wwPDB X-ray Structure Validation Summary Report (i)

May 22, 2020 – 05:13 pm BST

PDB ID	:	1SAC
Title	:	THE STRUCTURE OF PENTAMERIC HUMAN SERUM AMYLOID P COMPONENT
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Deposited on	:	1994-01-27
Resolution	:	2.00 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 following versions of software and data (see references (i)) were used in the production of this report:

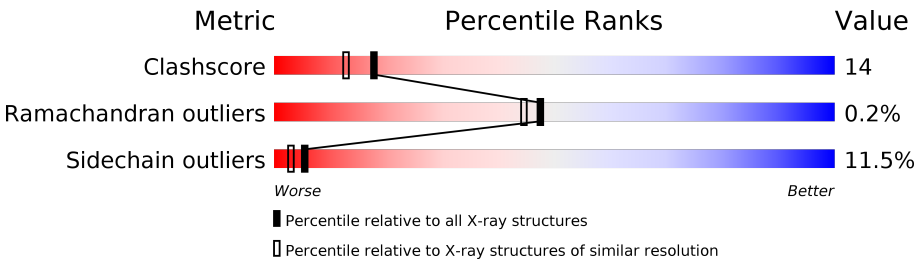
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)

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 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	A	204	67% 27% 5%
1	B	204	65% 25% 8% •
1	C	204	68% 24% 9%
1	D	204	66% 24% 9% •
1	E	204	68% 25% 5% •

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 8271 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.

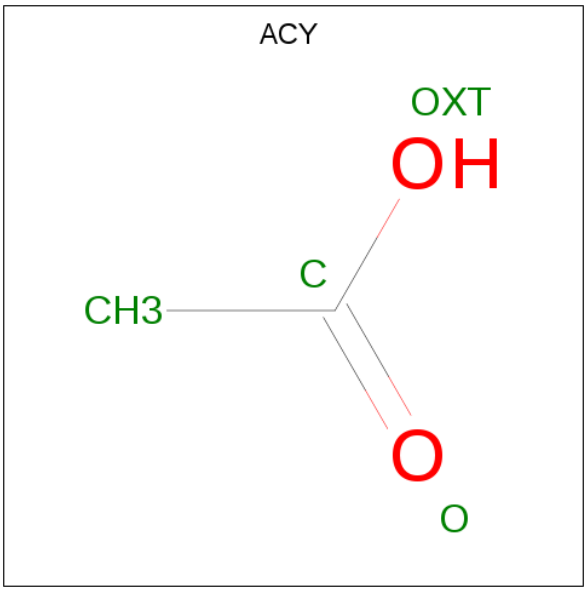
- Molecule 1 is a protein called SERUM AMYLOID P COMPONENT.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	204	1649	1071	272	303	3	0	0	0
1	B	204	1649	1071	272	303	3	0	0	0
1	C	204	1649	1071	272	303	3	0	0	0
1	D	204	1649	1071	272	303	3	0	0	0
1	E	204	1649	1071	272	303	3	0	0	0

- Molecule 2 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Ca		
2	B	2	2	2	0	0
2	A	2	2	2	0	0
2	D	2	2	2	0	0
2	C	2	2	2	0	0
2	E	2	2	2	0	0

- Molecule 3 is ACETIC ACID (three-letter code: ACY) (formula: $C_2H_4O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
3	A	1	4	2	2	0	0
3	B	1	4	2	2	0	0
3	D	1	4	2	2	0	0
3	E	1	4	2	2	0	0

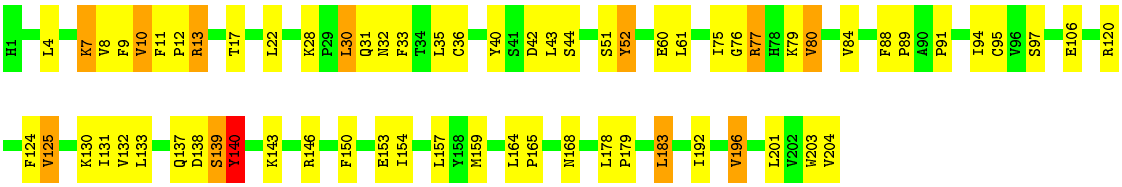
3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of 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.

Note EDS was not executed.

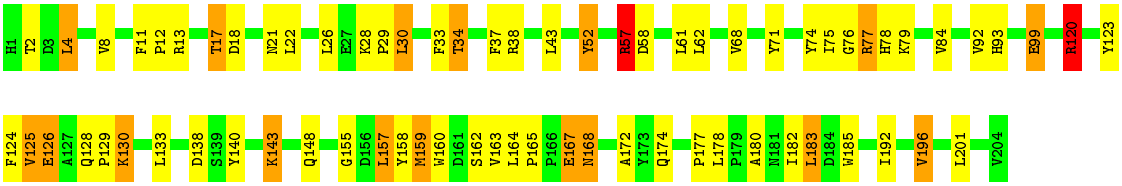
- Molecule 1: SERUM AMYLOID P COMPONENT

Chain A:



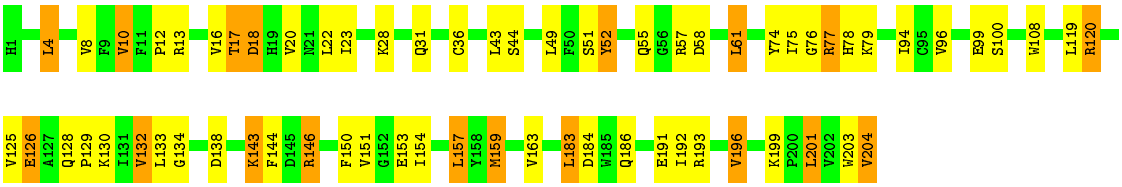
- Molecule 1: SERUM AMYLOID P COMPONENT

Chain B:



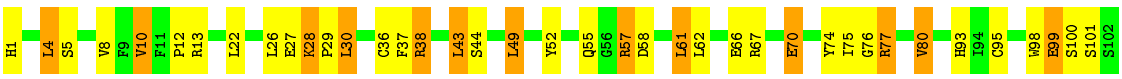
- Molecule 1: SERUM AMYLOID P COMPONENT

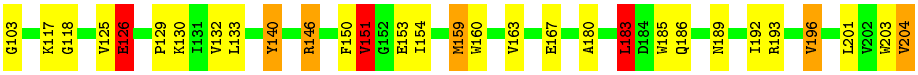
Chain C:



- Molecule 1: SERUM AMYLOID P COMPONENT

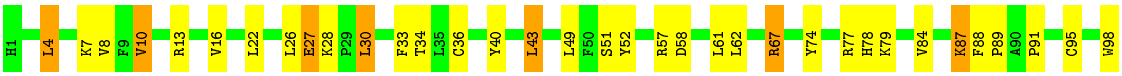
Chain D:





- Molecule 1: SERUM AMYLOID P COMPONENT

Chain E:



4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	68.90Å 99.30Å 96.70Å 90.00° 95.90° 90.00°	Depositor
Resolution (Å)	8.00 – 2.00	Depositor
% Data completeness (in resolution range)	(Not available) (8.00-2.00)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	RESTRAIN, X-PLOR	Depositor
R, R_{free}	0.179 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	8271	wwPDB-VP
Average B, all atoms (Å^2)	19.0	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: CA, ACY

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	0.90	0/1696	1.37	10/2306 (0.4%)
1	B	0.84	0/1696	1.39	11/2306 (0.5%)
1	C	0.88	1/1696 (0.1%)	1.26	9/2306 (0.4%)
1	D	1.15	1/1696 (0.1%)	1.23	11/2306 (0.5%)
1	E	0.88	1/1696 (0.1%)	1.24	11/2306 (0.5%)
All	All	0.94	3/8480 (0.0%)	1.30	52/11530 (0.5%)

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	A	0	2
1	B	0	6
1	C	0	6
1	D	0	3
1	E	0	4
All	All	0	21

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	204	VAL	C-OXT	30.01	1.80	1.23
1	E	204	VAL	C-OXT	7.80	1.38	1.23
1	C	204	VAL	C-OXT	-6.90	1.10	1.23

The worst 5 of 52 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	28	LYS	CD-CE-NZ	24.19	167.33	111.70
1	A	7	LYS	CB-CG-CD	22.16	169.22	111.60
1	B	28	LYS	CB-CG-CD	19.13	161.33	111.60
1	C	143	LYS	CG-CD-CE	15.00	156.91	111.90
1	A	7	LYS	CG-CD-CE	12.29	148.76	111.90

There are no chirality outliers.

5 of 21 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	139	SER	Mainchain
1	A	75	ILE	Mainchain
1	B	21	ASN	Mainchain
1	B	33	PHE	Peptide
1	B	92	VAL	Mainchain

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	1649	0	1624	34	0
1	B	1649	0	1626	50	0
1	C	1649	0	1626	36	0
1	D	1649	0	1626	56	0
1	E	1649	0	1626	43	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
2	C	2	0	0	0	0
2	D	2	0	0	0	0
2	E	2	0	0	0	0
3	A	4	0	3	0	0
3	B	4	0	3	1	0
3	D	4	0	3	0	0
3	E	4	0	3	0	0
All	All	8271	0	8140	218	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 218 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:D:204:VAL:C	1:D:204:VAL:OXT	1.80	1.20
1:D:57:ARG:HH12	1:D:126:GLU:HG3	1.17	1.06
1:A:165:PRO:HD2	1:A:168:ASN:HD22	1.29	0.98
1:B:34:THR:HG21	1:B:164:LEU:H	1.31	0.94
1:D:204:VAL:OXT	1:D:204:VAL:O	1.90	0.88

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	202/204 (99%)	195 (96%)	5 (2%)	2 (1%)	15 9
1	B	202/204 (99%)	198 (98%)	4 (2%)	0	100 100
1	C	202/204 (99%)	195 (96%)	7 (4%)	0	100 100
1	D	202/204 (99%)	189 (94%)	13 (6%)	0	100 100
1	E	202/204 (99%)	194 (96%)	8 (4%)	0	100 100
All	All	1010/1020 (99%)	971 (96%)	37 (4%)	2 (0%)	47 44

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	140	TYR
1	A	11	PHE

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	A	181/181 (100%)	160 (88%)	21 (12%)	5	3
1	B	181/181 (100%)	158 (87%)	23 (13%)	4	2
1	C	181/181 (100%)	160 (88%)	21 (12%)	5	3
1	D	181/181 (100%)	162 (90%)	19 (10%)	7	4
1	E	181/181 (100%)	161 (89%)	20 (11%)	6	3
All	All	905/905 (100%)	801 (88%)	104 (12%)	5	3

5 of 104 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	20	VAL
1	C	132	VAL
1	E	124	PHE
1	C	22	LEU
1	C	49	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 13 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	93	HIS
1	D	1	HIS
1	E	128	GLN
1	C	78	HIS
1	E	93	HIS

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)

Of 14 ligands modelled in this entry, 10 are monoatomic - leaving 4 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	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	ACY	D	300	2	1,3,3	3.75	1 (100%)	0,3,3	0.00	-
3	ACY	A	300	2	1,3,3	4.34	1 (100%)	0,3,3	0.00	-
3	ACY	B	300	2	1,3,3	3.83	1 (100%)	0,3,3	0.00	-
3	ACY	E	300	2	1,3,3	3.54	1 (100%)	0,3,3	0.00	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	300	ACY	CH3-C	4.34	1.54	1.48
3	B	300	ACY	CH3-C	3.83	1.53	1.48
3	D	300	ACY	CH3-C	3.75	1.53	1.48
3	E	300	ACY	CH3-C	3.54	1.53	1.48

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	300	ACY	1	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)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates (i)

EDS was not executed - this section is therefore empty.

6.4 Ligands (i)

EDS was not executed - this section is therefore empty.

6.5 Other polymers (i)

EDS was not executed - this section is therefore empty.