



# wwPDB X-ray Structure Validation Summary Report

Feb 27, 2014 – 12:21 PM GMT

PDB ID : 1P4L  
Title : Crystal structure of NK receptor Ly49C mutant with its MHC class I ligand H-2Kb  
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Deposited on : 2003-04-23  
Resolution : 2.90 Å(reported)

This is a wwPDB 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 <http://wwpdb.org/ValidationPDFNotes.html>

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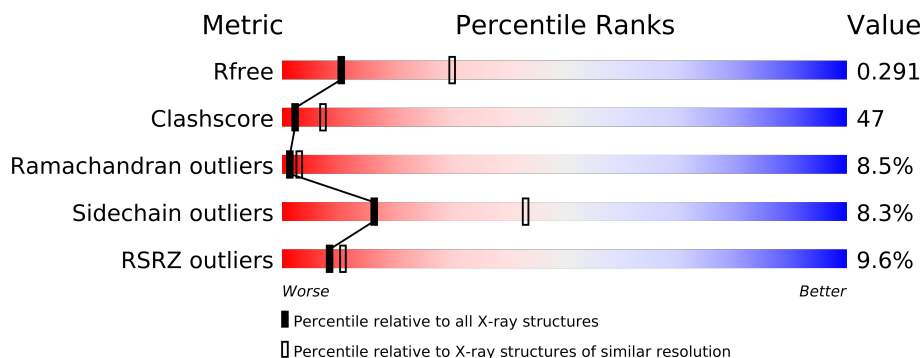
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.15 2013
Xtriage (Phenix)	:	dev-1323
EDS	:	stable22639
Percentile statistics	:	21963
Refmac	:	5.8.0049
CCP4	:	6.3.0 (Settle)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP)	:	stable22683

# 1 Overall quality at a glance

The reported resolution of this entry is 2.90 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))
$R_{free}$	66092	1053 (2.90-2.90)
Clashscore	79885	1326 (2.90-2.90)
Ramachandran outliers	78287	1290 (2.90-2.90)
Sidechain outliers	78261	1292 (2.90-2.90)
RSRZ outliers	66119	1054 (2.90-2.90)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	274	
2	B	99	
3	P	8	
4	D	122	

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 4134 atoms, of which 0 are hydrogen and 0 are deuterium.

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 MHC CLASS I H-2KB HEAVY CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	273	Total	C	N	O	S	0	0	0
			2228	1406	392	421	9			

- Molecule 2 is a protein called Beta-2-microglobulin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	99	Total	C	N	O	S	0	0	0
			818	523	138	150	7			

- Molecule 3 is a protein called Ovalbumin peptide.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	P	8	Total	C	N	O	0	0	0
			68	45	10	13			

- Molecule 4 is a protein called LY49-C.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	122	Total	C	N	O	S	0	0	0
			1020	664	170	175	11			

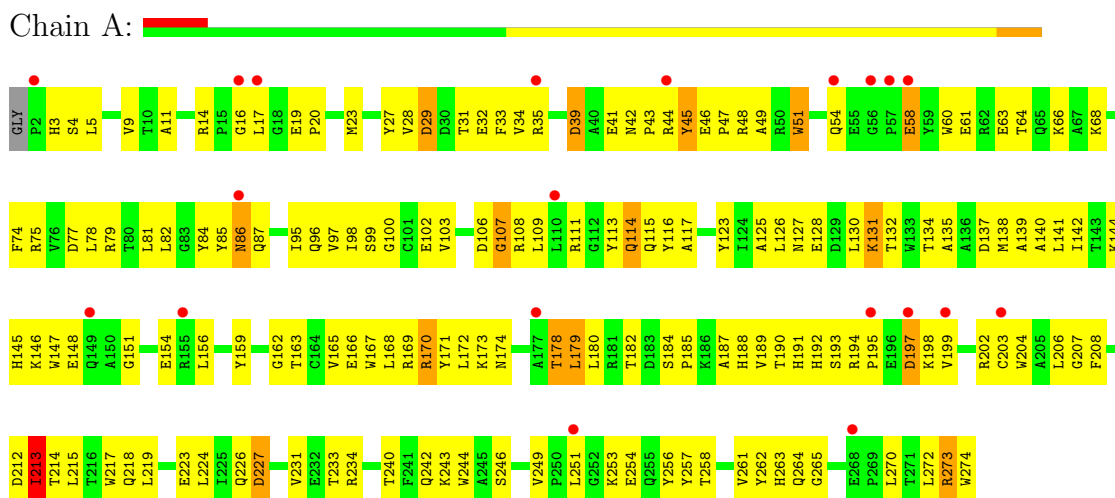
There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	171	GLY	SER	ENGINEERED	UNP Q64329
D	193	GLY	GLU	ENGINEERED	UNP Q64329
D	223	LYS	ARG	ENGINEERED	UNP Q64329

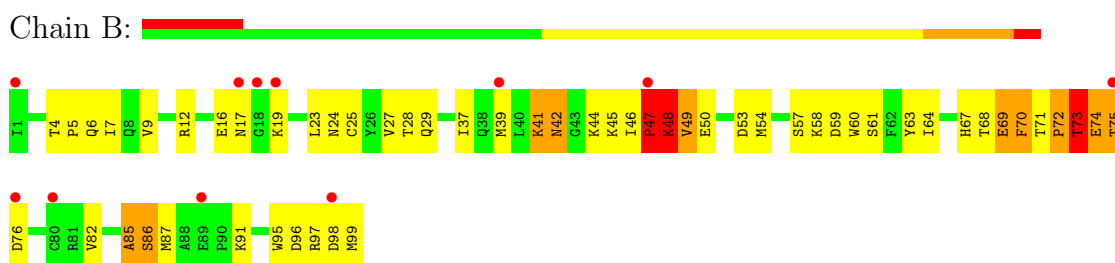
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). 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.

#### • Molecule 1: MHC CLASS I H-2KB HEAVY CHAIN



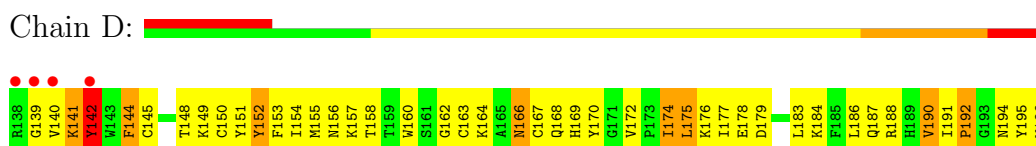
#### • Molecule 2: Beta-2-microglobulin

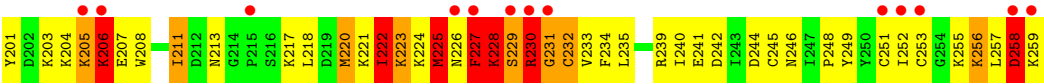


#### • Molecule 3: Ovalbumin peptide



#### • Molecule 4: LY49-C





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	152.01Å 152.01Å 64.66Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.96 – 2.90 19.96 – 2.90	Depositor EDS
% Data completeness (in resolution range)	95.6 (19.96-2.90) 95.5 (19.96-2.90)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	5.10 (at 2.88Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.269 , 0.295 0.267 , 0.291	Depositor DCC
$R_{free}$ test set	805 reflections (4.87%)	DCC
Wilson B-factor (Å <sup>2</sup> )	69.0	Xtriage
Anisotropy	0.306	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 52.6	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtriage
Outliers	0 of 16902 reflections	Xtriage
$F_o, F_c$ correlation	0.89	EDS
Total number of atoms	4134	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	75.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.39% of the height of the origin peak. No significant pseudotranslation is detected.*

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

## 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	0.37	0/2289	0.64	1/3107 (0.0%)
2	B	0.48	0/844	0.71	1/1144 (0.1%)
3	P	1.08	0/68	1.07	1/88 (1.1%)
4	D	0.74	2/1049 (0.2%)	0.94	4/1406 (0.3%)
All	All	0.52	2/4250 (0.0%)	0.74	7/5745 (0.1%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	225	MET	SD-CE	5.66	2.09	1.77
4	D	142	TYR	CE1-CZ	5.24	1.45	1.38

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	231	GLY	N-CA-C	8.26	133.74	113.10
4	D	232	CYS	N-CA-C	7.38	130.92	111.00
4	D	225	MET	N-CA-C	6.64	128.94	111.00
4	D	230	ARG	N-CA-C	5.93	127.00	111.00
2	B	74	GLU	N-CA-C	-5.30	96.70	111.00

There are no chirality outliers.

There are no planarity outliers.

### 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2228	0	2118	175	0
2	B	818	0	797	84	0
3	P	68	0	74	15	0
4	D	1020	0	1013	125	0
All	All	4134	0	4002	381	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 47.

The worst 5 of 381 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
4:D:225:MET:CE	4:D:225:MET:SD	2.09	1.38
2:B:72:PRO:O	2:B:73:THR:HG22	1.41	1.20
2:B:72:PRO:O	2:B:73:THR:CG2	2.05	1.05
4:D:154:ILE:HB	4:D:251:CYS:HB2	1.49	0.92
2:B:46:ILE:HG23	2:B:47:PRO:HD2	1.49	0.92

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone ⓘ

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	271/274 (99%)	226 (83%)	30 (11%)	15 (6%)	3	8
2	B	97/99 (98%)	73 (75%)	13 (13%)	11 (11%)	1	1
3	P	6/8 (75%)	4 (67%)	2 (33%)	0	100	100
4	D	120/122 (98%)	86 (72%)	18 (15%)	16 (13%)	0	1
All	All	494/503 (98%)	389 (79%)	63 (13%)	42 (8%)	1	3

5 of 42 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	45	TYR
2	B	42	ASN

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Mol	Chain	Res	Type
2	B	47	PRO
2	B	48	LYS
2	B	49	VAL

### 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	232/232 (100%)	224 (97%)	8 (3%)	49	86
2	B	93/93 (100%)	86 (92%)	7 (8%)	19	49
3	P	8/8 (100%)	7 (88%)	1 (12%)	7	19
4	D	111/111 (100%)	90 (81%)	21 (19%)	2	7
All	All	444/444 (100%)	407 (92%)	37 (8%)	16	43

5 of 37 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	D	141	LYS
4	D	156	ASN
4	D	246	ASN
4	D	142	TYR
4	D	144	PHE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 14 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	191	HIS
1	A	242	GLN
4	D	168	GLN
1	A	174	ASN
4	D	166	ASN

### 5.3.3 RNA ⓘ

There are no RNA chains 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 ⓘ

There are no ligands in this entry.

## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

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	273/274 (99%)	0.50	20 (7%) 15 18	22, 74, 124, 190	0
2	B	99/99 (100%)	0.55	11 (11%) 6 8	37, 72, 114, 137	0
3	P	8/8 (100%)	0.06	0 100 100	56, 59, 81, 81	0
4	D	122/122 (100%)	0.70	17 (13%) 4 5	28, 62, 133, 181	0
All	All	502/503 (99%)	0.55	48 (9%) 8 11	22, 71, 125, 190	0

The worst 5 of 48 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	D	227	PHE	12.2
4	D	229	SER	6.6
4	D	259	LYS	5.4
4	D	226	ASN	4.6
4	D	230	ARG	4.6

### 6.2 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

### 6.3 Carbohydrates

There are no carbohydrates in this entry.

### 6.4 Ligands

There are no ligands in this entry.

## 6.5 Other polymers ⓘ

There are no such residues in this entry.