CONTRIBUTION OF THE ADIPOSE TISSUE EXTRACELLULAR MATRIX IN OBESITY ASSOCIATED METABOLIC DISEASES AND FIBROSIS.

Alcaide-Puerto N[1], Buciegas-Quiles, S. [2], López-Pérez L.[2], Molina-Bravo A.[2], Olmo-Agudo P. [1], Peno-Montes M.A. [1], Puerto-Nieto.J.[1] Serrano-Abad P.[2]

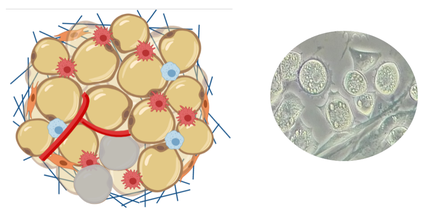
[1] IES Fidiana [2] CES Lope de Vega [3] Departamento de Biología Celular, Fisiología e Inmunología
Grupo GC11. Metabolismo y diferenciación adipocitaria. Síndrome metabólico

I- INTRODUCTION

Obesity is characterized by an excessive increase in adipose tissue and the development of cellular stress processes, which usually precedes the appearance of comorbidities such as insulin resistance and type 2 diabetes. However, not all obese individuals develop such comorbidities, showing an adaptive response to excess weight. In this sense, the identification of molecular factors that help explain these differences between individuals is fundamental for the design of new strategies against the development of insulin resistance and diabetes associated with obesity.

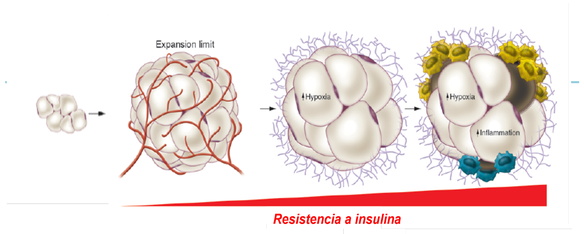
Adipocyte is the cell component most studied in the biology of adipose tissue for its involvement in the storage and management of fat and has a capacity of expansion superior to the vast majority of other cells that we can find in our body. However, this expansion capacity is limited by processes that are altered in obesity, such as adipogenesis, lipogenesis, cell death and fibrosis, causing the development of pathologies including insulin resistance (Vidal-Puig, 2010).

Fibrosis consists of an excessive accumulation of the components of the extracellular matrix, especially collagen. And, in the adipose tissue of people who present obesity, there are many more fibrosed areas that are associated with the reduction of plasticity causing metabolic dysfunction. The function of the extracellular matrix in many physiological processes and diseases is unknown to some extent.

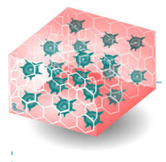


II- OBJECTIVE

To analyze the interaction between extracellular matrix and adipocytes developing a 3D cultures which are used to mimic the conditions associated to obesity and insulin resistance.

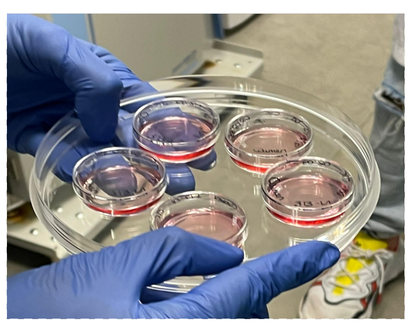


Modificada de Sun et al., 2011. J Clin Invest. 121:2094-2101

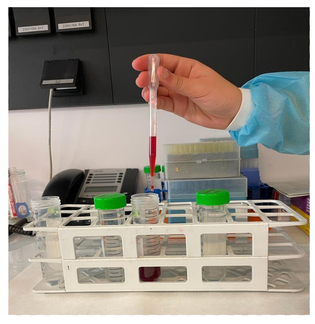


III- MATERIALS AND METHODS

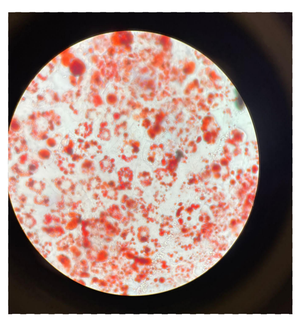
A collagen solution was prepared. Plates with 3D culture were incubated at 37ºC for 45 min.



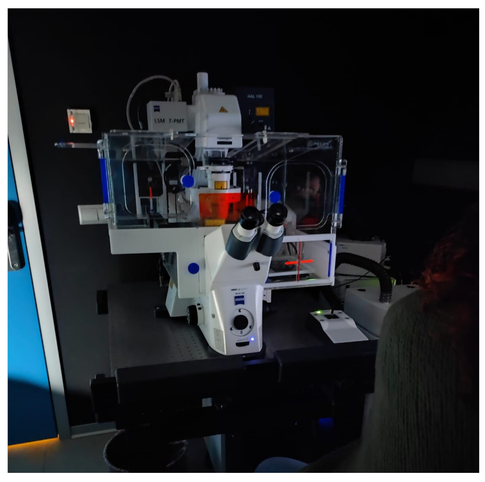
The present solution of Oil Red O dyes lipids red, while the cell nuclei are counterbalanced in blue by means of a solution of DAPI.

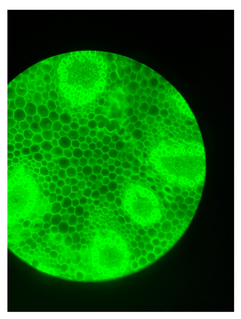


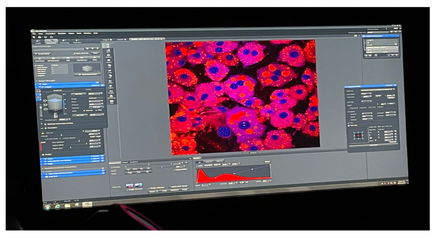
Allow to dry and observe under a microscope the presence of lipid drops dyed red and the cores dyed blue.



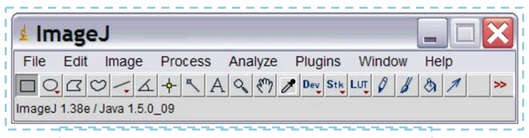
- With the confocal microscope we observe some cells: The confocal microscope is a microscope that employs an optical imaging technique to increase contrast and/or reconstruct three-dimensional images using a spatial pinhole to eliminate out-of-focus light or lens flare in specimens that are thicker than the focal plane.







ImageJ software was used to determine the amount of lipids per cells. The mean gray value of each treatment (with lumican vs w/o lumican) was compared using GraphPad Prism 5 applying t-student test.



Prism

IV- RESULTS

After analysis of the variables obtained, a lower percentage of lipids was observed in the cells tested in the presence of Lumican. The existence of this protein in the extracellular matrix hardly leads to an accumulation of lipids compared to that of the control cells.

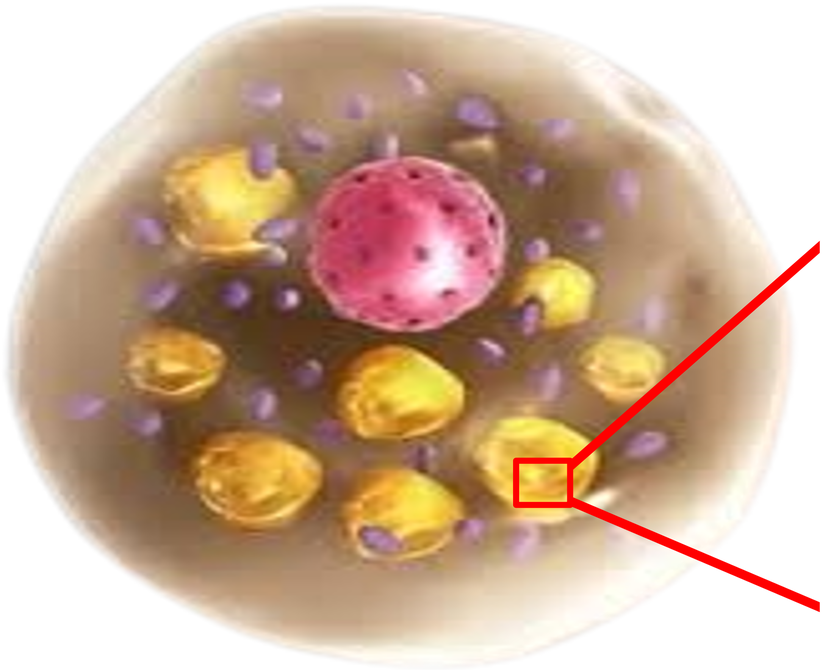


Figure 1: Typical adipose cell

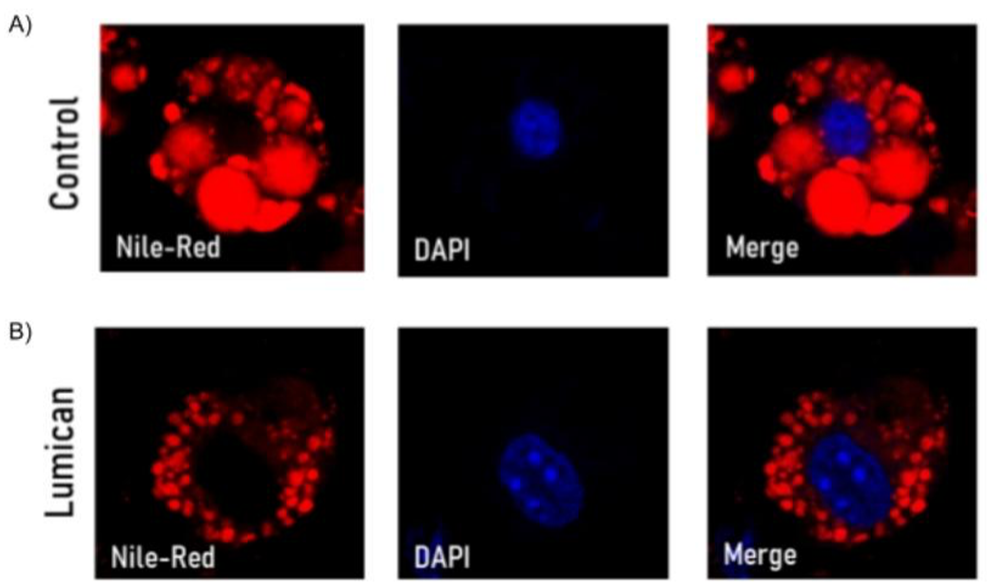


Figura 2: Cell lines tested, (A) In the presence of Lumican, (B) Control

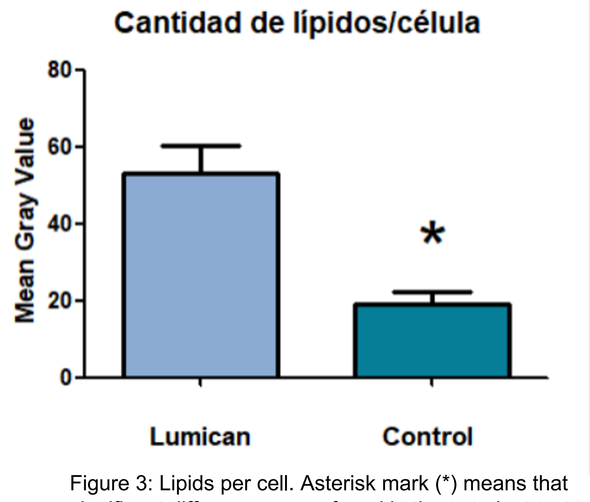


Figure 3: Lipids per cell. Asterisk mark (*) means that significant differences were found in the t-student test comparing cultures of adipocytes with or w/o lumican in the extracellular matrix from 3D cultures.

V- CONCLUSIONS

High lumican concentrations, as occurs in the adipose tissue of obese individuals with insulin resistance, alter the accumulation of lipids in adipocytes.

Our results support the idea that the imbalance in lumican concentration as occurs in obesity and insulin resistance could contribute to the pathogenic effects of fibrosis on adipocyte function.

GC11
Metabolismo y diferenciación adipocitaria.
Síndrome metabólico.

IMIBIC

iesfidiana.es

CES LOPE DE VEGA

UNIVERSIDAD D CORDOBA