

wwPDB X-ray Structure Validation Summary Report (i)

Jan 20, 2024 - 07:37 pm GMT

PDB ID	:	70J7
Title	:	Crystal structure of human coxsackievirus A24v in complex with a pentavalent
		N-acetylneuraminic acid conjugate
Authors	:	Zocher, G.; Stehle, T.
Deposited on		
Resolution	:	1.78 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 https://www.wwpdb.org/validation/2017/XrayValidationReportHelp with specific help available everywhere you see the (i) symbol.

The types of validation reports are described at http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references (1)) were used in the production of this report:

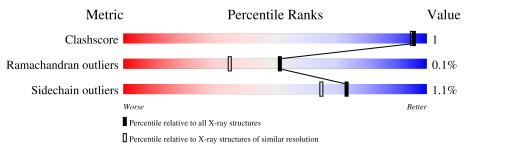
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7(2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure: $X\text{-}RAY \, DIFFRACTION$

The reported resolution of this entry is 1.78 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	$egin{array}{c} { m Whole \ archive} \ (\#{ m Entries}) \end{array}$	${f Similar\ resolution}\ (\#{ m Entries,\ resolution\ range}({ m \AA}))$
Clashscore	141614	10184 (1.80-1.76)
Ramachandran outliers	138981	10051 (1.80-1.76)
Sidechain outliers	138945	10050 (1.80-1.76)

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%

Mol	Chain	Length	Quality of chain	
1	111	305	89%	• 8%
2	222	271	94%	•••
3	333	240	93%	
4	444	69	80%	17%



Entry composition (i) $\mathbf{2}$

There are 8 unique types of molecules in this entry. The entry contains 7478 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 Capsid protein VP1.

Mol	Chain	Residues		At	oms			ZeroOcc	AltConf	Trace
1	111	281	Total 2267	C 1442	N 382	0 435	S 8	0	6	0

• Molecule 2 is a protein called Capsid protein VP2.

Mol	Chain	Residues		At	oms			ZeroOcc	AltConf	Trace
2	222	264	Total 2068	C 1318	N 343	O 393	S 14	0	4	0

• Molecule 3 is a protein called Capsid protein VP3.

Mol	Chain	Residues		At	oms			ZeroOcc	AltConf	Trace
3	333	234	Total 1855	C 1193	N 293	O 347	S 22	0	12	0

• Molecule 4 is a protein called Capsid protein VP4.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace		
4	444	57	Total 438	C 274	N 72	O 91	S 1	0	2	0

• Molecule 5 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	111	3	Total Ca 3 3	0	0

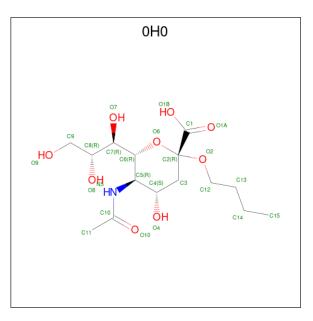
• Molecule 6 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf			
6	111	3	Total Cl 3 3	0	0			
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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	222	3	Total Cl 3 3	0	0
6	333	1	Total Cl 1 1	0	0

• Molecule 7 is Carbohydrate component from a pentavalent N-acetylneuraminic acid conjugate (three-letter code: 0H0) (formula: $C_{15}H_{27}NO_9$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	111	1	Total 24	C 14	N 1	O 9	0	0

• Molecule 8 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	111	286	Total O 286 286	0	0
8	222	238	Total O 238 238	0	0
8	333	226	Total O 226 226	0	0
8	444	66	Total O 66 66	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.

Chain 111:	89%	• 8%
CLY TLE CLU CLU CLU CLU CLU CLU CLU CLU CLU CLU	ASN ASN ALA LEU CLN CLN CLN CLN CLN CLN CLN CLN CLN CLN	
• Molecule 2: (Capsid protein VP2	
Chain 222:	94%	• •
SER PRO ASN VAL GLU GLU CYS CYS CYS E106	N117 L151 H168 H268 M201 F242 F238 F238 F332 R332 R332 R332 R332 R332	
• Molecule 3: 0	Capsid protein VP3	
Chain 333:	93%	• •
G341 9360 F457 8472 8472 M488	W495 8502 C503 HE 74 ALA ALA ALA ALA ALA ALA	
• Molecule 4: 0	Capsid protein VP4	
Chain 444:	80% .	17%
MET 62 62 61U 61U ASN VAL ALA ALA	GLY SER THR V25 N69	

• Molecule 1: Capsid protein VP1



4 Data and refinement statistics (i)

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Depositor
Resolution (Å)	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	Depositor EDS
% Data completeness	99.9 (49.96 - 1.78)	Depositor
(in resolution range)	99.9 (49.96 - 1.78)	EDS
R _{merge}	0.26	Depositor
R _{sym}	(Not available)	Depositor
$< I/\sigma(I) > 1$	$1.14 (at 1.78 \text{\AA})$	Xtriage
Refinement program	REFMAC 5.8.0232 $2018/13/08$	Depositor
D D	0.158 , (Not available)	Depositor
R, R_{free}	0.408 , (Not available)	DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor $(Å^2)$	21.2	Xtriage
Anisotropy	0.101	Xtriage
Bulk solvent $k_{sol}(e/Å^3)$, $B_{sol}(Å^2)$	0.42, 62.6	EDS
L-test for twinning ²	$< L > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.017 for -h,-l,-k	Xtriage
F_o, F_c correlation	0.75	EDS
Total number of atoms	7478	wwPDB-VP
Average B, all atoms $(Å^2)$	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: The largest off-origin peak in the Patterson function is 1.25% of the height of the origin peak. No significant pseudotranslation is detected.

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



¹Intensities estimated from amplitudes.

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: 0H0, CA, CL

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	
	Unam	RMSZ	# Z > 5	RMSZ	# Z > 5
1	111	0.60	0/2348	0.76	0/3207
2	222	0.59	0/2136	0.78	0/2917
3	333	0.60	0/1939	0.74	0/2640
4	444	0.64	0/451	0.71	0/608
All	All	0.60	0/6874	0.76	0/9372

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
2	222	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	222	151	LEU	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	111	2267	0	2198	5	0
2	222	2068	0	1994	4	0
3	333	1855	0	1856	8	0
4	444	438	0	428	1	0
5	111	3	0	0	0	0
6	111	3	0	0	0	0
6	222	3	0	0	0	0
6	333	1	0	0	0	0
7	111	24	0	0	0	0
8	111	286	0	0	2	0
8	222	238	0	0	0	0
8	333	226	0	0	0	0
8	444	66	0	0	0	0
All	All	7478	0	6476	15	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 1.

The worst 5 of 15 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)
3:333:360:GLN:HE22	4:444:32:TYR:H	1.31	0.79
1:111:836[B]:THR:HG22	8:111:1116:HOH:O	2.05	0.55
1:111:858:ALA:HA	3:333:569[A]:HIS:CE1	2.43	0.53
1:111:728:ASN:HD22	1:111:728:ASN:H	1.60	0.50
3:333:472[A]:SER:OG	3:333:530[A]:THR:OG1	2.29	0.49

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	Perce	ntiles
1	111	285/305~(93%)	274~(96%)	11 (4%)	0	100	100
2	222	266/271~(98%)	251 (94%)	14~(5%)	1 (0%)	34	19
3	333	243/240~(101%)	232~(96%)	11 (4%)	0	100	100
4	444	55/69~(80%)	53~(96%)	2~(4%)	0	100	100
All	All	849/885~(96%)	810 (95%)	38~(4%)	1 (0%)	51	35

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	222	117	ASN

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	111	252/268~(94%)	247~(98%)	5 (2%)	55 40
2	222	223/225~(99%)	222~(100%)	1 (0%)	91 88
3	333	218/212~(103%)	217 (100%)	1 (0%)	88 86
4	444	49/57~(86%)	48 (98%)	1 (2%)	55 40
All	All	742/762~(97%)	734 (99%)	8 (1%)	73 65

5 of 8 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	444	13	HIS
3	333	488	MET
1	111	864	GLU
1	111	813	LEU
2	222	332	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.



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 monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 11 ligands modelled in this entry, 10 are monoatomic - leaving 1 for Mogul analysis.

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	Mol Type Chain Res		Chain Res Link		Bond lengths			Bond angles		
INIOI	Type	Ullalli	nes		Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
7	0H0	111	907	-	23,24,25	2.11	6 (26%)	29,34,35	0.89	0

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
7	0H0	111	907	-	-	5/25/43/44	0/1/1/1

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms		Observed(Å)	Ideal(Å)
7	111	907	0H0	O6-C2	5.12	1.49	1.42
7	111	907	0H0	C4-C5	-4.07	1.49	1.53
7	111	907	0H0	C10-N5	3.47	1.46	1.34

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Mol	Chain	Res	Type	Atoms	\mathbf{Z}	Observed(Å)	Ideal(Å)
7	111	907	0H0	C5-N5	3.33	1.51	1.45
7	111	907	0H0	C11-C10	2.87	1.56	1.50

There are no bond angle outliers.

There are no chirality outliers.

All (5) torsion outliers are listed below:

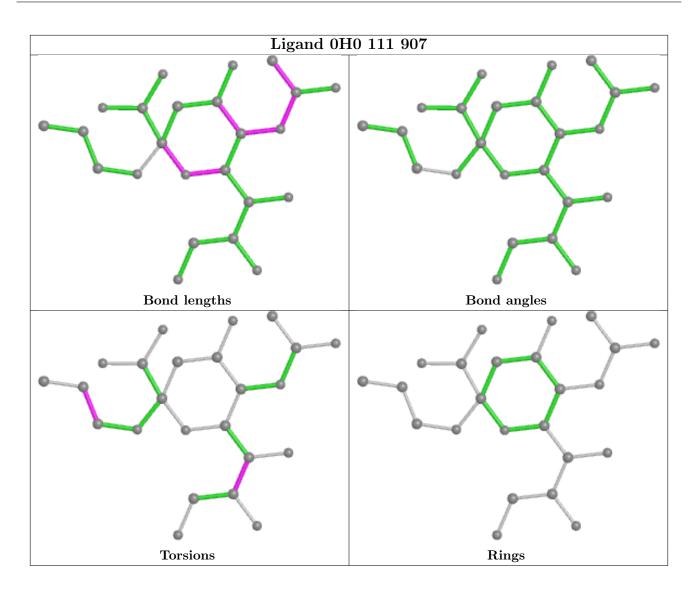
Mol	Chain	Res	Type	Atoms
7	111	907	0H0	O2-C12-C13-C14
7	111	907	0H0	O7-C7-C8-C9
7	111	907	0H0	C6-C7-C8-C9
7	111	907	0H0	07-C7-C8-O8
7	111	907	0H0	C6-C7-C8-O8

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





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)

Unable to reproduce the depositors R factor - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains (i)

Unable to reproduce the depositors R factor - this section is therefore empty.

6.3 Carbohydrates (i)

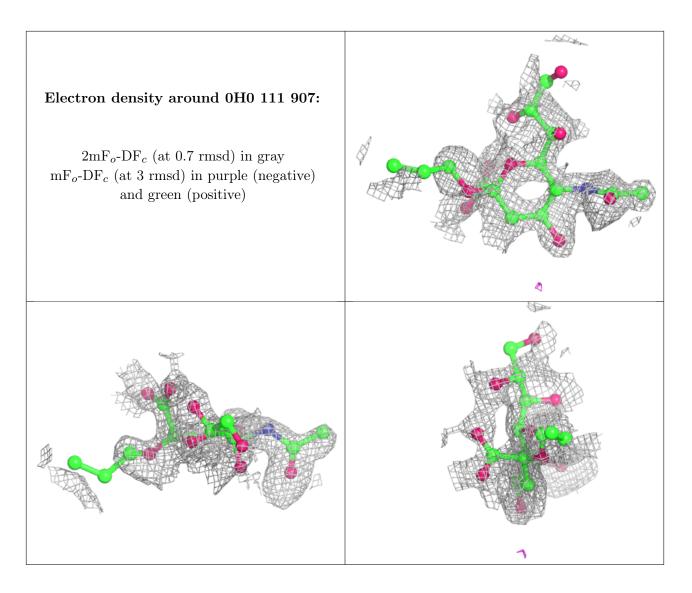
Unable to reproduce the depositors R factor - this section is therefore empty.

6.4 Ligands (i)

Unable to reproduce the depositors R factor - this section is therefore empty.

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.





6.5 Other polymers (i)

Unable to reproduce the depositors R factor - this section is therefore empty.

