Supplementary information

Experimental Section

All chemicals and solvents used were purchased from Acros Organic, Alfa Aesar or Sigma Aldrich as reagent grade and used without further purification. Melting points were determined with a Thermo Scientific Electrothermal Digital Melting Point Apparatus and are provided as uncorrected values. ^{1}H and ^{13}C NMR spectra were recorded with a Bruker AC or a Bruker Avance 500 spectrometer at 250 or 500 MHz in $CDCl_3$ or DMSO-d_6 as specified. ^{77}Se spectra were measured with a Bruker Avance 500 at 92.5 MHz in $CDCl_3$ or DMSO-d_6. All chemical shifts are reported in parts per million (ppm). Tetramethylsilane (TMS) and dimethylselenide were used as standard reference for ^{1}H and ^{13}C (δ 0 ppm) and for ^{77}Se, respectively. MS spectra were recorded on an Agilent Technologies GC-MS instrument equipped with a 7683 injector, 6890N gas chromatograph and a 5973 mass selective detector. The mass spectrometer was operated in EI mode at 70 eV, and MS spectra were recorded from m/z 50 to 650.

All reactions were routinely checked by TLC analysis on an Alugram SIL G/UV254 plate (Macherey-Nagel) with spots visualized by UV light.

General Procedure for Synthesis of 1-Hydroalkylphenyl Selenide (Telluride)

1-Hydroalkylphenyl selenide was synthesized according to Han *et al*, with some modifications.[1] Briefly, diphenyl diselenide or diphenyl ditelluride (1 eq.) was dissolved in 20 ml of anhydrous THF under argon, and then 20 ml of an aqueous solution of 5.0 eq. sodium borohydride was added. The reaction mixture was stirred for 10 min until the solution turned colourless, indicating the formation of PhSeNa or PhTeNa, respectively. The PhSeNa or PhTeNa solution was stirred for a further 20 min. A solution of a bromoalkylalcohol (2 eq.) in 5ml THF was then added to the reaction mixture and the reaction was kept at 50°C for 12 h under argon flow (for the telluride compound at 40°C). Then 50 ml of saturated aqueous NH_4Cl solution was added to the reaction mixture and the product was extracted with CH_2Cl_2 (3×50ml). The organic layers were combined and dried with $MgSO_4$, filtered, and the solvent was evaporated under vacuum. The oily solid obtained was purified by column chromatography with CH_2Cl_2 as the eluent. (R_f values of all compounds were between 0.2 to 0.3)

8-(phenylselanyl)octan-1-ol (DP11). Yield: 92%; white powder; mp 41°C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.45-7.47 (m, 2H, benzene protons), 7.20-7.25 (m, 3H, benzene protons), 3.60-3.62 (t, 2H, J = 7Hz, -CH_2OH), 2.87-2.90 (t, 2H, J = 7.5Hz, -SeCH_2-), 1.65-1.71 (m, 2H, -CH_2CH$_2$OH), 1.50-1.55 (m, 2H, -SeCH$_2$CH_2-), 1.25-1.40 (m, 8H, -(CH_2)$_4$CH$_2$CH$_2$OH) ppm; ^{13}C NMR (125 MHz, $CDCl_3$) δ 132.37 (2C), 130.64, 128.96 (2C), 126.58, 63.01, 32.73, 30.09, 29.71, 29.23, 29.00, 27.90, 25.63 ppm; ^{77}Se NMR (92.5 MHz, CDCl3) δ 291.02 ppm; HRMS (ESI) $[M+H]^+$ $C_{14}H_{23}OSe$ calcd. 287.0909, found 287.0916.

9-(phenylselanyl)nonan-1-ol (DP12). Yield: 87%; white powder; mp 46°C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.45-7.47 (m, 2H, benzene protons), 7.20-7.25 (m, 3H, benzene protons), 3.60-3.63 (t, 2H, J = 6.5Hz, -CH_2OH), 2.87-2.90 (t, 2H, J = 7.5Hz, -SeCH_2-), 1.65-1.71 (m, 2H, -CH$_2$CH_2OH), 1.50-1.56 (m, 2H, -SeCH$_2$CH_2-), 1.25-1.39 (m, 10H, -(CH_2)$_5$CH$_2$CH$_2$OH) ppm; ^{13}C NMR (125 MHz, $CDCl_3$) δ 132.37 (2C), 130.68, 128.96 (2C), 126.58, 63.05, 32.77, 30.12, 29.78, 29.42, 29.32, 28.99, 27.93, 25.69 ppm; ^{77}Se NMR (92.5 MHz, $CDCl_3$) δ 290.94 ppm; HRMS (ESI) $[M+Na]^+$ $C_{15}H_{24}NaOSe$ calcd 323.0885, found 323.0917.

10-(phenylselanyl)decan-1-ol (DP13). Yield: 96%; white powder; mp 52°C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.45-7.47 (m, 2H, benzene protons), 7.20-7.25 (m, 3H, benzene protons), 3.60-3.63 (t, 2H, J = 6.5Hz, -CH_2OH), 2.87-2.90 (t, 2H, J = 7.5Hz, -SeCH_2-), 1.65-1.71 (m, 2H, -CH$_2$CH_2OH), 1.51-1.55 (m, 2H, -SeCH$_2$CH_2-), 1.25-1.39 (m, 12H, -(CH_2)$_6$CH$_2$CH$_2$OH) ppm; ^{13}C NMR (125 MHz, $CDCl_3$) δ 132.35 (2C), 130.69, 128.95 (2C), 126.56, 63.06, 32.78, 30.12, 29.79, 29.48, 29.38, 29.36, 29.03, 27.93, 25.70 ppm; ^{77}Se NMR (92.5 MHz, $CDCl_3$) δ 290.96 ppm; HRMS (ESI) $[M+H]^+$ $C_{16}H_{27}OSe$ calcd. 315.1222, found 315.1223.

11-(phenylselanyl)undecan-1-ol (DP14). Yield: 92%; white powder; mp 58°C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.45-7.47 (m, 2H, benzene protons), 7.20-7.25 (m, 3H, benzene protons), 3.60-3.63 (t, 2H, J = 6.5Hz, -CH_2OH), 2.87-2.90 (t, 2H, J = 7.5Hz, -SeCH_2-), 1.65-1.71 (m, 2H, -CH$_2$CH_2OH), 1.51-1.57 (m, 2H, -SeCH$_2$CH_2-), 1.24-1.39 (m, 14H, -(CH_2)$_7$CH$_2$CH$_2$OH) ppm; ^{13}C NMR (125 MHz, $CDCl_3$) δ 132.34 (2C), 130.70, 128.95 (2C), 126.56, 63.06, 32.79, 30.12, 29.80, 29.54, 29.46, 29.44, 29.39, 29.05, 27.94, 25.71 ppm; ^{77}Se NMR (92.5 MHz, $CDCl_3$) δ 290.94 ppm; HRMS (ESI) $[M+H]^+$ $C_{17}H_{29}OSe$ calcd 329.1379, found 329.1384.

12-(phenylselanyl)dodecan-1-ol (DP15). Yield: 85%; white powder; mp 63°C, ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.45-7.47 (m, 2H, benzene protons), 7.20-7.24 (m, 3H, benzene protons), 3.60-3.63 (t, 2H, J = 6.5Hz, -CH_2OH), 2.87-2.90 (t, 2H, J = 6.5Hz, -SeCH_2-), 1.65-1.69 (m, 2H, -CH$_2$CH_2OH), 1.53-1.56 (m, 2H, -SeCH$_2$CH_2-), 1.23-1.39 (m, 16H, -(CH_2)$_8$CH$_2$CH$_2$OH) ppm; ^{13}C NMR (125 MHz, $CDCl_3$) δ 132.34 (2C), 130.70, 128.95 (2C), 126.56, 63.08, 32.80, 30.13, 29.81, 29.56, 29.52 (2C), 29.46, 29.41, 29.05, 27.94, 25.72; ^{77}Se NMR (92.5 MHz, $CDCl_3$) δ 290.94 ppm; HRMS (ESI) $[M+H]^+$ $C_{18}H_{31}OSe$ calcd. 343.1535, found 343.1539.

8-(phenyltellanyl)octan-1-ol (DP21). Yield: 97%; orange oil; ^{1}H NMR (500 MHz,$CDCl_3$) δ 7.75-7.77 (m, 2H, benzene protons), 7.23-7.33 (m, 3H, benzene protons), 3.64-3.67 (t, 2H, J = 6.5Hz, -CH_2OH), 2.93-2.96 (t, 2H, J = 7.5Hz, -TeCH_2-), 1.81-1.87 (m, 2H, -CH_2CH$_2$OH), 1.62-1.56 (2H, m, -TeCH$_2$CH_2-), 1.32-1.44 (m, 8H, - (CH_2)$_4$CH$_2$CH$_2$OH) ppm; ^{13}C NMR (125 MHz, $CDCl_3$) δ 138.11 (2C), 128.99 (2C), 127.31, 111.73, 62.78, 32.60, 31.74, 31.63, 29.15, 28.74, 25.56, 8.67 ppm; HRMS (ESI) $[M+H]^+$ $C_{14}H_{23}OTe$ calcd. 337.0806, found 337.0812.

9-(phenyltellanyl)nonan-1-ol (DP22). Yield: 95%; orange oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.75-7.77 (m, 2H, benzene protons), 7.23-7.33 (m, 3H, benzene protons), 3.66-3.68 (t, 2H, J = 6.5Hz, -CH_2OH), 2.93-2.96 (t, 2H, J = 7.5Hz, -TeCH_2-), 1.83-1.87 (m, 2H, -CH_2CH$_2$OH), 1.57-1.63 (m, 2H, -TeCH$_2$CH_2-), 1.31-1.43 (m, 10H, -(CH_2)$_5$CH$_2$CH$_2$OH) ppm; ^{13}C NMR (125 MHz, $CDCl_3$) δ 138.17 (2C), 129.04 (2C), 127.36, 111.78, 62.80, 32.70, 31.84, 31.69, 29.36, 29.27, 28.76, 25.65, 8.74 ppm. HRMS (ESI) $[M+H]^+$ $C_{15}H_{25}OTe$ calcd. 351.0962, found 351.0958.

10-(phenyltellanyl)decan-1-ol (DP23). Yield: 96%; orange oil; ^{1}H NMR (250 MHz, $CDCl_3$) δ 7.69-7.73 (m, 2H, benzene protons), 7.16-7.30 (m, 3H, benzene protons), 3.62-3.66 (t, 2H, J = 5Hz, -CH_2OH), 2.87-2.93 (t, 2H, J = 7.5Hz, -TeCH_2-), 1.74-

1.85 (m, 2H, -CH_2CH$_2$OH), 1.51-1.59 (m, 2H, -TeCH$_2$CH_2-), 1.26-1.43 (m, 12H, -(CH_2)$_6$CH$_2$CH$_2$OH) ppm; ^{13}C NMR (62.5 MHz, CDCl$_3$) δ 138.37 (2C), 128.73 (2C), 126.85, 111.82, 63.05, 32.78, 31.90, 31.75, 29.49, 29.38, 28.86, 29.37, 25.70, 8.78 ppm; HRMS (ESI) [M+H]$^+$ $C_{16}H_{27}OTe$ calcd. 365.1119, found 365.1120.

11-(phenyltellanyl)undecan-1-ol (DP24). Yield: 98%; white powder; mp 39°C;^{1}H NMR (500 MHz, DMSO-d$_6$) δ 7.63-7.65 (m, 2H, benzene protons), 7.20-7.28 (m, 3H, benzene protons), 3.35-3.38 (m, 2H, -CH_2OH), 2.88-2.91 (t, 2H, *J* = 7Hz, -TeCH_2-), 1.69-1.75 (m, 2H, -CH_2CH$_2$OH), 1.36-1.41 (m, 2H, -TeCH$_2$CH_2-), 1.21-1.34 (m, 14H, -(CH_2)$_7$CH$_2$CH$_2$OH) ppm; ^{13}C NMR (125 MHz, DMSO-d$_6$) δ 137.06 (2C), 129.24 (2C), 127.18, 112.06, 60.71, 32.52, 31.15 (2C), 29.02, 28.91, 28.88, 28.84, 28.21, 25.47, 8.21 ppm; HRMS [M+H]$^+$ $C_{17}H_{29}OTe$ calcd. 379.1275, found 379.1266.

12-(phenyltellanyl)dodecan-1-ol (DP25). Yield: 90%; yellow powder; mp 43°C; ^{1}H NMR (250 MHz, CDCl$_3$) δ 7.69-7.72 (m, 2H, benzene protons), 7.16-7.30 (m, 3H, benzene protons), 3.62-3.67 (t, 2H, *J* = 7.5Hz, -CH_2OH), 2.87-2.93 (t, 2H, *J* = 7.5Hz, -TeCH_2-), 1.74-1.85 (2H, m, -CH_2CH$_2$OH), 1.51-1.57 (m, 2H, -TeCH$_2$CH_2-), 1.25-1.43 (m, 16H, -(CH_2)$_8$CH$_2$CH$_2$OH) ppm; ^{13}C NMR (62.5 MHz, CDCl$_3$) δ 138.21 (2C), 129.07 (2C), 127.39, 111.82, 63.09, 32.80, 31.92, 29.56, 29.45, 29.40, 29.29, 29.13, 29.04, 28.88, 25,72, 8.79 ppm; HRMS (ESI) [M+H]$^+$ $C_{18}H_{31}OTe$ calcd. 393.1432, found 393.1428.

General Procedure for Synthesis of sodium phenylselanyl-alkyl sulfate.
1-Hydroalkylphenyl selenide or telluride (1eq.) was dissolved in 25ml anhydrous diethyl ether, then 1.5 eq. chlorosulfonic acid was added dropwise cautiously under nitrogen gas at 0°C for 10 min. The reaction mixture was stirred for a further 30 min. 1.0 eq of NaHCO$_3$ powder was added to the reaction mixture, then water was added dropwise until no further gas developed. The organic mixture was dried with MgSO$_4$. The remaining solid was separated, washed with anhydrous diethyl ether several times and the compound contained therein was resolubilized using 250 ml ethanol. The residual MgSO$_4$ and NaHCO$_3$ were removed by filtration. The solvent was evaporated and the product collected.

Sodium 8-(phenylselanyl)octyl sulfate (DP31). Yield: 69%; white powder; mp 112°C; ^{1}H NMR (500 MHz, DMSO-d$_6$) δ 7.44-7.46 (m, 2H, benzene protons), 7.21-7.30 (m, 3H, benzene protons), 3.34-3.38 (m, 2H, -CH_2OSO$_3$Na), 2.92-2.95 (t, 2H, *J* = 7.5Hz, -SeCH_2-), 1.59-1.62 (m, 2H, -CH_2CH$_2$OSO$_3$Na, 1.33-1.42 (m, 2H, -SeCH$_2$CH_2-), 1.20-1.26 (m, 8H, -(CH_2)$_5$CH$_2$CH$_2$OSO$_3$Na) ppm; ^{13}C NMR (125 MHz, DMSO-d$_6$) δ 131.29 (2C), 130.28, 129.15 (2C), 126.37, 60.69, 29.50, 28.97, 28.90, 28.84, 28.40, 26.65, 25.47; ^{77}Se NMR (92.5 MHz, DMSO-d$_6$) δ 283.17 ppm; HRMS (ESI) [M-Na]$^-$ $C_{14}H_{21}O_4SSe$ calcd. 365.0331, found 365.0337.

Sodium 9-(phenylselanyl)nonyl sulfate (DP32). Yield, 84%; white powder; mp 122°C; ^{1}H NMR (500 MHz, DMSO-d$_6$) δ:7.43-7.46 (m, 2H, benzene protons), 7.21-7.30 (m, 3H, benzene protons), 3.64-3.67 (t, 2H, *J* = 6.5Hz, -CH_2OSO$_3$Na), 2.92-2.95 (t, 2H, *J* = 7.5Hz, -SeCH_2-), 1.59-1.65 (m, 2H, -CH_2CH$_2$OSO$_3$Na), 1.42-1.51 (2H, m, -SeCH$_2$CH_2-), 1.18-1.36 (m, 10H, -(CH_2)$_5$CH$_2$CH$_2$OSO$_3$Na) ppm; ^{13}C NMR (125 MHz, DMSO-d$_6$) δ 131.31 (2C), 130.26, 129.17 (2C), 126.38, 65.41, 29.51, 29.04, 29.01, 28.84, 28.64, 28.35, 26.64, 25.46 ppm;^{77}Se NMR (92.5 MHz, DMSO-d$_6$) δ 283.17 ppm; HRMS (ESI) [M-Na]$^-$ $C_{15}H_{23}O_4SSe$ calcd. 365.0337, found 365.0331.

Sodium 10-(phenylselanyl)decyl sulfate (DP33). Yield, 81%; white powder; mp 125°C; ^{1}H NMR (500 MHz, DMSO-d$_6$) δ 7.43-7.45 (m, 2H, benzene protons), 7.22-7.29 (m, 3H, benzene protons), 3.65-3.68 (t, 2H, *J* = 6.5Hz, -CH_2OSO$_3$Na), 2.91-2.94 (t, 2H, *J* = 7.5Hz, -SeCH_2-), 1.58-1.64 (m, 2H, -CH_2CH$_2$OSO$_3$Na), 1.43-1.48 (m, 2H, -SeCH$_2$CH_2-), 1.22-1.36 (m, 12H, -(CH_2)$_6$CH$_2$CH$_2$OSO$_3$Na) ppm; ^{13}C NMR (125 MHz, DMSO-d$_6$) δ: 131.30 (2C), 130.25, 129.17 (2C), 126.38, 65.45, 29.49, 29.03, 28.88, 28.82, 28.71, 28.37, 26.64, 25.48; ^{77}Se NMR (92.5 MHz, DMSO-d$_6$) δ 283.15 ppm; HRMS (ESI) [M-Na]$^-$ $C_{16}H_{25}O_4SSe$ calcd. 393.0644, found 393.0671.

Sodium 11-(phenylselanyl)undecyl sulfate (DP34). Yield, 73%; white powder; mp 130°C; ^{1}H NMR (500 MHz, DMSO-d$_6$) δ 7.44-7.46 (m, 2H, benzene protons), 7.21-7.30 (m, 3H, benzene protons), 3.65-3.67 (t, 2H, *J* = 7Hz, -CH_2OSO$_3$Na), 2.92-2.95 (t, 2H, *J* = 7.5Hz, -SeCH_2-), 1.65-1.57 (m, 2H, -CH_2CH$_2$OSO$_3$Na), 1.44-1.49 (m, 2H, -SeCH$_2$CH_2-), 1.19-1.37 (m, 14H, -(CH_2)$_7$CH$_2$CH$_2$OSO$_3$Na) ppm; ^{13}C NMR (125 MHz, DMSO-d$_6$) δ , 132.61, 131.30, 130.67, 129.94, 129.61, 128.67, 65.33, 32.49, 28.97, 28.79, 28.74, 28.60, 28.56, 28.49, 28.20, 28.08, 25.40 ppm; ^{77}Se NMR (92.5 MHz, DMSO-d$_6$) δ 283.24 ppm; HRMS (ESI) [M-Na]$^-$ $C_{17}H_{27}O_4SSe$ calcd. 407.0801, found 407.0815.

Sodium 12-(phenylselanyl)dodecyl sulfate (DP35). Yield: 96%; colourless solid; mp 137°C; ^{1}H NMR (500 MHz, DMSO-d$_6$) δ 7.43-7.46 (m, 2H, benzene protons), 7.21-7.31 (m, 3H, benzene protons), 3.65-3.68 (t, 2H, *J* = 6.5Hz, -CH_2OSO$_3$Na), 2.92-2.95 (t, 2H, *J* = 7.5Hz, -SeCH_2-), 1.58-1.64 (m, 2H, -CH_2CH$_2$OSO$_3$Na), 1.44-1.50 (m, 2H, -SeCH$_2$CH_2-), 1.22-1.36 (m, 14H, -(CH_2)$_7$CH$_2$CH$_2$OSO$_3$Na) ppm; ^{13}C NMR (125 MHz, DMSO-d$_6$) δ 131.29 (2C), 130.27, 129.16 (2C), 126.37, 65.42, 29.49, 29.05, 29.00, 28.99, 28.95, 28.90, 28.86, 28.75, 28.38, 26.64, 25.50 ppm; ^{77}Se NMR (92.5 MHz, DMSO-d$_6$) δ 283.15 ppm; HRMS (ESI) [M-Na]$^-$ $C_{18}H_{29}O_4SSe$ calcd. 421.0957, found 421.1003.

Sodium 8-(phenyltellanyl)octyl sulfate (DP41). Yield: 65%; orange powder; mp 108°C; ^{1}H NMR (250 MHz, CDCl$_3$) δ 8.17-8.15 (m, 2H, benzene protons), 7.59-7.54 (m, 3H, benzene protons), 4.38-4.25 (m, 2H, -CH_2OSO$_3$Na), 3.86-3.57 (m, 2H, -TeCH_2-), 2.26-2.23 (m, 2H, -CH_2CH$_2$OSO$_3$Na), 1.80-1.77 (m, 2H, -TeCH$_2$CH_2-), 1.43-1.27 (m, 8H, -(CH_2)$_5$CH$_2$CH$_2$OSO$_3$Na) ppm; ^{13}C NMR (125 MHz, DMSO-d$_6$) δ 133.01, 132.75, 132.57, 129.31, 128.96, 128.72, 65.42, 30.97, 30.67, 29.07, 28.61, 28.47, 28.39, 25.42, 25.38 HRMS (ESI) [M-Na]$^-$ $C_{14}H_{21}O_4STe$ calcd. 415.0227, found 415.0248.

Sodium 9-(phenyltellanyl)nonyl sulfate (DP42). Yield: 85%; orange powder; mp 124°C; ^{1}H NMR (250 MHz, CDCl$_3$) δ 8.16 (m, 2H, benzene protons), 7.58 (m, 3H, benzene protons), 4.35 (m, 2H, -CH_2OSO$_3$Na), 3.79 (m, 2H, -TeCH_2-), 2.28 (m, 2H, -CH_2CH$_2$OSO$_3$Na), 1.80 (m, 2H, -TeCH$_2$CH_2-), 1.57-1.39 (m, 10H, -(CH_2)$_5$CH$_2$CH$_2$OSO$_3$Na); ^{13}C NMR (62.5 MHz, CDCl$_3$) δ 133.28 (2C), 131.87, 131.77, 130.13-129.89 (2C), 70.48, 31.01, 30.79, 29.16, 28.82, 28.68, 25.54, 25.27, 25.10; HRMS (ESI) $C_{15}H_{23}O_4STe$ calcd. [M-Na]$^-$ 429.0383, found 429.0380.

Sodium 10-(phenyltellanyl)decyl sulfate (DP43). Yield: 81%; orange powder; mp 127°C; ^{1}H NMR (250 MHz, CDCl$_3$) δ 8.17-8.15 (m, 2H, benzene protons), 7.83-7.56 (m, 3H, benzene protons), 4.22 (m, 2H, -CH_2OSO$_3$Na), 3.79-3.75 (t, 2H, *J* = 5 Hz,

-TeCH_2-), 2.27-2.24 (m, 2H, -CH_2CH_2OSO$_3$Na), 1.74 (m, 2H, -TeCH$_2$CH_2-), 1.55-1.33 (m, 12H, -(CH_2)$_6$CH$_2$CH$_2$OSO$_3$Na) ppm; ^{13}C NMR (62.5 MHz, CDCl$_3$) δ 133.26, 133.09, 132.16, 131.78, 130.53, 130.07, 70.17, 31.05, 29.37, 29.27, 29.17, 28.89, 25.64, 25.27, 24.67; HRMS (ESI) [M-Na]- $C_{16}H_{25}O_4STe$ calcd. 443.0540, found 443.0530.

Sodium 11-(phenyltellanyl)undecyl sulfate (DP44). Yield: 83%; orange powder; mp 131°C; ^{1}H NMR (250 MHz, CDCl$_3$) δ 8.17-8.16 (m, 2H, benzene protons), 7.58-7.57 (m, 3H, benzene protons), 4.31 (m, 2H, -CH_2OSO$_3$Na), 3.80-3.76 (t, 2H, J = 5 Hz, -TeCH_2-), 2.27-2.24 (m, 2H, -CH_2CH$_2$OSO$_3$Na), 1.78 (m, 2H, -TeCH$_2$CH_2-), 1.42-1.26 (m, 14H, -(CH_2)$_7$CH$_2$CH$_2$OSO$_3$Na) ppm; ^{13}C NMR (62.5 MHz, CDCl$_3$) δ 133.28, 133.19, 132.01, 131.77, 130.21, 130.07, 70.48, 31.05, 30.71, 29.41, 29.33, 29.21, 28.90, 28.65, 25.51, 25.28, 24.96 ppm; HRMS (ESI) [M-Na]$^-$ $C_{17}H_{27}O_4STe$ calcd 457.0696, found 457.0676.

Sodium 12-(phenylselanyl)dodecyl sulfate (DP45). Yield: 92%; orange powder; mp 135°C; ^{1}H NMR (250 MHz, CDCl$_3$) δ 8.18-8.15 (m, 2H, benzene protons), 7.58-7.56 (m, 3H, benzene protons), 4.26 (m, -CH_2OSO$_3$Na), 3.79-3.76 (t, 2H, J = 5 Hz, -TeCH_2-), 2.27-2.24 (t, 2H, J = 5 Hz, -CH_2CH$_2$OSO$_3$Na), 1.76 (m, 2H, -TeCH$_2$CH_2-), 1.41-1.31 (m, 16H, -(CH_2)$_8$CH$_2$CH$_2$OSO$_3$Na) ppm; ^{13}C NMR (62.5 MHz, CDCl$_3$) δ 137.73, 133.76, 133.10 (2C), 132.61, 130.54, 70.05, 35.14 (2C), 31.10, 30.50, 29.71, 29.43 (2C), 29.28, 28.53, 24.76 (2C) ppm; HRMS (ESI) [M-Na]$^-$ $C_{18}H_{29}O_4STe$ calcd 471.0853 found 471.0837.

Surface activity and Critical Micelle Concentration (CMC) measurements

Compounds were dissolved in double-distilled water and the final concentrations used for this experiment were as follows: 0.025 mM, 0.25 mM, 0.5 mM, 1 mM, 5 mM and 10 mM. This experiment was carried out with a KRÜSS Tensiometer K6 (KRÜSS GmbH, Hamburg) according to the manufacturer's instructions.

Cyclic voltammetry

Cyclic Voltammograms were recorded at a BAS CV-100W electrochemical workstation. In all electrochemical experiments, a glassy carbon electrode was used as a working electrode, an Ag/AgCl electrode (SSE) as reference and a platinum spiral as counter electrode. For the electrochemical studies, 33% methanolic 50 mM potassium phosphate buffer, pH 7.4, with in a final concentration of 250 µM of compound was used. The potential range was varied between -800 to 800 mV, with a scan rate of 500 mVs^{-1}. Four full cycles were recorded and the first cycle was used to identify the respective peak potentials. All experiments were preformed in triplicate at room temperature. To obtain oxygen-poor conditions, the electrolysis cell was purged with nitrogen before each measurement.

Haemolysis Assay

Drabkin's reagent kit (Sigma) was used for the haemolysis assay. All compounds were dissolved in DMSO (100 mM stock solutions). Stock solutions were diluted with DMSO to obtain a dilution series of 100 µM, 1 mM and 10 mM. The RBCs sample consisted of 990µl HPS buffer (NaCl 145 mM, KCl 7.5 mM, glucose 10 mM, HEPES 10 mM, pH 7.4). 10 µl of each compound were tested with 2.5 % haematocrit. The final concentrations of the compounds tested were 1 µM, 10 µM, 100 µM and 1 mM. The DMSO concentration in every sample was 1%. A negative control was used consisting of 990 µl HPS buffer and 10 µl DMSO with 2.5 % haematocrit. SDS served as a positive control. The RBC samples were incubated for 30 min at 37□C in a water bath. After incubation, the samples were centrifuged at 12,000 g for 30 s, the 500 µl supernatant for each concentration was transferred into 2 ml of Drabkin's solution. The supernatant of the positive control was transferred into 2 ml of Drabkin's solution with detergent to lyse all RBCs in the sample. After incubation of the samples at room temperature for 30 min in the dark, the absorption at 540 nm was measured with a UV-Vis spectrophotometer (UV mini 1240, UV-Vis Spectrophotometer, Shimadzu). Three different whole blood samples were used for each experiment.

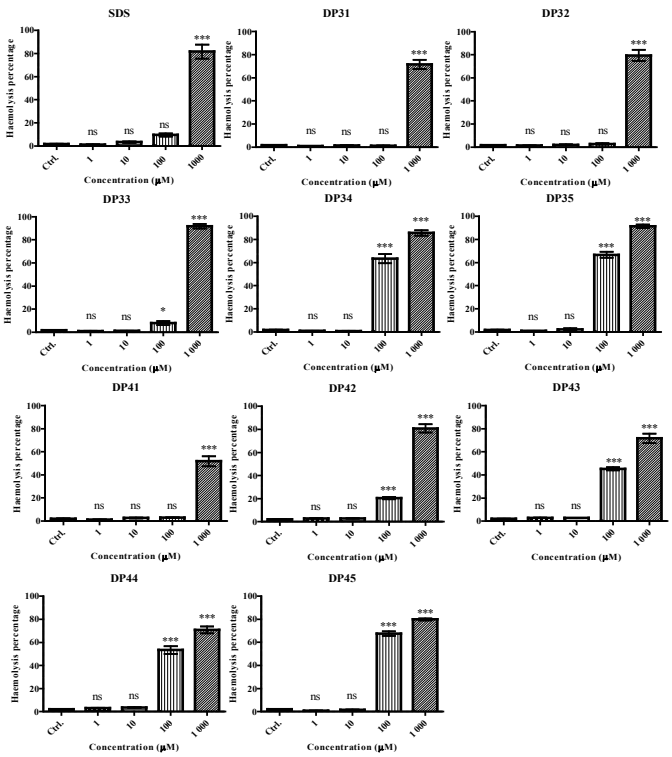

Figure S1. Impact of compounds on the membranes of RBCs. SDS was used as a positive control.

Circular dichroism measurements (CD)

CD spectra were measured at 20°C on a Jasco J720 spectropolarimeter (Jasco Corporation, Tokyo, Japan). For the determination of the interaction between compounds and proteins, samples contained 50 µM haemoglobin (Sigma) in 995µl potassium phosphate buffer (10mM, pH 7.4) and 5 µl of each compound in DMSO (10mM) or 20 µM Adx in 995 µl potassium phosphate buffer (10mM, pH 7.4) and 5 µl of each compound in DMSO (1mM stock solution) as well as 5 µl DMSO

as negative control in 1 cm glass cuvettes for measurements in the range of 250 to 650 nm. The spectra were accumulated three times and then smoothed. The spectrum of the potassium phosphate buffer was recorded in each case and saved respectively as a baseline.

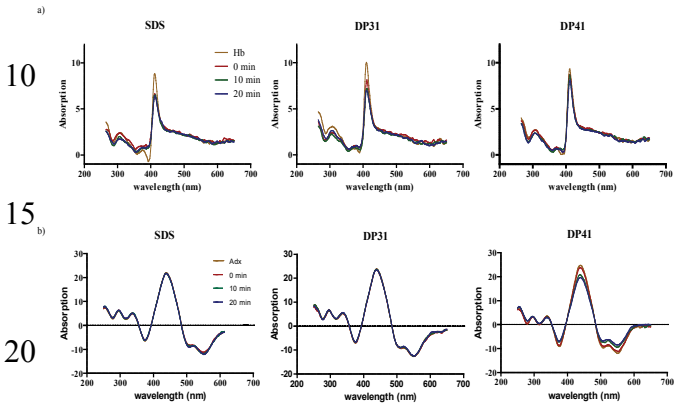

Figure S2. Interactions of selected compounds with proteins. SDS was used as positive control. a) haemoglobin b) Adx.

Cell culture

p53-Positive HCT116 wt cells were maintained at 37°C and 5% CO_2 in McCoy's 5A medium (PromoCell, Heidelberg, Germany) with 10% fetal calf serum (FCS). ARPE-19 cells were maintained at 37°C and 5% CO_2 in DMEM medium (PromoCell, Heidelberg, Germany) with 10% fetal calf serum (FCS). RAW 264.7 cells were cultured at 37 °C and 5% CO_2 in RPMI 1640 medium (PromoCell, Heidelberg, Germany). Organic selenide and telluride compounds were dissolved in DMSO as a 100 mM stock solution which was freshly prepared before use.

Evaluation of cell viability

In order to determine the effect of organic selenide and telluride compounds on HCT116, ARPE-19 cells or RAW 264.7, cells were seeded at 10^4 cells per well to a final volume of 200 µl in a 96-well plate and incubated overnight. Cells were then incubated with various concentrations of organic selenide and telluride compounds for 24h. Viability of the cells was determined by a colorimetric MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium, Sigma) assay according to the manufacturer's instructions. 1 h before the end of treatment, 50 µl MTT (5 mg/ml PBS) were added at 37 °C in a humified atmosphere. Following 1 h MTT treatment, the medium was removed and disposed and cells solubilized by adding 200 µl pure DMSO to each well to allow the formazan crystals to dissolve completely. The spectrophotometrical absorbance of the purple-blue formazan dye was determined with an absorbance reader at 595 nm. [2]

Reflection electron microscope (REM) and Energy-dispersive X-ray spectroscopy (EDX)

HCT116 cells were grown on coverslips until they were 50% confluent, washed with warm PBS (PH 7.4), treated with 50 µM organic selenide and telluride compounds and as negative control with same amount of DMSO. After incubation for 48 h, the medium was removed, cells were washed three times with PBS and subsequently fixed with 0.2 M cacodylate buffer containing 1% formaldehyde. Continuously increasing concentrations of ethanol were used for dehydration for 24 h. The fixed cells were coated with gold on a coverslip. REM and EDX analyses were recorded with a SUPRA^{TM} 40 (Carl Zeiss AG, Germany).

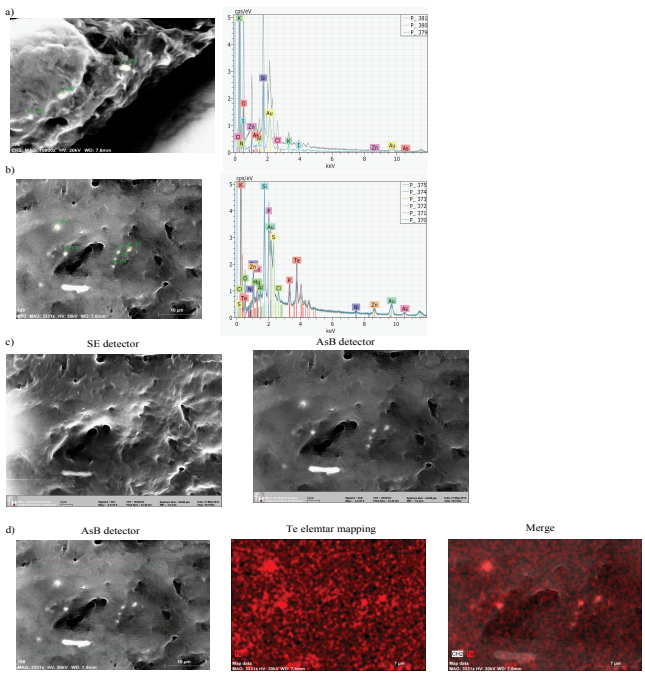

Figure S3. HCT116 cells were treated with compound DP41 for 48 h as well as with DMSO as negative control. a) and b) REM analysis with EDX analysis to detect Te atoms in the cells. Cells were treated with DMSO (a) as well as with DP41 (b). c) Detection of tellurium inside the cell using two different detectors (the SE-detector is used for cell surface imaging, the AsB detector for crystallographic contrast). d) Tellurium mapping to show the distribution of the tellurium in the cells.

JC-1 assay for estimating the mitochondrial membrane potential $\Delta\Psi_M$

Cells were plated onto coverslips with a density of 5×10^3 cells/coverslip and cultured for 24 h before further treatment. At this point, cells were treated with different concentrations of compounds for 2, 6 or 8 h. After cells were washed three times with Tyrode buffer (components in mM: 140 NaCl, 5 KCl, 10 Glucose, 10 HEPES, 1.8 $CaCl_2$, 1.0 $MgCl_2$, pH 7.4), they were incubated with 10 µg/ml JC-1 dye for 30 min. Subsequently, cells were washed three times with Tyrode buffer to remove any excess of dye. The coverslips were then mounted on a microscope (Karl Zeiss, Germany) and illuminated at 488 nm and 519 nm. The green and red channels of the fluorescence emitted were recorded. The fluorescence intensities of green and

red channels from 150 cells were integrated, respectively, and the final ratios of red to green fluorescence were calculated for further statistic analysis.

Nematode Assay

The nematode assay based on *Steinernema feltiae* is used to screen the toxicity of compounds against smaller organisms, especially against nematodes. *S. feltiae* were purchased from Sautter & Stepper, Germany. The nematodes were prepared and assayed as described previously.[3] Different concentrations of compounds were added (final concentrations of 50, 100, 200, and 400 µM in 1 % of DMSO in water). The viability of the nematodes was determined after 24 h of treatment, the control containing 1 % DMSO was set at 100 % viability and LD_{50} values were calculated accordingly.

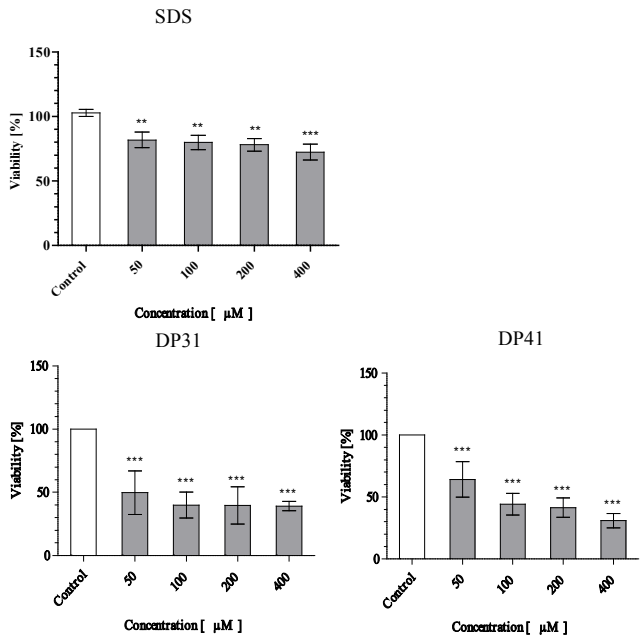

Figure S4. Nematicidal activity of selected compounds against *S. feltiae*. Nematodes were treated with different concentrations of SDS, DP31 and DP41 for 24 h. Significances are expressed to the control (1% DMSO in water). Data shown as means of three independent experiments. (* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$).

Bacterium-Inhibition Assays

Staphyllococcus aureus WDCM 5233 was obtained from the Microbiological Depository Centre, Armenia and *Escherichia coli* M17 VKPM-B8208 from the Russian National Collection of Industrial Microorganisms. Bacteria were cultured on agar plates according to standard procedures. The diameters of the inhibitory zones were measured in mm. The minimal antibacterial activity was taken according to the diameter of the absence of bacterial growth zones, not less than 12 mm. The MIC (minimum inhibitory concentrations) were calculated with the corresponding optical density measurements at 595nm.

Statistics

GraphPad Prism software (GraphPad Inc., USA) was used for statistical analysis. Results were expressed as the mean ±SEM. Differences between the experimental groups were analyzed using one-way ANOVA test (Dunnett) or Student's t-test (two-tail, unpaired). Statistical significance categories are shown as: $p < 0.05$ (*), $p < 0.01$ (**) or $p < 0.001$ (***).

Additional Literature for the *ESI*

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2. M. Doering, B. Diesel, M. C. H. Gruhlke, U. M. Viswanathan, D. Manikova, M. Chovanec, T. Burkholz, A. J. Slusarenko, A. K. Kiemer and C. Jacob, Tetrahedron, 2012, 68, 10577-10585.
3. B. Czepukojc, U. M. Viswanathan, A. Raza, S. Ali, T. Burkholz and C. Jacob, Phosphorus Sulfur and Silicon and the Related Elements, 2013, 188, 446-453.