



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 13, 2020 – 03:03 pm BST

PDB ID : 1HY1  
Title : CRYSTAL STRUCTURE OF WILD TYPE DUCK DELTA 2 CRYSTALLIN  
(EYE LENS PROTEIN)  
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Deposited on : 2001-01-17  
Resolution : 2.30 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](mailto: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 ⓘ symbol.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.11  
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) : 2.11

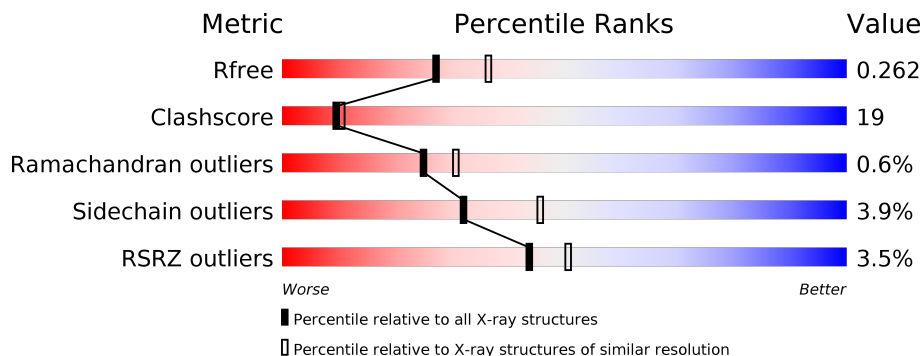
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.30 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))
$R_{free}$	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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  $\geq 3$ , 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  $\leq 5\%$ . 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	468	
1	B	468	
1	C	468	
1	D	468	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 14603 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.

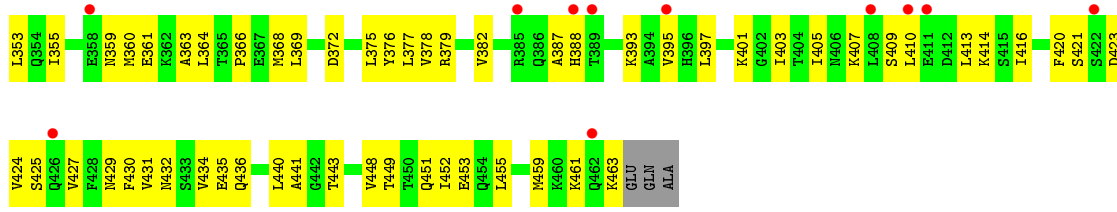
- Molecule 1 is a protein called DELTA CRYSTALLIN II.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	448	3484	2207	589	676	12	0	0	0
1	B	448	3481	2205	589	675	12	0	0	0
1	C	449	3490	2210	590	678	12	0	0	0
1	D	449	3493	2212	591	678	12	0	0	0

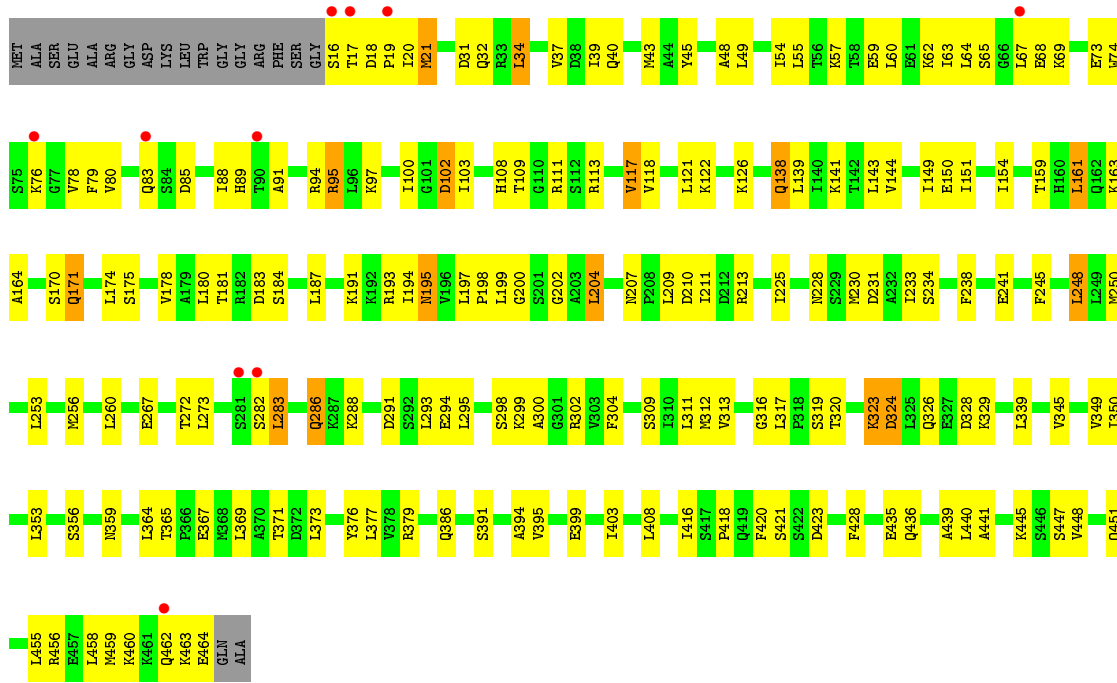
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	196	Total 196	O 196	0	0
2	B	135	Total 135	O 135	0	0
2	C	184	Total 184	O 184	0	0
2	D	140	Total 140	O 140	0	0

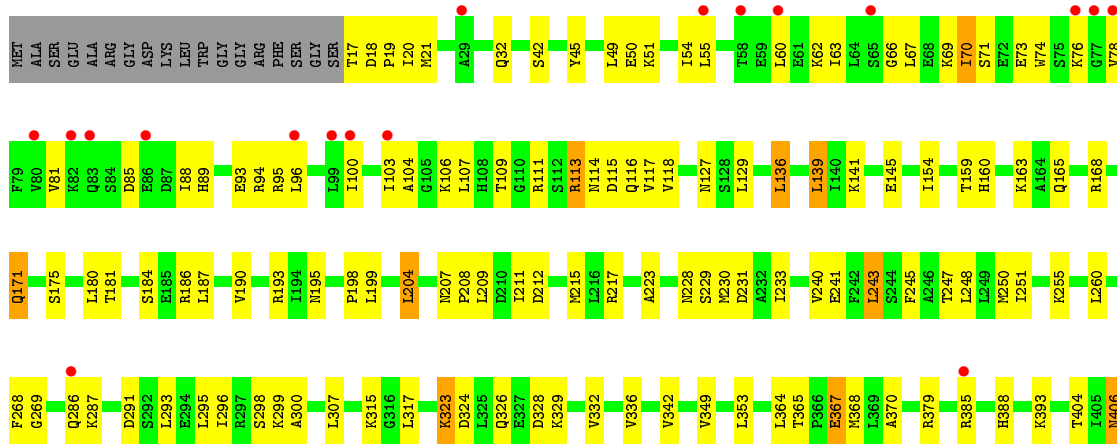




• Molecule 1: DELTA CRYSTALLIN II



• Molecule 1: DELTA CRYSTALLIN II





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	93.48Å 99.05Å 107.18Å 90.00° 102.08° 90.00°	Depositor
Resolution (Å)	20.00 – 2.30 19.99 – 2.30	Depositor EDS
% Data completeness (in resolution range)	86.6 (20.00-2.30) 86.7 (19.99-2.30)	Depositor EDS
$R_{merge}$	0.05	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.51 (at 2.30Å)	Xtrriage
Refinement program	CNS 1.0	Depositor
R, $R_{free}$	0.208 , 0.263 0.205 , 0.262	Depositor DCC
$R_{free}$ test set	7436 reflections (10.11%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	24.2	Xtrriage
Anisotropy	0.127	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 53.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	14603	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	33.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.47% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup> Intensities estimated from amplitudes.

<sup>2</sup> Theoretical 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.

## 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	A	0.33	0/3529	0.56	0/4759
1	B	0.33	0/3526	0.54	0/4755
1	C	0.34	0/3535	0.55	0/4767
1	D	0.34	0/3538	0.56	0/4771
All	All	0.33	0/14128	0.55	0/19052

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	3484	0	3605	133	0
1	B	3481	0	3604	163	0
1	C	3490	0	3610	172	0
1	D	3493	0	3613	133	0
2	A	196	0	0	11	0
2	B	135	0	0	5	0
2	C	184	0	0	14	0
2	D	140	0	0	11	0
All	All	14603	0	14432	552	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 19.



The worst 5 of 552 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:127:ASN:HB3	2:A:495:HOH:O	1.61	1.00
1:A:155:LEU:HB3	1:A:360:MET:HG2	1.43	0.98
1:B:379:ARG:HH12	1:B:436:GLN:HE21	1.10	0.95
1:A:398:ALA:HB2	1:A:408:LEU:HD23	1.50	0.94
1:D:49:LEU:HB3	1:D:55:LEU:HD23	1.48	0.93

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	446/468 (95%)	416 (93%)	28 (6%)	2 (0%)	34	42
1	B	446/468 (95%)	426 (96%)	17 (4%)	3 (1%)	22	26
1	C	447/468 (96%)	424 (95%)	20 (4%)	3 (1%)	22	26
1	D	447/468 (96%)	426 (95%)	19 (4%)	2 (0%)	34	42
All	All	1786/1872 (95%)	1692 (95%)	84 (5%)	10 (1%)	25	31

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	204	LEU
1	B	204	LEU
1	C	204	LEU
1	D	204	LEU
1	B	102	ASP

### 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	392/405 (97%)	381 (97%)	11 (3%)	43	60
1	B	392/405 (97%)	377 (96%)	15 (4%)	33	47
1	C	393/405 (97%)	374 (95%)	19 (5%)	25	36
1	D	393/405 (97%)	376 (96%)	17 (4%)	29	40
All	All	1570/1620 (97%)	1508 (96%)	62 (4%)	32	46

5 of 62 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	95	ARG
1	C	171	GLN
1	D	324	ASP
1	C	138	GLN
1	C	248	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 55 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	436	GLN
1	C	108	HIS
1	D	419	GLN
1	B	454	GLN
1	C	40	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](#)

There are no ligands in this entry.

## 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q < 0.9
1	A	448/468 (95%)	-0.09	12 (2%) 54 62	11, 28, 62, 76	0
1	B	448/468 (95%)	0.13	21 (4%) 31 38	13, 34, 61, 73	0
1	C	449/468 (95%)	-0.05	10 (2%) 62 69	10, 27, 65, 85	0
1	D	449/468 (95%)	0.01	19 (4%) 36 43	10, 28, 63, 80	0
All	All	1794/1872 (95%)	-0.00	62 (3%) 44 51	10, 29, 63, 85	0

The worst 5 of 62 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	16	SER	5.6
1	D	78	VAL	5.6
1	B	16	SER	5.2
1	C	67	LEU	3.9
1	C	83	GLN	3.8

### 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](#)

There are no ligands in this entry.

## 6.5 Other polymers

There are no such residues in this entry.