

Microbiota Intestinal



Contenido

- Microbiota hot topic
- Microbiota y enfermedades metabolicas
- ¿Como se puede cambiar la microbiota?



Microbiota hot topic



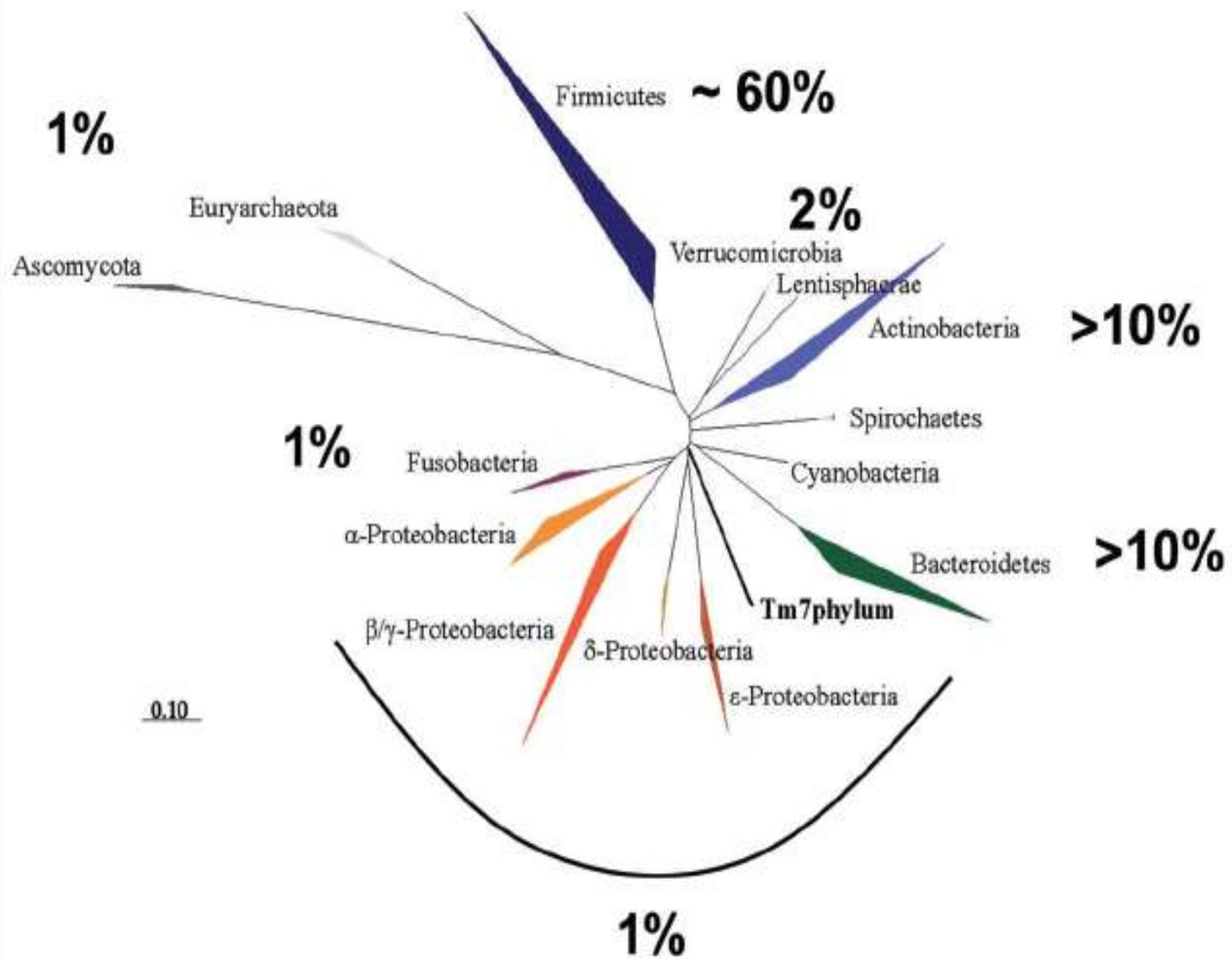
Publicaciones en las que aparece como tópico microbiota



MICROBIOTA

- Tienen un peso de 1.5 Kg.
- 10 veces más células que las células del ser humano
 - 100 billones de bacterias
 - 1000 especies
 - 150 veces mas genes que el genoma humano.





FUNCIÓNES DE LA MICROBIOTA

FUNCIÓN INMUNE

- Destrucción toxinas /carcinógenos
- Colonización por bacterias patógenas
 - Desarrollo del SI
- Modulación del estado inflamatorio

FUNCIÓN DIGESTIVA

- Motilidad digestiva
- Síntesis micronutrientes
- Absorción electrolitos/ minerales
- Fermentación sustancias indigeribles

Gill, SR et al. Metagenomic analysis of the human distal gut microbiome. Science. 2006; 312 (5778): 1355-59.



*Está cambiando la microbiota en
el ser humano en las últimas
décadas*



CAMBIOS EN ECOLOGÍA HUMANA AFECTAN A LA COMPOSICIÓN DE LA MICROBIOTA

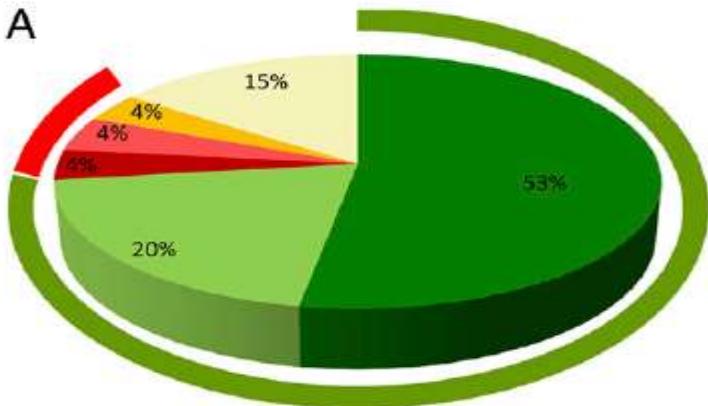
| CHANGE | CONSEQUENCES |
|---|---------------------------------|
| Water sanitation | Fecal transmission decrease |
| Cesarean surgery increase | Vaginal transmission decrease |
| Increase of the antibiotic use in preterm | Vaginal transmission decrease |
| Lactation reduction | Cutaneous transmission decrease |
| Small families | Early contamination decrease |
| Antibiotic use increase | Microbiota changes |
| Antibacterial soaps and toiletries increase | Microbiota changes |
| Mercury-amalgam dental filling increase | Microbiota changes |

Nature Reviews Microbiology | AOP, published online 9 November 2009;



B. FASO CHILDREN

A

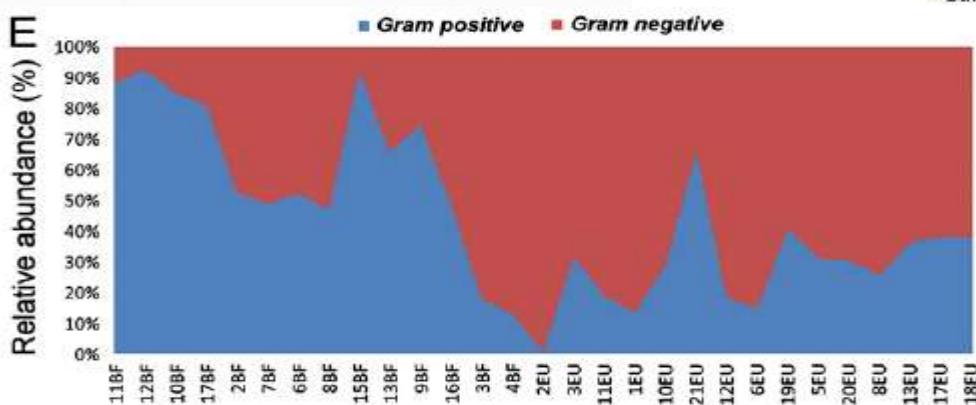


BF

- Prevotella
- Xylanibacter
- Acetitomaculum
- Faecalibacterium
- Subdoligranulum
- Others

Bacteroidetes

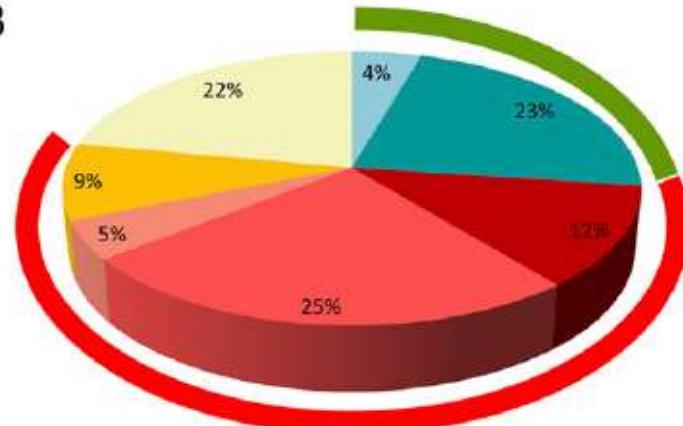
Firmicutes



De Filippo et al.

EUROPEAN CHILDREN

B



EU

- Alistipes
- Bacteroides
- Acetitomaculum
- Faecalibacterium
- Roseburia
- Subdoligranulum
- Others

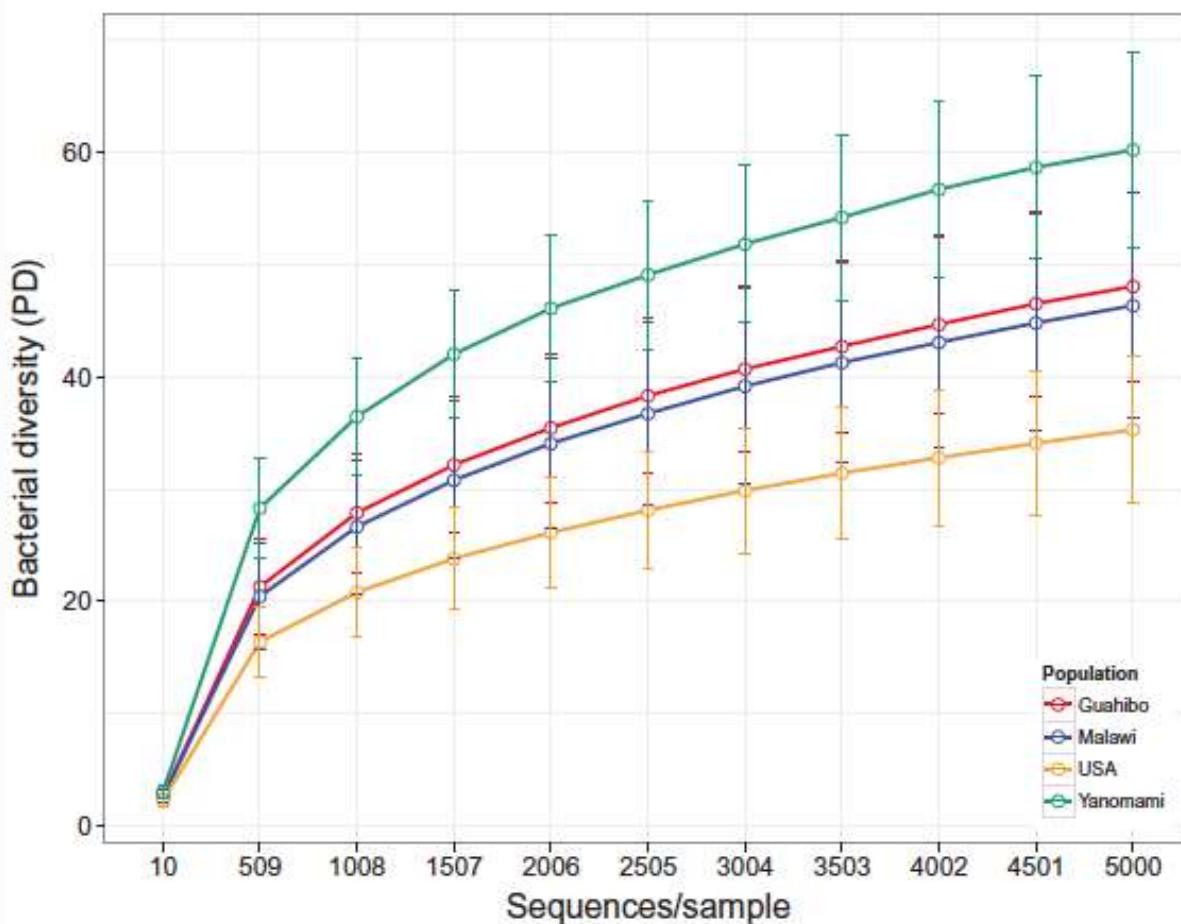
Bacteroidetes

Firmicutes

PNAS | August 17, 2010 | vol. 107 | no. 33 | 14693



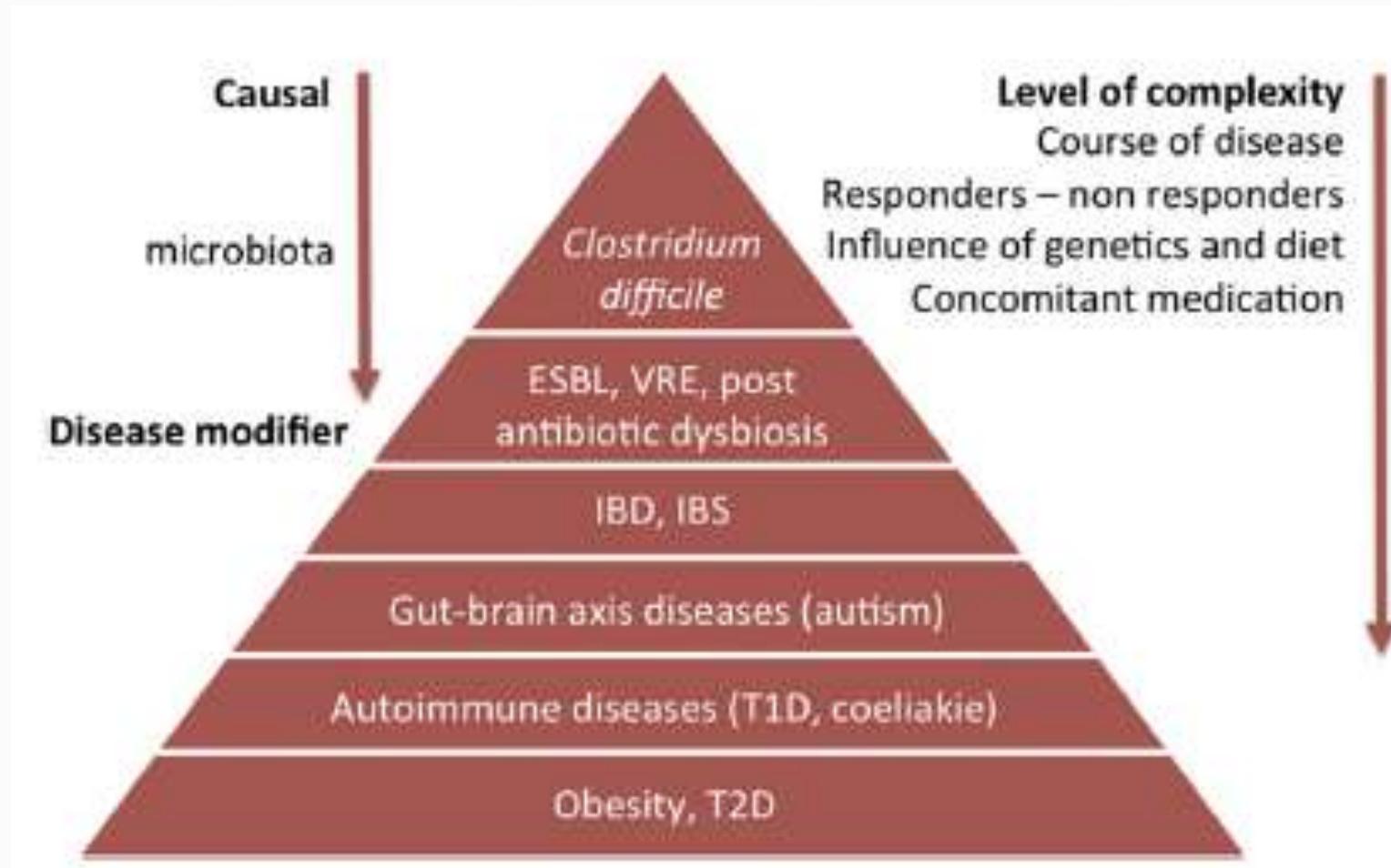
The microbiome of uncontacted Amerindians



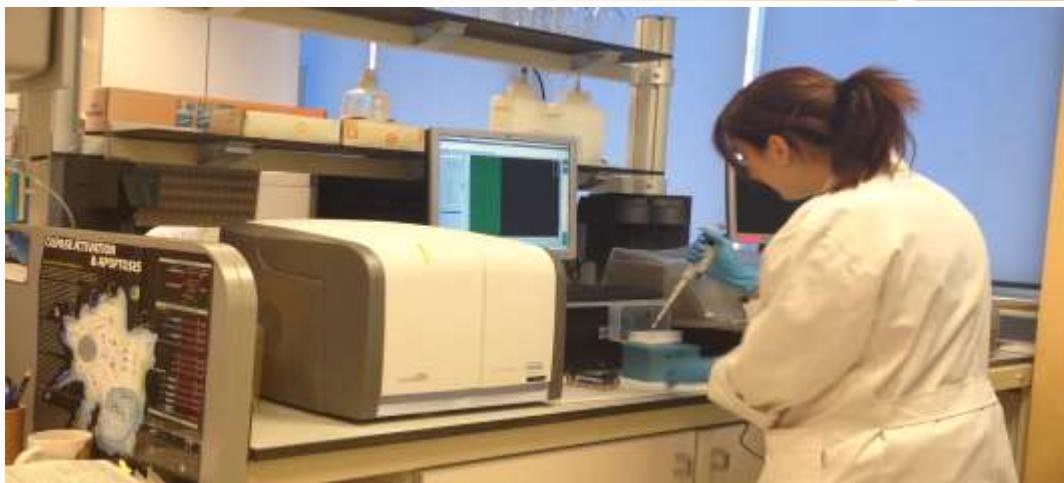
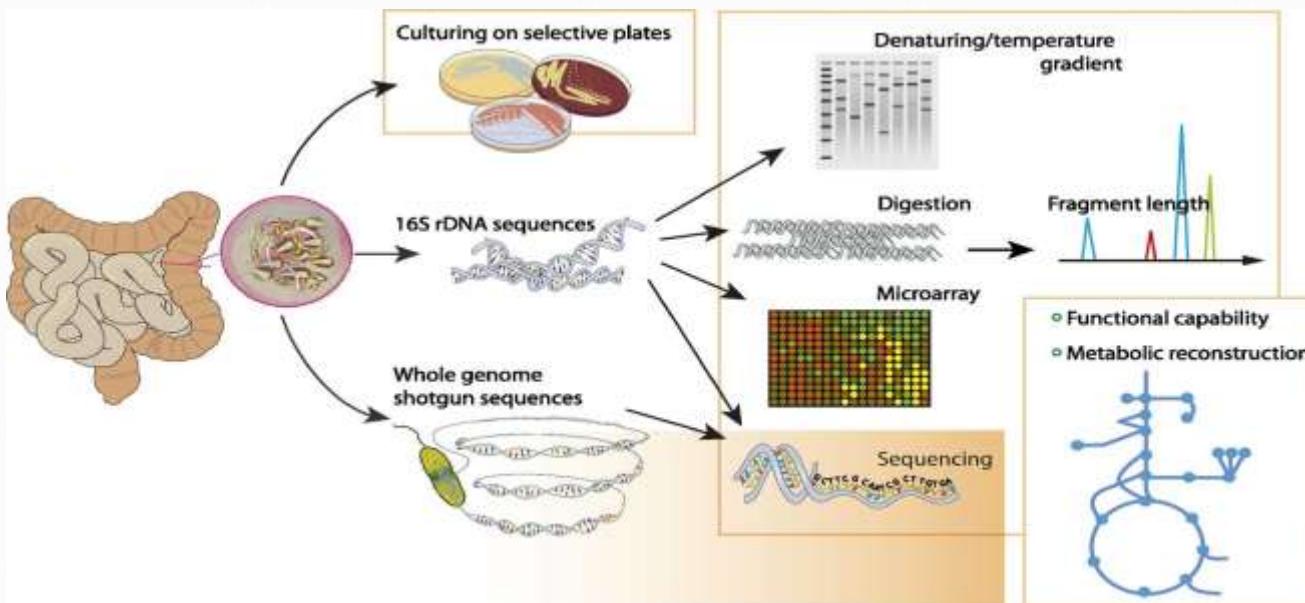
Clemente et al. Sci. Adv. 2015;1:e1500183



PAPEL HOLISTICO DE LA MICROBIOTA



METODOS DE DETERMINACION DE LA MICROBIOTA



¿ Que le ocurre al modelo animal que no tiene gérmenes en su intestino?

↓ Expresión de proteínas intestinales

relacionadas con la saciedad
PLoS One 2012; 7: e39748



↑ Incrementan consumo energía y soluciones dulces.
Br J Nutr 2012; 107: 621–30.

↓ Son más delgados que los controles a pesar de consumir más calorías

Proc Natl Acad Sci USA 2004

↑ Incrementan resistencia a padecer enfermedades metabólicas

con consumo dietas grasas

Proc Natl Acad Sci USA 2007

Tienen respuestas exageradas al estrés y alteraciones de la conducta
J Physiol 2017



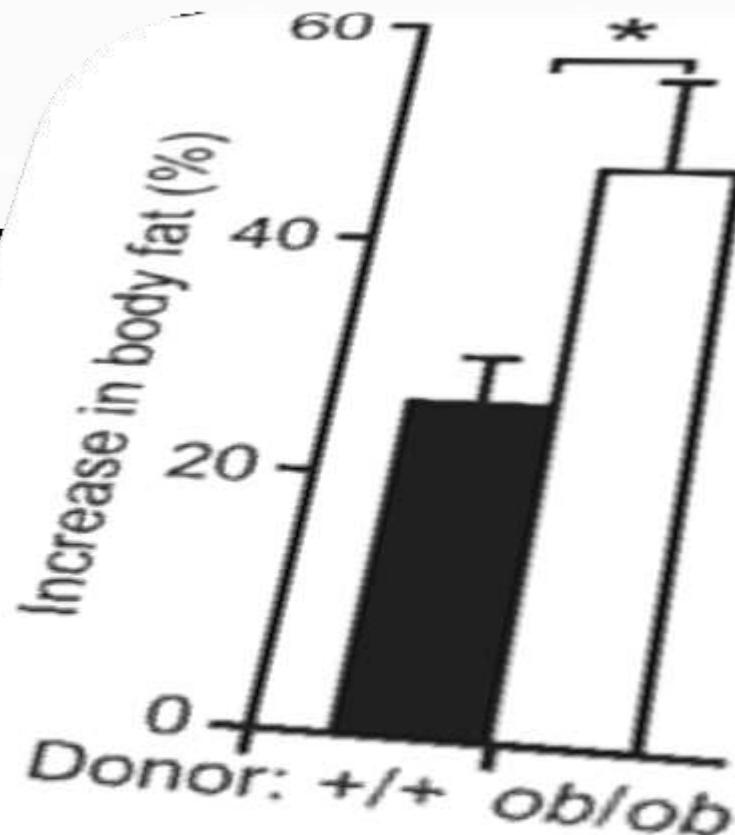
Microbiota y enfermedades metabolicas





MICROBIOTA OBESIDAD





Turnbaugh, PJ et al. Nature. 2006; 444: 736-739.



Gut Microbiota from Twins Discordant for Obesity Modulate Metabolism in Mice

Vanessa K. Ridaura *et al.*

Science 341, (2013);

DOI: 10.1126/science.1241214

delgado



Ln

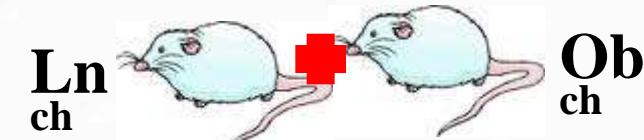


Ob



Gut Microbiota from Twins Discordant for Obesity Modulate Metabolism in Mice

Vanessa K. Ridaura *et al.*
Science **341**, (2013);
DOI: 10.1126/science.1241214

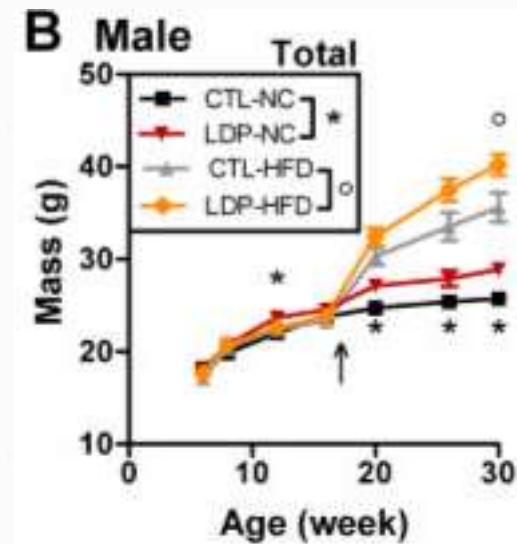
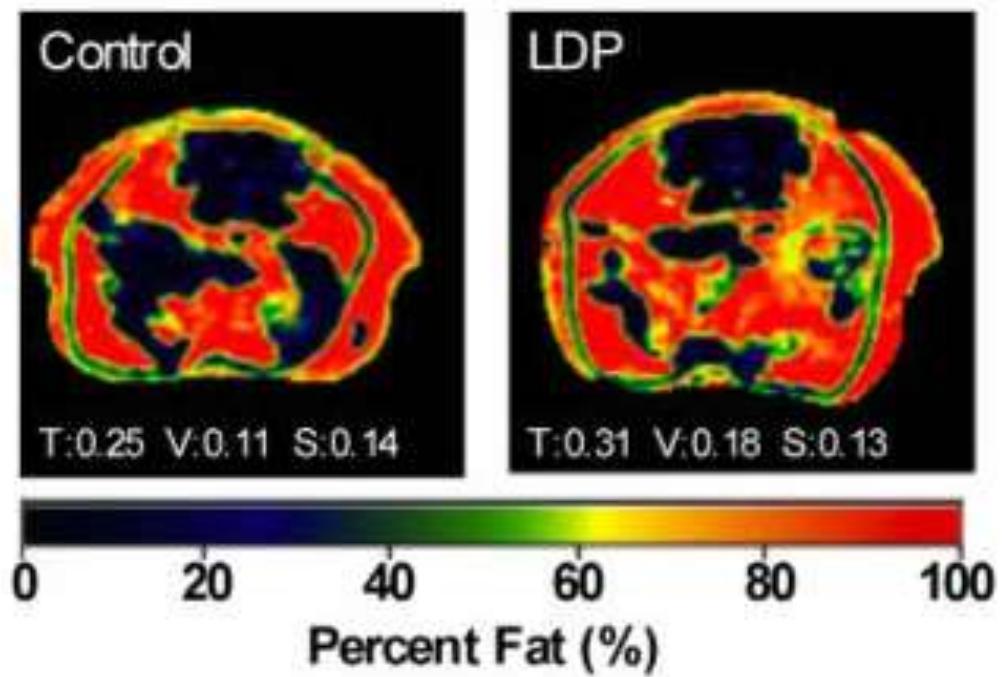


Ob^{ch} : Menor aumento de la adiposidad que el Ob
(similar a Ln o Ln^{ch})

Conclusión: Las interacciones modificables y transmisibles entre la dieta y la microbiota influyen en la biología del hospedador.



Tratamiento antibiotico tras el nacimiento en modelos animales



Cell. 2014 August 14; 158(4): 705–721.



FUNCIONES DIGESTIVAS DE LA MICROBIOTA

| Region | pH | Function | Bacteria | Density (cells/g) | Oxygen / antimicrobial substances |
|----------|-----|---|---|-------------------|-----------------------------------|
| Duodenum | 5-7 | Digestion of proteins, monosaccharides, SCFAs; Immunomodulation | Lactobacillaceae, Enterobacteriaceae | 10^3-10^4 | |
| Jejunum | 7-9 | Absorption of FFAs, Calcium, Vitamin A, D, E, K | Lactobacillaceae, Enterobacteriaceae | 10^4-10^5 | |
| Ileum | 7-8 | Absorption of vitamin B12, bile acids | Lactobacillaceae, Enterobacteriaceae | 10^8 | |
| Colon | 5-7 | Absorption of water, SCFAs | Bacteroidaceae, Prevotellaceae, Rikenellaceae, Lachnospiraceae, Ruminococcaceae | 10^{11} | |



Fermentación sustancias indigeribles

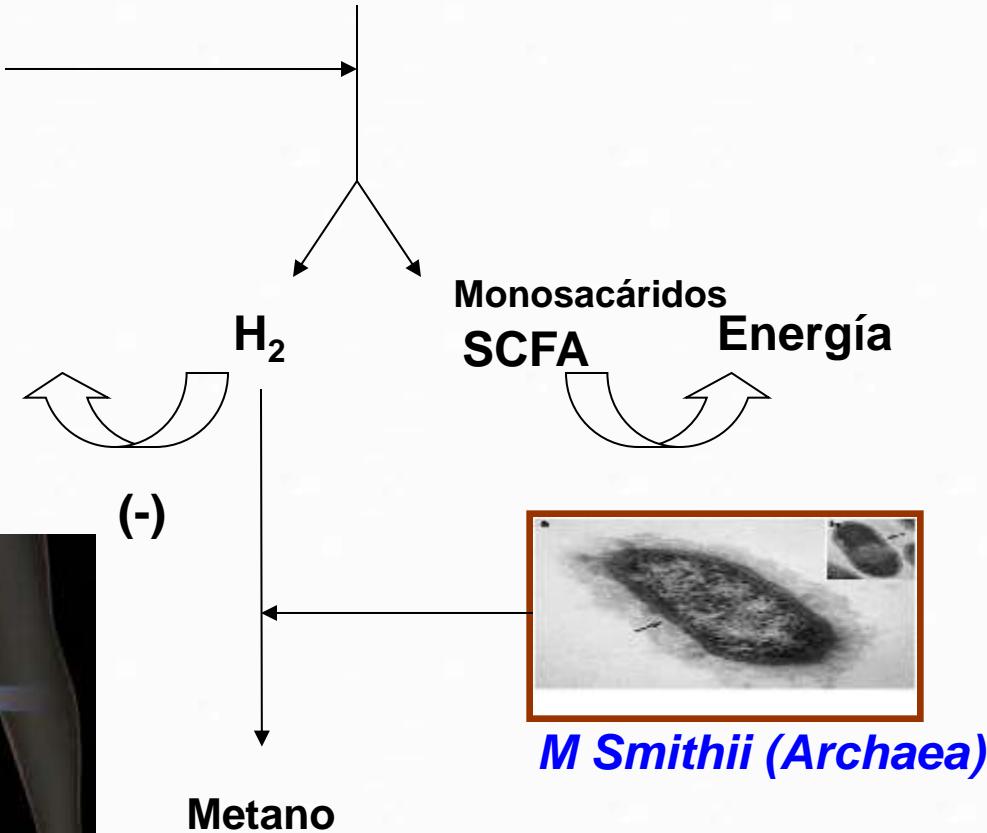


*Firmicutes
intestinales*



Polisacáridos

indigeribles



REGULACION BALANCE ENERGETICO

20
KILOCALORIAS
MAS AL DIA

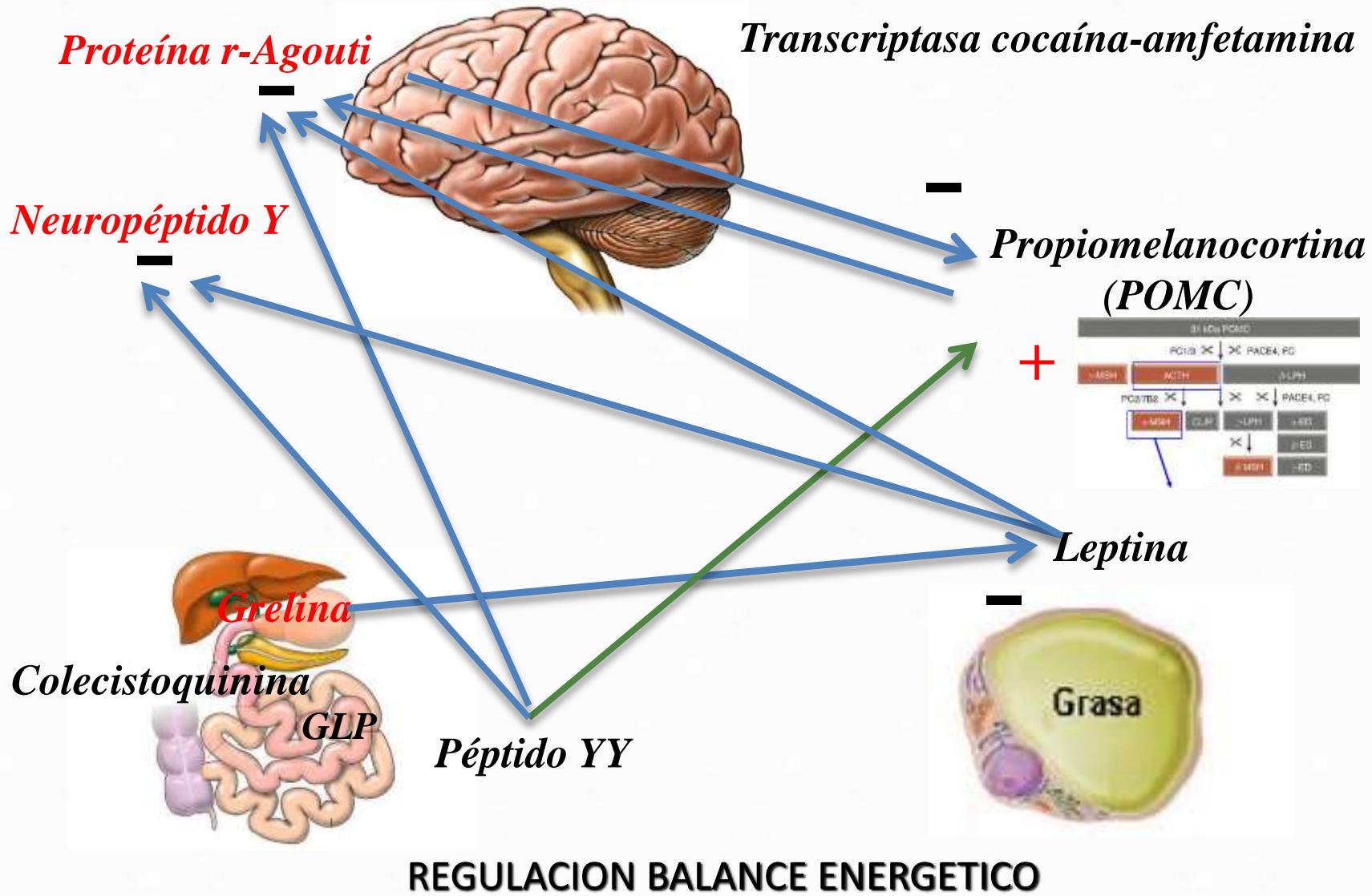


20 KILOS
MAS



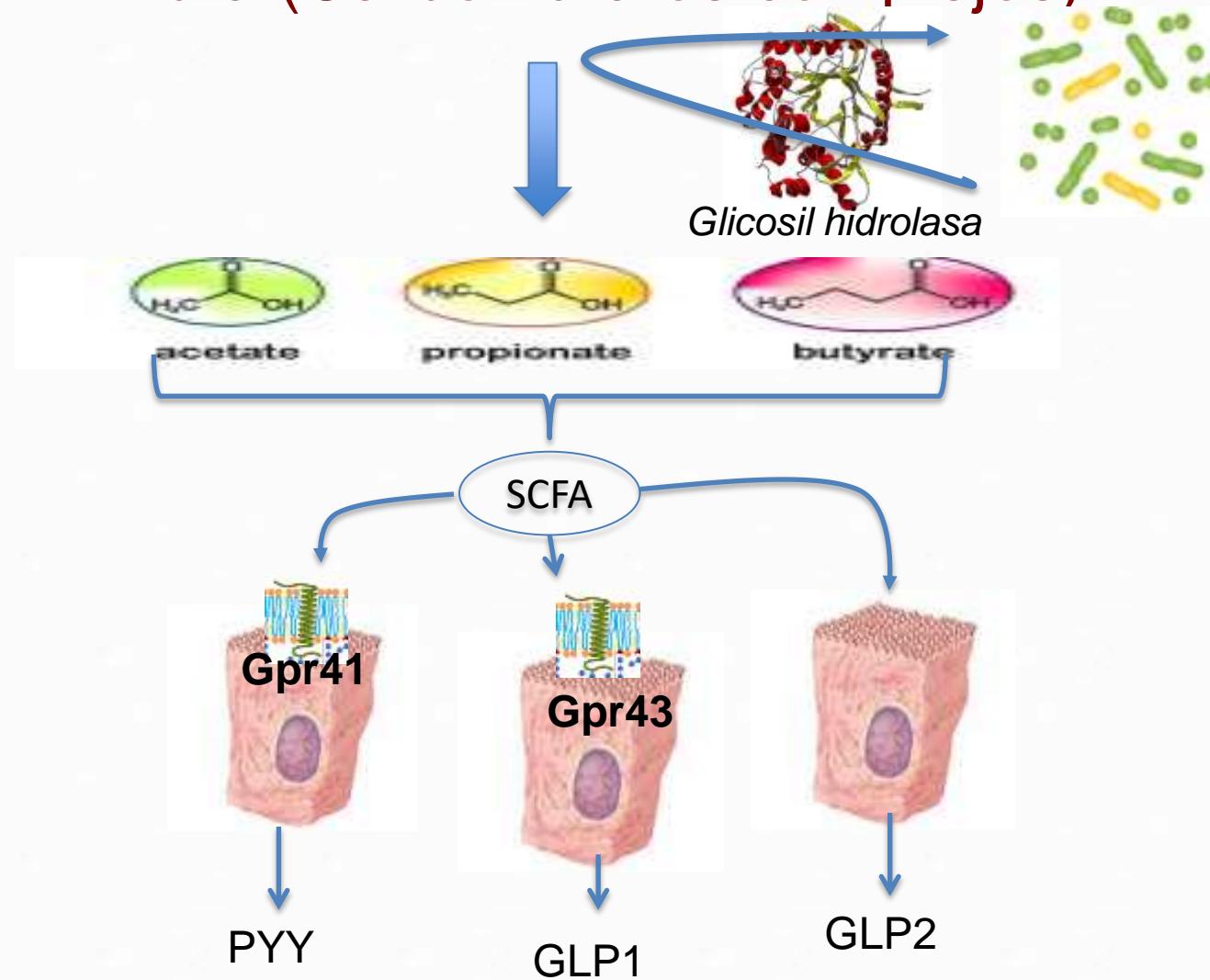
Modificación de la secreción de incretinas



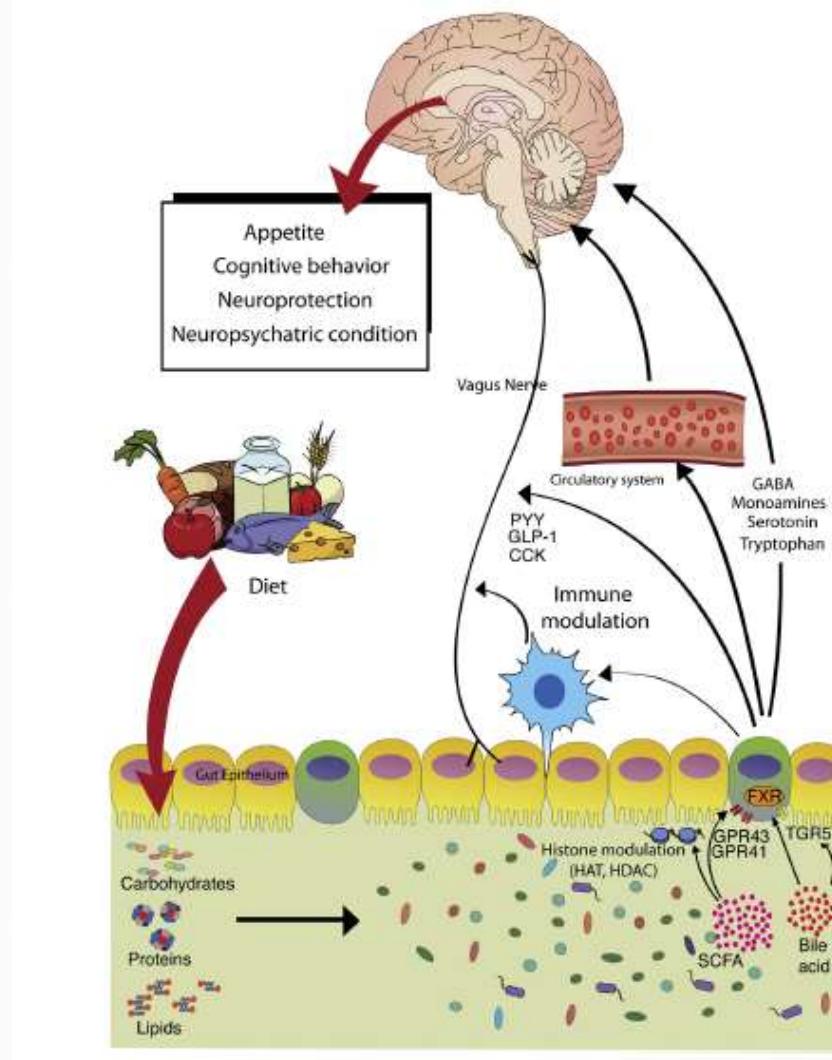


INCRETINAS

Fibra (Carbohidratos complejos)



Algo mas que señales anorexigénicas





DIABETES MICROBIOTA



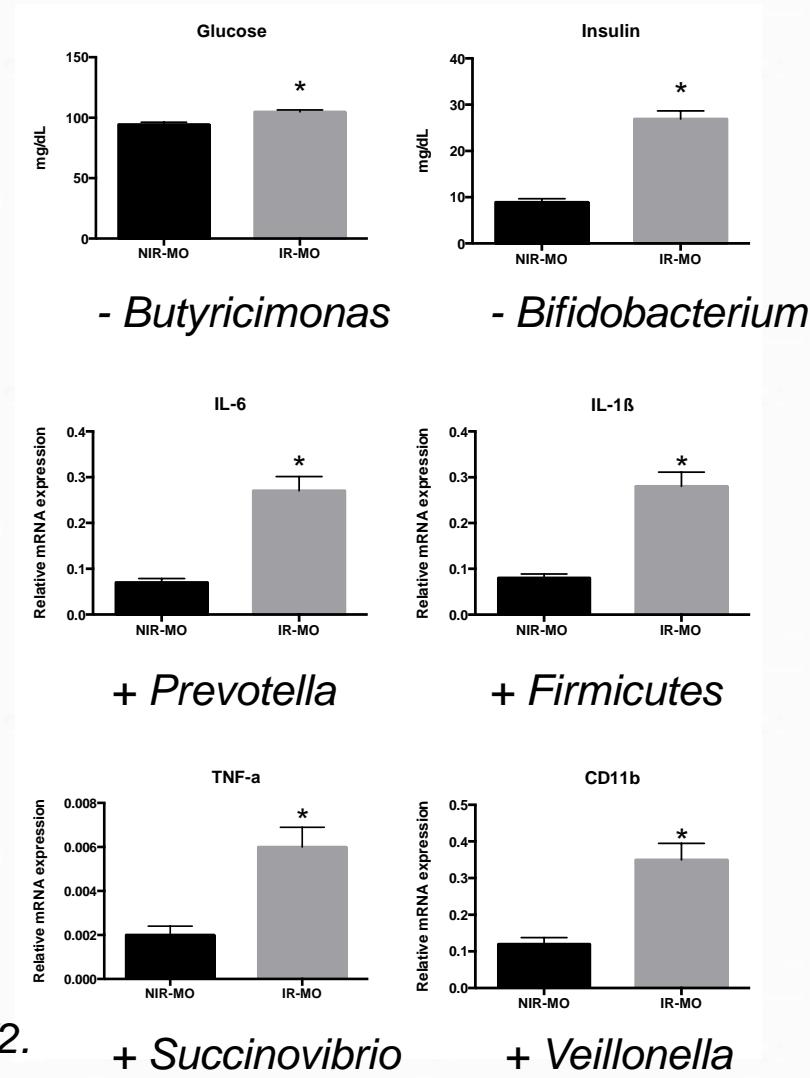
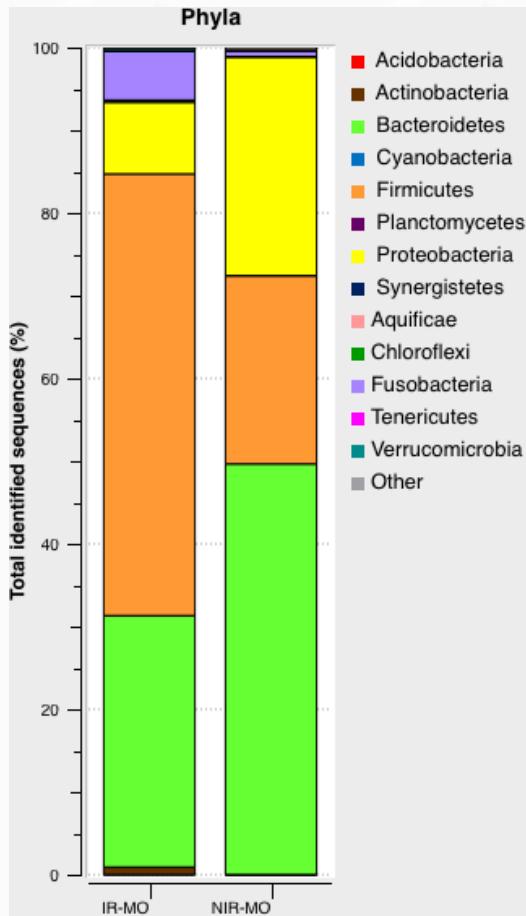
Hallazgos mayores en el análisis del metagenoma en diabetes tipo 2

- Descenso de bacterias productoras de butirato como *Roseburia intestinalis* and *Faecalibacterium prausnitzii*
- *Lactobacillus gasseri* and *Streptococcus mutans* y ciertos Clostridiales mas elevados en T2D
- Proteobacteria más alta en T2D
- Incremento de expresión de genes de la microbiota envueltos en estrés oxidativo e inflamación

Tilg H et al. Gut. 2014 Sep;63(9):1513-21



La microbiota está relacionada con la insulino-resistencia



Moreno-Indias et al. 2016. Am J Transl Res 8:5672.



Mecanismos microbiota diabetes



Microbiota/Diabetes

PRODUCCION DE BUTIRATO

Permeabilidad intestinal

Incretinas

ENDOTOXEMIA

ACIDOS BILIARES



Microbiota/Diabetes

**PRODUCCION DE BUTIRATO
Permeabilidad intestinal
Incretinas**

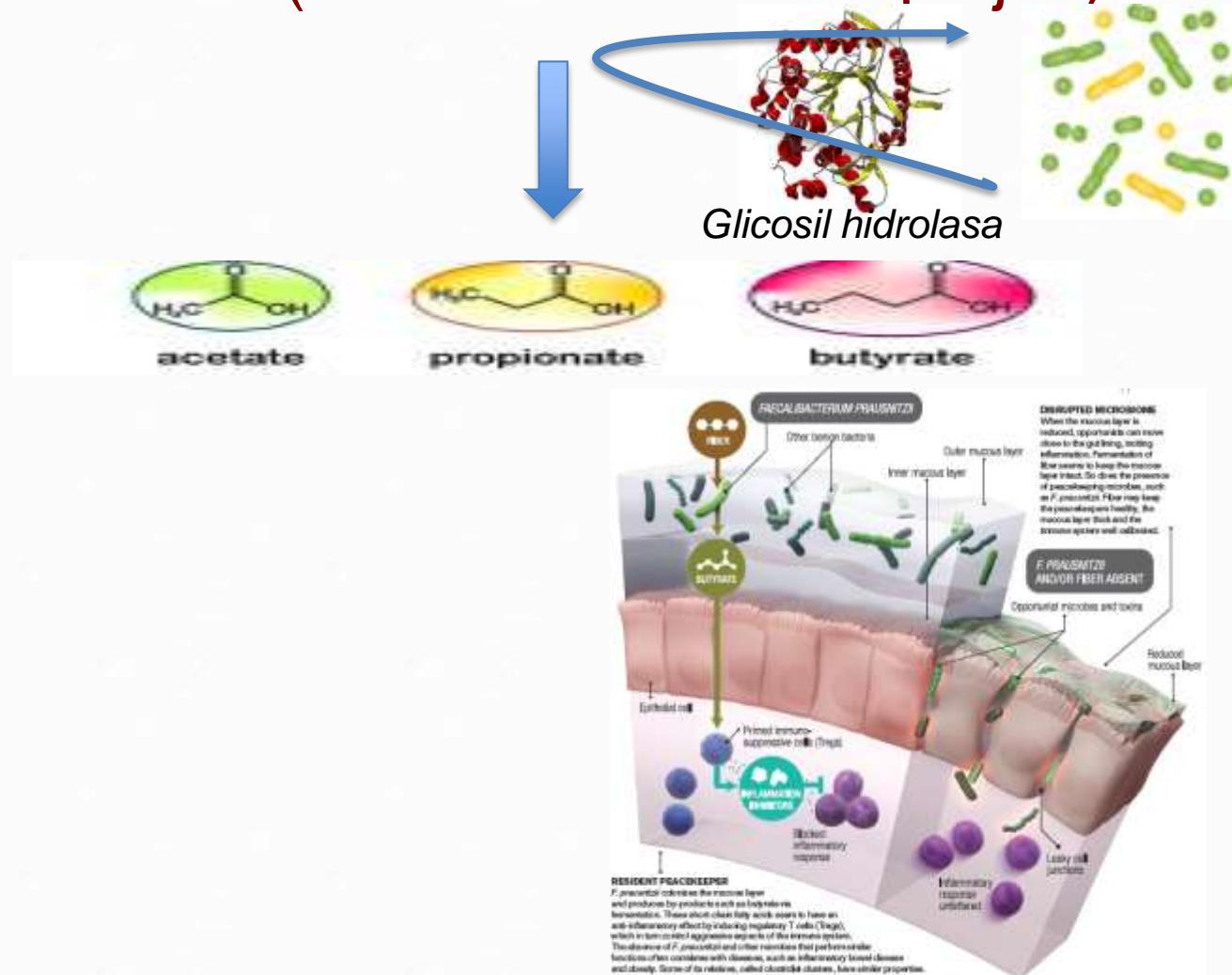
ENDOTOXEMIA

ACIDOS BILIARES



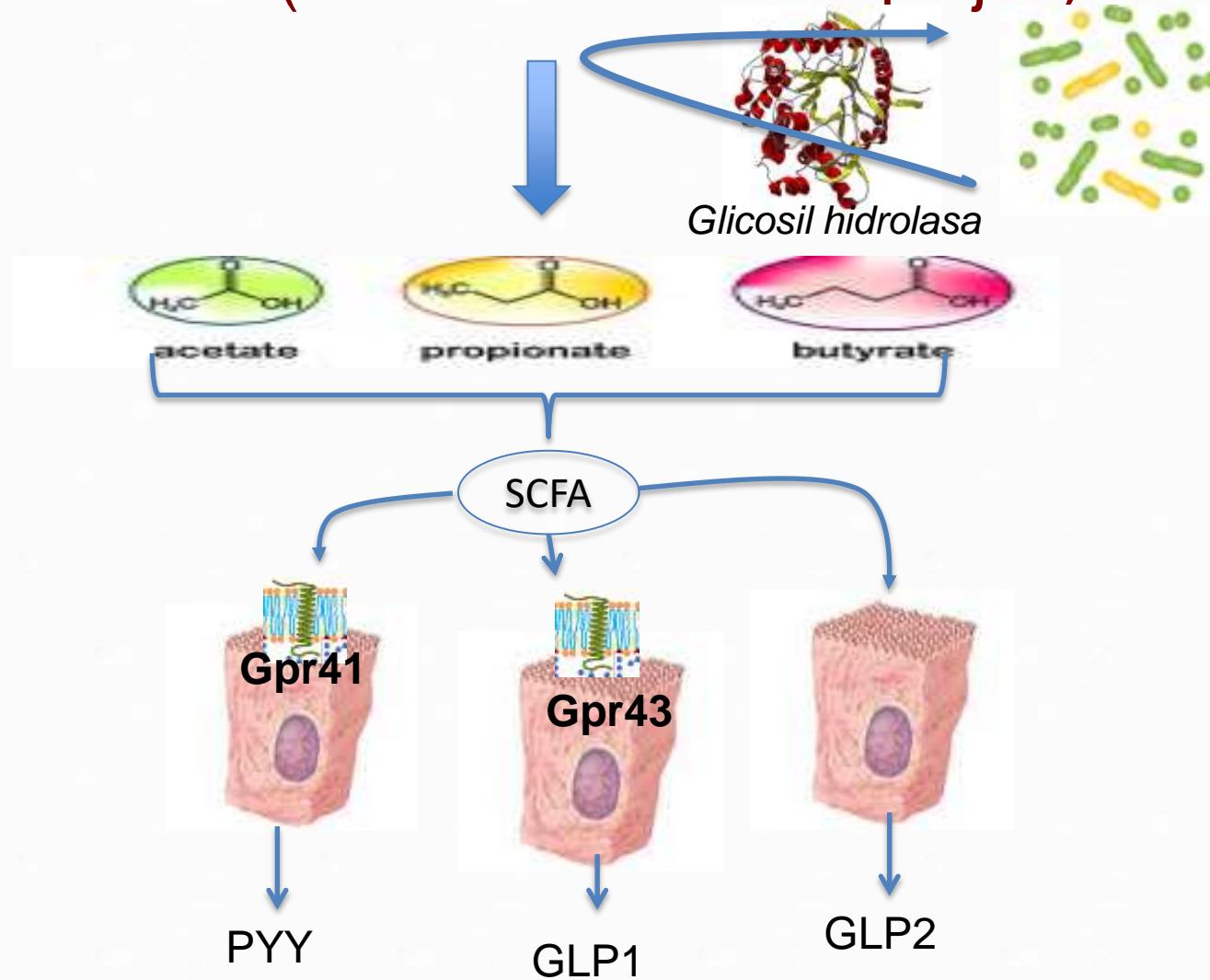
PERMEABILIDAD

Fibra (Carbohidratos complejos)



INCRETINAS

Fibra (Carbohidratos complejos)



Microbiota/Diabetes

PRODUCCION DE BUTIRATO

Permeabilidad intestinal

Incretinas

ENDOTOXEMIA

ACIDOS BILIARES

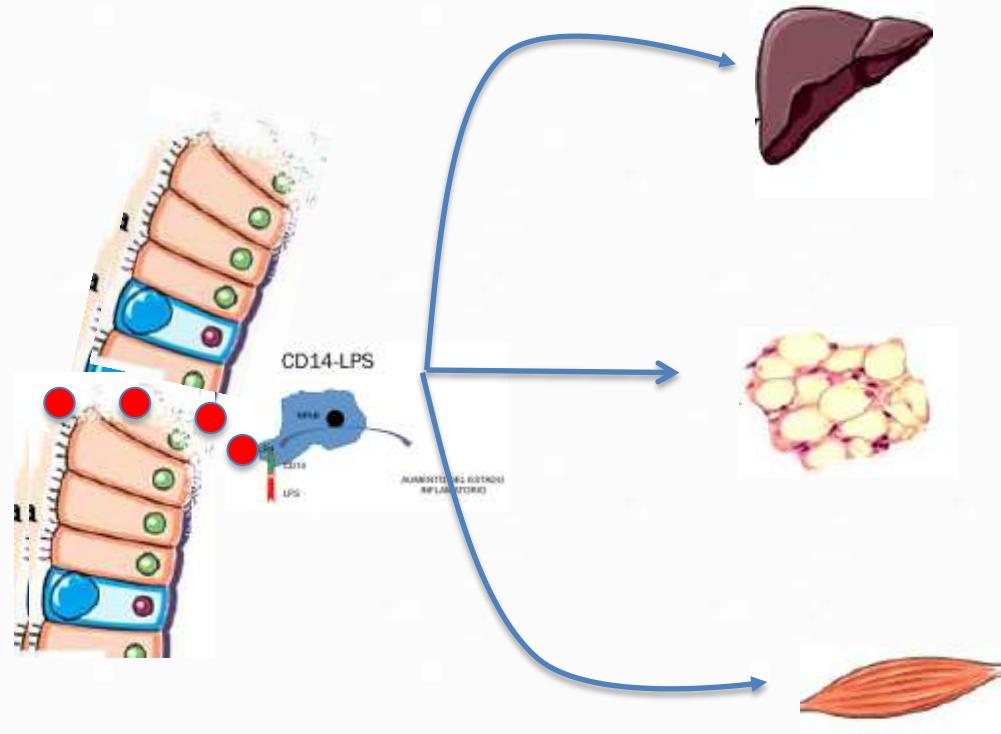


ENDOTOXEMIA

- ⬇ Roseburia
- ⬇ Bifidobacterias
- ⬆ GRAM negativas



LPS

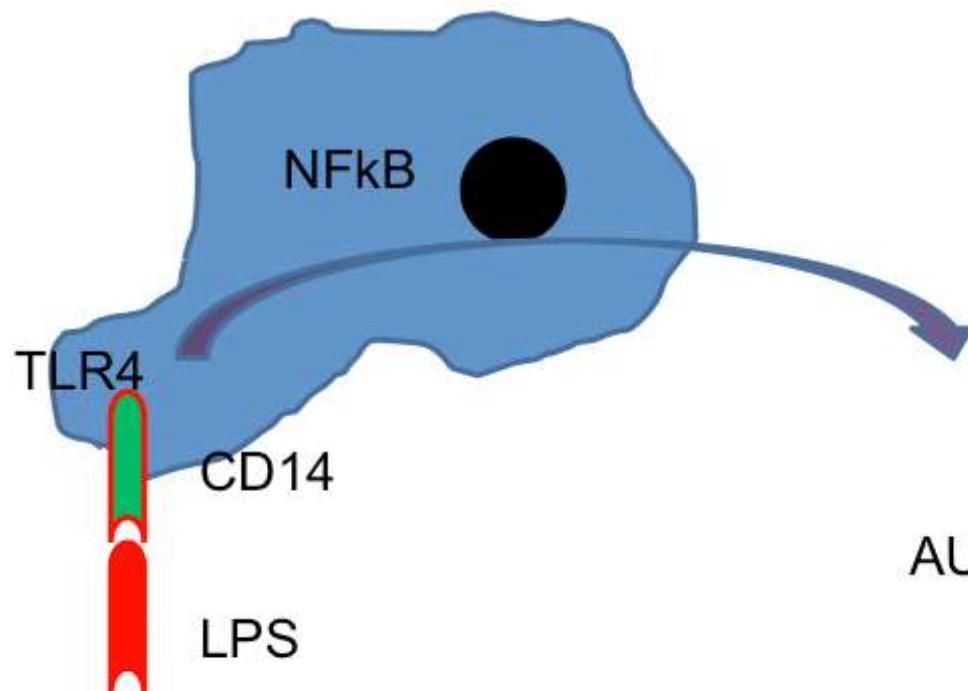


Inflamación
Resistencia a
insulina



ENDOTOXEMIA

CD14-LPS

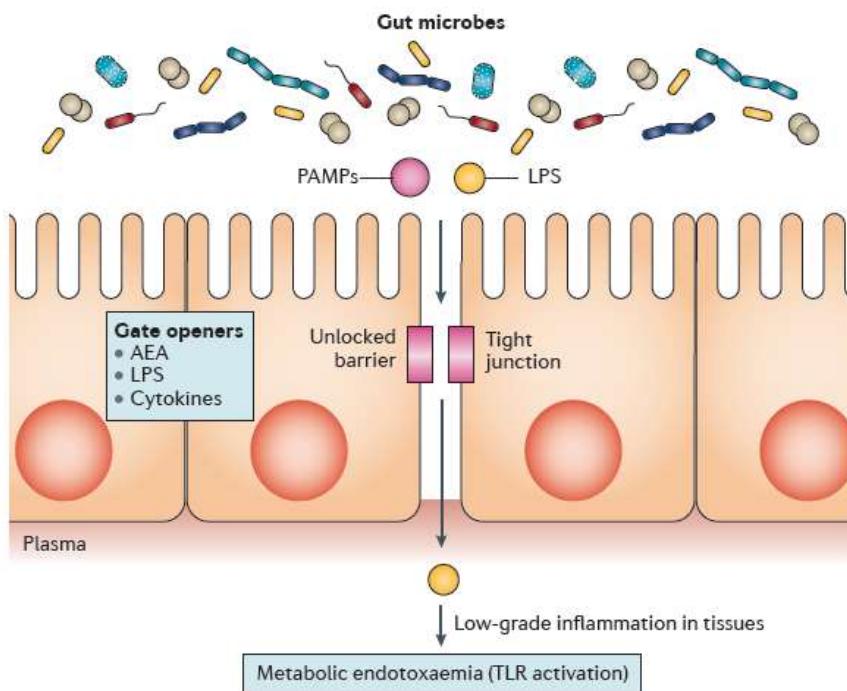


AUMENTO DEL ESTADO
INFLAMATORIO

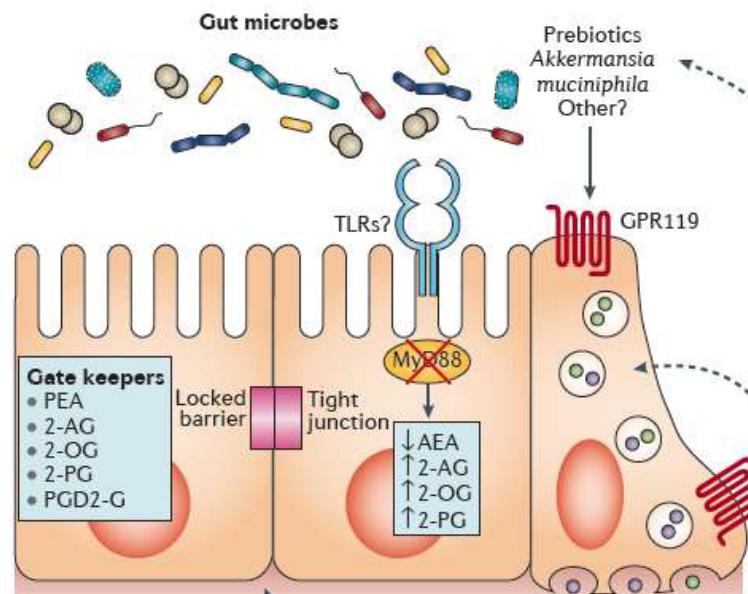


Los que abren y los que cierran

ABREN



CIERRAN



Cani P. Nature Reviews Endocrinology. 2016



Microbiota/Diabetes

PRODUCCION DE BUTIRATO
Permeabilidad intestinal
Incretinas

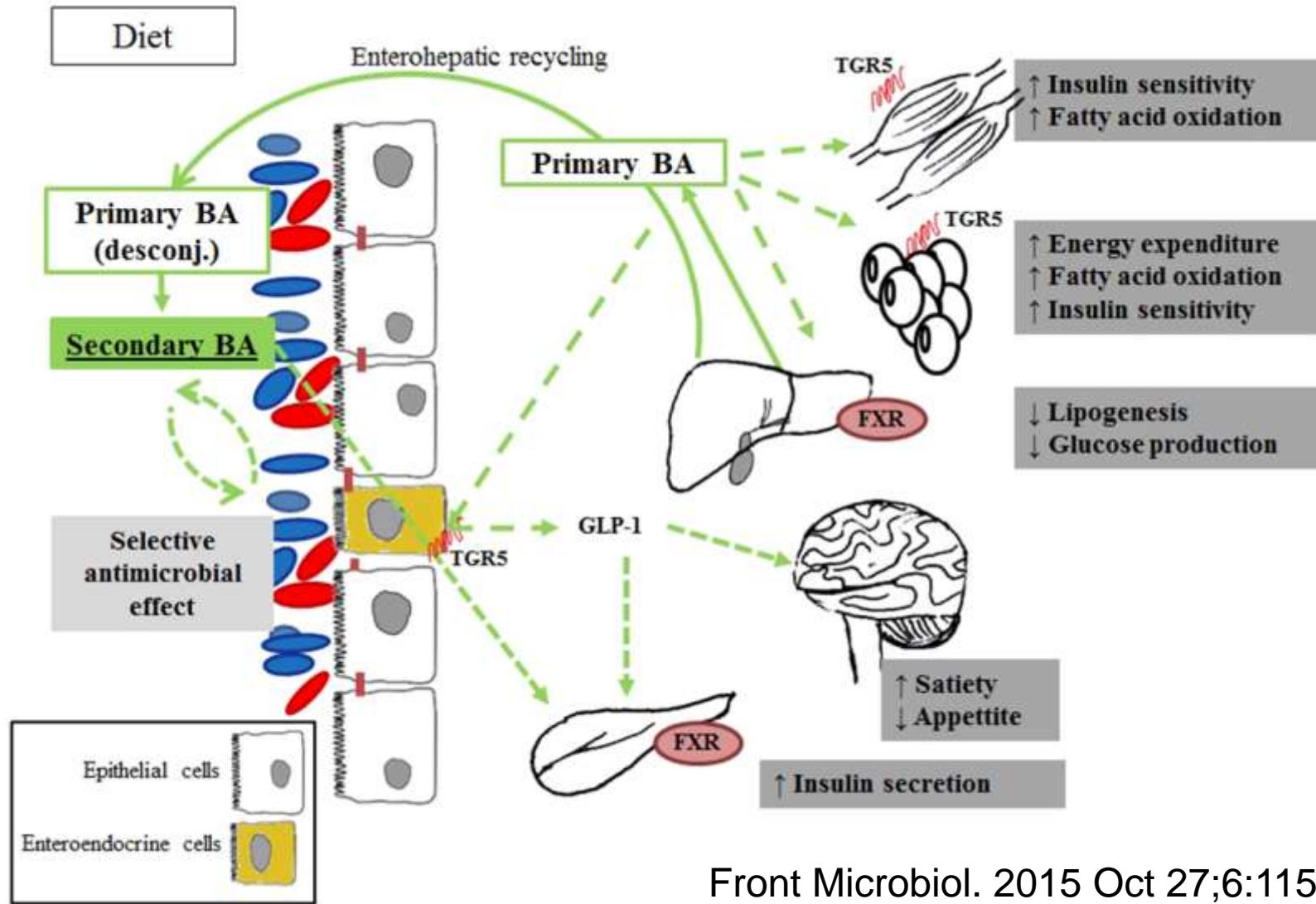
ENDOTOXEMIA

ACIDOS BILIARES

TEJIDO ADIPOSO MARRON



ACIDOS BILIARES



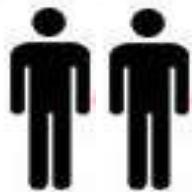
Front Microbiol. 2015 Oct 27;6:1151.



Modificando la microbiota con dieta y probioticos



STUDY DESIGN



10 volunteers with cardiovascular risk factors



Crossover, randomized, controlled

Washout

**1st Intervention
20 days
272 ml RED WINE**



**2nd Intervention
20 days
272 ml RED WINE**



**3rd Intervention
20 days
272 ml RED WINE**



**1st Intervention
20 days
272 ml DEALCOHOLIZED
RED WINE
(Polyphenol Control)**



**2nd Intervention
20 days
272 ml DEALCOHOLIZED
RED WINE
(Polyphenol Control)**



**3rd Intervention
20 days
272 ml DEALCOHOLIZED
RED WINE
(Polyphenol Control)**



**1st Intervention
20 days
100 ml GIN
(Alcohol Control)**



**2nd Intervention
20 days
100 ml GIN
(Alcohol Control)**



**3rd Intervention
20 days
100 ml GIN
(Alcohol Control)**



HECES

HECES

HECES

HECES

EFFECTS OF MODERATE WINE CONSUMPTION IN SUBJECTS WITH CARDIOVASCULAR RISK ON THE MICROBIAL COMPOSITION IN FECES

RESULTS



Firmicutes (

Bacteroidetes

Fusobacteri

Enterococc

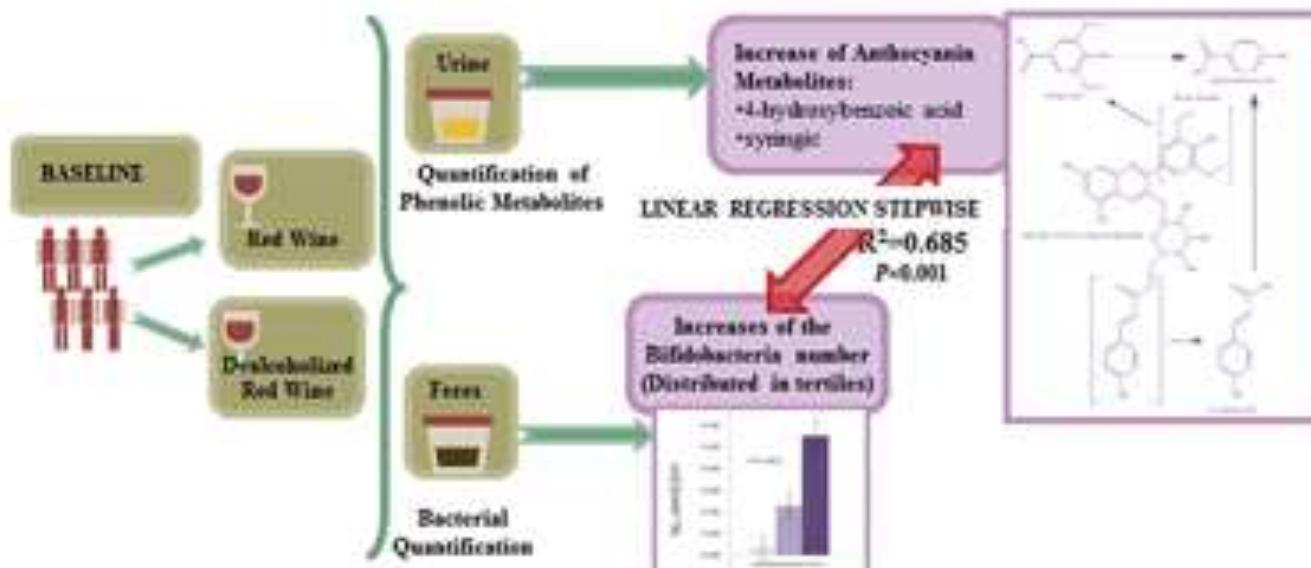
Bacteroides

Prevotella s

Clostridium

Bifidobacterium spp

Lactobacillus spp

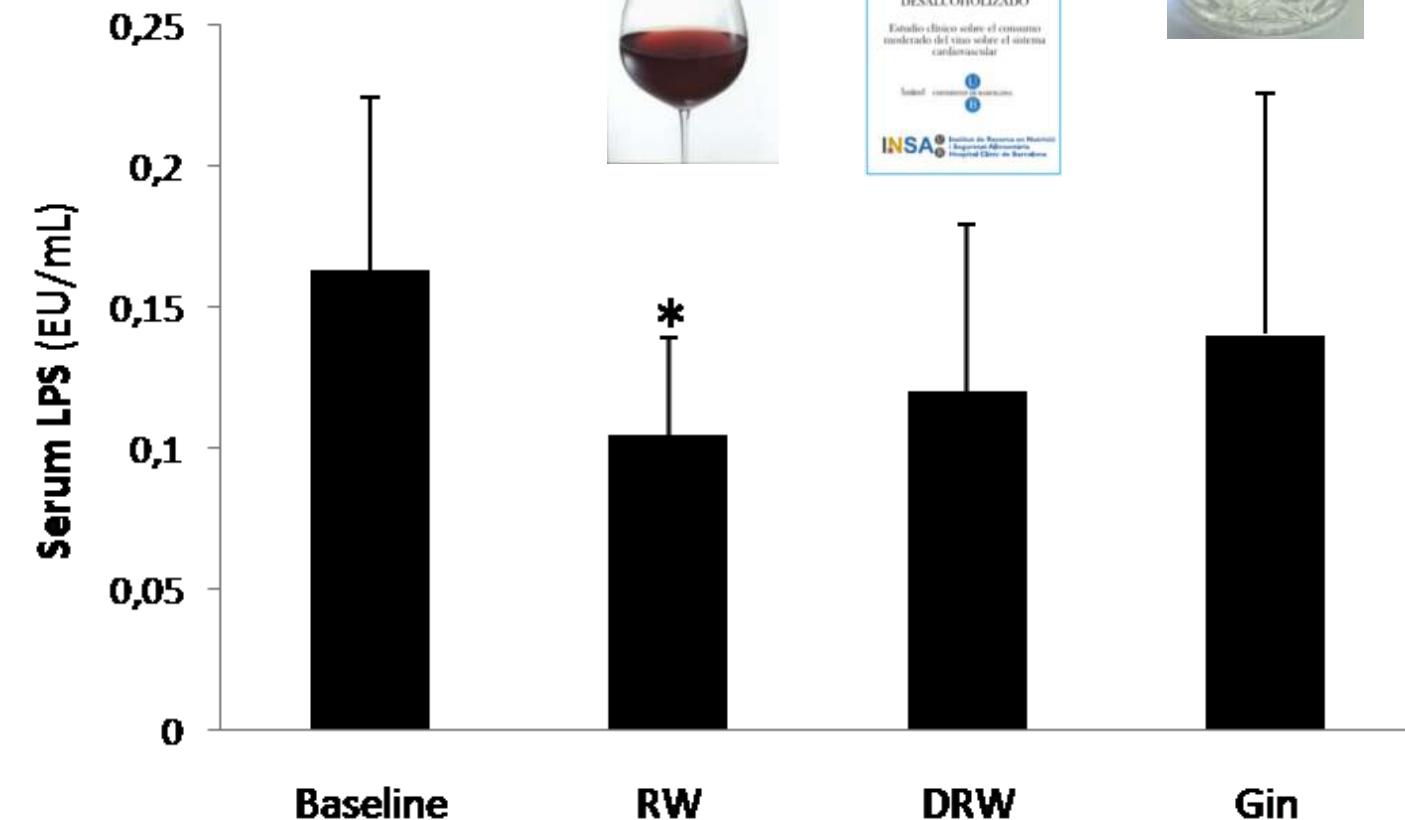


T

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Boto M et al Food Funct. 2014 Aug;5(8):1932-8.

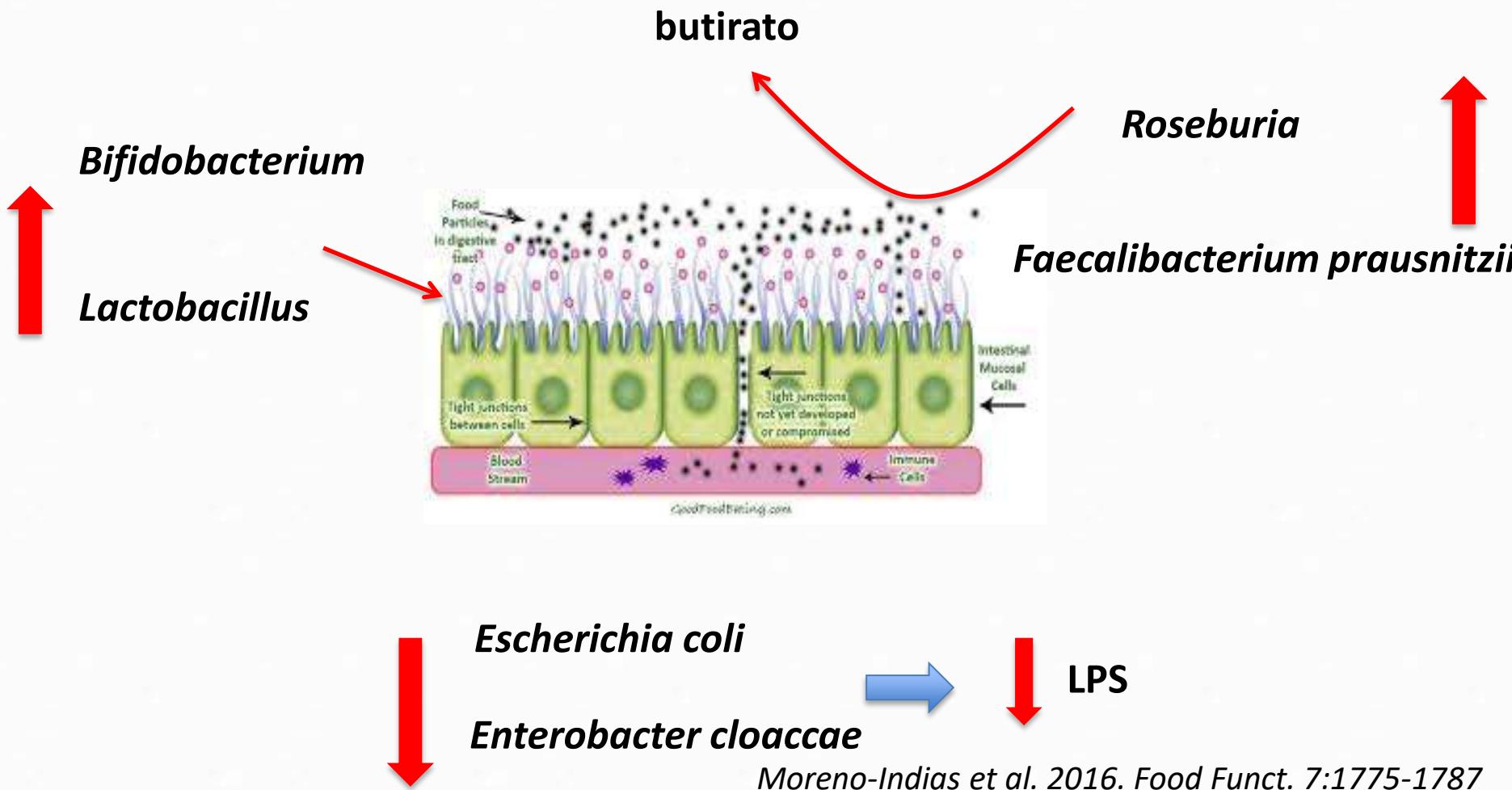
Vino y LPS



Clemente M et al. Am J Clin Nutr 2013

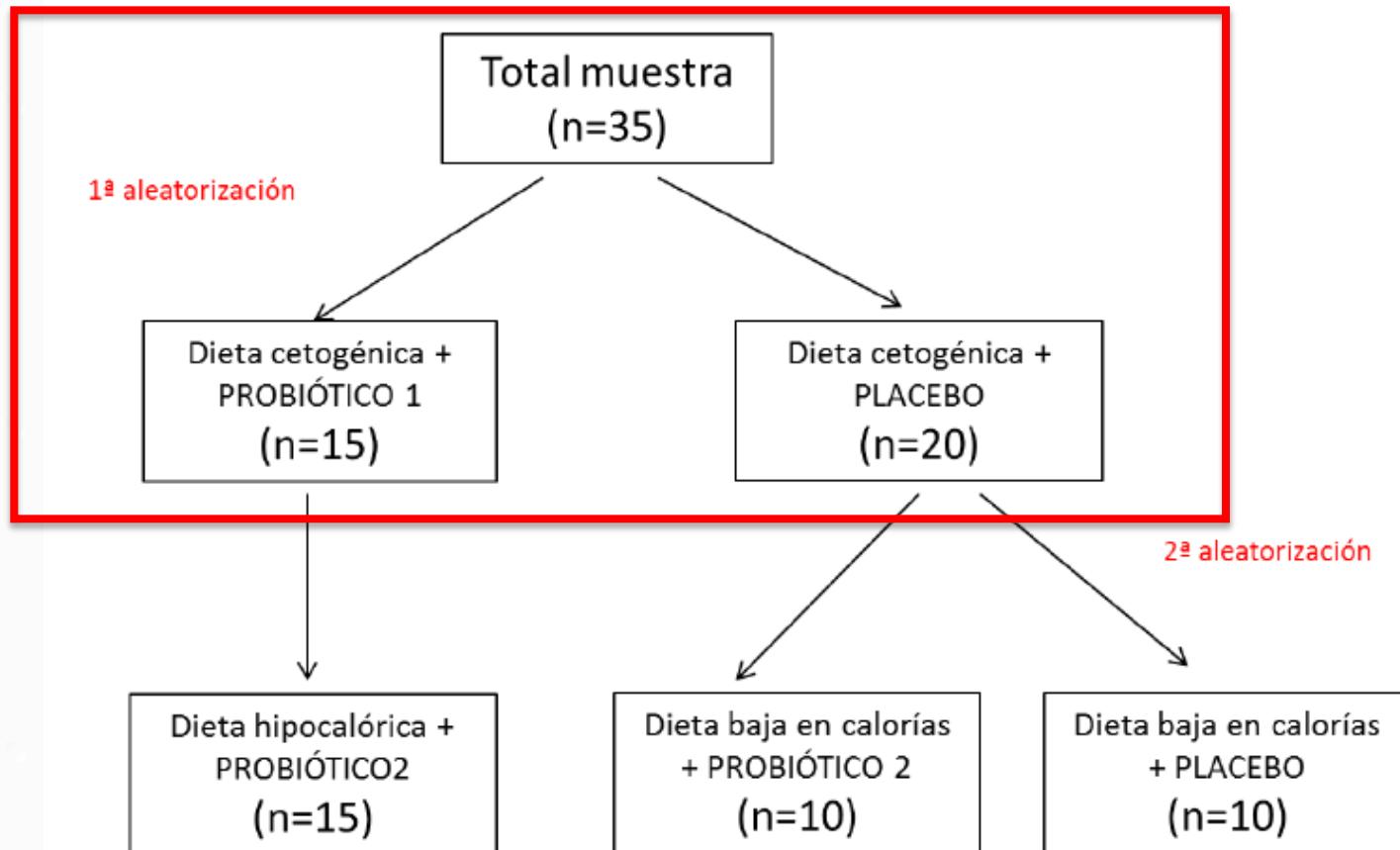


El componente prebiótico del vino tinto mejora el síndrome metabólico a través de la microbiota intestinal



Estudio MICROBIOTA

Estudio sobre los efectos de la dieta cetogénica baja en grasas en la microflora intestinal y su restitución mediante el uso de probióticos en pacientes obesos en tratamiento de pérdida de peso con Método PnK®



47

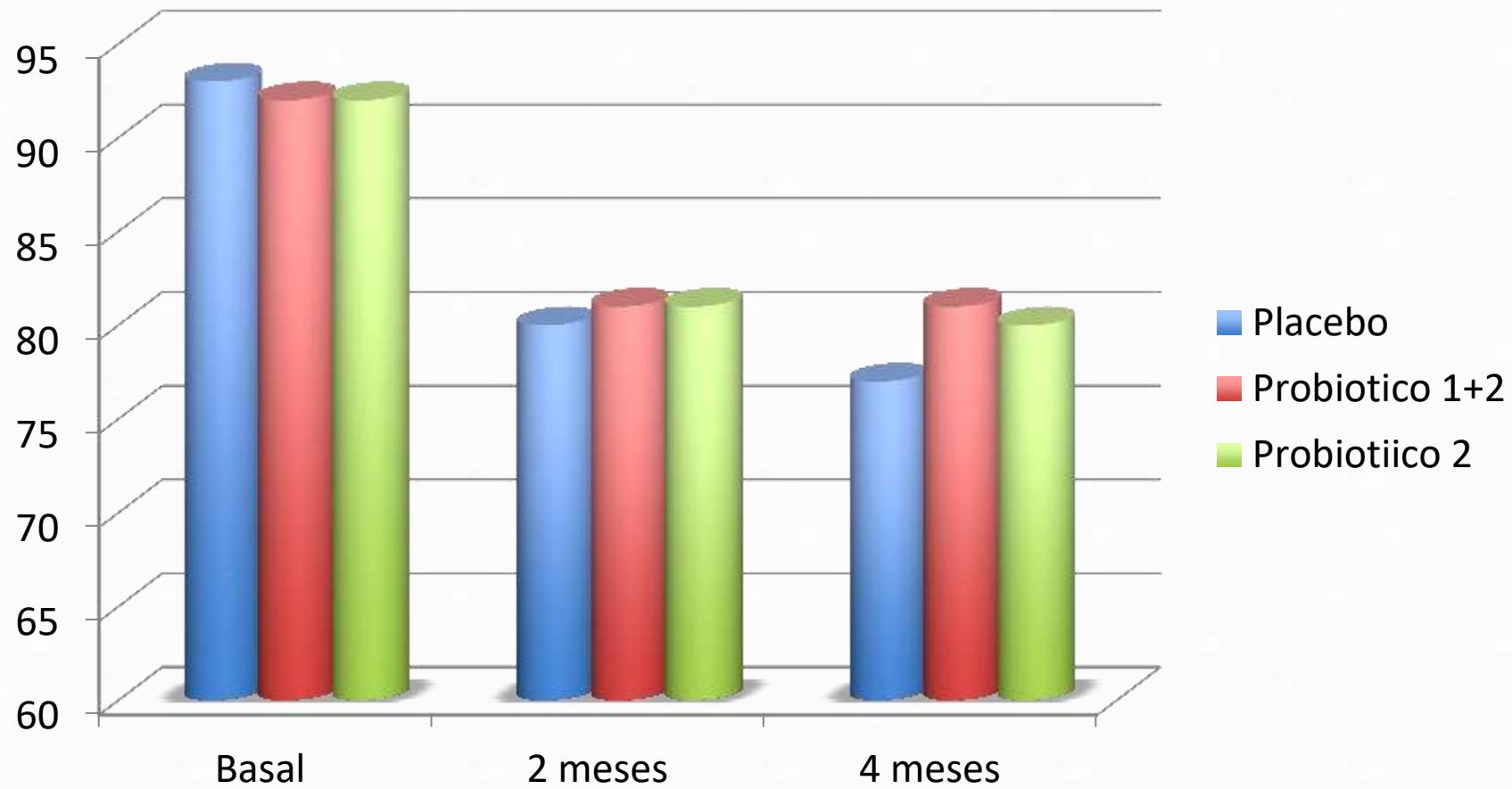
Probioticos

- Probiotico 1: Bifidobacterium Longum ES1
(Actinobacterias) y fibra prebiótica.
- Probiotico 2: Bifidobacterium animalis Subsp Lactis (Firmicutes) y Fibra prebiótica
(maltodextrina)



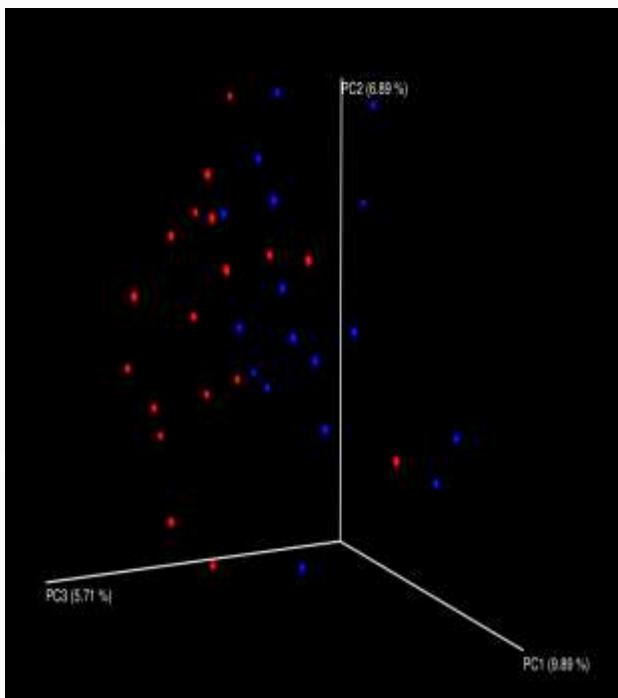
48

Efecto sobre el peso

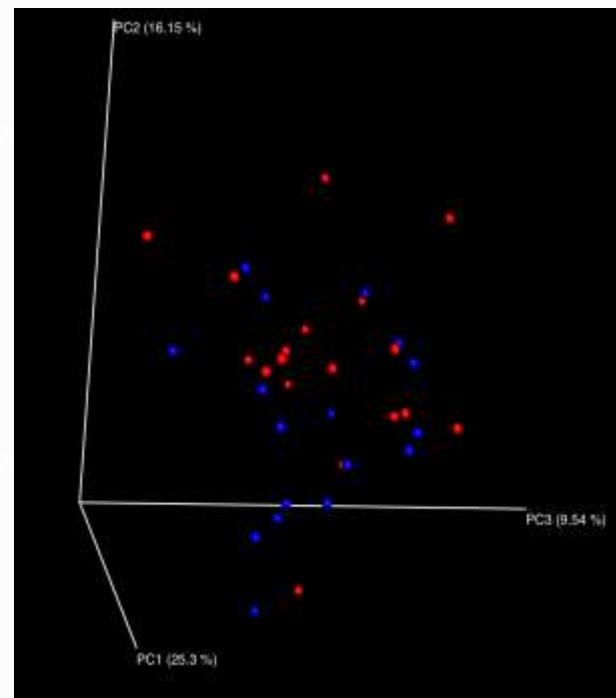


La dieta cetogénica cambia la microbiota intestinal

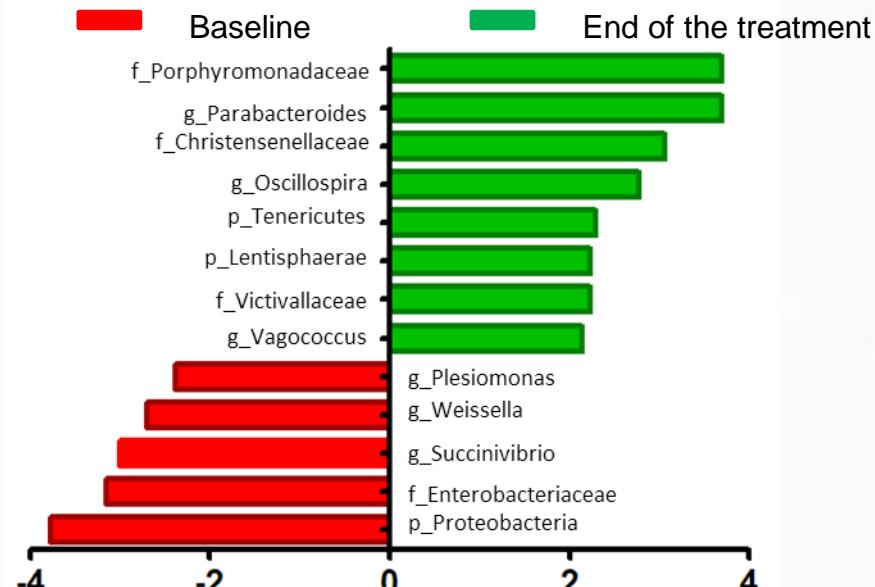
DIETA



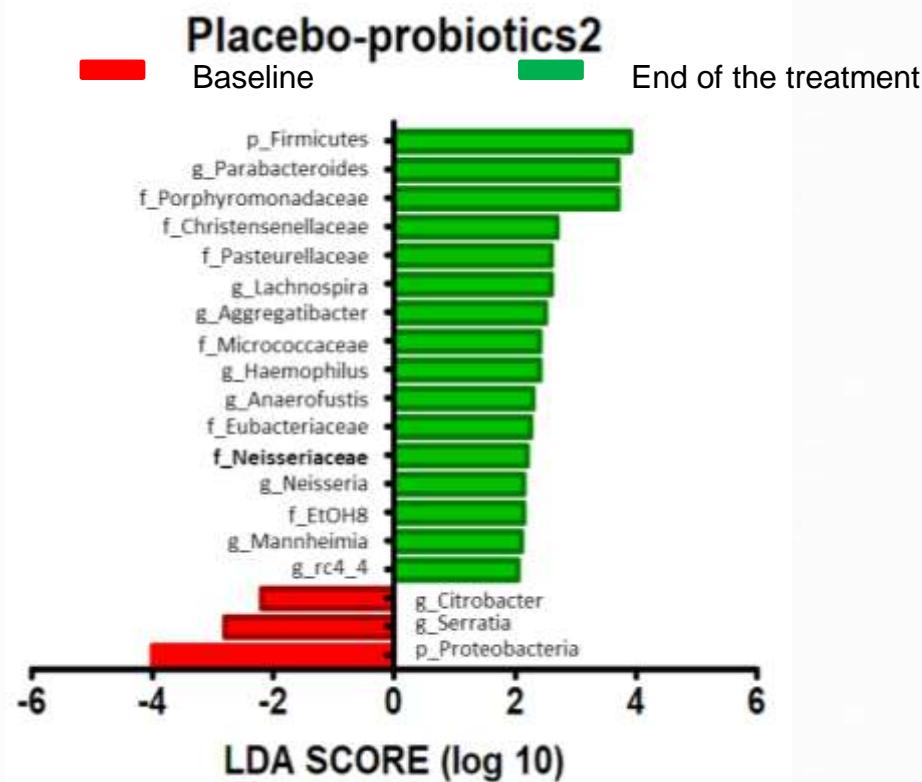
PROBIOTICO



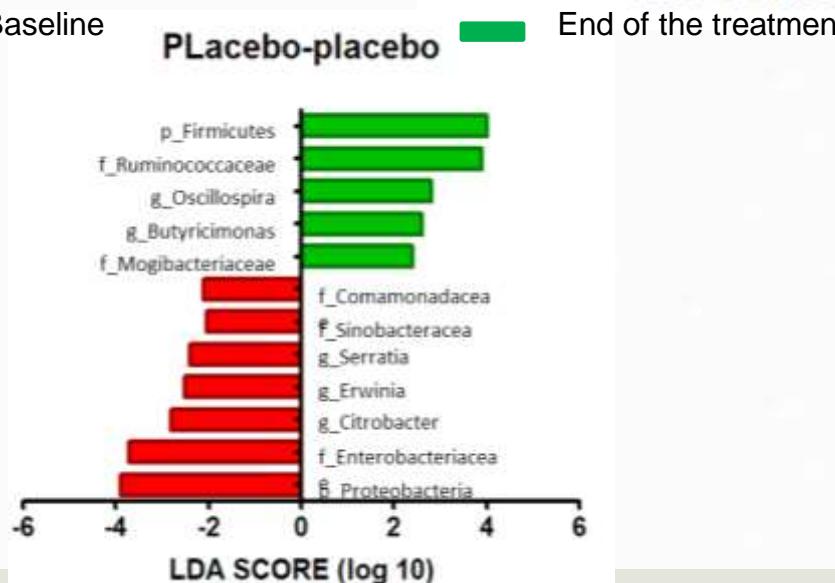
Probiotics1-Probiotics2



Placebo-probiotics2



PLacebo-placebo



Hay cambios específicos de cada intervención

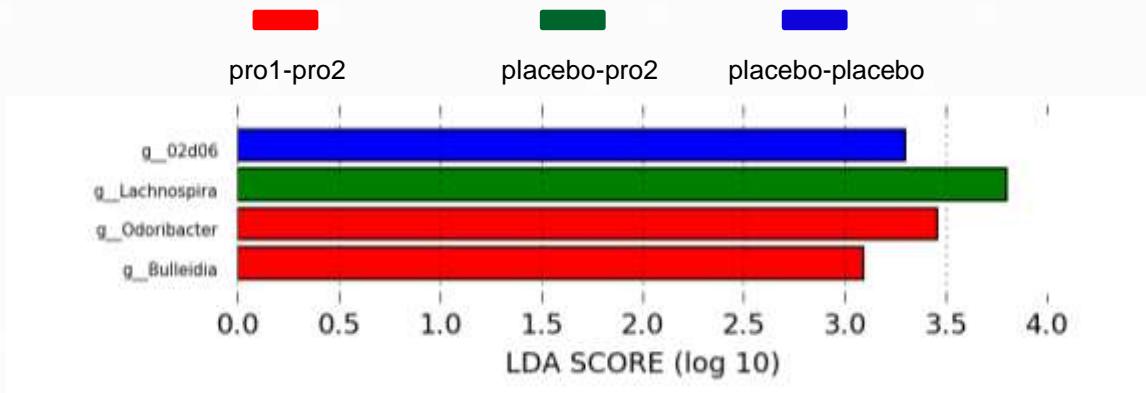


Figure 1: Histogram of the linear discriminant analysis (LDA) scores for differentially abundant bacterial groups in fecal samples between the three treatments. Red bars represent bacterial groups over-abundant in the pro1-pro2. Green bar represents the bacterial group over-abundant in the placebo-pro2. Blue bar represents the bacterial group over-abundant in placebo-placebo group.

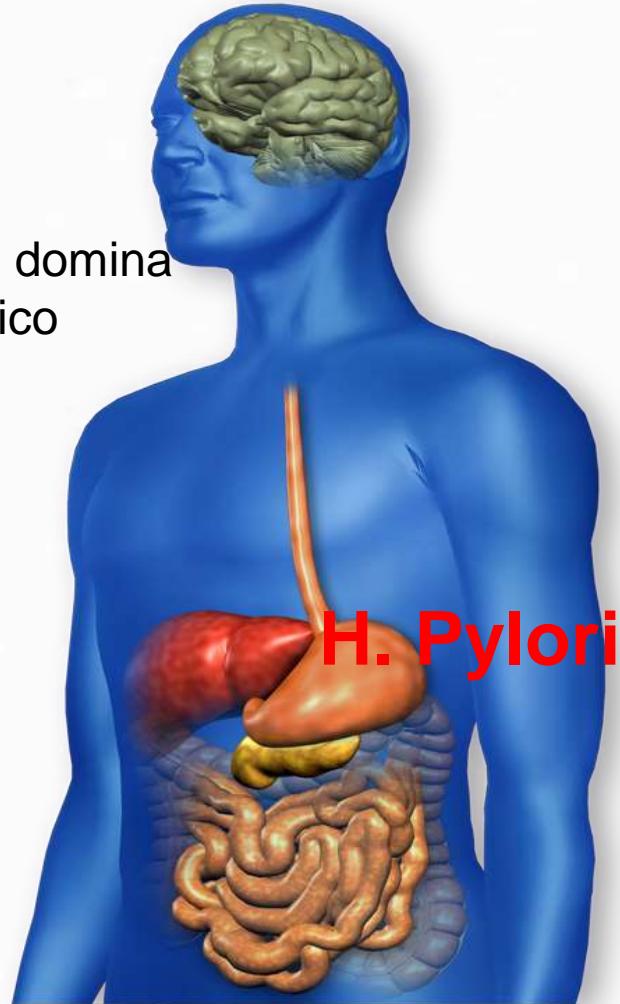


Cambiando la microbiota con antibioticos

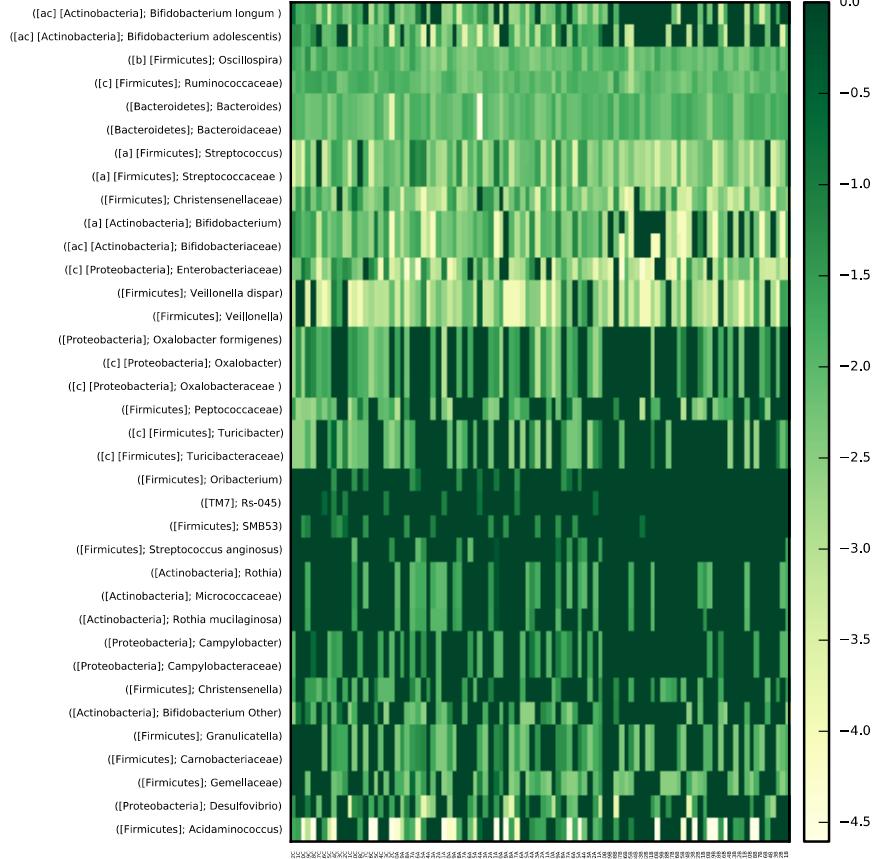
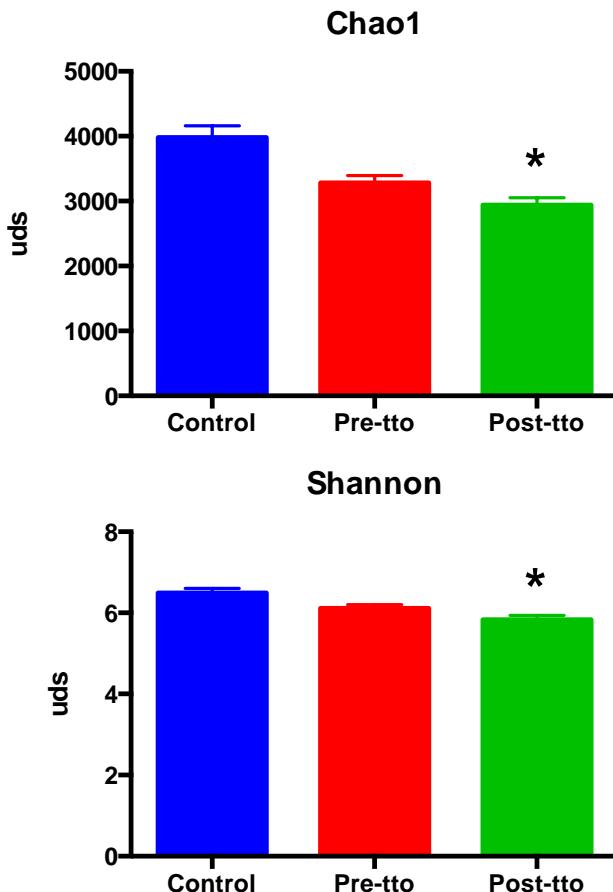


ANTIBIOTICOS

H Pylori microbiota que domina
en el nicho gástrico



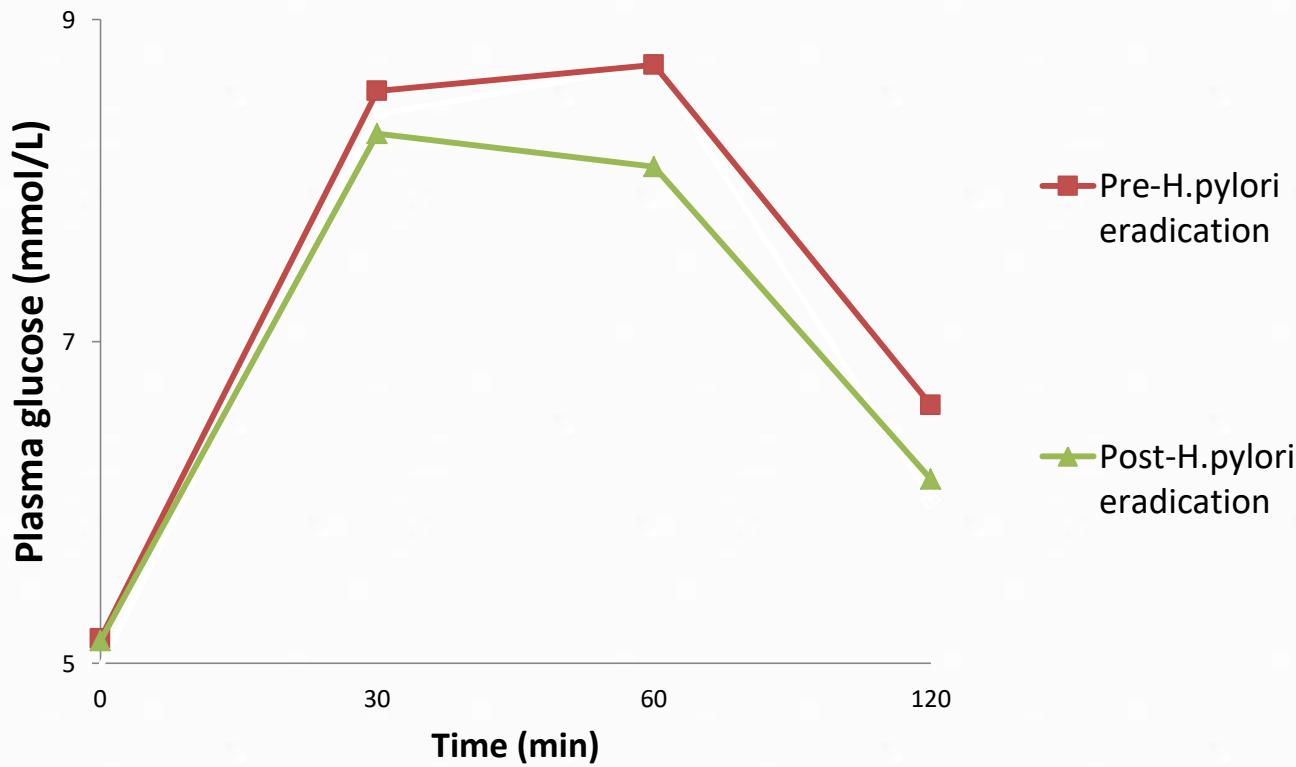
Las terapias antibióticas modulan la microbiota intestinal



Martín-Núñez et al. 2016. Submitted



La modulación de la microbiota intestinal por las terapias antibióticas, pueden tener efectos beneficiosos

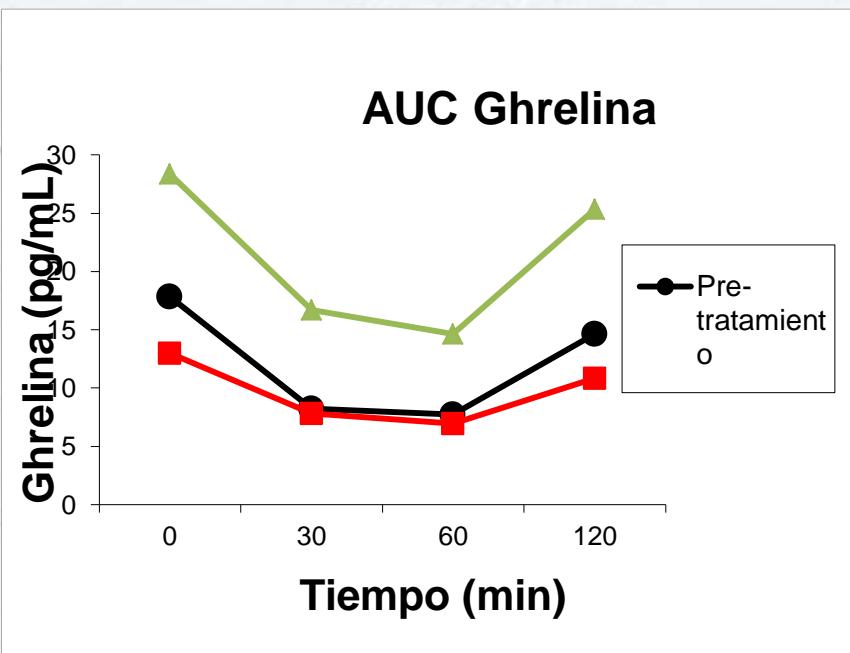


Roca MM et al. Diabetes Metabolism 2016

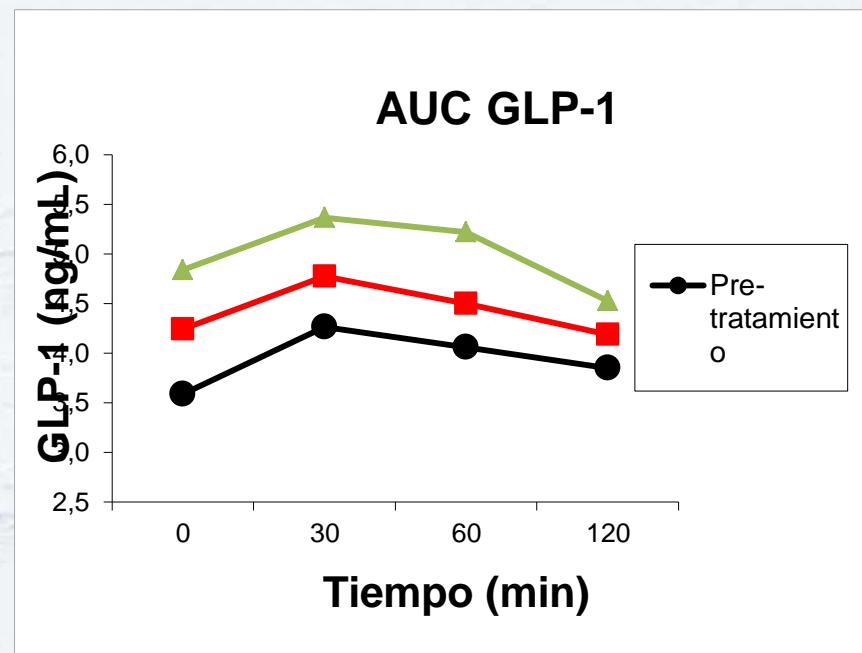


EFECTO ATB ESTATUS GLUCÉMICO

AUC GHRELINA tras SOG



AUC GLP-1 tras SOG



EL MERCADO POR DELANTE DE LA CIENCIA

The image displays three separate web pages side-by-side:

- Naturalinea.com**: A Mexican naturalist store. The header includes links for Contactanos, Quienes Somos, Cómo Comprar, Publicidad, and Condiciones Generales. Below the header is a banner for Angelina Jolie. The main content area features a testimonial about Angelina being extremely thin due to a method that clears the colon. It also includes social media links for Facebook, Twitter, and Google+.
- My Perfect Colon**: A website for a natural hydro-therapy system. The page shows a woman's torso with a red arrow pointing to her abdomen. The menu on the left lists Home, Sistema My Perfect Colon, Productos, FAQ, Testimonios, Video, Dónde comprar, and Tienda.
- HIDROTERAPIA DE COLON VALENCIA**: A diet and health blog. The header features the text "Eficaz" and "Hidroterapia de colon Valencia". The sidebar on the left has buttons for BENEFICIOS, QUIENES SOMOS, CONTACTENOS, SISTEMA DIGESTIVO, SALUD INTESTINAL, and INFORMACIONES EN DIGESTIVO. The main content area contains a blog post titled "Mi blog" with the text: "dieta, adelgazar,rápido,limpieza de colon,hidroterapia,bikini,aprender a comer". Below this is a question "¿Sanos o delgados?" and a reply from "Amparo Lucas Alba-Dietética clínica desde 1997" dated "08 de marzo de 2011 13:04".



Nutrition & Food Science Department.

Nutritional and Food Metabolomic Group
Cristina Andrés Lacueva

Joan Vendrell-Tarragona
Montse Fito-Barcelona
Jordi Salas-Reus
Albert Goday-Barcelona
Jose M Gonzalez-Clemente-Sabadell

[**Universidad de Córdoba**](#)
Manuel Tena
Francisco Pérez Jiménez

[**Hospital of Girona 'Dr Josep Trueta**](#)
José Manuel Fernández-Real

