Electronic Supplementary Information for

The effects of structural changes on anti-microbial and anti-proliferative activity of diimidazolium salts

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General procedure for the synthesis of the dibromide salts

α,α'-Dibromoxylene (2.5 g, 9.5 mmol) was dissolved in 2-propanol (10 mL). The obtained solution was placed in an oil bath at 85 °C. N-alkylimidazole (20 mmol) was dissolved in 2- propanol (10 mL) and the solution was added, dropwise, to the α,α'-dibromoxylene solution. The reaction mixture was heated at 85 °C for 24 h. After cooling, in the case of *para*-salts the reaction mixture was diluted with acetone (200 mL) and a white solid was collected by filtration. In the case of *meta*- and *orto*-salts after concentration, yellow viscous oil was obtained, which was washed several times with diethyl ether. The obtained dibromide salts were dissolved in anhydrous methanol and stirred overnight (12 h) at room temperature, in the presence of active charcoal (1% by weight). After filtration on neutral aluminum oxide and concentration in vacuo, the desired salt was obtained.

3,3'-Di-n-hexyl-1,1'-(1,4-phenylenedimethylene)diimidazolium dibromide, **[*p*-C_6im][Br]$_2$**: White solid; m.p. 165-169 °C; yield 83%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.47 (s, 2H), 7.89 (m, 4H), 7.46 (s, 4H), 5.51 (s, 4H), 4.23 (t, J=7.2 Hz, 4H), 1.84 (qt, J= 6.5 Hz, 4H), 1.20 (m, 12H), 0.90 (t, J= 6.7 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 136.3, 135.6, 129.0, 123.0, 122.7, 51.6, 49.1, 30.6, 29.33, 25.3, 22.0, 13.9 ppm; elemental analysis calcd (%) for $C_{26}H_{40}Br_2N_4$ (568): C 54.94, H 7.01, N 9.96, found: C 54.91, H 6.99, N 9.94.

3,3'-Di-n-octyl-1,1'-(1,2-phenylenedimethylene)diimidazolium dibromide, **[*o*-C_8im][Br]$_2$**: White solid; m.p. 182-185 °C; yield 60%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.36 (s, 2H), 7.88 (m, 2H), 7.79 (m, 2H), 7.48 (m, 2H), 7.30 (m, 2H), 5.66 (s, 4H), 4.19 (t, J= 7.3 Hz, 4H), 1.80 (t, J= 6.6 Hz, 4H), 1.25 (m, 20H), 0.85 (t, J= 6.9 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 136.9, 133.4, 130.1, 130.0, 123.3, 123.2, 49.5, 31.6, 29.8, 29.0, 28.8, 26.0, 22.5, 14.4 ppm; elemental analysis calcd (%) for $C_{30}H_{48}Br_2N_4$ (624): C 57.69, H 7.75, N 8.97, found: C 57.72, H 7.73, N 9.00.

3,3'-Di-n-decyl-1,1'-(1,3-phenylenedimethylene)diimidazolium dibromide, **[*m*-C_{10}im][Br]$_2$**: orange wax; yield 77%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.40 (s, 2H), 7.84 (m, 4H), 7.57 (s, 1H), 7.48 (m, 1H), 7.40 (m 2H), 5.45 (s, 4H), 4.18 (t, J=7.5 Hz, 4H), 1.79 (qt, J= 7.5 Hz, 4H), 1.24 (m, 28H), 0.86 (t, J= 6.7 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 136.7, 136.0, 130.2, 129.0, 128.9, 123.3, 123.0, 52.1, 49.5, 31.7, 29.7, 29.3, 29.3, 29.1, 28.8, 26.0, 22.5, 14.4 ppm; elemental analysis calcd (%) for $C_{34}H_{56}Br_2N_4$ (680): C 60.00, H 8.29, N 8.23, found: C 59.98, H 8.31, N 8.22.

3,3'-Di-n-decyl-1,1'-(1,2-phenylenedimethylene)diimidazolium dibromide, **[*o*-C_{10}im][Br]$_2$**: beige waxy-like solid; yield 76%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.29 (s, 2H), 7.88 (m, 2H), 7.76 (m, 2H), 7.49 (m, 2H), 7.30 (m, 2H), 5.63 (s, 4H), 4.18 (t, J=6.0 Hz, 4H), 1.80 (qt, J= 7.5 Hz, 4H), 1.24 (m, 28H), 0.86 (t, J= 6.0 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 136.9, 133.4, 130.1, 130.0, 123.3, 123.2, 49.5, 31.7, 29.8, 29.4, 29.3, 29.1, 28.8, 26.0, 22.5, 14.4 ppm; elemental analysis calcd (%) for $C_{34}H_{56}Br_2N_4$ (680): C 60.00, H 8.29, N 8.23, found: C 60.02, H 8.30, N 8.25.

General procedure for the synthesis of salts different than bromide

A column packed with Amberlite resin IRA-400 (chloride form, 11.50 g) was used to perform the exchange of anions. To convert the chloride form of the resin into the hydroxide form, it was firstly washed with an aqueous solution of NaOH (570 mL, 10% w/v) and subsequently with water until the eluate was neutral. A binary mixture of methanol/water (70:30, v/v) was used as eluent. Bromide salt (1.68 g, 2.69 mmol) was dissolved in the binary mixture (50 mL) and eluted. The eluate was collected in a flask containing a solution of the desired acid in stoichiometric amount. The neutral solution was concentrated in vacuo and the residue was dissolved in ethanol. The obtained solution was heated in the presence of active charcoal, and filtered. After the solvent removal under vacuum, the salt was washed with acetone to eliminate traces of other solvents. When possible the salts were crystallized from the ethanolic solution. The 2,6-naphthalenedisulfonic acid was obtained by elution of a water solution of the corresponding sodium salt through an Amberlite IR 120 plus column. In each case, the silver nitrate test, performed to verify the presence of residual bromide anion, gave a negative result.

3,3'-Di-n-hexyl-1,1'(1,4-phenylenedimethylene)diimidazolium ditetrafluoroborate, **[*p*-C_6im][BF_4]$_2$***:* White solid; m.p. 110-115 °C; yield: 97%; ^{1}H NMR (400 MHz, [D6]DMSO): δ= 9.39 (s, 2H), 7.80 (m, 4H), 7.46 (s, 4H), 5.43 (s, 4H), 4.16 (t, J= 8.0 Hz, 4H), 1.77 (qt, J= 8.0 Hz, 4H), 1.24 (m, 12H), 0.83 (t, J= 8.0 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 135.9, 129.4, 123.3, 123.0, 51.9, 49.4, 30.9, 29.6, 25.6, 22.3, 14.2 ppm. elemental analysis calcd (%) for $C_{26}H_{40}B_2F_8N_4$ (582): C 53.63, H 6.92, N 9.62, found: C 53.60, H 6.91, N 9.60.

3,3'-Di-n-hexyl-1,1'(1,4-phenylenedimethylene)diimidazolium D-Tartrate, **[*p*-C_6im][D-Tar]***:* Hygroscopic white solid; yield: 96%; ^{1}H NMR (400 MHz, [D6]DMSO): δ= 9.54 (s, 2H), 7.82 (m, 4H), 7.48 (s, 4H), 5.45 (s, 4H), 4.17 (t, J= 6.0 Hz, 4H), 3.73 (s, 2H), 1.77 (qt, J= 7.0 Hz, 4H), 1.24 (m, 12H), 0.84 (t, J= 6 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 175.2, 136.0, 129.4,

123.2, 123.0, 72.1, 51.8, 49.4, 30.9, 29.7, 25.6, 22.3, 14.2 ppm; elemental analysis calcd (%) for $C_{30}H_{44}N_4O_6$ (556): C 64.73, H 7.97, N 10.06, found: C 64.74, H 7.95, N 10.04. $[a]_{24.1°C}^{589nm}$ = -3.8°.

3,3'-Di-n-hexyl-1,1'(1,4-phenylenedimethylene)diimidazolium 2,6-naphthalendicarboxylate, **[*p*-C$_6$im][2,6-NDC]***:* White solid; m.p. 223-228 °C; yield: 98%; ^{1}H NMR (400 MHz, [D6]DMSO): δ= 9.45 (s, 2H), 8.35 (m, 2H), 7.96 (d, J= 8.0 Hz, 2H), 7.82 (m, 6H), 7.47 (s, 4H), 5.44 (s, 4H), 4.17 (t, J= 8.0 Hz, 4H), 1.78 (qt, J= 8.0 Hz, 4H), 1.24 (m, 12H), 0.84 (t, J= 8.0 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 169.1, 137.0, 136.0, 133.3, 129.3, 128.2, 127.3, 124.1, 123.3, 123.0, 122.7, 51.9, 49.4, 31.8, 30.9, 25.6, 22.3, 14.2 ppm. elemental analysis calcd (%) for $C_{38}H_{46}N_4O_4$ (622): C 73.28, H 7.44, N 9.00, found: C 73.27, H 7.41, N 8.98.

3,3'-Di-n-octyl-1,1'(1,4-phenylenedimethylene)diimidazolium ditetrafluoroborate, **[*p*-C$_8$im][BF$_4$]$_2$***:* White solid; m.p. 99.8-104.7 °C; yield: 98%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.36 (s, 2H), 7.85 (dt, J= 1.6, 7.6 Hz, 4H), 7.51 (s, 4H), 5.48 (s, 4H), 4.22 (t, J= 7.2 Hz, 4H), 1.84 (qt, J= 6.9 Hz, 4H), 1.30 (m, 20H), 0.91 ppm (t, J= 6.8 Hz, 6H); ^{13}C NMR (300 MHz, [D6]DMSO): δ= 136.3, 135.6, 129.0, 123.0, 122.7, 51.7, 49.2, 31.3, 29.4, 28.6, 28.4, 25.6, 22.2, 14.1 ppm. ^{19}F NMR ([D6]DMSO): δ: -147.46 ppm. elemental analysis calcd (%) for $C_{30}H_{48}B_2F_8N_4$ (638): C 56.45, H 7.58, N 8.78; found: C 56.40, H 7.60, N 8.75.

3,3'-Di-n-octyl-1,1'(1,3-phenylenedimethylene)diimidazolium ditetrafluoroborate, **[*m*-C$_8$im][BF$_4$]$_2$***:* pale-yellow oil; yield: 98%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.42 (s; 2H), 7.81 (d; J = 3.6 Hz; 4H), 7.47 (m; 4H), 5.43 (s; 4H), 4.16 (t; J= 7.3 Hz; 4H), 1.78 (qt, J= 7.0 Hz, 4H), 1.24 (m; 20H), 0.85 (t; J = 6.7 Hz; 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 138.8, 138.2, 132.3, 131.1, 131.0, 125.4, 125.1, 54.2, 51.5, 33.7, 31.8, 31.0, 30.9, 28.1, 24.6, 16.5 ppm. elemental analysis calcd (%) for $C_{30}H_{48}B_2F_8N_4$ (638): C 56.45, H 7.58, N 8.78; found: C 56.48, H 7.57, N 8.77.

3,3'-Di-n-octyl-1,1'(1,2-phenylenedimethylene)diimidazolium ditetrafluoroborate, **[*o*-C$_8$im][BF$_4$]$_2$***:* pale-yellow oil; yield: 97%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.28 (s; 2H), 7.85 (s; 2H), 7.74 (s; 2H), 7.48 (m; 2H), 7.29 (m; 2H), 5.60 (s; 4H), 4.16 (t; J= 7.3 Hz; 4H), 1.79 (qt, J= 6.9 Hz, 4H), 1.24 (m; 20H), 0.85 (t; J = 6.6 Hz; 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 136.9, 133.4, 130.1, 130.0, 123.3, 123.2, 49.5, 31.6, 29.8, 29.0, 28.8, 26.0, 22.5, 14.4 ppm. elemental analysis calcd (%) for $C_{30}H_{48}B_2F_8N_4$ (638): C 56.45, H 7.58, N 8.78; found: C 56.48, H 7.57, N 8.80.

3,3'-Di-n-octyl-1,1'(1,4-phenylenedimethylene)diimidazolium L-Tartrate: Hygroscopic white solid; m.p. 202-206 °C; yield: 85%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.78 (s; 2H), 7.88 (d; J = 6.4 Hz; 4H), 7.55 (s; 4H), 5.53 (s; 4H), 4.23 (t; J = 4.5 Hz; 4H), 3.77 (s; 2H), 1.83 (m; 4H), 1.24 (m; 20H), 0.90 (t; J = 3.6 Hz; 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 175.6, 137.0, 135.7, 129.1, 122.9, 122.6, 73.3, 51.5, 49.1, 31.3, 29.4, 28.6, 28.4, 25.7, 22.2, 14.1 ppm. elemental analysis calcd (%) for $C_{34}H_{52}N_4O_6$ (612): C 66.64, H 8.55, N 9.14; found: C 66.68, H 8.53, N 9.13. $[a]_{23.6\,°C}^{589nm}$ = 10.3°.

3,3'-Di-n-octyl-1,1'(1,4-phenylenedimethylene)diimidazolium D-Tartrate: Hygroscopic white solid; m.p. 202-204 °C; yield: 87%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.79 (s; 2H), 7.88 (d; J = 7.4 Hz; 4H), 7.55 (s; 4H), 5.52 (s; 4H), 4.23 (t; J = 4.8 Hz; 4H), 3.77 (s; 2H), 1.83 (m; 4H), 1.20 (m; 20H), 0.90 (t; J = 4.4 Hz; 6H) ppm;^{13}C NMR (300 MHz, [D6]DMSO): δ= 175.6, 136.9, 135.7, 129.2, 122.9, 122.6, 73.1, 51.6, 49.1, 31.3, 29.5, 28.6, 28.5, 25.7, 22.2, 14.1 ppm. elemental analysis calcd (%) for $C_{34}H_{52}N_4O_6$ (612): C 66.64, H 8.55, N 9.14; found: C 66.62, H 8.54, N 9.16. $[a]_{23.6\,°C}^{589nm}$ = -11.9°.

3,3'-Di-n-octyl-1,1'(1,2-phenylenedimethylene)diimidazolium D-Tartrate: Hygroscopic white wax; yield: 88%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.68 (s; 2H), 7.82 (s; 2H), 7.78 (s; 2H), 7.46 (m; 2H), 7.33 (m; 2H), 5.71 (s; 4H), 4.17 (t; J = 7.2 Hz; 4H), 3.75 (s; 2H), 1.79 (qt; J= 6.5 Hz; 4H), 1.24 (m; 20H), 0.85 (t; J = 6.6 Hz; 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 175.7, 137.5, 133.7, 130.2, 130.0, 123.1, 123.1, 72.9, 49.4, 31.6, 29.8, 29.0, 28.8, 26.0, 22.5, 14.4 ppm. elemental analysis calcd (%) for $C_{34}H_{52}N_4O_6$ (612): C 66.64, H 8.55, N 9.14; found: C 66.62, H 8.54, N 9.16. $[a]_{24.1\,°C}^{589nm}$ = -5.1°.

3,3'-Di-n-octyl-1,1'(1,4-phenylenedimethylene)diimidazolium meso-Tartrate: Hygroscopic white solid; m.p. 182-185 °C; yield: 86%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.78 (s; 2H), 7.77 (d; J = 6.6 Hz; 4H), 7.48 (s; 4H), 5.49 (s; 4H), 4.19 (tb; 4H), 3.33 (s; 2H), 1.83 (m; 4H), 1.16 (m; 20H), 0.84 (t; J = 4.4 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 174.5, 137.2, 135.6, 129.0, 122.6, 122.3, 79.2, 74.9, 51.3, 48.8, 31.1, 30.6, 29.4, 28.6, 28.5, 28.3 ppm. elemental analysis calcd (%) for $C_{34}H_{52}N_4O_6$ (612): C 66.64, H 8.55, N 9.14; found: C 66.60, H 8.58, N 9.13.

3,3'-Di-n-octyl-1,1'(1,4-phenylenedimethylene)diimidazolium ±-Tartrate: Hygroscopic white solid; m.p. 201-204 °C; yield: 90%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.81 (s; 2H), 7.88 (dd; J = 1.0, 7.0 Hz; 4H), 7.55 (s; 4H), 5.53 (s; 4H), 4.23 (t; J= 4.8 Hz; 4H), 3.76 (s; 2H), 1.83 (m; 4H), 1.18 (m;

20H), 0.90 (t; J = 4.5 Hz; 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 176.5, 137.8, 136.5, 129.9, 123.6, 123.4, 80.1, 74.2, 52.3, 49.8, 32.0, 31.5, 30.2, 29.5, 29.4, 29.2 ppm. elemental analysis calcd (%) for $C_{34}H_{52}N_4O_6$ (612): C 66.64, H 8.55, N 9.14; found: C 66.65, H 8.54, N 9.15.

3,3'-Di-n-octyl-1,1'(1,4-phenylenedimethylene)diimidazolium 2,6-naphthalendicarboxylate: White solid; m.p. 186-190 °C; yield: 96%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.91 (s; 2H), 8.34 (s; 2H), 8.00 (d; J = 8.7 Hz; 2H), 7.89 (s; 4H), 7.76 (d; J= 8.4 Hz, 2H), 7.52 (s; 4H), 5.53 (s; 4H), 4.23 (t; J= 7.2 Hz; 4H), 1.83 (qt; J= 6.3 Hz; 4H), 1.19 (m; 20H), 0.88 (t; J = 6.7 Hz; 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 169.9, 140.0, 137.8, 136.6, 134.0, 130.0, 128.8, 128.1, 127.9, 123.9, 123.6, 52.5, 50.1, 32.2, 30.4, 29.5, 29.4, 26.6, 23.1, 15.0 ppm. elemental analysis calcd (%) for $C_{42}H_{54}N_4O_4$ (679): C 74.30, H 8.02, N 8.25, found: C 74.31, H 8.00, N 8.23.

3,3'-Di-n-octyl-1,1'(1,2-phenylenedimethylene)diimidazolium 2,6-naphthalendicarboxylate: White solid; m.p. 196-205 °C; yield: 95%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.76 (s; 2H), 8.32 (s; 2H), 7.96 (d; J = 8.1 Hz; 2H), 7.82 (d; J= 6.6 Hz; 4H), 7.76 (d; J= 7.8 Hz, 2H), 7.45 (m; 2H), 7.35 (m; 2H), 5.74 (s; 4H), 4.16 (t; J= 6.6 Hz; 4H), 1.77 (m; 4H), 1.19 (m; 20H), 0.82 (t; J = 6.3 Hz; 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 169.6, 138.8, 136.0, 133.5, 133.3, 130.1, 128.2, 127.4, 123.2, 49.5, 49.4, 31.6, 29.7, 28.9, 28.7, 26.0, 22.5, 14.4 ppm. elemental analysis calcd (%) for $C_{42}H_{54}N_4O_4$ (679): C 74.30, H 8.02, N 8.25, found: C 74.27, H 7.99, N 8.24.

3,3'-Di-n-octyl-1,1'(1,4-phenylenedimethylene)diimidazolium adipate: Hygroscopic white solid; yield: 95%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 10.41 (s, 2H), 7.84 (s, 2H), 7.68 (s, 2H), 7.45 (s, 4H), 5.36 (s, 4H), 4.09 (t, J= 7.2 Hz, 4H), 1.69 (m, 8H), 1.28 (m, 4H), 1.14 (m, 20H), 0.75 (t, J= 6.3 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 176.3, 137.5, 135.8, 129.2, 122.7, 122.6, 51.5, 49.0, 31.3, 29.4, 28.6, 28.4, 27.2, 25.7, 22.2, 14.1. elemental analysis calcd (%) for $C_{36}H_{56}N_4O_4$ (609): C 71.02, H 9.27, N 9.20; found: C 70.99, H 9.30, N 9.21.

3,3'-Di-n-octyl-1,1'(1,4-phenylenedimethylene)diimidazolium suberate: Hygroscopic white solid; yield: 92%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 10.43 (s, 2H), 7.95 (d, J= 1.5 Hz, 2H), 7.85 (s, 2H), 7.57 (s, 4H), 5.55 (s, 4H), 4.23 (t, J= 7.2 Hz, 4H), 1.85 (m, 8H), 1.43 (t, J= 6.9 Hz, 8H), 1.28 (m, 20H), 0.8 (t, J= 7.2 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 176.2, 137.7, 135.9, 129.1, 122.8, 122.5, 51.4, 49.0, 31.3, 29.9, 29.5, 28.6, 28.4, 27.0, 25.7, 22.2, 14.1. elemental analysis calcd (%) for $C_{38}H_{60}N_4O_4$ (637): C 71.66, H 9.50, N 8.80; found: C 71.68, H 9.48, N 8.78.

3,3'-Di-n-decyl-1,1'(1,4-phenylenedimethylene)diimidazolium ditetrafluoroborate: White solid; m.p. 113-116 °C; yield: 98%; ^{1}H NMR (400 MHz, [D6]DMSO): δ= 9.29 (s, 2H), 7.78 (dt, J= 1,6 Hz, 9,2 Hz, 4H), 7.45 (s, 4H), 5.41 (s, 4H), 4.15(t, J= 8.0 Hz, 4H), 1.77 (qt, J= 8.0 Hz, 4H), 1.23 (m, 28H), 0.85 (t, J= 8.0 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 136.7, 135.9, 129.4, 123.3, 123.0, 51.9, 49.4, 31.7, 29.7, 29.4, 29.3, 29.1, 28.8, 26.0, 22.5, 14.4 ppm. elemental analysis calcd (%) for $C_{34}H_{56}B_2F_8N_4$ (694): C 58.80, H 8.13, N 8.07, found: C 58.78, H 8.14, N 8.08.

3,3'-Di-n-decyl-1,1'(1,3-phenylenedimethylene)diimidazolium ditetrafluoroborate: orange wax-like solid; m.p. 55-59 °C; yield: 97%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.35 (s, 2H), 7.81 (m, 4H), 7.52 (s, 1H), 7.41 (m, 3H), 5.43 (s, 4H), 4.17 (t, J= 7.2 Hz, 4H), 1.79 (qt, J= 6.7 Hz, 4H), 1.24 (m, 28H), 0.85 (t, J= 6.6 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 136.7, 136.0, 130.2, 129.0, 128.8, 123.3, 123.0, 52.1, 49.4, 31.7, 29.7, 29.3, 29.3, 29.1, 28.8, 26.0, 22.5, 14.4 ppm. elemental analysis calcd (%) for $C_{34}H_{56}B_2F_8N_4$ (694): C 58.80, H 8.13, N 8.07, found: C 58.77, H 8.16, N 8.05.

3,3'-Di-n-decyl-1,1'(1,2-phenylenedimethylene)diimidazolium ditetrafluoroborate: brown oil; yield: 94%; ^{1}H NMR (300 MHz, [D6]DMSO): δ= 9.20 (s, 2H), 7.85 (s, 2H), 7.71 (s, 2H), 7.48 (m, 2H), 7.29 (m, 2H), 5.58 (s, 4H), 4.16 (t, J= 7.2 Hz, 4H), 1.79 (qt, J= 6.5 Hz, 4H), 1.24 (m, 28H), 0.85 (t, J= 6.7 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 136.9, 133.3, 130.1, 130.1, 123.3, 123.2, 49.5, 31.7, 29.8, 29.4, 29.3, 29.1, 28.8, 26.0, 22.5, 14.4 ppm. elemental analysis calcd (%) for $C_{34}H_{56}B_2F_8N_4$ (694): C 58.80, H 8.13, N 8.07, found: C 58.81, H 8.14, N 8.08.

3,3'-Di-n-decyl-1,1'(1,4-phenylenedimethylene)diimidazolium D-Tartrate: Hygroscopic white solid; m.p. 102-105 °C; yield: 99%; ^{1}H NMR (400 MHz, [D6]DMSO): δ= 9.56 (s, 2H), 7.82 (m, 4H), 7.48 (s, 4H), 5.45 (s, 4H), 4.17 (t, J= 8.0 Hz, 4H), 3.72 (s, 2H), 1.77 (qt, J= 8.0 Hz, 4H), 1.23 (m, 28H), 0.85 (t, J= 8.0 Hz, 6H) ppm; ^{13}C NMR (300 MHz, [D6]DMSO): δ= 175.4, 136.0, 129.4, 123.2, 122.9, 72.4, 51.9, 49.4, 31.7, 29.8, 29.3, 29.3, 29.1, 28.8, 26.0, 22.5, 14.4 ppm; elemental analysis calcd (%) for $C_{38}H_{60}N_4O_6$ (668): C 68.23, H 9.04, N 8.38, found: C 68.25, H 9.02, N 8.40. $[a]_{24.1\,^{\circ}C}^{589nm}$ = -5.0°.

3,3'-Di-n-decyl-1,1'(1,4-phenylenedimethylene)diimidazolium 2,6-naphthalendicarboxylate: White solid; m.p. 223-228 °C; yield: 98%; ^{1}H NMR (400 MHz, [D6]DMSO): δ= 9.61 (s, 2H), 8.42 (s, 2H), 7.98 (d, J= 8.0 Hz, 2H), 7.88 (d, J= 8.0 Hz, 2H), 7.81 (m, 4H), 7.45 (s, 4H), 5.44 (s, 4H), 4.16 (t, J= 8.0 Hz, 4H), 1.76 (qt, J= 8.0 Hz, 4H), 1.24 (m, 28H), 0.83 (t, J= 8.0 Hz, 6H) ppm. ^{13}C NMR

(300 MHz, [D6]DMSO): δ= 168.98, 136.94, 135.93, 135.42, 133.34, 129.35, 127.36, 123.31, 122.96, 51.88, 49.41, 48.93, 31.73, 29.72, 29.27, 29.11, 28.78, 25.96, 22.55, 14.42 ppm; elemental analysis calcd (%) for $C_{46}H_{62}N_4O_4$ (734): C 75.17, H 8.50, N 7.62, found: C 75.19, H 8.51, N 7.65.

Preparation of solution for biological tests

Samples for a typical biological test were prepared by weighing in a screw capped vial the proper amount of desired salt. Each salt was firstly dried under vacuum at 60 °C for at least 2 hours. After drying the sample into the vials for additional two hours. the salts were dissolved in DMSO (1 mL). The concentration of each solution was chosen depending on the salt solubility.

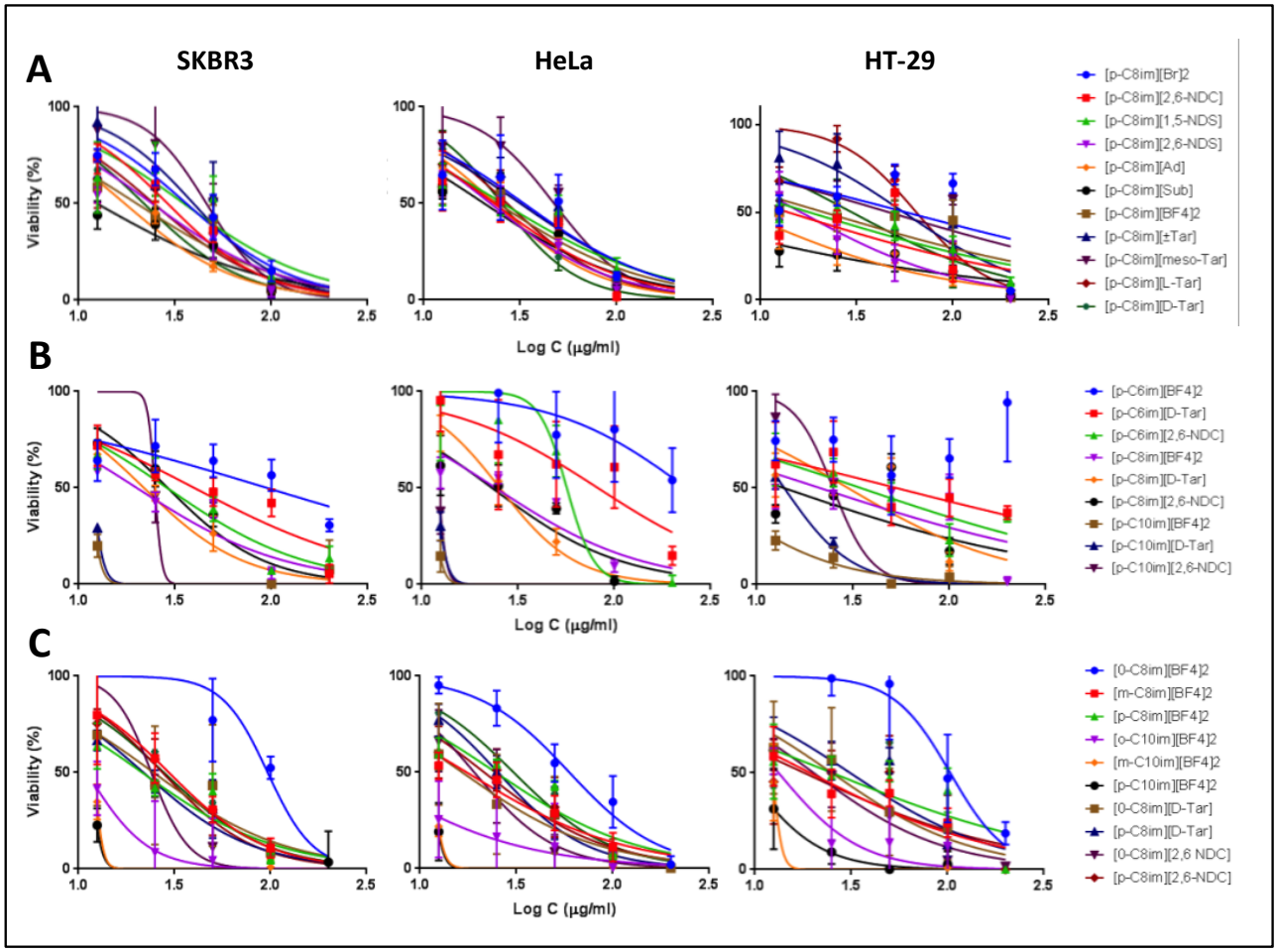

Figure S1. Dose–response curves of DOSs in cancer cell lines SKBR3, HeLa and HT-29 as function of different anion nature (A), alkyl chain length on the imidazolium ion (B) and isomeric substitution (C).

Microbiological assays

Antimicrobial activity was preliminarily evaluated using the diffusion agar technique.

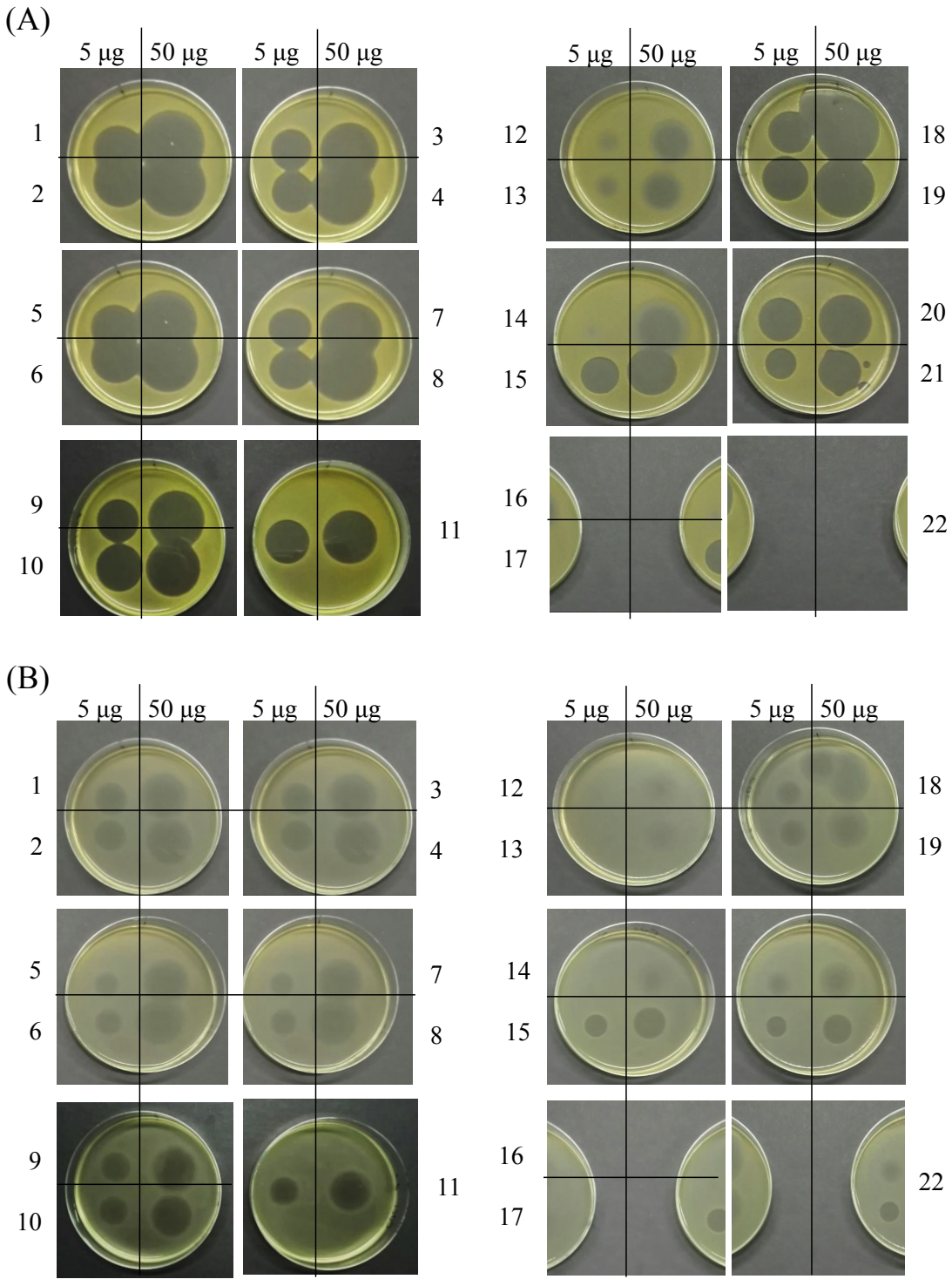

Figure S2. Representative agar diffusion tests performed using *K rhizophila* (A) and *E. coli* (B) as tester strains. DOS amounts were directly spotted on bacterial tester overlay and bacterial growth inhibition halos were observed with the higher DOS amount, the larger halo diameter. Numbers in (A) and (B) refer to : 1) [p-C8im][Br]2; 2) [p-C8im][2,6-NDC]; 3) [p-C8im][1,5-NDS]; 4) [p-C8im][2,6-NDS]; 5)[p-C8im][Ad]; 6) [p-C8im][Sub]; 7) [p-C8im][BF4]2; 8) [p-C8im][± Tar]; 9) [p-C8im][meso-Tar]; 10)[p-C8im][L-Tar]; 11)[p-C8im][D-Tar]; 12) [p-C6im][BF4]2; 13) [p-C6im][D-Tar]; 14) [p-C6im][2,6-NDC]; 15) [p-C10im][BF4]2; 16) [p-C10im][D-Tar]; 17)[p-C10im][2,6-NDC]; 18) [o-C8im][D-Tar]; 19) [o-xil-(oim)2][2,6-NDC]; 20) [m-C8im][BF4]2; 21) [m-C10im][BF4]2; 22) [o-C10im][BF4]2.

In order to evaluate MIC_{90} values, the bacterial tester strains were inoculated at the concentration of 10^6 cell/ml and incubated for 24 h in presence of different concentration of the different DOSs. Then the bacterial growth was comparatively evaluated using parallel untreated bacterial cultivations as control condition and the growth was reported as percentage values of optical density (OD) in the respect of control. The MIC_{90} was determined as the minimal DOS concentration among those tested causing more than 90% of bacterial growth reduction in terms OD. Mean values from at least three biological replicates are reported with standard deviation bars. Statistical test (one way ANOVA) was performed to asses significance ($P<0.05$) of spectrophotometric measuraments.

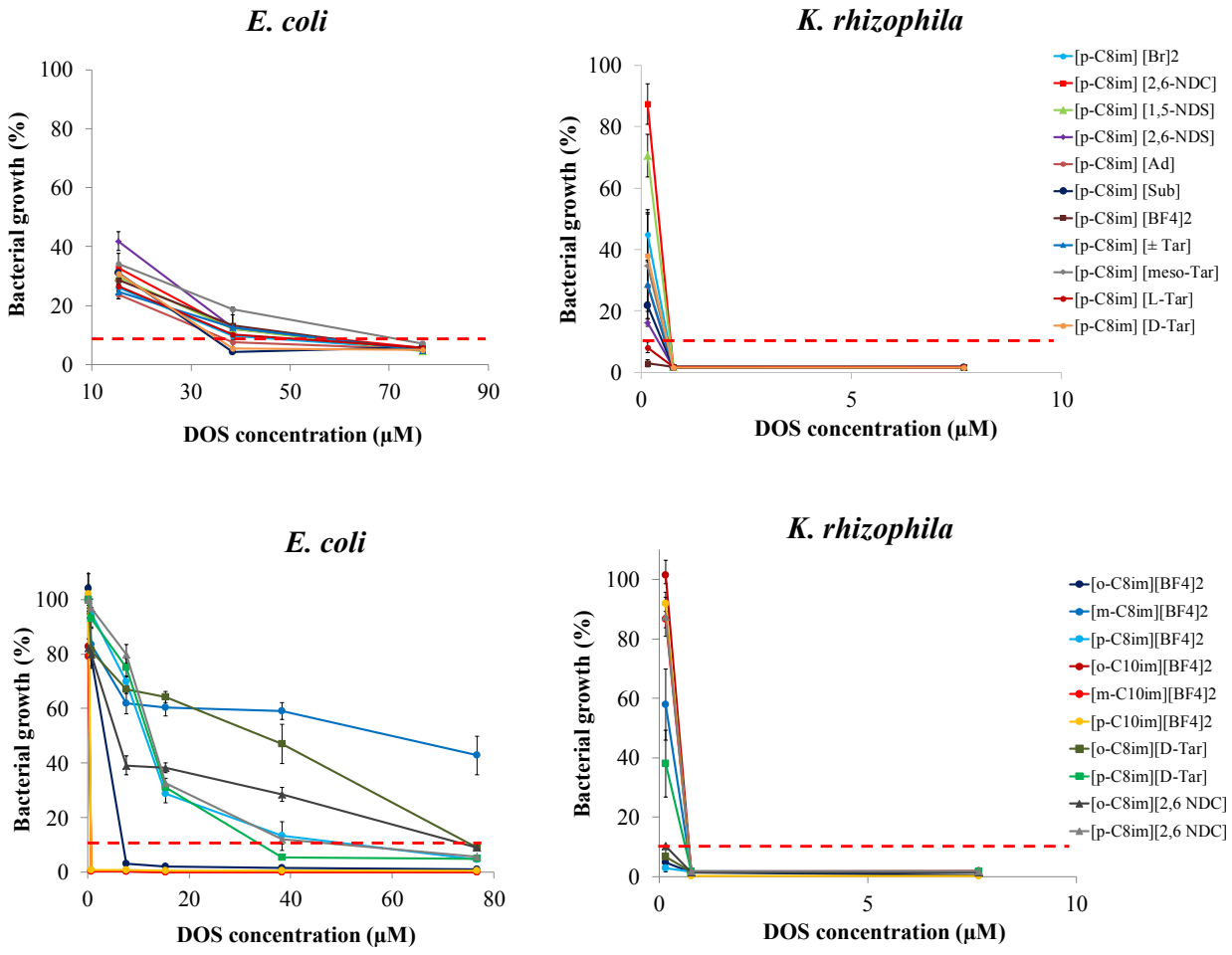

Figure S3. Examples of MIC_{90} values determination of bacterial cell growth using spectrophotometric measurement a 600 nm. Bacterial growth values are reported as OD percentage in the respect of unexposed cultivations (control condition) and were calculated as mean of three independent biological replicas. Vertical bars represent standard deviation. Dashed red line represent percentage threshold for MIC_{90} evaluation.

Table S1. IC_{50} values at 24h of the 23 synthesized DOSs in cancer cell lines SKBR3. HeLa and HT-29.

	IC_{50} (µM)±SD		
	SKBR3	**HeLa**	**HT-29**
[*p*-C_8im][Br]2	72.7±12.0	66.4±19.2	113.9±48.1
[*p*-C_8im][2,6-NDC]	53.4±9.8	42. 8±10.3	25.6±14.7
[*p*-C_8im][1,5-NDS]	58.7±22.2	43.0±14.6	29.8±12.0
[*p*-C_8im][2,6-NDS]	40.2±12.0	37.0±4.7	27.1±7.3
[*p*-C_8im][Ad]	35.8±9.8	48.4±6.6	16.3±4.1
[*p*-C_8im][Sub]	24.6±6.3	42.4±7.9	23.6±7.6
[*p*-C_8im][BF4]$_2$	39.3±8.6	47.6±13.3	41.9±11.8
[*p*-C_8im][±Tar]	80.5±20.4	64.6±13.9	113.1±26.1
[*p*-C_8im][meso-Tar]	94.0±16.3	96.5±19.6	94.6±32.6
[*p*-C_8im][L-Tar]	50.2±10.6	55.3±11.4	131.5±24.5
[*p*-C_8im][D-Tar]	44.6±8.2	52.0±5.7	60.9±12.6
[*p*-C_6im][BF_4]$_2$	>429.5	>429.6	>429.6
[*p*-C_6im][D-Tar]	179.5±44.8	184.5±90.67	119.4±46.7
[*p*-C_6im][2,6-NDC]	64.2±16.9	113.7±24.1	69.7±25.7
[*p*-C_{10}im][BF_4]$_2$	14.4±7.2	14.4±7.2	9.4±3.6
[*p*-C_{10}im][D-Tar]	15.0±7.5	15.0±7.5	14.9±7.5
[*p*-C_{10}im][2,6-NDC]	13.6±6.8	13.6±6.8	13.6±6.8
[*o*-C_8im][BF_4]$_2$	156.7±40.7	116.5±27.4	202.4±45.5
[*o*-C_8im][D-Tar]	73.3±17.1	55.5±10.6	77.2±16.3
[*o*-C_8im][2,6-NDC]	44.3±7.4	33.1±7.4	38.7±8.8
[*m*-C_8im][BF_4]$_2$	60.3±8.6	36.0±7.1	53.9±9.4
[*m*-C_{10}im][BF_4]$_2$	14.4±7.2	14.4±7.2	14.4±7.2
[*o*-C_{10}im][BF_4]$_2$	14.4±7.2	14.4±7.2	14.4±7.2
Doxorubicin	4.1±0.5	1.5±0.3	1.5±0.1

Table S2. IC_{50} values calculated at 24 and 48h of **[*p*-C_8im][BF_4]$_2$ [*m*-C_8im][BF_4]$_2$ [*o*-C_8im][BF_4]$_2$** non tumoral epithelial mammary cell line (HB2) and tumoral mammary cell line (SKBR3)

Compound	**IC_{50} (µM) against HB2**		**IC_{50} (µM) against SKBR3**		**(IC_{50}^{HB2}/ IC_{50}^{SKBR3})**	
	24h	*48h*	*24h*	*48h*	*24h*	*48h*
[*p*-C_8im][BF_4]$_2$	82.3±7.5	137.3±11.3	39.3±8.6	15.7±2.5	2.1	8.8
[*m*-C_8im][BF_4]$_2$	117.6±3.7	172.4±12.7	60.3±8.6	29.6±5.0	2.0	5.8
[*o*-C_8im][BF_4]$_2$	>391.9	>391.9	156.7±40.8	109.7±12.6	>2.5	>3.6
Doxorubicin	15.8±2.1	5.3±1.0	4.1±0.5	1.1±0.1	3.8	4.7

Table S3. MIC_{90} values of DOSs against different bacterial tester strains.

	Gram-negative	Gram-positive		
	E. coli	*K. rhizophila*	*S.aureus*	*B. subtilis*
DOS	**µM (µg/mL)**	**µM (µg/mL)**	**µM (µg/mL)**	**µM (µg/mL)**
[*p*-C_8im][Br]2	40 (25)	0.8 (0.5)	*	40 (25)
[*p*-C_8im][2,6-NDC]	74 (50)	0.7 (0.5)	*	15 (10)
[*p*-C_8im][1,5-NDS]	66 (50)	0.7 (0.5)	*	33 (25)
[*p*-C_8im][2,6-NDS]	67 (50)	0.7 (0.5)	*	33 (25)
[*p*-C_8im][Ad]	41 (25)	0.8 (0.5)	*	16 (10)
[*p*-C_8im][Sub]	39 (25)	0.8 (0.5)	*	16 (10)
[*p*-C_8im][BF_4]$_2$	78 (50)	0.2 (0.1)	*	39 (25)
[*p*-C_8im][±Tar]	82 (50)	0.8 (0.5)	*	41 (25)
[*p*-C_8im][*meso*-Tar]	82 (50)	0.8 (0.5)	*	41 (25)
[*p*-C_8im][L-Tar]	41 (25)	0.2 (0.1)	*	16 (10)
[*p*-C_8im][D-Tar]	41 (25)	0.8 (0.5)	*	16 (10)
[*p*-C_6im][BF_4]$_2$	*	86 (50)	*	*
[*p*-C_6im][D-Tar]	*	45 (25)	*	*
[*p*-C_6im][2,6-NDC]	*	161 (100)	*	160 (100)
[*p*-C_{10}im][BF_4]$_2$	0.7 (0.5)	0.7 (0.5)	72 (50)	0.7 (0.5)
[*p*-C_{10}im][D-Tar]	7 (5)	0.7 (0.5)	75 (50)	0.7 (0.5)
[*p*-C_{10}im][2,6-NDC]	7 (5)	0.7 (0.5)	68 (50)	0.1 (0.1)
[*o*-C_8im][BF_4]$_2$	8 (5)	0.2 (0.1)	*	39 (25)
[*o*-C_8im][D-Tar]	81 (50)	0.2 (0.1)	*	8 (5)
[o-C_8im][2,6-NDC]	74 (50)	1 (0.1)	*	7 (5)
[*m*-C_8im][BF_4]$_2$	157 (100)	0.8 (0.5)	*	8(5)
[*m*-C_{10}im][BF_4]$_2$	0.7 (0.5)	0.7 (0.5)	36 (25)	7 (5)
[*o*-C_{10}im][BF_4]$_2$	0.7 (0.5)	0.7 (0.5)	14 (10)	7 (5)

* No bacterial growth inhibition at the maximal concentration (100 µg/mL) tested.

Table S4. Selectivity index calculated for [p-C_8im][BF_4]$_2$, [m-C_8im][BF_4]$_2$ and [o-C_8im][BF_4]$_2$ as ratio between 24 h IC_{50} values against HB2 cells and MIC_{90} values against *E. coli*, *K. rhizophila* and *B. subtilis*, respectively.

DOS	IC_{50}^{HB2} / $MIC_{90}^{E.\ coli}$	IC_{50}^{HB2} / $MIC_{90}^{K.\ rhizophila}$	IC_{50}^{HB2} / $MIC_{90}^{B.\ subtilis}$
[*p*-C_8im][BF_4]$_2$	1.05	411.5	2.11
[*m*-C_8im][BF_4]$_2$	0.75	147.00	14.7
[*o*-C_8im][BF_4]$_2$	48.99	1959.50	10.05