## Discovery of a novel and potent class of *F. tularensis* enoylreductase (FabI) inhibitors by molecular shape and electrostatic matching

## **Supporting Information**

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## 1. ROCS/EON Validation Results: Diphenyl Class

EON(#n)+ ROCS	EF 1%	EON(#n)+ ROCS EF 1	%
#1+B EON_input	46.45	#1+C EON_input 46.4	5
#2+B EON_input	46.45	#2+C EON_input 46.4	-5
#3+B EON_input	46.45	#3+C EON_input 46.4	-5
#4+B EON_input	46.45	#4+C EON_input 46.4	-5
#5+B EON_input	46.45	#5+C EON_input 46.4	-5

#### Table S1. Diphenyl class validation: ROCS (Shape-only)/EON query combinations

Left: Diphenyl class ROCS (B) #1 +#2 (Shape-only) query combines with EON queries (#n / n=1~5)

Right: Diphenyl class ROCS (C) #1 +#2+#3 (Shape-only) query combines with EON queries (#n / n=1~5)

All the ROCS (Shape-only) /EON query combination listed in table 1 show perfect results. Therefore, we eventually choose "#1+C EON\_input" combination, the bold one in the right side of table 1, for the following ASDI production run, because ROCS (C) #1 +#2+#3 (Shape-only) query contains a larger shape than ROCS (B) #1 +#2 (Shape-only) query and #1 EON query contains the highest activity among all the other EON queries.

#### Table S2. Diphenyl class validation: ROCS plus pharmacophore features without EON refinement

Diphenyl ROCS plus pharmacophore feature query	AUC	EF1%
Diphenyl_ROCS_pharmacophore_1	1	46.45
Diphenyl_ROCS_pharmacophore_1+2	1	46.45
Diphenyl_ROCS_pharmacophore_1+2+3	1	46.45
Diphenyl_ROCS_pharmacophore_1+2+3+4	1	46.45
Diphenyl_ROCS_pharmacophore_1+2+3+4+5	1	46.45

#### 2. ROCS/EON Validation Results: Indole Class

EON(#n)+ ROCS	EF 1%	EON(#n)+ ROCS EF 1%
#1+C EON_input	0	#1+D EON_input 51
#2+C EON_input	0	#2+D EON_input 51
#3+C EON_input	0	#3+D EON_input 51
#4+C EON_input	0	#4+D EON_input 51
#5+C EON_input	0	#5+D EON_input 51

#### Table S3. Indole class validation: ROCS (Shape-only)/EON query combinations

Left: Indole class ROCS (C) #1 +#2+#3 (Shape-only) query combines with EON queries (#n / n=1~5).

Right: Indole class ROCS (D) #1 + #2 + #3 + #4 (Shape-only) query combines with EON queries ( $\#n / n=1\sim5$ ).

All the ROCS (Shape-only) /EON query combination listed in the right part of table 3 show perfect results. Therefore, we eventually choose "#1+D EON\_input" combination, the bold one in the right side of table 1, for the following ASDI production run, because #1 EON query contains the highest activity among all the other EON queries.

#### Table S4. Indole class validation: ROCS plus pharmacophore features without EON refinement

Indole ROCS plus pharmacophore feature query	AUC	EF1%
Indole_ROCS_pharmacophore_1	0.994	51
Indole_ROCS_pharmacophore_1+2	0.994	51
Indole_ROCS_pharmacophore_1+2+3	0.994	51
Indole_ROCS_pharmacophore_1+2+3+4	1	51
Indole_ROCS_pharmacophore_1+2+3+4+5	*	*

\* "Indole\_ROCS\_pharmacophore\_1+2+3+4+5" query is the same as "Indole\_ROCS\_pharmacophore\_1+2+3+4" query, so we did not perform Indole\_ROCS\_pharmacophore\_1+2+3+4+5 validation run.

#### 3. ROCS/EON Validation Results: Amide Class

EON(#n)+ ROCS	EF 1%	EON(#n)+ ROCS EF 1%
#1+C EON_input	14.67	#1+D EON_input 11
#2+C EON_input	18.33	#2+D EON_input 11
#3+C EON_input	14.67	#3+D EON_input 14.67
#4+C EON_input	11	#4+D EON_input 11
#5+C EON_input	18.33	#5+D EON_input 11

Table S5. Amide class validation: ROCS (Shape-only)/EON query combinations

Left: Amide class ROCS (C) #1 +#2+#3 (Shape-only) query combines with EON queries (#n / n=1~5)

Right: Amide class ROCS (D) #1 + #2 + #3 + #4 (Shape-only) query combines with EON queries ( $\#n / n=1\sim5$ )

Both #2+C and #5+C in the left side of table 4 are the best ROCS (Shape-only) /EON query combinations for the amide class. Therefore, we eventually choose "#2+C EON\_input" combination for the following ASDI production run because #2 amide EON query contains a higher activity than #5 amide EON query.

Amide ROCS plus pharmacophore feature query	AUC	EF1%
Amide_ROCS_pharmacophore_1	0.987	22
Amide_ROCS_pharmacophore_1+2	0.985	22
Amide_ROCS_pharmacophore_1+2+3	0.992	22
Amide_ROCS_pharmacophore_1+2+3+4	0.992	22
Amide_ROCS_pharmacophore_1+2+3+4+5	0.943	22

Table S6. Amide class validation: ROCS plus pharmacophore features without EON refinement

#### 4. ROCS/EON Validation Results: Imidazole Class

EON(#n)+ ROCS	EF 1%	EON(#n)+ ROCS EF 1%
#1+A EON_input	47.82	#1+B EON_input 11.96
#2+A EON_input	47.82	#2+B EON_input 11.96
#3+A EON_input	47.82	#3+B EON_input 11.96
#4+A EON_input	59.78	#4+B EON_input 11.96
#5+A EON_input	59.78	#5+B EON_input 11.96

Table S7. Imidazole class validation: ROCS (Shape-only)/EON query combinations

Left: Imidazole class ROCS (A) #1 (Shape-only) query combines with EON queries  $(\#n/n=1\sim5)$ 

Right: Imidazole class ROCS (B) #1 +#2 (Shape-only) query combines with EON queries (#n / n=1~5)

Both #4+A and #5+A in the left side of table 4 are the best ROCS (Shape-only) /EON query combinations for the imidazole class. However, #5+A shows a better performance in the enrichment factor at 2% (data not shown) and the activity of imidazole #4 and #5 EON query is not significantly different (IC<sub>50</sub> to *E.coli* are 1.2 $\mu$ M and 1.9 $\mu$ M respectively). Therefore, we eventually choose "#5+A EON\_input" combination for the following ASDI production run.

#### Table S8. Imidazole class validation: ROCS (Shape-only)/EON query combinations

Imidazole ROCS plus pharmacophore feature query	AUC	EF 1%
Imidazole_ROCS_pharmacophore_1	1	59.78
Imidazole_ROCS_pharmacophore_1+2	*	*
Imidazole_ROCS_pharmacophore_1+2+3	*	*
Imidazole_ROCS_pharmacophore_1+2+3+4	*	*
Imidazole_ROCS_pharmacophore_1+2+3+4+5	0.379	0

## 5. Diphenyl Actives







title: 10 KI\_ECOLI\_NM: 500.0



title: 15 KI\_ECOLI\_NM: 53000.0





title: 14 KI\_ECOLI\_NM: 150.0



title: 16 KI\_ECOLI\_NM: 1700000.0

title: 5 KI\_ECOLI\_NM: 620.0

title: 2-hydroxydiphenylether1 KI\_ECOLI\_NM: 500.0

title: 12 KI\_ECOLI\_NM: 3.2



title: 11 KI\_ECOLI\_NM: 0.001



title: 4 KI\_ECOLI\_NM: 1850.0



title: 3 KI\_ECOLI\_NM: 2750.0

title: 2-hydroxydiphenylether3 KI\_ECOLI\_NM: 2500.0

title: triclosan KI\_ECOLI\_NM: 0.007

title: 2-hydroxydiphenylether2 KI\_ECOLI\_NM: 16000.0

title: 1 KI\_ECOLI\_NM: 1000.0

title: 2 KI\_ECOLI\_NM: 1300.0

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## 6. Indole Actives



title: indole 5 Enzymologic: IC50 nM 1: 2700



title: indole 8 Enzymologic: IC50 nM 1: 34900



title: indole 11 Enzymologic: IC50 nM 1: 8800



title: indole 13 Enzymologic: IC50 nM 1: 4200



title: indole 20 Enzymologic: IC50 nM 1: 5200



title: indole 6 Enzymologic: IC50 nM 1: 18000



title: indole 9 Enzymologic: IC50 nM 1: 26800



title: indole 3 Enzymologic: IC50 nM 1: 4200



title: indole 14 Enzymologic: IC50 nM 1: 4500



title: indole 22 Enzymologic: IC50 nM 1: 16800



title: indole 7 Enzymologic: IC50 nM 1: 11000



title: indole 10 Enzymologic: IC50 nM 1: 27000



title: indole 12 Enzymologic: IC50 nM 1: 21400



title: indole 19 Enzymologic: IC50 nM 1: 2700



title: indole 23 Enzymologic: IC50 nM 1: 35800



title: indole 27 Enzymologic: IC50 nM 1: 4300



title: indole 32 Enzymologic: IC50 nM 1: 4400



title: indole 29 Enzymologic: IC50 nM 1: 35500



title: indole 34 Enzymologic: IC50 nM 1: 9900



title: indole 26 Enzymologic: IC50 nM 1: 38600



title: indole 31 Enzymologic: IC50 nM 1: 6100



title: indole 33 Enzymologic: IC50 nM 1: 3400



title: indole 25 Enzymologic: IC50 nM 1: 4000



title: indole 30 Enzymologic: IC50 nM 1: 8200



title: indole 35 Enzymologic: IC50 nM 1: 23000

#### 7. Amide Actives



title: pyridodiazepine11d IC50\_SAUREUS\_NM: 7

title: INDOLENAPHTHYRIDINONE32 IC50\_SAUREUS\_NM: 20

title: pyridodiazepine9a IC50\_SAUREUS\_NM: 26

title: pyridodiazepine1 IC50\_SAUREUS\_NM: 30

title: pyridodiazepine11a IC50\_SAUREUS\_NM: 31

title: pyridodiazepine18 IC50\_SAUREUS\_NM: 43

title: 1MFP\_ECOLI\_NAD\_SB611113\_2.33A

title: INDOLE NAPHTHYRIDINONE 21

IC50\_SAUREUS\_NM: 50

title: pyridodiazepine20b IC50\_SAUREUS\_NM: 48

IC50\_SAUREUS\_NM: 50

title: INDOLE NAPHTHYRIDINONE 31

title: INDOLENAPHTHYRIDINONE30

IC50\_SAUREUS\_NM: 50

IC50\_SAUREUS\_NM: 60

title: pyridodiazepine11b

IC50\_SAUREUS\_NM: 130

title: pyridodiazepine28 IC50\_SAUREUS\_NM: 61

title: pyridodiazepine9b IC50\_SAUREUS\_NM: 67

title: pyridodiazepine20a IC50\_SAUREUS\_NM: 57

title: pyridodiazepine16c IC50\_SAUREUS\_NM: 130

title: pyridodiazepine31 IC50 SAUREUS NM: 170

title: pyridodiazepin16a IC50\_SAUREUS\_NM: 510

title: pyridodiazepine11c IC50\_SAUREUS\_NM: 200

title: AMINOPYRIDINE 5

IC50\_SAUREUS\_NM: 910

title: ACETAMIDO DERIV. 12 IC50\_SAUREUS\_NM: 300



title: AMINOPYRIMIDINE DERIV. 10 IC50\_SAUREUS\_NM: 2200



title: PIPERIDINE 11 IC50\_SAUREUS\_NM: 2300



title: ACRYLAMIDE DERIV. 13 IC50\_SAUREUS\_NM: 11200



title: 1,4-BENZODIAZEPINEDERIV.3 IC50\_SAUREUS\_NM: 16500





title: AMINOPYRIDINEDERIV.9 IC50\_SAUREUS\_NM: 2400



title: AMINOPYRIDINEDERIV.14 IC50\_SAUREUS\_NM: 14200



title: 1LX6\_Ecoli\_NAD\_Benzamide\_2.40A IC50\_SAUREUS\_NM: 6700



title: BENZAMIDEDERIV.7 IC50\_SAUREUS\_NM: 16300

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title: 1,4-BENZODIAZEPINEDERIV.4 IC50\_SAUREUS\_NM: 21200 title: AMINO PYRIDINEDERIV.11 IC50\_SAUREUS\_NM: 93700 title: BENZAMIDEDERIV.6 IC50\_SAUREUS\_NM: 107000

#### 8. Imidazole Actives

title: DISUBSTITUTEDIMIDAZOLE23 E\_COLI\_IC50\_NM: 250



title: DISUBSTITUTEDIMIDAZOLE4 E\_COLI\_IC50\_NM: 360



title: DISUBSTITUTEDIMIDAZOLE28 E\_COLI\_IC50\_NM: 1130



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title: 112Z\_Ecoli\_NAD\_BRL12654\_2.80A E\_COLI\_IC50\_NM: 1240

title: DISUBSTITUTEDIMIDAZOLE21 E\_COLI\_IC50\_NM: 1900

title: DISUBSTITUTED IMIDAZOLE 20 E\_COLI\_IC50\_NM: 2030



title: DISUBSTITUTEDIMIDAZOLE27

title: DISUBSTITUTEDIMIDAZOLE25

E\_COLI\_IC50\_NM: 42400



E\_COLI\_IC50\_NM: 4070

title: DISUBSTITUTEDIMIDAZOLE8

E\_COLI\_IC50\_NM: 14700

title: OXADIAZOLE33 E\_COLI\_IC50\_NM: 50700



title: DISUBSTITUTEDIMIDAZOLE26

E\_COLI\_IC50\_NM: 36500

title: OXADIAZOLE 19 E\_COLI\_IC50\_NM: 51000

title: DISUBSTITUTEDIMIDAZOLE11 E\_COLI\_IC50\_NM: 6620

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E\_COLI\_IC50\_NM: 7660

title: DISUBSTITUTEDIMIDAZOLE29

## 9. Diphenyl Decoys

See separately attached .sdf file entitled "FabI\_Diphenyl\_Decoys\_500.sdf"

#### **10. Indole Decoys**

See Separately attached .sdf file entitled "Fabl\_Indole\_Decoys\_1000.sdf"

## **11. Amide Decoys**

See separately attached .sdf file entitled "FabI\_Amide\_Decoys\_533.sdf"

#### **12. Imidazole Decoys**

See separately attached .sdf file entitled "Fabl\_Imidazole\_Decoys\_529.sdf"

#### 13. Diphenyl Virtual Screen, Compounds Ordered and Tested



title: 250003954 Inhibition %25: 85% @ 100uM (55% @ 40uM)



title: 100038212 Inhibition %25: 14% @ 100uM (0% @ 40uM)



title: 650000242 Inhibition %25: 18% @ 100uM (3% @ 40uM)



title: 150012092 Inhibition %25: 14% @ 100uM (0% @ 40uM)



title: 600003523 Inhibition %25: 17% @ 100uM (6% @ 40uM)



title: 650005614 Inhibition %25: 13% @ 100uM (5% @ 40uM)



title: 800000443 Inhibition %25: 12% @ 100uM (14% @ 40uM)







title: 100084666 Inhibition %25: 9% @ 100uM (6% @ 40uM)





title: 600004374 Inhibition %25: 10% @ 100uM (0% @





40uM)



title: 100084635 title: 600001343 title: 450000131 Inhibition %25: 8% @ 100uM (0% @ 40uM) Inhibition %25: 3% @ 100uM (0% @ 40uM) Inhibition %25: 1% @ 100uM (6% @ 40uM)



title: 100026264



Inhibition %25: 0% @ 100uM (0% @ 40uM) Inhibition %25: 0% @ 100uM (0% @ 40uM)

title: 100072943

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## 14. Indole Virtual Screen, Compounds Ordered and Tested



title: 600009538 Inhibition %25: 68% @ 100uM (42% @ 40uM)



title: 100034909 Inhibition %25: 22% @ 100uM (25% @ 40uM)



title: 250002111 Inhibition %25: 18% @ 100uM (7% @ 40uM)



title: 100047760 Inhibition %25: 3% @ 100uM (12% @ 40uM)



title: 100039560 Inhibition %25: 0% @ 100uM (17% @ 40uM)



title: 950017010 Inhibition %25: 57% @ 100uM (0% @ 40uM)



title: 800003371 Inhibition %25: 21% @ 100uM (10% @ 40uM)



title: 650002560 Inhibition %25: 11% @ 100uM (0% @ 40uM)



title: 600008452 title: 650006798 Inhibition %25: 3% @ 100uM (0% @ 40uM) Inhibition %25: 2% @ 100uM (0% @ 40uM)



title: 100040675 Inhibition %25: 0% @ 100uM (0% @ 40uM



title: 600005310 Inhibition %25: 24% @ 100uM (26% @ 40uM)



title: 900087852 Inhibition %25: 21% @ 100uM (8% @ 40uM)



title: 650002232 Inhibition %25: 7% @ 100uM (0% @ 40uM)

0

## 15. Amide Virtual Screen, Compounds Ordered and Tested







title: 650005744 Inhibition %25: 39% @ 100uM (100% @ 4....



title: 650006663 Inhibition %25: 13% @ 100uM (17% @ 40uM)



title: 100066729 Inhibition %25: 0% @ 100uM (15% @ 40uM)

title: 250002532 Inhibition %25: 23% @ 100uM (5% @ 40uM)



title: 800000798



title: 100041600 Inhibition %25: 0% @ 100uM (0% @ 40uM)

title: 650000871 Inhibition %25: 17% @ 100uM (10% @ 40uM)



title: 100077132 Inhibition %25: 6% @ 100uM (1% @ 40uM) Inhibition %25: 3% @ 100uM (12% @ 40uM)

## 16. Imidazole Virtual Screen, Compounds Ordered and Tested

title: 100042025

40uM)



title: 100017167 Inhibition %25: 70% @ 100uM (94% @ 40uM)

Inhibition %25: 49% @ 100uM (45% @



title: 100065143 Inhibition %25: 31% @ 100uM (0% @ 40uM)







title: 100080858 Inhibition %25: 22% @ 100uM (11% @ 40uM)

title: 400000213 Inhibition %25: 22% @ 100uM (0% @ 40uM)

title: 650010595 Inhibition %25: 18% @ 100uM (23% @ 40uM)







title: 650002962 Inhibition %25: 18% @ 100uM (3% @ 40uM)



title: 600003750 Inhibition %25: 15% @ 100uM (0% @ 40uM)

title: 650002630



Inhibition %25: 10% @ 100uM (11% @ 40uM)









Inhibition %25: 3% @ 100uM (7% @ 40uM)



title: 650002616

title: 100042452 Inhibition %25: 4% @ 100uM (15% @

40uM)

title: 650004123

Inhibition %25: 2% @ 100uM (0% @ 40uM) Inhibition %25: 2% @ 100uM (0% @ 40uM)



title: 600001518

# 17. NMR Spectra for Published Compounds



CB-5269765 NMR spectrum



CB-5571325 NMR spectrum



CB-6750659 NMR spectrum



CB-7699754 NMR spectrum



Cb-772532 NMR spectrum



CB-5542661 NMR spectrum-1



CB-5542661 NMR spectrum-2



## CB-7355451 NMR spectrum



CB-9075115 NMR spectrum





CB-5125538 NMR spectrum



CB-5660856 NMR spectrum





CB-7996488 NMR spectrum



CB-6130731NMR spectrum



AG-205/36981057 NMR spectrum



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AE-848/11489669 NMR spectrum



AE-848/36959520 NMR spectrum

## **18. HPLC Analysis of Published** Compounds



MSD1 TIC, MS File (467\1FD-3001.D) APCI, Pos, Scan, Frag: 85

1	1.138	PBA	0.0880	2.90206e7	5.55998e6	100.0000
Total	s :			2.90206e7	5.55998e6	

Specs

File:9900036981057 Instrument:LC/MS B ID:AG-205/36981057 Vial:1:93 Description:C16H15CIN2 Date:18-Jun-2004

Printed: Fri Jun 18 13:46:13 2004

#### Sample Report (continued):



AG-205/36981057 LC-MS Spectrum

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# SPECS and BioSPECS B.V., The Netherlands File:9910111489669 ID:AE-848/11489669 Vial:1:6 Date:04-Sep-2000

Printed: Fri Sep 08 13:01:23 2000

#### Sample Report (continued):



AE-848/11489669 Spectrum

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Description:C15H12Cl2N2

Time:16:39:42