



Quantitat, distribució i funcionalitat del teixit adipós en funció de l'edat i el sexe.

Impacte de la pèrdua de pes en els diferents compartiments corporals

Núria Vilarrasa

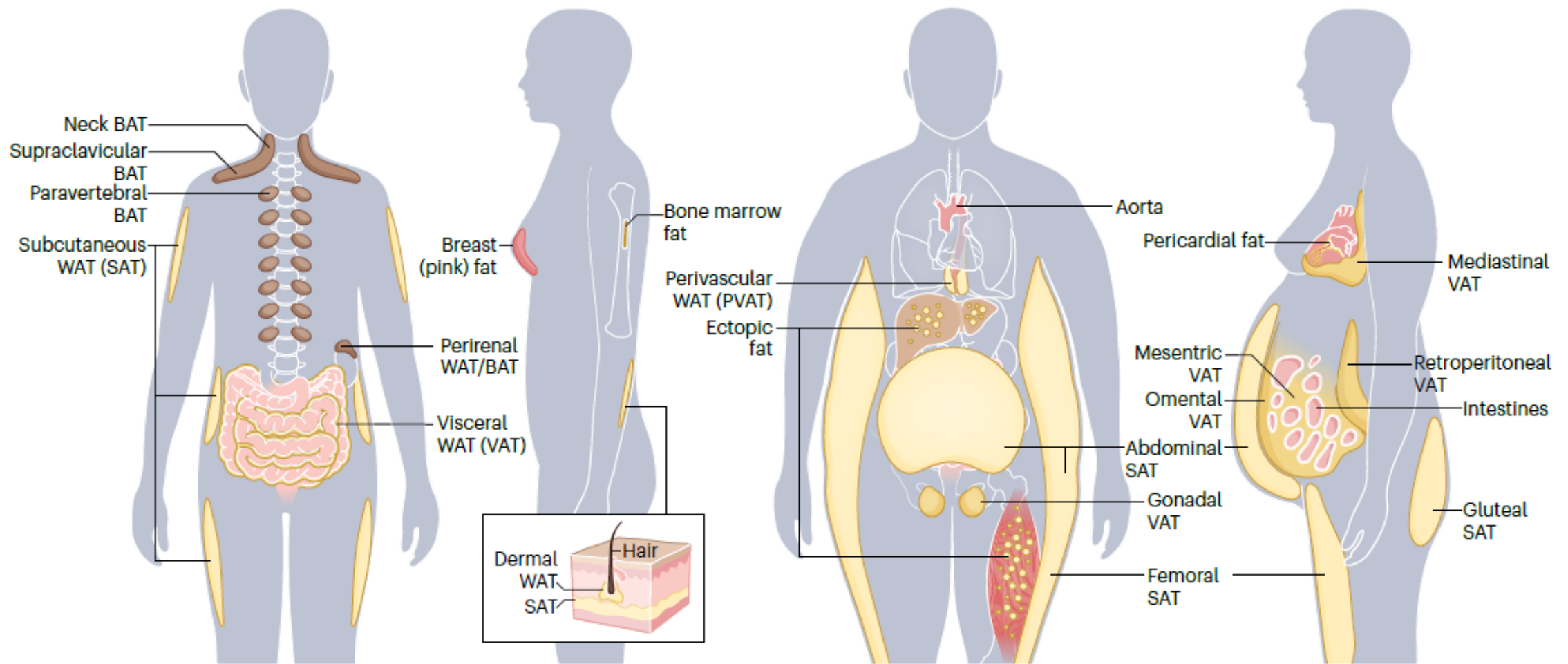
Hospital Universitari de Bellvitge-IDIBELL



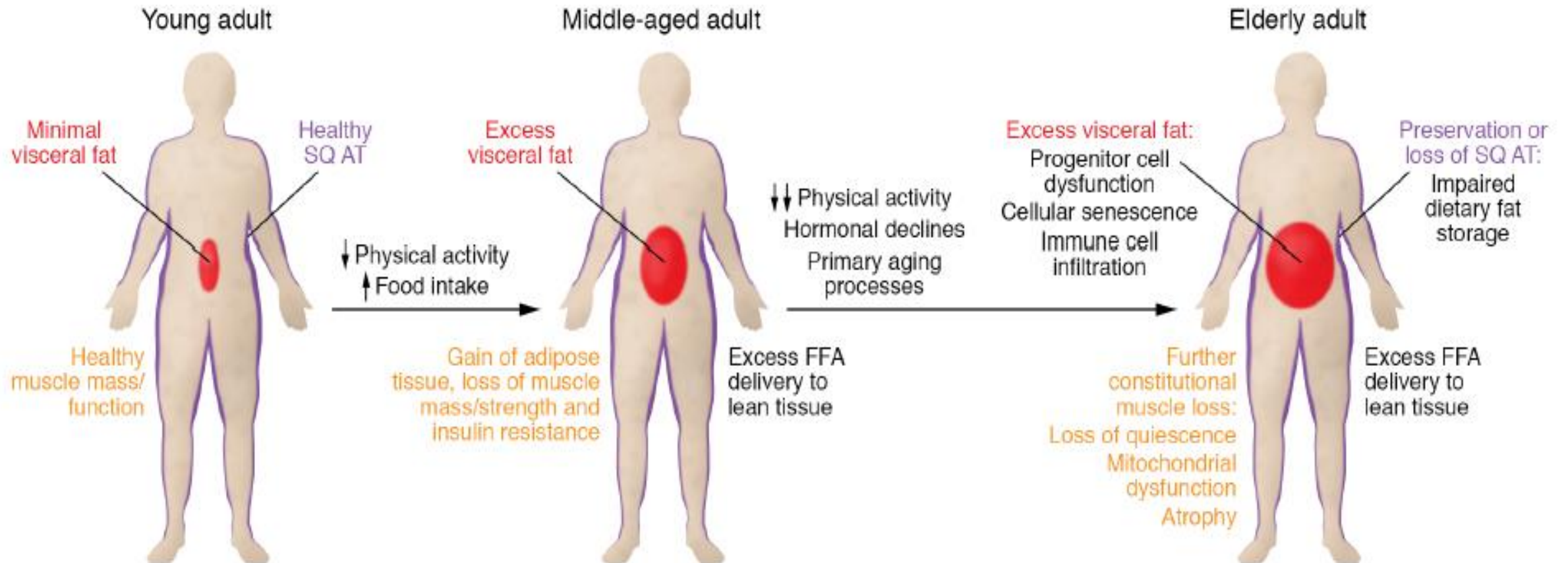
Índex

- Diferents **compartiments** greix corporal
- Limitacions de les **tècniques** per mesurar-lo
- Canvis en la **quantitat i distribució** amb l'envelliment
- Què és considera **saludable** en funció del sexe?
- Canvis en la **funcionalitat**
- Com **impacta la pèrdua de pes** en la distribució i funcionalitat greix

Dipòsits de greix corporal

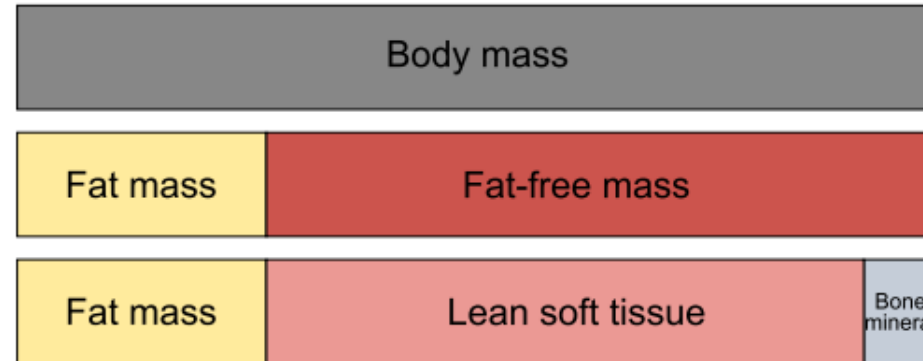


Què passa amb els dipòsits de greix amb l'envelliment?

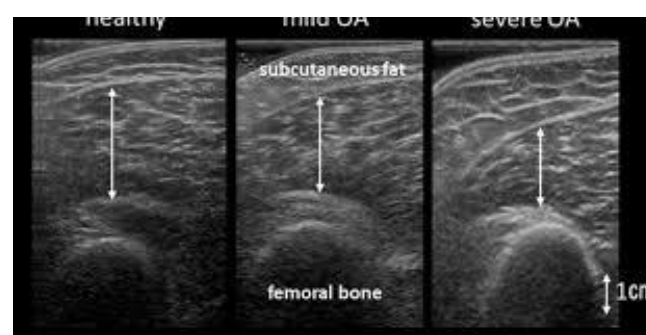




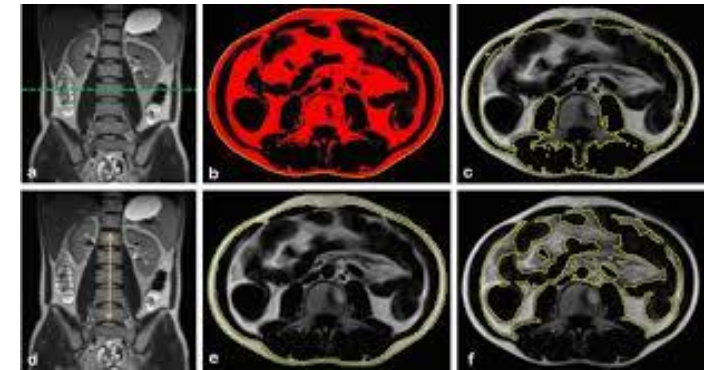
E



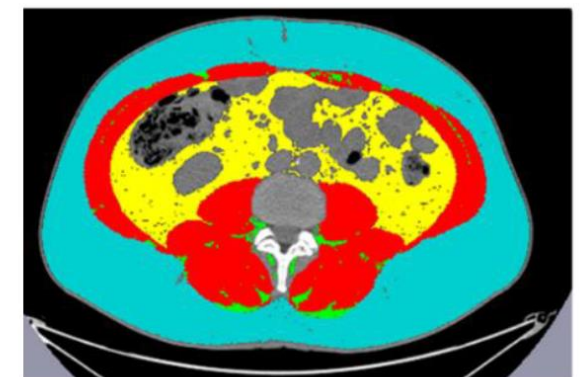
BIA



ECO



RMN

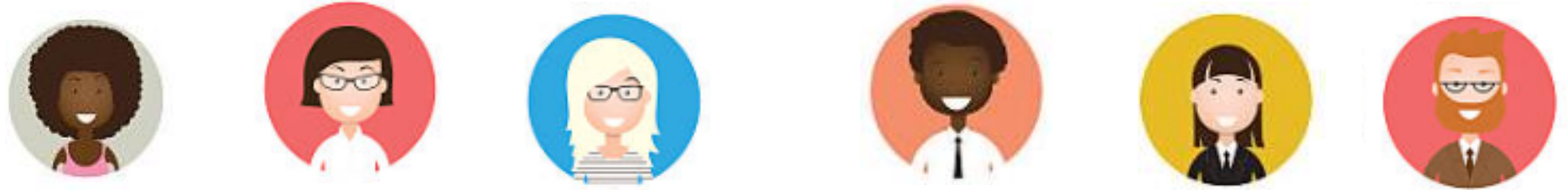


- Subcutaneous Adipose Tissue
- Skeletal Muscle
- Visceral Adipose Tissue
- Intramuscular Adipose Tissue

TAC

Percentatge de greix saludable en funció edat i sexe/raça

N=1626



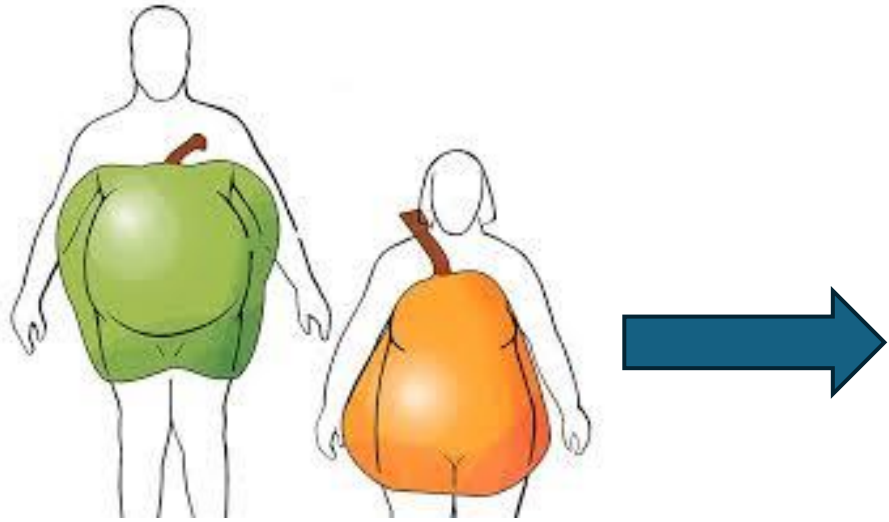
Predicted percentage body fat by sex and ethnicity based on 4-compartment estimates of percentage body fat¹

Age and BMI	Women				White
	African American	Asian	White		
20–39 y					
BMI <18.5	20			8	13
BMI ≥25	32			20	23
BMI ≥30	39			26	28
40–59 y					
BMI <18.5		25	23	9	13
BMI ≥25		36	35	22	24
BMI ≥30	39	41	41	27	29
60–79 y					
BMI <18.5	23	26	25	11	14
BMI ≥25	35	36	38	23	24
BMI ≥30	41	41	43	29	31

¹Calculated from Equation 4 centering on the ages of 30, 50, and 70 y.

Punt de tall per **obesitat DXA** >29% en Homes i ≥41% en dones 40-59 anys

Dimorfisme sexual en la distribució del greix



↑VAT
↑ WC
SAT/TAT 75%

↑SAT
↑ hip C
SAT/TAT 85%

Senyals hormonals

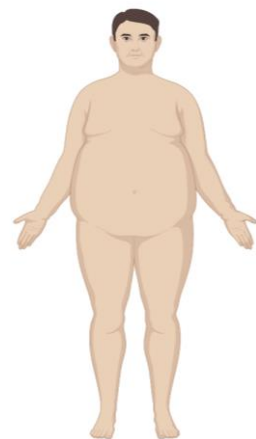
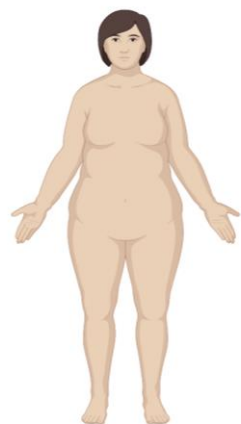
Estrògens ↑ R α 2-adrenèrgic en SAT
↑diferenciació pre-adipòcits

Testosterona: ↓LPL i ↓adipogènesi

Canvis epigenètics

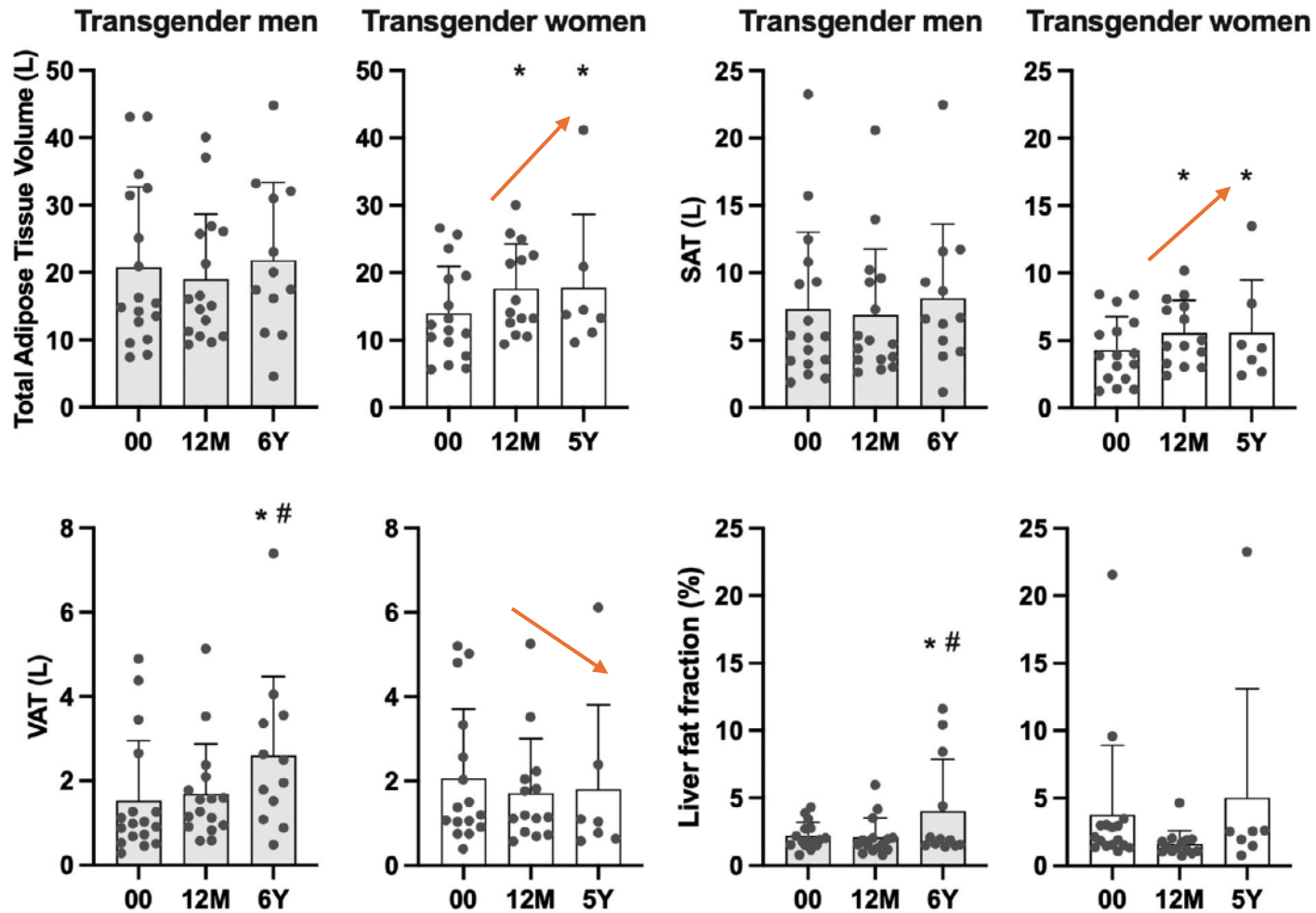
Cromosoma X

Proyecto SARCOBAR



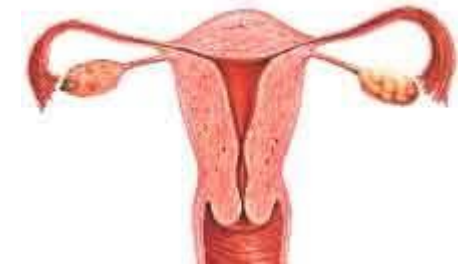
	N=342	N=140
Weight (kg)	118.7	141.7
BF (%)	51.1(4.4)	46.2(5.1)
Visceral Fat (cm2)	292.1(92.3)	373.4 (134.9)
Apendicular lean mass (kg)	57.42(9.4)	72.11 (11.1)
ALM/weight	19.27(2.3)	22.93(3.4)

Distribució del greix sota tractament hormonal en transgènere



Changes in body composition and weight during the menopause transition

Gail A. Greendale,¹ Barbara Sternfeld,² MeiHua Huang,¹ Weijuan Han,¹ Carrie Karvonen-Gutierrez,³ Kristine Ruppert,⁴ Jane A. Cauley,⁵ Joel S. Finkelstein,⁶ Sheng-Fang Jiang,² Arun S. Karlamangla¹



SWAN Cohort
N=1246
DXA

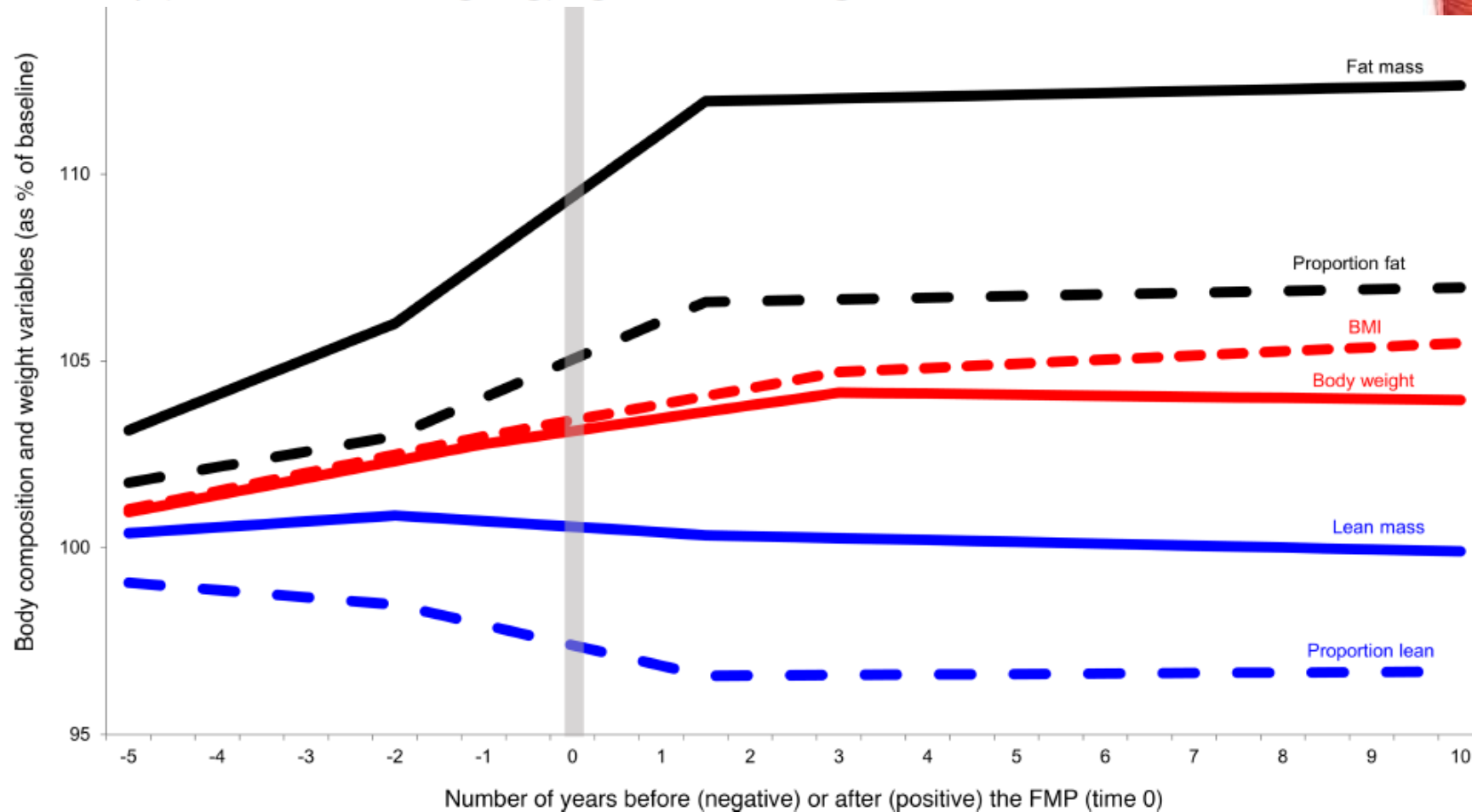


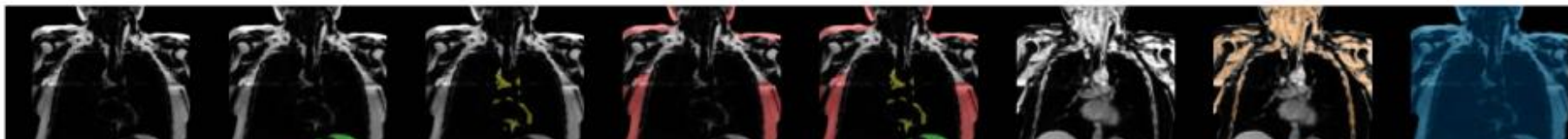
Figure 2. Model-predicted trajectories of body composition and body weight outcomes relative to the time prior to or after the FMP, SWAN. Values shown are for an average study participant (i.e., with each model covariate set at its analysis sample mean). Covariates were age at FMP, race, SWAN study site, and HT use.

Canvis distribució del greix segons en edat i sexe

EPIC Cohort
N=1192



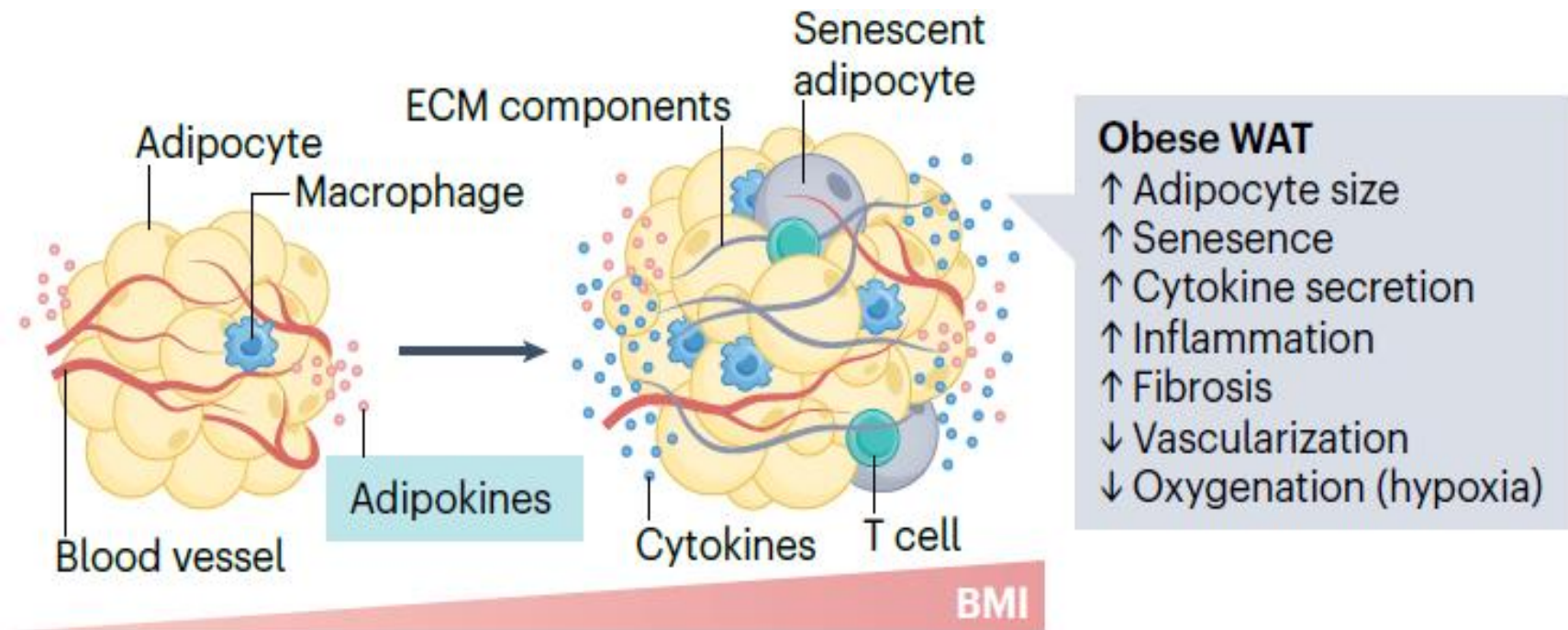
RMN



	Men			Women		
Age group	51–61	58–71	68–81	47–61	58–71	68–81
No. of participants	191	194	213	207	196	191
Anthropometry						
Weight, kg	85.9 (53.4,128.5)	85.5 (55.6,125.9)	80.8 (56.9,113.5)	71.0 (44.4,116.2)	70.3 (43.9,116.7)	68.6 (42.1,107.0)
Height, cm	177.6 (160.0,197.5)	175.5 (156.9,198.6)	173.2 (155.2,191.1)	164.8 (152.0,183.1)	162.5 (142.5,180.2)	161.3 (147.1,179.0)
BMI, kg/m ²	27.2 (18.6,40.8)	27.7 (20.2,38.3)	26.9 (19.1,38.9)	26.2 (17.1,40.8)	26.6 (18.0,42.1)	26.3 (17.1,40.5)
Waist, cm	99.2 (73.3,130.3)	102.1 (82.9,139.7)	101.1 (74.3,130.6)	88.9 (63.6,126.0)	91.3 (66.2,128.3)	90.9 (63.6,119.0)
Hip, cm	101.8 (85.5,123.0)	102.2 (78.3,122.0)	101.1 (86.9,127.1)	103.3 (80.0,137.7)	104.2 (84.8,141.2)	103.3 (83.6,129.6)
MRI body compartments						
TBV, l	73.3 (48.2,110.0)	73.8 (48.4,109.4)	70.1 (50.4,98.5)	63.4 (38.2,104.1)	63.4 (37.5,110.6)	61.8 (37.1,95.3)
TAT, l	20.7 (4.9,45.5)	<u>22.1 (6.6,41.0)</u>	20.9 (5.2,42.5)	24.3 (6.4,50.9)	<u>25.1 (9.4,62.7)</u>	24.0 (8.3,44.1)
VAT, l	4.8 (0.48,11.5)	5.4 (1.39,10.5)	<u>5.5 (0.24,10.5)</u>	2.7 (0.30,7.3)	3.0 (0.47,7.5)	<u>3.2 (0.63,7.9)</u>
SAT, l	15.5 (3.9,36.6)	<u>16.1 (5.1,34.3)</u>	14.9 (4.9,34.9)	21.4 (5.9,43.6)	<u>21.7 (8.2,56.4)</u>	20.5 (7.2,36.9)
CAT, l	0.42 (0.07,0.96)	0.50 (0.10,1.1)	0.51 (0.10,1.5)	0.24 (0.01,0.60)	0.31 (0.04,1.2)	0.32 (0.04,1.3)
SMT, l	25.4 (16.6,35.4)	24.3 (17.9,33.1)	22.6 (16.4,29.5)	16.9 (11.4,23.3)	16.2 (11.2,22.4)	15.8 (10.7,20.7)

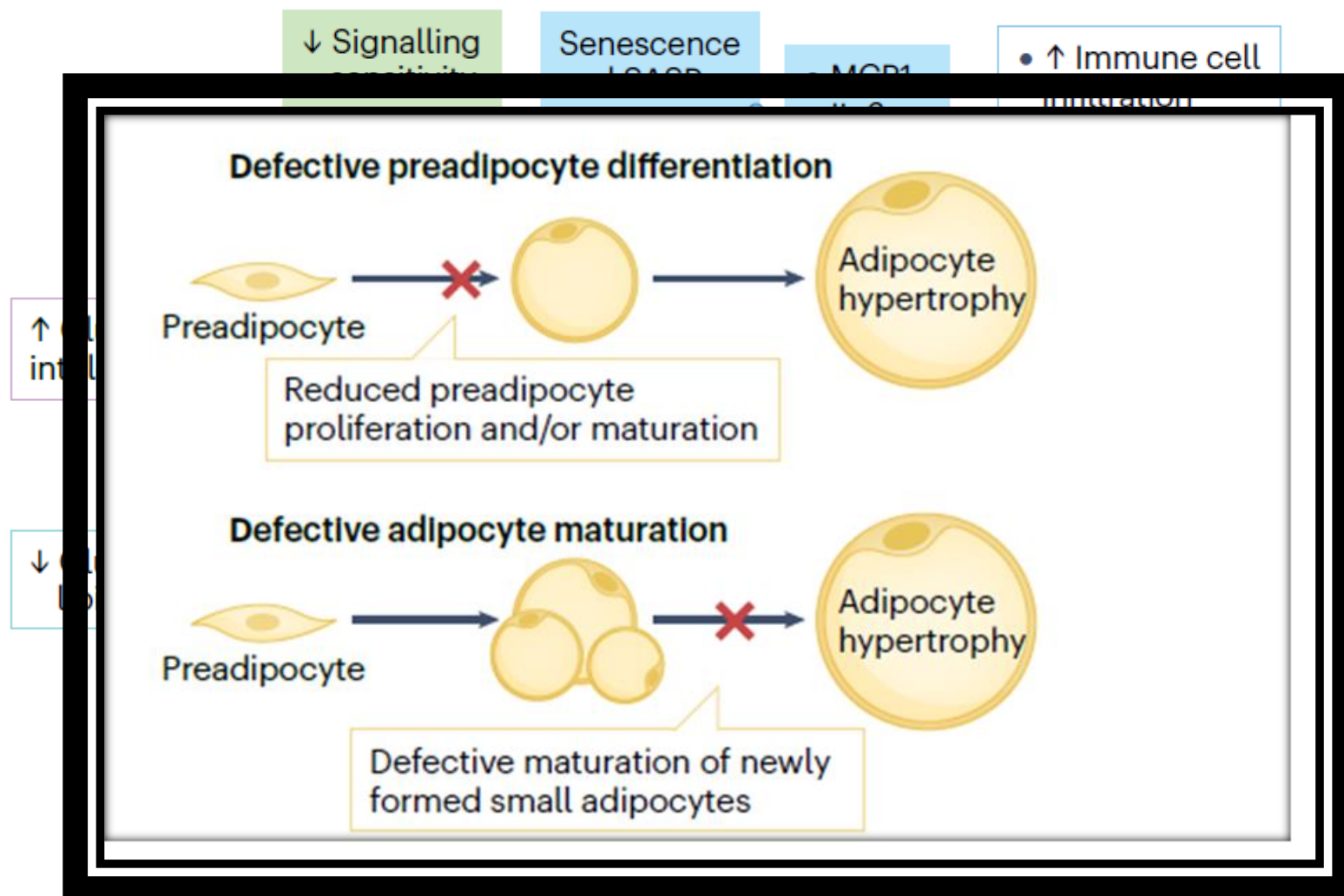
Funcionalitat de l' adipocit en l'envelliment i obesitat

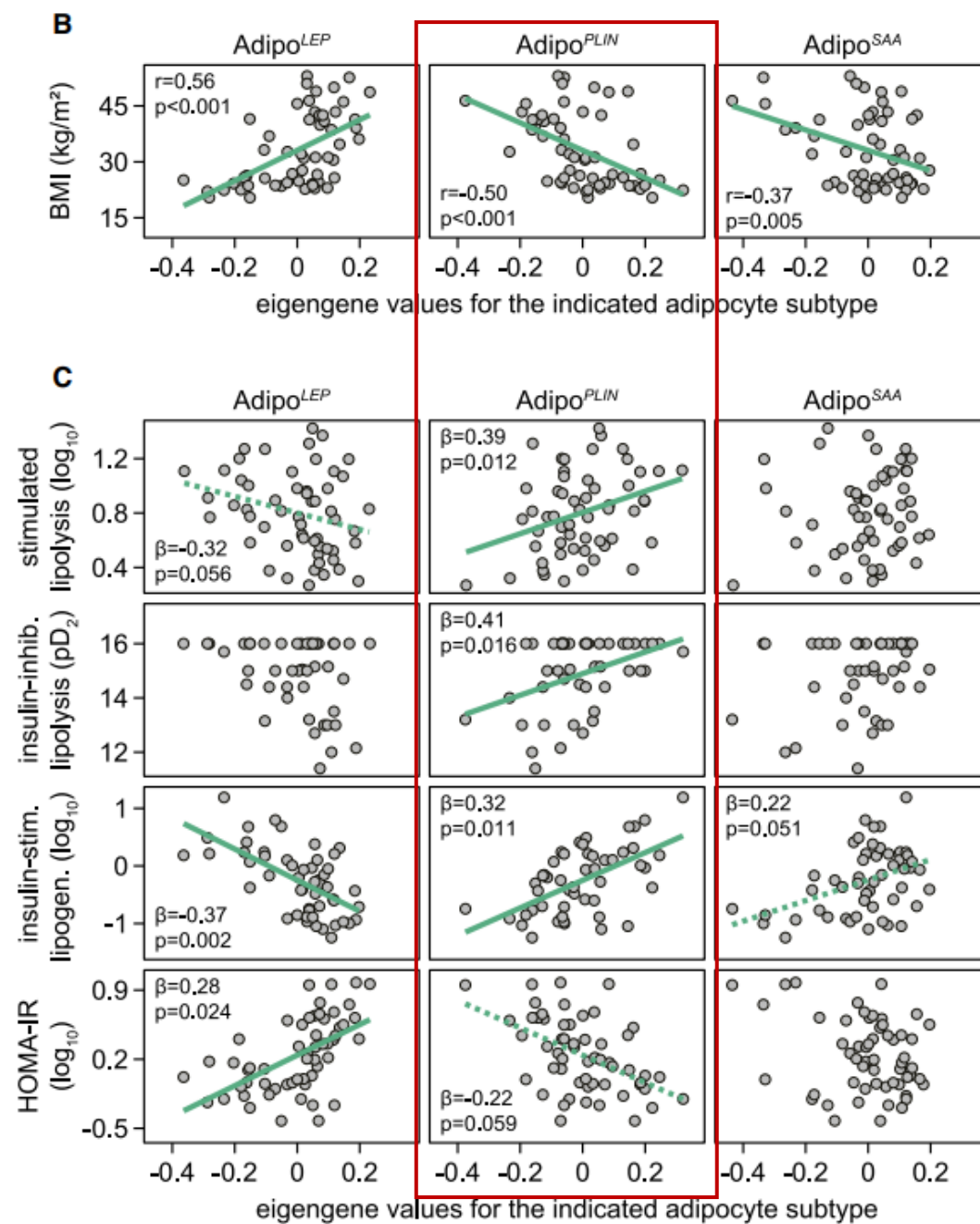
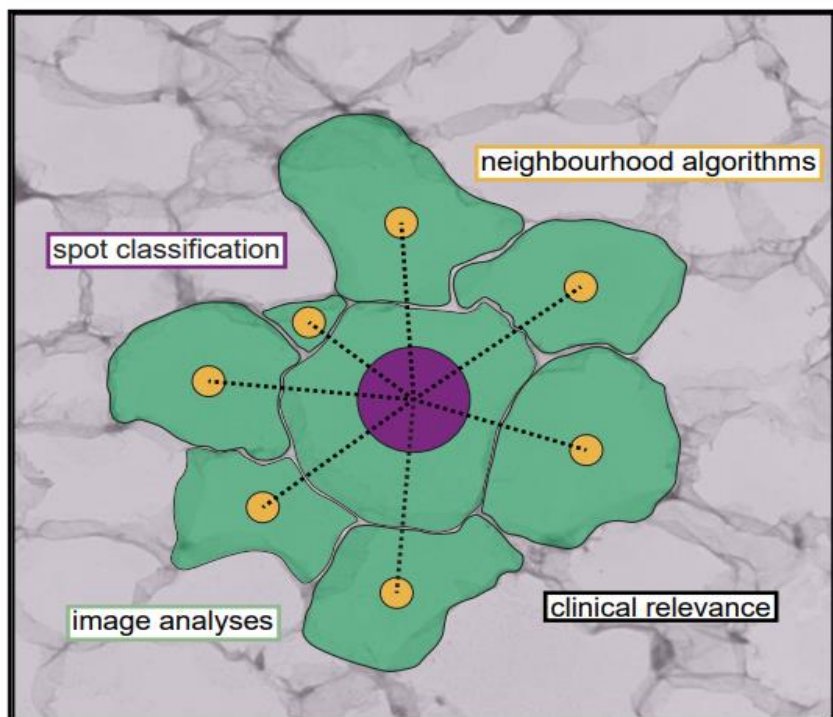
- ↑ Tamany adipòcit
- ↑ Inflamació teixit
- ↓ Vascularització
- Alteració MEC



Funcionalitat adipòcit: Hipòtesi expansibilitat

- ↑ Resistència a Insulina
- ↑ secreció de citocines inflamatòries
- ↑ Rigidesa MEC
- ↑ Senescència



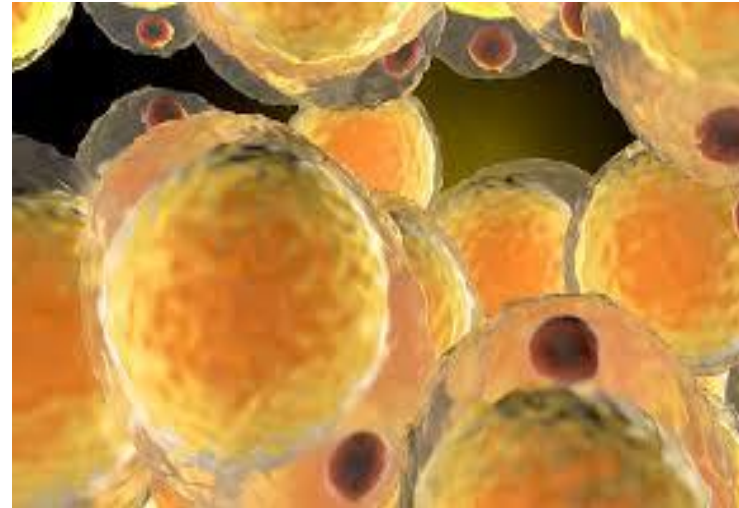




TNF-alpha and TNFR2 mRNAs ↑m expressió SAT en obesitat greu> obesitat> no obesitat. *Cytokine, 2006*

AQP7: TAV> SAT and = lipogenic and lipolytic genes. *JCEM, 2010*

Lamin A/C mRNA ↑ en obesitat i DM2
Obesity, 2008



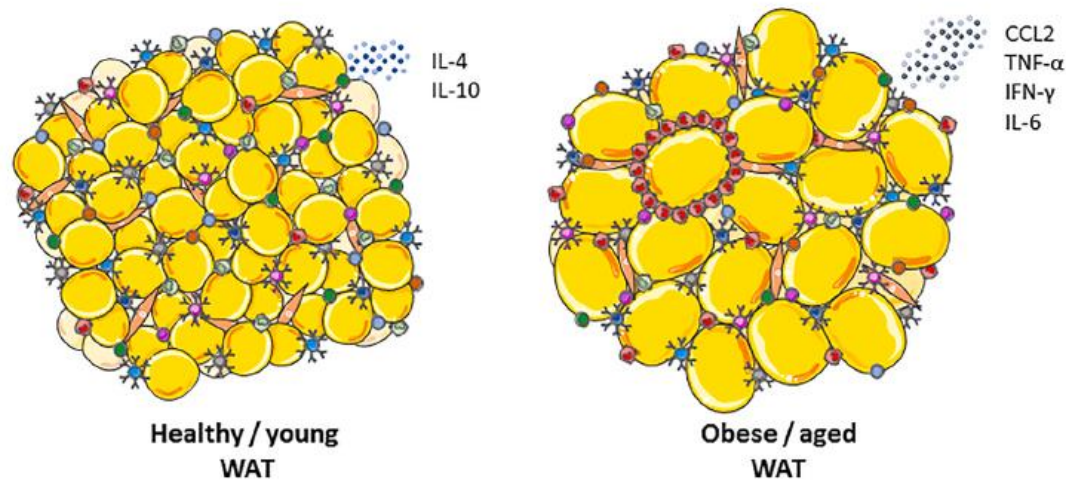
Proteomic analysis of VAS/TAS. *Mol Cell Endocrinol 2012*

GIP/GIPR senyalització alterada a TAS i VAT a obesitat greu. *JCEM 2014*

LEP and SUCNR1 ↑en SAT / VAT en obesitat greu. *Cell Metab, 2023*

GLP-1R ↑ a **VAT>SAT** inverse correlation with weight. *Sci rep 2019*

Biomarcadors de disfunció teixit adipòs



Ratio adiponectina/leptina ↓

TNF-α↑

IL-6↑

Resistina↑

Omentina↓

Irisina↑

FABP4↑

VEGFs↑

MCP-1/CCL2↑

SAA↑

IL-1RA↑

IGF-1↑

| Canvis en la composició corporal amb tractament dietètic

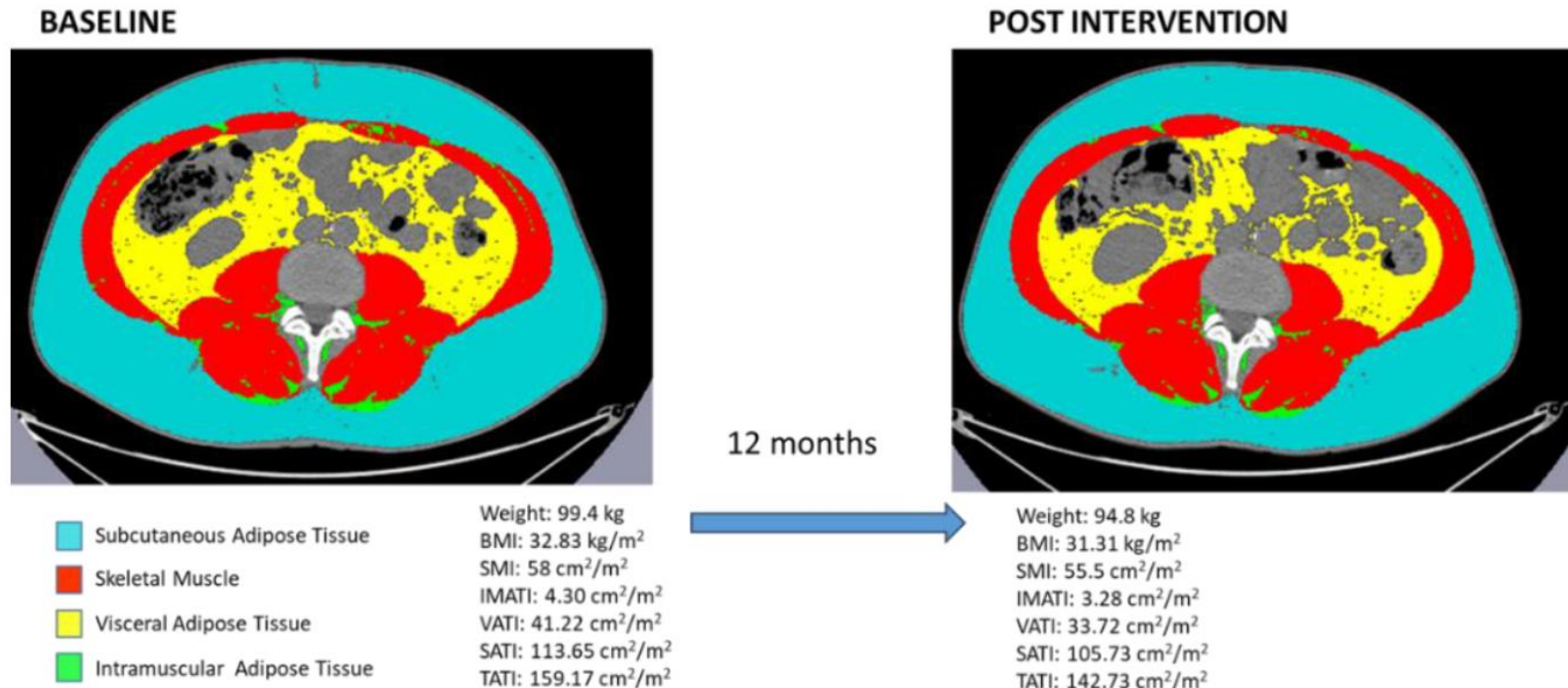


Article Effects of a One-Year Intensified Weight Loss Program on Body Composition Parameters in Patients with Severe Obesity and Obstructive Sleep Apnea (OSA): A Randomized Controlled Trial

Laia Miralles-Llumà ^{1,2,3,4,†}, Nuria Vilarrasa ^{2,5,6,†}, Carmen Monasterio ^{1,7}, Carla López-Padrós ¹, Carolina Alves ^{1,2}, Rosa Planas ⁸, Lorena Arribas ^{9,10} , Monica Montserrat ², Sandra Pérez-Ramos ¹, Natàlia Pallarès ¹¹ and Neus Salord ^{1,7,*}

N= 18 IG

N=16 CG



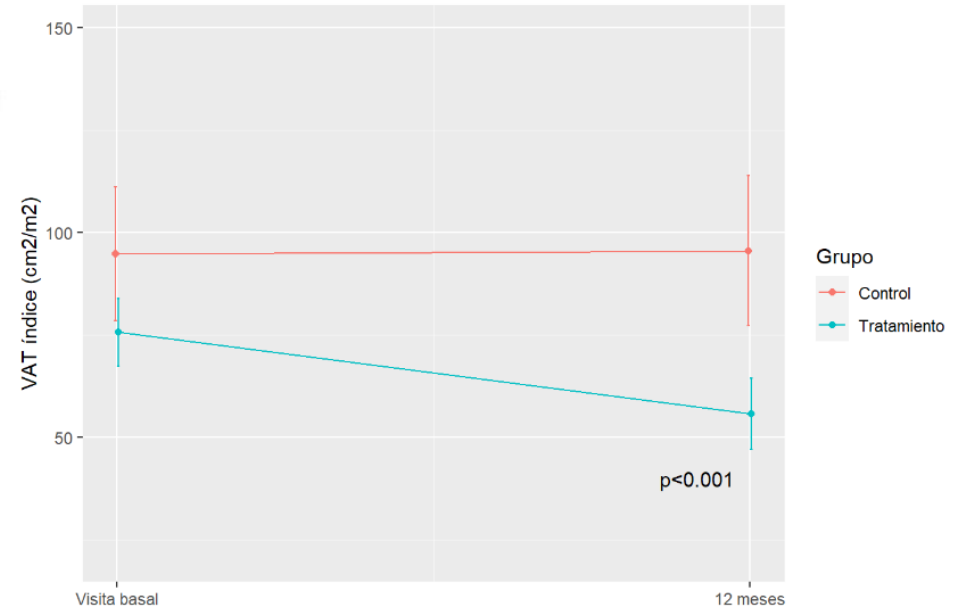
↓ -8.2 (5.9) kg in the IG

FM: -7.23 (5.01)kg

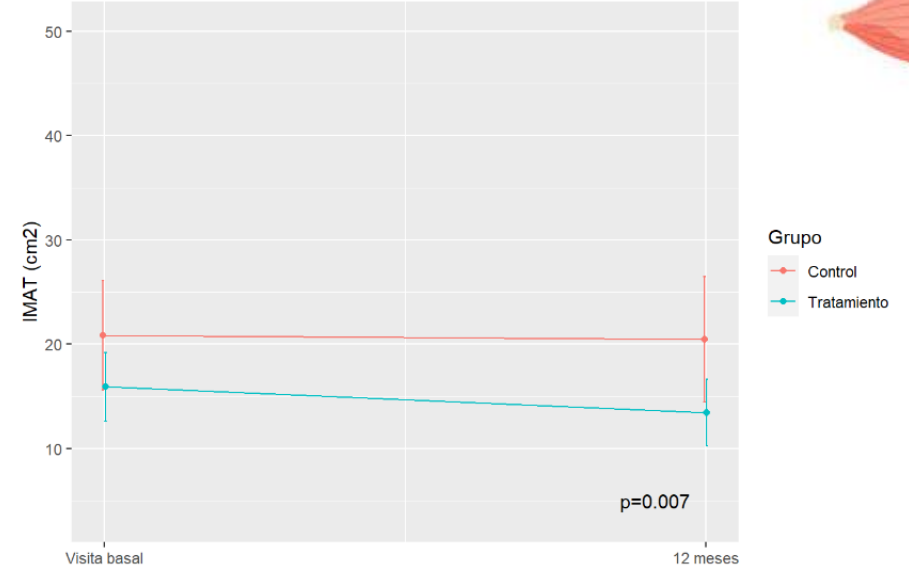
FFM: -1.38 (1.36)kg



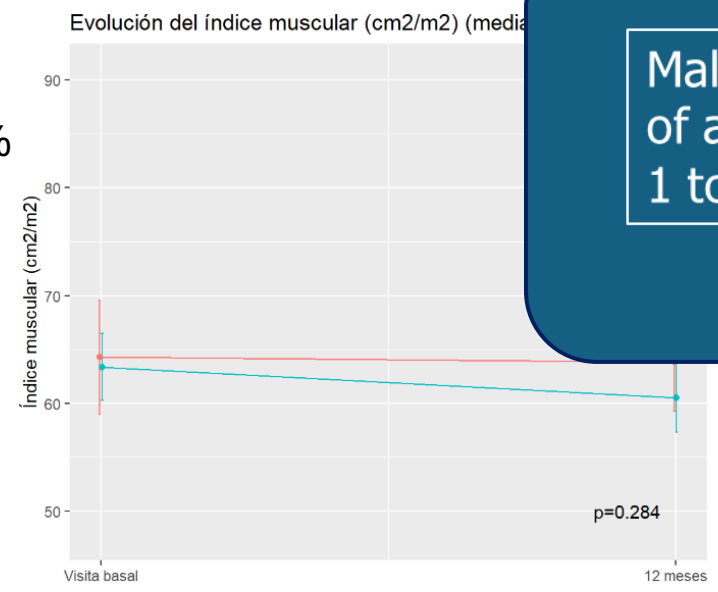
↓ 24%



Evolución del IMAT (cm2) (media y CI)

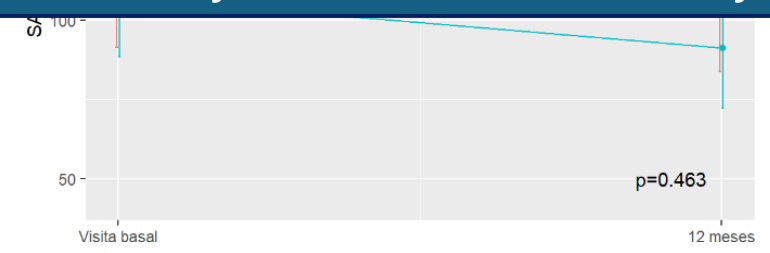


↓ 4.7%



Males and females with overweight and obesity in the absence of a structured exercise program ↓ LM of about 2 to 2.5 kg and 1 to 1.5 kg per 10-kg weight loss, respectively.

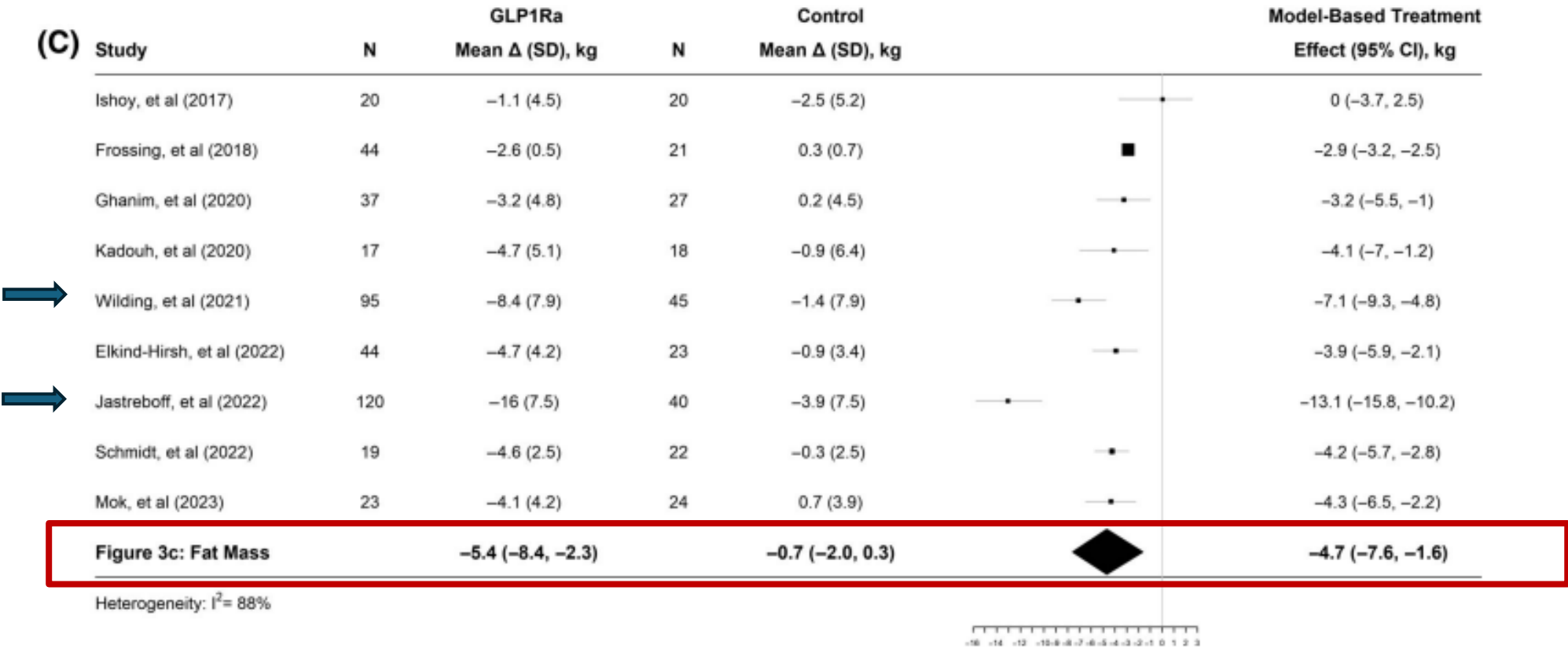
Heymsfield SB, et al. Obesity .2023



GLP1Ra-based therapies and DXA-acquired musculoskeletal health outcomes: a focused meta-analysis of placebo-controlled trials

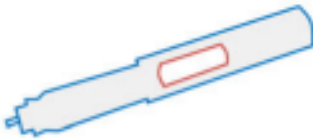
Kristen M. Beavers^{1,2} | Tiffany M. Cortes^{3,4,5} | Colleen M. Foy⁶ | Lauren Dinkla² |
Fernando Reyes San Martin³ | Jamy D. Ard⁷ | Monica C. Serra^{4,5,8} |
Daniel P. Beavers⁹

N= 419 Pèrdua : -8,1kg (-11,9, 4,2)



GLP1Ra-based therapies and DXA-acquired musculoskeletal health outcomes: a focused meta-analysis of placebo-controlled trials

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Fernando Reyes San Martin³ | Jamy D. Ard⁷ | Monica C. Serra^{4,5,8} |
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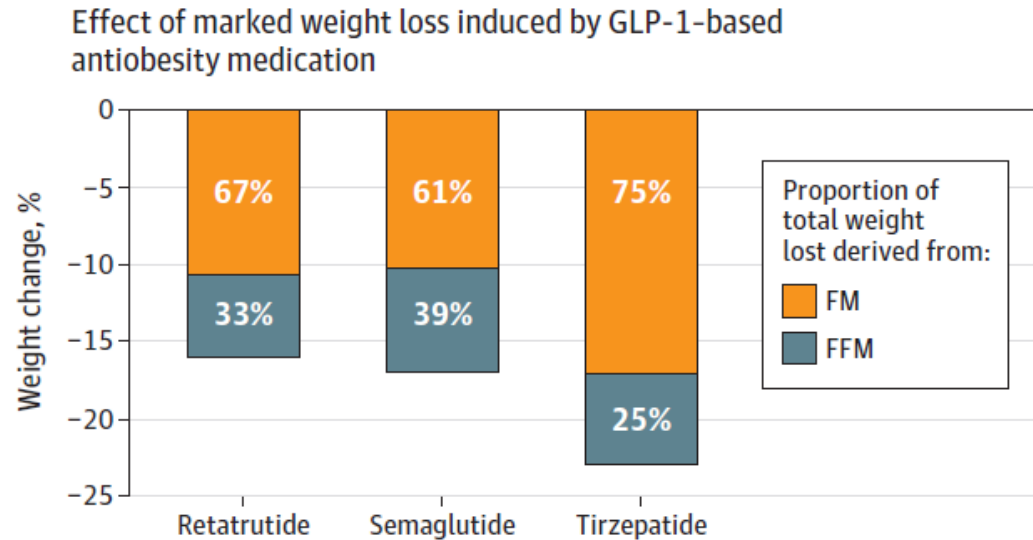
Approximately 30% of body weight lost with GLP1Ra-based therapy is Lean Mass.

(B) Study	N	GLP1Ra		Control		Model-Based Treatment Effect (95% CI), kg
		Mean Δ (SD), kg	N	Mean Δ (SD), kg		
Ishoy, et al (2017)	20	-0.7 (3.7)	20	-1 (2.8)		-0.3 (-2.5, 1.4)
Frossing, et al (2018)	44	-2.4 (0.7)	21	0.1 (0.4)		-2.5 (-2.8, -2.2)
Ghanim, et al (2020)	37	1.6 (4.6)	27	0 (3)		1.2 (-2, 2.8)
Kadouh, et al (2020)	17	-1.3 (5)				-1.1 (-3.4, 1.2)
Wilding, et al (2021)	95					-3.9 (-5.1, -2.6)
Elkind-Hustn				-0.3 (2.8)		-0.7 (-2.1, 0.6)
		-5.7 (3.3)	40	-1.4 (3.3)		-4.5 (-5.5, -3.4)
	19	-2.5 (1.7)	22	0 (1.7)		-2.3 (-3.3, -1.4)
Mok, et al (2023)	23	-4.2 (3)	24	-1.2 (3.2)		-3.1 (-4.6, -1.6)
Figure 3b: Lean Mass		-2.5 (-4.1, -0.8)		-0.6 (-1.2, 0.0)		-1.9 (-3.5, -0.2)

Heterogeneity: I² = 84%



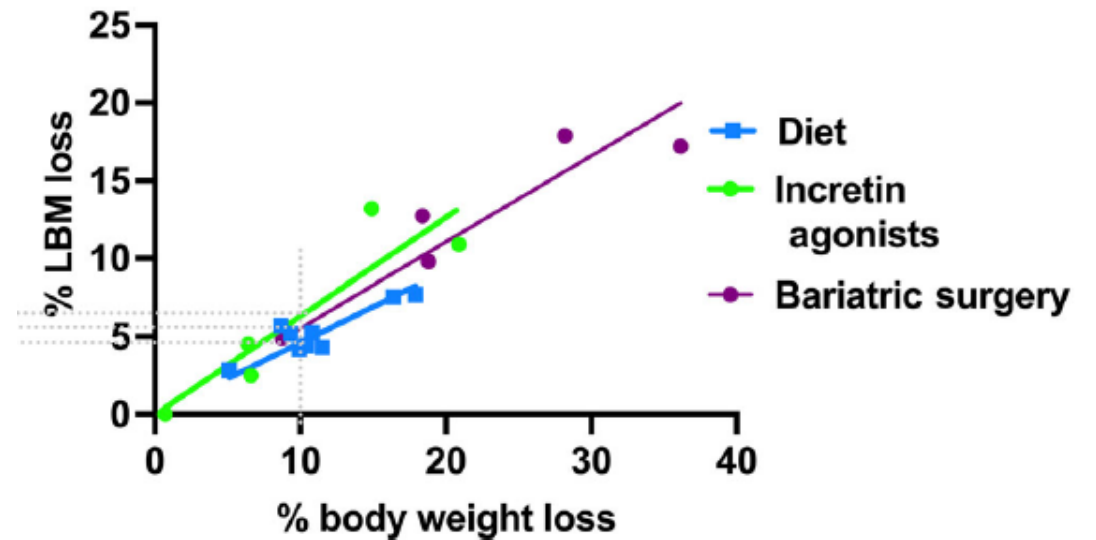
Canvis en la composició corporal amb tractament farmacològic



Greix Visceral



Greix ectòpic : IMAT, Fetge, Peri-epicàrdic



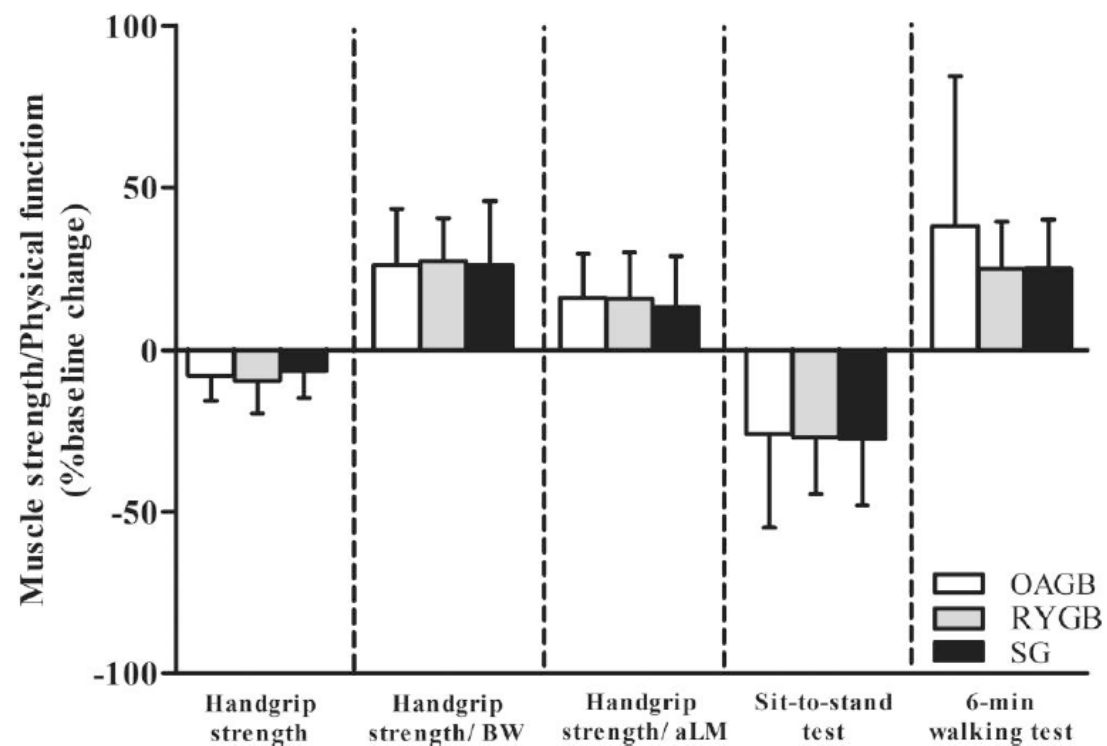
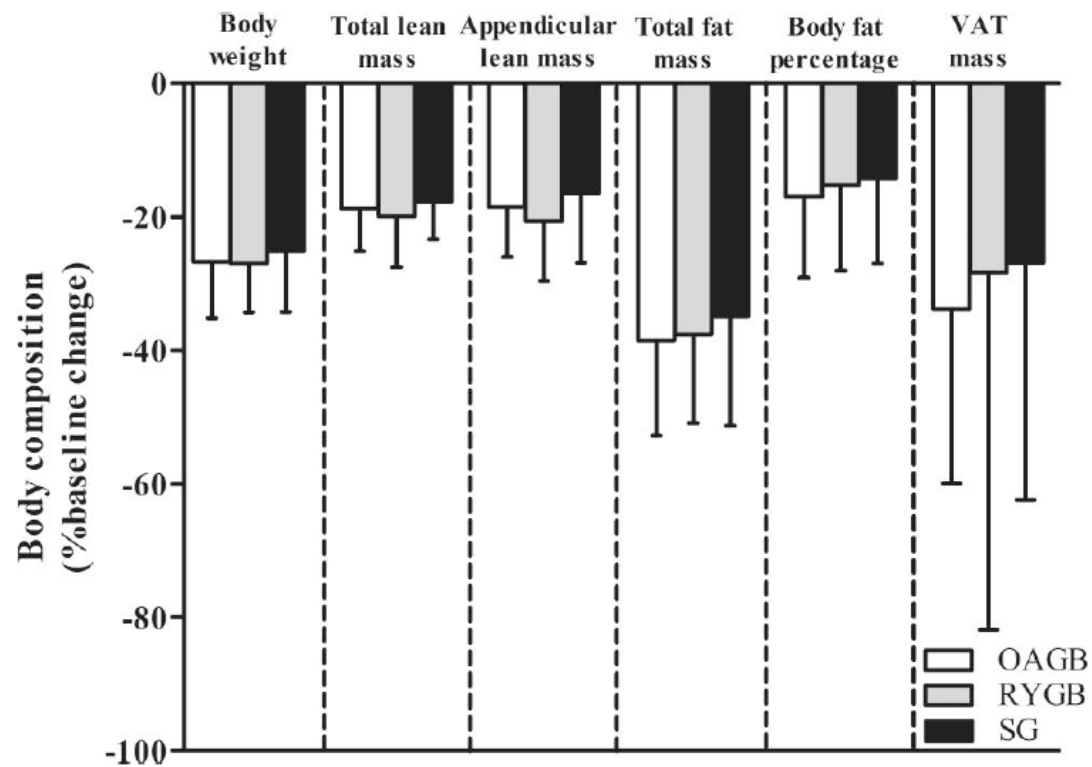
Canvis en composició corporal després de Cirurgia bariàtrica



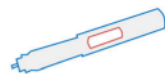
BARI-LIFESTYLE trial

N= 119 adults (77% women)

IMC 43.6 ± 5.5 kg/m²



Canvis en la disfunció TA amb agonistes rGLP-1

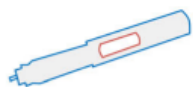


Liraglutida

↓ SAT/ TAV

SAT: ↑expressió TNR- α , *MCP-1*
↑ TGFB i collagen type 1 alpha 1 chain (COL1A1)

Pastel E et al. Clinical Science.2017



Semaglutida

↓ SAT/ VAT:

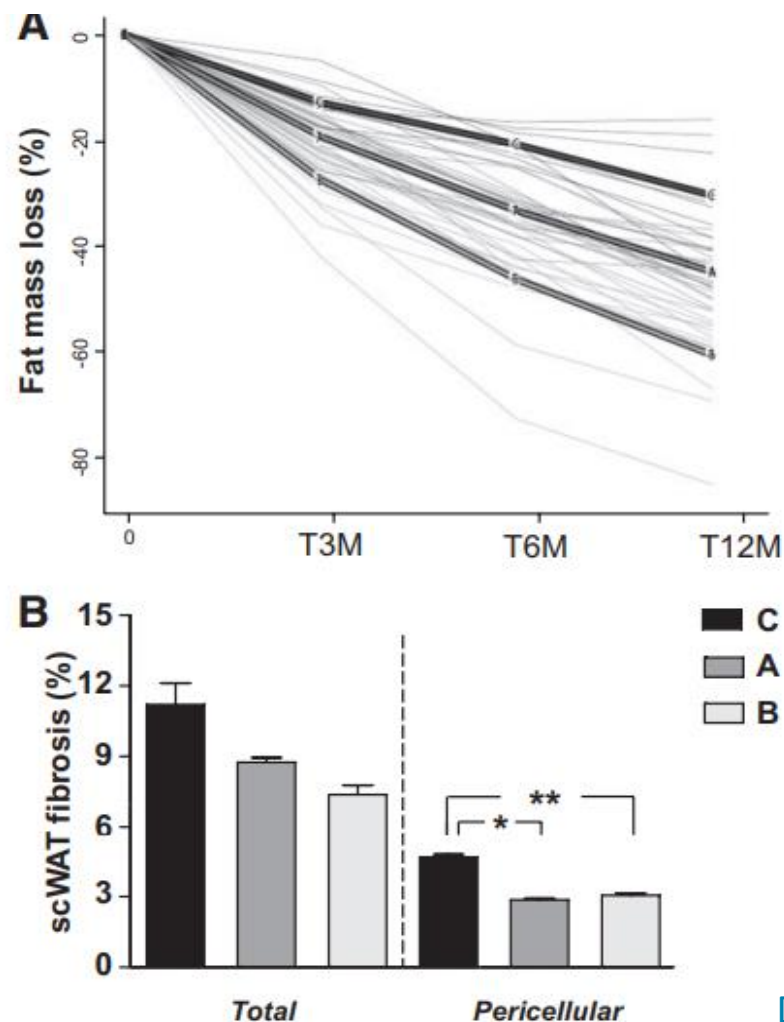
↓ Hipertrofia adipocitos e infiltración por macrófagos
↓ Citoquinas plasmáticas, expresión de genes inflamatorios
↓ Estrés retículo endoplasmático
↑ expresión genes implicados en el "browning"

Martins FF, et al. Cell Biochem Funct. 2022.

Fibrosi TAS com a predictor pèrdua de pes després CB

Fibrosis in Human Adipose Tissue: Composition, Distribution, and Link With Lipid Metabolism and Fat Mass Loss

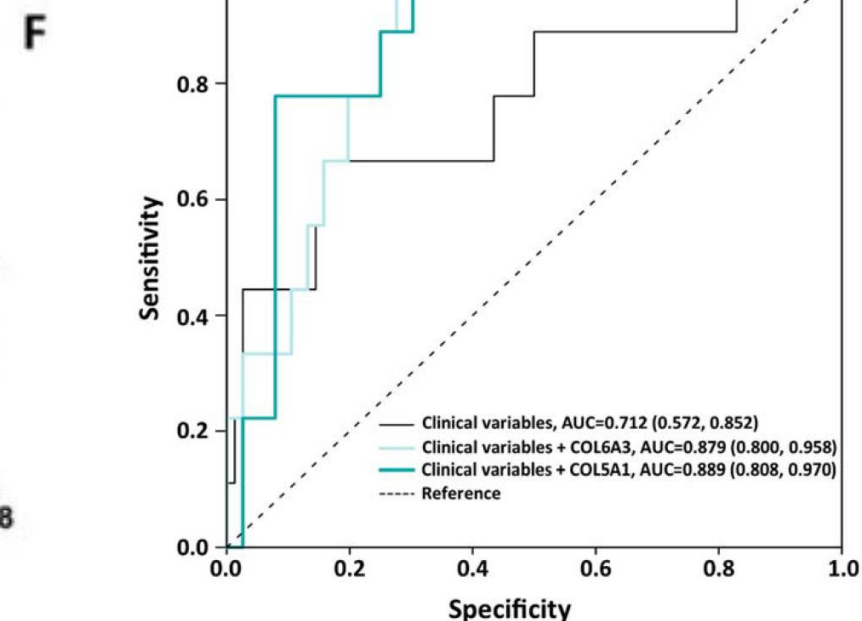
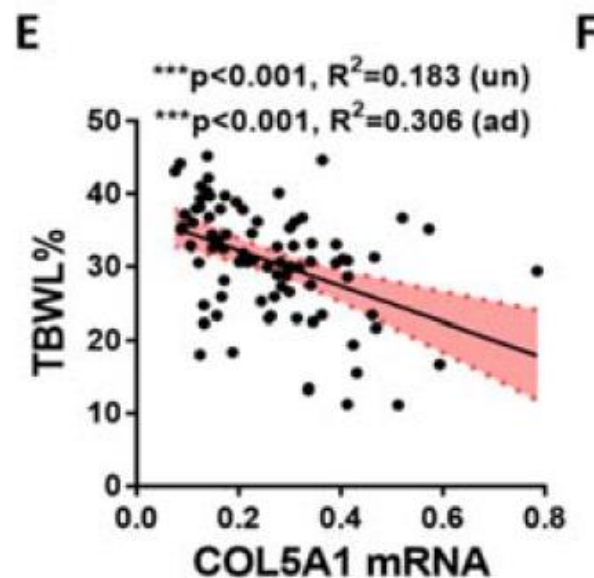
Adeline Divoux,¹ Joan Tordjman,¹ Danièle Lacasa,² Nicolas Veyrie,^{1,3} Danielle Hugol,^{1,4} Abdelhalim Aissat,^{1,3} Arnaud Basdevant,^{1,2} Michèle Guerre-Millo,¹ Christine Poitou,^{1,2} Jean-Daniel Zucker,¹ Pierre Bedossa,^{1,5} and Karine Clément^{1,2}



Divoux A, et al. Diabetes 2010

Expression of Adipose Tissue Extracellular Matrix-Related Genes Predicts Weight Loss after Bariatric Surgery

Óscar Osorio-Conles^{1,2,*}, Romina Olbeyra² , Josep Vidal^{1,2,3}, Ainitze Ibarzabal⁴, José María Balibrea⁴ and Ana de Hollanda^{2,3,5,*}



Osorio-Conles O et al, Cells 2023

Memòria “metabòlica” del Teixit adipós

Article

Adipose tissue retains an epigenetic memory of obesity after weight loss

<https://doi.org/10.1038/s41586-024-08165-7>

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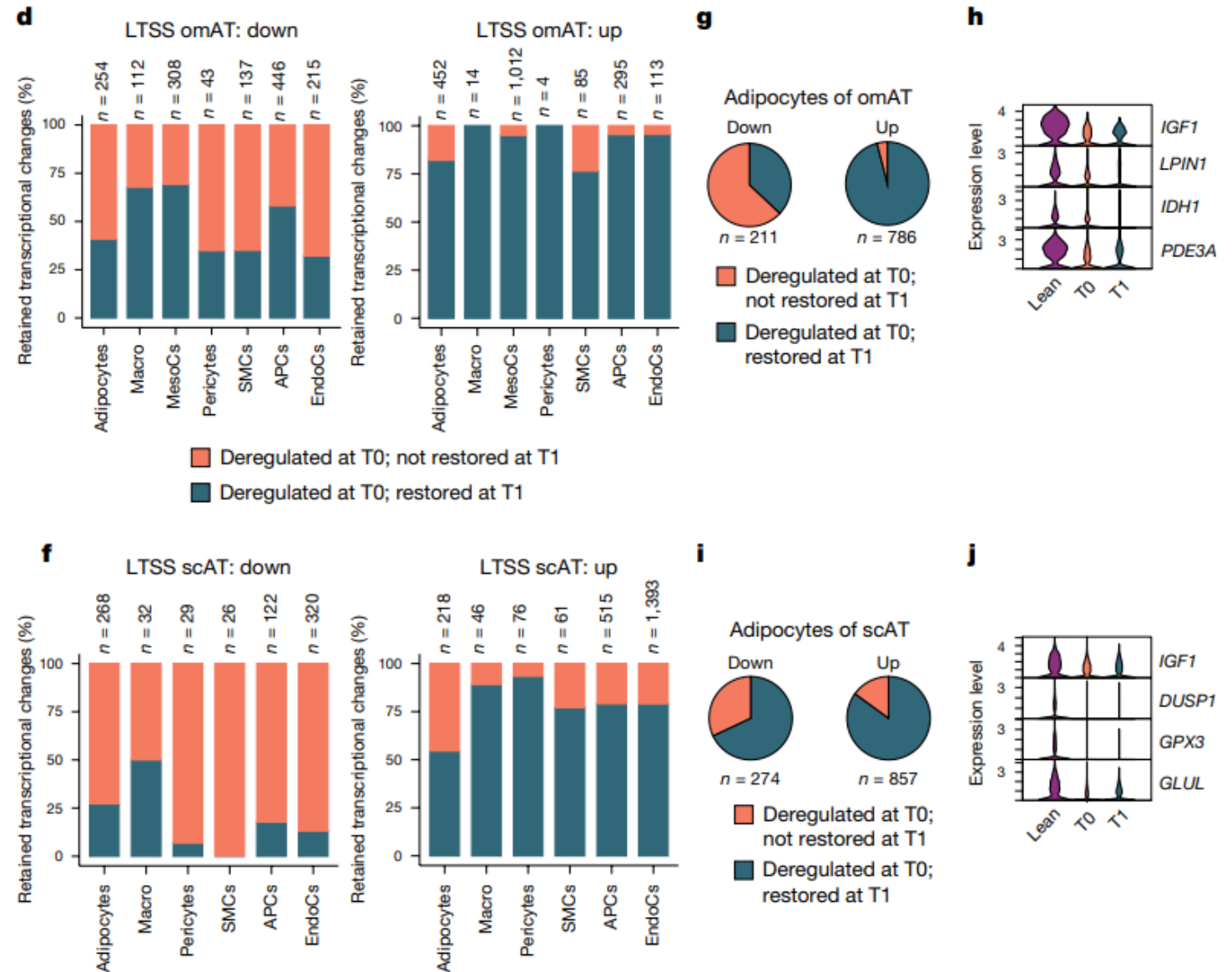
Published online: 18 November 2024

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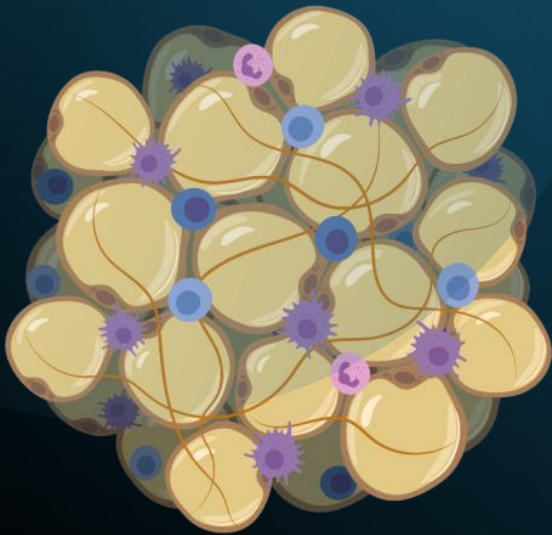
Persisteixen:

↑ vies fibrosi/ apoptosi

↓ Metabolisme / funció



Conclusions



- ✓ Després de > 30 anys d'estudi seguim aprenent de la fisiopatologia de l'adipòcit.
- ✓ Cada cop més aprop del fenotipat en la salut i malaltia
- ✓ Desconeixem el impacte a llarg plaç del efectes sobre la composició corporal i funcionalitat dels fàrmacs/ cirurgia
- ✓ Possibilitat de reversió de la memoria metabòlica del teixit adipòs.

A microscopic image showing several large, circular, orange-brown cells with a granular texture, possibly representing a cross-section of a plant or a specific type of microorganism. The cells are arranged in a somewhat regular pattern, with some showing internal structures. The background is a darker, more textured brown.

MOLTES GRÀCIES PER LA
SEVA ATENCIÓ