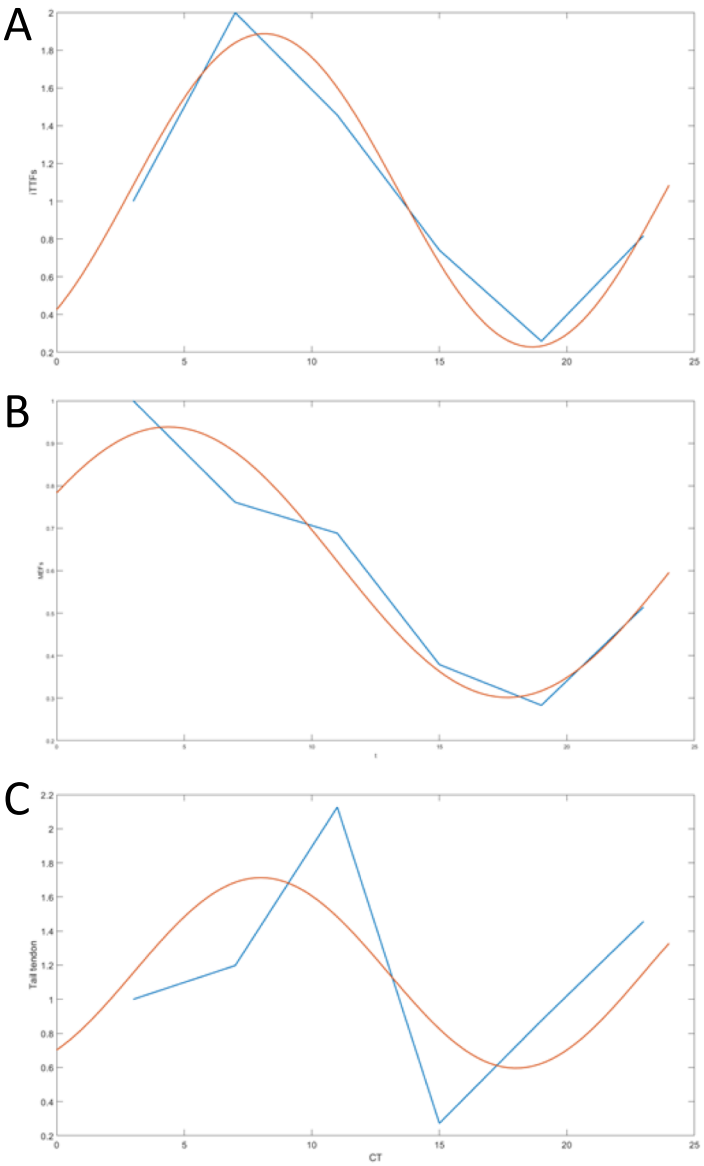
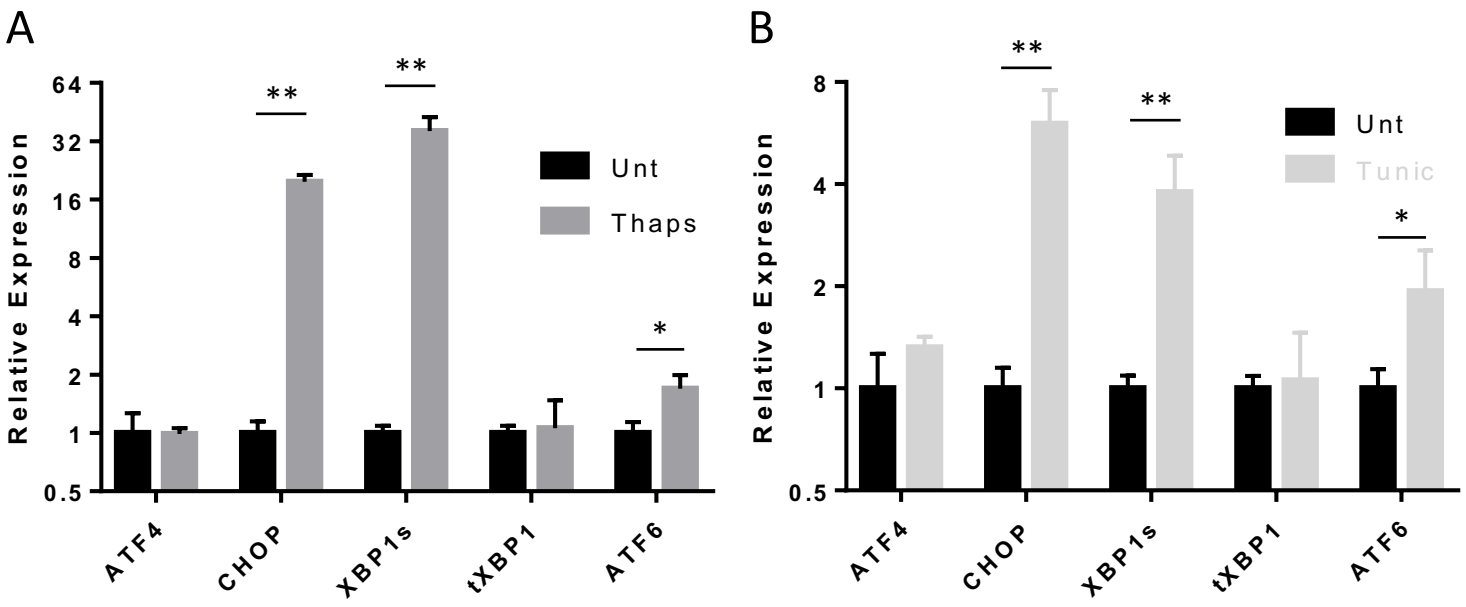
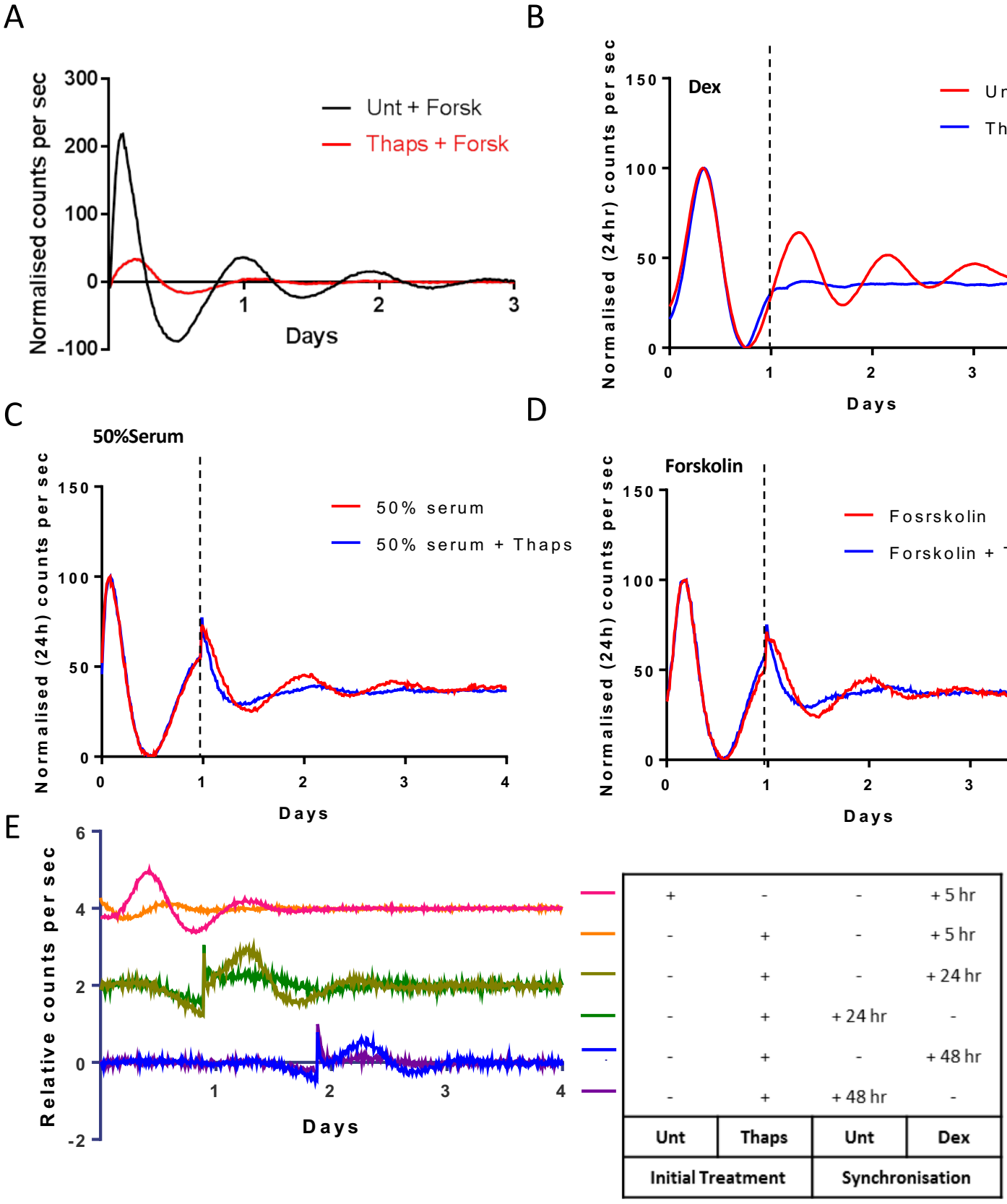


Supplementary figure 1: Rhythmic expression of Bip. Levels of Bip normalised to Gapdh (blue) in **A)** iTTFs, **B)** Mefs and **C)** tail tendons, using Circwave to identify the best fit harmonic curves (orange).

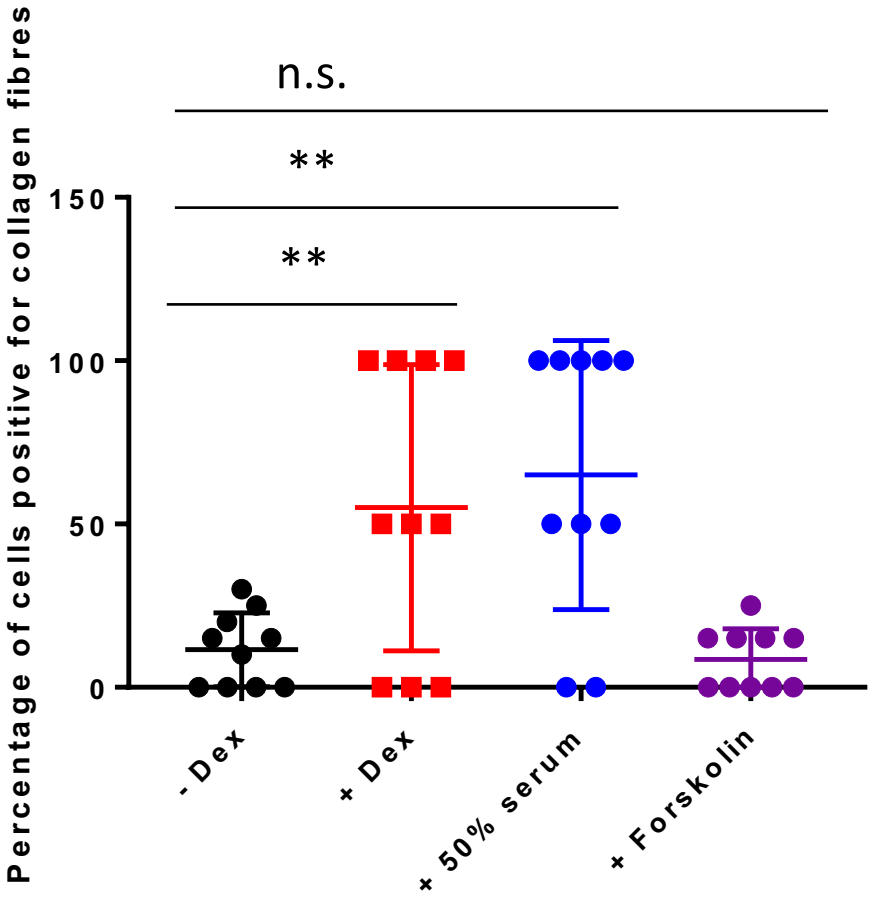
Supplementary Figure 2



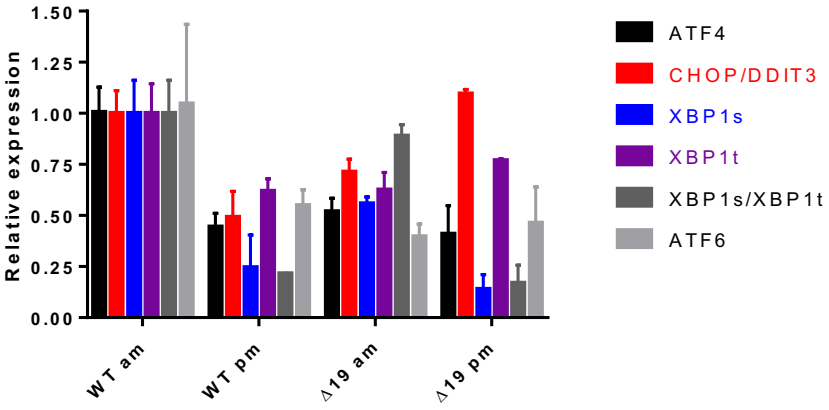
Supplementary figure 2: Levels of CHOP/DDIT3, spliced XBP1 (Xbp1s) and ATF6 indicate that the unfolded protein response has been activated following 5 hours treatment with **A)** 10 nM thapsigargin and **B)** 100 ng/mL tunicamycin. * indicates $p<0.05$, ** indicates $p<0.01$, paired t-test.



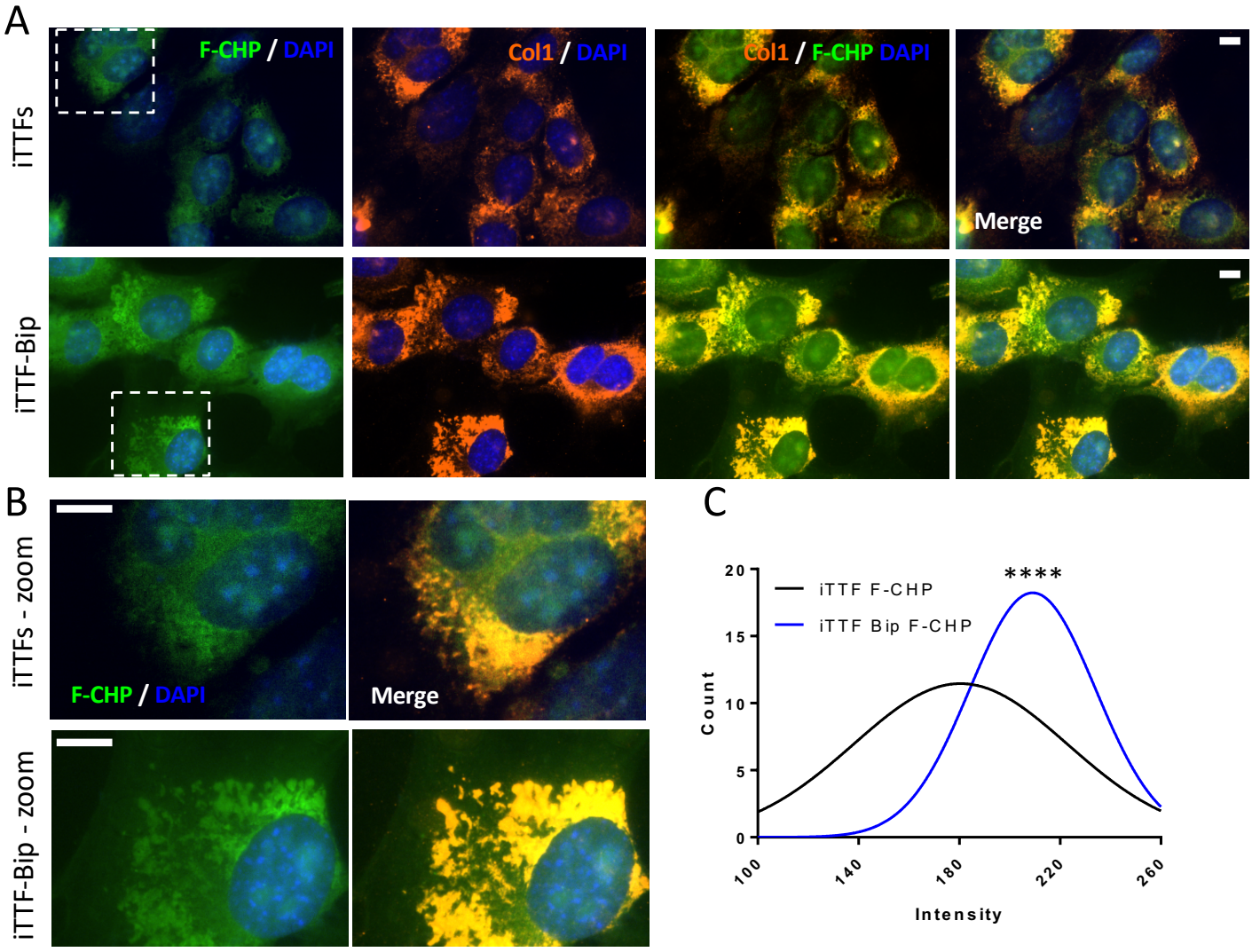
Supplementary figure 3: **A**) After 5 hours treatment with 10 nM thapsigargin Per2::Luc cells were synchronised with 10 μM Forskolin. **B**) After synchronising Per2::Luc cells with dexamethasone, bioluminescence was measured for 24 hours thereafter cells were treated with DMSO or 10 nM thapsigargin, as in Figure 1E. The treatment is indicated by the dashed line. **C**) As B but with 2 hours treatment with 50% serum as the synchronising event. **D**) As B but with 2 hours treatment with 10 μM forskolin as the synchronising event. **E**) Circadian rhythm can be induced in cells which received 5 hours thapsigargin following 24/48 hours recovery.



Supplementary figure 4: Effects of synchronising agents on collagen fibre production. Percentage of cells with associated collagen fibres following 72 hours culture in the absence of synchronisation (-Dex) or with 100 nM Dexamethasone (+Dex), 50% serum shock or 10 μM Forskolin. As assessed by immunofluorescence. N=2, 5 regions per samples measured each including at least 200 cells ** indicates $p<0.01$, paired t-test.

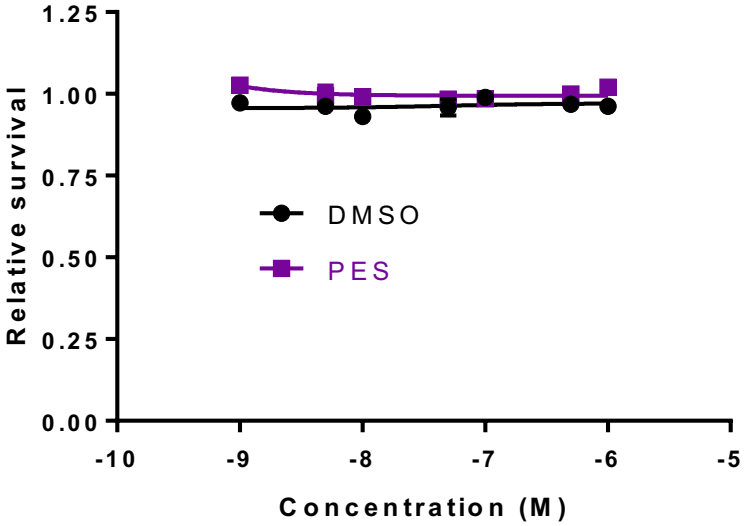


Supplementary figure 5. Reduced ER stress in Clock Δ19 tendons. RNA was isolated from tendons of wild-type (WT) and Clock Δ19 (Δ19) mice. Real-time PCR for ER stress related transcripts are shown.

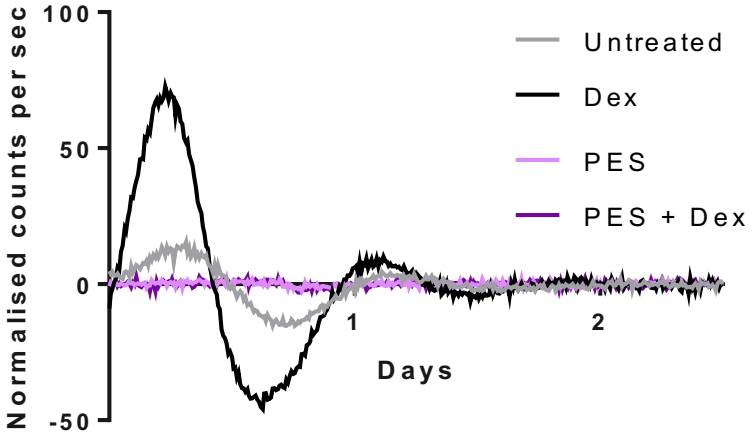


Supplementary figure 6. Bip expression retains collagen in a non-helical conformation. A) Identification of non-helical collagen (F-CHP) in control and Bip overexpressing fibroblasts. **B)** Regions in A are magnified to show non-helical collagen in swollen ER of Bip overexpressing fibroblasts. **C)** Distribution of F-CHP staining intensity taken from 10 random chosen iTTF and iTTF-Bip cells. Staining intensity was significantly elevated in Bip overexpressing cells, 10 randomly selected cells were assessed for staining intensity. ****p<0.0001. Mann-Whitney U test

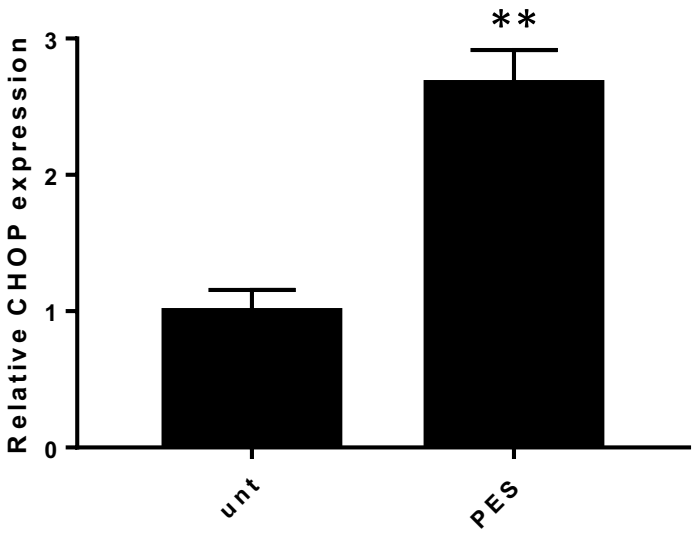
A



B



C



Supplementary figure 7. A) Cell viability after 72 hours in response to the indicated doses of PES. **B)** Representative traces showing the effects of 100 nM PES treatment suppresses on baseline and Dexamethasone-induced rhythms. **C)** PES treatment, 100 nM, induces the expression of CHOP transcripts after 5hours, suggesting that the unfolded protein response has been activated. **p<0.01, n=3, paired t-test.

Supplementary Table 1: Real-time PCR primers used in this study

Target	Forward primer	Reverse primer
Rplp0	actggtctaggacccgagaag	ctcccaccttgtctccagtc
Gapdh	cagcctcgtcccgtagacaa	caatctccactttgccactgc
Actb	ccaaccgtgaaaagatgacc	accagaggcatacagggaca
Atf4	atgatggcttggccagtg	ccattttctccaacatccaatc
Atf6	ggacgaggtggtgtcagag	gacagctcttcgctttggac
CHOP/Ddit3	gcgacagagccagaataaca	atgactgcacgtggaccag
Xbp1s	gagtccgcagcaggtg	gtgtcagagtccatggga
Total Xbp1	aagaacacgcttgggaatgg	actccccttggcctccac
Bip	ctgaggcgtatttgggaaag	tcatgacattcagtccagcaa
Col1a1	gcctgcttcgtgtaaactcc	ttggtttttggtcacgttca
Col1a2	caagcatgtctggttaggagag	aggacacccttctacgttgt