



# Full wwPDB X-ray Structure Validation Report

Feb 26, 2014 – 08:26 PM GMT

PDB ID : 2O4J  
Title : Crystal Structure of Rat Vitamin D Receptor Ligand Binding Domain Complexed with VitIII 17-20Z and the NR2 Box of DRIP 205  
Authors : Vanhooke, J.L.; Benning, M.M.; DeLuca, H.F.  
Deposited on : 2006-12-04  
Resolution : 1.74 Å(reported)

This is a full wwPDB validation 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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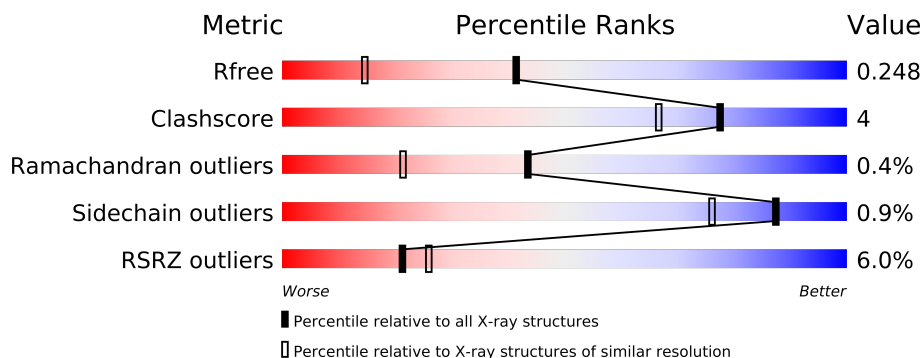
The following versions of software and data (see [references](#)) were used in the production of this report:

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 1.74 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	1657 (1.76-1.72)
Clashscore	79885	1881 (1.76-1.72)
Ramachandran outliers	78287	1859 (1.76-1.72)
Sidechain outliers	78261	1859 (1.76-1.72)
RSRZ outliers	66119	1658 (1.76-1.72)

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	292	
2	C	13	

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 2242 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 Vitamin D3 receptor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	240	Total	C	N	O	S	0	1	0
			1913	1216	325	361	11			

There are 78 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	SER	DELETION	UNP P13053
A	?	-	TYR	DELETION	UNP P13053
A	?	-	SER	DELETION	UNP P13053
A	?	-	PRO	DELETION	UNP P13053
A	?	-	ARG	DELETION	UNP P13053
A	?	-	PRO	DELETION	UNP P13053
A	?	-	THR	DELETION	UNP P13053
A	?	-	LEU	DELETION	UNP P13053
A	?	-	SER	DELETION	UNP P13053
A	?	-	PHE	DELETION	UNP P13053
A	?	-	SER	DELETION	UNP P13053
A	?	-	GLY	DELETION	UNP P13053
A	?	-	ASN	DELETION	UNP P13053
A	?	-	SER	DELETION	UNP P13053
A	?	-	SER	DELETION	UNP P13053
A	?	-	SER	DELETION	UNP P13053
A	?	-	SER	DELETION	UNP P13053
A	?	-	SER	DELETION	UNP P13053
A	?	-	ASP	DELETION	UNP P13053
A	?	-	LEU	DELETION	UNP P13053
A	?	-	TYR	DELETION	UNP P13053
A	?	-	THR	DELETION	UNP P13053
A	?	-	THR	DELETION	UNP P13053
A	?	-	SER	DELETION	UNP P13053
A	?	-	LEU	DELETION	UNP P13053
A	?	-	ASP	DELETION	UNP P13053

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Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	MET	DELETION	UNP P13053
A	?	-	MET	DELETION	UNP P13053
A	?	-	GLU	DELETION	UNP P13053
A	?	-	PRO	DELETION	UNP P13053
A	?	-	SER	DELETION	UNP P13053
A	?	-	GLY	DELETION	UNP P13053
A	?	-	PHE	DELETION	UNP P13053
A	?	-	SER	DELETION	UNP P13053
A	?	-	ASN	DELETION	UNP P13053
A	?	-	LEU	DELETION	UNP P13053
A	?	-	ASP	DELETION	UNP P13053
A	?	-	LEU	DELETION	UNP P13053
A	?	-	ASN	DELETION	UNP P13053
A	?	-	GLY	DELETION	UNP P13053
A	?	-	GLU	DELETION	UNP P13053
A	?	-	ASP	DELETION	UNP P13053
A	?	-	SER	DELETION	UNP P13053
A	?	-	ASP	DELETION	UNP P13053
A	?	-	ASP	DELETION	UNP P13053
A	?	-	PRO	DELETION	UNP P13053
A	424	LEU	-	CLONING ARTIFACT	UNP P13053
A	425	VAL	-	CLONING ARTIFACT	UNP P13053
A	426	PRO	-	CLONING ARTIFACT	UNP P13053
A	427	ARG	-	CLONING ARTIFACT	UNP P13053
A	428	GLY	-	CLONING ARTIFACT	UNP P13053
A	429	SER	-	CLONING ARTIFACT	UNP P13053
A	430	MET	-	CLONING ARTIFACT	UNP P13053
A	431	ALA	-	CLONING ARTIFACT	UNP P13053
A	432	ILE	-	CLONING ARTIFACT	UNP P13053
A	433	SER	-	CLONING ARTIFACT	UNP P13053
A	434	ASP	-	CLONING ARTIFACT	UNP P13053
A	435	PRO	-	CLONING ARTIFACT	UNP P13053
A	436	ASN	-	CLONING ARTIFACT	UNP P13053
A	437	SER	-	CLONING ARTIFACT	UNP P13053
A	438	SER	-	CLONING ARTIFACT	UNP P13053
A	439	SER	-	CLONING ARTIFACT	UNP P13053
A	440	VAL	-	CLONING ARTIFACT	UNP P13053
A	441	ASP	-	CLONING ARTIFACT	UNP P13053
A	442	LYS	-	CLONING ARTIFACT	UNP P13053
A	443	LEU	-	CLONING ARTIFACT	UNP P13053
A	444	ALA	-	CLONING ARTIFACT	UNP P13053
A	445	ALA	-	CLONING ARTIFACT	UNP P13053

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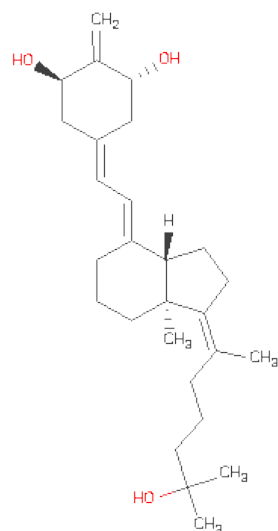
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Chain	Residue	Modelled	Actual	Comment	Reference
A	446	ALA	-	CLONING ARTIFACT	UNP P13053
A	447	LEU	-	CLONING ARTIFACT	UNP P13053
A	448	GLU	-	CLONING ARTIFACT	UNP P13053
A	449	HIS	-	EXPRESSION TAG	UNP P13053
A	450	HIS	-	EXPRESSION TAG	UNP P13053
A	451	HIS	-	EXPRESSION TAG	UNP P13053
A	452	HIS	-	EXPRESSION TAG	UNP P13053
A	453	HIS	-	EXPRESSION TAG	UNP P13053
A	454	HIS	-	EXPRESSION TAG	UNP P13053

- Molecule 2 is a protein called Peroxisome proliferator-activated receptor-binding protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	12	Total	C	N	O	S	0	0	0
			87	56	16	13	2			

- Molecule 3 is (1R,3R,7E,17Z)-17-(5-HYDROXY-1,5-DIMETHYLHEXYLIDENE)-2-METHYLENE-9,10-SECOESTRA-5,7-DIENE-1,3-DIOL (three-letter code: VD4) (formula: C<sub>27</sub>H<sub>42</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			30	27	3		

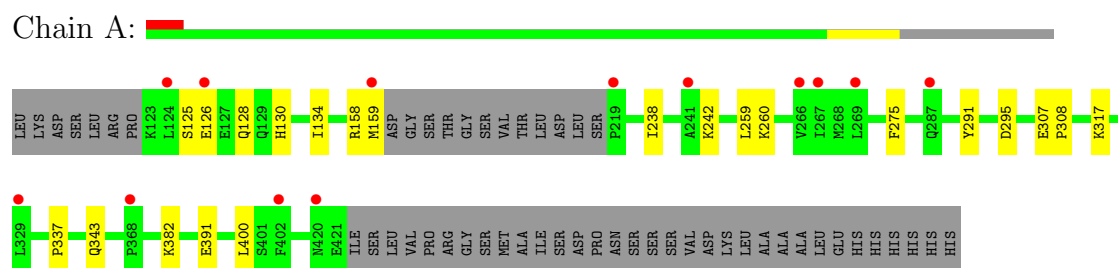
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	203	Total 203	O 203	0	0
4	C	9	Total 9	O 9	0	0

### 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: Vitamin D3 receptor



- Molecule 2: Peroxisome proliferator-activatedreceptor-binding protein



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	155.50Å 42.40Å 41.90Å 90.00° 96.50° 90.00°	Depositor
Resolution (Å)	30.00 – 1.74 26.84 – 1.74	Depositor EDS
% Data completeness (in resolution range)	98.4 (30.00-1.74) 98.4 (26.84-1.74)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.04	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.05 (at 1.74Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.199 , 0.246 0.200 , 0.248	Depositor DCC
$R_{free}$ test set	1388 reflections (5.29%)	DCC
Wilson B-factor (Å <sup>2</sup> )	20.9	Xtriage
Anisotropy	0.767	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 42.6	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.52$ , $\langle L^2 \rangle = 0.36$	Xtriage
Outliers	0 of 27629 reflections	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	2242	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.74% 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

Bond lengths and bond angles in the following residue types are not validated in this section: VD4

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	0.65	0/1959	0.69	1/2652 (0.0%)
2	C	0.47	0/88	0.70	0/116
All	All	0.64	0/2047	0.69	1/2768 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	400	LEU	CA-CB-CG	6.89	131.15	115.30

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	1913	0	1903	14	0
2	C	87	0	87	2	0
3	A	30	0	42	1	0
4	A	203	0	0	4	0
4	C	9	0	0	0	0
All	All	2242	0	2032	15	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 4.

All (15) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:391:GLU:HG3	4:A:662:HOH:O	1.73	0.88
1:A:343:GLN:HG3	4:A:645:HOH:O	1.80	0.81
1:A:382:LYS:NZ	4:A:673:HOH:O	2.32	0.62
1:A:337:PRO:HD2	4:A:556:HOH:O	2.05	0.55
1:A:260:LYS:NZ	2:C:627:HIS:HE1	2.06	0.54
1:A:259:LEU:CD1	2:C:634:LEU:HD21	2.44	0.48
1:A:307:GLU:HB3	1:A:308:PRO:HD3	1.97	0.46
1:A:130:HIS:NE2	1:A:134:ILE:HD11	2.30	0.45
1:A:275:PHE:O	1:A:317:LYS:HE3	2.18	0.44
1:A:158:ARG:O	1:A:159:MET:CB	2.66	0.43
1:A:125:SER:H	1:A:128:GLN:NE2	2.17	0.43
1:A:125:SER:H	1:A:128:GLN:HE21	1.65	0.42
3:A:500:VD4:H222	3:A:500:VD4:H122	2.01	0.42
1:A:238:ILE:O	1:A:242:LYS:HG3	2.21	0.41
1:A:291:TYR:HA	1:A:295:ASP:OD2	2.21	0.40

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	237/292 (81%)	231 (98%)	6 (2%)	0	100	100
2	C	10/13 (77%)	8 (80%)	1 (10%)	1 (10%)	1	0
All	All	247/305 (81%)	239 (97%)	7 (3%)	1 (0%)	43	21

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	C	626	ASN

### 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	217/265 (82%)	216 (100%)	1 (0%)	94	89
2	C	9/13 (69%)	8 (89%)	1 (11%)	9	1
All	All	226/278 (81%)	224 (99%)	2 (1%)	87	76

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	126	GLU
2	C	635	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	128	GLN
1	A	235	GLN
1	A	255	GLN
1	A	273	GLN
1	A	320	ASN
1	A	343	GLN
2	C	627	HIS

### 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 ⓘ

1 ligand is 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$
3	VD4	A	500	-	32,32,32	0.90	1 (3%)	48,48,48	1.89	6 (12%)

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
3	VD4	A	500	-	-	0/16/60/60	0/1/3/3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	500	VD4	C6-C7	2.19	1.49	1.42

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	500	VD4	C15-C14-C13	7.87	109.39	104.37
3	A	500	VD4	C16-C15-C14	-5.04	95.62	104.86
3	A	500	VD4	C14-C13-C17	-4.89	95.96	100.69
3	A	500	VD4	C13-C14-C8	-3.87	105.85	113.56
3	A	500	VD4	C10-C5-C4	3.40	117.56	113.03
3	A	500	VD4	C23-C22-C20	-2.07	108.32	113.55

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

## 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	240/292 (82%)	0.46	13 (5%) 25 30	13, 24, 37, 46	0
2	C	12/13 (92%)	1.16	2 (16%) 2 3	30, 36, 46, 48	0
All	All	252/305 (82%)	0.50	15 (5%) 21 26	13, 24, 39, 48	0

All (15) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	219	PRO	5.9
1	A	159	MET	4.9
1	A	266	VAL	3.6
1	A	402	PHE	3.5
1	A	420	ASN	3.3
1	A	287	GLN	3.3
1	A	267	ILE	3.2
1	A	124	LEU	2.8
2	C	636	ASP	2.5
1	A	126	GLU	2.4
1	A	241	ALA	2.3
1	A	368	PRO	2.3
1	A	269	LEU	2.3
2	C	635	LYS	2.2
1	A	329	LEU	2.1

### 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

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, 95<sup>th</sup> 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	RSR	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
3	VD4	A	500	30/30	0.14	0.68	13,16,19,20	0

## 6.5 Other polymers

There are no such residues in this entry.