Electronic Supplementary Information (ESI)

Designing anti-inflammatory drugs from parasitic worms: a synthetic small molecule analogue of the *Acanthocheilonema viteae* product ES-62 prevents development of collagen-induced arthritis

*Lamyaa Al-Riyami[†1], Miguel A. Pineda[†2], Justyna Rzepecka[†1], Judith K. Huggan[3], Abedawn I. Khalaf[3], Colin J. Suckling[3], Fraser J. Scott[3], David T. Rodgers[2], Margaret M. Harnett[2], and William Harnett[*1]*

[1]Strathclyde Institute of Pharmacy and Biomedical Sciences, University of Strathclyde, Glasgow G4 0RE, UK [2]Institute of Infection, Immunity and Inflammation, University of Glasgow, Glasgow G12 8TA, UK and [3]Department of Pure and Applied Chemistry, University of Strathclyde, Glasgow G1 1XL, UK

Contents

Synthesis of sulfones

1-(2-[(4-Methylbenzyl)sulfonyl]ethyl}pyrrolidine (11c)
White crystalline solid, 81% yield, mp 84-86 °C. ^{1}H-NMR (DMSO-d_6): 7.28 (2H, d, J = 8.0 Hz), 7.21 (2H, d, J = 8.0 Hz), 4.50 (2H, s), 3.20 (2H, t, J = 7.0 Hz), 2.80 (2H, t, J = 7.0 Hz), 2.48-2.44 (4H, m), 1.69-1.65 (4H, m). ^{13}C-NMR (DMSO-d_6): 137.7, 130.9, 129.0, 125.4, 58.3, 53.2, 50.3, 48.0, 23.1. IR (KBr): 3437, 2971, 2781, 1629, 1515, 1404, 1383, 1312, 1257, 1160, 1120, 1025, 891, 823, 558, 497 cm^{-1}. HRESIMS: Calculated for $C_{14}H_{21}NO_2S$ 267.1293 Found 267.1290.

1-{2-[(4-Bromobenzyl}sulfonyl]ethyl}pyrrolidine (11d)

Pale yellow solid, 60% yield, mp 90-92 °C. ^{1}H-NMR (DMSO-d_6): 7.62 (2H, d, J = 8.0 Hz), 7.35-7.33 (2H, d, J = 8.0 Hz), 4.52 (2H, s), 3.18 (2H, t, J = 7.0 Hz), 2.83(2H, t, J = 7.0 Hz), 2.50-2.47(4H, m), 1.69-1.67 (4H, m). ^{13}C-NMR (DMSO-d_6): 133.1, 131.4, 127.9, 121.9, 57.8, 53.2, 50.6, 48.0, 23.1. IR (KBr): 2964, 2801, 1590, 1486, 1416, 1294, 1275, 1185, 1145, 1121, 1012, 887, 814, 753 cm^{-1}. HRESIMS: Calculated for $C_{13}H_{18}$ ^{79,81}$BrNO_2S$ 331.0242/333.0221 Found 331.0240/333.0228.

***N*-{2-[(3-Fluorobenzyl)sulfonyl]ethyl}-*N*,*N*-dimethylamine (11e)**

Cream coloured solid, 44% yield, mp 45-47 ^{o}C. ^{1}H-NMR (DMSO-d_6): 7.44-7.42 (1H, m), 7.25-7.21 (3H, m), 4.55 (2H, s), 3.22 (2H, t, *J* = 7.3 Hz), 2.65 (2H, t, *J* = 7.3 Hz), 2.16 (6H, s). IR (KBr): 1592, 1489, 1456, 1287, 1265, 1121, 1062, 1108, 949, 906, 791, 763, 713 cm^{-1}. HRESIMS: calculated for $C_{11}H_{17}FNO_2S$ 246.0958 Found: 246.0956.

N^1-{2-[(3-Fluorobenzyl)sulfonyl]ethyl}-N^1,N^2,N^2-trimethyl-1,2-ethanediamine (11f)
Colourless oil, 66% yield. ^{1}H-NMR (DMSO-d_6): 7.48-7.44 (1H, m), 7.27-7.23 (3H, m), 4.59 (2H, s), 3.40 (2H, t, *J* = 6.9Hz), 3.24 (2H, t, *J* = 6.2 Hz), 3.02 (2H, s, br), 2.85 (2H, s, br), 2.78 (6H, s), 2.37 (3H, s). IR (Liquid film): 1682, 1594, 1489, 1420, 1319, 1201, 950, 835, 799, 722, 707 cm^{-1}. HRESIMS: calculated for $C_{14}H_{24}FN_2O_2S$ 303.1537 Found: 303.1537.

4-{2-[(3-Fluorobenzyl)sulfonyl]ethyl}morpholine (11g)
White crystalline solid, 77% yield, mp 74-76 ^{o}C. ^{1}H-NMR (DMSO-d_6): 7.48-7.43 (1H, m), 7.26-7.21 (3H, m), 4.58 (2H, s), 3.58 (4H, t, *J* = 4.6 Hz), 3.29 (2H, t, *J* = 7.0 Hz), 2.71 (2H, t, *J* = 7.1 Hz), 2.41 (4H, t, *J* = 4.4 Hz). IR (KBr): 1613, 1589, 1447, 1300, 1279, 1149, 1112, 1009, 887, 795, 760, 717 cm^{-1}. HRESIMS: calculated for $C_{13}H_{19}FNO_3S$ 288.1064 Found: 288.1064.

1-{2-[(3-Fluorobenzyl)sulfonyl]ethyl}pyrrolidine (11h)
White crystalline solid, 52% yield, mp 66-68 ^{o}C. ^{1}H-NMR (DMSO-d_6): 7.48-7.42 (1H, m), 7.25-7.21 (3H, m), 4.56 (2H, s), 3.25 (2H, t, *J* = 7.0 Hz), 2.81 (2H, t, *J* = 7.3 Hz), 2.47 (4H, m), 1.69 (4H, t, *J* = 3.1 Hz). IR (KBr): 1593, 1499, 1448, 1316, 1263, 1239, 1119, 947, 889, 803, 753, 689 cm^{-1}. HRESIMS: calculated for $C_{13}H_{19}FNO_2NS$ 272.1115 Found: 272.1115.

***N*-{2-[(4-Fluorobenzyl)sulfonyl]ethyl}-*N*,*N*-dimethylamine (11i)**
White solid, 98% yield, mp 50-52 ^{o}C. ^{1}H-NMR ($CDCl_3$): 7.44 (2H, dd, *J* = 5.2 Hz, & *J* = 8.7 Hz), 7.13 (2H, t, *J* = 8.7 Hz), 4.33 (2H, s), 3.04 (2H, t, *J* = 6.6 Hz), 2.85 (2H, t, *J* = 6.6 Hz), 2.31 (6H, s). IR (KBr): 1606, 1510, 1465, 1415, 1379, 1317, 1221, 1116, 835, 777, 703 cm^{-1}. HRESIMS: calculated for $C_{11}H_{17}FNO_2NS$ 246.0958 Found: 246.0956.

4-{2-[(4-Fluorobenzyl)sulfonyl]ethyl}morpholine (11j)
White solid, 91% yield, mp 72-74 ^{o}C. ^{1}H-NMR ($CDCl_3$): 7.44 (1H, d, *J* = 5.2 Hz), 7.42 (1H, d, *J* = 5.2 Hz), 7.14 (2H, t, *J* = 8.6 Hz), 4.34 (2H, s), 3.76 (4H, br), 3.09 (2H, br), 2.91 (2H, br), 2.55 (4H, br). IR (KBr): 1604, 1511, 1464, 1364, 1321, 1278, 1231, 1147, 1116, 890, 849, 777 cm^{-1}. HRESIMS: calculated for $C_{13}H_{19}FNO_3NS$ 288.1064 Found: 288.1062.

1-{2-[(4-Fluorobenzyl)sulfonyl]ethyl}pyrrolidine (11k)
White solid, 92% yield, mp 76-78 ^{o}C. ^{1}H-NMR ($CDCl_3$): 7.43 (1H, d, *J* = 5.2 Hz), 7.41 (1H, d, *J* = 5.2 Hz), 7.12 (2H, t, *J* = 8.6 Hz), 4.33 (2H, s), 3.09-2.97 (4H, m), 2.58 (4H, s, br), 1.85 (4H, m). IR (KBr): 1604, 1510, 1460, 1312, 1285, 1230, 1123, 838, 787 cm^{-1}. HRESIMS: calculated for $C_{13}H_{19}FNO_2S$ 272.1115 Found: 272.1113.

N^1-{2-[(4-Fluorobenzyl)sulfonyl]ethyl}-N^1,N^2,N^2-trimethyl-1,2-ethanediamine (11l)
Pale yellow oil, 73% yield. ^{1}H-NMR ($CDCl_3$): 7.45-7.41 (2H, m), 7.15 (2H, t, *J* = 8.5 Hz), 4.36 (2H, s), 3.41 (2H, br), 3.32 (2H, br), 3.24 (4H, m), 2.93 (6H, s), 2.58 (3H, s). IR (KBr): 1682, 1606, 1512, 1422, 1312, 1199, 1125, 837, 798, 722, 707 cm^{-1}. HRESIMS: calculated for $C_{22}H_{20}FN_2O_2S$ 303.1543 Found: 303.1536.

***(S)-N*-(2-((4-Bromobenzyl)sulfonyl)ethyl)butan-2-amine (11m)**
Yellow oil, 81% yield. ^{1}H NMR ($CDCl_3$): 7.54 (2H, d, J = 6.5 Hz), 7.31 (2H, d, J = 6.5 Hz), 4.32 (2H, s), 3.20-3.08 (2H, m), 3.02 (2H, t, J = 6.0 Hz), 2.62-2.57 (1H, m), 1.54-1.47 (1H, m), 1.40-1.30 (1H, m), 1.05 (3H, d, J = 6.0 Hz), 0.91 (3H, t, J = 7.5). IR (KBr): 2965, 2932, 2876, 1587, 1485, 1403, 1298, 1272, 1121, 1011, 814 cm^{-1}. LSESIMS: calculated for $C_{13}H_{21}BrNO_2S$ 334.05 Found: 334.00.

***(R)-N*-(2-((4-Bromobenzyl)sulfonyl)ethyl)butan-2-amine (11n)**
Yellow oil, 82% yield. ^{1}H-NMR ($CDCl_3$): 7.54 (2H, d, J = 6.5 Hz), 7.31 (2H, d, J = 6.5 Hz), 4.32 (2H, s), 3.20-3.08 (2H, m), 3.05 (2H, t, J = 6.0 Hz), 2.64-2.56 (1H, m), 1.54-1.47 (1H, m), 1.40-1.30 (1H, m), 1.06 (3H, d, J = 6.0 Hz), 0.91 (3H, t, J = 7.5 Hz). IR (KBr): 2962, 2922, 2872, 1589, 1487, 1300, 1280, 1118, 1071, 1011 cm^{-1}. LSESIMS: calculated for $C_{13}H_{21}{}^{79/81}BrO_2NS$ 334.0471/336.0450 Found: 334.0463/336.0440.

***(S)-N*-(2-((3-Fluorobenzyl)sulfonyl)ethyl)butan-2-amine (11o)**
Yellow oil, 87% yield. ^{1}H-NMR ($CDCl_3$): 7.42-7.35 (1H, m), 7.25-7.17 (2H, m), 7.13-7.08 (1H, m), 4.36 (2H, s), 3.21-3.08 (2H, m), 3.05 (2H, t, J = 6.0 Hz), 2.64-2.57 (1H, m), 1.54-1.47 (1H, m), 1.40-1.30 (1H, m), 1.06 (3H, d, J = 6.0 Hz), 0.91 (3H, t, J = 7.5 Hz). IR (KBr): 2965, 2935, 2866, 1619, 1587, 1487, 1451, 1312, 1304, 1286, 1112, 948, 793 cm^{-1}. LSESIMS: calculated for $C_{13}H_{21}FNO_2S$ 274.1272 Found: 274.1266.

***(R)-N*-(2-((3-Fluorobenzyl)sulfonyl)ethyl)butan-2-amine (11p)**
Yellow oil, 87% yield. ^{1}H-NMR ($CDCl_3$): 7.42-7.35 (1H, m), 7.25-7.17 (2H, m), 7.13-7.08 (1H, m), 4.36 (2H, s), 3.21-3.08 (2H, m), 3.05 (2H, t, J = 6.0 Hz), 2.64-2.57 (1H, m), 1.54-1.47 (1H, m), 1.40-1.30 (1H, m), 1.06 (3H, d, J = 6.0 Hz), 0.91 (3H, t, J = 7.5 Hz). IR (KBr): 2962, 2935, 2879, 1591, 1489, 1451, 1315, 1291, 1269, 1239, 1140, 1110, 950, 795 cm^{-1}. LSESIMS: calculated for $C_{13}H_{21}FNO_2S$ 274.1272 Found: 274.1266.

1-Methyl-1-{2-[(4-methylbenzyl)sulfonyl]ethyl}pyrrolidinium iodide (12c)
Pale yellow solid, 51% yield, mp 214-216 °C. ^{1}H-NMR (DMSO-d_6): 7.33 (2H, d, J = 8.0 Hz), 7.25 (2H, d, J = 8.0 Hz), 4.58 (2H), 3.84-3.80 (2H, m), 3.78-3.74 (2H, m), 3.56-3.48 (4H, m), 3.04 (3H, s), 2.33 (3H, s), 2.17-2.05 (4H, m). ^{13}C-NMR (DMSO-d_6): 138.2, 131.0, 129.2, 124.4, 63.9, 57.9, 55.6, 47.9, 45.8, 21.1, 18.61. IR (KBr): 3436, 2975, 2909, 1512, 1455, 1313, 1129, 1050, 928, 822, 774, 573, 510 cm^{-1}. HRESIMS: Calculated for $C_{15}H_{24}NO_2S$ 282.1528 Found 282.1535.

1-{2-[(4-Bromobenzyl)sulfonyl]ethyl}-1-methylpyrrolidinium iodide (12d)
Pale yellow solid, 62% yield, mp 196-198 °C. ^{1}H-NMR (DMSO-d_6): 7.67(2H, d, J = 8.0 Hz), 7.39(2H, d, J = 8.0 Hz), 4.64 (2H, s), 3.85-3.77 (4H, m), 3.56-3.51 (4H, m), 3.04 (3H, s), 2.11-2.06 (4H, m). IR (KBr): 1712, 1656, 1569, 1487, 1450, 1319, 1256, 1127, 1092, 1014, 809, 743 cm^{-1}. HRESIMS: Calculated for $C_{14}H_2BrNO_2S$ 346.0476/348.0456 Found 346.0475/348.0457.

3-(4-Methylbenzylthio)propan-1-ol (14a)
White solid, 78%, mp 67-69 °C. ^{1}H-NMR (DMSO-d_6): 7.30 (2H, d, J = 8.0 Hz), 7.21 (2H, d, J = 8.0 Hz), 4.64 (1 H, br, s, OH), 4.41 (2H, s), 3.48 (2H, t, J = 7.0 Hz), 3.03-2.99 (2H, m), 2.31 (3H,

s), 1.84-1.77 (2H, m). ^{13}C-NMR (DMSO-d_6): 137.6, 130.78, 129.0, 125.7, 58.9, 57.6, 48.0, 24.4, 20.7. IR (KBr): 3490, 2969, 2941, 2879, 1510, 1440, 1395, 1376, 1297, 1281, 1253, 1216, 1132, 1060, 1034, 886, 819, 766, 721 cm^{-1}. HRESIMS: Calculated for $C_{11}H_{16}O_3S$ 228.0820 Found 228.0822.

3-(4-Methylbenzylsulfonyl)propyl methanesulfonate (15b)
Orange solid, 65% yield, mp 72-74 °C. ^{1}H-NMR (DMSO-d_6): 7.31 (2H, d, J = 8.0 Hz), 7.22 (2H, d, J = 8.0 Hz), 4.47 (2H, s), 4.30 (2H, t, J = 7.0 Hz), 3.17 (3H, s), 3.14-3.10 (2H, m), 2.31 (3H, s), 2.12-2.05 (2H, m). ^{13}C-NMR (DMSO-d_6): 137.7, 130.8, 129.0, 125.4, 68.3, 57.6, 47.1, 36.6, 21.4, 20.7. IR (KBr): 3025, 3986, 2977, 2927, 1786, 1724, 1614, 1515, 1444, 1412, 1354, 1340, 1313, 1280, 1237, 1175, 1134, 1121, 980,928, 853, 815, 766, 732, 713 cm^{-1}. HRESIMS: Calculated for $C_{12}H_{18}O_5S_2$ 306.0596 Found 306.0599.

1-(3-((4-Bromobenzyl)sulfonyl)propyl)pyrrolidine (16a)
White solid, mp 82-85°C. ^{1}H-NMR (DMSO-d_6): 7.62 (2H, d, J = 8.0 Hz), 7.36 (2H, d, J = 8.0 Hz), 4.50 (2H, s), 3.06 (2H, m), 2.49 (2H, t, J = 7.0 Hz), 2.44 (4H, m), 1.83 (2H, m), 1.64 (4H, m). ^{13}C NMR (DMSO-d_6): 133.0, 131.4, 128.2, 121.8, 57.0, 53.5, 53.2, 49.3, 23.0, 20.6. IR (KBr): 1723, 1627, 1488, 1454, 1404, 1356, 1295, 1281, 1250, 1121, 1071, 962 cm^{-1}. HRESIMS: Calculated for $C_{14}H_{20}$ ^{79,81}BrNO$_2$S 345.0398/347.0378 Found 345.0400/347.0372.

3-((4-Bromobenzyl)sulfonyl)-*N,N*-dimethylpropan-1-amine (16b)
^{1}H NMR (DMSO-d_6): 7.61 (2H, d, J = 8.0 Hz), 7.37 (2H, d, J = 8.0 Hz), 4.96 (2H, s), 3.03 (2H, m), 2.27 (2H, t, J = 7.0 Hz), 2.10 (6H, s), 1.77 (2H, m). ^{13}C NMR (DMSO-d_6): 133.0, 131.4, 128.2, 121.8, 57.0, 56.9, 49.2, 44.8, 19.3. IR (KBr): 1725, 1639, 1485, 1457, 1300, 1269, 1208, 1130, 1107, 1012 956, 827 cm^{-1}. HRESIMS: Calculated for $C_{12}H_{18}$ ^{79,81}BrNO$_2$S 320.0320/322.0300 Found 320.0317/322.0301.

4-(3-((4-Bromobenzyl)sulfonyl)propyl)morpholine (16c)
White solid, mp 128-130 °C. ^{1}H-NMR (DMSO-d_6): 7.61 (2H, d, J = 8.0 Hz), 7.36 (2H, d, J = 8.0 Hz), 4.50 (2H, s), 3.54 (4H, m), 3.05 (2H, m), 2.32 (6H, m), 1.82 (2H, m). ^{13}C-NMR (DMSO-d_6): 138.1, 133.0, 131.4, 128.3, 121.9, 66.1, 56.9, 55.9, 53.0, 49.2, 18.5. IR (KBr): 3436, 2944, 2810, 1650, 1574, 1488, 1316, 1263, 1122, 1071, 1043, 1007, 705, 620 cm^{-1}. HRESIMS: Calculated for $C_{14}H_{20}BrNO_3S$ 361.0347/363.0327 Found 361.0344/363.0330.

1-{3-[(4-Methylbenzyl)sulfonyl]propyl}-pyrrolidine (16d)
Orange solid, 85% yield, mp 84-86 °C. ^{1}H-NMR (DMSO-d_6): 7.30 (2H, d, J = 8.0 Hz), 7.21 (2H, d, J = 8.0 Hz), 4.42 (2H, s), 3.04-3.00 (2H, m), 2.46 (2H, t, J = 7.0 Hz), 2.40-2.38 (4H, m), 2.31 (3H, s), 1.85-1.78 (2H, m), 1.67-1.65 (4H, m). ^{13}C-NMR (DMSO-d_6): 137.6, 130.7, 129.0, 125.7, 57.5, 53.6, 53.2, 49.0, 23.0, 20.7. IR (KBr): 1625, 1512, 1456, 1311, 1258, 1159, 1118, 1023, 887, 822, 700 cm^{-1}. HRESIMS: Calculated for $C_{15}H_{23}NO_2S$ 281.1450 Found 281.1448.

***N,N*-Dimethyl-3-((4-methylbenzyl)sulfonyl)propan-1-amine (16e)**
^{1}H-NMR (DMSO-d_6): 7.28 (2H, d, J = 8.0 Hz), 7.19 (2H, d, J = 8.0 Hz), 4.42 (2H, s), 3.00 (2H, m), 2.30 (3H, s), 2.26 (2H, t, J = 7.0 Hz), 2.10 (6H, s), 1.77 (2H, m). ^{13}C-NMR (DMSO-d_6): 137.6, 130.7, 129.0, 125.7, 57.6, 57.0, 48.7, 44.8, 20.7, 19.3. IR (KBr): 3417, 2974, 2767, 1630,

1513, 1462, 1401, 1311, 1253, 1118, 1040, 892, 825 cm^{-1}. HRESIMS: Calculated for $C_{13}H_{21}NO_2S$ 255.1293 Found 255.1296.

4-{3-[(4-Methylbenzyl)sulfonyl[propyl}-morpholine (16f)
Yellow crystalline solid, 56% yield, mp 92-93 °C. ^{1}H-NMR (DMSO-d_6): 7.30(2H, d, *J* = 8.0 Hz), 7.21 (2H, d, *J* = 8.0 Hz), 4.42 (2H, s), 3.56-3.53 (4H, m), 3.31 (3H, s), 3.03-2.99 (2H, m), 2.35-2.31 (6H, m), 1.85-1.77 (2H, m). ^{13}C-NMR (DMSO-d_6): 137.6, 130.7, 129.0, 125.7, 66.12, 57.4, 56.0, 52.9, 48.8, 20.7, 18.5. IR (KBr): 1514, 1450, 1355, 1300, 1283, 1149, 1114, 1013, 947, 897, 859, 801, 713 cm^{-1}. HRESIMS: Calculated for $C_{15}H_{23}NO_3S$ 297.1399 Found 297.1397.

4-(3-((4-Bromobenzyl)sulfonyl)propyl)-4-methylmorpholin-4-ium iodide (17a)
^{1}H NMR (DMSO-d_6): 7.63 (2H, d, *J* = 8.0 Hz), 7.38 (2H, d, *J* = 8.0 Hz), 4.59 (2H, s), 3.90 (4H, m), 3.53 (2H, m), 3.44 (4H, m), 3.38 (3H, s), 3.11 (2H, m), 2.08 (2H, m). ^{13}C NMR (DMSO-d_6): 134.0, 132.5, 132.2, 128.8, 123.0, 60.7, 60.0, 58.1, 53.7, 48.6, 47.3, 15.3. IR (KBr): 3467, 2961, 2884, 1640, 1487, 1404, 1230, 1127, 1066, 1010, 913, 850, 776 cm^{-1}. HRESIMS: Calculated for $C_{15}H_{23}BrNO_3S$ 376.0582/378.0562 Found 376.0585/378.0566.

3-((4-Bromobenzyl)sulfonyl)-N,N,N-trimethylpropan-1-aminium iodide (17b)
^{1}H-NMR (DMSO-d_6): 7.63 (2H, d, *J* = 8.3 Hz), 7.38 (2H, d, *J* = 8.3 Hz), 4.59 (2H, s), 3.76 (2H, m), 3.12 (2H, t, *J* = 7.0 Hz), 3.07 (9H, s), 2.15 (2H, m). ^{13}C-NMR (DMSO-d_6): 133.1, 131.5, 127.9, 122.1, 63.4, 57.1, 52.3, 47.7, 15.5. IR (KBr): 3434, 2963, 2918, 1723, 1625, 1485, 1404, 1295, 1116, 1068, 1012 cm^{-1}. HRESIMS: Calculated for $C_{13}H_{21}{}^{79,81}BrNO_2S$ 334.0476/336.0456 Found 336.0463/334.0482.

1-(3-((4-Bromobenzyl)sulfonyl)propyl)-1-methylpyrrolidin-1-ium iodide (17c)
^{1}H-NMR (DMSO-d_6): 7.63 (2H, d, *J* = 8.0 Hz), 7.38 (2H, d, *J* = 8.0 Hz), 4.59 (2H, s), 3.51 (2H, m), 3.41 (4H, m), 3.15 (2H, t, *J* = 7.0 Hz), 3.01 (3H, s), 2.16 (2H, m), 2.08 (4H, m). ^{13}C-NMR (DMSO-d_6): δ 133.1, 131.5, 127.9, 122.0, 63.6, 61.3, 57.1, 47.8, 21.0, 16.3. IR (KBr): 3439, 2957, 2901, 1723, 1619, 1485, 1404, 1292, 1194, 1124, 1068, 1006, 931 cm^{-1}. HRESIMS: Calculated for $C_{15}H_{23}{}^{79,81}BrNO_2S$ 360.0633/362.0613 Found 360.0632/362.0613.

1-Methyl-1-{3-[(4-methylbenzyl)sulfonyl]propyl}pyrrolidinium iodide (17e)
1-{3-[(4-Methylbenzyl)sulfonyl]propyl}-pyrrolidine (0.139 g, 0.49 mmol) was dissolved in DCM (20 ml) at room temperature to which methyl iodide (0.620 mL, 9.96 mmol, 20.3 eq.) was added. The mixture was stirred at room temperature for 20 h before being evaporated under reduced pressure. Title compound was obtained as a pale orange amorphous solid (0.108 g, 0.26 mmol, 52%). ^{1}H-NMR (DMSO-d_6): 7.32-7.30 (2H, d, *J* = 8.0 Hz), 7.23-7.21 (2H, d, *J* =8.0 Hz), 4.51 (2H, s), 3.53-3.49 (2H, m), 3.45-3.37 (4H, m), 3.12-3.08 (2H, m), 3.01 (3H, s), 2.31 (3H, s), 2.18-2.14(2H, m), 2.14-2.08 (4H, m). ^{13}C-NMR (DMSO-d_6): 137.8, 130.8, 129.1, 125.3, 63.6, 61.0, 57.6, 47.5, 21.0, 20.7, 16.3. IR (KBr): 1613, 1514, 1455, 1300, 1286, 1209, 1121, 1056, 1004,934, 823, 765, 702cm^{-1}. HRESIMS: Calculated for $C_{16}H_{26}INO_2S$ 296.1684 Found 296.1689,

4-Methyl-4-{3-[(4-methylbenzyl)sulfonyl]propyl}morpholin-4-ium iodide (17f)
Off-white solid, 24% yield, mp 181-183 ^oC. ^{1}H-NMR (DMSO-d_6): 7.32 (2H, d, *J* = 8.0 Hz), 7.23 (2H, d, *J* = 8.0 Hz), 4.52 (2H, s), 3.91-3.90 (4H, m), 3.55-3.51 (2H, m), 3.49-3.44 (4H, m), 3.16

(3H, s), 3.11 (2H, t, J = 6.0 Hz), 2.32(3H, s), 2.19-2.08 (2H, m). ^{13}C-NMR (DMSO-d_6): 142.5, 137.8, 130.8, 125.3, 61.3, 59.7, 59.0, 57.6, 47.4, 46.4, 20.7, 14.4. IR (KBr): 1509, 1485, 1472, 1447, 1344, 1328, 1278, 1239, 1137, 1120, 1067, 970, 915, 778, 734 cm^{-1}. HRESIMS: Calculated for $C_{16}H_{26}INO_3S$ 312.1633 Found 312.1369.

N^1,N^1,N^2-Trimethyl-N^2-[2-(phenylsulfonyl)ethyl]-1,2-ethanediamine (18a)
Pale yellow oil, 100% yield. ^{1}H NMR (DMSO-d_6): 7.92 (2H, t, J = 7.3 Hz), 7.77 (1H, t, J = 7.3 Hz), 7.68 (2H, t, J = 7.3 Hz), 3.49 (2H, t, J = 7.2 Hz), 2.66 (2H, t, J = 7.4 Hz), 2.31 (2H, t, J = 6.4 Hz), 2.13 (2H, t, J = 7.4 Hz), 2.05 (6H, s), 2.04 (3H, s). IR (NaCl): 1448, 1300, 1143, 1084, 1038, 744, 731, 689 cm^{-1}. HRESIMS: calculated for $C_{13}H_{23}N_2O_2S$ 271.1475 Found: 271.1470.

4-[2-(Phenylsulfonyl)ethyl]thiomorpholine (18b)
Clear oil, 100% yield. ^{1}H NMR (DMSO-d_6): 7.92 (2H, t, J = 7.1 Hz), 7.77 (1H, t, J = 7.3 Hz), 7.68 (2H, t, J = 7.3 Hz), 3.53 (2H, t, J = 6.7 Hz), 2.64 (2H, t, J = 6.8 Hz), 2.49 (4H, t, J = 5.3 Hz), 2.34 (4H, t, J = 5.4 Hz). IR (NaCl): 1446, 1404, 1306, 1269, 1227, 1132, 1078, 999, 966, 943, 874, 760, 723, 685 cm^{-1}. HRESIMS: calculated for $C_{12}H_{18}NO_2S_2$ 272.0773 Found: 272.0771.

4-[2-(Phenylsulfonyl)ethyl]morpholine (18c)
Colourless oil in quantitative yield. ^{1}H-NMR ($CDCl_3$): 7.93-7.96 (2H, m), 7.69 (1H, t, J = 7.2 Hz), 7.59 (2H, t, J = 7.2 Hz), 3.58 (4H, br, s), 3.34 (2H, br, s), 2.81 (2H, br, s), 2.39 (4H, br, s). IR: 1459, 1446, 1312, 1304, 1273, 1142, 1114, 1086, 1104 cm^{-1}. HRESIMS: calculated for $C_{12}H_{18}NO_3S$ 256.1002 Found: 256.1005.

1-[2-(Phenylsulfonyl)ethyl]pyrrolidine (18d)
Colourless oil, 100% yield. ^{1}H-NMR ($CDCl_3$): 7.93-7.96 (2H, m), 7.69 (1H, t, J = 7.2 Hz), 7.60 (2H, t, J = 7.2 Hz), 3.43 (2H, br, s), 2.97 (2H, br, s), 2.57 (4H, br, s), 1.80 (4H, br, s). IR: 1452, 1308, 1293, 1252, 1144, 1086, 745, 725, 389 cm^{-1}. HRESIMS: calculated for $C_{12}H_{18}NO_2S$ 240.1053 Found: 240.1049.

***(R)*-*N*-[2-(Phenylsulfonyl)ethyl]butan-2-amine (18e)**
Colourless oil, 100% yield. ^{1}H-NMR ($CDCl_3$): 7.93-7.96 (2H, m), 7.69 (1H, t, J = 7.2 Hz), 7.60 (2H, t, J = 7.2 Hz), 3.39 (2H, t, J = 12.0 Hz), 3.06-3.16(2H, m), 2.62-2.68(1H, m), 1.47-1.58 (1H, m), 1.31-1.42 (1H, m), 1.07 (3H, d, J = 6.0 Hz), 0.91 (3H, t, J = 7.2). IR: 1452, 1379, 1308, 1289, 1142, 1084, 730, 689 cm^{-1}. HRESIMS: Calculated for $C_{12}H_{20}NO_2S$ 242.1209 Found: 242.1205.

***(S)*-*N*-[2-(Phenylsulfonyl)ethyl]butan-2-amine (18f)**
Colourless oil, 100% yield. ^{1}H-NMR ($CDCl_3$): 7.93-7.96 (2H, m), 7.69 (1H, t, J = 7.2 Hz), 7.60 (2H, t, J = 7.2 Hz), 3.39 (2H, t, J = 12.0 Hz), 3.06-3.16 (2H, m), 2.62-2.68 (1H, m), 1.47-1.58 (1H, m), 1.31-1.42 (1H, m), 1.07 (3H, d, J = 6.0 Hz), 0.91 (3H, t, J = 7.2 Hz). IR: 1455, 1375, 1302, 1289, 1232, 1142, 1086, 728, 689 cm^{-1}. HRESIMS: calculated for $C_{12}H_{20}NO_2S$ 242.1209 Found: 242.1205.

N^1,N^1-Dimethyl-N^2-[2-(phenylsulfonyl)ethyl]ethane-1,2-diamine (18g)

Colourless oil, 100% yield. ^{1}H-NMR ($CDCl_3$): 7.93-7.96 (2H, m), 7.68 (1H, t, *J* = 7.2 Hz), 7.60 (2H, t, *J* = 7.2 Hz), 3.34 (2H, t, *J* = 6.8 Hz), 3.06 (2H, t, *J* = 6.8 Hz), 2.72 (2H, t, *J* = 6.0 Hz), 2.46 (2H, t, *J* = 6.0 Hz), 2.29 (6H, s). IR: 1457, 1452, 1306, 1289, 1142, 1086, 1032, 743, 728, 389 cm^{-1}. HRESIMS: calculating for $C_{12}H_{21}N_2O_2S$ 257.1318 Found: 257.1316.

***N*-[2-(Phenylsulfonyl)ethyl]propan-1-amine (18h)**
Colourless oil, 100% yield. ^{1}H-NMR ($CDCl_3$): 7.93-7.96 (2H, m), 7.68 (1H, t, *J* = 7.2 Hz), 7.60 (2H, t, *J* = 7.2 Hz), 3.39 (2H, t, *J* = 6.8 Hz), 3.11 (2H, t, *J* = 6.8 Hz), 2.62 (2H, t, *J* = 7.2 Hz), 1.53 (2H, m), 0.93 (3H, t, *J* = 7.6 Hz). IR: 1588, 1474, 1467, 1446, 1302, 1276, 1140, 1082, 1002, 728, 687 cm^{-1}. HRESIMS: calculated for $C_{11}H_{18}NO_2S$ 228.1053 Found: 228.1049.

***N*-[2-(Phenylsulfonyl)ethyl]propan-2-amine (18i)**
Colourless oil, 100% yield. ^{1}H-NMR ($CDCl_3$): 7.93-7.97 (2H, m), 7.70 (1H, t, *J* = 7.2 Hz), 7.61 (2H, t, *J* = 7.2 Hz), 3.38 (2H, t, *J* = 6.8 Hz), 3.09 (2H, t, *J* = 6.8 Hz), 2.86 (1H, m), 1.09 (6H, d, *J* = 6.0 Hz). IR: 3070, 2967, 2922, 2870, 2844, 1452, 1386, 1302, 1284, 1174, 1142, 1084730, 689 cm^{-1}. HRESIMS: calculated for $C_{11}H_{18}NO_2S$ 228.1053 Found: 228.1049.

3-[(2-(Phenylsulfonyl)ethyl)amino]propan-1-ol (18j)
Colourless oil, 100% yield. ^{1}H-NMR ($CDCl_3$): 7.93-7.97 (2H, m), 7.70 (1H, t, *J* = 7.2 Hz), 7.61 (2H, t, *J* = 7.2 Hz), 3.85 (1H, m), 3.79 (2H, t, *J* = 5.2 Hz), 3.30 (2H, t, *J* = 6.4 Hz), 3.08 (2H, t, *J* = 6.4 Hz), 3.01 (1H, m), 2.86 (2H, t, *J* = 6.0 Hz), 1.71 (2H, m). IR: 1560, 1547, 1481, 1446, 1409, 1293, 1144, 1084, 1071, 749, 685 cm^{-1}. HRESIMS: calculated for $C_{11}H_{18}NO_3S$ 244.1002 Found: 244.0998.

2-Methyl-*N*-[2-(phenylsulfonyl)ethyl]propan-2-amine (18k)
Colourless oil, 100% yield. ^{1}H-NMR ($CDCl_3$): 7.93-7.97 (2H, m), 7.70 (1H, t, *J* = 7.2 Hz), 7.61 (2H, t, *J* = 7.2 Hz), 3.33 (2H, t, *J* = 6.8 Hz), 3.01 (2H, t, *J* = 6.8 Hz), 1.10 (9H, s). IR: 1452, 1390, 1364, 1308, 1288, 1234, 1211, 1137, 1088, 922, 730, 685 cm^{-1}. HRESIMS: calculated $C_{12}H_{20}NO_2S$ 242.1209 Found: 242.1205.

1-Methyl-4-[2-(phenylsulfonyl)ethyl]piperazine (18l)
Colourless oil, 100% yield. ^{1}H-NMR ($CDCl_3$): 7.93-7.97 (2H, m), 7.70 (1H, t, *J* = 7.2 Hz), 7.61 (2H, t, *J* = 7.2 Hz), 3.32 (2H, m), 2.81 (2H, m), 2.42-2.49 (4H, br, s), 2.32-2.41 (4H, br, s), 2.28 (3H, s). IR: 1459, 1446, 1321, 1308, 1280, 1165, 1144, 1086, 1010, 747, 726, 689 cm^{-1}. HRESIMS: calculated for $C_{13}H_{21}N_2O_2S$ 269.1318 Found: 269.1314.

Arylmethyl sulfonamides

(4-Bromophenyl)-*N*-[2-(dimethylamino)ethyl]methanesulfonamide (19a)
(4-Bromophenyl)methanesulfonyl chloride (250 mg, 0.928 mmol) was dissolved in DCM (5 mL, dry) to which N^1,N^1-dimethyl-1,2-ethanediamine (82 mg, 102 μL, 0.928 mmol) was added neat dropwise at room temperature with stirring under nitrogen. The reaction mixture was stirred at room temperature overnight. The reaction mixture was washed with aqueous sodium hydroxide solution (187 mg, 4.675 mmol in 10 mL). The organic layer was separated, dried ($MgSO_4$) and the solvent removed under reduced pressure to give the required product as a white microcrystalline solid (250 mg, 84%), mp 112-115 ^oC, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^1H NMR (DMSO-d_6): 7.58 (2H, d, *J* = 8.4 Hz), 7.33 (2H, d, *J* = 8.4 Hz), 4.35 (2H, s), 2.95 (2H, t, J = 6.8 Hz), 6.9Hz), 2.11 (6H, s). IR [KBr]: 1489, 1466, 1445, 1406, 1327, 1260, 1157, 1125, 1107, 1047, 899, 838, 818 cm^{-1}. Calculated for $C_{11}H_{17}BrN_2O_2S$ C, 41.13; H, 5.33; N, 8.72; Br, 24.87; S, 9.98 Found: C, 41.21; H, 5.45; N, 8.54; Br, 25.36; S, 10.32. HRFABMS: calculated for $C_{11}H_{18}{}^{81}BrN_2O_2S$ 323.0252 Found: 323.0254.

Similarly prepared were

Phenyl-*N*-[2-(1-pyrrolidinyl)ethyl]methanesulfonamide (19b)
White solid (56%), mp 97-99 ^oC, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^1H NMR (DMSO-d_6): 7.38-7.33 (5H, m), 6.98(1H, t, J = 5.5Hz), 4.35(2H, s), 2.99 (2H, q, J = 6.7Hz), 2.45-2.41(6H, m), 1.67-1.64 (4H, m). IR [KBr]: 1496, 1455, 1325, 1124, 1106, 892, 784 cm^{-1}. Calculated for $C_{13}H_{20}N_2O_2S$ C, 58.18; H, 7.51; N, 10.44; S, 11.95 Found: C, 58.49; H, 7.47; N, 10.41; S, 14.01. HRFABMS: calculated for $C_{13}H_{21}N_2O_2S$ 269.1324 Found 269.1323.

***N*-[2-(4-Morpholinyl)ethyl](phenyl)methanesulfonamide (19c)**
Colourless oil (56%), R_F = 0.4 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^1H NMR (DMSO-d_6): 7.39-7.32 (5H, m), 6.94 (1H, t, *J* = 5.8 Hz), 4.36 (2H, s), 3.55 (4H, t, *J* = 4.6 Hz), 3.01 (2H, q, *J* = 6.6 Hz), 2.35-2.31 (6H, m). IR [KBr]: 1495, 1456, 1403, 1322, 1151, 1125, 962, 860, 782 cm^{-1}. Microanalysis: calculated for $C_{13}H_{20}N_2O_3S$ C, 58.18; H, 7.51; N, 10.44 Found: C, 58.48; H, 7.46; N, 10.54. HRFABMS: calculated for $C_{13}H_{21}N_2O_3S$ 285.1273 Found: 285.1277.

(4-Bromophenyl)-*N*-[2-(1-pyrrolidinyl)ethyl]methanesulfonamide (19e)
White solid (65%), mp 93-95 ^oC, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^1H NMR (DMSO-d_6): 7.58 (2H, d, *J* = 8.4Hz), 7.33 (2H, d, *J* = 8.4 Hz), 7.02 (1H, br), 4.36 (2H, s), 2.98 (2H, br), 2.45-2.32 (6H, m), 1.67-1.64 (4H, m). IR [KBr]: 1630, 1590, 1487, 1325, 1310, 1126, 1103, 1071, 817 cm^{-1}. Calculated for $C_{13}H_{19}BrN_2O_2S$ C, 44.96; H, 5.51; N, 8.07 Found: C, 44.80; H, 5.41; N, 8.27. HRFABMS: calculated for $C_{13}H_{20}{}^{79}BrN_2O_2S$ 347.0429 Found: 347.0433.

(4-Bromophenyl)-*N*-[2-(4-morpholinyl)ethyl]methanesulfonamide (19f)
White solid (74%), mp 105-107 ^oC, R_F = 0.4 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^1H NMR (DMSO-d_6): 7.58 (2H, d, *J* = 8.4 Hz), 7.35 (2H, d, *J* = 8.4 Hz), 6.99 (1H, t, *J* = 5.8 Hz), 4.37 (2H, s), 3.55 (4H, t, *J* = 4.6 Hz), 3.04 (2H, q, *J* = 6.7 Hz), 2.35-2.31 (6H, m). Calculated for $C_{13}H_{19}BrN_2O_3S$ C, 42.98; H, 5.27; N, 7.71 Found: C, 42.98; H, 5.42; N, 7.39. HRFABMS: calculated for $C_{13}H_{19}{}^{79}BrN_2O_3S$ 363.0378 Found: 363.0375.

***N*-[2-(Dimethylamino)ethyl](4-fluorophenyl)methanesulfonamide (19g)**
White microcrystalline solid (71%), mp 116-119 ^{o}C, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^{1}H NMR (DMSO-d_6): 7.42-7.39 (2H, m), 7.22-7.18 (2H, m), 6.94 (1H, br), 4.35 (2H, s), 2.95 (2H, t, J = 6.8 Hz), 2.26 (2H, t, *J* = 6.9Hz), 2.11 (6H, s). IR [KBr]: 1600, 1511, 1470, 1330, 1262, 1229, 1150, 1128, 1109, 897, 840 cm^{-1}. calculated for $C_{11}H_{17}FN_2O_2S$ C, 50.75; H, 6.58; N, 10.76; S, 12.32 Found: C, 51.05; H, 6.54; N, 10.67; S, 12.54. HRFABMS: calculated for $C_{11}H_{17}FN_2O_2S$ 260.0995 Found: 260.0993.

(4-Fluorophenyl)-*N*-[2-(1-pyrrolidinyl)ethyl]methanesulfonamide (19h)
White microcrystalline solid (50%), mp 108-110 ^{o}C, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^{1}H NMR (DMSO-d_6): 7.42-7.39 (2H, m), 7.22-7.18 (2H, m), 4.36 (2H, s), 2.98(2H, q, J = 5.8 Hz), 2.42-2.32 (6H, m), 1.66 (4H, m). IR [KBr]: 1603, 1511, 1324, 1229, 1090, 1150, 844, 783 cm^{-1}. Calculated for $C_{13}H_{20}O_2N_2FS$ C, 54.52; H, 6.69; N, 9.78; S, 11.20 Found: C, 55.41; H, 6.74; N, 9.65; S, 12.43. HRFABMS: calculated for $C_{13}H_{20}O_2N_2FS$ 287.1230 Found: 287.1229.

(4-Fluorophenyl)-*N*-[2-(4-morpholinyl)ethyl]methanesulfonamide (19i)
Colourless oil (70 mg, 87%), R_F = 0.4 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^{1}H NMR (DMSO-d_6): 7.44-7.40 (2H, m), 7.22-7.18 (2H, m), 6.94 (1H, br), 4.37 (2H, s), 3.56 (4H, t, *J* = 4.6 Hz), 3.00 (2H, m), 2.35-2.32 (6H, m). IR [NaCl]: 1603, 1511, 1324, 1290, 1230, 1090, 845, 783 cm^{-1}. Calculated for $C_{13}H_{19F}N_2O_3S$ C, 51.64; H, 6.33; N, 9.26 Found: C, 51.44; H, 6.64; N, 9.39. HRFABMS: calculated for $C_{13}H_{19}FN_2O_3S$ 303.1179 Found: 303.1176.

***N*-[2-(Dimethylamino)ethyl](4-methylphenyl)methanesulfonamide (19j)**
White solid (74%), mp 95-96 ^{o}C, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^{1}H NMR (DMSO-d_6): 7.26 (2H, d, *J* = 8.0 Hz), 7.18 (2H, d, *J* = 8.0 Hz), 6.87 (1H, t, *J* = 5.5 Hz), 4.28 (2H, s), 2.95 (2H, q, *J* = 6.6 Hz), 2.29 (3H, s), 2.27 (2H, t, *J* = 7.0 Hz), 2.11 (6H, s). IR (KBr): 1613, 1513, 1470, 1322, 1155, 1126, 1113, 1085, 896, 824 cm^{-1}. Calculated for $C_{12}H_{20}N_2O_2S$ C, 56.22; H, 7.86; N, 10.93 Found: C, 56.52; H, 7.67; N, 10.64. HRFABMS: calculated for $C_{12}H_{20}N_2O_2S$ 257.1324 Found: 257.1323.

(4-Methylphenyl)-*N*-[2-(1-pyrrolidinyl)ethyl]methanesulfonamide (19k)
White solid (67%), mp 72-74 ^{o}C, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^{1}H NMR (DMSO-d_6): 7.26 (2H, d, *J* = 8.0 Hz), 7.17 (2H, d, *J* = 8.0 Hz), 6.91 (1H, br), 4.29 (2H, s), 2.96 (2H, t, *J* = 6.4 Hz), 2.44-2.39 (6H, m), 2.29 (3H, s), 1.67 (4H, qt, *J* = 3.1 Hz). IR (KBr): 1511, 1430, 1311, 1272, 1168, 1128, 1071, 986, 882, 818, 762 cm^{-1}. Calculated for $C_{14}H_{22}N_2O_2S$ C, 59.54; H, 7.85; N, 9.92 Found: C, 59.42; H, 7.63; N, 9.74. HRFABMS: calculated for $C_{14}H_{22}N_2O_2S$ 283.1480 Found: 283.1477.

(4-Methylphenyl)-*N*-[2-(4-morpholinyl)ethyl]methanesulfonamide (19l)
White solid (68%), mp 82-84 ^{o}C, R_F = 0.4 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^{1}H NMR (DMSO-d_6): 7.26 (2H, d, *J* = 8.0 Hz), 7.18 (2H, d, *J* = 8.0 Hz), 6.88 (1H, br), 4.30 (2H, s), 3.56 (4H, t, *J* = 4.6 Hz), 2.98 (2H, t, *J* = 6.4 Hz), 2.34-2.24 (9H, m). IR (KBr): 1611, 1511, 1463, 1412, 1310, 1170, 1129, 1113, 1070, 878, 818, 763 cm^{-1}. Calculated for $C_{14}H_{22}N_2O_3S$ C, 56.35;

H, 7.43; N, 9.39 Found: C, 56.44; H, 7.63; N, 9.64. HRFABMS: calculated for $C_{14}H_{22}N_2O_3S$ 299.1429 Found: 299.1432.

***N*-[2-(Dimethylamino)ethyl](4-nitrophenyl)methanesulfonamide (19m)**
White solid (69%), mp 128-130°C, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^{1}H NMR (DMSO-d_6): 8.25(2H, d, *J* = 8.8 Hz), 7.67(2H, d, *J* = 8.8 Hz), 7.12 (1H, br), 4.57 (2H, s), 3.02 (2H, t, *J* = 6.7 Hz), 2.31 (2H, t, *J* = 6.8 Hz), 2.13 (6H, s). IR (KBr): 1611, 1511, 1463, 1412, 1310, 1170, 1129, 1113, 1070, 878, 818, 763 cm^{-1}. Microanalysis: calculated for $C_{11}H_{17}N_3O_4S$ C, 45.98; H, 5.96; N, 14.62 Found: C, 46.07; H, 5.36; N, 14.55. HRCIMS: Calculated for $C_{11}H_{18}N_3O_4S$ 288.1018 Found: 288.1015.

(4-Nitrophenyl)-*N*-[2-(1-pyrrolidinyl)ethyl]methanesulfonamide (19n)
Light brown solid (74%), mp 112-114 °C, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^{1}H NMR (DMSO-d_6): 8.26 (2H, d, *J* = 8.8 Hz), 7.67 (2H, d, *J* = 8.8 Hz), 7.16 (1H, br), 4.58 (2H, s), 3.04 (2H, br), 2.48-2.44 (6H, m), 1.68-1.65 (4H, m). IR (KBr): 1606, 1518, 1347, 1315, 1162, 1129, 1105, 930, 870, 857 cm^{-1}. Calculated for $C_{13}H_{19}N_3O_4S$ C, 49.83; H, 6.11; N, 13.41 Found: C, 49.92; H, 6.40; N, 13.23. HRCIMS: Calculated for $C_{13}H_{20}N_3O_4S$ 314.1175 Found: 314.1173.

***N*-[2-(4-Morpholinyl)ethyl](4-nitrophenyl)methanesulfonamide (19o)**
Pale yellow oil (60%), R_F = 0.4 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^{1}H NMR (DMSO-d_6): 8.25 (2H, d, *J* = 8.8 Hz), 7.68 (2H, d, *J* = 8.8 Hz), 3.57 (4H, t, *J* = 4.6 Hz), 3.08 (2H, t, *J* = 6.2 Hz), 2.38-2.34 (6H, m). IR (KBr): 1606, 1520, 1455, 1348, 1319, 1153, 1127, 1115, 858, 770 cm^{-1}. Calculated for $C_{13}H_{19}N_3O_5S$ C, 47.41; H, 5.81; N, 12.76 Found: C, 47.44; H, 5.92; N, 12.67. HRCIMS: Calculated for $C_{13}H_{20}N_3O_5S$ 330.1124 Found: 330.1122.

(4-Bromophenyl)-*N*-[3-(dimethylamino)propyl]methanesulfonamide (19p)
White crystalline solid (43%), mp 95-97 °C, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^{1}H NMR (DMSO-d_6): 7.58 (2H, d, *J* = 8.4 Hz), 7.32 (2H, d, *J* = 8.4 Hz), 7.07 (1H, t, *J* = 5.5 Hz), 4.30 (2H, s), 2.92 (2H, q, *J* = 6.8 Hz), 2.17 (2H, t, *J* = 7.0 Hz), 2.07 (6H, s), 1.55 (2H, qt, *J* = 7.0 Hz). IR (KBr): 1591, 1488, 1461, 1326, 1154, 1124, 1096, 1072, 970, 840 cm^{-1}. Calculated for $C_{12}H_{19}BrN_2O_2S$ C, 42.99; H, 5.71; N, 8.36 Found: C, 43.39; H, 5.25; N, 8.53. HRFABMS: Calculated for $C_{12}H_{20}{}^{79}BrN_2O_2S$ 335.0429 Found: 335.0427.

***N*-[3-(Dimethylamino)propyl](4-nitrophenyl)methanesulfonamide (19q)**
Pale yellow solid (45%), mp 103-105 °C, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^{1}H NMR (DMSO-d_6): 8.25 (2H, d, *J* = 8.8 Hz), 7.65 (2H, d, *J* = 8.8 Hz), 7.19 (1H, t, *J* = 5.4 Hz), 4.52 (2H, s), 2.96 (2H, q, *J* = 5.4 Hz), 2.21 (2H, t, *J* = 7.0 Hz), 2.08 (6H, s), 1.57 (2H, qt, *J* = 7.0 Hz). IR (KBr): 1604, 1514, 1326, 1351, 1163, 1127, 1090, 978, 863, 812 cm^{-1}. calculated for $C_{12}H_2N_3O_4S$ C, 47.83; H, 6.35; N, 13.94 Found: C, 47.77; H, 6.06; N, 13.66. HRFABMS: Calculated for $C_{12}H_2N_3O_4S$ 302.1175 Found: 302.1173.

***N*-[3-(Dimethylamino)propyl](4-methylphenyl)methanesulfonamide (19r)**
Pale yellow solid (61%), mp 90-93 °C, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^{1}H NMR (DMSO-d_6): 7.25 (2H, d, *J* = 8.1 Hz), 7.18 (2H, d, *J* = 8.1 Hz), 7.01 (1H, t, *J* = 5.7 Hz), 4.23 (2H, s), 2.92 (2H, q, *J* = 6.9 Hz), 2.29 (3H, s), 2.20 (2H, t, *J* = 6.9 Hz), 2.08 (6H, s), 1.55

(2H, qt, *J* = 6.9 Hz). IR (KBr): 1514, 1464, 1325, 1265, 1155, 1130, 1096, 1027, 970, 823 cm^{-1}. Calculated for $C_{13}H_{23}N_2O_2S$ C, 57.75; H, 8.20; N, 10.36 Found: C, 57.85; H, 8.33; N, 10.30. HRFABMS: Calculated for $C_{13}H_{23}N_2O_2S$ 271.1480 Found: 271.1482.

***N*-[3-(Dimethylamino)propyl](4-fluorophenyl)methanesulfonamide (19s)**
White solid (55%), mp 100-103 ^oC, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^1H NMR (DMSO-d_6): 7.38-7.37 (2H, m), 7.22-7.18 (2H, m), 7.07 (1H, t, J = 5.6 Hz), 4.31 (2H, s), 2.93 (2H, q, J = 6.8 Hz), 2.20 (2H, t, J = 7.0 Hz), 2.08 (6H, s), 1.55 (2H, qt, J = 7.0 Hz). IR (KBr): 1604, 1508, 1325, 1227, 1123, 1151, 1081, 1007, 849, 772 cm^{-1}. Calculated for $C_{12}H_{19}FN_2O_2S$ C, 52.53; H, 6.98; N, 10.21 Found: C, 52.75; H, 7.20; N, 10.11. HRFABMS: Calculated for $C_{12}H_{19}FN_2O_2S$ 275.1230 Found: 275.1231.

***N*-[3-(Dimethylamino)propyl](phenyl)methanesulfonamide (19t)**
White solid (58%), mp 107-109^oC, R_F = 0.1 [TLC: basic, 99% ethyl acetate and 1% TEA]. ^1H NMR (DMSO-d_6): 7.35-7.31 (5H, m), 7.05 (1H, t, J = 5.6 Hz), 4.29 (2H, s), 2.91 (2H, q, J = 5.8 Hz), 2.20 (2H, t, 6.9 Hz), 1.53 (2H, qt, J = 7.0 Hz). IR (KBr): 1514, 1464, 1326, 1265, 1155, 1130, 1096, 1027, 970, 823 cm^{-1}. Calculated for $C_{12}H_{20}N_2O_2S$ C, 56.22; H, 7.86; N, 10.93 Found: C, 56.43; H, 7.91; N, 10.72. HRFABMS: Calculated for $C_{12}H_{21}O_2N_2S$ 257.1324 Found: 257.1326.

Naphthalene sulfonamides

Sodium 2-naphthylmethanesulfonate [1]

2-(Chloromethyl)naphthalene (1.00 g, 4.50 mmol) and sodium sulphite hydrated [$Na_2SO_3.7H_2O$] (1.25 g, 4.97 mmol, 1.1 molar equivalent) were dissolved in water (6 mL) and acetone (10 mL). The reaction mixture was heated under reflux for 3h then the solvents were removed under reduced pressure to give the required product as white crystals (1.03, 94%), mp >230 ^oC, after filtration, washing with water and drying under reduced pressure. ^1H NMR (DMSO-d_6): 7.86-7.75 (4H, m), 7.51-7.42 (3H, m), 3.86 (2H, s). IR (KBr): 1630, 1595, 1507, 1409, 1362, 1211, 1193, 1154, 1139, 1063, 874, 861, 827, 752, 729 cm^{-1}.

***N*,*N*,*N*-tributyl-1-butanaminium 2-naphthylmethanesulfonate**

Sodium 2-naphthylmethanesulfonate (500 mg, 2.00 mmol), tetrabutylammonium bisulfate $(CH_3CH_2CH_2CH_2)_4NHSO_4$ (679 mg, 2.00 mmol), sodium hydroxide (80 mg, 20 mmol) were dissolved in water (5 mL) and dichloromethane (5 mL). The reaction mixture was stirred for 15 min at room temperature then the organic layer was separated, and the water layer was extracted with dichloromethane. The organic layers were combined, dried ($MgSO_4$), filtered, and the solvent removed under reduced pressure to give the pure product as white solid (521 mg, 56%), mp 123-125 ^oC [Lit. mp 115-118 ^oC]. ^1H NMR (DMSO-d_6): 7.82-7.74 (4H, m), 7.51-7.42 (3H, m), 3.84 (2H, s), 3.17-3.13 (8H, m), 1.55 (8H, m), 1.34-1.25 (8H, sextet, J = 7.6 Hz), 0.93 (12H, t, J = 7.2 Hz). IR (KBr): 1630, 1599, 1489, 1386, 1358, 1225, 1198, 1035, 874, 826, 775, 753 cm^{-1}.

2-Naphthylmethanesulfonyl chloride

N,*N*,*N*-Tributyl-1-butanaminium 2-naphthylmethanesulfonate (0.516 g, 1.11 mmol) was dissolved in DCM (5 mL, dry) and cooled to -20 ^oC. Phosphoros pentachloride (0.232 g, 1.11 mmol) was dissolved in DCM (5 mL, dry) and then added to the starting material dropwise with stirring under nitrogen. The stirring was continued while the temperature was left to rise to room temperature over 30 min. The reaction mixture was applied to silica gel column. The eluate was collected and the column was then washed with ethyl acetate (dry)/n-hexane (dry) (50 mL, 1/1). Solvents the combined eluate and washing) were removed under reduced pressure to give the required product as a white solid (175 mg, 66%), mp 110-112 ^oC. ^1H NMR ($CDCl_3$): 7.99-7.89 (4H, m), 7.60-7.55 (3H, m), 5.04 (2H, s). IR (KBr): 1598, 1509, 1402, 1366, 1275, 1262, 1245, 1175, 1132, 869, 831, 756, 719 cm^{-1}.

***N*-[2-(4-Morpholinyl)ethyl](2-naphthyl)methanesulfonamide (19u)**

White solid (86%), mp131-134 ^oC, R_F = 0.2 [ethyl acetate only]. ^1H NMR (DMSO-d_6): 7.92-7.90 (4H, m), 7.54-7.51 (3H, m), 6.96 (1H, br), 4.55 (2H, s), 3.55 (4H, t, J = 4.8 Hz), 3.05 (2H, t, J = 6.8 Hz), 2.36-2.32 (6H, m). IR (KBr): 1676, 1642, 1594, 1561, 1506, 1462, 1423, 1308, 1174, 1118, 1070, 980, 911, 870, 823, 752, 722 cm^{-1}. Calculated for $C_{17}H_{22}N_2O_3S$ C, 61.05; H, 6.63; N, 8.38 Found: C, 61.12; H, 6.73; N, 8.01. HREIMS: Calculated for $C_{17}H_{22}N_2O_3S$ 334.1351 Found: 334.1352.

2-Naphthyl-*N*-[2-(1-pyrrolidinyl)ethyl]methanesulfonamide (19v)

White solid (91%), mp 106-109 ^oC, R_F = 0.05 [ethyl acetate only]. ^1H NMR (DMSO-d_6): 7.93-7.90 (4H, m), 7.55-7.51 (3H, m), 7.01 (1H, br), 4.53 (2H, s), 3.00 (2H, br), 2.46-2.40 (6H, m),

1.66-1.63 (4H, m). IR (KBr): 1627, 1597, 1506, 1457, 1426, 1307, 1270, 1175, 1116, 1072, 1020, 982, 913, 873, 829, 747 cm^{-1}. Calculated for $C_{17}H_{22}N_2O_2S$ C, 64.12; H, 6.96; N, 8.80 Found: C, 64.33; H, 6.70; N, 8.81. HREIMS: Calculated for $C_{17}H_{22}N_2O_2S$ 318.1402 Found: 318.1400.

***N*-[2-(Dimethylamino)ethyl](2-naphthyl)methanesulfonamide (19w)**
White solid (50 mg, 82%), mp 121-124 ^oC, R_F = 0.05 [ethyl acetate only]. ^1H NMR (DMSO-d_6): 7.93-7.90 (4H, m), 7.55-7.51 (3H, m), 6.96 (1H, br), 4.53(2H, s), 2.99 (2H, t, *J* = 6.8 Hz), 2.28 (2H, t, *J* = 6.9 Hz), 2.11 (6H, s). Calculated for $C_{15}H_{20}N_2O_2S$ C, 61.62; H, 6.89; N, 9.58 Found: C, 61.34; H, 6.90; N, 8.71. HREIMS: Calculated for $C_{15}H_{20}N_2O_2S$ 292.1245 Found: 292.1243.

Phenylmethylamine sulfonamides

_N_-Benzylethylenesulfonamide (20a)

Benzylamine (1.275 g, 11.89 mmol) was dissolved in DCM (5 mL, dry) at 0 ^{o}C with stirring under N_2 to which a solution of 2-chloroethanesulfonyl chloride (0.969 g, 5.94 mmol) dissolved in DCM (5 mL, dry) was added at 0 ^{o}C with stirring under N_2. After which time the reaction mixture was stirred at room temperature for 2 h. The reaction mixture was extracted with dilute hydrochloric acid and the organic layers were collected, dried ($MgSO_4$), filtered and the solvent removed under reduced pressure. The crude product was purified by column chromatography (ethyl acetate/n-hexane 1/3, R_F=0.2). The product was obtained as colourless oil (390 mg, 33%). ^{1}H NMR (DMSO-d_6): 7.82 (1H, t, *J* = 6.3Hz), 7.35-7.25 (5H, m), 6.69 (1H, dd, *J* = 10.0 Hz & 16.5 Hz), 6.04(1H, d, *J* = 16.5 Hz), 5.95 (1H, d, *J* = 10.0 Hz), 4.04 (2H, d, *J* = 6.2Hz). Calculated for $C_9H_{11}NO_2S$ C, 54.80; H, 5.62; N, 7.10 Found: C, 54.89; H, 5.72; N, 7.04. HRCIMS: Calculated for $C_9H_{12}NO_2S$ 198.0589 Found: 198.0590.

_N_-(4-Bromobenzyl)ethylenesulfonamide (20b)

4-Bromobenzylamine (1.00 g, 5.37 mmol) was dissolved in DCM (5 mL, dry) at 0 ^{o}C with stirring under N_2 to which a NMM (542 mg; 542 µL; 5.37mmol) was added with stirring. A solution of 2-chloroethanesulfonyl chloride (0.876g, 565µL, 5.37mmol) dissolved in DCM (5 mL, dry) was added at 0 ^{o}C with stirring under N_2. After which time the reaction mixture was stirred at room temperature overnight. The reaction mixture was extracted with dilute hydrochloric acid and the organic layers were collected, dried ($MgSO_4$), filtered and the solvent removed under reduced pressure. The crude product was purified by column chromatography (ethyl acetate/n-hexane 1/3, R_F=0.2). The product was obtained as a white solid (1.100 g, 74%), mp 70-72 ^{o}C. ^{1}H NMR (DMSO-d_6): 7.86 (1H, t, *J* = 6.2 Hz), 7.53 (2H, d, *J* = 8.4 Hz), 7.28 (2H, d, *J* = 8.4 Hz), 6.71 (1H, dd, J = 10.0 & J = 16.5 Hz), 6.04 (1H, d, *J* = 16.6 Hz), 5.95 (1H, d, *J* = 10.0 Hz), 4.03 (2H, d, *J* = 6.3Hz). IR (KBr): 1593, 1488, 1423, 1323, 1143, 1067, 1035, 1009, 970, 895, 807, 751 cm^{-1}. Calculated for $C_9H_{10}BrNO_2S$ C, 39.14; H, 3.65; N, 5.07 Found: C, 39.36; H, 3.65; N, 5.03. HREIMS: Calculated for $C_9H_{10}{}^{79}BrNO_2S$ 274.9616 Found: 274.9619.

_N_-(4-Methylbenzyl)ethylenesulfonamide (20c)

(4-Methylphenyl)methanamine (1.00 g, 8.25 mmol) was dissolved in DCM (5 mL, dry) at 0 ^{o}C with stirring under N_2 to which NMM (736 mg; 800 µL; 7.27 mmol) was added with stirring. A solution of 2-chloroethanesulfonyl chloride (1.39 g, 900 µL, 8.53 mmol) dissolved in DCM (5 mL, dry) was added at 0 ^{o}C with stirring under N_2. After which time the reaction mixture was stirred at room temperature overnight. The reaction mixture was extracted with dilute hydrochloric acid and the organic layers were collected, dried ($MgSO_4$), filtered and the solvent removed under reduced pressure. The crude product was purified by column chromatography (ethyl acetate/n-hexane 1/3, R_F=0.3). The product was obtained as a white solid (0.610 g, 35%), mp 80-83 ^{o}C. ^{1}H NMR (DMSO-d_6): 7.78 (1H, t, *J* = 6.2 Hz), 7.20 (2H, d, *J* = 8.0 Hz), 7.14 (2H, d, *J* = 8.0 Hz), 6.67 (1H, dd, *J* = 10.0 & 16.5 Hz), 6.03 (1H, d, *J* = 16.5 Hz), 5.94 (1H, d, *J* = 10.0 Hz), 3.99 (2H, d, *J* = 6.2 Hz), 2.27 (3H, s). IR (KBr): 1611, 1515, 1431, 1321, 1147, 1048, 981, 917, 811, 758 cm^{-1}. Calculated for $C_{10}H_{13}NO_2S$ C, 56.85; H, 6.20; N, 6.63 Found: C, 56.99; H, 6.95; N, 6.83. HRFABMS: Calculated for $C_{10}H_{14}NO_2S$ 212.0745 Found: 212.0748.

_N_-(4-Nitrobenzyl)ethylenesulfonamide (20d)

(4-Nitrophenyl)methanamine (1.00 g, 5.30 mmol) was dissolved in DCM (5 mL, dry) at 0 ^{o}C with stirring under N_2 to which a NMM (1.15 g; 1.25 mL; 11.39 mmol) was added with stirring. A solution of 2-chloroethanesulfonyl chloride (0.864 g, 558 μL, 5.30 mmol) dissolved in DCM (5 mL, dry) was added at 0 ^{o}C with stirring under N_2. After which time the reaction mixture was stirred at room temperature overnight. The reaction mixture was extracted with dilute hydrochloric acid and the organic layers were collected, dried ($MgSO_4$), filtered and the solvent removed under reduced pressure. The crude product was purified by column chromatography (ethyl acetate/n-hexane 1/2, R_F=0.1). The product was obtained as a white solid after recrystallization from ethyl acetate/n-hexane (0.396 g, 31%), mp 83-86 ^{o}C. ^{1}H NMR (DMSO-d_6): 8.22 (2H, d, *J* = 8.8 Hz), 8.04 (1H, t, *J* = 6.2 Hz), 7.61 (2H, d, *J* = 8.8 Hz), 6.76 (1H, dd, *J* = 9.9 & 16.5 Hz), 6.07 (1H, d, *J* = 16.5 Hz), 5.98 (1H, d, *J* = 9.9 Hz), 4.21(2H, d, *J* = 6.2 Hz). IR (KBr): 1605, 1414, 1345, 1322, 1156, 1141, 1109, 1156, 1141, 1109, 1055, 1043, 856,795,743 cm^{-1}. Calculated for $C_9H_{10}N_2O_4S$ C, 44.62; H, 4.16; N, 11.56. Found: C, 44.76; H, 4.20; N, 11.41. HRCIMS: Calculated for $C_9H_{11}N_2O_4S$ 243.0440 Found: 243.0439.

***N*-(4-Fluorobenzyl)ethylenesulfonamide (20e)**

4-Fluorobenzylamine (1.00 g, 7.99 mmol) was dissolved in DCM (5 mL, dry) at 0 ^{o}C with stirring under N_2 to which a NMM (808 mg; 879 μL; 7.99 mmol) was added with stirring. A solution of 2-chloroethanesulfonyl chloride (1.30 g, 840 μL, 7.99 mmol) dissolved in DCM (5 mL, dry) was added at 0 ^{o}C with stirring under N_2. After which time the reaction mixture was stirred at room temperature overnight. The reaction mixture was extracted with dilute hydrochloric acid and the organic layers were collected, dried ($MgSO_4$), filtered and the solvent removed under reduced pressure. The crude product was purified by column chromatography (ethyl acetate/n-hexane 1/3, R_F=0.2). The product was obtained as a white solid (0.927 g, 54%), mp 54-57 ^{o}C. ^{1}H NMR (DMSO-d_6): 7.84 (1H, t, *J* = 6.2 Hz), 7.36 (1H, d, *J* = 5.6 Hz), 7.34 (1H, d, *J* = 5.6 Hz), 7.17 (2H, t, 9.0 Hz), 6.69 (1H, dd, *J* = 10.0 & 16.5 Hz), 6.04 (1H, d, *J* = 16.5 Hz), 5.95 (1H, d, *J* = 10.0 Hz), 4.04 (2H, d, *J* = 6.2 Hz). IR (KBr): 1605, 1515, 1346, 1322, 1141, 857, 794, 743 cm^{-1}. Calculated for $C_9H_{10}FNO_2S$ C, 50.22; H, 4.68; N, 6.51 Found: C, 50.46; H, 4.73; N, 6.51. HRCIMS: Calculated for $C_9H_{11}FNO_2S$ 216.0495 Found: 216.0491.

***N*-Benzyl-2-(1-pyrrolidinyl)ethanesulfonamide (21a)**

N-Benzylethylenesulfonamide (140 mg, 0.709 mmol) was dissolved in DCM (5 mL, dry) at room temperature to which pyrrolidine (500 mg; 590 μL, 7.09 mmol) was added at room temperature with stirring. The reaction mixture was left standing at room temperature for 48 h. Solvent and excess pyrrolidine were removed under reduced pressure. The white solid material obtained was triturated with n-hexane and filtered to give the required product as a white solid (135 mg, 71%), R_F=0.2 (ethyl acetate/NMM 100/1; basic TLC), mp 100-103 ^{o}C. ^{1}H NMR (DMSO-d_6): 7.60 (1H, t, *J* = 6.2 Hz), 7.36-7.24 (5H, m), 4.15 (2H, d, *J* = 6.2 Hz), 3.11 (2H, t, *J* = 7.5 Hz), 2.71 (2H, t, *J* = 7.9 Hz), 2.37-2.32 (4H, m), 1.67-1.63 (4H, m). IR (KBr): 1642, 1458, 1331, 1133, 1072, 1017, 870, 761, 738, 705 cm^{-1}. Calculated for $C_{13}H_{20}N_2O_2S$ C, 58.18; H, 7.51; N, 10.44 Found: C, 58.03; H, 7.84; N, 10.32. HRFABMS: Calculated for $C_{13}H_{21}N_2O_2S$ 269.1324 Found: 269.1325.

Similarly prepared were:

***N*-Benzyl-2-(4-morpholinyl)ethanesulfonamide (21b)**

White solid (66%), R_F=0.4 (ethyl acetate/NMM 100/1; basic TLC), mp 100-103 ^oC. ^1H NMR (DMSO-d_6): 7.57 (1H, t, *J* = 6.3 Hz), 7.35-7.24 (5H, m), 4.16 (2H, d, *J* = 6.3 Hz), 3.53 (4H, t, *J* = 4.5 Hz), 3.13 (2H, t, *J* = 7.3 Hz), 2.61 (2H, t, *J* = 7.6 Hz), 2.31 (4H, m). IR (KBr): 1642, 1458, 1331, 1133, 1072, 1017, 870, 761, 738, 705 cm^{-1}. Calculated for $C_{13}H_{20}N_2O_3S$ C, 54.91; H, 7.09; N, 9.85 Found: C, 54.99; H, 7.15; N, 9.73. HRFABMS: Calculated for $C_{13}H_{21}N_2O_3S$ 285.1273 Found: 285.1276.

***N*-Benzyl-2-(dimethylamino)ethanesulfonamide (21c)**
White solid (60%), R_F=0.2 (ethyl acetate/NMM 100/1; basic TLC), mp 47-50 ^oC. ^1H NMR (DMSO-d_6): 7.61 (1H, t, *J* = 6.3 Hz), 7.37-7.24 (5H, m), 4.15 (2H, d, *J* = 6.3 Hz), 3.07 (2H, t, *J* = 7.5 Hz), 2.56 (2H, t, *J* = 7.8 Hz), 2.08 (6H, s). IR (KBr): 1490, 1330, 1295, 1144, 1065, 845, 738, 719, 694 cm^{-1}. Calculated for $C_{11}H_{18}N_2O_2S$ C, 54.52; H, 7.49; N, 11.56 Found: C, 54.89; H, 7.25; N, 11.33. HRFABMS: Calculated for $C_{11}H_{19}N_2O_2S$ 243.1167 Found: 243.1164.

***N*-(4-Bromobenzyl)-2-(4-morpholinyl)ethanesulfonamide (21d)**
N-(4-Bromobenzyl)ethylenesulfonamide (150 mg, 0.543 mmol) was dissolved in DCM (5 mL, dry) to which morpholine (50 mg, 50 μL, 0.574 mmol) was added neat dropwise at room temperature with stirring under nitrogen. The reaction mixture was stirred at room temperature overnight. DCM and excess morpholine were removed under reduced pressure and the crude product obtained was applied to a silica gel column chromatography. The product was eluted with ethyl acetate / NMM (100/1), R_F=0.4 (basic TLC). The required product was obtained as a white solid (100 mg, 51%), mp 102-105 ^oC. ^1H NMR (DMSO-d_6): 7.65 (1H, s), 7.55 (2H, d, *J* = 8.4 Hz), 7.31 (2H, d, *J* = 8.4 Hz), 4.13 (2H, s), 3.54 (4H, t, *J* = 4.6 Hz), 3.15 (2H, t, *J* = 7.3 Hz), 2.61 (2H, t, *J* = 7.6 Hz), 2.32 (4H, m). IR (KBr): 1477, 1448, 1321, 1270, 1114, 1074, 1008, 874, 799, 755 cm^{-1}. Calculated for $C_{13}H_{19}BrN_2O_3S$ C, 42.98; H, 5.27; N, 7.71 Found: C, 43.06; H, 5.35; N, 7.43. HRCIMS: Calculated for $C_{13}H_{20}{}^{79}BrN_2O_3S$ 363.0378 Found: 363.0373.

Similarly prepared were
***N*-(4-Bromobenzyl)-2-(1-pyrrolidinyl)ethanesulfonamide (21e)**
White solid after recrystallization from ethyl acetate/n-hexane (104 mg, 55%), mp 112-115 ^oC. ^1H NMR (DMSO-d_6): 7.61 (1H, t, *J* = 6.2 Hz), 7.55 (2H, d, *J* = 8.4 Hz), 7.31 (2H, d, *J* = 8.4 Hz), 4.13 (2H, d, *J* = 6.0 Hz), 3.14 (2H, t, *J* = 7.4 Hz), 2.71 (2H, t, *J* = 7.8 Hz), 2.38 (4H, m), 1.65 (4H, m). IR (KBr): 1489, 1431, 1316, 1134, 1073, 1012, 882, 803 cm^{-1}. Calculated for $C_{13}H_{19}BrN_2O_2S$ C, 44.96; H, 5.51; N, 8.07 Found: C, 44.99; H, 5.65; N, 7.93. HRCIMS: Calculated for $C_{13}H_{20}{}^{79}BrN_2O_2S$ 347.0429 Found: 347.0426.

***N*-(4-Bromobenzyl)-2-(dimethylamino)ethanesulfonamide (21f)**
White solid after recrystallization from ethyl acetate/n-hexane (110 mg, 63%), mp 92-95 ^oC. ^1H NMR (DMSO-d_6): 7.64 (1H, t, *J* = 6.3 Hz), 7.55 (2H, d, *J* = 8.4 Hz), 7.31 (2H, d, *J* = 8.4 Hz), 4.13 (2H, d, *J* = 6.2 Hz), 3.11 (2H, t, *J* = 7.4 Hz), 2.57 (2H, t, *J* = 7.7 Hz), 2.10 (6H, s). IR (KBr): 1488, 1460, 1440, 1316, 1150, 1134, 1068, 1011, 853, 801 cm^{-1}. Calculated for $C_{11}H_{17}BrN_2O_2S$ C, 41.13; H, 5.33; N, 8.72 Found: C, 41.39; H, 5.45; N, 8.83. HRCIMS: Calculated for $C_{11}H_{18}{}^{79}BrN_2O_2S$ 321.0272 Found: 321.0257.

***N*-(4-Bromobenzyl)-2-[[2-(dimethylamino)ethyl](methyl)amino]ethanesulfonamide (21o)**

Colourless oil (73%). ^{1}H NMR (DMSO-d_6): 8.30 (1H, br), 7.55 (2H, d, *J* = 8.3 Hz), 7.30 (2H, d, *J* = 8.3 Hz), 4.06 (2H, d, *J* = 5.3 Hz), 3.12 (2H, t, *J* = 6.4 Hz), 2.68 (2H, t, *J* = 6.4 Hz), 2.38 (2H, t, *J* = 6.0 Hz), 2.28 (2H, m), 2.22 (3H, s), 2.00 (6H, s). IR (NaCl): 1668, 1586, 1462, 1319, 1139, 1073, 1012, 947, 803 cm$^{-1.}$ HRFABMS: Calculated for $C_{14}H_{25}N_3O_2{}^{79}BrS$ 314.1902 Found: 378.0831.

***N*-(4-Methylbenzyl)-2-(4-morpholinyl)ethanesulfonamide (21g)**
N-(4-Methylbenzyl)ethylenesulfonamide (150 mg, 0.709 mmol) was dissolved in DCM (5 mL, dry) to which morpholine (500 mg, 500 µL, 5.73 mmol) was added neat dropwise at room temperature with stirring under nitrogen. The reaction mixture was stirred at room temperature overnight. DCM and excess morpholine were removed under reduced pressure and the crude product obtained was applied to a silica gel column chromatography. The product was eluted with ethyl acetate / NMM (100/1), R_F=0.4 (basic TLC). The required product was obtained as a white solid (173 mg, 82%), mp 80-82 ^{o}C. ^{1}H NMR (DMSO-d_6): 7.53 (1H, t, *J* = 4.0 Hz), 7.23 (2H, d, *J* = 8.0 Hz), 7.16 (2H, d, *J* = 8.0 Hz), 4.10 (2H, d, *J* = 6.2 Hz), 3.53 (4H, t, *J* = 4.4 Hz), 3.10 (2H, t, *J* = 7.3 Hz), 2.60 (2H, t, *J* = 7.6 Hz), 2.29 (4H, m), 2.27 (3H, s). IR (KBr): 1617, 1515, 1452, 1301, 1139, 1127, 1116, 1054, 1007, 866, 804, 753 cm^{-1}. Calculated for $C_{14}H_{22}N_2O_3S$ C, 56.35; H, 7.43; N, 9.39 Found: C, 56.59; H, 7.45; N, 9.23. HRCIMS: Calculated for $C_{14}H_{23}N_2O_3S$ 299.1429 Found: 299.1427.

Similarly prepared were
***N*-(4-Methylbenzyl)-2-(1-pyrrolidinyl)ethanesulfonamide (21h)**
White solid (80%), mp 124-126 ^{o}C. ^{1}H NMR (DMSO-d_6): 7.54 (1H, t, *J* = 6.2 Hz), 7.22 (2H, d, *J* = 8.0 Hz), 7.15 (2H, d, *J* = 8.0 Hz), 4.09 (2H, d, *J* = 6.2 Hz), 3.09 (2H, t, *J* = 7.3 Hz), 2.70 (2H, t, *J* = 7.6 Hz), 2.36 (4H, m), 2.27 (3H, s), 1.63 (4H, m). IR (KBr): 1615, 1515, 1450, 1311, 1133, 1082, 863, 809, 742 cm^{-1}. Calculated for $C_{14}H_{22}N_2O_2S$ C, 59.54; H, 7.85; N, 9.92 Found: C, 59.69; H, 7.95; N, 9.83. HRFABMS: Calculated for $C_{14}H_{23}N_2O_2S$ 283.1480 Found: 283.1478.

2-(Dimethylamino)-*N*-(4-methylbenzyl)ethanesulfonamide (21i)
White solid (50%), mp 72-75 ^{o}C. ^{1}H NMR (DMSO-d_6): 7.54 (1H, t, *J* = 6.1 Hz), 7.22 (1H, d, *J* = 8.0 Hz), 7.15 (2H, d, *J* = 8.0 Hz), 4.10 (2H, d, *J* = 6.2 Hz), 3.05 (2H, t, *J* = 7.4 Hz), 2.56 (2H, t, *J* = 7.7 Hz), 2.29 (3H, s), 2.08 (3H, s). IR (KBr): 1514, 1478, 1322, 1264, 1004, 1147, 1067, 806 cm$^{-1.}$ Calculated for $C_{12}H_{20}N_2O_2S$ C, 56.22; H, 7.86; N, 10.93 Found: C, 56.39; H, 7.90; N, 9.91. HRCIMS: Calculated for $C_{12}H_{21}N_2O_2S$ 257.1324 Found: 257.1323.

2-[[2-(Dimethylamino)ethyl](methyl)amino]-*N*-(4-methylbenzyl)ethanesulfonamide (21o)
White crystals (66%), mp 88-90 ^{o}C. ^{1}H NMR (DMSO-d_6): 8.18(1H, t, *J* = 6.1 Hz), 7.21 (2H, d, *J* = 8.0 Hz), 7.15 (2H, d, *J* = 8.0 Hz), 4.03 (2H, d, *J* = 6.1 Hz), 3.08 (2H, t, *J* = 6.3 Hz), 2.74(2H, t, *J* =6.3 Hz), 2.36 (2H, t, *J* = 6.6 Hz), 2.27 (3H, s), 2.26 (2H, t, *J* = 6.0 Hz), 2.22 (3H, s), 2.20 (3H, s), 1.96 (6H, s). IR (NaCl): 1668, 1509, 1460, 1319, 1142, 1067, 947, 803, 745 cm^{-1}. HRFABMS: Calculated for $C_{15}H_{26}N_3O_2S$ 314.1902 Found: 312.1756.

2-(4-Morpholinyl)-*N*-(4-nitrobenzyl)ethanesulfonamide (21j)
N-(4-Nitrobenzyl)ethylenesulfonamide (100 mg, 0.413 mmol) was dissolved in DCM (5 mL, dry) to which morpholine (36 mg, 36 µL, 0.413 mmol) was added neat dropwise at room temperature with stirring under nitrogen. The reaction mixture was stirred at room temperature

overnight. DCM and excess morpholine were removed under reduced pressure and the crude product obtained was applied to a silica gel column chromatography. The product was eluted with ethyl acetate / NMM (100/1), R_F=0.2 (basic TLC). The required product was obtained as pale yellow oil (70 mg, 52%). ^{1}H NMR (DMSO-d_6): 8.23 (2H, d, *J* = 8.2 Hz), 7.78 (1H, t, *J* = 6.1 Hz), 7.62 (2H, d, *J* = 8.2 Hz), 4.32 (2H, d, *J* = 6.1 Hz), 3.54 (4H, m), 3.24 (2H, m), 2.65 (2H, m), 2.36 (4H, m). IR (NaCl): 1654, 1602, 1520, 1454, 1346, 1270, 1346, 1144, 1114, 1070, 1004, 856 cm^{-1}. Calculated for $C_{13}H_{19}N_3O_5S$ C, 47.41; H, 5.81; N, 12.76 Found: C, 47.56; H, 5.92; N, 12.41. HREIMS: Calculated for $C_{13}H_{19}N_3O_5S$ 329.1045 Found: 329.1044.

Similarly prepared were

***N*-(4-Nitrobenzyl)-2-(1-pyrrolidinyl)ethanesulfonamide (21k)**

Pale yellow solid (39%), mp 91-93 ^{o}C. ^{1}H NMR (DMSO-d_6): 8.23 (2H, d, *J* = 8.8 Hz), 7.77 (1H, s), 7.62 (2H, d, *J* = 8.8 Hz), 4.30 (2H, s), 3.22 (2H, t, *J* = 7.3 Hz), 2.75 (2H, t, *J* = 7.3 Hz), 3.89 (4H, m), 1.65 (4H, m). IR (KBr): 1608, 1599, 1519, 1346, 1322, 1140, 1108, 1067, 857 cm^{-1}. Calculated for $C_{13}H_{19}N_3O_4S$ C, 49.83; H, 6.11; N, 13.41 Found: C, 50.06; H, 6.23; N, 13.55. HRCIMS: Calculated for $C_{13}H_{20}N_3O_4S$ 314.1175 Found: 314.1176.

2-(Dimethylamino)-*N*-(4-nitrobenzyl)ethanesulfonamide (21l)

Pale yellow solid (25%). ^{1}H NMR (DMSO-d_6): 8.23 (2H, d, *J* = 8.6 Hz), 7.57 (2H, d, *J* = 8.6 Hz), 4.41 (2H, s), 3.19 (2H, t, *J* = 6.0 Hz), 2.84 (2H, t, *J* = 6.2 Hz), 2.27 (6H, s). IR (KBr): 1608, 1519, 1346, 1140, 1109, 1067, 858, 770, 740 cm^{-1}. Calculated for $C_{11}H_{17}N_3O_4S$ C, 45.98; H, 5.96; N, 14.62 Found: C, 45.66; H, 5.94; N, 14.51. HREIMS: Calculated for $C_{11}H_{17}N_3O_4S$ 287.0940 Found: 287.0942.

***N*-(4-Fluorobenzyl)-2-(4-morpholinyl)ethanesulfonamide (21l)**

N-(4-Fluorobenzyl)ethylenesulfonamide (200 mg, 0.928 mmol) was dissolved in DCM (5 mL, dry) to which morpholine (81 mg, 81 µL, 0.928 mmol) was added neat dropwise at room temperature with stirring under nitrogen. The reaction mixture was stirred at room temperature overnight. DCM and excess morpholine were removed under reduced pressure and the crude product obtained was recrystallized from ethyl acetate/n-hexane. The required product was obtained as white solid (262 mg, 52%), mp 68-71 ^{o}C. ^{1}H NMR (DMSO-d_6): 7.61 (1H, t, *J* = 6.3 Hz), 7.39 (2H, q, *J* = 5.6 Hz), 7.19 (2H, t, *J* = 9.0 Hz), 4.14 (2H, d, *J* = 6.3 Hz), 3.53 (4H, t, *J* = 4.6 Hz), 3.15 (2H, t, *J* = 7.4 Hz), 2.61 (2H, t, *J* = 7.6 Hz), 2.33 (4H, t, *J* = 4.4 Hz). IR (KBr): 1610, 1513, 1452, 1309, 1231, 1127, 1116, 1070, 870, 833, 758 cm^{-1}. Calculated for $C_{13}H_{19}FN_2O_3S$ C, 51.64; H, 6.33; N, 9.26 Found: C, 51.66; H, 6.43; N, 9.29. HRCIMS: Calculated for $C_{13}H_{20}FN_2O_3S$ 303.1179 Found: 303.1183.

Similarly prepared were

***N*-(4-Fluorobenzyl)-2-(1-pyrrolidinyl)ethanesulfonamide (21m)**

White solid recrystallised from ethyl acetate (94%), mp 97-100 ^{o}C. ^{1}H NMR (DMSO-d_6): 7.59 (1H, t, *J* = 6.3 Hz), 7.39 (2H, q, *J* = 5.6 Hz), 7.19 (2H, t, *J* = 8.9 Hz), 4.12 (2H, d, *J* = 6.3 Hz), 3.13 (2H, t, *J* = 7.4 Hz), 2.71 (2H, t, *J* = 7.8 Hz), 2.38 (4H, m), 1.64 (4H, m). IR (KBr): 1609, 1459, 1317, 1226, 1138, 1075, 1020, 853, 840, 823, 765 cm^{-1}. Calculated for $C_{13}H_{19}FN_2O_2S$ C, 54.52; H, 6.69; N, 9.78 Found: C, 54.55; H, 6.71; N, 9.74. HRCIMS: Calculated for $C_{13}H_{20}FN_2O_2S$ 287.1230 Found: 287.1226.

2-(Dimethylamino)-*N*-(4-fluorobenzyl)ethanesulfonamide (21n)
White solid (99%), mp 75-77 ^{o}C. ^{1}H NMR (DMSO-d_6): 7.62(1H, t, J = 6.3 Hz), 7.39 (2H, m), 7.19 (2H, t, J = 8.9 Hz), 4.14 (2H, d, J = 6.2 Hz), 3.09 (2H, t, J = 7.5 Hz), 2.56 (2H, t, J = 7.7 Hz), 2.09 (6H, s). IR (KBr): 1604, 1513, 1465, 1327, 1311, 1223, 1142, 1053, 1010, 871, 816, 766, 752 cm^{-1}. Calculated for $C_{11}H_{17}FN_2O_2S$ C, 50.75; H, 6.58; N, 10.76 Found: C, 50.50; H, 6.61; N, 10.74. HRCIMS: Calculated for $C_{11}H_{18}FN_2O_2S$ 261.1073 Found: 261.1072.

Coumarin derivatives

1-[(7-Methoxy-2-oxo-2*H*-chromen-4-yl)methyl]-3,5,7-triaza-1-azoniatricyclo[3.3.1.1^{3,7}] decane bromide[2]

Hexamethylenetetramine (HMTA) (0.527 g, 3.76 mmol) in DCM (80 mL, dry) and acetone (15 mL) was added dropwise into a solution of 4-(bromomethyl)-7-methoxy-2*H*-chromen-2-one (1.011 g, 3.76 mmol) in acetone (500 mL) within a period of ~ 20 min at room temperature with stirring. About 10 min after the complete addition of the HMTA solution, the reaction mixture turned cloudy and a white precipitate began to form. The reaction mixture was stirred for 24 h at room temperature. A white fine powder (1.37 g, 89%) was obtained, mp 200^{o}C (decomposition). IR (KBr): 1715, 1612, 1553, 1300, 1271, 1148, 1005, 813 cm.$^{-1}$ ^{1}H NMR 500Hz (DMSO-d$_6$): 8.05 (1H, d, *J* = 8.9 Hz), 7.04 (1H, d, *J* = 2.5 Hz), 7.04 (1H, dd, *J* = 2.5 Hz & *J* = 8.9 Hz), 6.58 (1H, s), 5.21 (6H, s), 4.60 (3H, d, *J* = 12.5 Hz), 4.44 (3H, d, *J* = 12.3 Hz), 4.21 (3H, s).

(7-Methoxy-2-oxo-2*H*-chromen-4-yl)methanaminium chloride

1-[(7-Methoxy-2-oxo-2*H*-chromen-4-yl)methyl]-3,5,7-triaza-1-azoniatricyclo[3.3.1.1^{3,7}]decane bromide (500 mg, 1.22 mmol) was suspended in [27 mL] of hydrochloric acid (conc.): 1 part and ethanol: 15 parts [made up in a 1/15 ratio (v/v)]. The reaction mixture was heated under reflux for 2.5 h and then cooled to room temperature. Fine white crystals formed at room temperature; these were collected by filtration to give the required product (280 mg, 95%), mp 234^{o}C (decomposition). IR (KBr): 1731, 1680, 1617, 1425, 1354, 1294, 1147, 1072, 1026, 903, 843 cm.$^{-1}$ ^{1}H NMR (DMSO-d$_6$): 8.77 (3H, br), 7.74 (1H, d, *J* = 8.9 Hz), 7.05 (1H, d, *J* = 2.5 Hz), 7.01 (1H, dd, *J* = 2.5 Hz & *J* = 8.9 Hz), 6.41 (1H, s), 4.35 (2H, d, *J* = 1.2 Hz), 3.87 (3H, s).

***N*-[(7-Methoxy-2-oxo-2*H*-chromen-4-yl)methyl]ethylenesulfonamide**

(7-Methoxy-2-oxo-2*H*-chromen-4-yl)methanaminium chloride (0.280 g, 1.16 mmol) was suspended in DCM (5 mL, dry) to which triethylamine (750 µL, 0.352 g, 3.48 mmol) was added. A solution of 2-chloroethanesulfonyl chloride (0.189 g, 1.16 mmol, 121µL) dissolved in DCM (5 mL, dry) was added to the reaction mixture dropwise with stirring under nitrogen at room temperature. The stirring was continued at room temperature overnight. The reaction mixture was diluted with ethyl acetate and water, the product was extracted, the organic layer was collected, dried over $MgSO_4$ and filtered. The solvent was removed under reduced pressure and the crude product was applied to a column chromatography using ethyl acetate / *n*-hexane (1/1) containing 1% TEA, R_F = 0.1. The product was obtained as a white solid after recrystallization from ethyl acetate / *n*-hexane (152 mg, 44%), mp 160-163^{o}C. IR (KBr): 1718, 1610, 1406, 1288, 1138, 1095, 985, 880, 839, 749 cm.$^{-1}$ ^{1}H NMR (DMSO-d$_6$): 8.02 (1H, s), 7.75 (1H, d, *J* = 8.8 Hz), 7.02 (1H, d, *J* = 2.5 Hz), 6.98 (1H, dd, *J* = 2.5 Hz & *J* = 8.8 Hz), 6.88 (1H, dd, *J* = 10.0 Hz & *J* = 16.5 Hz), 6.29 (1H, s), 6.13 (1H, d, *J* = 16.5Hz), 6.03 (1H, d, *J* = 10.0 Hz), 4.30 (2H, s), 3.85 (3H, s). HRFABMS: Calculated for $C_{13}H_{14}O_5NS$ 296.0593 Found: 296.0594.

***N*-[(7-Methoxy-2-oxo-2*H*-chromen-4-yl)methyl]-2-(4-morpholinyl)ethanesulfonamide (21r)**

N-[(7-Methoxy-2-oxo-2*H*-chromen-4-yl)methyl]ethylenesulfonamide (37 mg, 0.125 mmol) was dissolved in DCM (2 mL, dry) to which morpholine (20 mg, 20 µL, 0.230 mmol) was added at room temperature with stirring. The reaction mixture was left standing at room temperature for 4 days. The reaction mixture was applied to a column chromatography using ethyl acetate/TEA (100/1) first then ethyl acetate/methanol/TEA (50/50/1). The product was obtained as semisolid

pale yellow (45 mg, 94%), R_F = 0.2 (ethyl acetate/TEA 100/1). IR (KBr): 1720, 1613, 1399, 1329, 1290, 1149, 1114, 1039, 864 cm.$^{-1}$ ^{1}H NMR (DMSO-d_6): 7.77-7.73 (2H, m), 7.03 (1H, d, *J* = 2.8 Hz), 7.00 (1H, dd, *J* = 2.4 Hz & *J* = 8.8 Hz), 6.31 (1H, s), 4.42 (2H, d, *J* = 5.6 Hz), 3.86 (3H, s), 3.56 (4H, t, *J* = 4.5 Hz), 3.36 (2H, t, *J* = 7.1 Hz), 2.69 (2H, t, *J* = 7.5 Hz), 2.39 (4H, m). HRFABMS: Calculated for $C_{17}H_{23}O_6N_2S$ 383.1277 Found: 383.1283.

***N*-[(7-methoxy-2-oxo-2*H*-chromen-4-yl)methyl]-2-(1-pyrrolidinyl)ethanesulfonamide (21s)**
N-[(7-Methoxy-2-oxo-2*H*-chromen-4-yl)methyl]ethylenesulfonamide (37 mg, 0.125 mmol) was dissolved in DCM (2 mL, dry) to which pyrrolidine (9 mg, 10 µL, 0.230 mmol) was added at room temperature with stirring. The reaction mixture was left standing at room temperature for 4 days. The reaction mixture was applied to a column chromatography using ethyl acetate/TEA (100/1) first then ethyl acetate/methanol/TEA (50/50/1). The product was obtained as pale yellow (amorphous) (40 mg, 87%), R_F = 0.2 (ethyl acetate/TEA 100/1). IR (KBr): 1716, 1618, 1459, 1327, 1148, 1105, 1022, 830 cm.$^{-1}$ ^{1}H NMR (DMSO-d_6): 7.89 (1H, br), 7.76 (1H, d, *J* = 8.8 Hz), 7.03 (1H, d, *J* = 2.4 Hz), 7.00 (1H, dd, *J* = 2.4 Hz & *J* = 8.8 Hz), 6.31 (1H, s), 4.43 (2H, s), 3.86 (3H, s), 3.44 (2H, br), 3.07 (4H, m), 1.76 (6H, br). HRFABMS: Calculated for $C_{17}H_{23}O_5N_2S$ 367.1328 Found: 367.1331.

2-(Dimethylamino)-*N*-[(7-methoxy-2-oxo-2*H*-chromen-4-yl)methyl]ethanesulfonamide (21t)
N-[(7-Methoxy-2-oxo-2*H*-chromen-4-yl)methyl]ethylenesulfonamide (37 mg, 0.125 mmol) was dissolved in DCM (2 mL, dry) to which dimethylamine (1 mL, 2.0M solution) was added at room temperature with stirring. The reaction mixture was left standing at room temperature for 4 days. The reaction mixture was applied to a column chromatography using ethyl acetate/TEA (100/1) first then ethyl acetate/methanol/TEA (100/10/1). The product was obtained as pale yellow oil (25 mg, 59%), R_F = 0.5 (ethyl acetate/TEA 100/1). IR (KBr): 1719, 1616, 1463, 1329, 1291, 1150, 1111, 1044, 850 cm.$^{-1}$ ^{1}H NMR ($CDCl_3$): 7.58 (1H, d, *J* = 8.8 Hz), 6.90 (1H, dd, *J* = 2.5 Hz & *J* = 8.8 Hz), 6.85 (1H, d, *J* = 2.5 Hz), 4.44 (2H, d, *J* = 1.1 Hz), 3.88 (3H, s), 3.24 (2H, t, *J* = 5.8 Hz), 2.88 (2H, t, *J* = 6.5 Hz), 2.29 (6H, s). HRESI: Calculated for $C_{15}H_{21}O_5N_2S$ 341.11767 Found: 341.11542.

Aniline sulfonamides

_N_-Phenyl-2-(1-pyrrolidinyl)ethanesulfonamide (23b)
_N_-Phenylethylenesulfonamide (300 mg, 1.64 mmol) was dissolved in DCM (5 mL, dry) to which pyrrolidine (117 mg, 137 μL, 1.64 mmol) was added at room temperature with stirring. The reaction mixture was stirred at room temperature overnight. Volatile material was removed under reduced pressure and the crude product obtained was applied to a silica gel column chromatography. The product was eluted with ethyl acetate / NMM (100/1), R_F=0. The required product was obtained as a white solid after recrystallization from ethyl acetate/n-hexane (330 mg, 79%), mp 63-65 ^oC. ^1H NMR (DMSO-d_6): 9.76 (1H, br), 7.35-7.06 (5H, m), 3.24 (2H, t, J = 7.4 Hz), 2.75-2.72 (2H, m), 2.41-2.13 (4H, m), 1.66-1.61 (4H, m). IR (KBr): 1591, 1491, 1454, 1318, 1221, 1137, 1021, 949, 908, 878, 773, 733, 696 cm^{-1}. Microanalysis: Calculated for $C_{12}H_{18}N_2O_2S$ C, 56.67; H, 7.13; N, 11.01 Found: C, 56.77; H, 7.25; N, 11.14. HRFABMS: Calculated for $C_{12}H_{19}N_2O_2S$ 255.1167 Found: 255.1170.

Similarly prepared were:
2-(4-Morpholinyl)-_N_-phenylethanesulfonamide (23c)
White solid (80%), mp 91-94 ^oC. ^1H NMR (DMSO-d_6): 9.78 (1H, br), 7.33-7.06 (5H, m), 3.47 (4H, t, J = 9.3 Hz), 3.27 (2H, t, J = 7.2 Hz), 2.66 (2H, t, J = 6.0 Hz), 2.28 (4H, t, J = 4.6 Hz). IR (KBr): 1600, 1492, 1452, 1339, 1293, 1152, 1113, 956, 922, 760, 713 cm^{-1}. Microanalysis: Calculated for $C_{12}H_{18}N_2O_3S$ C, 53.31; H, 6.71; N, 10.36 Found: C, 53.45; H, 6.85; N, 10.16. HRFABMS: Calculated for $C_{12}H_{19}N_2O_3S$ 271.1116 Found: 271.1114.

2-(Dimethylamino)-_N_-(4-fluorophenyl)ethanesulfonamide (23d)
_N_-(4-Fluorophenyl)ethylenesulfonamide (300 mg, 1.49 mmol) was dissolved in DCM (5 mL, dry) to which dimethylamine (2 mL, 2.0 M solution in THF) was added at room temperature with stirring. The reaction was exothermic. The reaction mixture was stirred at room temperature overnight. Volatile material was removed under reduced pressure and the crude product obtained was applied to a silica gel column chromatography. The product was eluted with ethyl acetate / NMM (100/1), R_F=0.2. The required product was obtained as a white solid after recrystallization from ethyl acetate/n-hexane (270 mg, 74%), mp 83-85 ^oC. ^1H NMR (DMSO-d_6): 9.74 (1H, br), 7.25-7.15 (4H, m), 3.19 (2H, t, J = 7.4 Hz), 2.62 (2H, t, J = 7.6 Hz), 2.05 (6H, s). IR (KBr): 1506, 1468, 1339, 1275, 1210, 1155, 1044, 940, 839, 766 cm^{-1}. Microanalysis: Calculated for $C_{10}H_{15}FN_2O_2S$ C, 48.76; H, 6.14; N, 11.37 Found: C, 48.66; H, 6.01; N, 11.24. HRFABMS: Calculated for $C_{10}H_{16}FN_2O_2S$ 247.0917 Found: 247.0920.

Similarly prepared were:
_N_-(4-Fluorophenyl)-2-(1-pyrrolidinyl)ethanesulfonamide (23e)
White solid after recrystallization from ethyl acetate/n-hexane (68%), mp 89-92 ^oC. ^1H NMR (DMSO-d_6): 9.75(1H, br), 7.24-7.14(4H, m), 3.21(2H, t, J = 7.3Hz), 2.75(2H, t, J = 7.3Hz), 2.34(4H, m), 1.63(4H, m). IR (KBr): 1608, 1505, 1462, 1388, 1338, 1283, 1210, 1153, 1101, 933, 840, 801 cm^{-1}. Microanalysis: Calculated for $C_{12}H_{17}FN_2O_2S$ C, 52.92; H, 6.29; N, 10.29 Found: C, 52.47; H, 6.07; N, 10.02. HRFABMS: Calculated for $C_{12}H_{18}FN_2O_2S$ 273.1073 Found: 273.1077.

_N_-(4-Fluorophenyl)-2-(4-morpholinyl)ethanesulfonamide (23f)

Colourless oil (80%). ^{1}H NMR (DMSO-d_6): 9.75 (1H, br), 7.25-7.15 (4H, m), 3.48 (4H, t, *J* = 4.5 Hz), 3.24 (2H, t, *J* = 7.2 Hz), 2.67 (2H, t, *J* = 7.5 Hz), 2.30 (4H, t, *J* = 4.5 Hz). IR (NaCl): 1608, 1507, 1459, 1396, 1332, 1281, 1211, 1150, 1114, 1007, 923, 839, 762 cm^{-1}. Microanalysis: Calculated for $C_{12}H_{17}FN_2O_3S$ C, 49.99; H, 5.94; N, 9.72 Found: C, 49.91; H, 5.76; N, 9.55. HRFABMS: Calculated for $C_{12}H_{18}FN_2O_3S$ 289.1022 Found: 289.1023.

2-[[2-(Dimethylamino)ethyl](methyl)amino]-*N*-(4-fluorophenyl)ethanesulfonamide (23g)
Colourless oil (97%), mp 104-105 ^{o}C. ^{1}H NMR (DMSO-d_6): 8.17 (1H, br), 7.23-7.13 (4H, m), 3.08 (2H, t, *J* = 6.3 Hz), 2.74 (2H, t, *J* = 6.3 Hz), 2.42 (2H, t, *J* = 6.4 Hz), 2.31 (2H, t, *J* = 6.0 Hz), 2.13 (6H, s), 2.11 (3H, s). IR (KBr): 1605, 1502, 1457, 1320, 1209, 1153, 974, 943, 848, 812, 771, 751, 715 cm^{-1}. Microanalysis: Calculated for $C_{13}H_{22}FN_3O_2S$ C, 51.46; H, 7.31; N, 13.85 Found: C, 51.59; H, 7.61; N, 13.36. HRFABMS: Calculated for $C_{13}H_{23}FN_3O_2S$ 304.1495 Found: 304.1500.

2-[[2-(Dimethylamino)ethyl](methyl)amino]-*N*-phenylethanesulfonamide (23h)
White crystalline solid (66%), mp 95-96 ^{o}C. ^{1}H NMR (DMSO-d_6): 10.50-9.50 (1H, br), 7.33-7.06 (5H, m), 3.11 (2H, t, *J* = 6.6 Hz), 2.74 (2H, t, *J* = 6.5 Hz), 2.40 (2H, t, *J* = 6.7 Hz), 2.29 (2H, t, *J* = 6.0 Hz), 2.12 (6H, s), 2.08 (3H, s).IR (KBr): 1661, 1460, 1319, 1142, 1066, 947, 803 cm^{-1}. Microanalysis: Calculated for $C_{13}H_{23}N_3O_2S$ C, 54.71; H, 8.12; N, 14.72 Found: C, 54.95; H, 7.95; N, 14.04. HRFABMS: Calculated for $C_{13}H_{24}N_3O_2S$ 286.1589 Found: 286.1591.

Amides

2-Phenyl-*N*-[2-(1-pyrrolidinyl)ethyl]acetamide (24b)

2-(1-Pyrrolidinyl)ethanamine (648 mg, 717 µL, 5.67 mmol) was dissolved in DCM (20 mL, dry). Phenylacetyl chloride (877 mg, 5.67 mmol) was dissolved in DCM (20 mL, dry) then it was added dropwise with stirring at 0 ^{o}C to the amine solution. The stirring was continued overnight at room temperature. The reaction mixture was extracted with sodium hydroxide solution (500 mg in 25 mL of water). The organic layer was collected, dried ($MgSO_4$) and the solvent was removed under reduced pressure. The crude product was purified by column chromatography using ethyl acetate / NMM / Methanol (98/1/1), R_F = 0.1, to give the product as a white crystals (0.780 g, 59%), mp 56-59 ^{o}C. ^{1}H NMR (DMSO-d_6): 7.97 (1H, br), 7.27-7.17 (5H, m), 3.39 (2H, s), 3.17 (2H, q, *J* = 6.7 Hz), 2.44-2.39 (6H, m), 1.68-1.62 (4H, m). IR (KBr): 1652, 1549, 1355, 1151, 878, 747, 699 cm^{-1}. Microanalysis: Calculated for $C_{14}H_{20}N_2O$ C, 72.38; H, 8.68; N, 12.06 Found: C, 72.40; H, 8.82; N, 12.11. HRCIMS: Calculated for $C_{14}H_{21}N_2O$ 233.1654 Found: 233.1655.

Similarly prepared were:

***N*-[2-(4-Morpholinyl)ethyl]-2-phenylacetamide (24c)**

White crystals (99%), mp 78-80 ^{o}C. ^{1}H NMR (DMSO-d_6): 7.90 (1H, br), 7.30-7.20 (5H, m), 3.53 (4H, t, *J* = 4.6 Hz), 3.39 (2H, s), 3.18 (2H, q, *J* = 6.7 Hz), 2.33 (6H, m). IR (KBr): 1642, 1558, 1449, 1370, 1245, 1114, 1072, 1006, 909, 862, 796, 752, 708 cm^{-1}. Microanalysis: Calculated for $C_{14}H_{20}N_2O_2$ C, 67.71; H, 8.12; N, 11.28 Found: C, 67.31; H, 8.22; N, 11.62. HRCIMS: Calculated for $C_{14}H_{21}N_2O_2$ 249.1603 Found: 249.1599.

***N*-[3-(Dimethylamino)propyl]-2-phenylacetamide (24d)**

Colourless oil (75%). ^{1}H NMR (DMSO-d_6): 7.97 (1H, br), 7.30-7.20 (5H, m), 3.37 (2H, s), 3.06 (2H, q, *J* = 6.8 Hz), 2.17 (2H, t, *J* = 7.0 Hz), 2.0 (6H, s), 1.53 (2H, qt, *J* = 7.0 Hz). IR (NaCl): 1648, 1551, 1459, 1262, 1161, 1037, 702 cm^{-1}. HREIMS: Calculated for $C_{13}H_{20}N_2O$ 220.1576 Found: 220.1574.

***N*-(5-Isoquinolinylmethyl)-3-(4-morpholinyl)propanamide (24e)**

Sodium 3-(4-morpholinyl)propanoate (379 mg, 2.09 mmol) and 5-isoquinolinylmethanamine (300 mg, 2.09 mmol) were dissolved in DMF (4 mL, dry) to which HBTU (1.586 g, 4.18 mmol) was added with stirring at room temperature. The stirring was continued at room temperature overnight. Ethyl acetate and brine were added and the product was extracted. The organic layer was collected, dried ($MgSO_4$), and the solvent removed under reduced pressure to give the crude product. This was applied to a column chromatography using ethyl acetate / methanol / TEA (90/10/1), R_F = 0.1. The required product was obtained as a pale yellow solid. This material was further purified by HPLC to give clear oil, which solidified on standing to give microcrystalline solid (27 mg, 11%), mp 137-140 ^{o}C. ^{1}H NMR (DMSO-d_6): 9.77 (1H, br), 9.49 (1H, br), 8.76 (1H, t, *J* = 5.6 Hz), 8.61 (1H, br), 8.17 (1H, d, *J* = 8.1 Hz), 8.10 (1H, d, *J* =5.7 Hz), 7.82 (1H, d, *J* = 6.5 Hz), 7.75 (1H, t, *J* = 8.1 Hz), 4.78 (2H, d, *J* =5.7 Hz), 3.94 (2H, br), 3.65 (2H,br), 3.39 (4H, t, *J* = 7.3 Hz), 3.07 (2H, br), 2.70 (2H, t, *J* = 7.4 Hz). IR (KBr): 1677, 1553, 1424, 1207, 1179, 1125, 831, 796, 720 cm^{-1}. HRFABMS: Calculated for: $C_{17}H_{22}N_2O_3$ 300.1712 Found: 300.1711.

***N*-[2-(Dimethylamino)ethyl]-3-methoxybenzamide[3] (25a)**

From 3-methoxybenzoyl chloride as a colourless oil (46%). ^{1}H NMR (DMSO-d_6): 8.34 (1H, br), 7.40-7.06 (4H, m), 3.78 (3H, s), 3.35 (2H, q, *J* = 6.8 Hz), 2.39(2H, t, *J* = 6.9 Hz), 2.16 (6H, s). IR

(NaCl): 1643, 1583, 1545, 1482, 1462, 1306, 1246, 1044, 877, 805, 753 cm^{-1}. HRCIMS: Calculated for $C_{12}H_{19}N_2O_2$ 223.1447 Found: 223.1449.

3-Methoxy-*N*-[2-(1-pyrrolidinyl)ethyl]benzamide (25b)
Colourless oil (42%). ^{1}H NMR (DMSO-d_6): 8.39 (1H, br), 7.41-7.06 (4H, m), 3.79 (3H, s), 3.38 (2H, q, *J* = 6.8 Hz), 2.56 (2H, t, *J* = 7.0 Hz), 2.49-2.46 (4H, m), 1.66 (4H, m). IR (NaCl): 1642, 1583, 1545, 1483, 1302, 1245, 1144, 1044, 879, 804, 753, 691 cm^{-1}. HRCIMS: Calculated for $C_{14}H_{21}N_2O_2$ 249.1603 Found: 249.1606.

3-Methoxy-*N*-[2-(4-morpholinyl)ethyl]benzamide[3] (25c)
White crystals (78%), mp 135-138 ^oC. ^{1}H NMR (DMSO-d_6): 8.40 (1H, t, *J* = 5.6 Hz), 7.40-7.06 (4H, m), 3.78 (3H, s), 3.57 (4H, t, *J* = 4.6 Hz), 3.39 (2H, q, *J* = 6.7 Hz), 2.46-2.40 (6H, m). IR (KBr): 1638, 1556, 1311, 1241, 1135, 1115, 1050, 873, 815, 714 cm^{-1}. Microanalysis: Calculated for $C_{14}H_{20}N_2O_3$ C, 63.62; H, 7.63; N, 10.60 Found: C, 63.80; H, 7.94; N, 10.00. HREIMS: Calculated for $C_{14}H_{21}N_2O_3$ 265.1547 Found: 265.1537.

***N*-[3-(Dimethylamino)propyl]-3-methoxybenzamide[3] (25d)**
Colourless oil (51%). ^{1}H NMR (DMSO-d_6): 8.48 (1H, t, *J* = 6.0 Hz), 7.40-7.06 (4H, m), 3.78 (3H, s), 3.28 (2H, q, *J* = 6.9 Hz), 2.26 (2H, t, *J* = 7.0 Hz), 2.12 (6H, s), 1.67 (2H, qt, *J* = 7.1 Hz). IR (NaCl): 1642, 1583, 1544, 1462, 1306, 1245, 1044, 806, 754 cm^{-1}.

Methyl 3-(4-morpholinyl)propanoate [4]
Morpholine (0.955 g, 0.011 mol) was dissolved in ether (5 mL) and added to a solution of methyl acrylate (0.955 g, 0.011 mol) in ether (5 mL) at room temperature with stirring. The stirring was continued at room temperature overnight. The solvent was removed under reduced pressure to give the required product as colourless oil (100%). ^{1}H NMR (DMSO-d_6): 3.67 (3H, s), 3.54 (4H, t, *J* = 4.6 Hz), 2.55-2.44 (4H, m), 2.34 (4H, t, *J* = 4.6 Hz). IR (NaCl): 1739, 1441, 1360, 1258, 1201, 1119, 1011, 863, 774 cm^{-1}. HREIMS: Calculated for $C_8H_{15}NO_3$ 173.1052 Found: 173.1049.

Diethyl 4-methylbenzylphosphonate [5]
1-(Bromomethyl)-4-methylbenzene (1.522 g, 8.22 mmol) and triethyl phosphite (1.467 g, 8.83 mmol) were heated under reflux overnight. Excess triethyl phosphite was removed under reduced pressure to give the product as colourless oil (1.991 g, 100%). ^{1}H NMR (DMSO-d_6): 7.16-7.09(4H, m), 3.96(4h, qt, *J* = 7.2Hz), 3.17(2H, d, *J* = 21.4Hz), 2.26(3H, s), 1.17(6H, t, *J* = 7.1Hz). IR (NaCl): 1515, 1446, 1393, 1251, 1163, 1051, 1026, 963, 847, 789, 725 cm^{-1}. HRFABMS: Calculated for: $C_{12}H_{20}O_3P$ 243.1150 Found: 243.1149.

1-Methyl-4-[(*E*)-2-phenylethenyl]benzene [6]
Diethyl 4-methylbenzylphosphonate (1.00 g, 4.13 mmol) was dissolved in THF (5 mL, dry) to which was added NaH (330 mg, 8.26 mmol, 60% in oil) at 0 ^oC under N_2 with stirring. Benzaldehyde (0.438 g, 4.13 mmol) was dissolved in THF (5 mL, dry) and added dropwise to the reaction mixture with stirring. The stirring was continued at room temperature overnight. The reaction mixture was cooled to 0 ^oC then water (1 mL) was added dropwise under nitrogen with stirring. Hydrochloric acid (1 mL, dilute) was added dropwise to the reaction mixture then it was extracted with ether. The organic layers were collected, dried ($MgSO_4$), filtered and the solvent

removed under reduced pressure to give the crude product, which was applied to a silica gel column chromatography using n-hexane only (R_F = 0.5). Fractions containing the required product were collected and the solvent removed under reduced pressure to give white crystals (0.640 g, 80%), mp 123-126 ^oC [ref mp 121.5-122 ^oC]. ^1H NMR (DMSO-d_6): 7.59 (2H, d, *J* = 7.2 Hz), 7.49 (2H, d, *J* = 8.1 Hz), 7.38 (2H, t, *J* = 5.7 Hz), 7.27-7.17 (5H, m), 2.30 (3H, s). IR (KBr): 1591, 1509, 1490, 1446, 967, 804, 748, 705, 688 cm^{-1}. HRFABMS: Calculated for: $C_{15}H_{14}$ 194.1096 Found: 194.1098.

1-(Bromomethyl)-4-[(*E*)-2-phenylethenyl]benzene [7]

1-Methyl-4-[(*E*)-2-phenylethenyl]benzene (0.640 g, 3.29 mmol) was dissolved in carbon tetrachloride (25 mL) to which NBS (0.586 g, 3.29 mmol) and AIBN (130 mg) were added. The reaction mixture was heated under reflux for 5 h then it was left at room temperature overnight. The precipitated material was filtered off and the filtrate was concentrated and applied to a silica gel column chromatography using n-hexane only. Fist fraction proved to be the starting material (63 mg, %), R_F = 0.4, second fraction was the required product (150 mg, 19%), R_F = 0.2, mp 118-121 ^oC, [Ref mp 117-118 ^oC]. ^1H NMR (DMSO-d_6): 7.61-7.58 (4H, m), 7.45 (2H, d, *J* = 8.3 Hz), 7.39 (2H, t, *J* = 7.3 Hz), 7.29-7.26 (3H, m), 4.72 (2H, s). IR (KBr): 1604, 1510, 1490, 1445, 1416, 1223, 1200, 969, 825, 755, 691 cm^{-1}.

{4-[(*E*)-2-Phenylethenyl]phenyl}methanesulfonic acid Sodium salt

1-(Bromomethyl)-4-[(*E*)-2-phenylethenyl]benzene (150 mg, 0.590 mmol) and sodium sulphite hydrated $Na_2SO_3.7H_2O$ (152 mg, 0.604 mmol, 1.1 molar excess) were dissolved in water (20 mL) and acetone (20 mL). The reaction mixture was heated under reflux for 3 h then the solvents were removed under reduced pressure to give the required product as a white solid in quantitative yield with no distinct melting point. ^1H NMR (DMSO-d_6): 7.61 (2H, d, *J* = 7.2 Hz), 7.49 (2H, d, *J* = 8.2 Hz), 7.38 (2H, t, *J* = 7.4 Hz), 7.30 (2H, d, *J* = 8.2 Hz), 7.22 (2H, d, *J* = 6.2 Hz), 7.21 (1H, s), 3.70 (2H, s). IR (KBr): 1655, 1512, 1447, 1418, 1221, 1176, 1054, 963, 825, 746, 689 cm^{-1}. HRESI: Calculated for $C_{15}H_{14}O_3NaS$ 297.0556 Found: 297.0545.

***N*,*N*,*N*-Tributyl-1-butanaminium {4-[(*E*)-2-phenylethenyl]phenyl}methanesulfonate**

{4-[(*E*)-2-Phenylethenyl]phenyl}methanesulfonic acid sodium salt (150 mg, 0.506 mmol), tetrabutylammonium hydrogen sulfate (172 mg, 0.506 mmol) were dissolved in DCM (5 mL) to which an aqueous solution of sodium hydroxide (202 mg, 5.06 mmol in 5 mL) was added. The reaction mixture was stirred at room temperature for 15 min. The organic layer was extracted, dried ($MgSO_4$) and the solvent removed under reduced pressure to give the required product as colourless oil (250 mg, 96%). ^1H NMR (DMSO-d_6): 7.36-7.21 (11H, m), 5.74 (2H, s), 3.17 (8H, t, *J* = 8.1 Hz), 1.56 (8H, qt, *J* = 7.2 Hz), 1.34 (8H, sextet, *J* = 7.2 Hz), 0.95 (12H, t, *J* = 7.2 Hz). IR (NaCl): 1630, 1597, 1486, 1462, 1382, 1216, 1182, 1034, 966, 883, 826, 746 cm^{-1}. HRESI: Calculated for $C_{32}H_{50}O_5NS$ 560.3415 [M^++HCO^-_2] Found: 560.3428.

{4-[(*E*)-2-Phenylethenyl]phenyl}methanesulfonyl chloride

N,*N*,*N*-Tributyl-1-butanaminium {4-[(*E*)-2-phenylethenyl]phenyl}methanesulfonate (250 mg, 0.485 mmol) was dissolved in DCM (5 mL, dry) and cooled to (-20 ^oC). PCl_5 (101 mg, 0.485 mmol) was dissolved in DCM (5 mL, dry) then added dropwise with stirring to the reaction mixture, then it was left at (-20 ^oC) stirring for 30 min. DCM was removed and the crude product was applied to a silica gel column chromatography using ethyl acetate / n-hexane (both solvents

were dry in a ratio of 1/1). The solvents were removed under reduced pressure to give the required product as white solid (100 mg, 71%), mp 120-123 ^{o}C, R_F = 0.8 (ethyl acetate / n-hexane 1/1). ^{1}H NMR ($CDCl_3$): 7.50-7.09(11H, m), 4.88(2H, s). IR (KBr): 1509, 1448, 1367, 1257, 1164, 963, 824, 756, 690 cm^{-1}. Microanalysis: Calculated for $C_{15}H_{13}ClO_2S$ C, 61.53; H, 4.48 Found: C, 61.55; H, 4.52.

***N*-[2-(Dimethylamino)ethyl]{4-[(*E*)-2-phenylethenyl]phenyl}methanesulfonamide (19x)**
{4-[(*E*)-2-Phenylethenyl]phenyl}methanesulfonyl chloride (100 mg, 0.342 mmol) was dissolved in DCM (2 mL, dry) to which N^1,N^1-dimethyl-1,2-ethanediamine (30 mg, 0.342 mmol, 38 μL) was added at room temperature with stirring and it was stirred overnight. The reaction mixture was extracted with a solution of sodium hydroxide (160 mg in water 10 mL). The organic layer was collected, dried ($MgSO_4$) and the solvent removed under reduced pressure to give the crude product which was purified by column chromatography using ethyl acetate / NMM (100/1), R_F = 0.1. The product was obtained as white solid (50 mg, 42%), mp 171-174 ^{o}C. ^{1}H NMR (DMSO-d_6): 7.61 (4H, d, *J* = 8.3 Hz), 7.39-7.35 (4H, m), 7.26 (2H, s), 6.93 (1H, t, *J* = 5.6 Hz), 4.35 (2H, s), 2.97 (2H, q, *J* = 6.5 Hz), 2.29 (2H, t, *J* = 6.8 Hz), 2.12 (6H, s). IR (KBr): 1657, 1446, 1307, 1135, 1045, 966, 826, 741, 688 cm^{-1}. HRFABMS: Calculated for: $C_{19}H_{25}O_2N_2S$ 345.1637 Found: 345.1638.

Sodium 3-(4-morpholinyl)propanoate [8]
Sodium hydroxide (0.380 g, 9.51 mmol) was dissolved in water (5 mL) and added to methyl 3-(4-morpholinyl)propanoate (1.647 g, 9.51 mmol) at room temperature with stirring. The reaction mixture was heated under reflux for 10 min then water and methanol were removed under reduced pressure to give the required product as white solid (1.510 g, 88%), with no distinct melting point. ^{1}H NMR (DMSO-d_6): 3.52 (4H, t, *J* = 4.5 Hz), 2.44 (2H, t, *J* = 7.9 Hz), 2.29 (4H, s), 1.99 (2H, t, *J* = 7.9 Hz). IR (KBr): 1597, 1447, 1379, 1285, 1116, 1075, 1009, 918, 868, 805, 694 cm^{-1}

References for Electronic Supplementary Information

1. Kotoris, C.C.; Chen, M.-J; Taylor, S.D., Novel phosphate mimetics for the design of non-peptidyl inhibitors of protein tyrosine phosphatases. *Bioorg. Med. Chem. Lett.,* **1998**, *8*, 3275-3280.
2. Li, M.; White, E.J.; Fluorogenic *N*-Nitrosoamides. Active-Site Labeling Reagents for Chymotrypsin-like Proteases. *Bioconjugate Chem*. **1994**, *5*, 454-458.
3. Bodnar, A.L.; Cortes-Burgos, L.A.; Cook, K.K.; Dinh, D.M.; Groppi, V.E.; Hajos, M.; Higdon, N.R.; Hoffmann, W.E.; Hurst, R.S.; Myers, J.K.; Rogers, B.N.; Wall, T.M.; Wolfe, M.L.; Wong, E. Discovery and Structure-Activity Relationship of Quinuclidine Benzamides as Agonists of α7 Nicotinic Acetylcholine Receptors. *J. Med. Chem.* **2005**, *48*, 905-908.
4. Le Sann, C.; Huddleston, J.; Mann, J. Synthesis and preliminary evaluation of novel analogues of quindolines as potential stabilizers of telomeric G-quadruplex DNA. *Tetrahedron* **2007**, *63*, 12903-12911.
5. Li, X.; Zhang, D.; Pang, H.; Shen, F.; Fu, Hua; J., Yuyang; Z., Yufen. Synthesis of a Diverse Series of Phosphacoumarins with Biological Activity. *Org. Lett.,* **2005**, *7*, 4919-4922.

6. Linn, W.J. Tetracyanoethylene Oxide. 111. Mechanism of the Addition to Olefins. *J. Am. Chem. Soc.* **1965,** *87*, 3665-3672.
7. Kon, G.A.R. 4-Styrylbenzylamine and 4-styrylbenzyldimethylamine. *J. Chem. Soc*., **1948**, 224-227.
8. Hirst, G.C.; Rafferty, P.; Ritter, K.; Calderwood, D.; Wishart, N.; Arnold, L.D.; Friedman, M.M. Preparation of 3-(azahetero)aryl-1H-pyrazolo[3,4-d]pyrimidin-3-amines as protein kinase inhibitors with antiangiogenic properties. U.S. Patent Application **2002,** 20156081.