**Raw data for Fig. 1: Effects of palmitate (C16:0) on the viability of immortal rodent-derived INS-1 and human-derived EndoC-βH1 β-cells.**

**Fig. 1A. INS-1 C16:0**

| Concentration | 0 | 125 | 250 | 500 |
|---|---|---|---|---|
| | 3 | 13 | 19 | 64 |
| | 2 | 7 | 16 | 68 |
| | 3 | 10 | 18 | 69 |
| | 6.8 | 7 | 22.5 | 57 |
| | 4.8 | 7.7 | 22.2 | 47.8 |
| | 7.4 | 16.6 | 18.6 | 60.5 |
| | 7.3 | 10.6 | 17.1 | 52.3 |
| | 5.9 | 8.4 | 21.6 | 54.4 |
| | 6.4 | 7.3 | 19.1 | 58.9 |

**Fig. 1B. INS-1 C16:0 + C18:1**

| Concentration | Vehicle | C16:0 | C18:1 | C16:0+C18:1 |
|---|---|---|---|---|
| | 1.5 | 14.3 | 2.8 | 2.7 |
| | 3.8 | 26 | 4.1 | 2.2 |
| | 3.2 | 13.4 | 3.6 | 3 |
| | 2.5 | 12.4 | 6.4 | 2.5 |
| | 4.2 | 13.7 | 3.7 | 2.6 |
| | 2.5 | 12.59 | 4.1 | 2.6 |
| | 6.53 | 8.5 | 4.17 | 2.22 |
| | 5.49 | 10.06 | 2.8 | 1.75 |
| | 3.48 | | 4.77 | 2.66 |

**Fig.1C. EndoC-βH1 C16:0**

| Concentration | 0 | 250 | 500 | 1000 |
|---|---|---|---|---|
| | 19.5 | 12.4 | 11.9 | 9.5 |
| | 12.7 | 11.1 | 9.6 | 7.3 |
| | 10.3 | 9.7 | 19.5 | 10.2 |
| | 16.4 | 19 | 10.4 | 9.3 |
| | 18.1 | 19.8 | 8 | 8.6 |
| | 9.4 | | 7.4 | 8.9 |
| | 6.2 | | 6.4 | 22.2 |
| | 2.9 | | 5.4 | 14.5 |
| | 5.7 | | 6.1 | 9.1 |
| | 4 | | 6.1 | |
| | 3.9 | | 8.6 | |
| | 5.9 | | 7.6 | |
| | 4.7 | | 7.9 | |
| | 4.2 | | 17.7 | |
| | 12.2 | | 14.6 | |
| | 11 | | 15.9 | |
| | 11.7 | | | |

**Raw data for Fig. 2A: Quantification of the total are of EndoC-βH1 cells covered by fluorescent puncta after treatment with C16:0 (500µM) and BODIPY FL C16 (400nM).**

**A. EndoC-βH1 C16:0 lipid droplet (% total area of the cell covered by lipid droplet)**

| 2h | BODIPY FL $C_{16}$ | BODIPY FL $C_{16}$ + C16:0 | BODIPY FL $C_{16}$ + C18:1 |
|---|---|---|---|
| | 0.00 | 0.77 | 0.90 |
| | 0.00 | 0.00 | 0.00 |
| | 0.00 | 1.78 | 3.08 |
| | 0.00 | 0.00 | 2.91 |
| | 0.00 | 0.00 | 2.47 |
| | 0.00 | 0.00 | 2.37 |
| | 0.00 | 0.00 | 1.64 |
| | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | |
| | 0.00 | 0.00 | |

| 6h | BODIPY FL $C_{16}$ | BODIPY FL $C_{16}$ + C16:0 | BODIPY FL $C_{16}$ + C18:1 |
|---|---|---|---|
| | 0.00 | 0.00 | 3.67 |
| | 0.00 | 0.00 | 5.61 |
| | 0.00 | 0.00 | 5.54 |
| | 0.00 | 0.00 | 2.44 |
| | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | |
| | 0.00 | 0.00 | |
| | 0.00 | 0.00 | |
| | 0.00 | 0.00 | |

| 24h | BODIPY FL $C_{16}$ | BODIPY FL $C_{16}$ + C16:0 | BODIPY FL $C_{16}$ + C18:1 |
|---|---|---|---|
| | 0.00 | 0.00 | 4.13 |
| | 0.00 | 0.00 | 4.79 |
| | 0.00 | 0.00 | 5.04 |
| | 0.00 | 0.00 | 9.72 |
| | 0.00 | 0.00 | 7.31 |
| | 0.00 | 0.00 | 4.31 |
| | 0.00 | 0.00 | 4.09 |
| | 0.00 | 0.00 | |
| | 0.00 | 0.00 | |
| | 0.00 | 0.00 | |

**Raw data for Fig. 2B: Quantification of the total are of INS-1E cells covered by fluorescent puncta after treatment with C16:0 (500µM) and BODIPY FL C16 (400nM) alone or in combination with 250µM C18:1.**

| 2h | BODIPY FL $C_{16}$ | BODIPY FL $C_{16}$ + C16:0 |
|---|---|---|
| | 0.00 | 1.22 |
| | 0.00 | 1.22 |
| | 0.00 | 2.79 |
| | 0.00 | 1.36 |
| | 0.00 | 4.65 |
| | 0.00 | 0.90 |
| | 0.00 | 0.69 |
| | 0.00 | 0.00 |
| | 0.00 | 0.00 |
| | 0.00 | 0.00 |

| 6h | BODIPY FL $C_{16}$ | BODIPY FL $C_{16}$ + C16:0 |
|---|---|---|
| | 0.00 | 2.15 |
| | 0.00 | 1.05 |
| | 0.00 | 4.10 |
| | 0.00 | 6.84 |
| | 0.00 | 4.34 |
| | 0.00 | 1.90 |
| | 0.00 | 6.30 |
| | 0.00 | 2.74 |
| | 0.00 | 1.91 |
| | 0.00 | 3.76 |
| | | 2.08 |

| 24h | BODIPY FL $C_{16}$ | BODIPY FL $C_{16}$ + C16:0 |
|---|---|---|
| | 0.00 | 9.49 |
| | 0.00 | 11.67 |
| | 0.00 | 5.54 |
| | 0.00 | 13.84 |
| | 0.00 | 17.45 |
| | 0.00 | 8.92 |
| | 0.00 | 11.93 |
| | 0.00 | 15.46 |
| | 0.00 | 18.23 |
| | 0.00 | 12.69 |
| | 0.00 | 9.35 |
| | 0.00 | 10.02 |
| | | 5.19 |

**Raw data for Fig. 2C: Pearson correlation coefficient to demonstrate the co-localisation of BODIPY FL C16 with PLIN2 in EndoC-βH1 and INS-1E cells treated with C16:0 +/- C18:1.**

| EndoC-βH1 C16:0 | INS-1E C16:0 | INS-1E C16:0+C18:1 |
|---|---|---|
| 0.64 | 0.2 | 0.69 |
| 0.51 | 0.21 | 0.58 |
| 0.55 | 0.08 | 0.73 |
| 0.74 | 0.33 | 0.79 |
| 0.567 | 0.13 | 0.71 |
| 0.58 | 0.38 | 0.49 |

**Raw data for Fig. 4C: Pearson correlation coefficient to demonstrate the co-localisation of BODIPY FL C16 and CellLight Golgi-RFP in EndoC-βH1 and INS-1E cells treated with C16:0 +/- C18:1.**

| INS-1 C16:0 | EndoC-βH1 C16:0 |
|---|---|
| 0.64 | 0.26 |
| 0.57 | 0.3 |
| 0.49 | 0.01 |
| 0.68 | 0.23 |
| 0.67 | 0.3 |

**Raw data for Fig. 5A-D: INS-1E cells were treated with either 250µM C16:0, 250µM C18:1, 250µM C19:0, 250µM C16:0 + 250µM C18:1, or 5µg/ml Tunicamycin for 6h or 16h. Total eIF2a, peIF2a, CHOP and GAPDH levels were analysed by Western blotting and quantified as peIF2α/total eIF2α ratio or CHOP/GAPDH ratio.**

**A. INS-1 peif2a/eif 6h**

| Vehicle | C16.0 | C18.1 | C16.0+C18.1 | Tunicamycin |
|---|---|---|---|---|
| 0.34648 | 0.359425 | 0.371968 | 0.246501 | 0.61561 |
| 0.116273 | 0.188032 | 0.100138 | 0.056933 | 0.35473 |
| 0.235421 | 0.305675 | 0.174448 | 0.090487 | 0.767011 |
| 0.231006 | 0.35988 | 0.352319 | 0.332568 | 0.809762 |

**B. INS-1 peif2a/eif 16h**

| Vehicle | C16.0 | C18.1 | C16.0+C18.1 | Tunicamycin |
|---|---|---|---|---|
| 0.098459 | 0.119771 | 0.153359 | 0.115623 | 0.602362 |
| 0.079686 | 0.104778 | 0.110982 | 0.084102 | 0.563482 |
| 0.377515 | 0.377772 | 0.223857 | 0.240524 | 1.248146 |
| 0.346243 | 0.448156 | 0.704467 | 0.560031 | 0.994813 |
| 0.586535 | 0.734115 | 0.58094 | 0.560343 | 1.360326 |

**C. INS-1 CHOP 6h**

| Vehicle | C16.0 | C18.1 | C16.0+C18.1 | Tunicamycin |
|---|---|---|---|---|
| 0.284053 | 0.575032 | 0.429228 | 0.471097 | 1.267003 |
| 0.498714 | 0.722078 | 0.710788 | 0.513608 | 0.840967 |
| 0.253836 | 0.266555 | 0.195764 | 0.219375 | 0.442682 |
| 0.329529 | 0.235861 | 0.322306 | 0.435529 | 0.682446 |

**D. INS-1 CHOP 16h**

| Vehicle | C16.0 | C18.1 | C16.0+C18.1 | Tunicamycin |
|---|---|---|---|---|
| 0.210109 | 0.240953 | 0.326351 | 0.207606 | 0.456582 |
| 0.160895 | 0.494086 | 0.422976 | 0.436821 | 1.034611 |
| 0.138276 | 0.181319 | 0.19816 | 0.1734 | 0.807969 |
| 0.341225 | 0.311787 | 0.35772 | 0.430945 | 0.683465 |

**Raw data for Fig. 5E-H: EndoC-βH1 cells were treated with either 250µM C16:0, 250µM C18:1, 250µM C19:0, 250µM C16:0 + 250µM C18:1, or 5µg/ml Tunicamycin for 6h or 16h. Total eIF2a, peIF2a, CHOP and Western blotting and quantified as peIF2α/total eIF2α ratio or CHOP/GAPDH ratio.**

**E. EndoC-BH1 peif2a/eif 6h**

| Vehicle | C16.0 | C18.1 | C16.0+C18.1 | C19:0 |
|---|---|---|---|---|
| 0.73787 | 0.61552 | 0.213996 | 0.225601 | 0.43138 |
| 0.710839 | 0.572077 | 0.293398 | 0.452821 | 0.381116 |
| 0.763446 | 0.411326 | 0.318784 | 0.613437 | 0.315201 |

**F. EndoC-BH1 peif2a/eif 18h**

| Vehicle | C16.0 | C18.1 | C16.0+C18.1 | C19:0 | Tunicamycin |
|---|---|---|---|---|---|
| 0.850501 | 0.585974 | 0.349128 | 0.872201 | 0.86256 | 1.202224 |
| 0.852473 | 0.353947 | 0.186298 | 0.164667 | 0.194146 | 0.983159 |
| 0.492459 | 0.338988 | 0.329944 | 0.311498 | 0.189645 | 0.706628 |

**G. EndoC-BH1 CHOP 6h**

| Vehicle | C16.0 | C18.1 | C16.0+C18.1 | C19:0 |
|---|---|---|---|---|
| 0.220275 | 0.206575 | 0.154855 | 0.014336 | 0.118543 |
| 0.370521 | 0.402648 | 0.338492 | 0.245298 | 0.242491 |
| 0.355876 | 0.134027 | 0.264036 | 0.449371 | 0.293785 |

**H. EndoC-BH1 CHOP 18h**

| Vehicle | C16.0 | C18.1 | C16.0+C18.1 | C19:0 | Tunicamycin |
|---|---|---|---|---|---|
| 0.120117 | 0.225966 | 0.204019 | 0.149214 | 0.143958 | 0.305506 |
| 0.336496 | 0.22395 | 0.253194 | 0.075316 | 0.166249 | 1.904165 |
| 0.541734 | 0.362446 | 0.218513 | 0.253294 | 0.38567 | 1.080142 |