## Exploration of a structure-activity relationship for the 4(3H)-quinazolinone antibiotics

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## **Supporting Information**

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Figure S1. MRSA COL sensitization to antibacterials through antisense PBP knockdown. Left column shows background growth inhibition of the COL strain in the absence of xylose and right column shows activity in the presence of 50 mM xylose. (A) COL PBP1 antisense strain; (B) COL PBP2 antisense strain; (C) COL PBP2a antisense strain; (D) COL PBP3 antisense strain. Plates were spotted with compound 27 (left top to bottom: 200, 100, and 50  $\mu$ g), compound **30** (middle top to bottom: 300, 200, and 100 µg), and ceftaroline (CFT; right top to bottom: 0.8, 0.4, and  $0.2 \mu g$ ). Precipitation at the highest concentration of compound **30** occurred upon spotting onto the plate. Red arrows highlight large changes in zones of inhibition in the presence of xylose for compound 27.



**Table S1.** Experimental procedures and characterization data of reported compounds











	NMR (500 MHz, DMSO- $d_6$ ) $\delta$ 2.65 (t, $J = 8.77$ Hz, 2H), 2.99 (t, $J = 8.57$ Hz, 2H), 6.79 (m, 2H), 6.90 (d, $J = 8.17$ Hz, 1H), 7.06
	(d, J = 6.98  Hz, 2H), 7.14 (t, J = 7.18  Hz, 1H), 7.22 (t, J = 7.58
	Hz, 2H), 7.33 (t, $J = 7.78$ Hz, 1H), 7.53 (t, $J = 7.18$ Hz, 1H),
	7.71 (d, $J = 7.58$ Hz, 1H), 7.86 (t, $J = 7.18$ Hz, 1H), 8.11 (d, $J =$
	7.98 Hz, 1H), 9.85 (s, 1H). $^{13}$ C NMR (126 MHz, DMSO- $d_6$ )
	δ 32.17, 37.03, 95.43, 115.61, 116.02, 118.97, 120.55, 126.02,
	126.32, 126.54, 126.88, 128.18, 128.35, 130.21, 134.58, 138.13,
	147.10, 156.01, 158.26, 161.20, HRMS $(m/z)$ ; $[M + H]^+$ , calcd
	for C <sub>22</sub> H <sub>19</sub> N <sub>2</sub> O <sub>2</sub> , 343.1441; found, 343.1454.
<u>o</u>	2-benzyl-3-(3-hydroxyphenyl)quinazolin-4(3H)-one (25).
	This compound was purchased from ChemDiv.
	1 1
~	
0	3-(3-hydroxyphenyl)-2-(4-tolyl)quinazolin-4(3 <i>H</i> )-one (26).
ЛОН	This compound was purchased from ChemDiv.
N	
	(E)-3-(3-carboxyphenyl)-2-(4-ethynylstyryl)quinazolin-
	4(3H)-one (27). This compound was prepared according to the
	procedure for 2 and purified by silica gel column
	chromatography in 24% yield (0.05 g). <sup>1</sup> H NMR (600 MHz,
o	CD <sub>3</sub> OD) $\delta$ 3.60 (s, 1H), 6.38 (d, J = 15.55 Hz, 1H), 7.29 (d, J =
	8.57 Hz, 2H), 7.39 (d, $J = 8.17$ Hz, 2H), 7.54 (t, $J = 6.98$ Hz,
	1H), 7.64 (d, $J = 7.98$ Hz, 1H), 7.76 (t, $J = 7.98$ Hz, 1H), 7.82
	(d, J = 8.17  Hz, 1H), 7.88 (m, 2H), 8.07 (s, 1H), 8.20 (d, J =
	7.78 Hz, 1H), 8.25 (d, $J = 7.78$ Hz, 1H). <sup>13</sup> C NMR (126 MHz,
	DMSO-d <sub>6</sub> ) 8 82.70, 83.24, 120.66, 121.04, 122.84, 126.51.
	126.81, 127.31, 127.83, 129.98, 130.12, 132.33, 132.39, 133.49.
	134.90, 135.21, 137.21, 137.99, 147.36, 151.04, 161.37,
	166.58. HRMS $(m/z)$ : $[M + H]^+$ , calcd for C <sub>25</sub> H <sub>17</sub> N <sub>2</sub> O <sub>3</sub> .
	393.1234; found, 393.1250.
	(E)-3-(3-carboxyphenyl)-2-(4-(3-hydroxyprop-1-yn-1-
	yl)styryl)quinazolin-4(3H)-one (28). 1 M NaOH solution (aq,
0	0.5 mL) was added to a solution of 29 (100 mg, 0.25 mmol) in
	0.5 mL ethanol and stirred for 2 h at room temperature. Water (3
$ \begin{bmatrix} & N & CO_2H \\ & \downarrow & \downarrow \end{bmatrix} $	mL) was added and the resulting solution acidified with 3 M
l → N. J	HCl (aq). Extraction with dichloromethane followed and the
	organic layer dried over Na <sub>2</sub> SO <sub>4</sub> and concentrated in vacuo to
	yield pure product in 73% yield (0.068 g). <sup>1</sup> H (400 MHz,
Он	DMSO- $d_6$ ) $\delta$ 4.29 (s, 2H), 6.34 (d, $J = 15.6$ Hz, 1H), 7.40 (m,
	4H), 7.55 (ddd, <i>J</i> = 7.6, 7.2, 1.2 Hz, 1H), 7.74 (m, 2H), 7.78 (d,
	J = 8 Hz, 1H), 7.88 (d, $J = 15.6$ Hz, 1H), 7.89 (ddd, $J = 8.0, 7.2,$
	1.6 Hz, 1H), 8.02 (m, 1H), 8.13 (m, 2H). <sup>13</sup> C NMR (101 MHz,



	NMR (126 MHz, DMSO- <i>d</i> <sub>6</sub> ) δ 118.1, 118.3, 120.8, 120.9,
	121.3, 122.1, 127.1, 127.5, 127.9, 128.6, 128.7, 130.6, 130.7,
	133.0, 133.6 (2C), 134.1, 135.5, 137.1, 137.7, 147.9, 151.7,
	157.3, 159.3, 161.9, 167.2. HRMS $(m/z)$ : $[M + H]^+$ , calcd for
	C <sub>23</sub> H <sub>15</sub> FClN <sub>2</sub> O <sub>3</sub> , 421.0750; found, 421.0751.
	( <i>E</i> )-3-(3-carboxyphenyl)-2-(4-
	(methylsulfonyl)styryl)quinazolin-4(3H)-one (33). This
0	compound was prepared according to the procedure described
	previously in 46% yield (0.26 g). <sup>1</sup> <sup>1</sup> H (500 MHz, DMSO- $d_6$ )
	$\delta$ 3.19 (s, 3H), 6.49 (d, $J = 15.5$ Hz, 1H), 7.57 (t, $J = 8.0$ Hz,
N N	1H), 7.66 (d, <i>J</i> = 8.0 Hz, 2H), 7.74 (m, 2H), 7.81 (d, <i>J</i> = 8.0 Hz,
	1H), 7.86 (m, 4H), 8.05 (s, br, 1H), 8.12 (m, 2H). <sup>13</sup> C NMR
S S	(100 MHz, DMSO- <i>d</i> <sub>6</sub> ) δ 44.0, 121.4, 124.1, 127.2, 127.7, 128.0,
	128.3, 128.9, 130.6, 130.7, 130.8, 133.0, 134.1, 135.5, 137.6,
	137.7, 140.3, 141.7, 147.9, 151.5, 161.9, 167.2. HRMS ( <i>m/z</i> ):
	$[M + H]^+$ , calcd for C <sub>24</sub> H <sub>19</sub> N <sub>2</sub> O <sub>5</sub> S, 447.1009; found, 447.1029.
	( <i>E</i> )-3-(3-carboxyphenyl)-2-(4-(2-methoxy-2-
	oxoethyl)styryl)quinazolin-4(3H)-one (34). The compound
	was prepared according to the procedure described previously in
	85% yield (0.374 g). <sup>1 1</sup> H (600 MHz, DMSO- $d_6$ ) $\delta$ 3.59 (s, 3H),
o h	3.67 (s, 2H), $6.29$ (d, $J = 15.6$ Hz, 1H), $7.24$ (d, $J = 7.8$ Hz, 2H),
	7.33 (d, $J = 7.8$ Hz, 2H), 7.54 (ddd, $J = 8.4$ , 7.8, 1.2 Hz, 1H),
	7.74 (m, 2H), 7.79 (d, <i>J</i> = 7.8 Hz, 1H), 7.87 (d, <i>J</i> = 15.6 Hz,
	1H), 7.88 (ddd, <i>J</i> = 8.4, 7.8, 1.2 Hz, 1H), 8.02 (m, 1H), 8.13 (m,
CO <sub>2</sub> Me	2H), 13.13 (s, 1H). <sup>13</sup> C NMR (151 MHz, DMSO- <i>d</i> <sub>6</sub> ) δ 39.86,
	51.74, 119.70, 120.57, 126.44, 126.59, 127.20, 127.60 (2C),
	129.92, 130.00, 130.02, 130.05 (2C), 132.33, 133.42, 133.44,
	134.80, 136.22, 137.25, 138.68, 147.39, 151.21, 161.33, 166.50,
	171.22. HRMS $(m/z)$ : $[M + H]^+$ , calcd for $C_{26}H_{21}N_2O_5$ ,
	441.1445; found, 441.1475.
	(E)-3-(2-hydroxyphenyl)-2-(4-nitrostyryl)quinazolin-4(3H)-
	one (35). This compound was prepared according to the
	procedure for 5 in 22% yield (0.05 g). <sup>1</sup> H NMR (500 MHz,
O O	DMSO- $d_6$ ) $\delta$ 6.59 (d, $J = 15.55$ Hz, 1H), 7.02 (t, $J = 6.98$ Hz,
N N	1H), 7.41 (t, $J = 7.98$ Hz, 1H), 7.57 (t, $J = 7.58$ Hz, 1H), 7.64 (d,
N OH	J = 7.38 Hz, 2H), 7.79 (d, $J = 7.78$ Hz, 1H), 7.90 (t, $J = 7.18$ Hz,
	1H), $8.15_{12}$ (d, $J = 7.58$ Hz, 1H), $8.20$ (d, $J = 6.78$ Hz, 2H), 10.05
	$(s, 1H)$ . <sup>13</sup> C NMR (126 MHz, DMSO- <i>d</i> <sub>6</sub> ) $\delta$ 116.79, 119.77,
	120.96, 123.52, 123.85, 124.24, 126.49, 127.29, 128.43, 130.07,
	130.82, 134.80, 141.30, 147.25, 147.52, 151.36, 153.13, 160.84,
	162.38. HRMS $(m/z)$ : $[M + H]^+$ , calcd for C <sub>22</sub> H <sub>16</sub> N <sub>3</sub> O <sub>4</sub> ,
	386.1135; found, 386.1159.









	(E)-3-(3-nitrophenyl)-2-(4-cyanostyryl)quinazolin-4(3H)-one
	(49). This compound was prepared according to the procedure for <b>5</b> in 99% yield (6.32 g). <sup>1</sup> H (500 MHz, DMSO- <i>d</i> <sub>6</sub> ) $\delta$ 6.54 (d, <i>J</i> = 15.35 Hz, 1H), 7.58 (t, <i>J</i> = 7.78 Hz, 1H), 7.67 (d, <i>J</i> = 8.17 Hz, 2H), 7.80 (m, 3H), 7.91 (m, 4H), 8.14 (d, <i>J</i> = 7.98 Hz, 1H), 8.43 (d, <i>J</i> = 8.18 Hz, 1H), 8.52 (s, 1H). <sup>13</sup> C NMR (126 MHz, DMSO- <i>d</i> <sub>6</sub> ) $\delta$ 111.77, 118.80, 120.88, 123.48, 124.50, 124.94, 126.68, 127.24, 127.54, 128.73, 131.16, 132.89, 135.18, 136.10, 137.54, 137.97, 139.35, 147.37, 148.72, 150.76, 161.45. HRMS ( <i>m</i> / <i>z</i> ): [M + H] <sup>+</sup> , calcd for C <sub>23</sub> H <sub>14</sub> N <sub>4</sub> NaO <sub>3</sub> , 417.0958; found, 417.0941.
O N N CN	( <i>E</i> )-3-(3-aminophenyl)-2-(4-cyanostyryl)quinazolin-4(3 <i>H</i> )- one (50). This compound was prepared according to the procedure for 41 from compound 49 (6.0 g, 15.2 mmol) in 37 % yield (2.24 g). <sup>1</sup> H (500 MHz, DMSO- <i>d</i> <sub>6</sub> ) $\delta$ 5.47 (s, 2H), 6.51 (d, J = 7.78 Hz, 1H), 6.56 (m, 2H), 6.73 (d, $J = 8.37$ Hz, 1H), 7.23 (t, $J = 7.98$ Hz, 1H), 7.55 (m, 3H), 7.76 (d, $J = 8.17$ Hz, 1H), 7.82 (d, $J = 8.37$ Hz, 2H), 7.87 (t, $J = 8.17$ Hz, 1H), 7.90 (d, $J =$ 15.55 Hz, 1H), 8.12 (d, $J = 7.98$ Hz, 1H). <sup>13</sup> C NMR (126 MHz, DMSO- <i>d</i> <sub>6</sub> ) $\delta$ 111.50, 113.50, 114.57, 115.42, 118.61, 120.79, 123.52, 126.48, 126.92, 127.27, 128.00, 130.00, 132.92, 134.73, 136.48, 137.34, 139.43, 147.14, 150.04, 150.89, 160.91. HRMS ( <i>m</i> / <i>z</i> ): [M + H] <sup>+</sup> , calcd for C <sub>23</sub> H <sub>17</sub> N <sub>4</sub> O, 365.1397; found, 365.1367.
	<b>(E)-3-(3-(isopropylamino)phenyl)-2-(4-</b> <b>cyanostyryl)quinazolin-4(3H)-one (51).</b> Compound <b>50</b> (0.15 g, 0.42 mmol) was dissolved in 10 mL CH <sub>2</sub> Cl <sub>2</sub> , to which acetone (92 µL), 3 Å activated molecular sieves, and sodium triacetoxyborohydride (0.18 g, 0.84 mmol) were added. The mixture was stirred at room temperature for 6 days, filtered through celite, and concentrated <i>in vacuo</i> . The residue was purified by silica gel column chromatography to give the product in 13% yield (0.022 g). <sup>1</sup> H (500 MHz, CDCl <sub>3</sub> ) $\delta$ 1.19 (d, $J = 6.0$ Hz, 3H), 1.23 (d, $J = 6.5$ Hz, 3H), 3.59 (m, 1H), 6.53 (s, 1H), 6.59 (m, 2H), 6.78 (d, $J = 8.0$ Hz, 1H), 7.34 (t, $J = 8.0$ Hz, 1H), 7.42 (d, $J = 8.5$ Hz, 2H), 7.47 (m, 1H), 7.58 (d, $J = 8.5$ Hz, 2H), 7.77 (m, 2H), 7.93 (d, $J = 15.5$ Hz, 1H), 8.30 (d, $J = 7.5$ Hz, 1H). <sup>13</sup> C NMR (126 MHz, CDCl <sub>3</sub> ) $\delta$ 22.6, 22.9, 112.6, 118.7, 121.4, 123.9, 127.2, 127.4, 127.6, 128.3, 130.8, 132.7, 134.8, 137.3, 137.8, 139.9, 147.7, 151.2, 162.1. HRMS ( <i>m</i> /z): IM + H1 <sup>+</sup> calcd for C <sub>26</sub> H <sub>22</sub> N4O 407 1866; found 407 1863











	395.1143.
	(E)-3-(3-carbomylphenyl)-2-(4-fluorostyryl)pyrido[4,3-
	d]pyrimidin-4(3H)-one (70). This compound was prepared
	according to the procedure for 72 from compound 67 (0.12 g, $0.21$ mm s1) in (0.02 min) $\frac{1}{10}$ (0.02 min)
	$0.31 \text{ mmol}$ ) in 69 % yield (0.083 g). H (400 MHz, DMSO- $a_6$ )
N CONH <sub>2</sub>	$\delta 6.28$ (d, $J = 15.6$ Hz, 1H), $/.21$ (t, $J = 8.8$ Hz, 2H), $/.4/$ (m,
N	$^{2}$ H), /.56 (s, br, 1H), /.65 (m, 3H), /.98 (s, br, 1H), 8.01 (d, $J =$
	15.6 Hz, 1H), 8.08 (m, 2H), 8.8/ (5.6 Hz, 1H), 9.2/ (s, 1H). <sup>15</sup> C
F	NMR (100 MHZ, DMSO- $a_6$ ) $\delta$ 116.1, 116.2, 116.3, 119.3, 120.2, 120.2, 120.2, 121.0, 121.1, 121.(
	120.2, 128.1, 128.4, 129.8, 130.2, 130.3, 131.0, 131.1, 131.6, 125.9, 126.2, 140.1, 140.0, 152.2, 152.6, 155.9, 160.9, 161.0, 125.9, 160.9, 161.0,
	135.8, 130.3, 140.1, 149.9, 152.3, 153.0, 155.8, 160.8, 161.9,
	$104.4, 100.7$ . HKMS ( <i>m/z</i> ): [M + H], calcd for $C_{22}H_{16}FN_4O_2$ ,
	38/.1252; found, 38/.1262.
	(E)-3-(3-carbomylphenyl)-2-(4-chlorostyryl)pyrldo[4,3-
	according to the procedure for <b>72</b> from compound <b>68</b> (0.125 g
o	according to the procedure for $72$ from compound <b>68</b> (0.125 g, 0.31 mmol) in 68% yield (0.085 g). <sup>1</sup> H (400 MHz, DMSO d.)
	6.34 (d I = 15.2 Hz 1H) 7.41 (m 4H) 7.55 (s hr 1H) 7.66
N	(m 3H) 7.98 (s hr 1H) 8.00 (d $I = 15.6$ Hz 2H) 8.08 (m
	(iii, 511), 7.56 (3, 61, 111), 6.66 (d, $5^{-15.6}$ 12, 211), 6.66 (iii, 2H) 8.88 (d $I = 5.6$ Hz 1H) 9.28 (s 1H) $^{13}$ C NMR (100
	$MH_{Z}$ DMSO- $d_{c}$ ) $\delta$ 116 3 120 1 120 2 128 2 128 4 129 1
	152.2, 153.6, 155.6, 160.7, 166.7, HRMS $(m/z)$ : $[M + H]^+$ , calcd
	for C <sub>22</sub> H <sub>16</sub> ClN <sub>4</sub> O <sub>2</sub> , 403.0956; found, 403.0934.
	(E)-3-(3-carbomylphenyl)-2-(4-cyanostyryl)pyrido[4,3-
	d]pyrimidin-4(3H)-one (72). Compound 69 (0.10 g, 0.26
	mmol) was dissolved in 6 mL DMF, to which EDCI (0.082 g,
	0.42 mmol), HOAt (0.035 g, 0.26 mmol), and NH <sub>4</sub> Cl (0.069 g,
	1.29 mmol) were added. The reaction was stirred at room
	temperature for 14 h and 100 mL EtOAc was added to the
O	mixture and washed three times with saturated NH <sub>4</sub> Cl. The
	organic phase was dried over Na <sub>2</sub> SO <sub>4</sub> , concentrated <i>in vacuo</i> ,
N	and purified by silica gel column chromatography to give the
	product in 77% yield (0.078 g). <sup>1</sup> H (400 MHz, DMSO- $d_6$ )
CN	$\delta$ 6.49 (d, $J$ = 15.6 Hz, 1H), 7.56 (s, br, 1H), 7.60 (d, $J$ = 8.0 Hz,
	1H), 7.67 (m, 3H), 7.82 (d, $J = 8.4$ Hz, 2H), 7.99 (s, br, 1H),
	8.02 (d, J = 15.6 Hz, 1H), 8.04 (m, 2H), 8.89 (d, J = 5.6 Hz, 1H), 8.02 (d, J = 5.6 Hz, 1H), 8.04 (m, 2H), 8.89 (d, J = 5.6 Hz, 1H), 8.04 (m, 2H), 8.89 (d, J = 5.6 Hz, 1H),
	1H), 9.28 (s, 1H). <sup>13</sup> C NMR (100 MHz, DMSO- $d_6$ ) $\delta$ 112.0,
	116.4, 118.5, 120.3, 122.9, 128.1, 128.5, 129.8, 131.6, 132.9,
	135.8, 136.1, 138.9, 139.1, 149.9, 152.1, 153.7, 155.3, 160.7,
	$[100. /. HKMS (m/z): [M + H], calcd for C_{23}H_{16}N_5O_2, 394.1299;$
	tound, 394.1318.





Table S2. MICs of reported compounds against S. aureus and E. faecium

Structure	Number	MIC (µg/mL) S. aureus ATCC 29213	MIC (μg/mL) <i>E. faecium</i> NCTC 7171
	1	2	32
	2	>128	8
	3	128	64
P N N F	4	0.25	>128



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O N O Me	13	4	>128
O N O H CN	14	0.03	64
O N O H O H	15	0.003	16
O N N N N N N N N N N N N N N	16	16	32
O N O O H CO <sub>2</sub> H	17	>128	>128
O N O H	18	0.5	64
	19	2	32
	20	2	>128



O N CO <sub>2</sub> H OAc	29	0.25	>128
CO <sub>2</sub> H	30	1	>128
CO <sub>2</sub> H	31	2	>128
	32	2	>128
N CO <sub>2</sub> H	33	>128	>128
	34	8	>128
	35	2	>128
O N N N N N N N N N N N N N N N N N	36	>128	64

O N N NO <sub>2</sub>	37	>128	64
O OAc N N NO <sub>2</sub>	38	>128	32
O OMe	39	>128	>128
	40	>128	>128
O N N F	41	2	128
	42	1	>128
	43	0.125	>128
N N F	44	4	>128

о N N F	45	2	>128
O N CO <sub>2</sub> H	46	8	>128
O OAc	47	0.03	>128
CN	48	>128	>128
	49	>128	>128
	50	0.5	>128
	51	0.01	>128
	52	0.25	>128





	69	>128	>128
	70	>128	>128
	71	>128	>128
	72	>128	>128
Br O OH N OH NO <sub>2</sub>	73	>128	>128
HO N OH	74	32	32
	75	64	>128
	76	128	>128

0         0         CO2H         77         32         >128	
* UN	

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