34	0	40	5	0
2	B	34	0	40	13	0
2	C	34	0	40	10	0
3	A	24	0	19	2	0
3	B	24	0	18	3	0
3	C	24	0	19	1	0
3	D	24	0	19	2	0
4	A	51	0	0	8	0
4	B	48	0	0	2	0
4	C	59	0	0	3	0
4	D	49	0	0	4	0
All	All	11424	0	11095	555	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 25.

The worst 5 of 555 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:A:146:HIS:ND1	1:A:149:ALA:HB2	1.63	1.13
1:C:146:HIS:ND1	1:C:149:ALA:HB2	1.63	1.12
1:B:146:HIS:ND1	1:B:149:ALA:HB2	1.63	1.11
1:D:146:HIS:ND1	1:D:149:ALA:HB2	1.64	1.10
1:A:124:ARG:HB2	1:A:146:HIS:HD2	1.26	1.00

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	337/425 (79%)	307 (91%)	23 (7%)	7 (2%)	9	6
1	B	339/425 (80%)	307 (91%)	29 (9%)	3 (1%)	21	25
1	C	340/425 (80%)	314 (92%)	23 (7%)	3 (1%)	21	25
1	D	344/425 (81%)	314 (91%)	26 (8%)	4 (1%)	16	17
All	All	1360/1700 (80%)	1242 (91%)	101 (7%)	17 (1%)	15	15

5 of 17 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	22	ARG
1	B	345	ILE
1	B	346	PRO
1	C	27	LYS
1	D	402	SER

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	297/364 (82%)	266 (90%)	31 (10%)	9	10
1	B	298/364 (82%)	266 (89%)	32 (11%)	8	8
1	C	300/364 (82%)	269 (90%)	31 (10%)	9	10
1	D	302/364 (83%)	271 (90%)	31 (10%)	9	10
All	All	1197/1456 (82%)	1072 (90%)	125 (10%)	9	10

5 of 125 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	341	GLN
1	C	85	THR
1	D	296	THR

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Mol	Chain	Res	Type
1	B	344	PRO
1	C	14	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 53 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	210	GLN
1	C	96	GLN
1	D	210	GLN
1	B	256	ASN
1	B	312	GLN

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](#)

7 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	GET	A	601	-	33,36,36	1.27	1 (3%)	43,55,55	1.65	8 (18%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	ORX	A	602	-	21,24,24	3.66	8 (38%)	24,33,33	4.56	12 (50%)
2	GET	B	602	-	33,36,36	1.09	3 (9%)	43,55,55	1.65	5 (11%)
3	ORX	B	603	-	21,24,24	3.50	8 (38%)	24,33,33	4.61	12 (50%)
2	GET	C	603	-	33,36,36	1.21	3 (9%)	43,55,55	1.46	5 (11%)
3	ORX	C	604	-	21,24,24	3.08	6 (28%)	24,33,33	4.68	14 (58%)
3	ORX	D	426	-	21,24,24	3.33	8 (38%)	24,33,33	4.64	13 (54%)

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	GET	A	601	-	1/1/15/16	0/13/74/74	0/3/3/3
3	ORX	A	602	-	-	0/15/19/19	0/1/1/1
2	GET	B	602	-	1/1/15/16	0/13/74/74	0/3/3/3
3	ORX	B	603	-	-	0/15/19/19	0/1/1/1
2	GET	C	603	-	1/1/15/16	0/13/74/74	0/3/3/3
3	ORX	C	604	-	-	0/15/19/19	0/1/1/1
3	ORX	D	426	-	1/1/3/4	0/15/19/19	0/1/1/1

The worst 5 of 37 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	604	ORX	P-OP1	-2.47	1.43	1.51
3	B	603	ORX	P-OP1	-2.22	1.43	1.51
3	D	426	ORX	P-OP1	-2.18	1.44	1.51
3	A	602	ORX	P-OP1	-2.15	1.44	1.51
2	C	603	GET	C51-C61	2.01	1.55	1.52

The worst 5 of 69 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	604	ORX	C3-C4-C5	-9.08	109.26	118.82
3	B	603	ORX	C3-C4-C5	-8.77	109.59	118.82
3	A	602	ORX	C3-C4-C5	-8.74	109.62	118.82
3	D	426	ORX	C3-C4-C5	-8.68	109.68	118.82
3	D	426	ORX	C5A-C5-C6	-4.93	109.96	119.28

All (4) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	601	GET	C61
3	D	426	ORX	CAA
2	B	602	GET	C61
2	C	603	GET	C61

There are no torsion outliers.

There are no ring outliers.

7 monomers are involved in 36 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	601	GET	5	0
3	A	602	ORX	2	0
2	B	602	GET	13	0
3	B	603	ORX	3	0
2	C	603	GET	10	0
3	C	604	ORX	1	0
3	D	426	ORX	2	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	349/425 (82%)	0.14	10 (2%) 55 58	24, 41, 74, 97	0
1	B	349/425 (82%)	0.11	8 (2%) 64 66	19, 41, 75, 97	0
1	C	352/425 (82%)	0.14	12 (3%) 49 52	22, 41, 77, 91	0
1	D	354/425 (83%)	0.13	11 (3%) 52 56	20, 40, 76, 99	2 (0%)
All	All	1404/1700 (82%)	0.13	41 (2%) 55 58	19, 41, 76, 99	2 (0%)

The worst 5 of 41 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	74	TRP	6.3
1	A	74	TRP	4.7
1	B	27	LYS	4.6
1	D	74	TRP	4.5
1	B	22	ARG	4.4

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
3	ORX	D	426	24/24	0.93	0.21	2.01	31,47,52,54	0
3	ORX	C	604	24/24	0.91	0.19	1.30	34,48,54,55	0
3	ORX	A	602	24/24	0.95	0.19	1.29	29,39,45,46	0
2	GET	C	603	34/34	0.76	0.26	1.05	95,97,100,101	0
2	GET	A	601	34/34	0.79	0.28	0.59	99,101,106,106	0
2	GET	B	602	34/34	0.81	0.27	0.50	99,104,112,113	0
3	ORX	B	603	24/24	0.96	0.15	0.15	18,46,52,52	0

6.5 Other polymers [i](#)

There are no such residues in this entry.