May 15, 2020 – 11:40 am BST

PDB ID : 6OEF
EMDB ID : EMD-20020
Title : PolyAla Model of the O-layer from the Type 4 Secretion System of H. pylori
Authors : Chung, J.M.; Sheedlo, M.J.; Campbell, A.; Sawhney, N.; Frick-Cheng, A.E.; Lacy, D.B.; Cover, T.L.; Ohi, M.D.
Deposited on : 2019-03-27
Resolution : 3.80 Å (reported)

This is a Full wwPDB EM Map/Model Validation 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/EMValidationReportHelp
with specific help available everywhere you see the symbol.

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

EMDB validation analysis : 0.0.0.dev33
MolProbity : 4.02b-467
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

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.80 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.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Whole archive (#Entries)</th>
<th>EM structures (#Entries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clashscore</td>
<td>158937</td>
<td>4297</td>
</tr>
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</table>

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments on the 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%. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all atom inclusion < 40%). The numeric value is given above the bar.

<table>
<thead>
<tr>
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<th>Quality of chain</th>
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Continued from previous page...
2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 51240 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 PolyAla Model of OMCC O-Layer.

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</table>
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 the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map 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 diamond above a residue indicates a poor fit to the EM map for this residue (all atom inclusion < 40%). 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: PolyAla Model of OMCC O-Layer

Chain A:

Chain B:

Chain C:
- Molecule 1: PolyAla Model of OMCC O-Layer

Chain D:

- Molecule 1: PolyAla Model of OMCC O-Layer

Chain E:

- Molecule 1: PolyAla Model of OMCC O-Layer

Chain F:
- Molecule 1: PolyAla Model of OMCC O-Layer

**Chain G:**

- 5%  
- 94%  
- 6%

- Molecule 1: PolyAla Model of OMCC O-Layer

**Chain H:**

- 5%  
- 93%  
- 6%

- Molecule 1: PolyAla Model of OMCC O-Layer

**Chain I:**

- 6%  
- 94%  
- 6%
• Molecule 1: PolyAla Model of OMCC O-Layer

Chain J:

• Molecule 1: PolyAla Model of OMCC O-Layer

Chain K:

• Molecule 1: PolyAla Model of OMCC O-Layer

Chain L:

• Molecule 1: PolyAla Model of OMCC O-Layer

Chain M:
• Molecule 1: PolyAla Model of OMCC O-Layer

Chain N:
## 4 Experimental information

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<th>Property</th>
<th>Value</th>
<th>Source</th>
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<tbody>
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<td>EM reconstruction method</td>
<td>SINGLE PARTICLE</td>
<td>Depositor</td>
</tr>
<tr>
<td>Imposed symmetry</td>
<td>POINT, C14</td>
<td>Depositor</td>
</tr>
<tr>
<td>Number of particles used</td>
<td>17159</td>
<td>Depositor</td>
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<td>Resolution determination method</td>
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<td>Depositor</td>
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<tr>
<td>CTF correction method</td>
<td>PHASE FLIPPING AND AMPLITUDE CORRECTION</td>
<td>Depositor</td>
</tr>
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<td>Microscope</td>
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<tr>
<td>Maximum defocus (nm)</td>
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<td>Depositor</td>
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<td>Magnification</td>
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<tr>
<td>Maximum map value</td>
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<td>Average map value</td>
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<td>Map value standard deviation</td>
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<td>Map size (Å)</td>
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<td>Map dimensions</td>
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<td>Map angles (°)</td>
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<td>Pixel spacing (Å)</td>
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</tbody>
</table>
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).

There are no protein, RNA or DNA chains available to summarize Z scores of covalent bonds and angles.

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 main chain group or atoms of a sidechain that are expected to be planar.

<table>
<thead>
<tr>
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<th>#Chirality outliers</th>
<th>#Planarity outliers</th>
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</thead>
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<td>A</td>
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<td>16</td>
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<tr>
<td>1</td>
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</table>

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (224) planarity outliers are listed below:

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Continued on next page...
Continued from previous page...

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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.

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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 4.

All (254) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.
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</table>

There are no symmetry-related clashes.

5.3 Torsion angles  

5.3.1 Protein backbone  

There are no protein backbone outliers to report in this entry.

5.3.2 Protein sidechains  

There are no protein residues with a non-rotameric sidechain to report in this entry.

5.3.3 RNA  

There are no RNA molecules 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

The following chains have linkage breaks:

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6 Map visualisation

This section contains visualisations of the EMDB entry EMD-20020. These are intended to permit visual inspection of the internal detail of the map and identification of artifacts.

6.1 Orthogonal projections

The images above show the map projected in three orthogonal projections, in greyscale.

6.2 Central slices

The images above show central slices of the map in three orthogonal directions, in greyscale.
6.3 Largest variance slices

The images above show the highest variance slices of the map in three orthogonal directions, in greyscale.

6.4 Orthogonal surface views

The images above show the 3D surface view of the map at the recommended contour level 0.027. This in conjunction with the slice images can indicate whether an appropriate contour level has been selected.

6.5 Mask visualisation

This section was not generated. No masks were provided.
7 Map analysis

This section contains the results of statistical analysis of the map.

7.1 Map-value distribution

The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.
7.2 Volume estimate

![Volume estimate graph]

The volume at the recommended contour level is 1439 nm$^3$; this corresponds to an approximate mass of 1300 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.
7.3 Rotationally averaged power spectrum

![Rotationally averaged power spectrum graph]

- **Intensity (log10)**
- **Spatial frequency (Å⁻¹)**

- **Rotationally averaged power spectrum**
- **Reported resolution**: 3.80 Å
- **Corresponding to spatial frequency**: 0.263 Å⁻¹
8 Fourier-Shell correlation

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution for single-particle and subtomogram-averaging methods. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. Curves are displayed for $3\sigma$, 1-bit and 1/2-bit in addition to lines showing the 0.143 gold standard cut-off, 0.333 cut-off and legacy 0.5 cut-off.

8.1 Resolution estimates

These are global values for the map.

<table>
<thead>
<tr>
<th>Source</th>
<th>Criterion</th>
<th>Resolution estimate (Å)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported value</td>
<td>FSC 0.143 CUT-OFF</td>
<td>3.80</td>
</tr>
<tr>
<td>Author-provided FSC</td>
<td>FSC 0.5 CUT-OFF</td>
<td>4.25</td>
</tr>
<tr>
<td>Author-provided FSC</td>
<td>FSC 1 BIT CUT-OFF</td>
<td>4.06</td>
</tr>
<tr>
<td>Author-provided FSC</td>
<td>FSC 0.33 CUT-OFF</td>
<td>4.06</td>
</tr>
<tr>
<td>Author-provided FSC</td>
<td>FSC 1/2 BIT CUT-OFF</td>
<td>3.85</td>
</tr>
<tr>
<td>Author-provided FSC</td>
<td>FSC 0.143 CUT-OFF</td>
<td>3.81</td>
</tr>
<tr>
<td>Author-provided FSC</td>
<td>FSC 3 SIGMA CUT-OFF</td>
<td>3.39</td>
</tr>
</tbody>
</table>

8.2 Calculated FSC

This section was not generated. Half-maps were not provided.
8.3 Author-provided FSC

This FSC information was provided by the depositor.
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-20020 and PDB model 6OEF. Per-residue inclusion information can be found in section 3 on page 5.

9.1 Map-model overlay

The images above show the 3D surface view of the map at the recommended contour level 0.027 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.
9.2 Atom inclusion

At the recommended contour level, 93% of all backbone atoms, 88% of all non-hydrogen atoms, are inside the map.