Supplementary material

In silico evaluation of the stability and antibacterial activity of some cobalt complexes

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Receptor: *S. aureus* tyrosyl-tRNA (1jij.pdb)

Table S1. Binding affinity for cobalt complexes (M06L/TZ2P geometries) with *S. aureus* tyrosyl-tRNA (1jij.pdb) for nine conformations (kcal/mol) (rigid ligands)

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
1a	-5.3	-5.1	-5.0	-5.0	-4.7	-4.7	-4.6	-4.6	-4.5	-4.83
1b	-6.4	-6.3	-6.0	-5.8	-5.7	-5.6	-5.6	-5.4	-5.3	**-5.78**
1c	-7.4	-6.9	-6.6	-6.2	-6.2	-6.2	-6.0	-6.0	-6.0	**-6.38**
2a	-5.5	-5.4	-5.0	-5.0	-4.8	-4.8	-4.7	-4.7	-4.7	**-4.96**
2b	-6.1	-6.0	-5.6	-5.4	-5.3	-5.3	-5.2	-5.2	-5.2	-5.47
2c	-6.9	-6.7	-6.6	-6.5	-6.2	-6.1	-6.1	-5.9	-5.8	**-6.31**
Cefazolin	-7.4	-7.4	-7.1	-6.9	-6.9	-6.7	-6.5	-6.5	-6.5	**-6.87**

Table S2. Binding affinity for cobalt complexes (M06L/TZ2P geometries) with *S. aureus* tyrosyl-tRNA (1jij.pdb) for nine conformations (kcal/mol) (torsion ligands)

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
1a	-4.9	-4.8	-4.7	-4.6	-4.6	-4.5	-4.5	-4.4	-4.3	-4.58
1b	-5.7	-5.6	-5.5	-5.4	-5.3	-5.3	-5.1	-5.1	-5.1	-5.34
1c	-6.2	-6.1	-6.1	-5.9	-5.9	-5.8	-5.8	-5.7	-5.6	-5.90
2a	-5.0	-4.9	-4.9	-4.7	-4.6	-4.6	-4.5	-4.5	-4.4	-4.67
2b	-5.7	-5.6	-5.5	-5.4	-5.4	-5.3	-5.1	-5.0	-5.0	-5.33
2c	-6.0	-6.0	-6.0	-6.0	-5.9	-5.8	-5.7	-5.7	-5.6	-5.85
Cefazolin	-6.5	-6.4	-6.3	-6.3	-6.0	-6.0	-5.9	-5.9	-5.8	-6.12

Table S3. Binding affinity for cobalt complexes (B3LYP/LanL2DZ geometries) with *S. aureus* tyrosyl-tRNA (1jij.pdb) for nine conformations (kcal/mol) (rigid ligands)

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
1a	-5.5	-5.4	-5.1	-4.9	-4.9	-4.7	-4.6	-4.5	-4.5	**-4.90**
1b	-6.1	-6.0	-5.9	-5.9	-5.7	-5.7	-5.6	-5.5	-5.5	-5.76
1c	-7.0	-6.4	-6.4	-6.1	-6.0	-6.0	-5.9	-5.8	-5.8	-6.15
2a	-5.6	-5.2	-5.0	-5.0	-4.9	-4.7	-4.7	-4.6	-4.5	-4.91

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	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
2b	-6.1	-5.9	-5.9	-5.9	-5.7	-5.5	-5.5	-5.4	-5.4	**-5.70**
2c	-7.0	-6.5	-6.4	-6.4	-6.1	-6.0	-5.8	-5.7	-5.7	-6.17
Cefazolin	-7.4	-7.4	-7.1	-6.9	-6.9	-6.7	-6.5	-6.5	-6.5	**-6.87**

Table S4. Binding affinity for cobalt complexes (B3LYP/LanL2DZ geometries) with *S. aureus* tyrosyl-tRNA (1jij.pdb) for nine conformations (kcal/mol) (torsion ligands)

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
1a	-4.8	-4.7	-4.6	-4.6	-4.6	-4.5	-4.5	-4.2	-4.2	-4.52
1b	-5.3	-5.2	-5.2	-5.2	-5.1	-5.0	-4.9	-4.9	-4.9	-5.08
1c	-5.9	-5.8	-5.8	-5.7	-5.5	-5.4	-5.4	-5.4	-5.4	-5.59
2a	-4.9	-4.8	-4.7	-4.7	-4.6	-4.6	-4.6	-4.4	-4.4	-4.63
2b	-5.6	-5.3	-5.2	-5.2	-5.2	-5.2	-5.0	-5.0	-5.0	-5.19
2c	-6.1	-6.0	-5.9	-5.7	-5.6	-5.6	-5.6	-5.6	-5.5	-5.73
Cefazolin	-6.5	-6.4	-6.3	-6.3	-6.0	-6.0	-5.9	-5.9	-5.8	-6.12

Receptor: *E. coli* DNA polymerase II (1q8i.pdb)

Table S5. Binding affinity for cobalt complexes (M06L/TZ2P geometries) with *E. coli* DNA polymerase II for nine conformations (kcal/mol) (rigid ligands)

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
1a	-5.5	-5.5	-5.5	-5.3	-5.3	-5.2	-5.2	-5.1	-5.1	**-5.30**
1b	-6.6	-6.5	-6.4	-6.0	-5.9	-5.7	-5.7	-5.7	-5.7	-6.02
1c	-7.0	-6.8	-6.5	-6.5	-6.5	-6.4	-6.1	-6.1	-6.0	-6.43
2a	-5.5	-5.5	-5.5	-5.4	-5.4	-5.4	-5.3	-5.3	-5.2	**-5.38**
2b	-6.5	-6.5	-6.2	-6.2	-6.2	-6.1	-6.0	-5.9	-5.8	**-6.15**
2c	-7.1	-7.0	-6.9	-6.9	-6.7	-6.4	-6.3	-6.2	-6.2	**-6.63**
Cefazolin	-8.1	-7.5	-7.4	-7.3	-7.3	-7.1	-6.9	-6.8	-6.7	**-7.23**

Table S6. Binding affinity for cobalt complexes (M06L/TZ2P geometries) with *E. coli* DNA polymerase II for nine conformations (kcal/mol) (torsion ligands)

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
1a	-5.4	-5.1	-5.1	-5.1	-5.1	-5.1	-5.0	-4.9	-4.8	-5.06
1b	-5.6	-5.6	-5.5	-5.4	-5.4	-5.4	-5.3	-5.3	-5.2	-5.41
1c	-6.1	-6.1	-6.1	-6.0	-5.9	-5.8	-5.8	-5.8	-5.7	-5.92
2a	-5.1	-5.0	-5.0	-5.0	-4.9	-4.9	-4.8	-4.7	-4.7	-4.90
2b	-5.6	-5.6	-5.5	-5.3	-5.3	-5.3	-5.3	-5.3	-5.1	-5.36
2c	-6.2	-6.2	-6.1	-5.9	-5.8	-5.8	-5.7	-5.7	-5.5	-5.87
Cefazolin	-7.1	-6.5	-6.5	-6.4	-6.3	-6.3	-6.3	-6.3	-6.2	-6.43

Table S7. Binding affinity for cobalt complexes (B3LYP/LanL2DZ geometries) with *E. coli* DNA polymerase II for nine conformations (kcal/mol) (rigid ligands)

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
1a	-5.6	-5.4	-5.3	-5.3	-5.3	-5.2	-5.1	-5.1	-4.9	-5.24
1b	-6.5	-6.2	-6.2	-6.2	-6.1	-6.1	-6.0	-5.9	-5.8	**-6.11**
1c	-7.1	-6.8	-6.7	-6.7	-6.6	-6.5	-6.4	-6.3	-6.3	**-6.60**
2a	-5.6	-5.3	-5.1	-5.1	-5.1	-5.0	-5.0	-5.0	-4.8	-5.11
2b	-6.4	-6.3	-6.3	-6.2	-6.2	-6.1	-6.1	-5.8	-5.7	-6.12
2c	-7.0	-6.9	-6.8	-6.6	-6.6	-6.5	-6.3	-6.2	-6.2	-6.56
Cefazolin	-8.1	-7.5	-7.4	-7.3	-7.3	-7.1	-6.9	-6.8	-6.7	**-7.23**

Table S8. Binding affinity for cobalt complexes (B3LYP/LanL2DZ geometries) with *E. coli* DNA polymerase II for nine conformations (kcal/mol) (torsion ligands)

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
1a	-5.4	-5.2	-5.0	-5.0	-4.7	-4.7	-4.6	-4.6	-4.5	-4.85
1b	-5.8	-5.7	-5.7	-5.6	-5.6	-5.6	-5.5	-5.5	-5.4	-5.60
1c	-6.1	-6.0	-6.0	-5.9	-5.9	-5.8	-5.8	-5.7	-5.7	-5.88
2a	-3.8	-3.8	-3.6	-3.6	-3.5	-3.4	-3.3	-3.2	-3.2	-3.49
2b	-6.2	-6.0	-5.7	-5.6	-5.3	-5.3	-5.2	-5.2	-5.2	-5.52
2c	-6.7	-6.2	-5.9	-5.9	-5.9	-5.8	-5.8	-5.7	-5.7	-5.96
Cefazolin	-7.1	-6.5	-6.5	-6.4	-6.3	-6.3	-6.3	-6.3	-6.2	-6.43

Receptor: Methicillin-resistant *S. aureus*, a panthetonate synthetase (2x3f.pdb)

Table S9. Binding affinity for cobalt complexes (M06L/TZ2P geometries) with Methicillin-resistant *S. aureus*, a panthetonate synthetase (2x3f.pdb) for nine conformations (kcal/mol) (rigid ligands)

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
1a	-5.4	-5.3	-5.0	-5.0	-5.0	-4.8	-4.7	-4.6	-4.5	**-4.92**
1b	-5.7	-5.6	-5.5	-5.5	-5.5	-5.4	-5.4	-5.4	-5.3	-5.47
1c	-6.5	-6.4	-6.3	-6.3	-6.2	-6.1	-5.9	-5.9	-5.9	-6.16
2a	-5.3	-5.2	-5.0	-4.9	-4.8	-4.7	-4.6	-4.5	-4.5	**-4.83**
2b	-5.9	-5.9	-5.8	-5.8	-5.5	-5.4	-5.4	-5.4	-5.4	-5.38
2c	-6.4	-6.2	-6.2	-6.2	-6.1	-6.1	-6.1	-6.0	-5.9	**-6.13**
Cefazolin	-7.3	-7.0	-7.0	-7.0	-6.9	-6.9	-6.5	-6.5	-6.4	**-6.83**

Table S10. Binding affinity for cobalt complexes (M06L/TZ2P geometries) with Methicillin-resistant *S. aureus*, a panthetonate synthetase (2x3f.pdb) for nine conformations (kcal/mol) (torsion ligands)

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
1a	-4.7	-4.7	-4.6	-4.4	-4.3	-4.3	-4.2	-4.2	-4.1	-4.45
1b	-5.4	-5.4	-5.3	-5.3	-5.2	-5.1	-5.1	-5.0	-5.0	-5.20
1c	-6.1	-6.1	-5.9	-5.8	-5.8	-5.7	-5.7	-5.6	-5.6	-5.83
2a	-4.7	-4.7	-4.6	-4.5	-4.4	-4.4	-4.3	-4.3	-4.3	-4.46
2b	-5.4	-5.2	-5.1	-5.1	-5.1	-4.9	-4.9	-4.9	-4.8	-5.04
2c	-5.9	-5.7	-5.6	-5.5	-5.5	-5.4	-5.4	-5.4	-5.3	-5.52
Cefazolin	-6.0	-5.7	-5.6	-5.5	-5.5	-5.4	-5.4	-5.4	-5.4	-5.54

Table S11. Binding affinity for cobalt complexes (B3LYP/LanL2DZ geometries) with Methicillin-resistant *S. aureus*, a panthetonate synthetase (2x3f.pdb) for nine conformations (kcal/mol) (rigid ligands)

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
1a	-5.1	-5.0	-4.9	-4.8	-4.8	-4.7	-4.6	-4.5	-4.5	-4.76
1b	-6.1	-5.8	-5.6	-5.5	-5.5	-5.4	-5.4	-5.4	-5.4	**-5.56**
1c	-6.7	-6.5	-6.4	-6.3	-6.2	-6.2	-6.2	-6.1	-6.1	**-6.30**
2a	-4.9	-4.8	-4.8	-4.7	-4.6	-4.5	-4.3	-4.3	-4.3	-4.57
2b	-6.0	-5.7	-5.6	-5.6	-5.5	-5.5	-5.5	-5.4	-5.3	**-5.56**
2c	-6.5	-6.5	-6.4	-6.3	-6.2	-5.8	-5.7	-5.6	-5.6	-6.06
Cefazolin	-7.3	-7.0	-7.0	-7.0	-6.9	-6.9	-6.5	-6.5	-6.4	**-6.83**

Table S12. Binding affinity for cobalt complexes (B3LYP/LanL2DZ geometries) with Methicillin-resistant *S. aureus*, a panthetonate synthetase (2x3f.pdb) for nine conformations (kcal/mol) (torsion ligands)

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
1a	-4.8	-4.7	-4.6	-4.5	-4.5	-4.3	-4.0	-4.0	-4.0	-4.38

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E
1b	-5.6	-5.6	-5.5	-5.2	-5.1	-5.0	-4.8	-4.8	-4.8	-5.16
1c	-6.5	-6.2	-5.9	-5.7	-5.6	-5.6	-5.6	-5.6	-5.6	-5.81
2a	-4.7	-4.7	-4.4	-4.4	-4.4	-4.3	-4.1	-4.1	-4.1	-4.36
2b	-5.5	-5.3	-5.2	-5.1	-5.0	-4.9	-4.8	-4.8	-4.7	-5.03
2c	-6.6	-6.3	-6.1	-6.0	-5.9	-5.5	-5.4	-5.4	-5.3	-5.83
Cefazolin	-6.0	-5.7	-5.6	-5.5	-5.5	-5.4	-5.4	-5.4	-5.4	-5.54

The interactions ligand-receptor, for the best average binding affinities, are presented in figures below.

Receptor: *S. aureus* tyrosyl-tRNA (1jij.pdb)

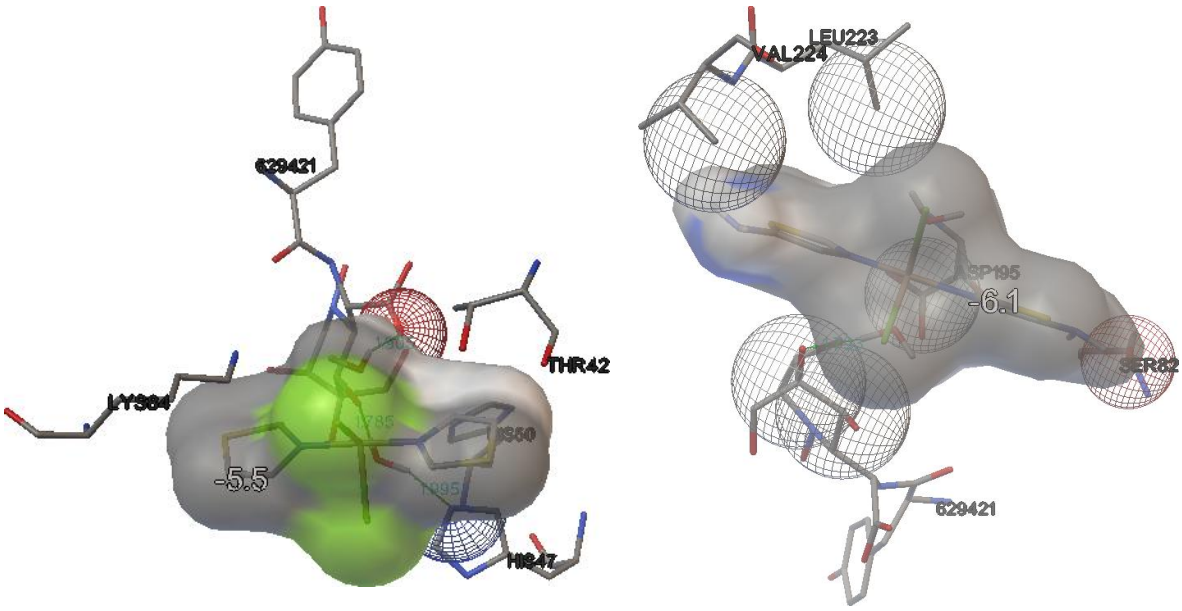

Figure S1. Ligand **1a** (B3LYP/LanL2DZ) – receptor interactions (left) and ligand **1b** (M06L/TZ2P) – receptor interactions (right)

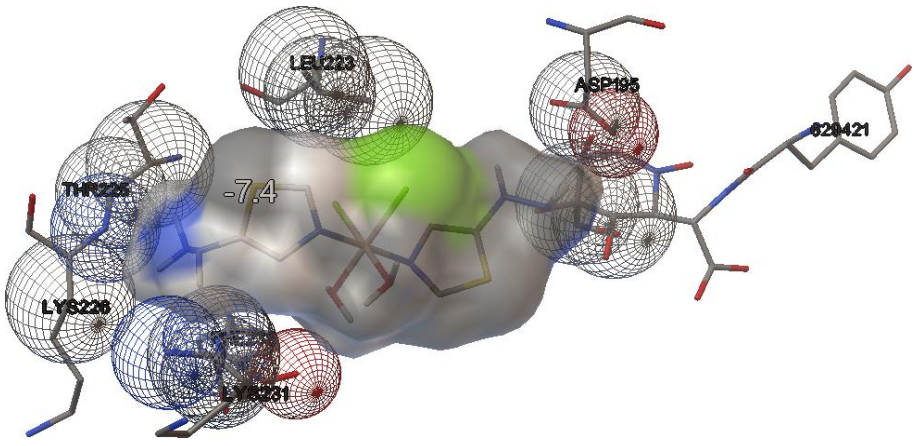

Figure S2. Ligand **1c** (M06L/TZ2P) – receptor interactions

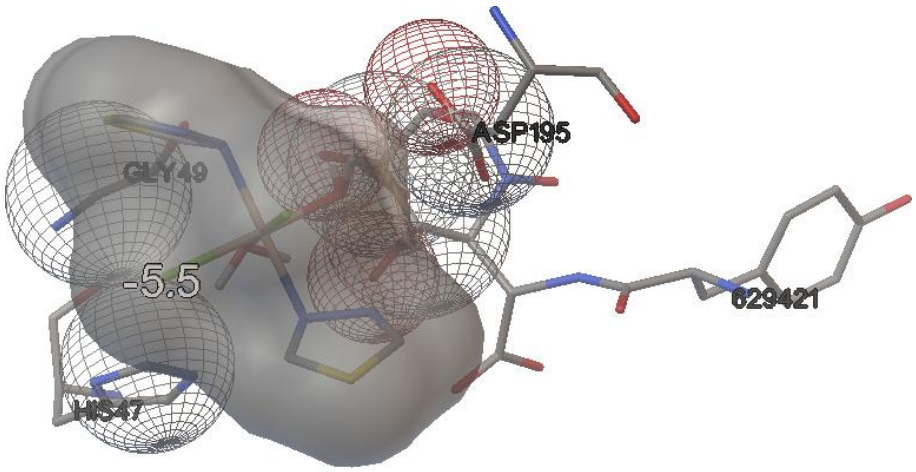

Figure S3. Ligand **2a** (M06L/TZ2P) – receptor interactions

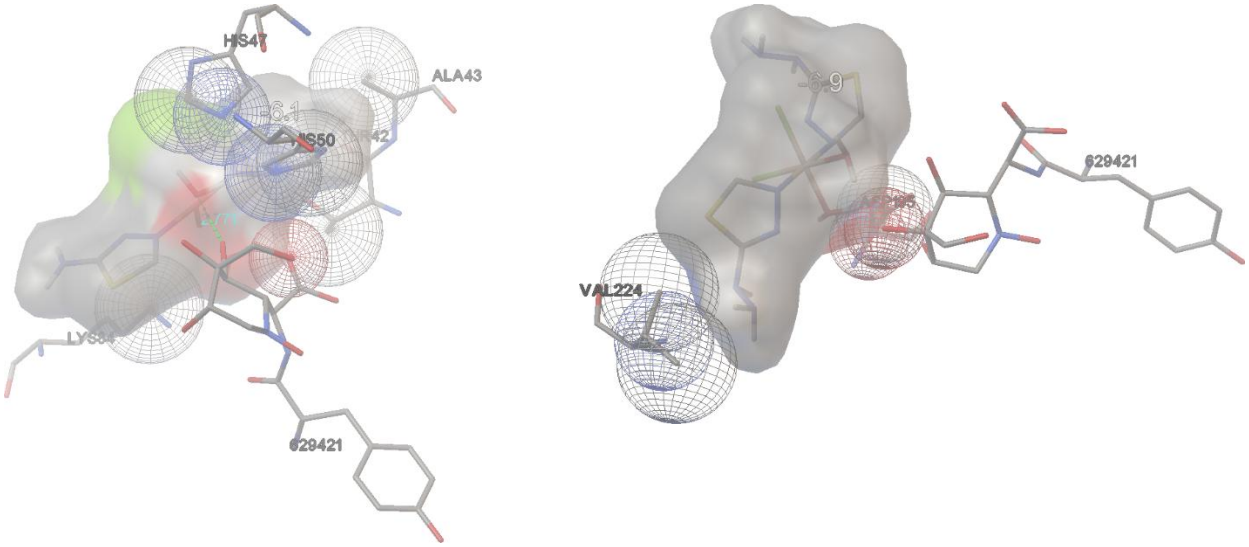

Figure S4. Ligand **2b** (B3LYP/LanL2DZ) – receptor interactions (left) and ligand **2c** (M06L/TZ2P) – receptor interactions (right)

Receptor: *E. coli* DNA polymerase II (1q8i.pdb)

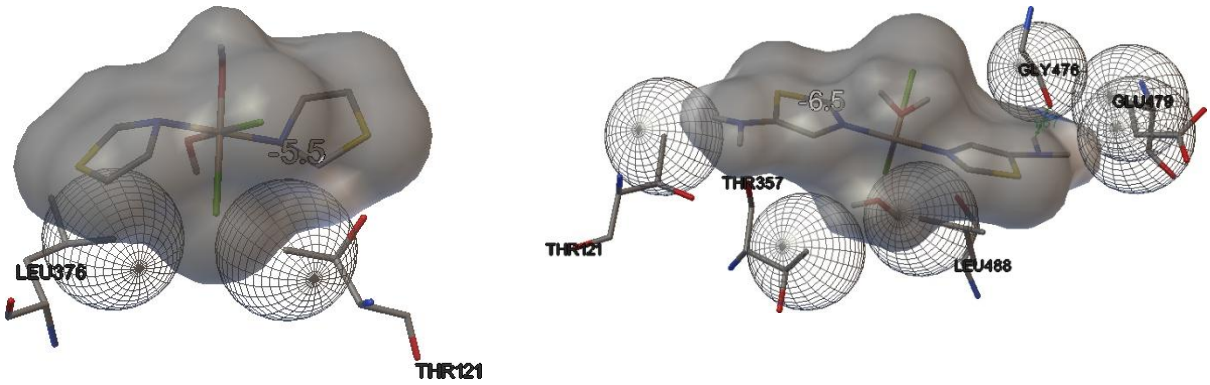

Figure S5. Ligand **1a** (M06L/TZ2P) – receptor interactions (left) and ligand **1b** (B3LYP/LanL2DZ) – receptor interactions (right)

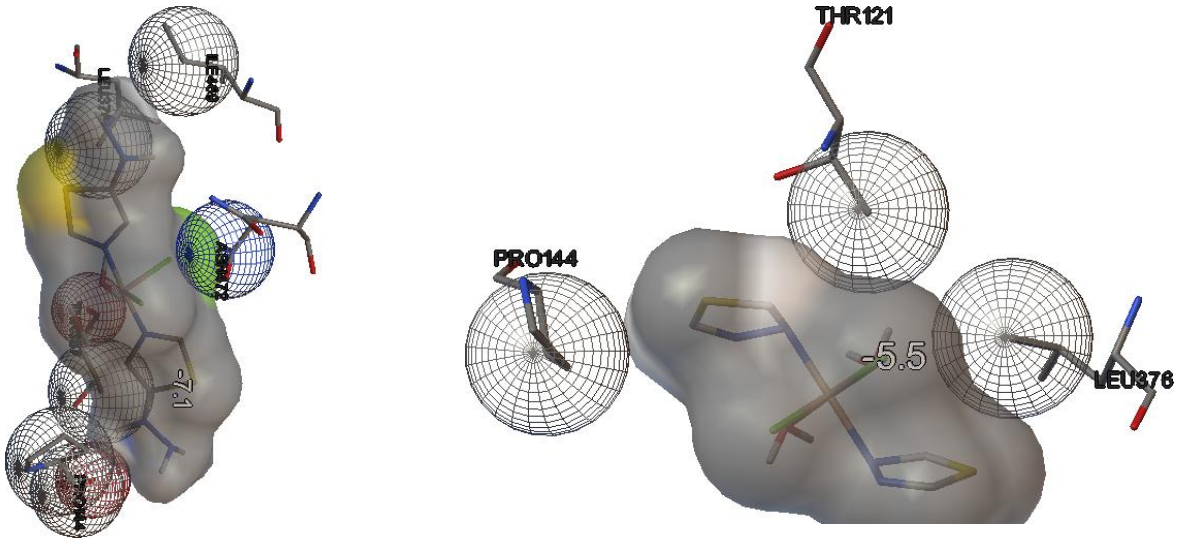

Figure S6. Ligand **1c** (B3LYP/LanL2DZ) – receptor interactions (left) and ligand **2a** (M06L/TZ2P) – receptor interactions (right)

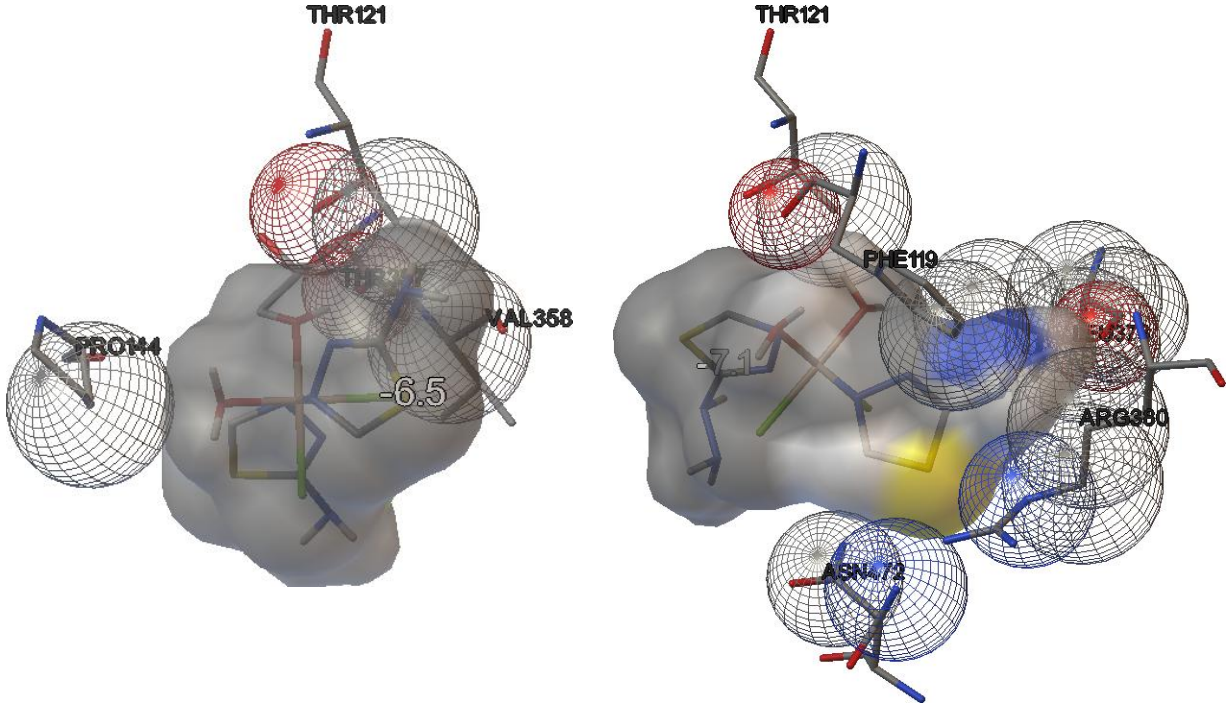

Figure S7. Ligand **2b** (M06L/TZ2P) – receptor interactions (left) and ligand **2c** (M06L/TZ2P) – receptor interactions (right)

Receptor: Methicillin-resistant *S. aureus*, a panthetonate synthetase (2x3f.pdb)

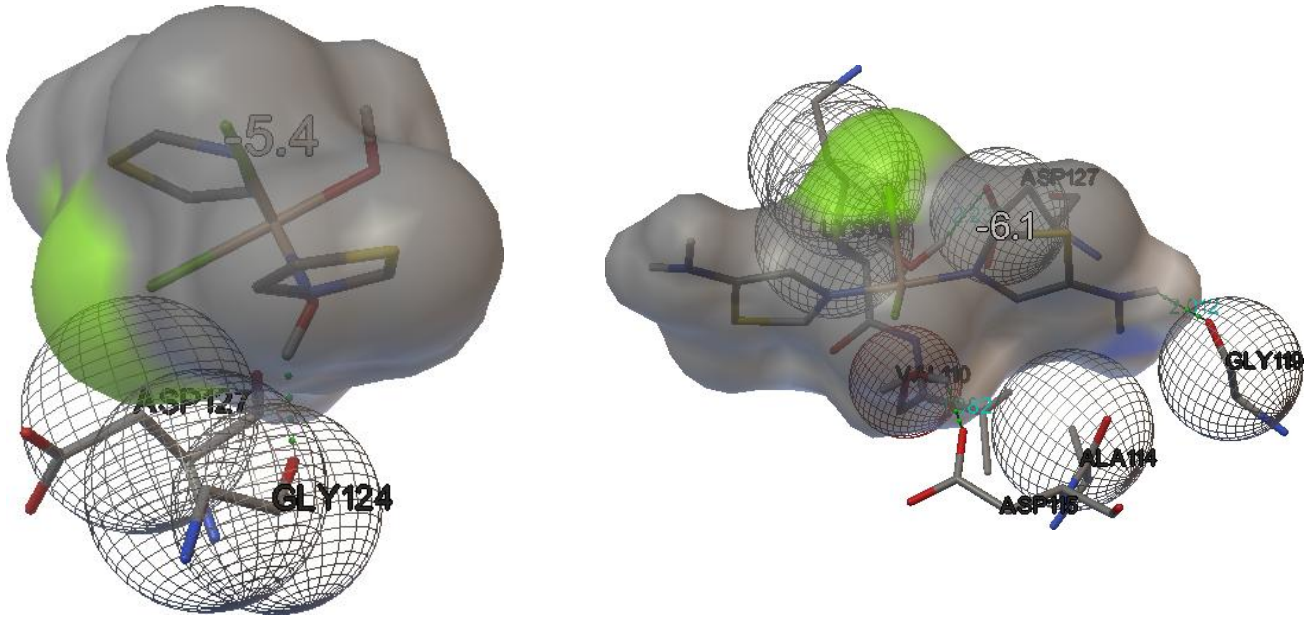

Figure S8. Ligand **1a** (M06L/TZ2P) – receptor interactions (left) and ligand **1b** (B3LYP/LanL2DZ) – receptor interactions (right)

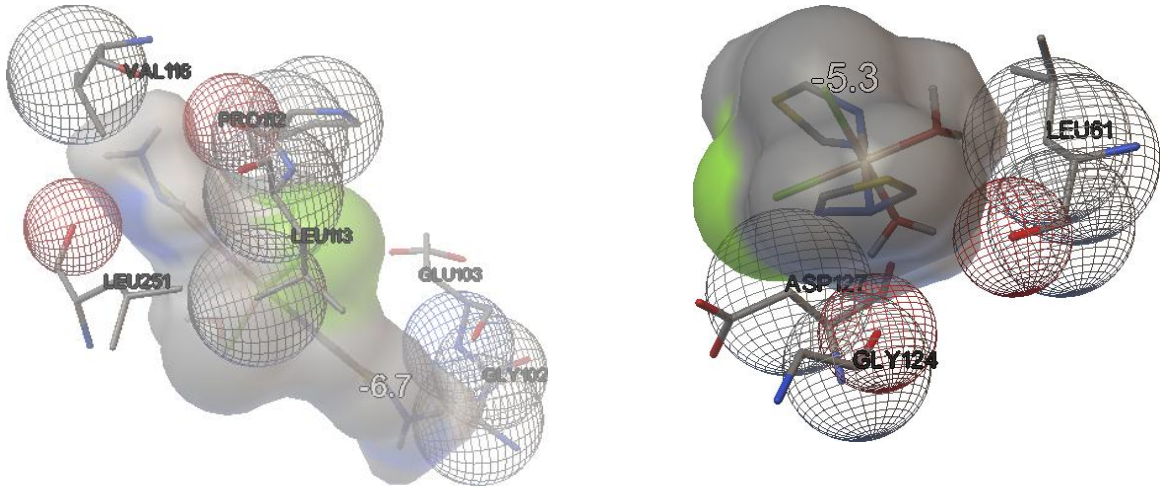

Figure S9. Ligand **1c** (B3LYP/LanL2DZ) – receptor interactions (left) and ligand **2a** (M06L/TZ2P) – receptor interactions (right)

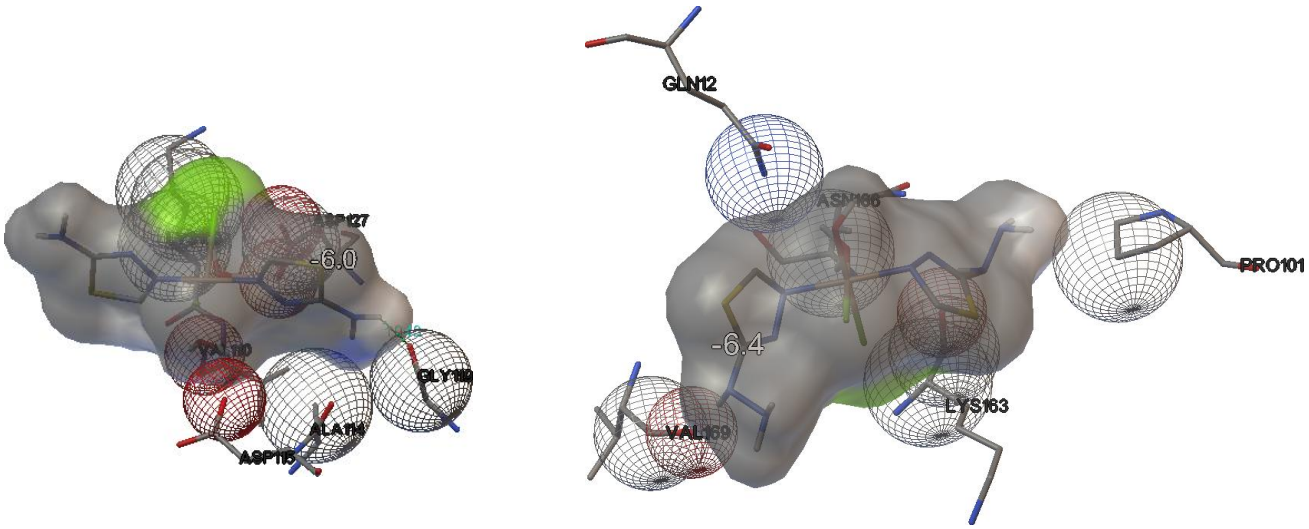

Figure S10. Ligand **2b** (B3LYP/LanL2DZ) – receptor interactions (left) and ligand **2c** (M06L/TZ2P) – receptor interactions (right)

Cefazolin interactions

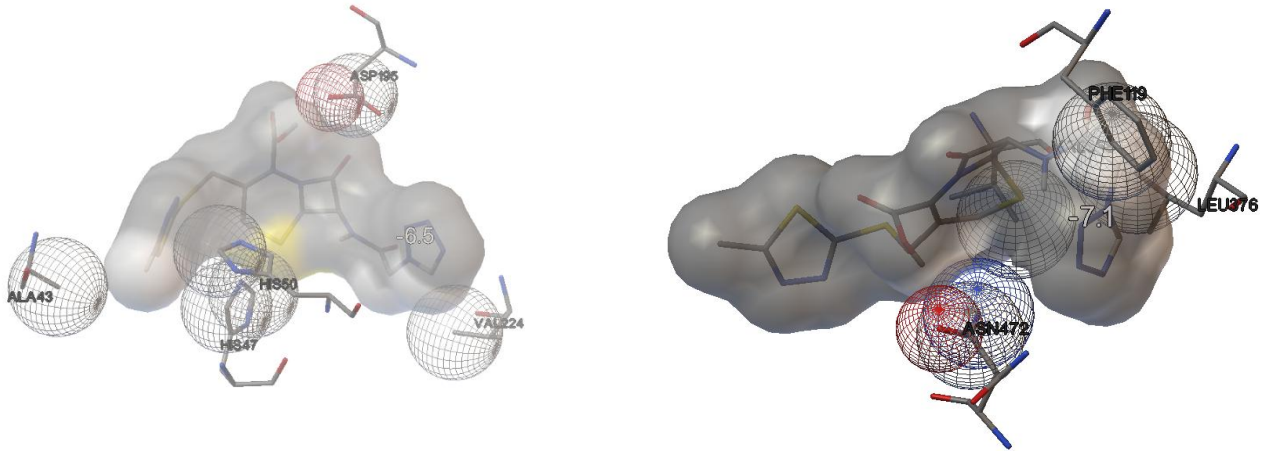

Figure S11. Cefazolin interactions (flexible docking) with ***S. aureus*** **tyrosyl-tRNA** (1jij.pdb) (left) and ***E. coli*** **DNA polymerase II** (1q8i.pdb) (right)

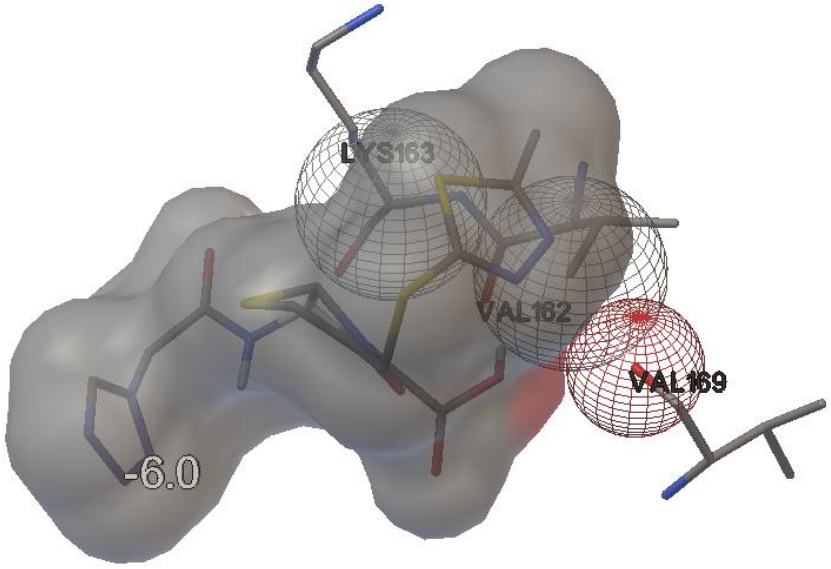

Figure S12. Cefazolin interactions (flexible docking) with **Methicillin-resistant *S. aureus*,** a panthetonate synthetase (2x3f.pdb)