**Supplementary Information 1: Synthesis of biotinylated compound D**

***5-[(3aS,4S,6aR)-2-Oxo-1,3,3a,4,6,6a-hexahydrothieno[3,4-d]imidazol-4-yl]-N-[5-[4-[[3-[6-(isopentylamino)-3-pyridyl]imidazo[1,2-b]pyridazin-6-yl]amino]-1-piperidyl]pentyl]pentanamide***

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***tert-Butyl 4-[(3-bromoimidazo[1,2-b]pyridazin-6-yl)amino]piperidine-1-carboxylate***

A solution of 3-bromo-6-chloroimidazo[1,2-b]pyridazine (3.00 g, 12.9 mmol 1.0 eq) in NMP (5 mL) was treated with *tert*-butyl 4-aminopiperidine-1-carboxylate (5.10 g, 25.8 mmol, 2.0 eq), DIPEA (5.60 mL, 32.3 mmol, 2.5 eq) and heated at 140°C for 8 hours. The reaction mixture was diluted with EtOAc (100 mL) and washed with de-ionised water (4 x 100 mL) and brine (100mL). The separated organic was dried (MgSO4), concentrated *in vacuo* and column chromatography (50-100% EtOAc in pet. ether) gave an off-white solid (2.07 g, 40%); 1H NMR (400 MHz, DMSO-d6) δ = 7.71 (d, *J=*9.6 Hz, 1 H), 7.48 (s, 1 H), 7.10 (d, *J=*7.3 Hz, 1H), 6.68 (d, *J=*10.1 Hz, 1H), 3.87-3.82 (m, 3H), 3.02-2.93 (m, 2H), 2.02-1.98 (m, 2H), 1.41 (s, 9H), 1.40-1.31 (m, 2H); m/z (ES+APCI)+: 396/398 [M+H]+.

***3-[6-(Isopentylamino)-3-pyridyl]-N-(4-piperidyl)imidazo[1,2-b]pyridazin-6-amine***

A mixture of *tert*-butyl 4-[(3-bromoimidazo[1,2-b]pyridazin-6-yl)amino]piperidine-1-carboxylate (1.00 g, 2.52 mmol, 1.0 eq), 2-isopentylamino-5-pyridineboronic acid pinacol ester (876 mg, 3.02 mmol, 1.2 eq), Pd(dppf)CI2 (238 mg, 0.29 mmol, 0.1 eq), Cs2CO3 (3.28 g, 10.08 mmol, 4.0 eq), water (1 mL) and THF (10 mL) was heated at 90°C for 4 hours. The mixture was allowed to cool, then concentrated to dryness and purified by chromatography on silica gel (50-100% EtOAc in pet. ether) to give 223 mg of the protected intermediate which was treated with 4M HCl in Dioxane and purification by prep-HPLC gave the product as a white solid (140 mg, 15%); 1H NMR (400MHz, DMSO-d6) δ = 8.70 (d, *J=*2.3 Hz, 1H), 8.07 (dd, *J=*2.5, 8.9 Hz, 1H), 7.69 (d, *J=*9.6 Hz, 1H), 7.67 (s, 1H), 6.93 (d, *J=*6.9 Hz, 1H), 6.67-6.63 (m, 1H), 6.61 (d, *J=*9.6 Hz, 1H), 6.52 (d, *J=*8.2 Hz, 1H), 3.76-3.58 (m, 1H), 3.34-3.22 (m, 2H), 3.07-2.96 (m, 2H), 2.65-2.55 (m, 2H), 2.07-1.95 (m, 2H), 1.76-1.57 (m, 1H), 1.51-1.40 (m, 2H), 1.40-1.29 (m, 2H), 0.91 (d, *J=*6.9 Hz, 6H); m/z (ES+APCI)+: 380 [M+H]+.

***Benzyl N-(5-bromopentyl)carbamate***

To a solution of benzyl N-(5-hydroxypentyl)carbamate (1.00 g, 4.21 mmol, 1.0 eq) in DCM was added tetrabromomethane (1.53 g, 4.63 mmol, 1.1 eq) and triphenylphosphine (2.20 g, 8.42 mmol, 2.0 eq) and the reaction mixture was stirred overnight at RT. The solution was concentrated *in vacuo* and purification by column chromatography (10-50% EtOAc in pet. ether) gave the product as a white solid (1.10 g, 87%); 1H NMR (400MHz, CDCl3) δ = 7.42-7.27 (m, 5H), 5.08 (s, 2H), 4.77 (br. s, 1H), 3.39 (t, *J=*6.6 Hz, 2H), 3.20 (q, *J=*6.4 Hz, 2H), 1.86 (quin, *J=*7.0 Hz, 2H), 1.59-1.39 (m, 4H).

***N-[1-(5-Aminopentyl)-4-piperidyl]-3-[6-(isopentylamino)-3-pyridyl]imidazo[1,2-b]pyridazin-6-amine***

To a solution of 3-[6-(isopentylamino)-3-pyridyl]-N-(4-piperidyl)imidazo[1,2-b]pyridazin-6-amine (140 mg, 0.368 mmol, 1.0 eq) in EtOH (2 mL) was added Et3N (102 µL, 0.736 mmol, 2.0 eq) and benzyl *N*-(5-bromopentyl)carbamate (110 mg, 0.368 mmol, 1.0 eq) and stirred overnight at RT. The reaction mixture was concentrated *in vacuo* and purification by column chromatography (5-25% MeOH in DCM) to give the protected intermediate which was hydrogenated on an H-Cube (10% Pd/C, Full H2, 50°C) to give the product as an off-white solid (44 mg, 26%); 1H NMR (400MHz, DMSO-d6) δ = 8.73 (s, 1H), 8.72 (s, 1H), 8.05 (d, *J=*8.2 Hz, 1H), 7.71-7.67 (m, 1H), 7.67 (s, 1H), 6.92 (d, *J=*6.2 Hz, 1H), 6.66 (t, *J=*5.7 Hz, 1H), 6.61 (d, *J=*9.6 Hz, 1H), 6.52 (d, *J=*9.0 Hz, 1H), 4.10 (m, 2H), 3.58 (m, 1H), 3.37-3.26 (m, 2H), 2.85 (d, *J=*11.4 Hz, 2H), 2.75-2.70 (m, 2H), 2.28-2.25 (m, 2H), 2.08-1.94 (m, 4H), 1.71-1.62 (m, 1H), 1.54-1.39 (m, 8H), 1.35-1.23 (m, 2H), 0.92 (d, *J=*6.9 Hz, 6H).

***5-[(3aS,4S,6aR)-2-Oxo-1,3,3a,4,6,6a-hexahydrothieno[3,4-d]imidazol-4-yl]-N-[5-[4-[[3-[6-(isopentylamino)-3-pyridyl]imidazo[1,2-b]pyridazin-6-yl]amino]-1-piperidyl]pentyl]pentanamide***

To a solution of biotin (21 mg, 0.086 mmol, 1.0 eq) in DMF (1 mL) and Et3N (60 µL, 0.43 mmol, 5.0 eq) was added TBTU (30 mg, 0.095 mmol, 1.1 eq) and the mixture stirred at RT for 10 minutes before adding *N*-[1-(5-aminopentyl)-4-piperidyl]-3-[6-(isopentylamino)-3-pyridyl]imidazo[1,2-b]pyridazin-6-amine (44 mg, 0.095 mmol, 1.1 eq). The reaction mixture was stirred for 2 hours at RT, concentrated *in vacuo* and purification by prep-HPLC gave the product as a yellow solid (26 mg, 40%); 1H NMR (400MHz, DMSO-d6) δ = 8.71 (s, 1H), 8.06 (d, *J=*8.2 Hz, 1H), 7.77-7.66 (m, 3H), 6.92 (d, *J=*6.0 Hz, 1H), 6.66 (t, *J=*5.5 Hz, 1H), 6.61 (d, *J=*10.1 Hz, 1H), 6.52 (d, *J=*8.9 Hz, 1H), 6.43 (s, 1H), 6.36 (s, 1H), 4.31-4.27 (m, 1H), 4.14-4.09 (m, 1H), 3.55 (m, 1H), 3.33-3.30 (m, 2H), 3.12-2.99 (m, 3H), 2.81 (m, 3H), 2.59-2.52 (m, 1H), 2.26 (br. s, 2H), 2.11-1.95 (m, 6H), 1.71-1.53 (m, 2H), 1.52-1.36 (m, 11H), 1.34-1.23 (m, 4H), 0.92 (d, *J=*6.4 Hz, 6H); m/z (ES+APCI)+: 691 [M+H]+.

***5-[(3aS,4S,6aR)-2-Oxo-1,3,3a,4,6,6a-hexahydrothieno[3,4-d]imidazol-4-yl]-N-[4-[[5-[6-[(1-methyl-4-piperidyl)amino]imidazo[1,2-b]pyridazin-3-yl]-2-pyridyl]amino]butyl]pentanamide***



***3-(6-Chloro-3-pyridyl)-N-(1-methyl-4-piperidyl)imidazo[1,2-b]pyridazin-6-amine***

A mixture of 3-bromo-N-(1-methyl-4-piperidyl)imidazo[1,2-b]pyridazin-6-amine (1.00 g, 3.22 mmol, 1.0 eq), (6-chloro-3-pyridyl)boronic acid (608 mg, 3.86 mmol, 1.2 eq), Pd(dppf)CI2 (262 mg, 0.32 mmol, 0.1 eq), Cs2CO3 (4.2 g, 12.88 mmol, 4.0 eq), water (1 mL) and THF (10 mL) was combined and heated at 80°C for 4 hours. The mixture was allowed to cool, then concentrated to dryness and purified by column chromatography (50-100% EtOAc in pet. ether) to give the crude product as a yellow solid (853 mg, 77%) which was used without further purification; 1H NMR (400MHz, DMSO-d6) δ = 9.21 (d, *J=*3.2 Hz, 1H), 8.55 (dd, *J=*2.5, 8.5 Hz, 1H), 8.02 (s, 1H), 7.76 (d, *J=*9.6 Hz, 1H), 7.58 (d, *J=*9.2 Hz, 1H), 7.11 (d, *J=*6.3 Hz, 1H), 6.74-6.63 (m, 1H), 3.65-3.48 (m, 1H), 2.85-2.68 (m, 2H), 2.21 (s, 3H), 2.19-2.07 (m, 2H), 2.05-1.94 (m, 2H), 1.56-1.39 (m, 2H).

***5-[(3aS,4S,6aR)-2-Oxo-1,3,3a,4,6,6a-hexahydrothieno[3,4-d]imidazol-4-yl]-N-[4-[[5-[6-[(1-methyl-4-piperidyl)amino]imidazo[1,2-b]pyridazin-3-yl]-2-pyridyl]amino]butyl]pentanamide***

To a solution of Pd(OAc)2 (4 mg, 0.014 mmol, 0.5 eq) in DME (0.5 mL) was added CyPFtBu (8 mg, 0.014 mmol, 0.5 eq). The solution was allowed to stand for 2 minutes then added to a solution of 3-(6-chloro-3-pyridyl)-*N*-(1-methyl-4-piperidyl)imidazo[1,2-b]pyridazin-6-amine (100 mg, 0.291 mmol, 1.0 eq) and NaOtBu (39 mg, 0.408 mmol, 1.4 eq) in DME (1.5 mL). The reaction mixture was stirred for 5 minutes before adding *tert*-butyl *N*-(4-aminobutyl)carbamate (78 µL, 0.408 mmol, 1.4 eq) and stirring for a further 2 hours at 90°C. The reaction mixture was concentrated *in vacuo* and purification by column chromatography (0-10% MeOH in DCM with 1% NH4OH) gave *tert*-butyl *N*-[4-[[5-[6-[(1-methyl-4-piperidyl)amino]imidazo[1,2-b]pyridazin-3-yl]-2-pyridyl]amino]butyl]carbamate as a yellow solid (122 mg, 0.247 mmol, 1.0 eq) which was treated with 4 M HCl in dioxane (1 mL). The reaction mixture was stirred at RT for 2 hours before concentrating *in vacuo*. The resulting solid was dissolved in DMF (1 mL) and treated with Et3N (178 µL, 1.235 mmol, 5.0 eq) then added to a pre-mixed solution of biotin (72 mg, 0.296 mmol, 1.2 eq) and TBTU (95 mg, 0.296 mmol, 1.2 eq) in DMF (1 mL). The reaction mixture was stirred overnight at RT, concentrated *in vacuo* and purification by prep HPLC gave the product as an off-white solid (8 mg, 5%); 1H NMR (400MHz, DMSO-d6) δ = 8.68 (d, *J=*2.3 Hz, 1H), 8.09 (dd, *J=*2.3, 8.8 Hz , 1H), 7.77 (t, *J=*5.6 Hz, 1H), 7.70 – 7.67 (m, 2H), 6.91 (d, *J=*6.1 Hz, 1H), 6.70 (t, *J=*5.4 Hz, 1H), 6.61 (d, *J=*9.8 Hz, 1H), 6.53 (d, *J=*8.9 Hz, 1H), 6.42 (s, 1H), 6.35 (s, 1H), 4.29-4.25 (m, 1H), 4.16-4.04 (m, 1H), 3.57 – 3.53 (m, 1H), 3.28-3.25 (m, 2H), 3.10-2.98 (m, 3H), 2.82-2.72 (m, 3H), 2.59-2.52 (m, 1H), 2.18 (s, 3H), 2.08-1.98 (m, 6H), 1.63-1.40 (m, 10H), 1.37-1.23 (m, 2H); m/z (ES+APCI)+: 621 [M+H]+.