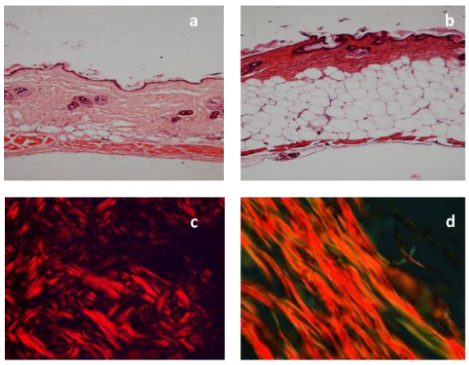
In vitro investigation of the effect of obesity on the skin function and integrity

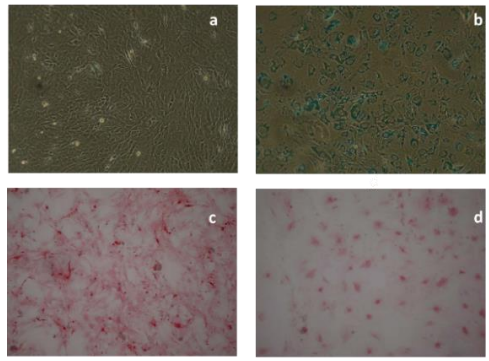
Background

The majority of obese or diabetic individuals will experience skin complications during the natural history of their disease, ranging from relatively benign skin manifestations, through to potentially catastrophic delays in wound healing. Obese individuals have impaired skin function and integrity, and cutaneous fragility. Increased adiposity in obese states may contribute to compromised dermal fibroblast physiology and promote damage by altering collagen deposition and integrity through the release of inflammatory cytokines and consequently increasing free radicals and oxidative stress.

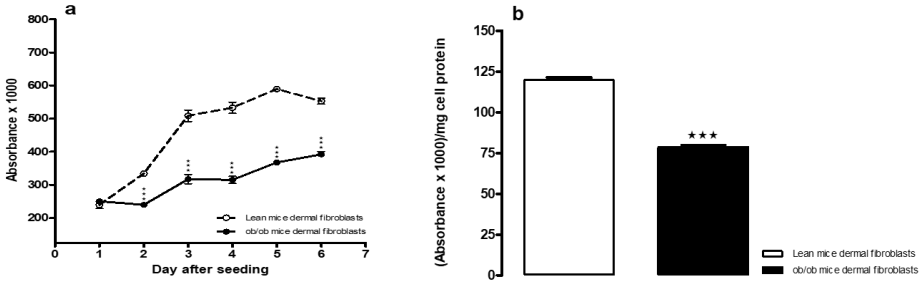
Our previous data in animal cells showed compromised cell functions in obese C57BL/6 Lep^{ob}/Lep^{ob} mice dermal fibroblasts, when compared to the lean mice dermal fibroblasts. The cells are displaying an increase in senescence, consequently their growth rate was reduced and reduced collagen synthesis.



Representative H&E and PicroSirius stained sections of dorsal mouse skin. 3-month-old lean C57BL/6 (a, c) and age-matched C57BL/6 (ob/ob) mice (b,d) are shown. Collagen structure was assessed using eosin auto-fluorescence (b, e) and cross-polar imaging of PicroSirius stained sections (c, f) all at 100x original magnification)



Senescence assays by typical fields of β-galactosidase, and qualitative measures of collagen deposition normalised to total cellular protein using a Picro-Sirius assay. inC57BL/6 (a, c) and C57BL/6 (ob/ob primary dermal fibroblasts (b, d), at10x original magnification. Cells with blue staining cytoplasm prevalent in b are Senescent.



In vitro* assessment of mice dermal fibroblast proliferation and collagen deposition. a)** growth curves were generated for wild-type (*wt/wt*) and C57BL/6 Lep^{ob}/Lep^{ob} cell lines. Experiments were performed on cells from 3 different mice per group. indicates P<0.001.
b) Quantitative measures of collagen deposition normalised to total cellular protein using a PicroSirius assay (*** indicates P<0.001).

M. S. Zaibi, et al, (2011). Skin from obese (Lepob/Lepob) mice shows compromised dermal fibroblast physiology and disorganised collagen structure. 18th European Congress on Obesity (ECO 2011). 25-28 May 2011. Istanbul, Turkey.

Research project

Our research project aims to translate our previous findings observed in animal tissues into human cell models. To understand the cross talk between adipose tissue and dermis, we intend to investigate the effects of human subcutaneous adipocytes hyperplasia and/or hypertrophy on human dermal fibroblasts integrity and functions, particularly on cell growth and/or cell senescence, collagen synthesis, inflammatory responses (pro-inflammatory cytokines release and their genes expression), as well as related oxidative stress.