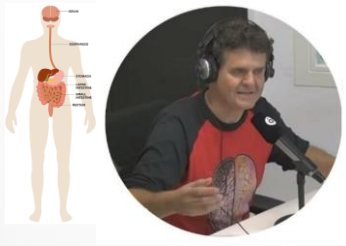
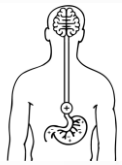
Octubre 2021





Neurofelicidad: Eje intestino-corazón-cerebro

Dr. Raúl Espert

Dpto de Psicobiología (UV)

Unidad de Neuropsicología

Hospital Clínico (Valencia)

raul.espert@uv.es

@esperttortajada

Raul Espert

CFIE VALLADOLID

Hospital "Dr. Peset"

desde 1993 a 1999

Hospital Arnau de Vilanova

desde 1999-2007

Clinico desde 1999

Hospital Universitario La Fe. Valencia
Unidad de Neuropsicologia y Neurocirugía consciente (2015)

RAUL ESPERT

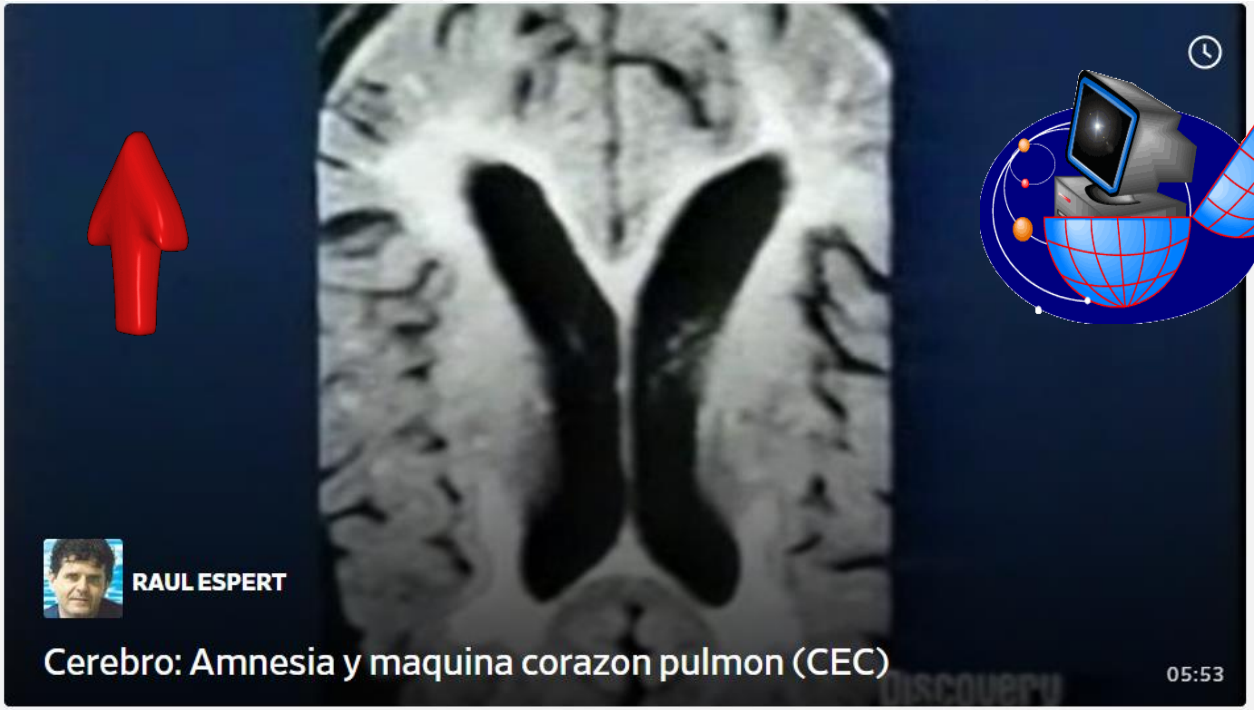
NEUROPSYCHOLOGY AND PSYCHOBIOLOGY

PROFESOR TITULAR DE UNIVERSIDAD DEPARTAMENTO DE PSICOBIOLOGIA UNIVERSITAT DE VALENCIA (ESPAÑA) NEUROPSICOLOGO EN HOSPITAL CLINICO UNIVERSITARIO (VALENCIA) SERVICIO DE NEUROCIRUGIA. H...

Dailymotion.com/raulespert

36.5M | 4.5K | 13K

37,295,350	32,797,739	4591	11,558
vistas	minutos vistos	seguidores	Me gusta



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Playlist: Psicología Positiva

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VIDEOS SOBRE PSICOBIOLOGIA Y OTROS TEMAS AFINES

CONTACTOS (10) »

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Asallam 0 videos
gusotron 0 videos
Cantimplor 0 videos
bestofmalt 29 videos
bestofmau 56 videos

más »

MI VIDEO ESTRELLA

VÍDEOS »

MIS VÍDEOS »

Los + populares »


Vacuna contra la nicotina
0 votos
3 vistas | 0 com.


LSD y cerebro
0 votos
1 vista | 0 com.


MDMA: Alexander Shulgin
0 votos
1 vista | 0 com.


Egas Moniz: Lobotomia
0 votos
1 vista | 0 com.


Conductismo radical: ¿Terapia o
0 votos
4 vistas | 0 com.


Konrad Lorenz: Padre de la
0 votos
2 vistas | 0 com.

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Vacuna contra la nicotina
Por **raulespert** hace 5 horas
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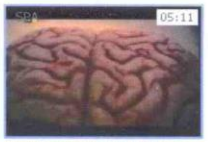
Habitos toxicos: Tabaco y alcohol
Por **raulespert** hace 22 horas
3 vistas


Clasificacion de drogas peligrosas
Por **raulespert** hace 20 horas
7 vistas


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El extasis (MDMA)
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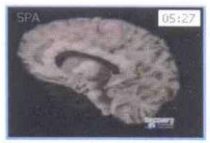
Vacuna contra la cocaina
Por **raulespert** hace 2 días
5 vistas


Cannabis y psicosis
Por **raulespert** ayer
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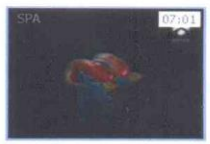
20 vistas


Nicotina y cerebro 2
Por **raulespert** hace 3 días


Neurobiologia de las Benzodiacepinas
Por **raulespert** hace 3 días


Neurobiologia de los opiaceos
Por **raulespert** hace 3 días

Dailymotion .com/raulespert

Playlist: Emociones y cerebro

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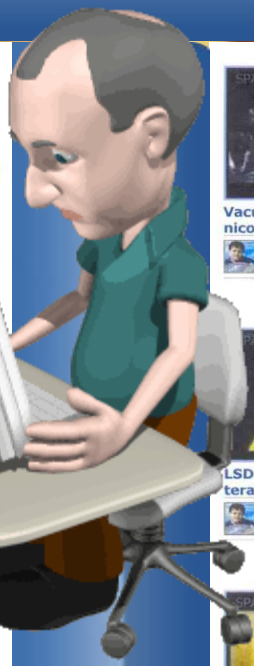


Vacuna contra la nicotina
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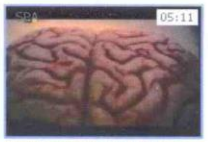
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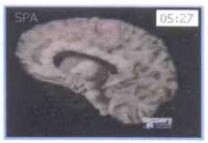
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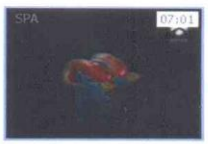
Neurobiologia de los opiaceos
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Playlist: microbiota

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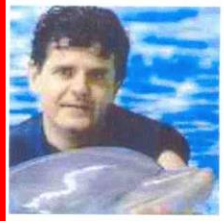
MI PERFIL



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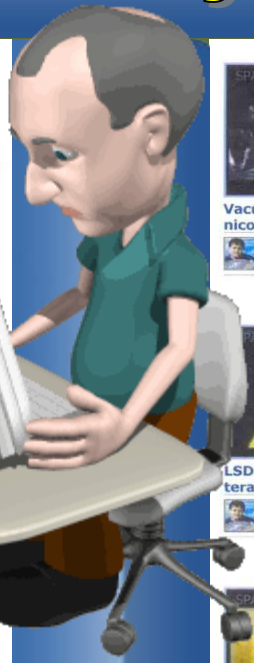


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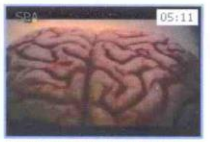
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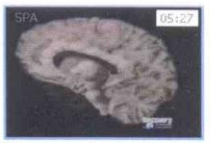
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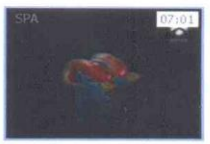
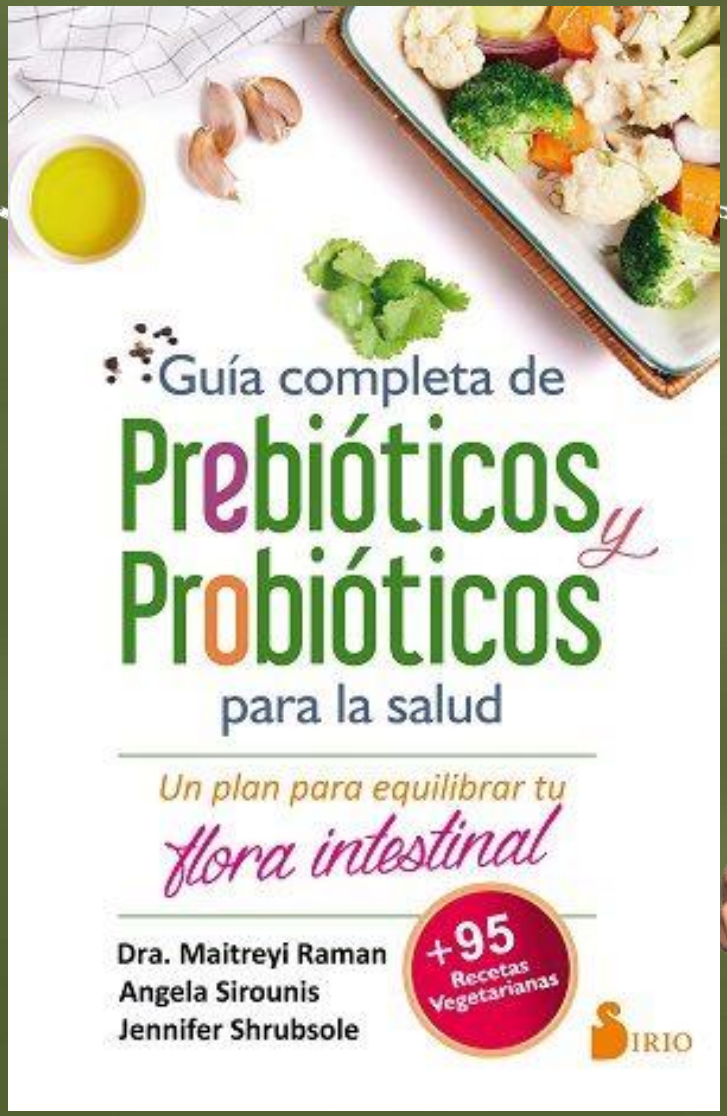
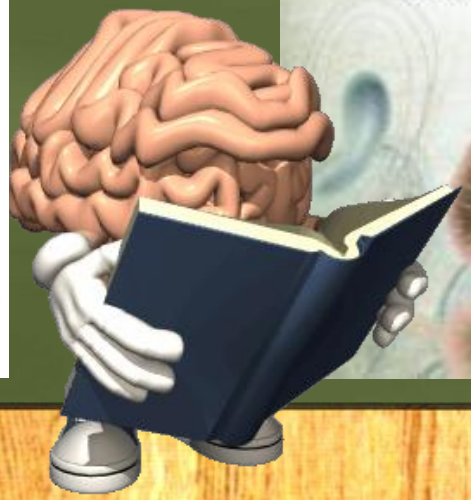
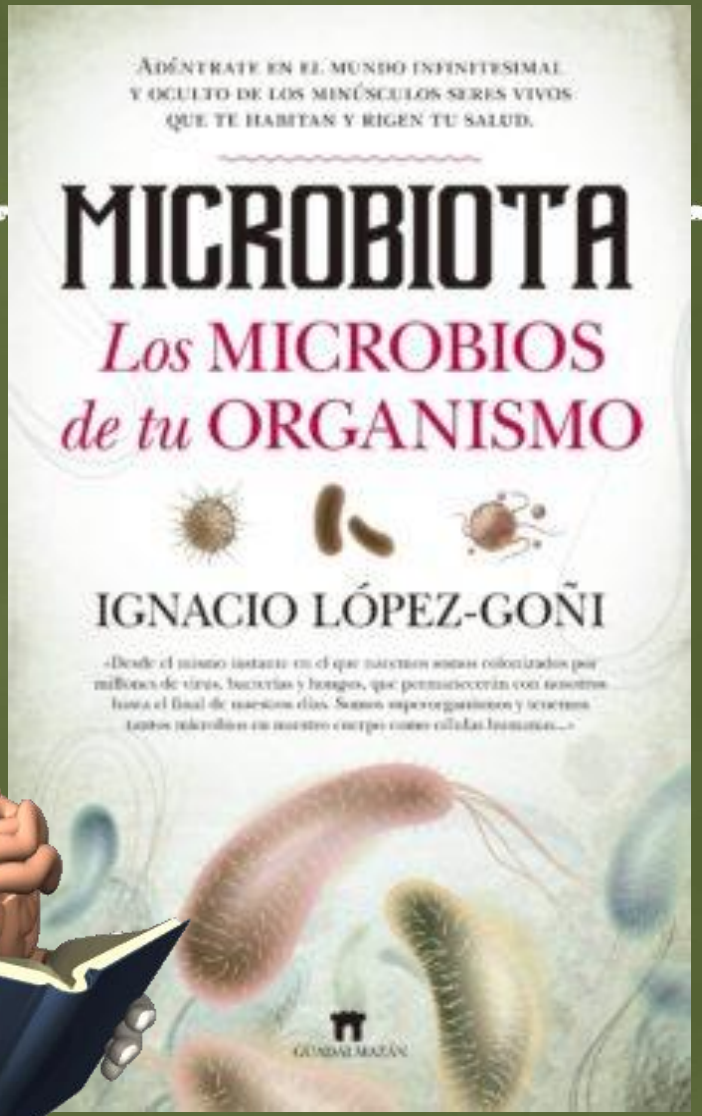

Neurobiologia de los opiaceos
Por raulespert hace 3 días

Libros recomendados

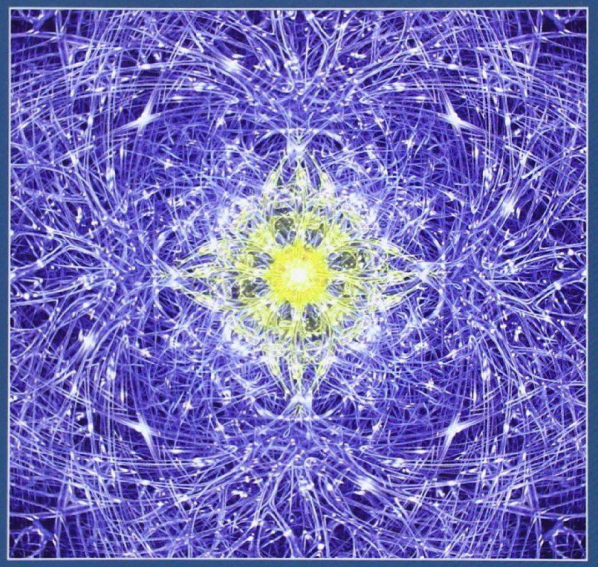






MICROBIÓTICA

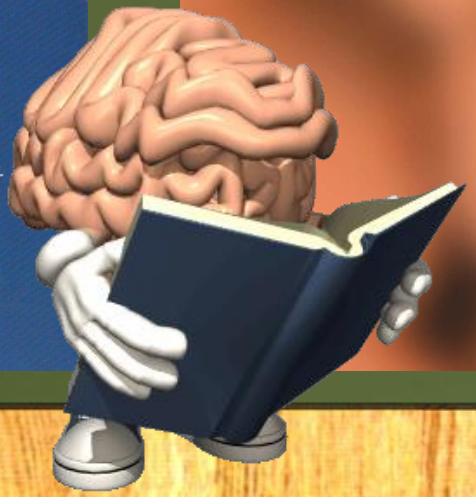
Nutrición Simbiótica y Microorganismos Regeneradores



Una revolución para salvar la Tierra y el ser humano

Lynn Margulis - Bonnie Bassler - Máximo Sandín - Jairo Restrepo - Juana Labrador
Virginia Ruiperez - Francisco Mata - Emilio Santos - Palmira Pozuelo - Jesús Mier
Martín Goldman - Luis Antonio Lázaro - Ander Urederra

ediciones i



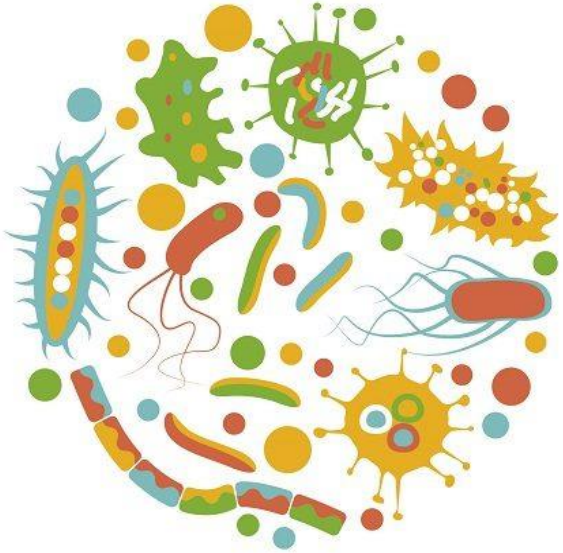
Alberto Ramos-Cormenzana
Mercedes Monteoliva Sánchez
Fátima E. Nader Macías

PROBIÓTICOS Y SALUD

DIAZ DE SANTOS

Probióticos, prebióticos y simbióticos

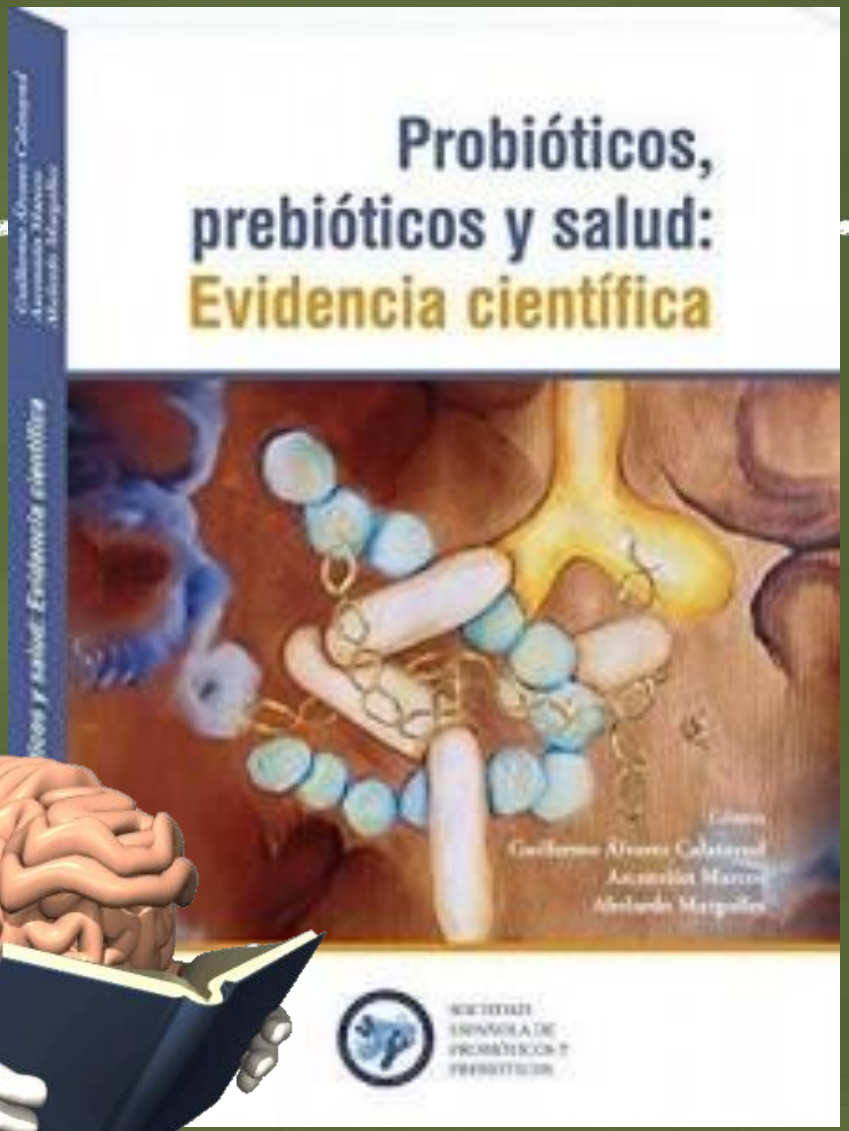
Aplicaciones por patologías

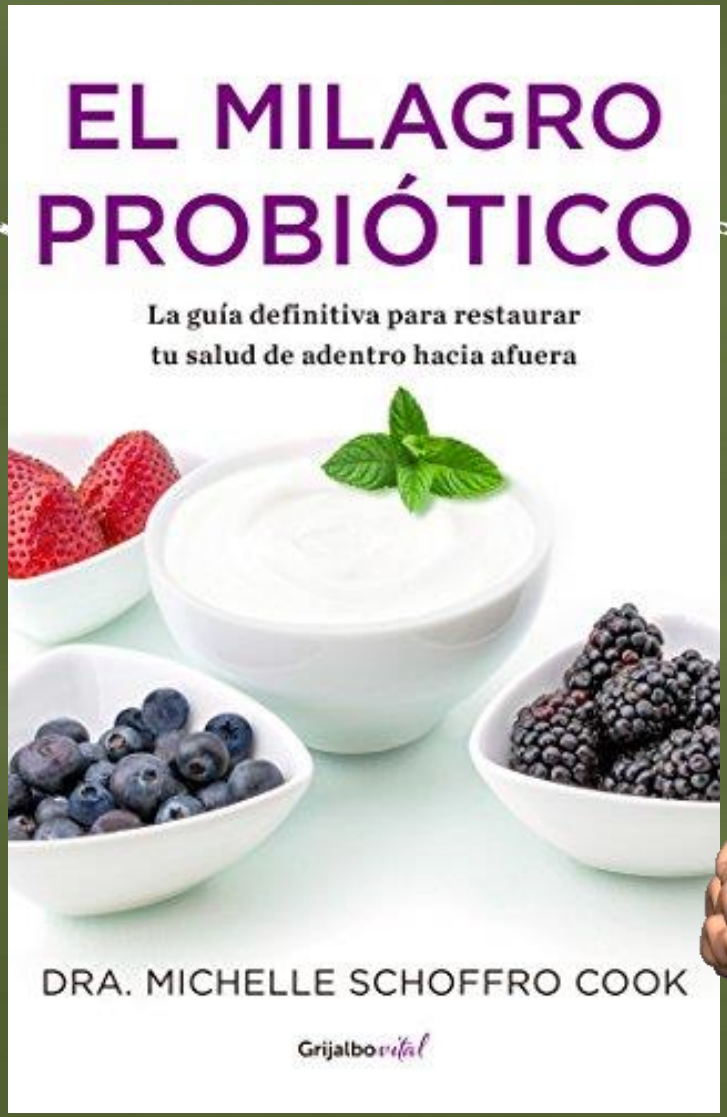


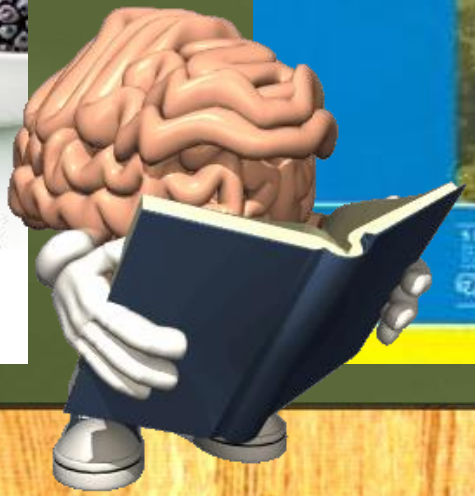
Microbiota humana

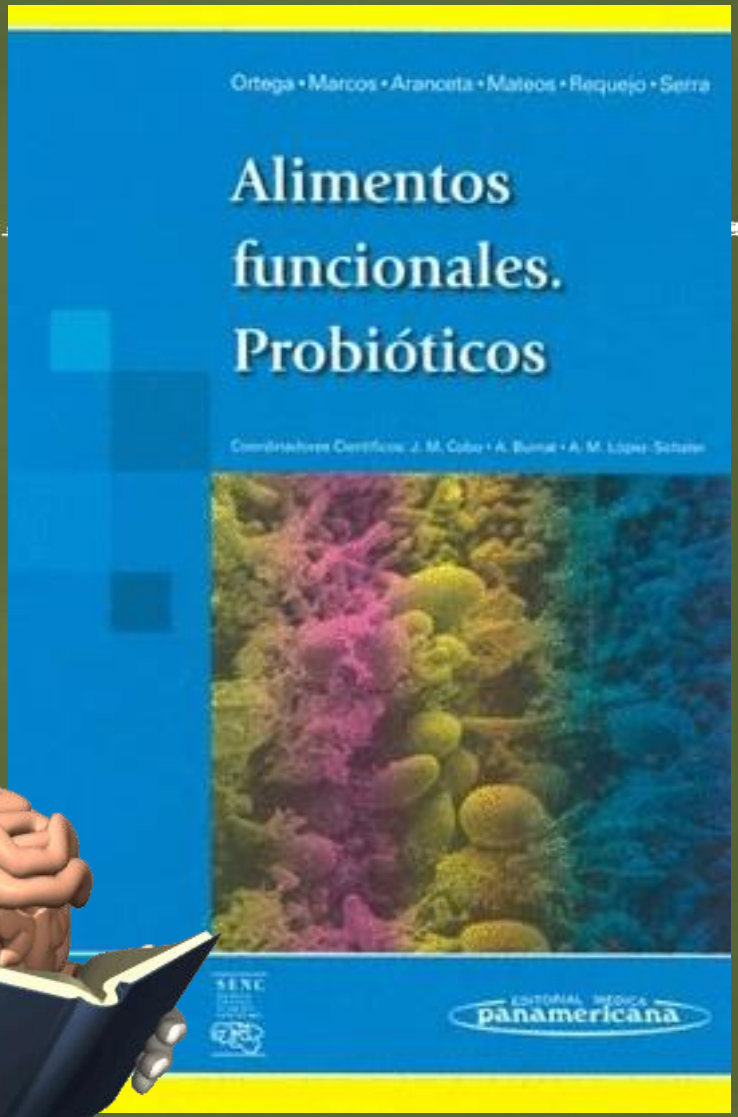
Francisca Agustín Layunta
María José García Abad
María Luisa Morales Marina

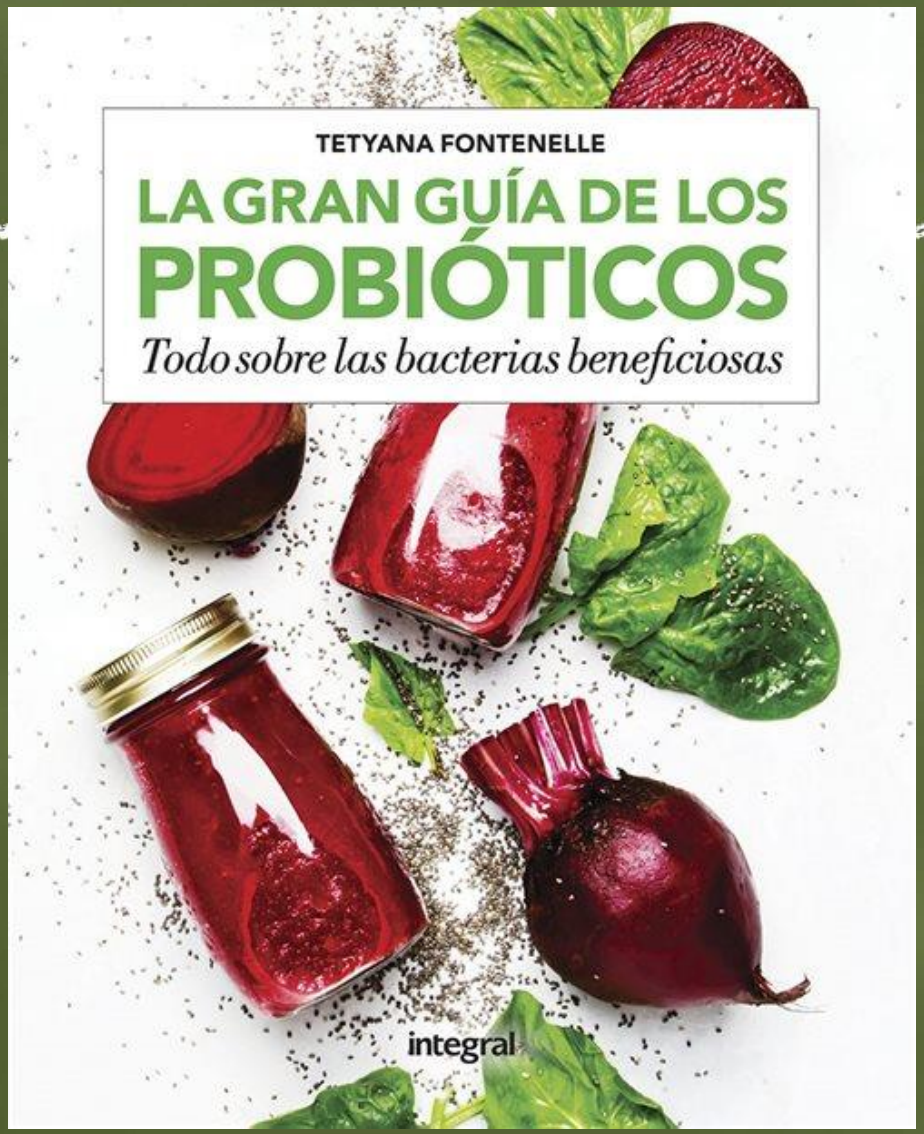
ediciones i

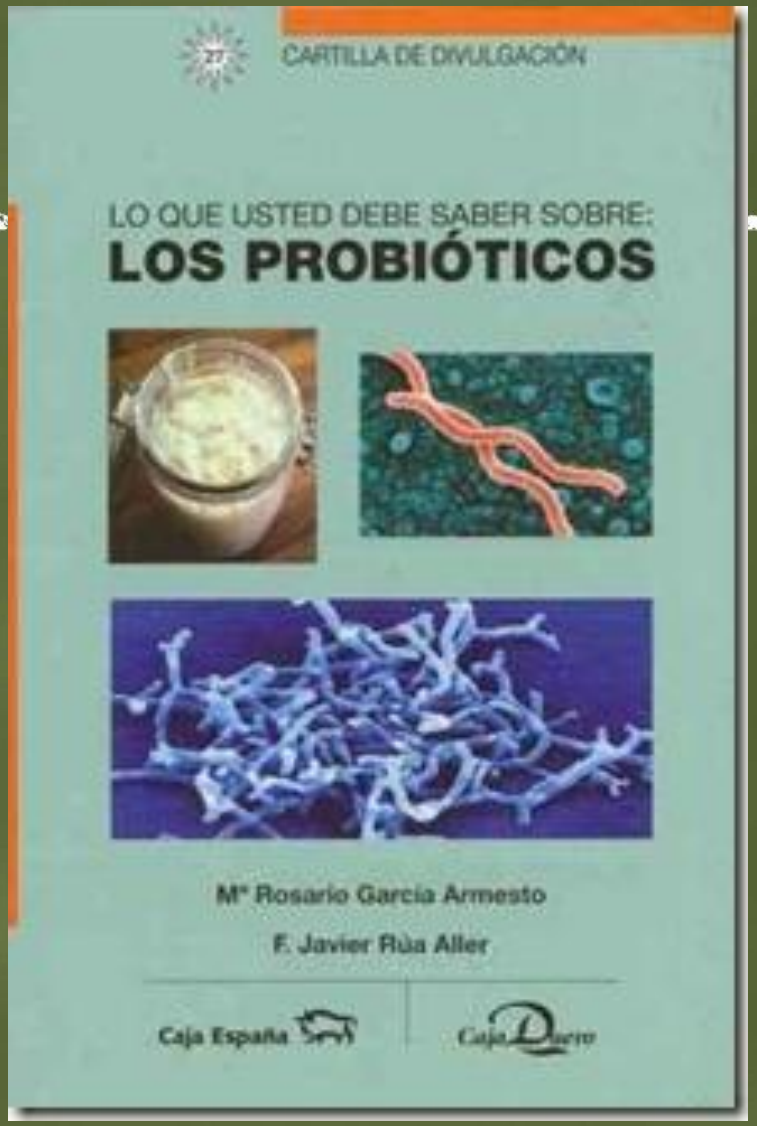



EL MILAGRO PROBIÓTICO
La guía definitiva para restaurar tu salud de adentro hacia afuera
DRA. MICHELLE SCHOFFRO COOK
Grijalbo vital




Ortega • Marcos • Aranceta • Mateos • Requejo • Serra
Alimentos funcionales. Probióticos
panamericana


TETYANA FONTENELLE
LA GRAN GUÍA DE LOS
PROBIÓTICOS
Todo sobre las bacterias beneficiosas
integral


27
CARTILLA DE DIVULGACIÓN
LO QUE USTED DEBE SABER SOBRE:
LOS PROBIÓTICOS
Mª Rosario García Armesto
F. Javier Rúa Aller
Caja España
Caja Duero

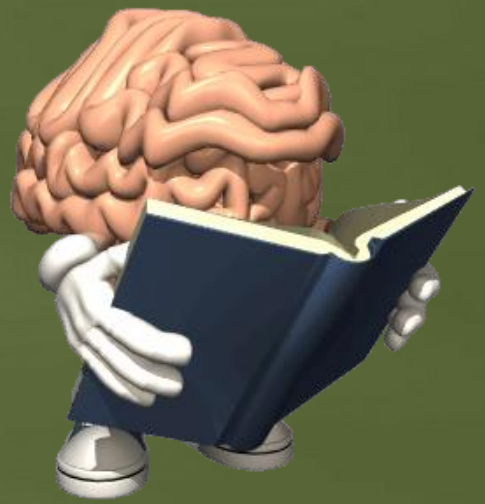
Blanca García-Orea Haro

@blancanutri

Dime qué comes y te diré qué bacterias tienes

El intestino, nuestro segundo cerebro

Grijalbo



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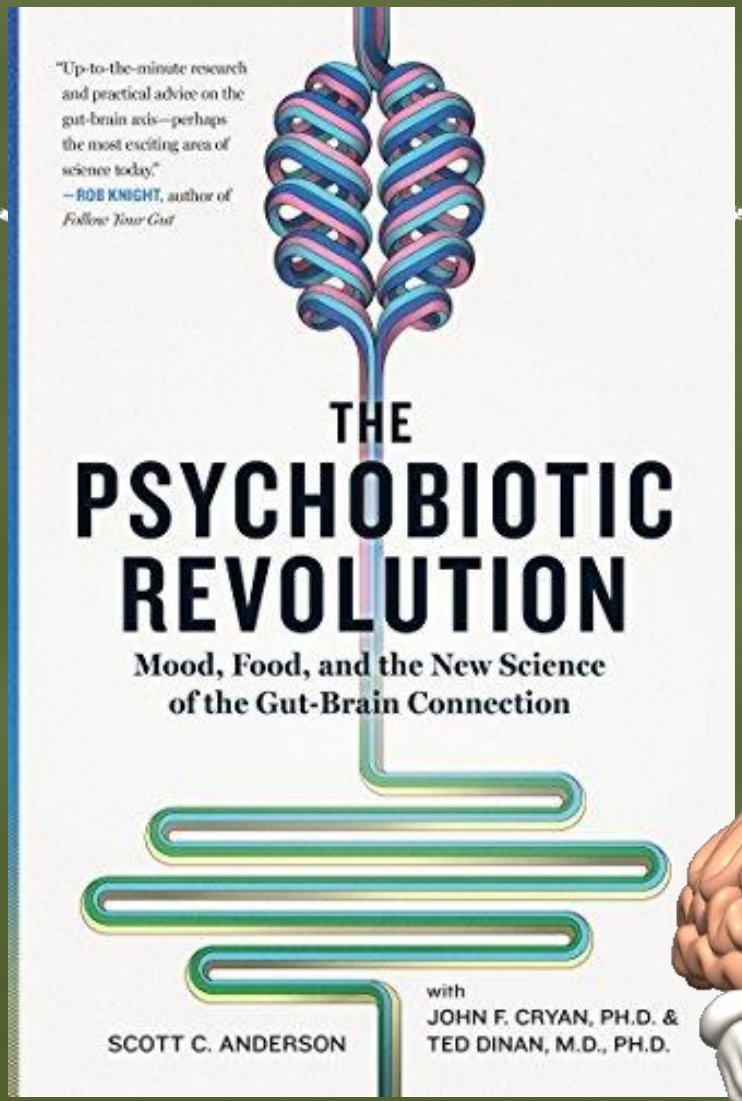
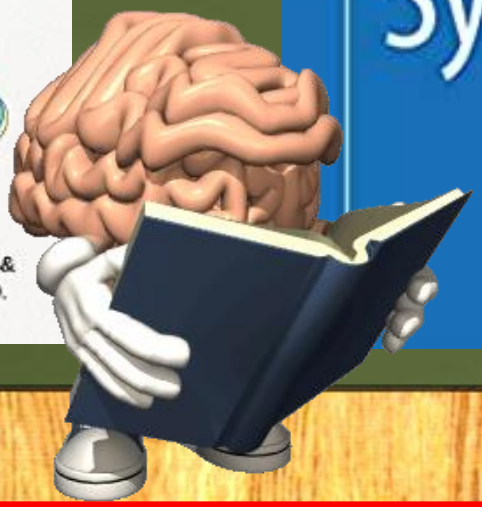
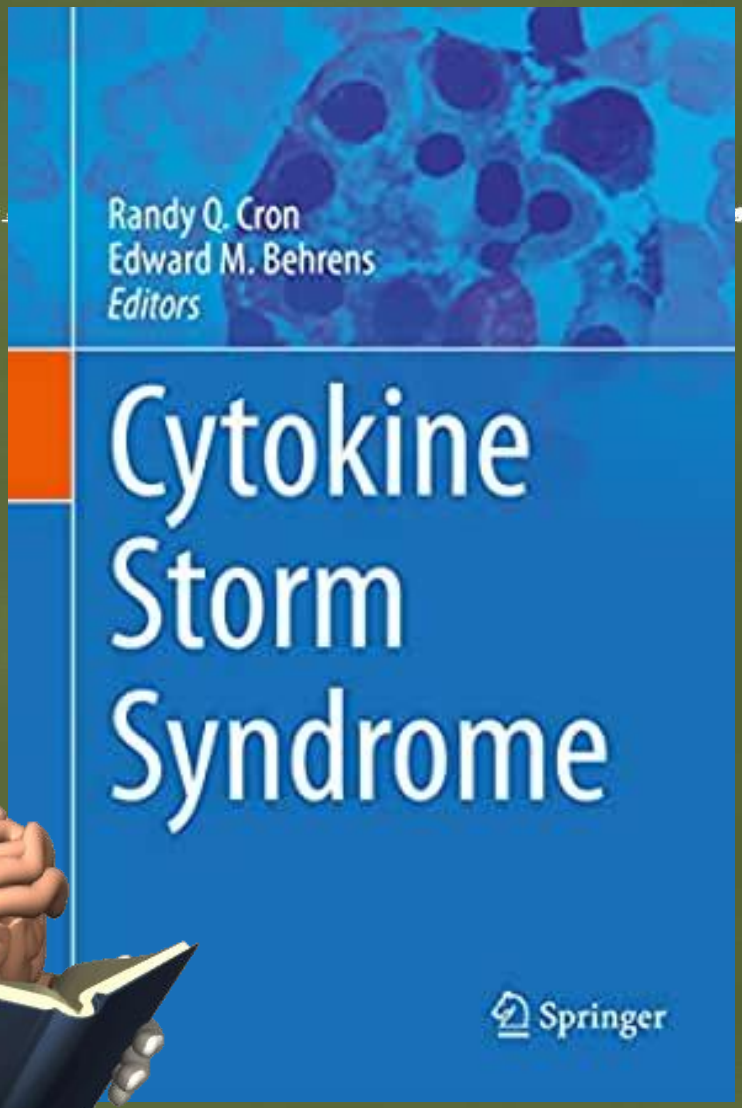
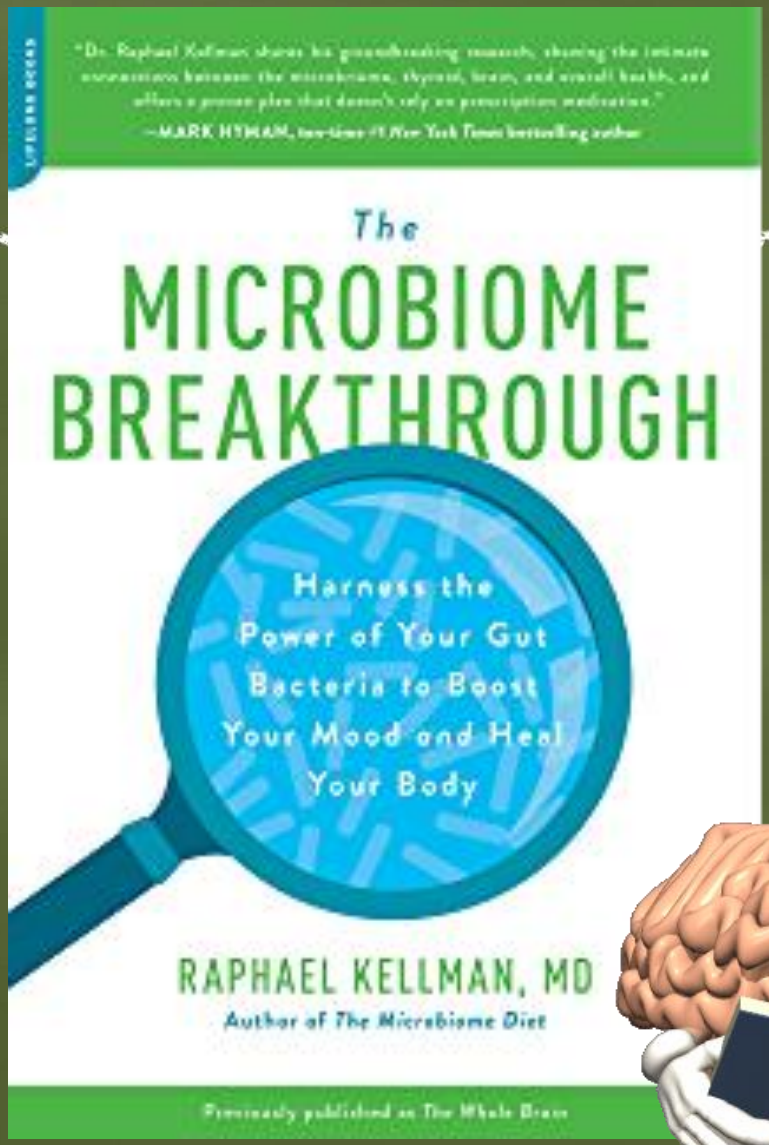
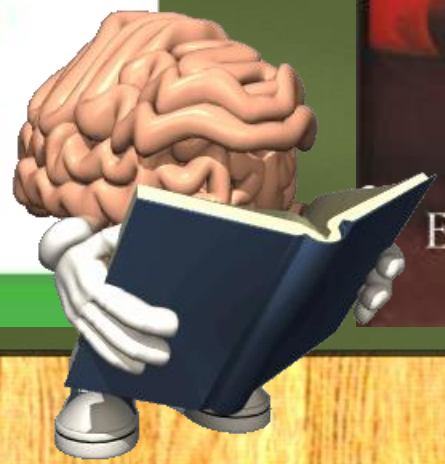


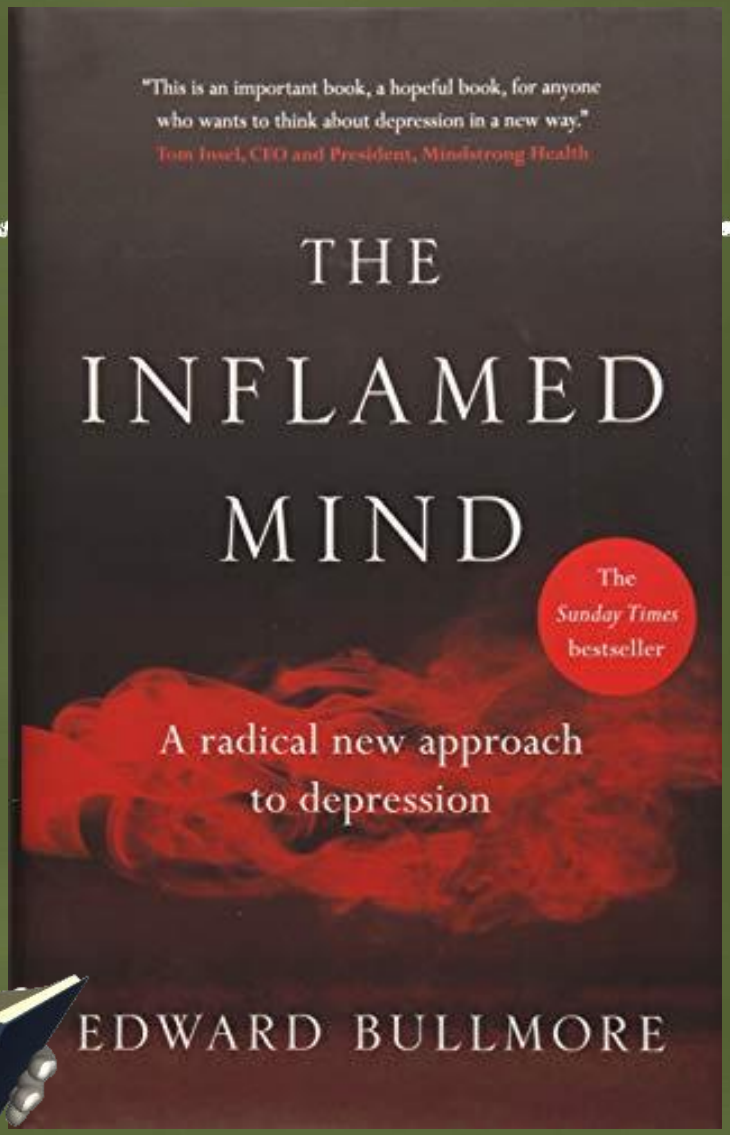




Libros recomendados







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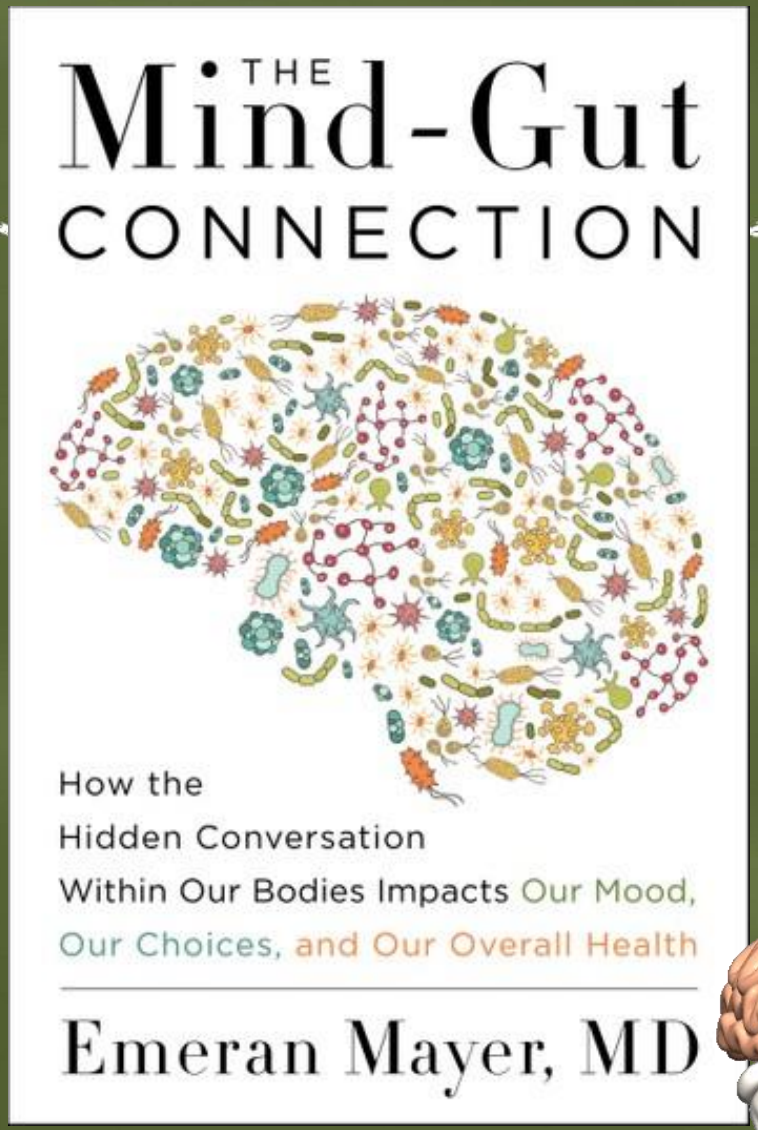
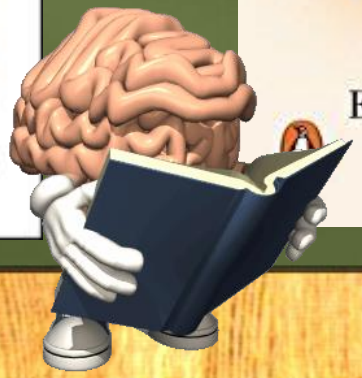
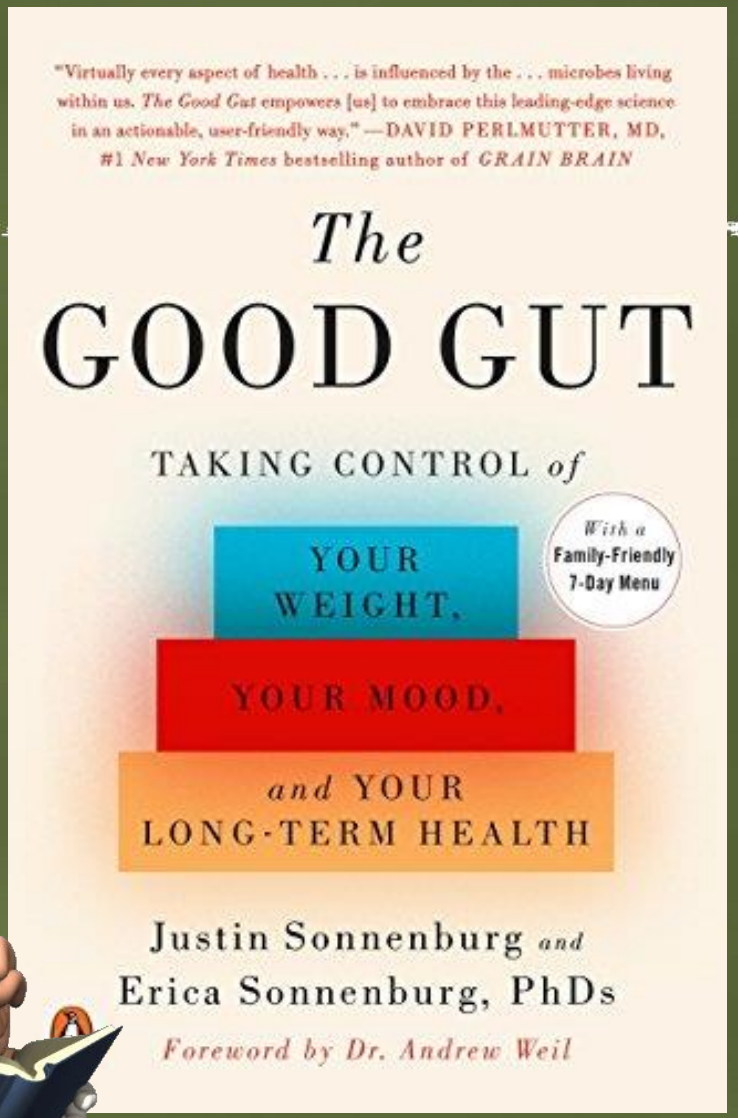






-¿Que es el Segundo cerebro? ¿Qué es una emoción?

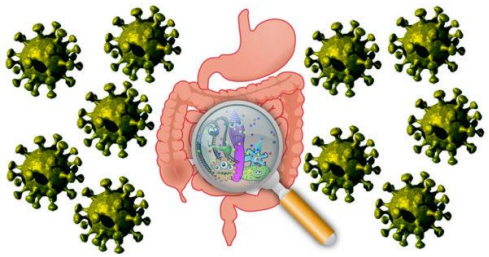
-¿Que es la microbiota intestinal? ¿y los marcadores somáticos?

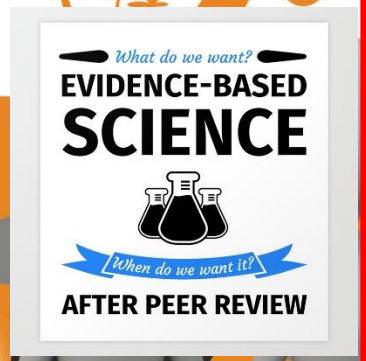
-¿Está relacionada con el estado de ánimo y el estrés?

-¿Podemos regular el estrés y ansiedad a través de la dieta?

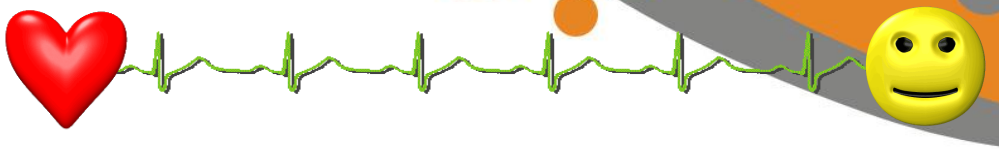
-¿Podemos conseguir una dieta con efectos antiinflamatorios?

¿Podría una dieta pre y probiótica mejorar el aprendizaje?





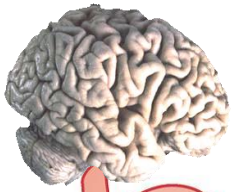
INDICE

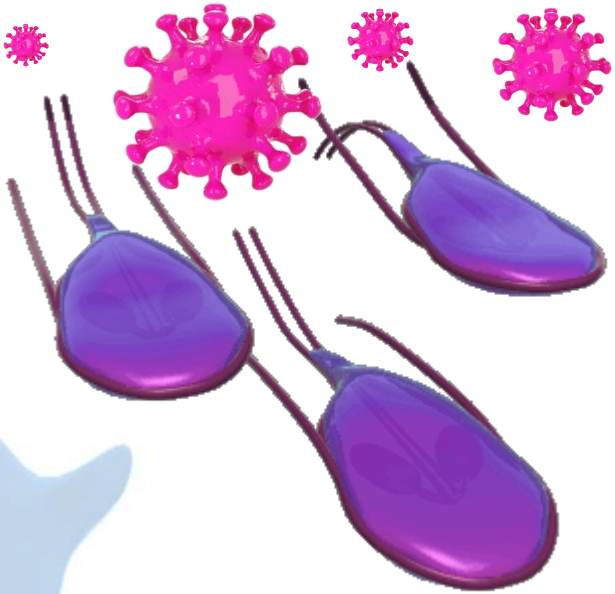


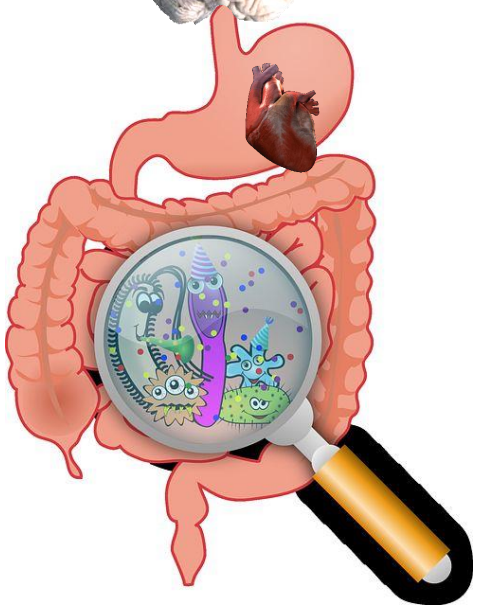
1. SISTEMA NERVIOSO ENTÉRICO
(Eje microbiota-intestino-corazón-cerebro)

Dr. RAUL ESPERT
DPTO. PSICOBIOLOGIA (UV)

raul.espert@uv.es

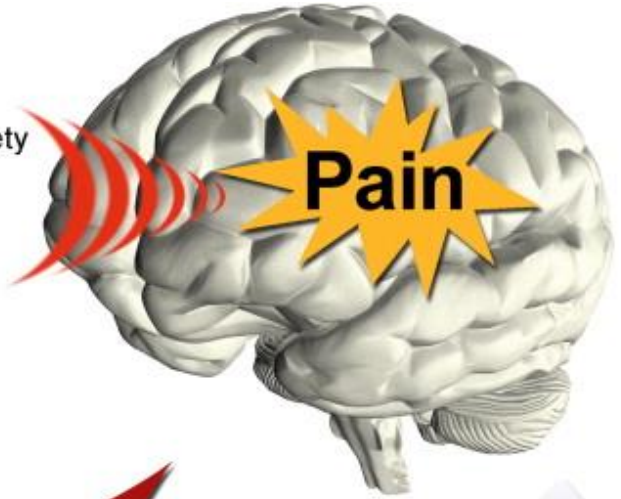






¿Qué necesitan nuestros dos cerebros?

- Stress & Anxiety
- Depression
- Attention
- Expectation
- Conditioning

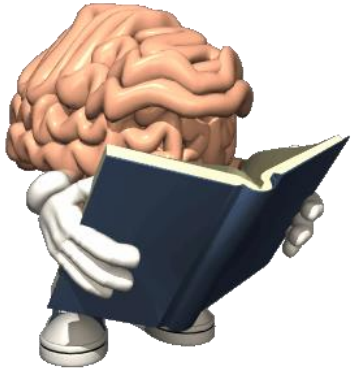


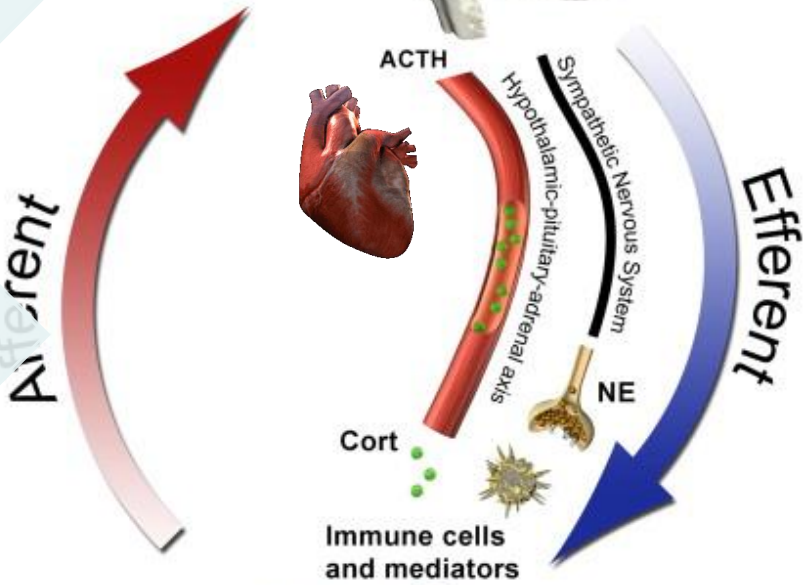
Sentidos (Estímulos)
Oxígeno
Glucosa
Vitaminas (B)

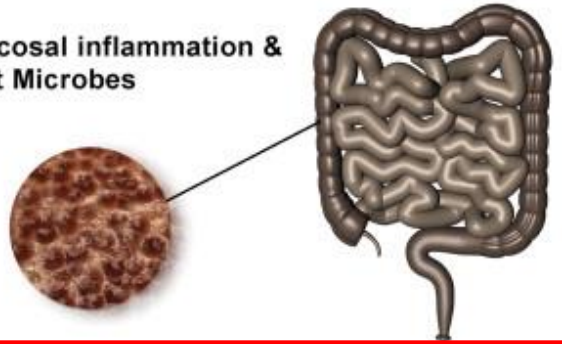
- *Primer cerebro (SNC)*

Dieta pre y probiótica
Parto vaginal
NO abuso Antibióticos
Higiene (adecuada)

- *Segundo cerebro*
- *(Sistema N. entérico)*
- *Microbiota intestinal*







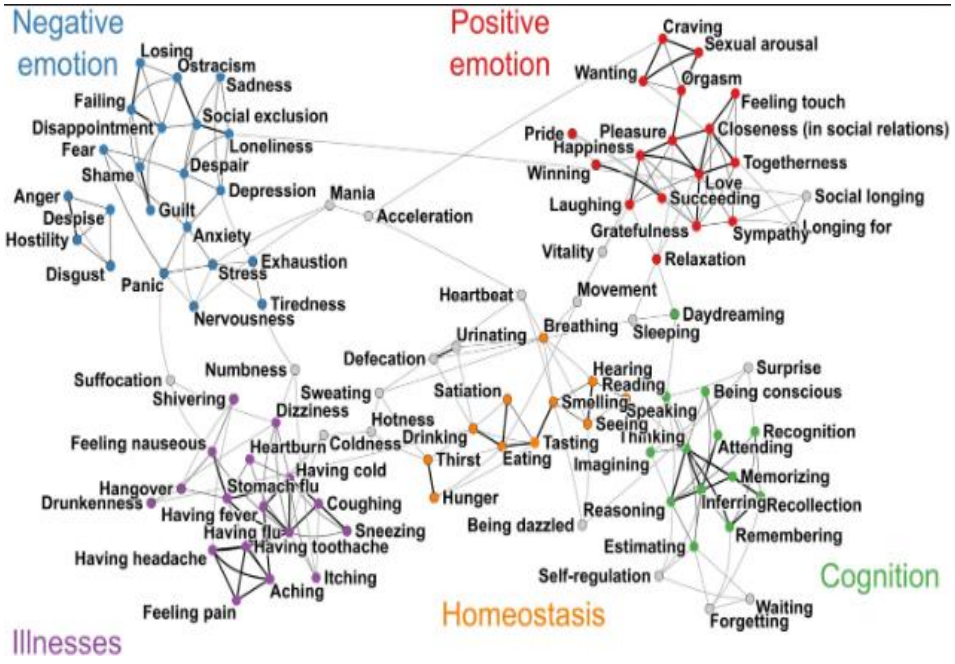
Maps of subjective feelings

PNAS | September 11, 2018 | vol. 115 | no. 37 |

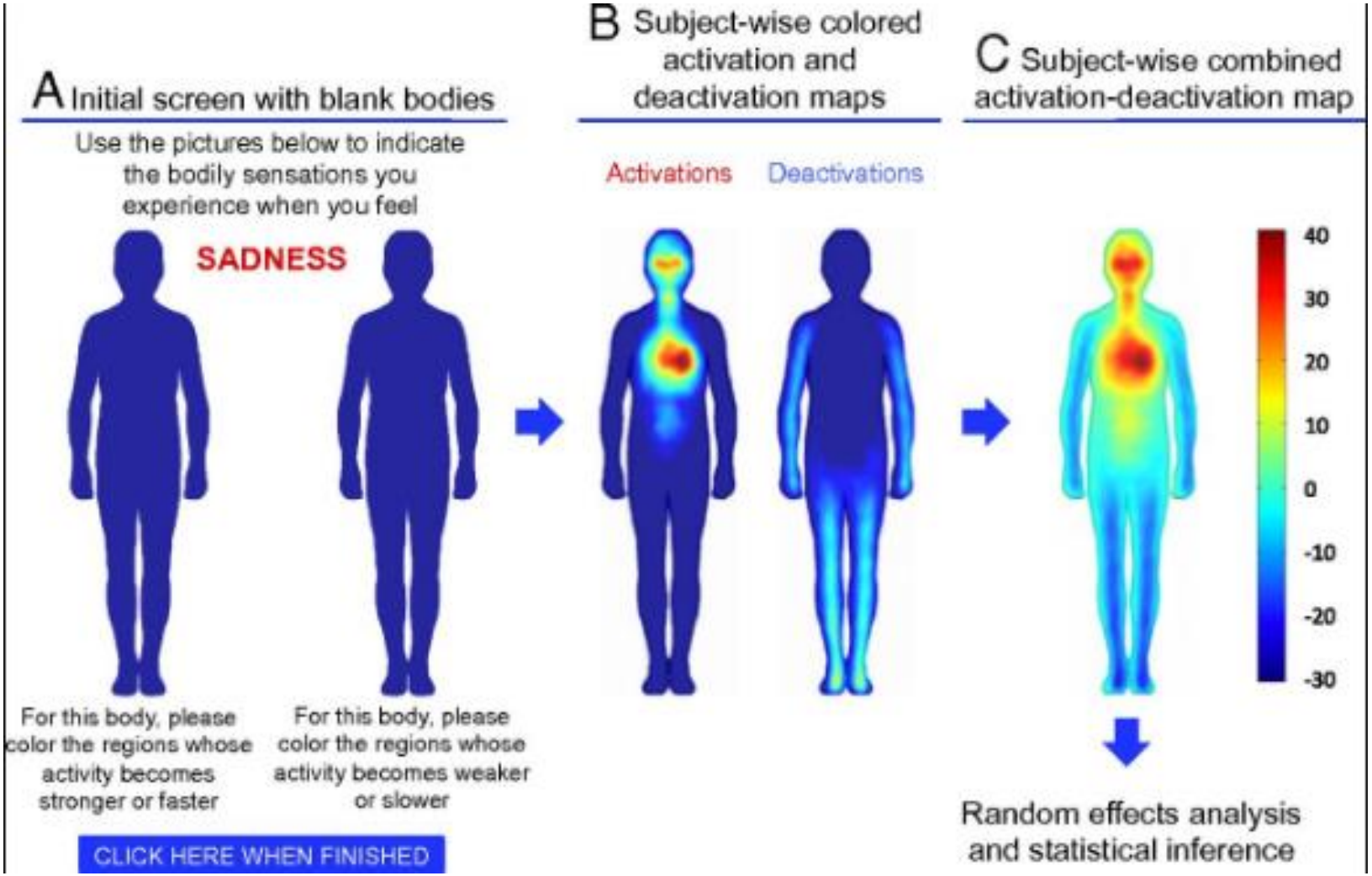
Lauri Nummenmaa[a,b,1], Riitta Hari[c,1], Jari K. Hietanen[d], and Enrico Glerean[a]

[a]Turku PET Centre and Turku University Hospital, University of Turku, FI-20520, Turku, Finland; [b]Turku University Hospital, University of Turku, FI-20520, Turku, Finland; [c]Department of Art, School of Arts, Design and Architecture, Aalto University, FI-00076, Espoo, Finland; [d]Faculty of Social Sciences and Psychology, University of Tampere, FI-33014, Tampere, Finland; [e]Department of Neuroscience and Biomedical Engineering, School of Science, Aalto University, FI-00076, Espoo, Finland; [f]Department of Computer Science, School of Science, Aalto University, FI-00076, Espoo, Finland; and [g]Helsinki Institute of Information Technology, Aalto University, FI-00076, Espoo, Finland

Subjective feelings are a central feature of human life. We defined the organization and determinants of a feeling space involving 100 core feelings that ranged from cognitive and affective processes to somatic sensations and common illnesses. The feeling space was determined by a combination of basic dimension rating, similarity mapping, bodily sensation mapping, and neuroimaging meta-analysis. A total of 1,026 participants took part in online surveys where we assessed (*i*) for each feeling, the intensity of four hypothesized basic dimensions (mental experience, bodily sensation, emotion, and controllability), (*ii*) subjectively experienced similarity of the 100 feelings, and (*iii*) topography of bodily sensations associated with each feeling. Neural similarity between a subset of the feeling states was derived from the NeuroSynth meta-analysis database based on the data from 9,821 brain-imaging studies. All feelings were emotionally valenced and the saliency of bodily sensations correlated with the saliency of mental experiences associated with each feeling. Nonlinear dimensionality reduction revealed five feeling clusters: positive emotions, negative emotions, cognitive processes, somatic states and illnesses, and homeostatic states. Organization of the feeling space was best explained by basic dimensions of emotional valence, mental experiences, and bodily sensations. Subjectively felt similarity of feelings was associated with basic feeling dimensions and the topography of the corresponding bodily sensations. These findings reveal a map of subjective feelings that are categorical, emotional, and embodied.

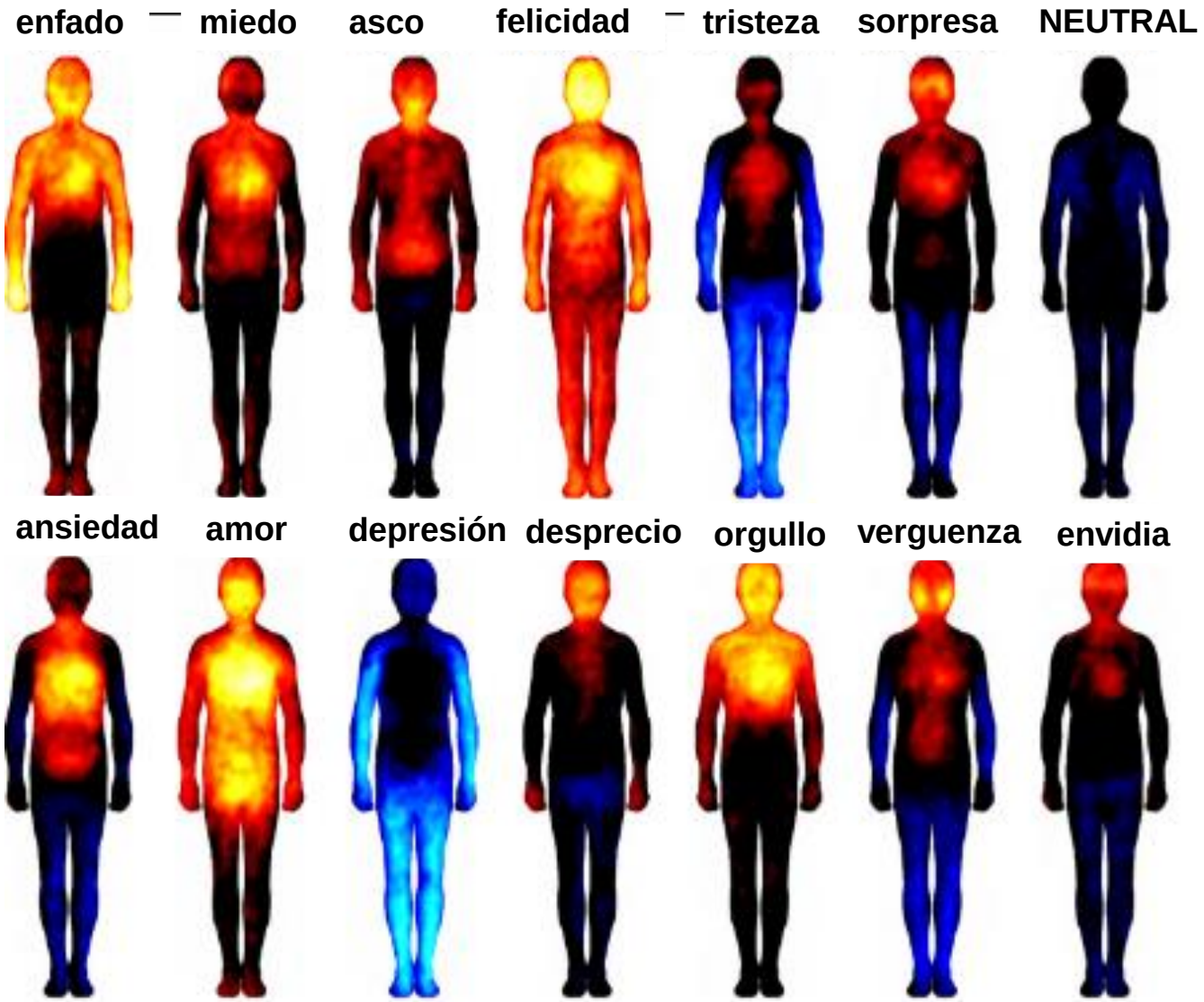


CEREBRO EMOCIONAL

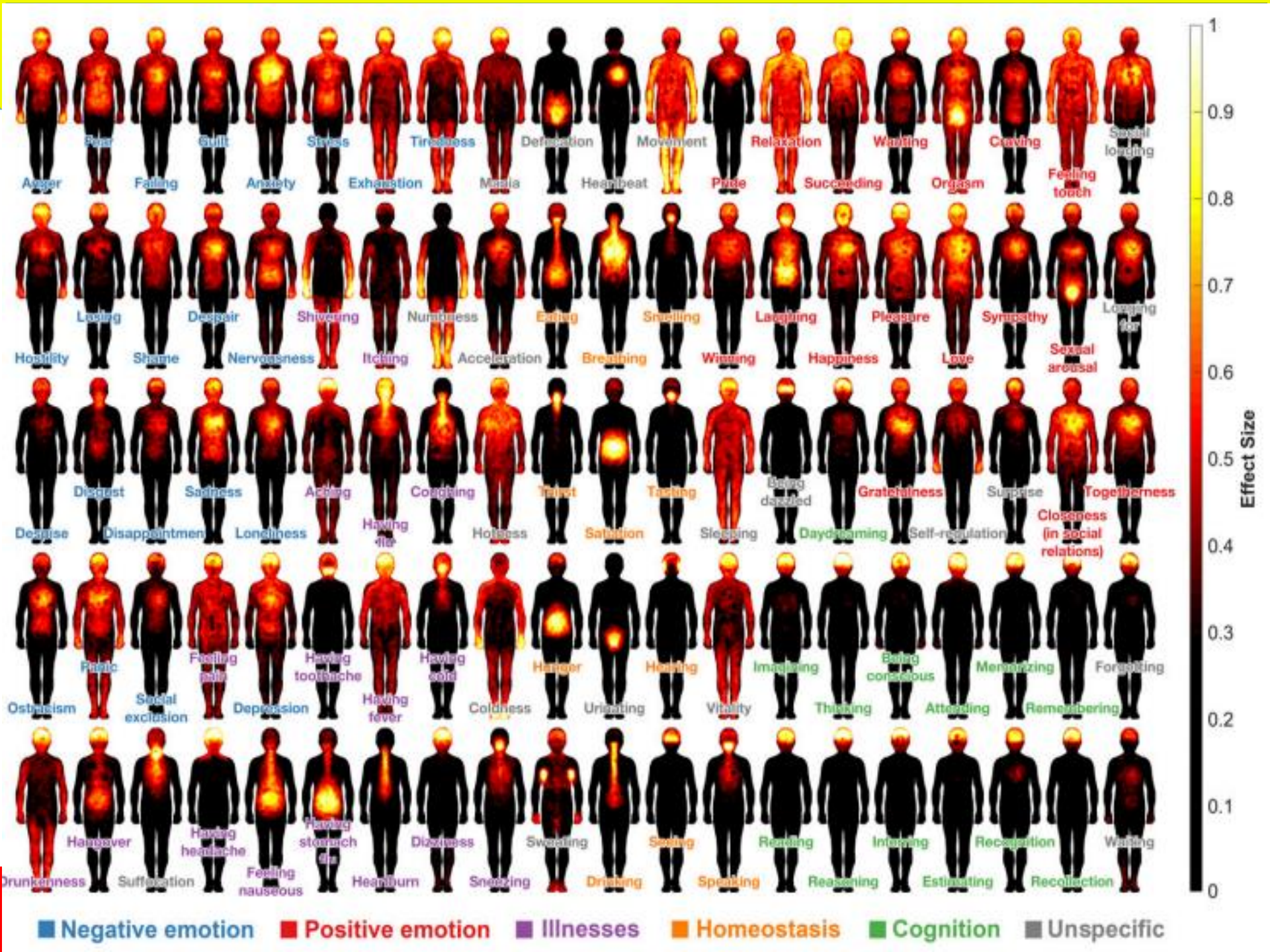


www.pnas.org/cgi/doi/10.1073/pnas.1807390115

CEREBRO EMOCIONAL

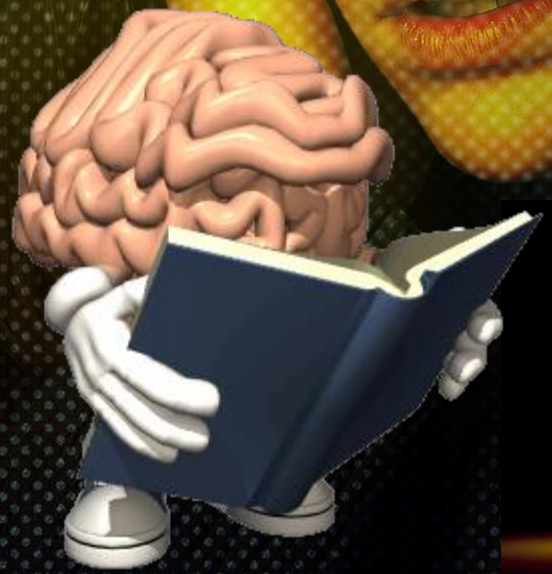


www.pnas.org/cgi/doi/10.1073/pnas.1807390115


Fear
Guilt
Stress
Tiredness
Defecation
Movement
Relaxation
Waiting
Craving
Sexual longing
Anger
Failing
Anxiety
Exhilaration
Malaise
Heartbeat
Pride
Succeeding
Orgasm
Feeling touch
Losing
Despair
Shivering
Numbness
Eating
Smelling
Laughing
Pleasure
Sympathy
Longing for
Hostility
Shame
Nervousness
Itching
Acceleration
Breathing
Winning
Happiness
Love
Sexual arousal
Disgust
Sadness
Aching
Coughing
Thirst
Tasting
Being dazzled
Gratefulness
Surprise
Togetherness
Disappointment
Loneliness
Having flu
Hotness
Satiation
Sleeping
Daydreaming
Self-regulation
Closeness (in social relations)
Panic
Feeling pain
Having toothache
Having cold
Hunger
Heating
Imagining
Being conscious
Memorizing
Forgetting
Social exclusion
Depression
Having fever
Coldness
Urinating
Vitality
Thinking
Attending
Remembering
Hangover
Having headache
Having stomach ache
Dizziness
Sweating
Seeing
Reading
Interesting
Recognition
Waiting
Suffocation
Feeling nauseous
Heartburn
Sneezing
Drinking
Speaking
Reasoning
Estimating
Recollection
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Effect Size
Negative emotion
Positive emotion
Illnesses
Homeostasis
Cognition
Unspecific

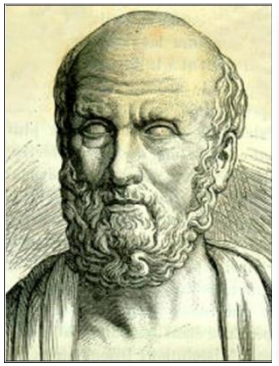
BREVE HISTORIA DE LAS EMOCIONES

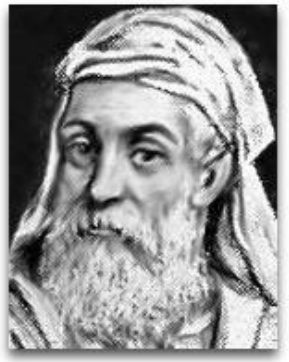
Corazón vs. cerebro



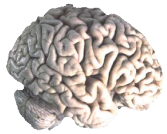
1. LAS EMOCIONES: BREVE HISTORIA

Comportamiento (mente) está controlado por un alma:



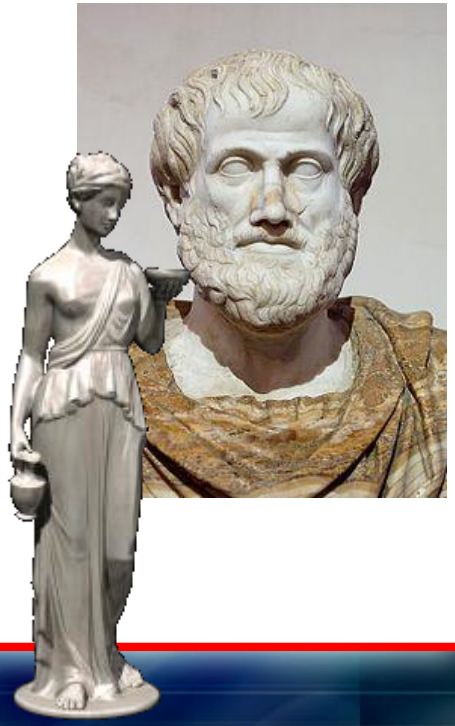


-Alcmeon de Crotona (500 años a. de C.): Cerebro



-Empédocles (490 a de C.): Corazón

Aristóteles: El corazón era la sede de las sensaciones de las pasiones y de la inteligencia. El cerebro compuesto de agua y tierra no tenía otro papel que refrigerar el organismo.



Ni en el Antiguo ni en el Nuevo Testamento se cita ni una sola vez la palabra cerebro, sin embargo sí citan cientos de veces el corazón y hacen referencia al hígado, intestino... como lugares de asiento de la pasión, el coraje y la compasión. “ *Te doy un corazón de sabiduría*” dijo el profeta.

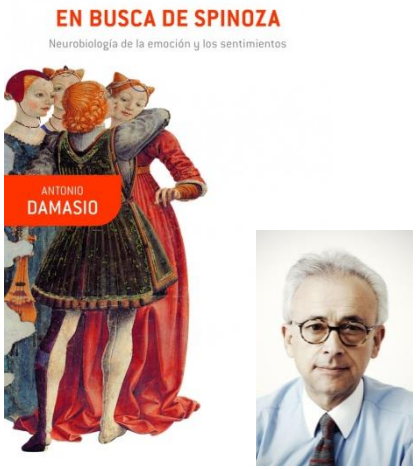
Legado actual: Frases como “*me has roto el corazón*”

CORAZÓN vs. CEREBRO

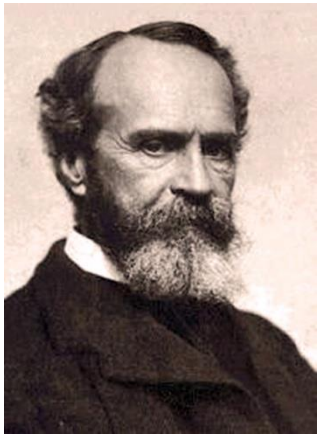
1-¿Qué es una emoción?

1. LAS EMOCIONES

- ***Damasio* (2003): «las emociones se representan en el teatro del cuerpo». «Los sentimientos se representan en el teatro de la mente».**
- ***«Las emociones son el fundamento de los sentimientos».***



- ***William James* (1884): «como respuesta a las experiencias y estímulos, el sistema nervioso autónomo crea respuestas fisiológicas (tensión muscular, lagrimeo, aceleración cardiorrespiratoria…) a partir de las cuales se crean las emociones»**



Damasio, A. (2003). En busca de Spinoza. Neurobiología de la emoción y los sentimientos. Barcelona: Booket.

2. DEFINICIÓN

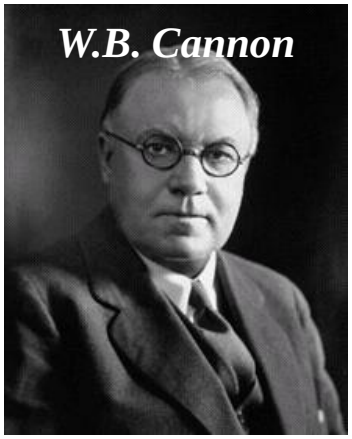
- ***DEFINICIÓN DE EMOCIÓN*** *(Damasio, 2003):*
- *«**conjunto complejo de respuestas químicas y neuronales automáticas que forman un patrón distintivo**». «Estas respuestas son **producidas por el cerebro sano cuando detecta un estímulo emocionalmente competente, ya sea de origen externo o interno**»*
- *«La mayoría de los estímulos nos provoca alguna reacción emocional (por pequeña que sea)»*

«El cerebro está preparado por la evolución para responder a determinados estímulos emocionalmente competentes con repertorios específicos de acción. Sin embargo, existen muchos otros que son aprendidos en toda una vida de experiencia. El resultado inmediato de todas estas respuestas es un cambio temporal en el estado del propio cuerpo»

Damasio, A. (2003). En busca de Spinoza. Neurobiología de la emoción y los sentimientos. Barcelona: Booket.

2. DEFINICIÓN

- *Todos los organismos vivos (desde una ameba hasta un ser humano), nacen con una maquinaria diseñada para resolver automáticamente, sin que se requiera el razonamiento adecuado, los problemas básicos de la vida (**homeostásis**): (emociones en animales)*



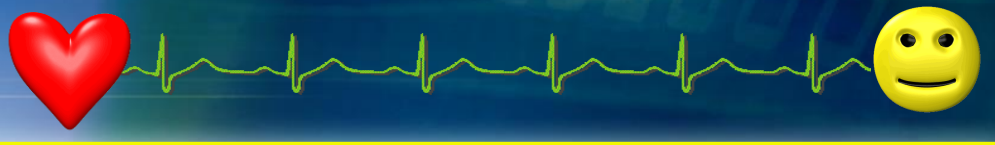
1. -Encontrar fuentes de energía; mantener un equilibrio químico del interior compatible con el proceso vital

2. -Conservar la estructura del organismo mediante la reparación del desgaste natural.

3. -Detener los agentes externos de enfermedad y daño físico.

Sapolsky, R.M. (1995). ¿Por qué las cebras no tienen úlcera? La guía del estrés. Madrid, Alianza.

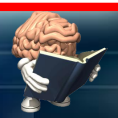
2. DEFINICION



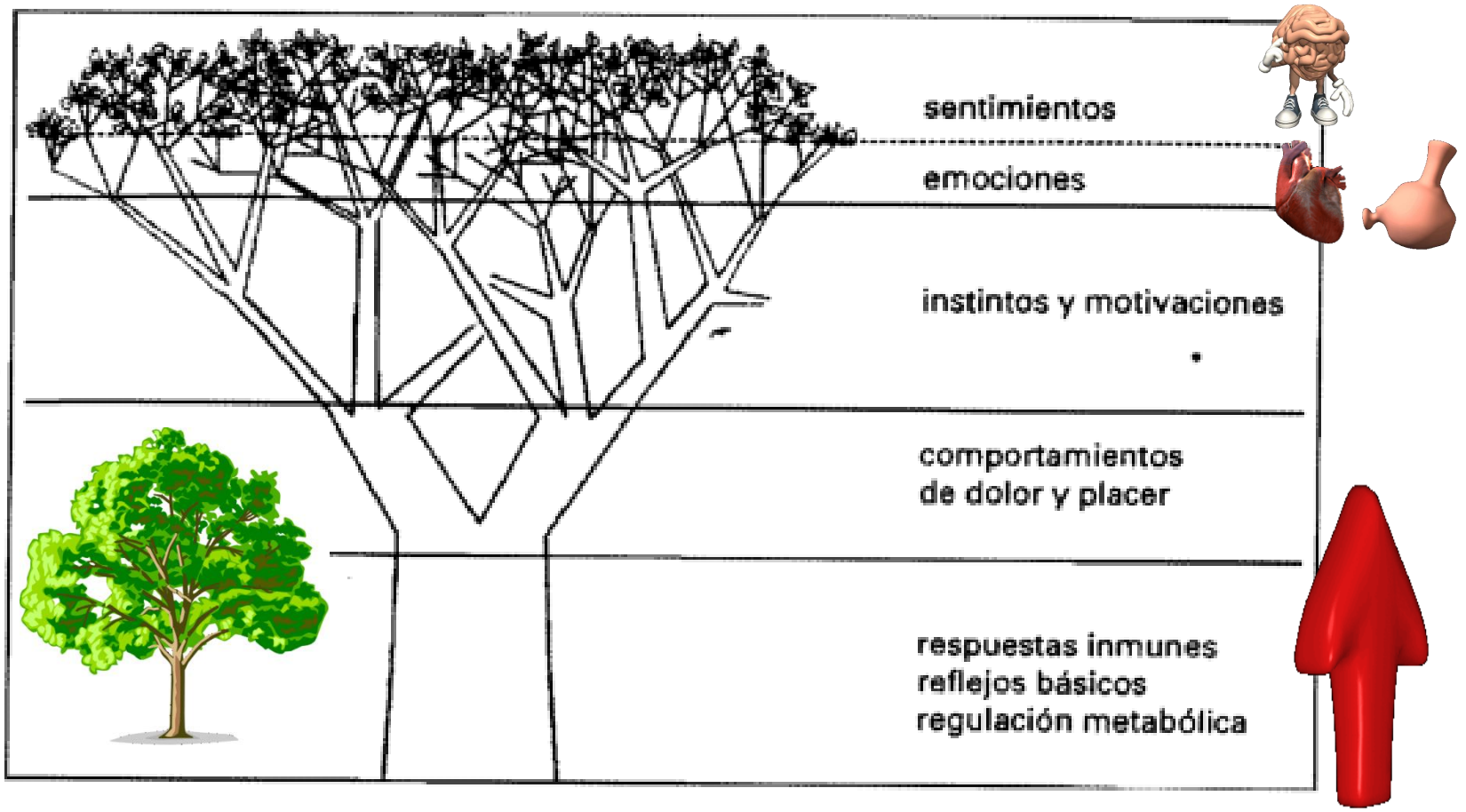
- *Niveles de **regulación homeostática**, desde lo simple a lo complejo:*

- ***-Regulación metabólica.** Mantener el equilibrio de las **señales químicas** internas (acidez y alcalinidad; síntesis y transporte de proteínas, lípidos y carbohidratos, etc.).*
- ***-Reflejos básicos.** **Reflejo de sobresalto**: los organismos responden ante un ruido fuerte o contacto. **Tropismos** que hacen los organismos para alejarse del frío y acercarse al calor, o bien para alejarse de la oscuridad y acercarse a la luz.*
- ***-El sistema inmune**. Preparado para detectar virus, parásitos, bacterias y moléculas de sustancias químicas tóxicas que invaden el organismo.*
- ***-Comportamientos de dolor y placer**. Cuando hay o una lesión inminente de tejidos del cuerpo, las células de la región afectada emiten señales químicas nociceptivas. En respuesta, el organismo reacciona automáticamente con comportamientos de dolor o comportamientos de enfermedad (**citoquina**s). Placer: **endorfinas**.*
- ***-Instintos y motivaciones**. Hambre, sed, curiosidad, exploración, juego y sexo.*
- ***-Emociones propiamente dichas**. Desde la alegría, la pena y el miedo hasta el orgullo, la vergüenza y la simpatía. En esta misma cúspide también encontraríamos los sentimientos.*

Sapolsky, R.M. (1995). ¿Por qué las cebras no tienen úlcera? La guía del estrés. Madrid, Alianza.



1. LAS EMOCIONES

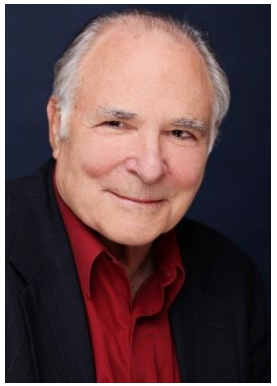


Niveles de regulación homeostática automatizada, desde lo simple a lo complejo. Los sentimientos son una expresión mental de todos los demás niveles de regulación homeostática

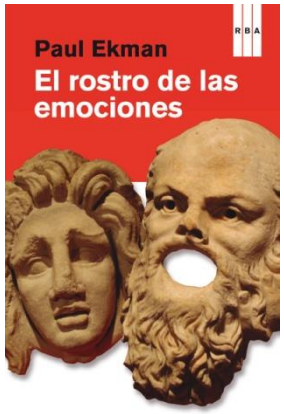
Damasio, A. (2003). En busca de Spinoza. Neurobiología de la emoción y los sentimientos. Barcelona: Booket.

1. LAS EMOCIONES

- ***CATEGORIAS DE LAS EMOCIONES***
- ***Emociones de fondo:*** *Consecuencia del despliegue de determinadas combinaciones de reacciones reguladoras más sencillas (por ejemplo, procesos homeostáticos básicos, comportamientos de dolor y placer y apetitos).*



- ***Emociones primarias (o básicas)*** *Miedo, ira, asco, sorpresa, tristeza y alegría. Estas emociones las encontramos en todas las culturas (**Paul Ekman**)*
- ***Emociones sociales:*** *Simpatía**, amor,** la turbación, vergüenza, culpabilidad, orgullo, celos, envidia, gratitud, admiración, indignación y el desdén. Piénsese de qué manera la emoción social "desdén" toma prestadas las expresiones sociales de "repugnancia", una emoción primaria que evolucionó en asociación con el rechazo automático y beneficioso de algunos alimentos tóxicos.*



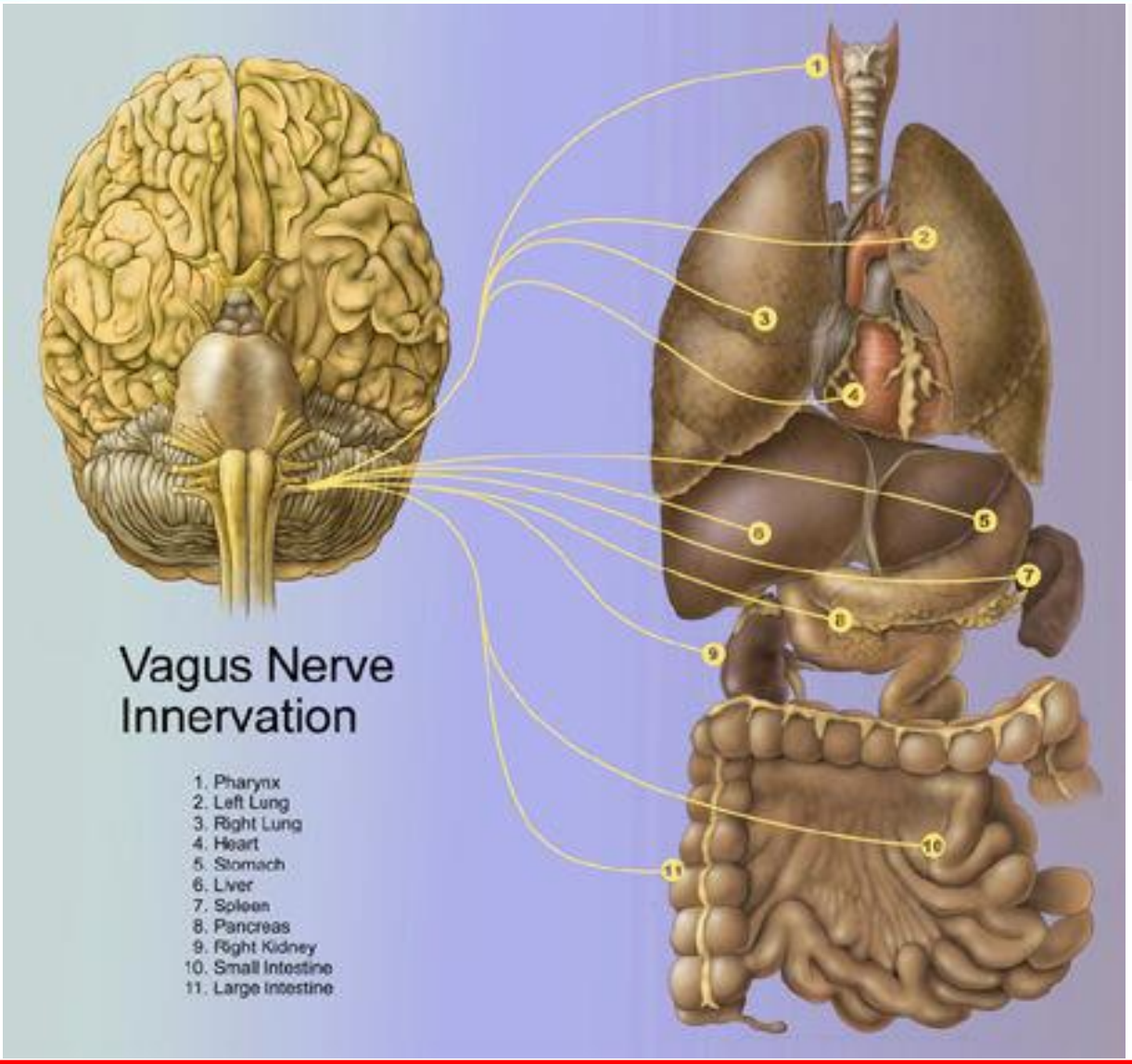
Ekman, P.(2012). El rostro de las emociones. RBA Libros.

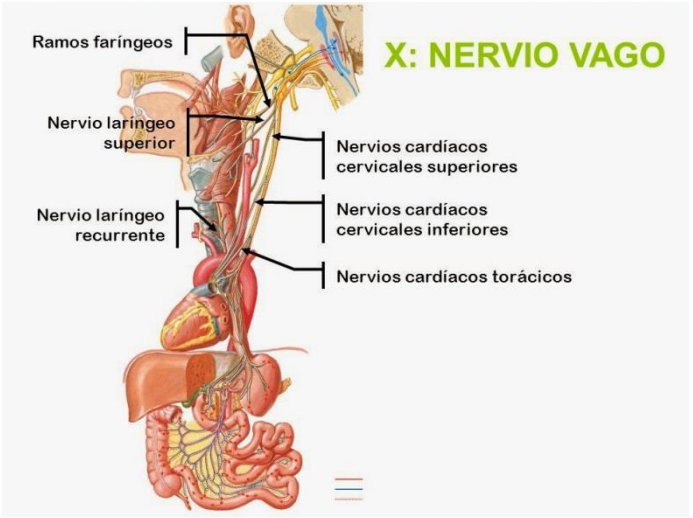
1. LAS EMOCIONES

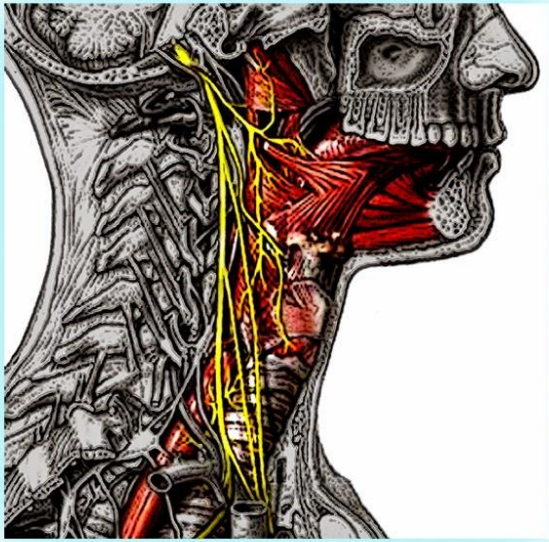
Taxonomía de los sentimientos								
Protoemociones	Bienestar		Malestar					
Emociones básicas	Alegría		Miedo		Enfado		Tristeza	
Emociones cognitivas primarias (ejemplos)	Buen humor	Satisfacción	Amenaza	Angustia	Disgusto	Frustración	Decepción	Abatimiento
Emociones cognitivas secundarias (ejemplos)	Amor Suerte		Vergüenza Celos Envidia		Cólera Desprecio		Luto	

Ekman, P.(2012). El rostro de las emociones. RBA Libros.

3. LAS EMOCIONES: NERVIO VAGO





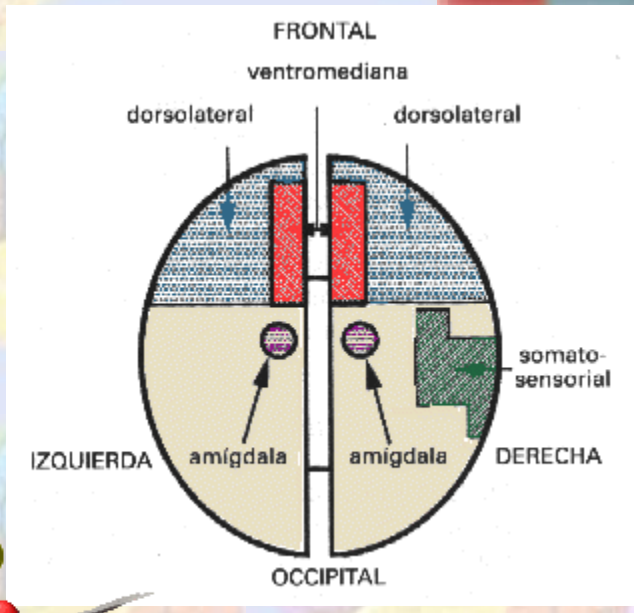


2. CEREBRO EMOCIONAL

Marcadores somáticos

El marcador somático

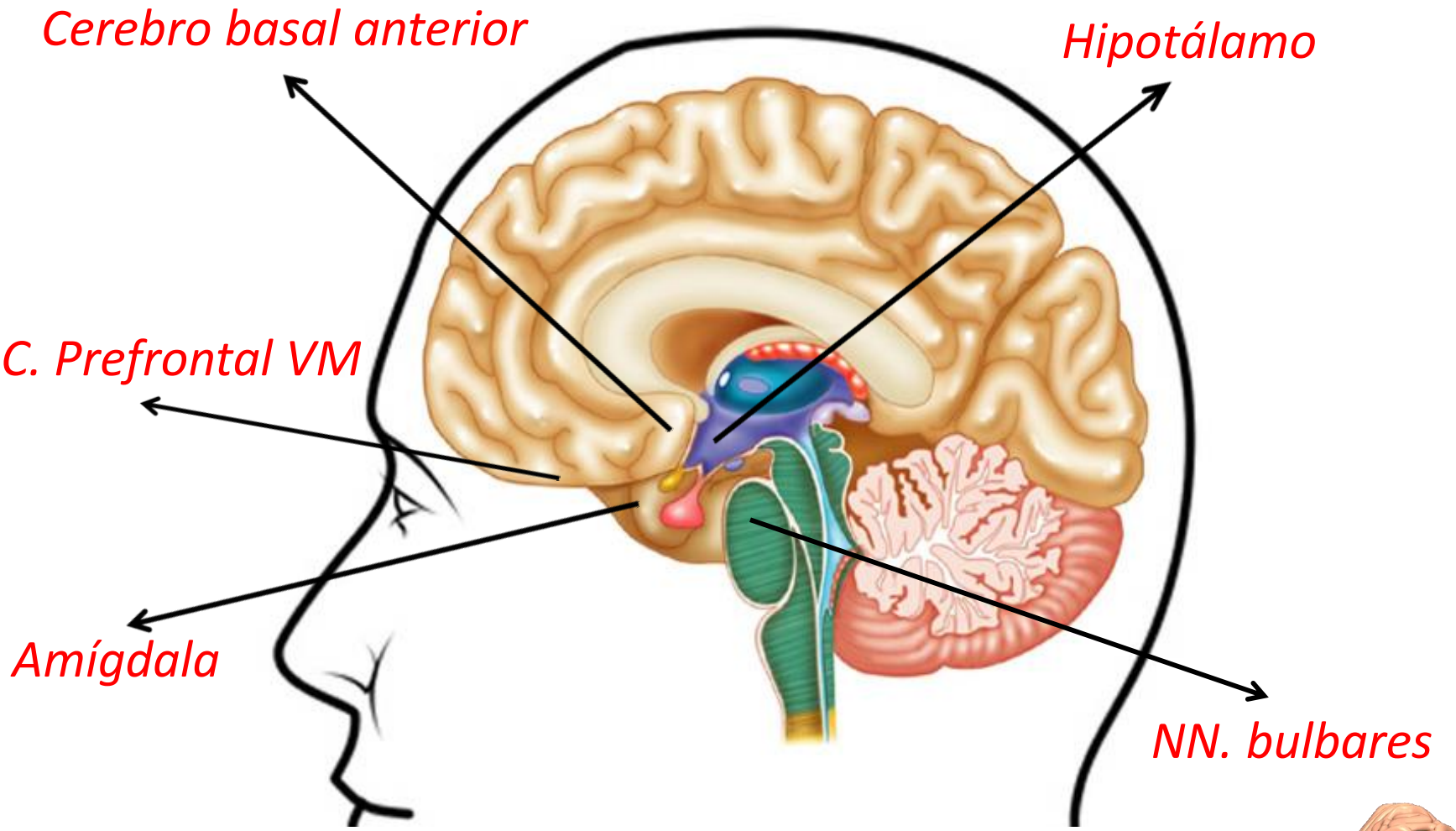
Las cortezas prefrontales serían las encargadas de la adquisición de las señales de los marcadores somáticos. Sus múltiples y variadas conexiones con todas las regiones sensoriales (incluidas las cortezas somatosensoriales), con los núcleos del troncoencéfalo y del prosencéfalo basal, con la amígdala, la ínsula anterior, con el cortex cingulado anterior y el hipotálamo, le mantienen actualizada de lo que ocurre al organismo.



*La **región prefrontal ventromedial** cumple una función crítica en la representación somatosensorial, interpretando las sensaciones de nuestro cuerpo, asociadas a los eventos emocionales (generan respuestas inmediatas mediadas por el SNA)*

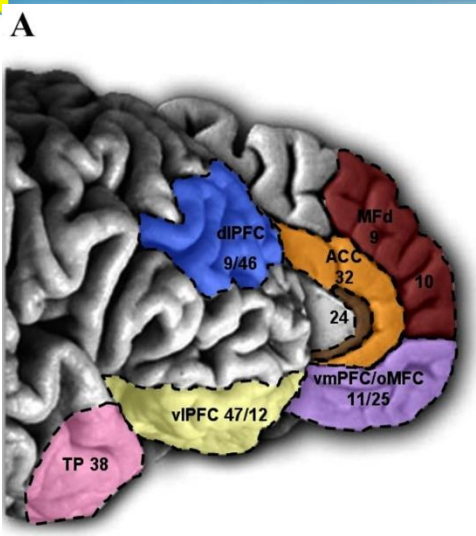
Las cortezas prefrontales establecen categorizaciones de las distintas situaciones que ha debido enfrentar el organismo, creando así una especie de "banco de datos" ordenado sobre nuestras distintas experiencias y a partir de cómo ha reaccionado nuestro cuerpo en aquellas situaciones.

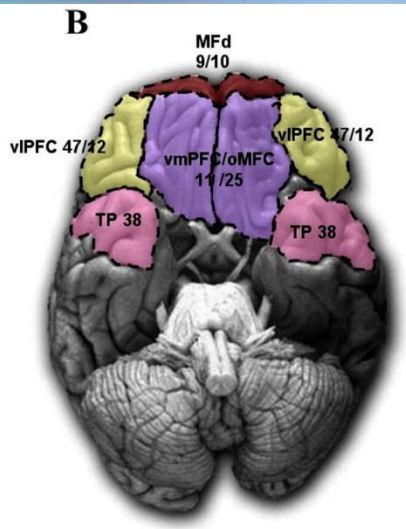
4. CEREBRO EMOCIONAL

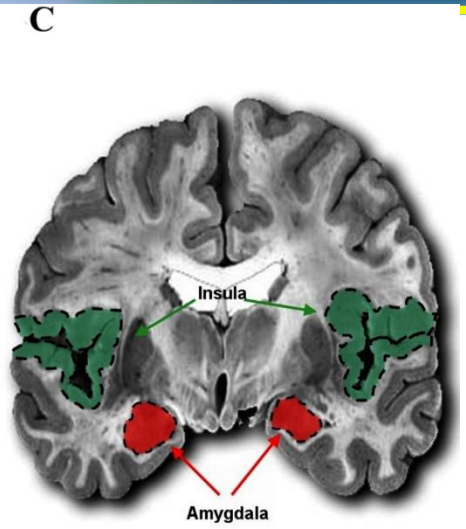


«la emoción resulta de la participación combinada de varios lugares de un sistema cerebral» (Damasio, 2003).

4. CEREBRO EMOCIONAL







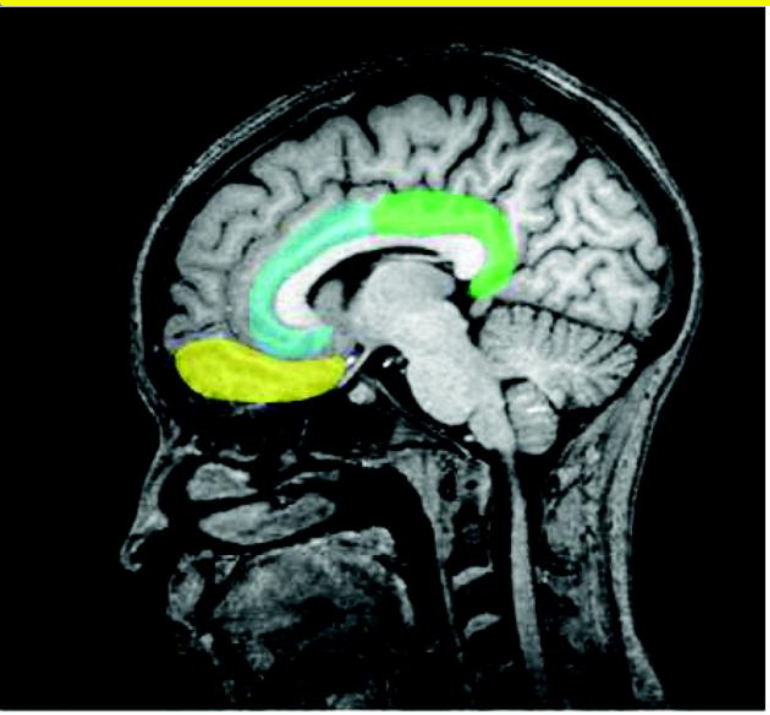
Mobbs D, Lau HC, Jones OD, Frith CD (2007)- Law, Responsibility, and the Brain. PLoS Biol 5(4): April 17,

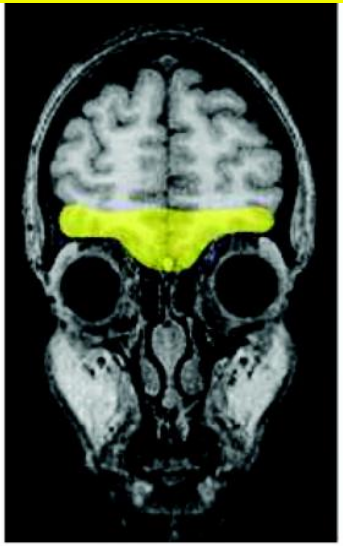
Brain Region	Pro-Social Behaviour
Anterior cingulate cortex	Empathy [71,72]
Orbital PFC	Regret [24]
Ventromedial PFC	Ethical decisions [73,74]
Ventrolateral PFC	Inhibition of behaviour [75]
Dorsolateral PFC	Reasoning [46,76]

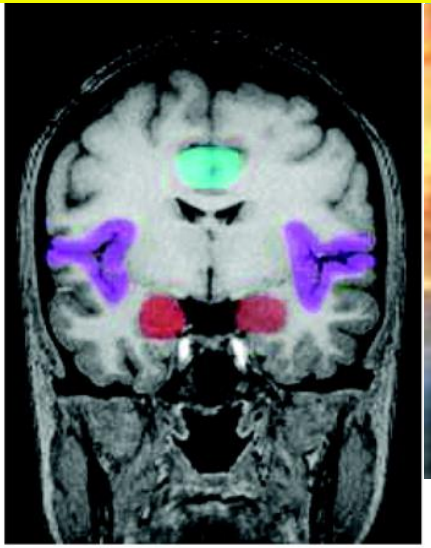
doi:10.1371/journal.pbio.0050103.t001

MARCADORES SOMÁTICOS

4. CEREBRO EMOCIONAL







Science 8 November 2007: Vol. 298. no. 5596, pp. 1191 – 119
Review NEUROSCIENCE AND PSYCHOLOGY:
Emotion, *COGNITION****, and Behavior R. J. Dolan***

Brain regions implicated in emotional experience include orbitofrontal cortex (yellow), insular cortex (purple), and anterior (blue) and posterior (green) cingulate cortices. The amygdala (red) is involved in linking perception with automatic emotional responses and memory

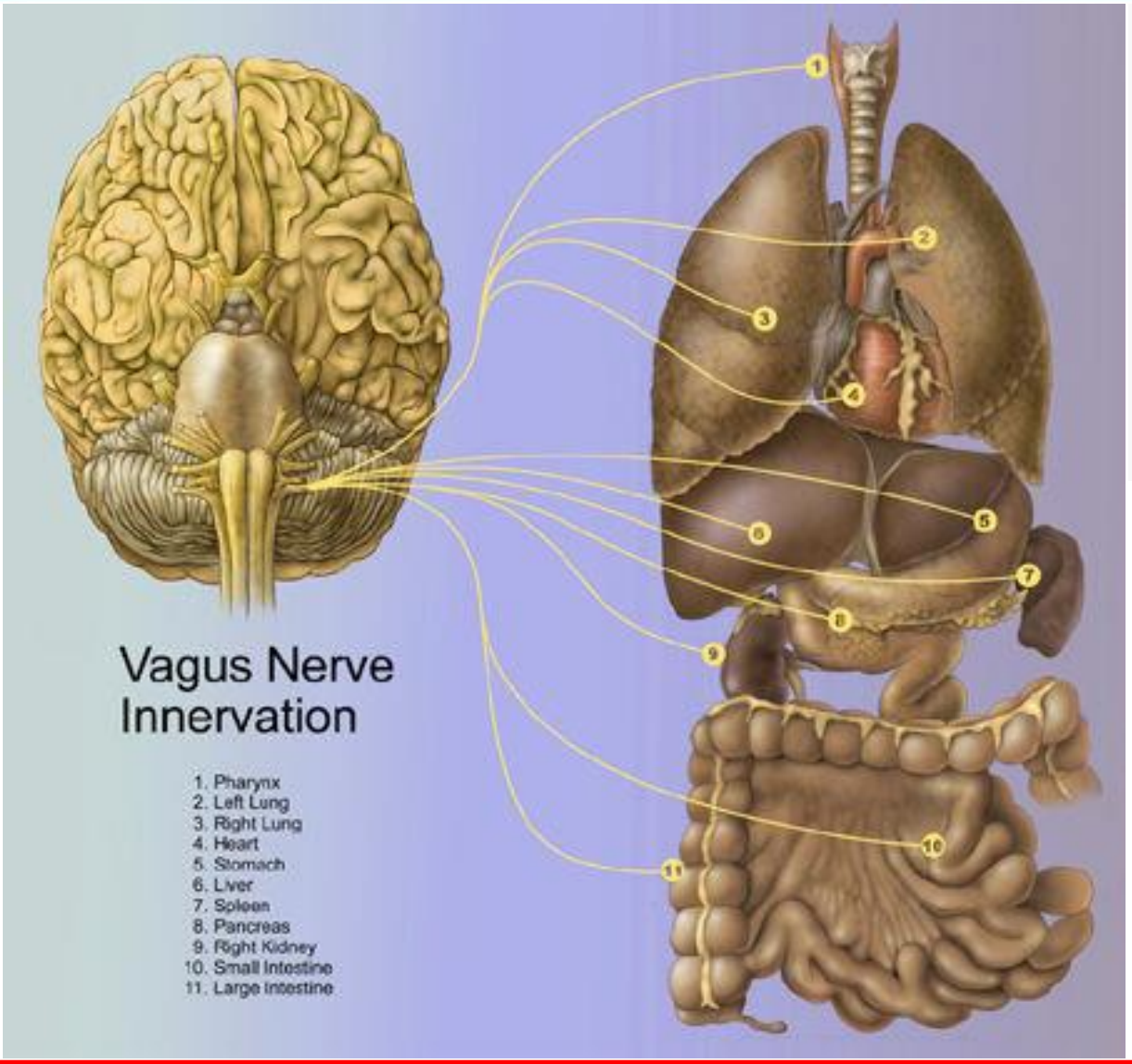
MARCADORES SOMÁTICOS

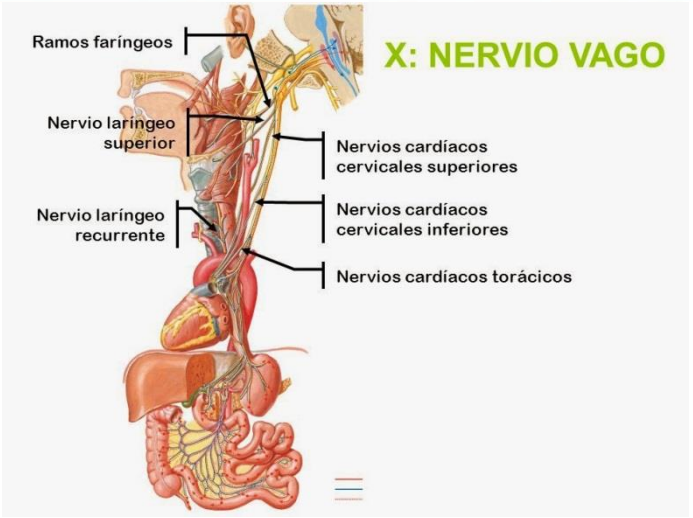
4. CEREBRO EMOCIONAL: Marcadores somáticos

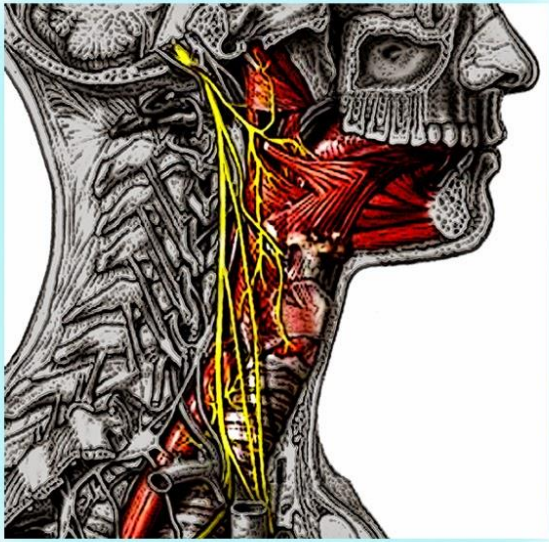
Evaluación y definición de un estímulo emocional (miedo)	1	Corteza cerebral sensorial asociativa (superior)
Disparo (inducción)	2	Amígdala
Ejecución	3	Cerebro basal anterior Hipotálamo Troncoencéfalo
Estado emocional	4	Cambios transitorios en el medio interno (vísceras y sistema musculoesquelético)

Damasio, A. (2003). En busca de Spinoza. Neurobiología de la emoción y los sentimientos. Barcelona: Booket.

3. LAS EMOCIONES: NERVIO VAGO

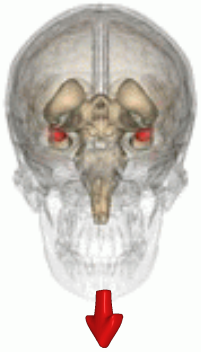






4. CEREBRO EMOCIONAL

http://www.dailymotion.com/video/x8upy4_cerebro-emocional-amigdala_school

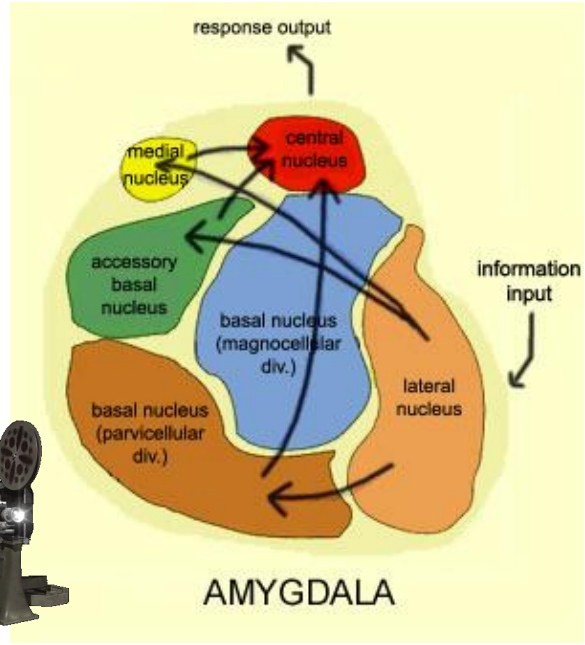


Amígdala

*-La **hipótesis amígdala-miedo** ha sido la más popularizada por la neurociencia apoyando que la amígdala (en particular el núcleo central) provoca cambios cardiovasculares en ratas en respuesta a sobresaltos (tonos asociados a pequeñas descargas eléctricas) (LeDoux et al., 1990).*

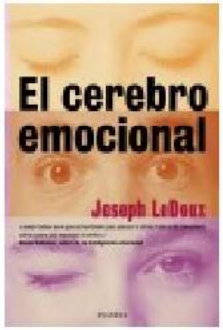
*-Pacientes con **lesiones en la amígdala** (LaBar et al., 1995) o **atrofia** (Bechara et al., 1995) mostraron dificultades para percibir el miedo y deterioro en las respuestas de la conductancia de la piel.*

Feinstein et al. (2011) estudiaron un individuo con lesión amigdalina bilateral que no informó sentir miedo cuando se le expuso en contacto directo con serpientes y arañas.



LeDoux, J., Ciccetti, P., Xagoraris, A., Romanski, L. (1990). The lateral amygdaloid nucleus: Sensory interface of the amygdala in fear conditioning. Journal of Neuroscience, 10, 1062–69.

4. CEREBRO EMOCIONAL



http://www.dailymotion.com/video/xpfvzf_cerebro-el-circuito-del-miedo-joseph-ledoux_school

http://www.dailymotion.com/video/xpovem_cerebro-y-emociones-joseph-ledoux_school

http://www.dailymotion.com/video/xpql27_cerebro-el-sistema-del-miedo-joseph-ledoux_school

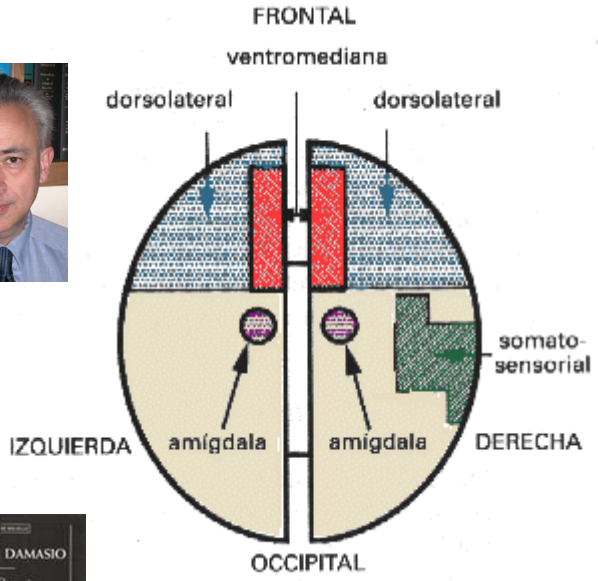
http://www.dailymotion.com/video/xbbrnj_vias-cerebrales-del-miedo-joseph-le_school

http://www.dailymotion.com/video/x6nf05_amigdala-vs-lobulo-frontal_school

Le Doux, J. (1999). El cerebro emocional. Editorial Planeta

4. CEREBRO EMOCIONAL: Los marcadores somáticos

Las cortezas prefrontales *serían las encargadas de la adquisición de las señales de los marcadores somáticos. Sus múltiples y variadas conexiones con todas las regiones sensoriales (incluidas las cortezas somatosensoriales), con los núcleos del troncoencéfalo y del prosencéfalo basal, con la amígdala, la ínsula anterior, con el cortex cingulado anterior y el hipotálamo, le mantienen actualizada de lo que ocurre al organismo a través del* ***nervio vago****.*



La ***región prefrontal ventromedial*** *cumple una función crítica en la representación somatosensorial, interpretando las sensaciones de nuestro cuerpo, asociadas a los eventos emocionales (generan respuestas inmediatas mediadas por el SNA)*

Las cortezas prefrontales establecen categorizaciones de las distintas situaciones que ha debido enfrentar el organismo, creando así una especie de "banco de datos" ordenado sobre nuestras distintas experiencias y a partir de cómo ha reaccionado nuestro cuerpo en aquellas situaciones.

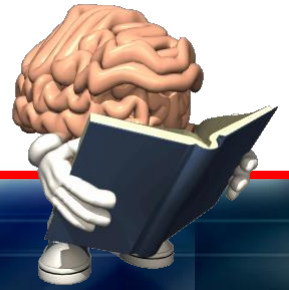
Damasio, A. (2011). El error de Descartes. Editorial Destino

4. EMOCIONES: Miedo y amígdalas

La amígdala también está implicada en algunas psicopatologías (ansiedad y la psicopatía). La RMf ha puesto de manifiesto que en el caso de la ansiedad, la amígdala se encontraría ***hiperreactiva****, en cambio, en la psicopatía la amígdala está* ***hipofuncional*** *(junto con la corteza prefrontal orbitofrontal), por ello, estos individuos son incapaces de empatizar emocionalmente con el resto de seres humanos.*

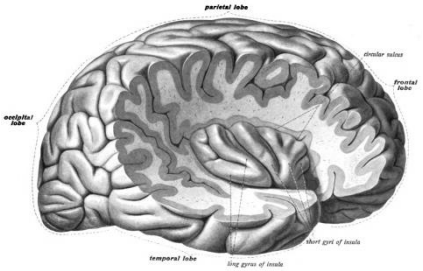
Otra función muy importante de la amígdala es la ***focalización de la atención a estímulos aversivos*** *(Anderson y Phelps, 2001) y a* ***estímulos socialmente relevantes*** *(Kennedy y Adolphs, 2010). Esto nos sugiere la idea de que la amígdala está implicada en la* ***atención hacia estímulos salientes*** *(Lindquist et al., 2012) y su estimulación eléctrica produce una gama de experiencias en los humanos que no únicamente se reducen al miedo (Bancaud et al., 1994).*

*Según el neurocientífico Joseph Ledoux: «****la amígdala es útil para desencadenar respuestas rápidas ante situaciones de peligro»****. De modo que si está enfrentada a un peligro, sabe que lo es y lo racionaliza.*



4. EMOCIONES: La ínsula anterior

*-La **hipótesis de la ínsula anterior y asco** es la más reconocida hasta la actualidad: Tienen dificultades para percibir asco o disgusto en caras (Adolphs et al., 2003). Estos individuos experimentan menos repugnancia cuando se les exponen a insectos, excrementos u otros estímulos que normalmente provocan asco a personas con la ínsula intacta (Calder et al., 2000).*



-Enfermedades neurodegenerativas que afectan a la ínsula y ganglios basales (v.g. Corea de Huntington y Parkinson) muestran un menor asco o disgusto ante estímulos malolientes (Mitchell et al., 2005).

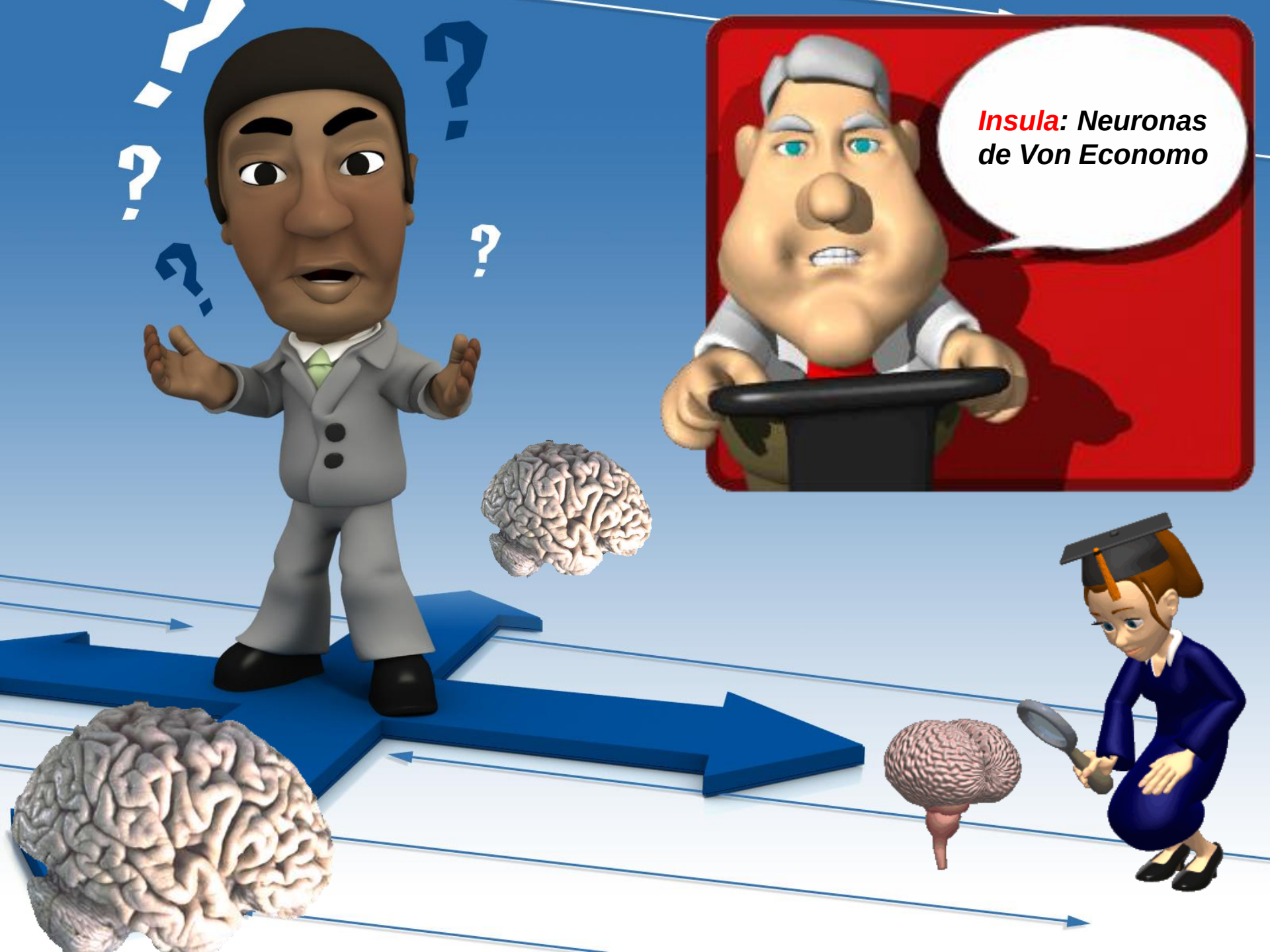
-Pacientes con estimulación eléctrica en la ínsula anterior informaron sensaciones viscerales consistentes con la experiencia de asco (por ejemplo, sensaciones en el estómago y garganta, náuseas; Penfield y Faulk, 1995).

*-Está implicada en la **toma de conciencia de las sensaciones corporales** (Craig, 2002) y del **estado afectivo principal** (Craig, 2009). La ínsula anterior muestra una mayor activación cuando tomamos conciencia del movimiento de nuestro cuerpo, la distensión gástrica, durante el orgasmo, movimiento, espasmos, calor y hormigueo en los labios, la lengua, los dientes, los brazos, las manos y los dedos (no solo asco).*

4. LAS EMOCIONES: Asco e insula anterior

http://www.dailymotion.com/video/x8fowh_asco-en-el-cerebro-rmf_school

MARCADORES SOMÁTICOS

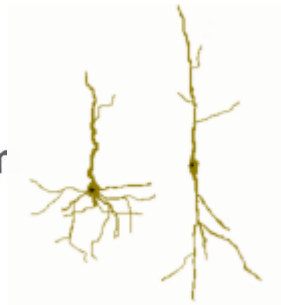

Insula: Neuronas de Von Economo

Opinion TRENDS in Cognitive Sciences Vol.9 No.8 August 2005

Intuition and autism: a possible role for Von Economo neurons

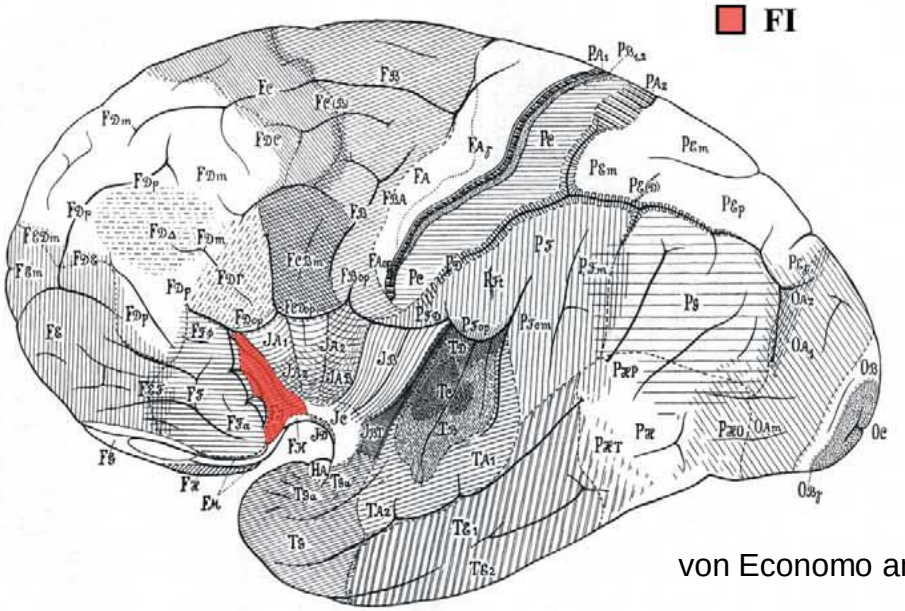
John M. Allman, Karli K. Watson, Nicole A. Tetreault and Atiya Y. Hakeem

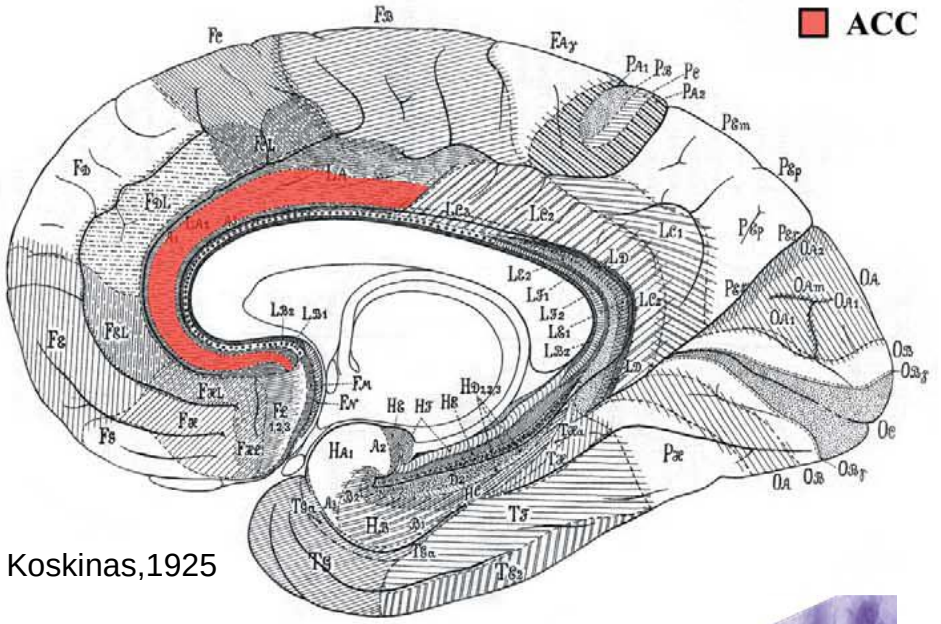
Division of Biology, M. C. 216-76, California Institute of Technology, Pasadena, CA 91125, USA



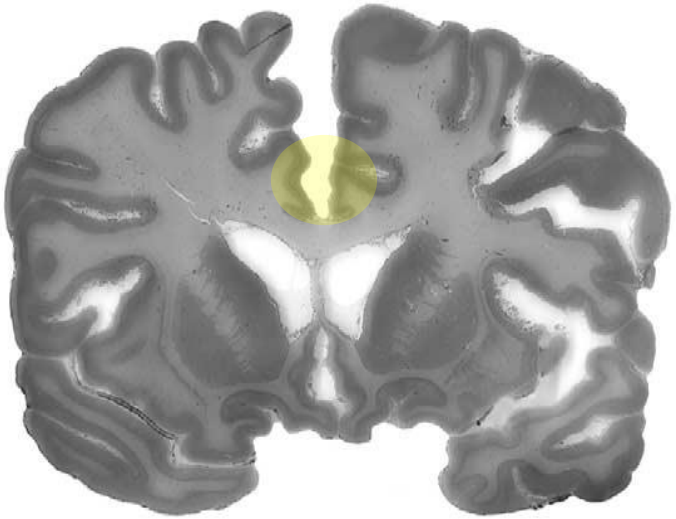
Von Economo neurons (VENs) are a recently evolved cell type which may be involved in the fast intuitive assessment of complex situations. As such, they could be part of the circuitry supporting human social networks. We propose that the VENs relay an output of fronto-insular and anterior cingulate cortex to the parts of frontal and temporal cortex associated with theory-of-mind, where fast intuitions are melded with slower, deliberative judgments. The VENs emerge mainly after birth and increase in number until age 4 yrs. We propose that in autism spectrum disorders the VENs fail to develop normally, and that this failure might be partially responsible for the associated social disabilities that result from faulty intuition.

mapped in humans by Von Economo and Koskinas [2]. Elsewhere we have referred to them as the 'spindle' neurons, but because of potential confusion with other uses of this term, we now refer to them by the first author of the best description of these cells. They are found only in humans and great apes [3] and are far more abundant in humans than in apes (see Figure 2). They are thus a phylogenetic specialization that has arisen within the last 15 million years in hominoids and have proliferated greatly within the human line of descent. Because of this late emergence in phylogeny, natural selection has had only a relatively short time to shape VEN functioning and integration with other cell populations. Consequently the VENs might be particularly vulnerable to dysfunction in a manner analogous to the propensity of humans to suffer

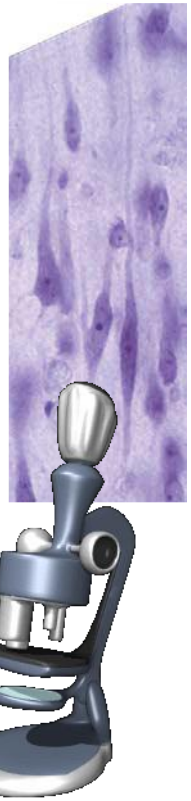




von Economo and Koskinas,1925



Regions of the brain containing Von Economo neurons (VENs).
(a) A lateral view of the brain, with fronto-insular cortex (FI) shown in red. (b) A medial view of the brain, with anterior cingulate cortex (ACC) shown in red. Adapted from Von Economo and Koskinas [2]. (c) FI and the spindle-cell-containing region of ACC indicated on coronal sections through a human brain (50-year-old female) and (d) a common chimpanzee brain (sections shown with the right hemisphere of the brain on the right of the figure). Sections are from the Yakovlev Brain Collection at the National Museum of Health and Medicine, and were scanned by the authors. Note that FI is much larger in the human than in the chimpanzee. (e) A Von Economo neuron and a pyramidal neuron in layer 5 of FI. Both types of neuron have a single apical dendrite, but note that the VEN also has only a single basal dendrite, in contrast to the pyramidal neuron's multiple basal dendrites. Photomicrograph by the authors of a section fromthe 50-year-old human brain shown in part (c).



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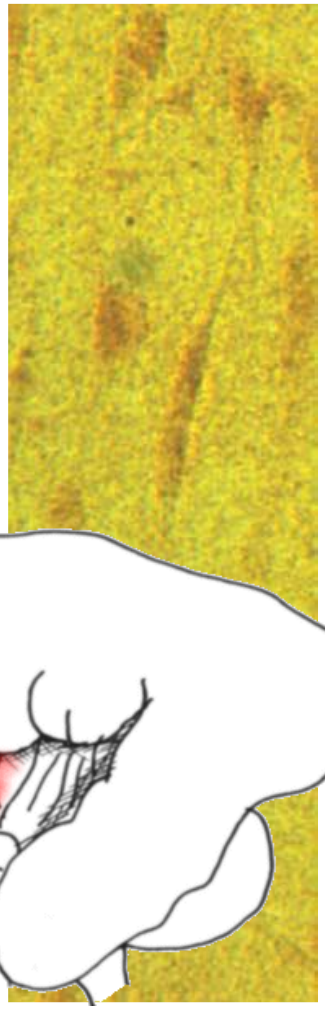
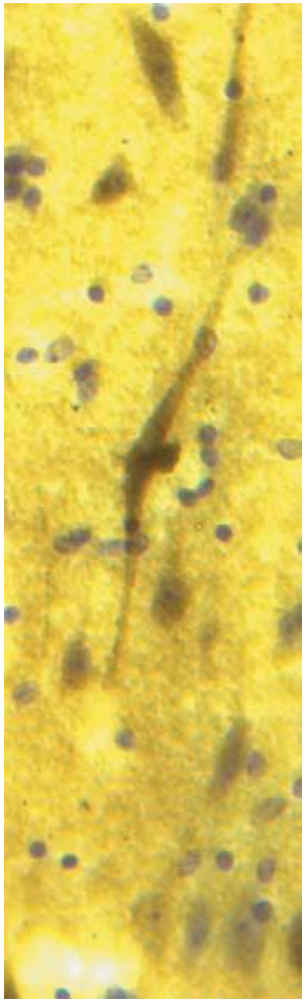
John M. Allman, Karli K. Watson, Nicole A. Tetreault and Atiya Y. Hakeem
TRENDS in Cognitive Sciences Vol.9 No.8 August 2005

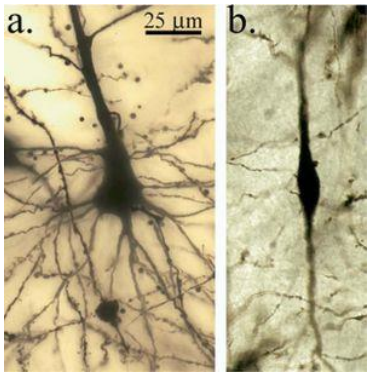
Vasopressin 1a

Dopamine d3

Serotonin 2b







Immunocytochemistry of Von Economo neurons. VENs in ACC of male humans, labeled with antibodies to:

(a) the vasopressin 1a receptor, which has been linked to the formation of social bonds in rodents

(b) the dopamine d3 receptor, a high-affinity receptor potentially linked to the anticipation of reward under conditions of uncertainty;

(c) the serotonin 2b receptor which may be linked to the anticipation of punishment.

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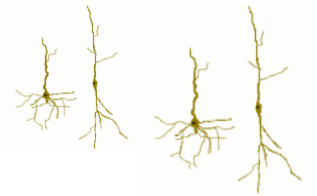
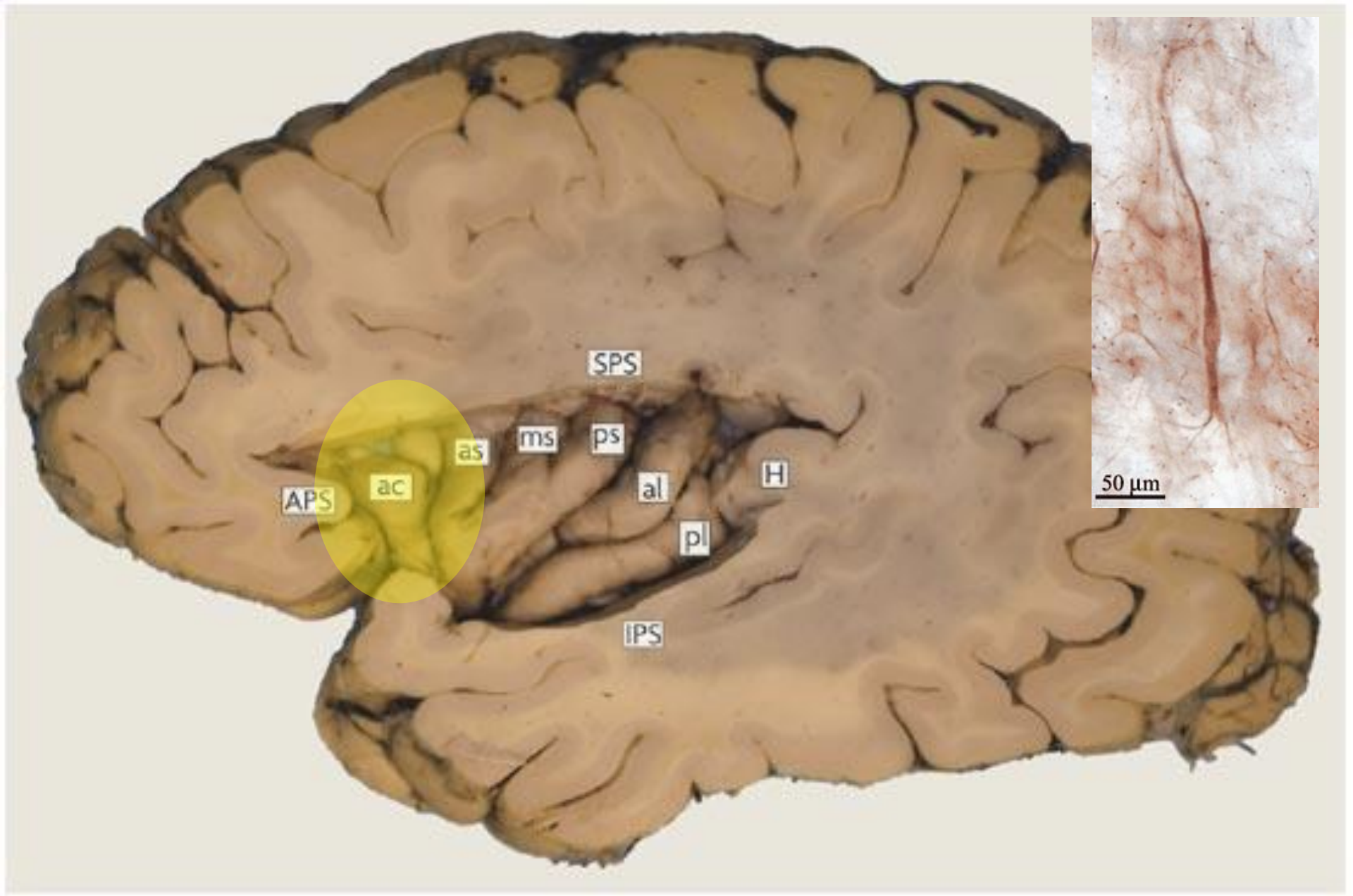




Insula

Nature Reviews | Neuroscience

Early Frontotemporal Dementia Targets Neurons Unique to Apes and Humans

William W. Seeley, MD,[1] Danielle A. Carlin, BA,[1] John M. Allman, PhD,[2] Marcelo N. Macedo, BS,[1] Clarissa Bush, BA,[3] Bruce L. Miller, MD[1] and Stephen J. DeArmond, MD, PhD,[3]

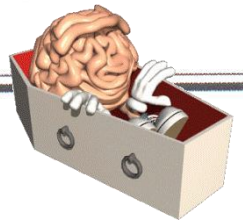
Objective: Frontotemporal dementia (FTD) is a neurodegenerative disease that erodes uniquely human aspects of social behavior and emotion. The illness features a characteristic pattern of early injury to anterior cingulate and frontoinsular cortex. These regions, though often considered ancient in phylogeny, are the exclusive homes to the von Economo neuron (VEN), a large bipolar projection neuron found only in great apes and humans. Despite progress toward understanding the genetic and molecular bases of FTD, no class of selectively vulnerable neurons has been identified.

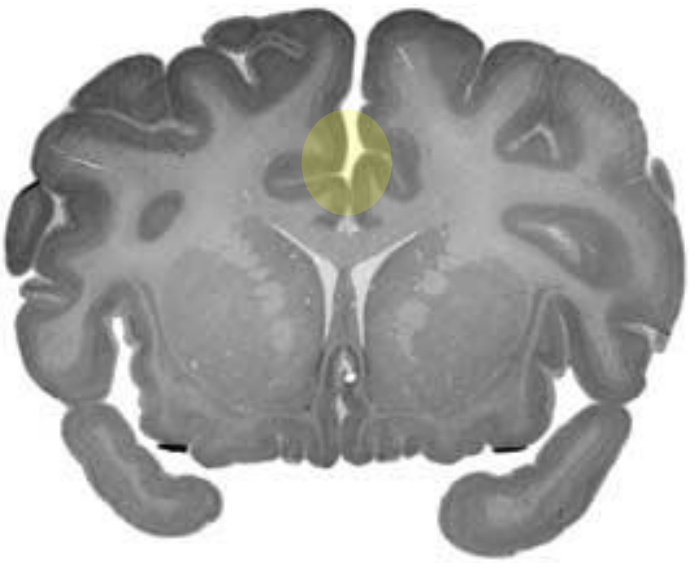
Methods: Using unbiased stereology, we quantified anterior cingulate VENs and neighboring Layer 5 neurons in FTD (n = 7), Alzheimer's disease (n = 5), and age-matched nonneurological control subjects (n = 7). Neuronal morphology and immunohistochemical staining patterns provided further information about VEN susceptibility.

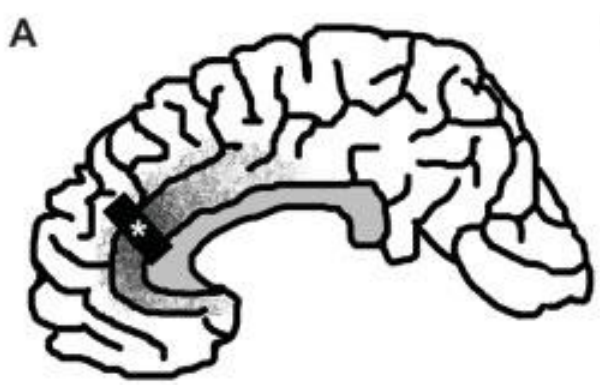
Results: FTD was associated with early, severe, and selective VEN losses, including a 74% reduction in VENs per section compared with control subjects. VEN dropout was not attributable to general neuronal loss and was seen across FTD pathological subtypes. Surviving VENs were often dysmorphic, with pathological tau protein accumulation in Pick's disease. In contrast, patients with Alzheimer's disease showed normal VEN counts and morphology despite extensive local neurofibrillary pathology.

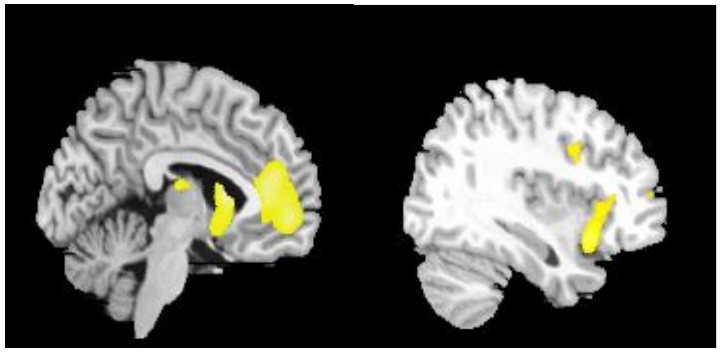
Interpretation: VEN loss links FTD to its signature regional pattern. The findings suggest a new framework for understanding how evolution may have rendered the human brain vulnerable to specific forms of degenerative illness.

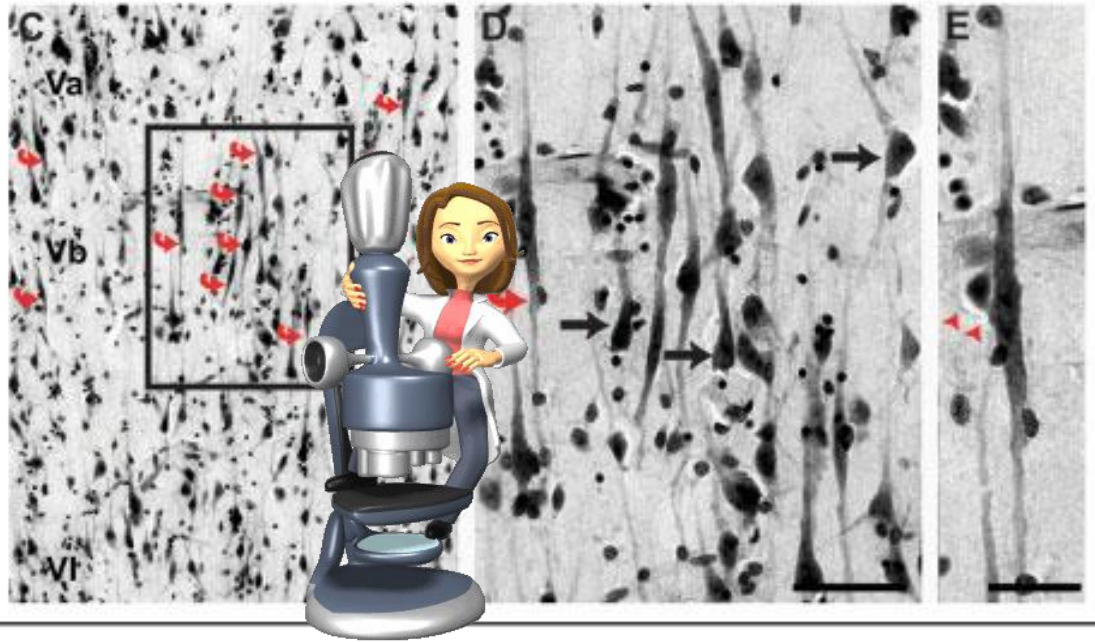
Ann Neurol 2006;60:660–667







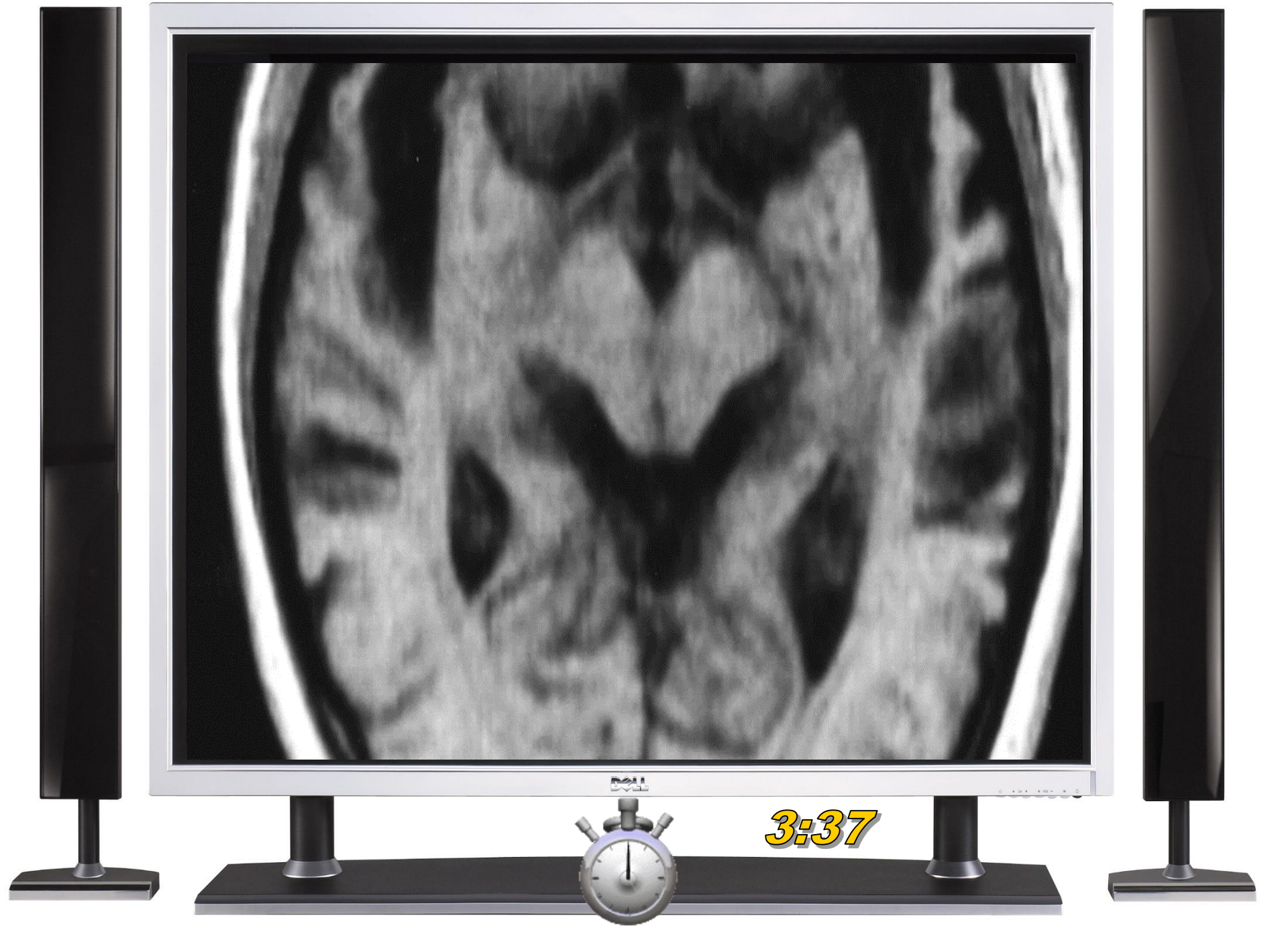




Anterior cingulate sampling site and von Economo neuron (VEN) characteristics in control subjects. (A) VENs are distributed throughout the mid- and anterior cingulate cortex. Dots, *drawn schematically based on previous work,31 highlight the increasing posterior-to-anterior VEN gradient in the normal brain. For this study, tissue blocks were cut from the pregenual anterior cingulate cortex (ACC)* (asterisk). *(B) ACC VEN distribution in a representative nonneurological control subject. Overlaid contours of the ACC (outer) and Layer 5 (red, inner) were manually traced on 5 to 10 sections per subject.* Dots *represent VENs, which are concentrated in the crowns of the gyrus. (C–E) VENs (curved red arrows in C) are located in Layer 5b and are distinguished from neighboring neurons (e.g.* straight black arrows *in D) by their large size and bipolar dendritic architecture. VENs form vertically oriented clusters, often adjacent to small arterioles. Box in (C) is magnified in (D). One of six VENs in (D) is highlighted* (curved red arrow) *and magnified in (E) to show the typical VEN morphology, including a large VEN axon* (red arrowheads). *Cresyl violet stain.*

Early Frontotemporal Dementia Targets Neurons Unique to Apes and Humans
William W. Seeley, et al, Ann Neurol 2006;60:660–667

asnie
inteligencia emocional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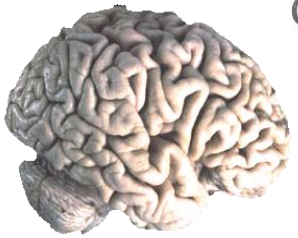
Von Economo neurons are present in the dorsolateral (dysgranular) prefrontal cortex of humans



C. Fajardo [a], M.I. Escobar [a], E. Buriticá [a], G. Arteaga [a], J. Umbarila [a], M.F. Casanova [b], H. Pimienta [a,*]

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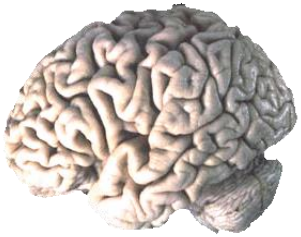
[b] *University of Lousville, Department of Psychiatry, Louisville, KY, United States*

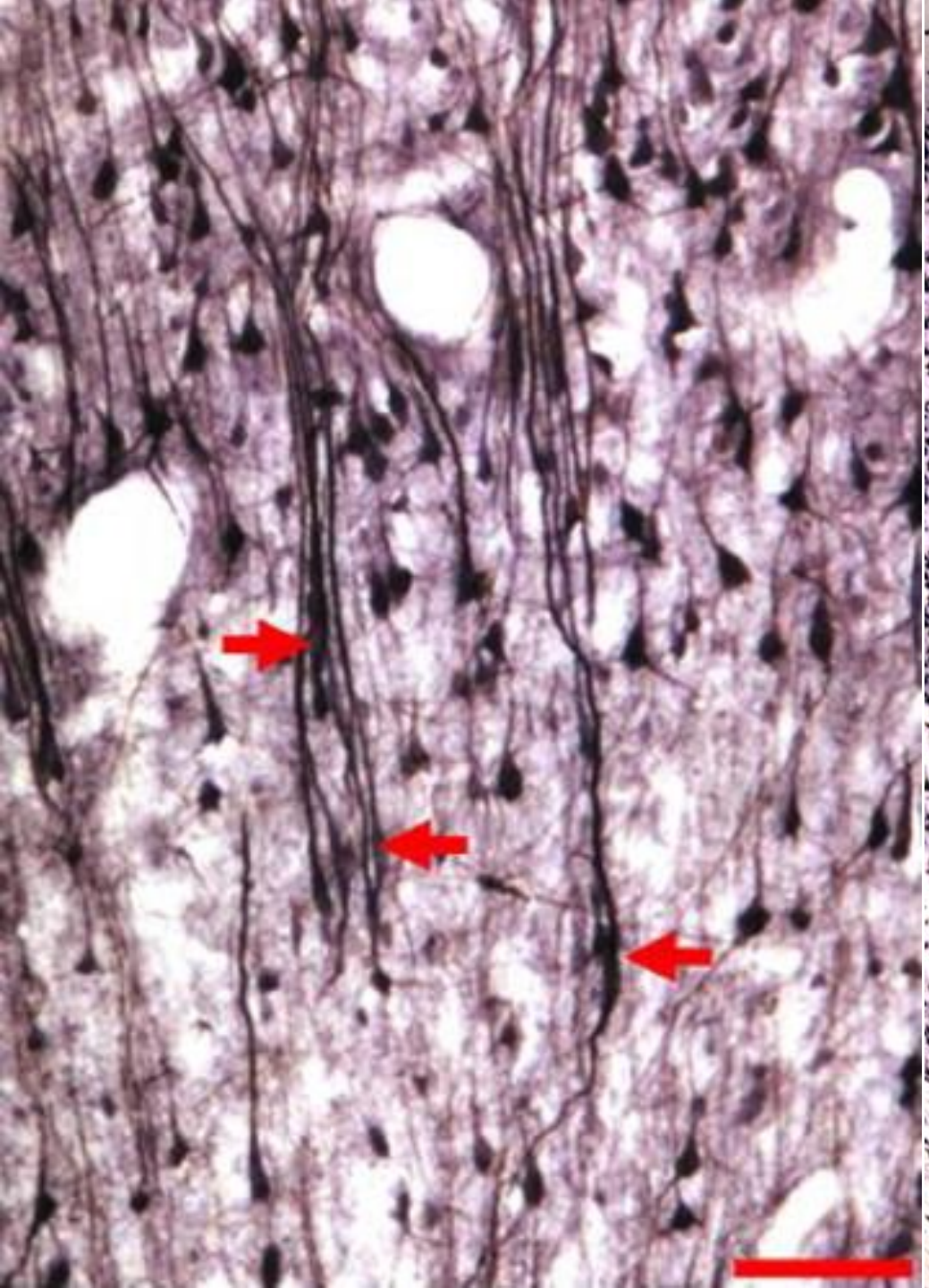
Received 10 January 2008; received in revised form 12 February 2008; accepted 18 February 2008

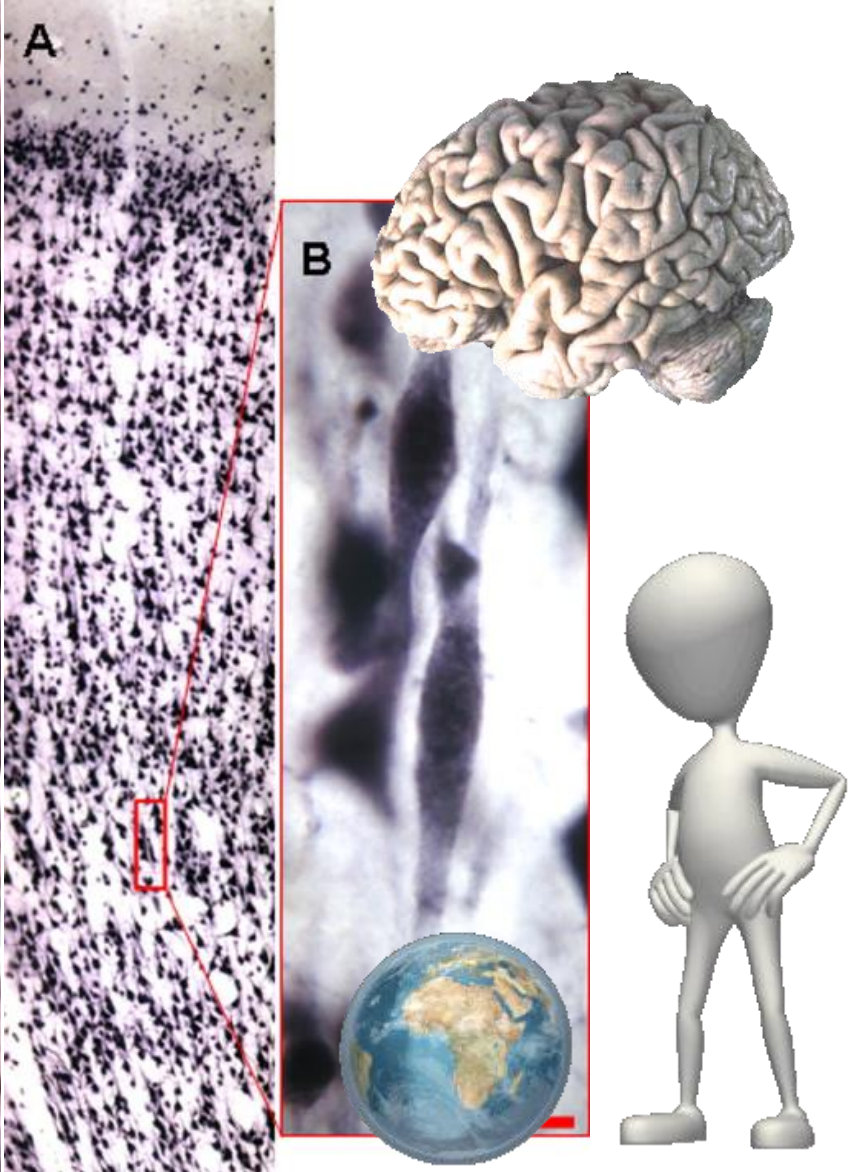


Abstract

Von Economo neurons (VENs), also known as spindle cells, have been described in layer V of the anterior cingulate (BA 24) and frontoinsular cortex (FI) of humans and other great apes. In the present study we used immunohistochemistry against two specific neuronal markers (NeuN and MAP2) in order to establish the presence of these cell types in Brodmann area 9 (BA 9) of the human prefrontal cortex. We evaluated tissue samples of eight human postmortem brains (age range 26–50) from BAs 9, 24, 4, 46, 45, 10 and 17. We identified a group of cells with similar morphology to that previously described for VENs in all specimens of BA 9 examined, albeit less frequently than in BA 24. This is the first description of this cell type in a human brain area with well developed granular layers (BA 9).

Keywords: Von Economo neurons; Spindle cells; Anterior cingulate gyrus; Frontoinsular cortex; Dorsolateral prefrontal cortex





Neuroscience Letters
Volume 435, Issue 3, 25 April 2008, 215-218
Von Economo neurons are present in the dorsolateral (dysgranular) prefrontal cortex of humans **C. Fajardo et al.**

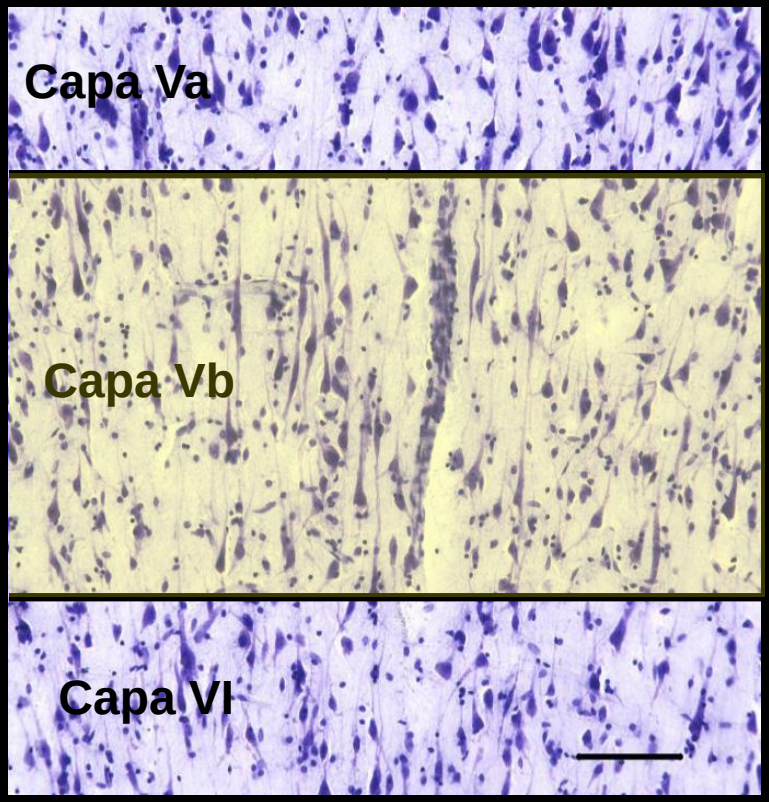
Neuronas de Von Economo

Estructura

Arquitectura simple
Capa Vb, FI>>ACC
Agrupaciones columnares paralelas a pequeñas arteriolas
Hemisferio D/I = 3:1

Ontogenia

Surgen entre la semana 34-38 de gestación
Pico máximo = 8m-4 años
Recién nacido: 28.200
A los 4 años: 184.000
Humano adulto: 193.000



Filogenia

Ausente en en monos y pequeños simios
Orangutan<Gorila<Chimp.
Grandes simios<Humanos
cetáceos-elefantes
Media en simios: 6.950 neuronas

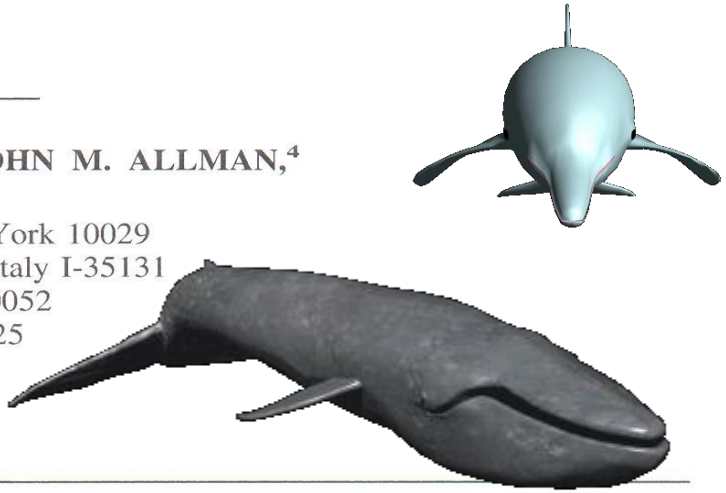
Neuroquímica

Los somas y dendritas proximales expresan receptores:

D3
5HT1b/2b
Vasopresina 1a

The Journal of Comparative Neurology 515:243–259 (2009)
Research in Systems Neuroscience

Total Number and Volume of Von Economo Neurons in the Cerebral Cortex of Cetaceans

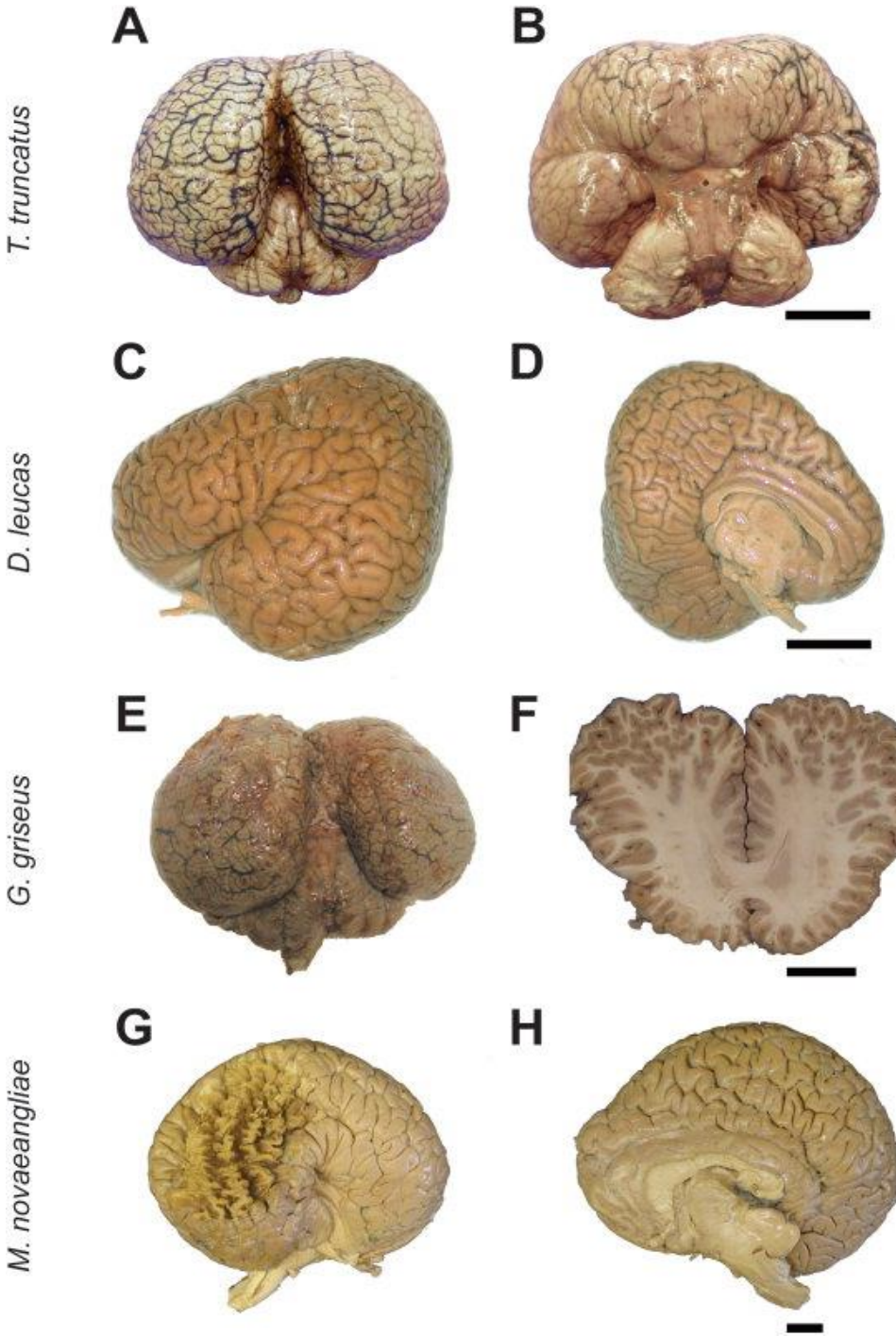


CAMILLA BUTTI,[1,2] CHET C. SHERWOOD,[3] ATIYA Y. HAKEEM,[4] JOHN M. ALLMAN,[4] AND PATRICK R. HOF[1,5]*

[1]Department of Neuroscience, Mount Sinai School of Medicine, New York, New York 10029
[2]Department of Experimental Veterinary Sciences, University of Padova, Padova, Italy I-35131
[3]Department of Anthropology, George Washington University, Washington, DC 20052
[4]Division of Biology, California Institute of Technology, Pasadena, California 91125
[5]New York Consortium in Evolutionary Primatology, New York, New York

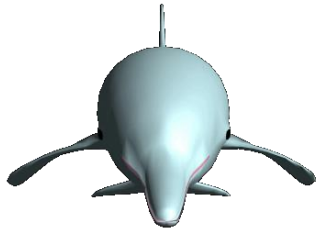
ABSTRACT

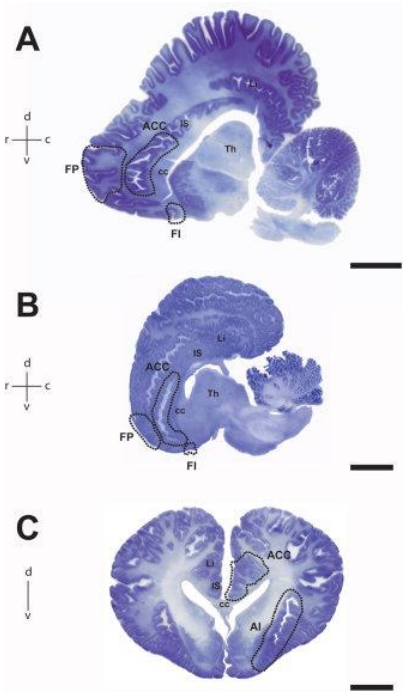
Von Economo neurons (VENs) are a type of large, layer V spindle-shaped neurons that were previously described in humans, great apes, elephants, and some large-brained cetaceans. Here we report the presence of Von Economo neurons in the anterior cingulate (ACC), anterior insular (AI), and frontopolar (FP) cortices of small odontocetes, including the bottlenose dolphin (*Tursiops truncatus*), the Risso's dolphin (*Grampus griseus*), and the beluga whale (*Delphinapterus leucas*). The total number and volume of VENs and the volume of neighboring layer V pyramidal neurons and layer VI fusiform neurons were obtained by using a design-based stereologic approach. Two humpback whale (*Megaptera novaeangliae*) brains were investigated for comparative purposes as representatives of the suborder Mysticeti. Our results show that the distribution of VENs in these cetacean species is comparable to that reported in humans, great apes, and elephants. The number of VENs in these cetaceans is also comparable to data available from great apes, and stereologic estimates indicate that VEN volume follows in these cetacean species a pattern similar to that in hominids, the VENs being larger than neighboring layer V pyramidal cells and conspicuously larger than fusiform neurons of layer VI. The fact that VENs are found in species representative of both cetacean suborders in addition to hominids and elephants suggests that these particular neurons have appeared convergently in phylogenetically unrelated groups of mammals possibly under the influence of comparable selective pressures that influenced specifically the evolution of cortical domains involved in complex cognitive and social/emotional processes. J. Comp. Neurol. 515:243–259, 2009.

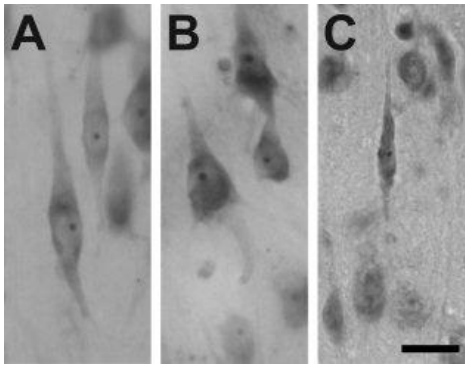


Macroscopic views of the brains of the cetacean species analyzed in the present study. Dorsal (**A**) and ventral (**B**) views of the brain of a bottlenose dolphin; lateral (**C**) and midline (**D**) views of the left hemisphere of the brain of a beluga whale; dorsal view (**E**) and coronal slab at the level of the genu of the corpus callosum (**F**) of the brain of a Risso's dolphin; lateral (**G**) and midline view (**H**) of the right hemisphere of the brain of a humpback whale. Note the large size of the brains and the complex gyral pattern. The lateral aspect of the parietal lobe of the humpback whale brain sustained damage when the specimen was removed from the skull (G). This, however, did not affect the present study. The brains are not shown to scale.

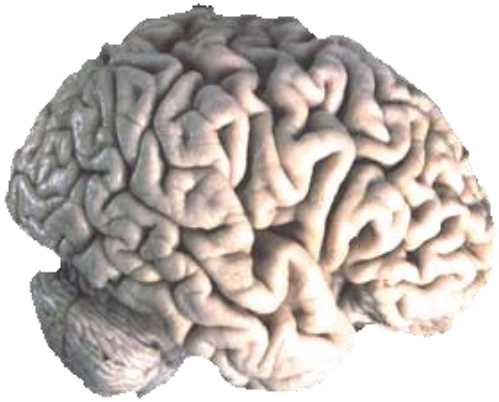
The Journal of Comparative Neurology, 2009, Volume 515, Issue 2, Pages 243-259
Total number and volume of Von Economo neurons in the cerebral cortex of cetaceans. C. Butti et al.







THE ANATOMICAL RECORD 292:242–248 (2009)



Von Economo Neurons in the Elephant Brain

ATIYA Y. HAKEEM,[1]* CHET C. SHERWOOD,[2] CHRISTOPHER J. BONAR,[3] CAMILLA BUTTI,[4,5] PATRICK R. HOF,[4] AND JOHN M. ALLMAN[1]

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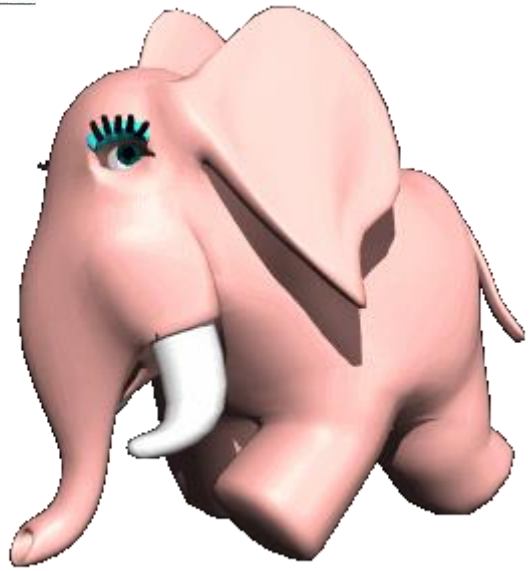
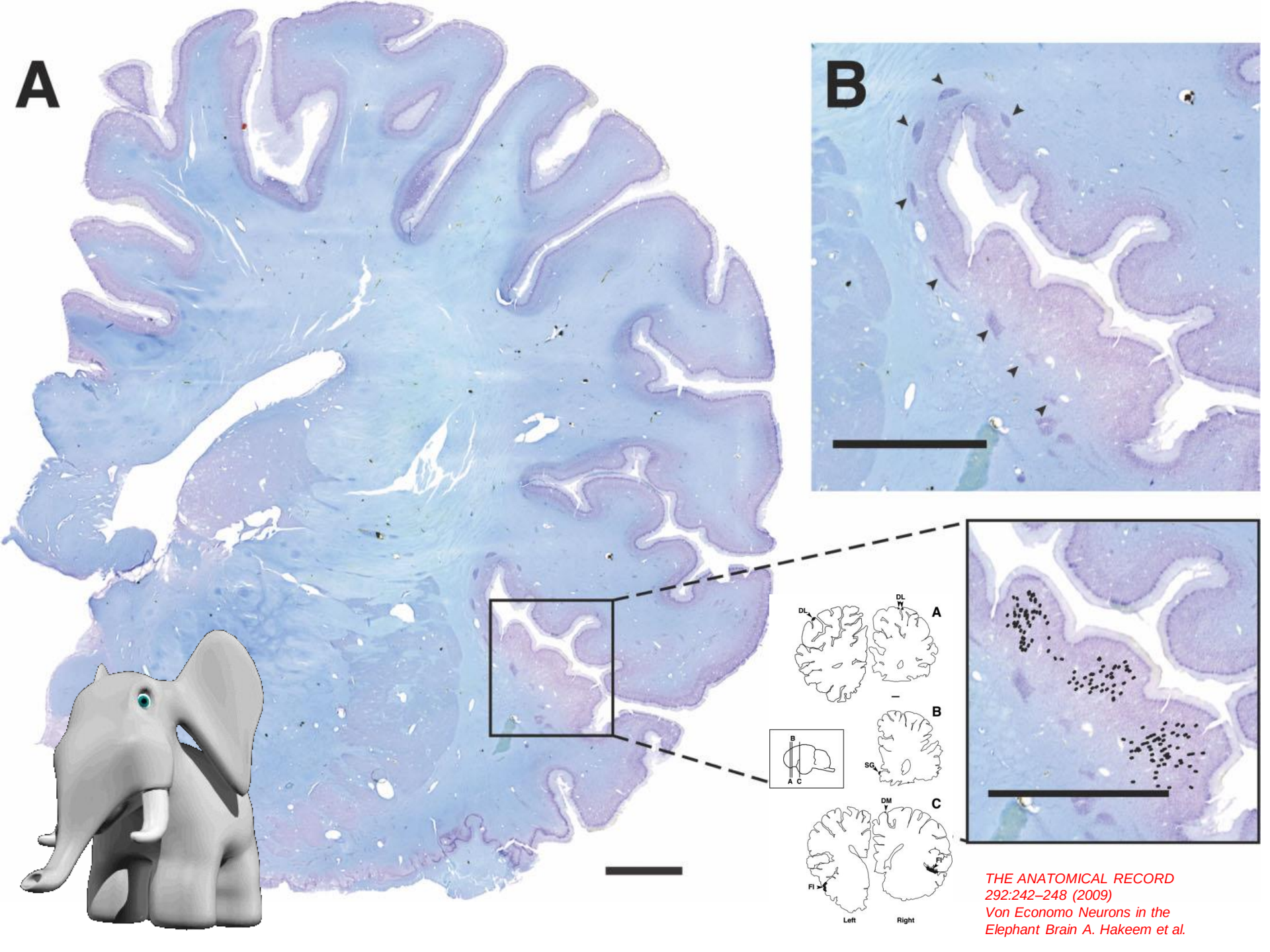
[4]Department of Neuroscience, Mount Sinai School of Medicine, New York, New York
[5]Department of Experimental Veterinary Sciences, University of Padua, Padua, Italy



ABSTRACT

Von Economo neurons (VENs), previously found in humans, all of the great ape species, and four cetacean species, are also present in African and Indian elephants. The VENs in the elephant are primarily found in similar locations to those in the other species. They are most abundant in the frontoinsular cortex (area FI) and are also present at lower density in the anterior cingulate cortex. Additionally, they are found in a dorsolateral prefrontal area and less abundantly in the region of the frontal pole. The VEN morphology appears to have arisen independently in hominids, cetaceans, and elephants, and may reflect a specialization for the rapid transmission of crucial social information in very large brains. Anat Rec, 292:242–248, 2009.

Key words: elephant; Von Economo neuron; frontoinsular cortex; cetacean; large brains



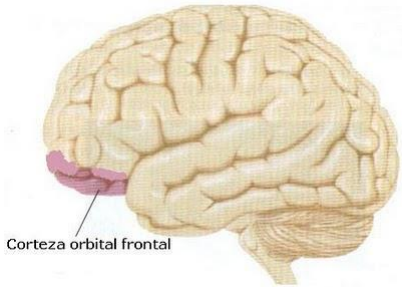
THE ANATOMICAL RECORD
292:242–248 (2009)
Von Economo Neurons in the
Elephant Brain A. Hakeem et al.

4. EMOCIONES: Corteza orbitofrontal (COF)

-La **hipótesis localizacionista relaciona la COF con la IRA** *(Vytal & Hamann, 2010)*

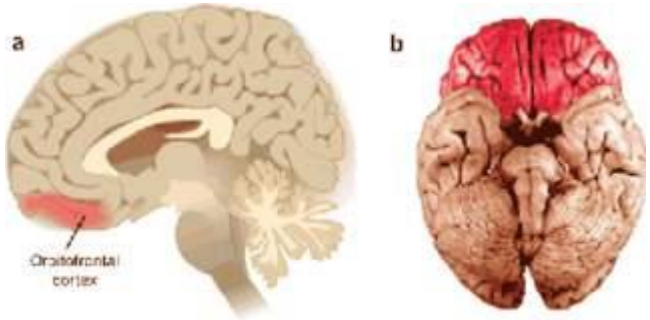
-***Lesión cerebral en COF****: Cambios de personalidad y aplanamiento afectivo (ira más verbal que física)*

-*La COF es una estructura (entre otras) que integra la información exteroceptiva e interoceptiva para guiar el comportamiento (**marcador somático**).*



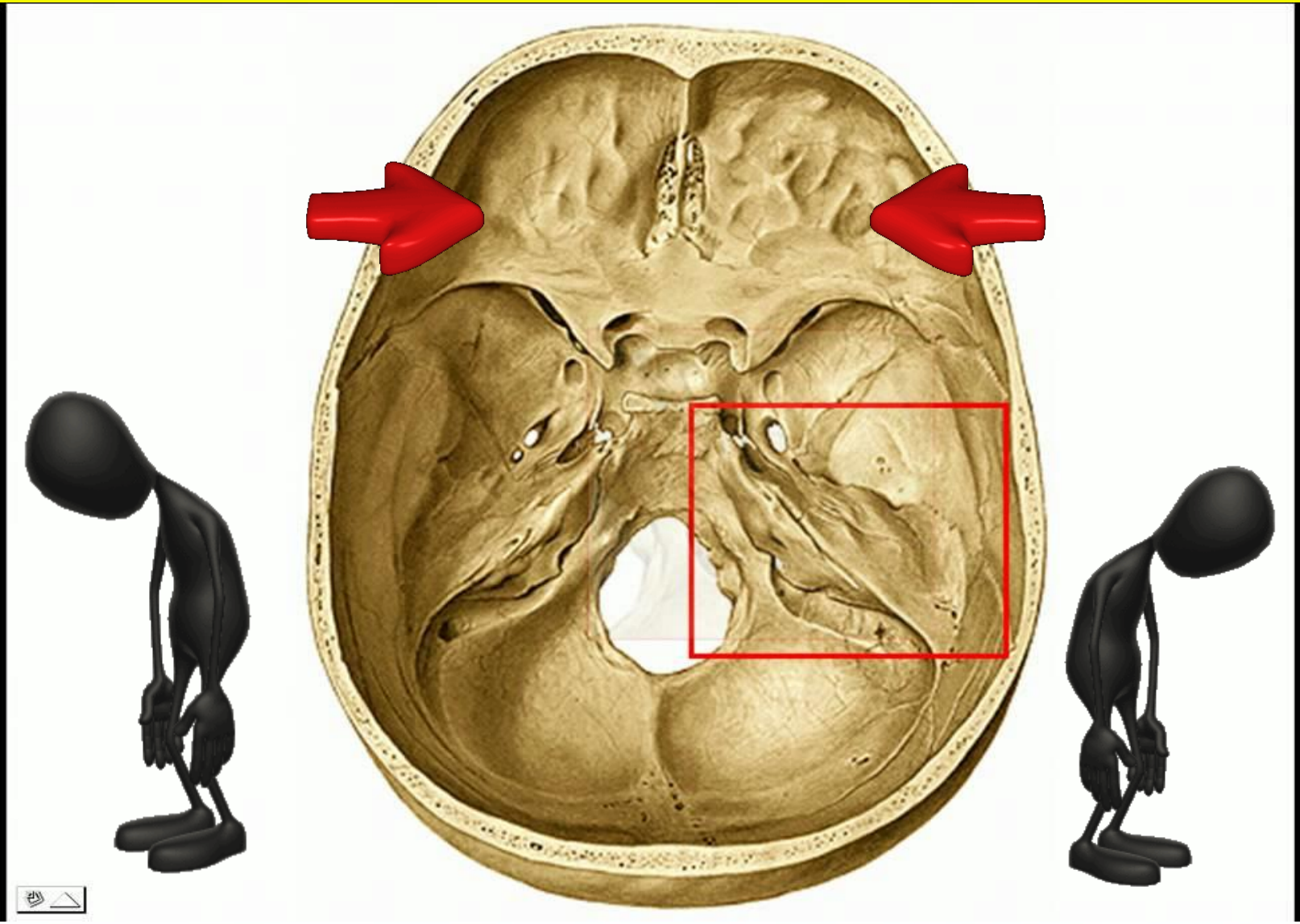
-***La hipótesis del marcador somático de Damasio*** *(1994) dice que la COF es la estructura cerebral que asocia una situación con su consecuencia y con la emoción primaria que desencadena dicha consecuencia.*

De tal manera, una lesión en esta estructura provoca una incapacidad para asociar una conducta con el estado interno que producen sus consecuencias.



Vytal, K., Hamann, S. (2010). Neuroimaging support for discrete neural correlates of basic emotions: A voxel-based meta-analysis. Journal of Cognitive Neuroscience, 22(12), 2864–85.

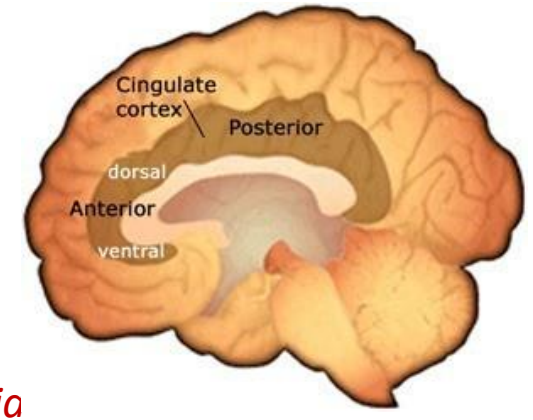
4. EMOCIONES: Corteza orbitofrontal (COF)



Vytal, K., Hamann, S. (2010). Neuroimaging support for discrete neural correlates of basic emotions: A voxel-based meta-analysis. Journal of Cognitive Neuroscience, 22(12), 2864–85.


LÓBULO FRONTAL:
APLANAMIENTO AFECTIVO
3:37

4. EMOCIONES: Corteza cingulada anterior



-La hipótesis localizacionista asocia la corteza cingulada anterior pregenual (CCAP) y la corteza cingulada anterior subgenual (CCAS) área 25 de Brodmann) o ventral con la ***tristeza*** *(**función afectiva: dolor emocional**) (**Tania Singer**). La **depresión clínica** se caracteriza por cambios estructurales y funcionales en la CCAS (25). La estimulación Eléctrica TDCS de estas zonas alivia los síntomas de apatía y anhedonia*

*-Un **estudio en humanos** encontró que lesiones en la CCAP (incluyendo daños en la corteza prefrontal dorsomedial) provocaban hipersensibilidad y una mayor tendencia al llanto en eventos tristes (Hornak et al., 2003). Si la CCAP estuviera implicada en crear experiencias de tristeza, **daños en esta estructura** deberían abolir la tendencia a llorar ante eventos tristes.*

-La CCAP también está implicada en el dolor y en la vergüenza

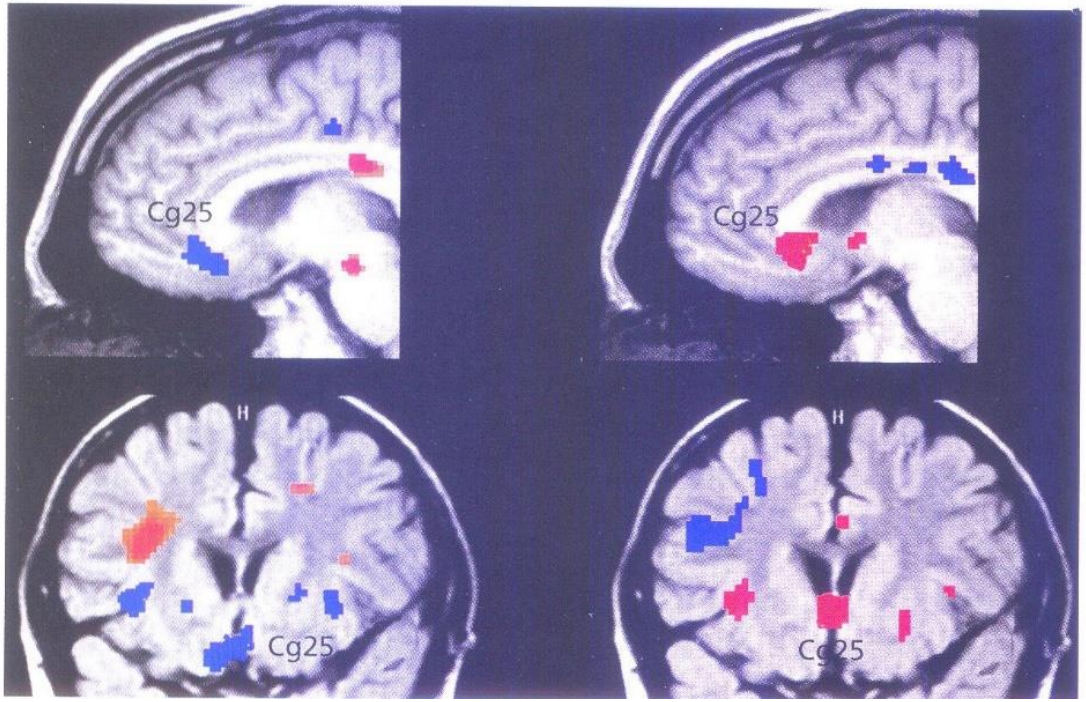
*-La parte **más dorsal de la corteza cingulada** parece que desempeña un papel importante en **la atención ejecutiva.** Desde este punto de vista, esta estructura ofrece fuentes de información sensorial exteroceptiva (desde proyecciones talámicas) junto con información sensorial interna (desde la ínsula) para dirigir la atención y dar respuestas motoras (**marcador somático**).*

-Hornak, J., Bramham, J., Rolls, E., Morris, R., O'Doherty, J., Bullock, P. (2003). Changes in emotion after circumscribed surgical lesions of the orbitofrontal and cingulate cortices. Brain: 126, 1691–712.

4. EMOCIONES: Corteza cingulada anterior

EL ÁREA 25, UNA DE LAS CLAVES

Las imágenes de tomografía por emisión de positrones muestran cómo en los individuos que se curan de la depresión disminuye el metabolismo en el área 25 de Brodmann (imágenes a la izquierda, con tonalidades azules en el área 25 que indican un metabolismo adecuado en ese área), mientras aumenta en aquellos que son sometidos a estímulos tristes (imágenes a la derecha, con tonalidades en rojo, indicando un hipermetabolismo en esa región).



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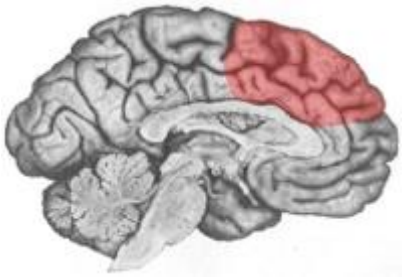
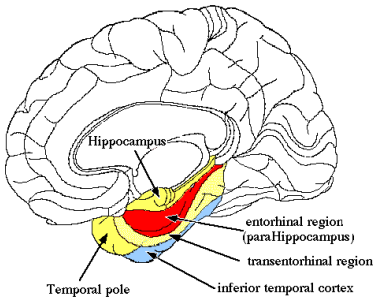
4. EMOCIONES: Corteza DM, temporal medial, retrosplenial, cíngulo posterior

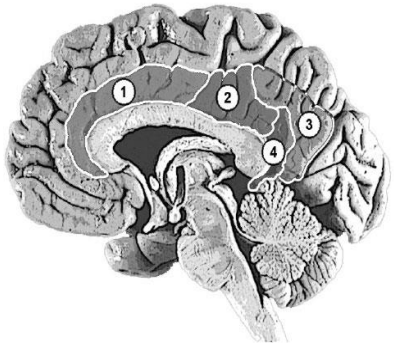


-Estas áreas cerebrales utilizan experiencias anteriores para crear un nuevo significado de nuestro estado afectivo principal, viniendo estas señales de nosotros mismos u observando a otros (evaluación de situaciones).

-Experiencias de tristeza y de felicidad fueron asociadas a una activación consistente en la CPF DM

-El miedo se ha asociado a un incremento en la activación del lóbulo temporal medial. Este hallazgo está más relacionado con la codificación de estímulos Salientes, ya que la amígdala se activa durante experiencias de miedo y tiene una conexión funcional muy fuerte con el hipocampo durante la codificación de estímulos.

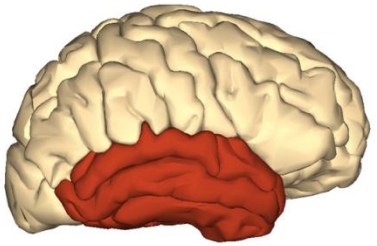




-Hornak, J., Bramham, J., Rolls, E., Morris, R., O'Doherty, J., Bullock, P. (2003). Changes in emotion after circumscribed surgical lesions of the orbitofrontal and cingulate cortices. Brain: 126, 1691–712.

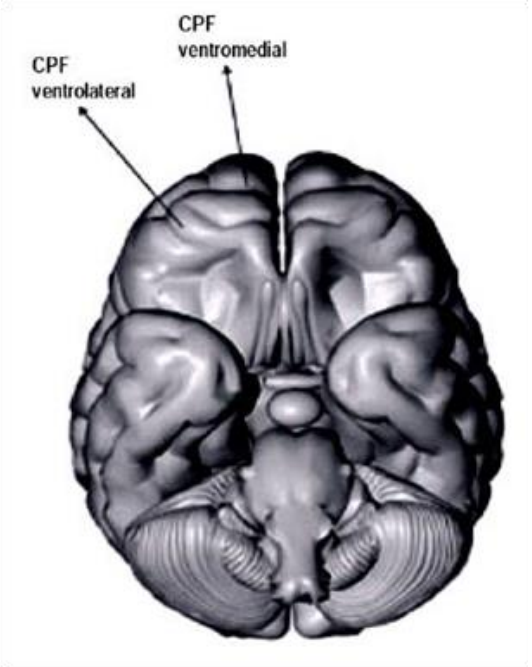
4. EMOCIONES: Lóbulo temporal anterior (LTA) y corteza prefrontal ventrolateral (CPVL)

*-Pacientes con demencia semántica tienen atrofia local en el **LTA**, dificultad para utilizar y asociar conceptos semánticos, y también tienen **dificultad para la percepción de emociones y empatía.***



*-El LTA (especialmente el izquierdo) está implicado en la **ira.***

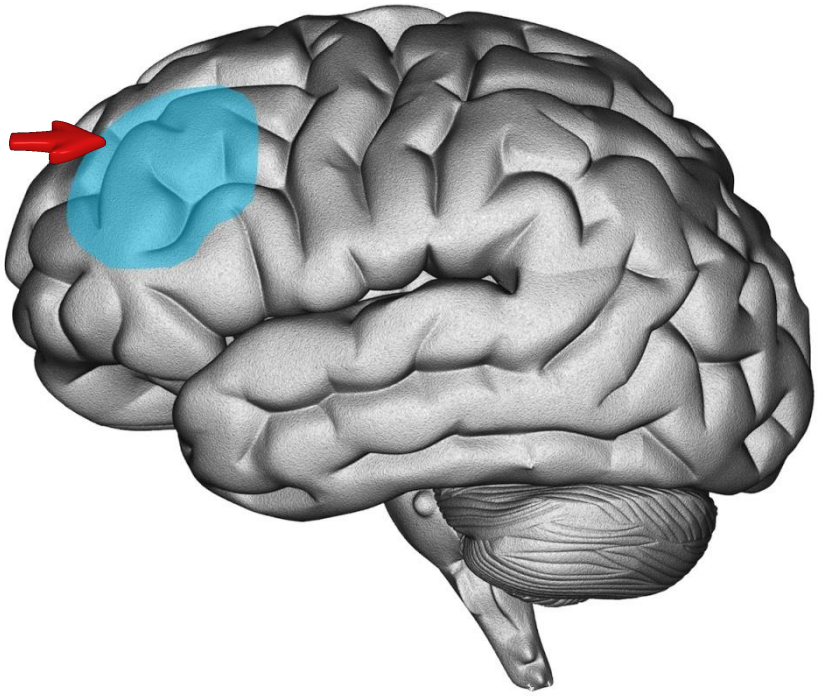
*-La **CPFVL** está implicada en tareas de **procesamiento semántico categorización de objetos, abstracción, atención y la inhibición de respuestas.***



Corbetta, M., Patel, G., Shulman, G. (2008). The reorienting system of the human brain: From environment to theory of mind. Neuron, 58, 306–24.

4. EMOCIONES: Corteza prefrontal dorsolateral (CFDL)

*-La corteza **prefrontal dorsolateral (CPFDL)** forma parte de la red frontoparietal dorsal que está implicada en el procesamiento arriba-abajo: atención y memoria de trabajo*



-Lindquist et al. (2012), refieren que esta región cerebral se activaba cuando, por ejemplo, los participantes tenían que mantener información afectiva en la mente para categorizarla.

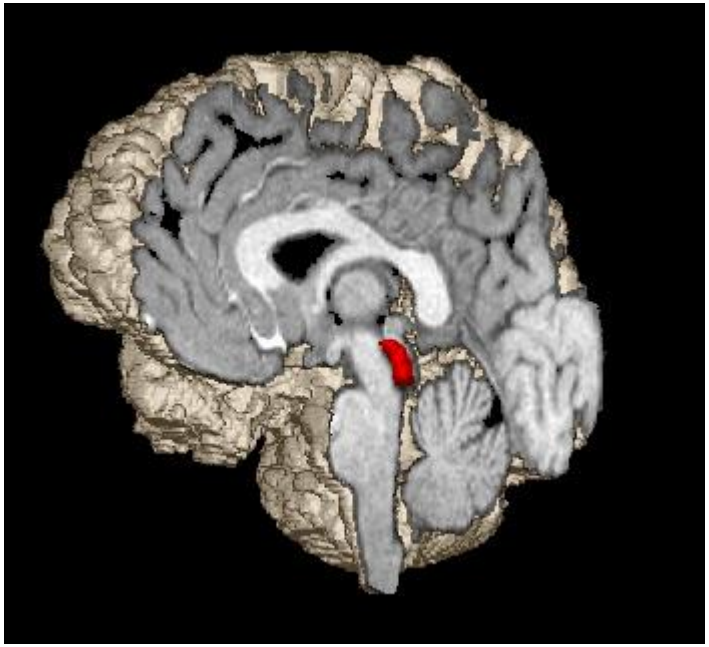
Además, había una mayor activación en la CPFDL cuando percibían estados emocionales relacionados con la ira.

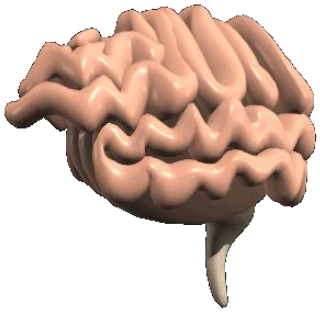
Lindquist, K., Wager, T., Kober, H., Bliss-Moreau, E. (2012). The brain bases of emotion: A meta-analytic review. Behavioral and brain sciences, 35, 121-202.

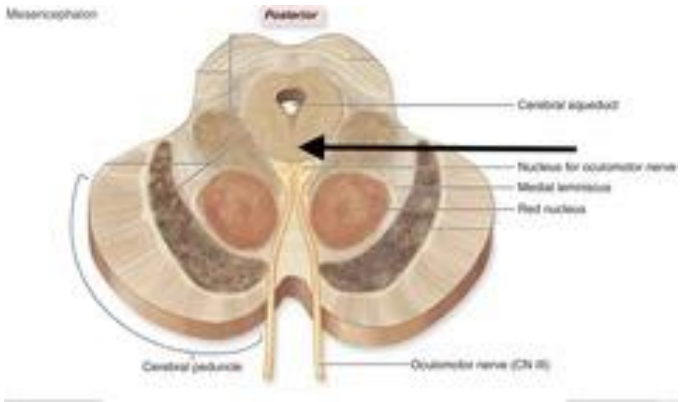
4. EMOCIONES: Sustancia gris periacueductal (SGPA)

-Está implicada en la regulación de los sustratos autonómicos que nos permiten adaptaciones conductuales tales como quedarnos paralizados, huir, vocalizar y comportamiento reproductivo (Mobbs et al., 2007).

-Un enfoque localizacionista ha vinculado la SGPA a distintos circuitos correspondientes con varias categorías de emoción: ***rabia, miedo, alegría, angustia, amor y lujuria.***



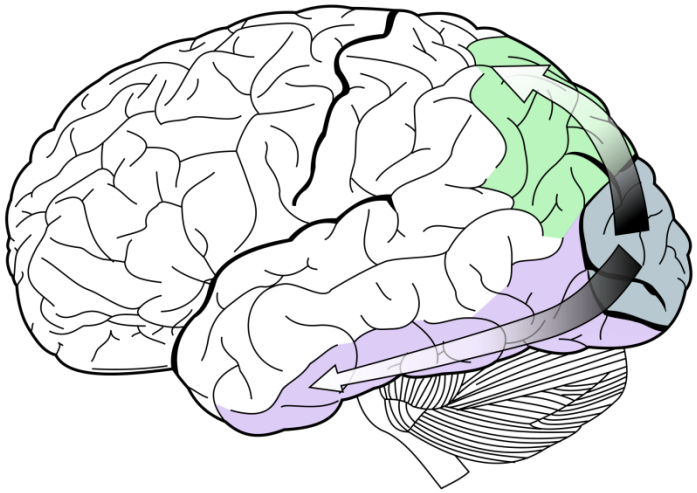




Mobbs, D., Petrovic, P., Marchant, J., Hassabis, D., Weiskopf, N., Seymour, B., Dolan, R., Frith, C. (2007). When fear is near: Threat imminence elicits prefrontal periaqueductal gray shifts in humans. Science, 317(5841), 1079–83

4. EMOCIONES: Cortex visual

-Lindquist et al. (2012): La emoción surge como una conceptualización de sensaciones internas del cuerpo y sensaciones externas del mundo para crear una experiencia unificada de nuestro yo en un contexto determinado.

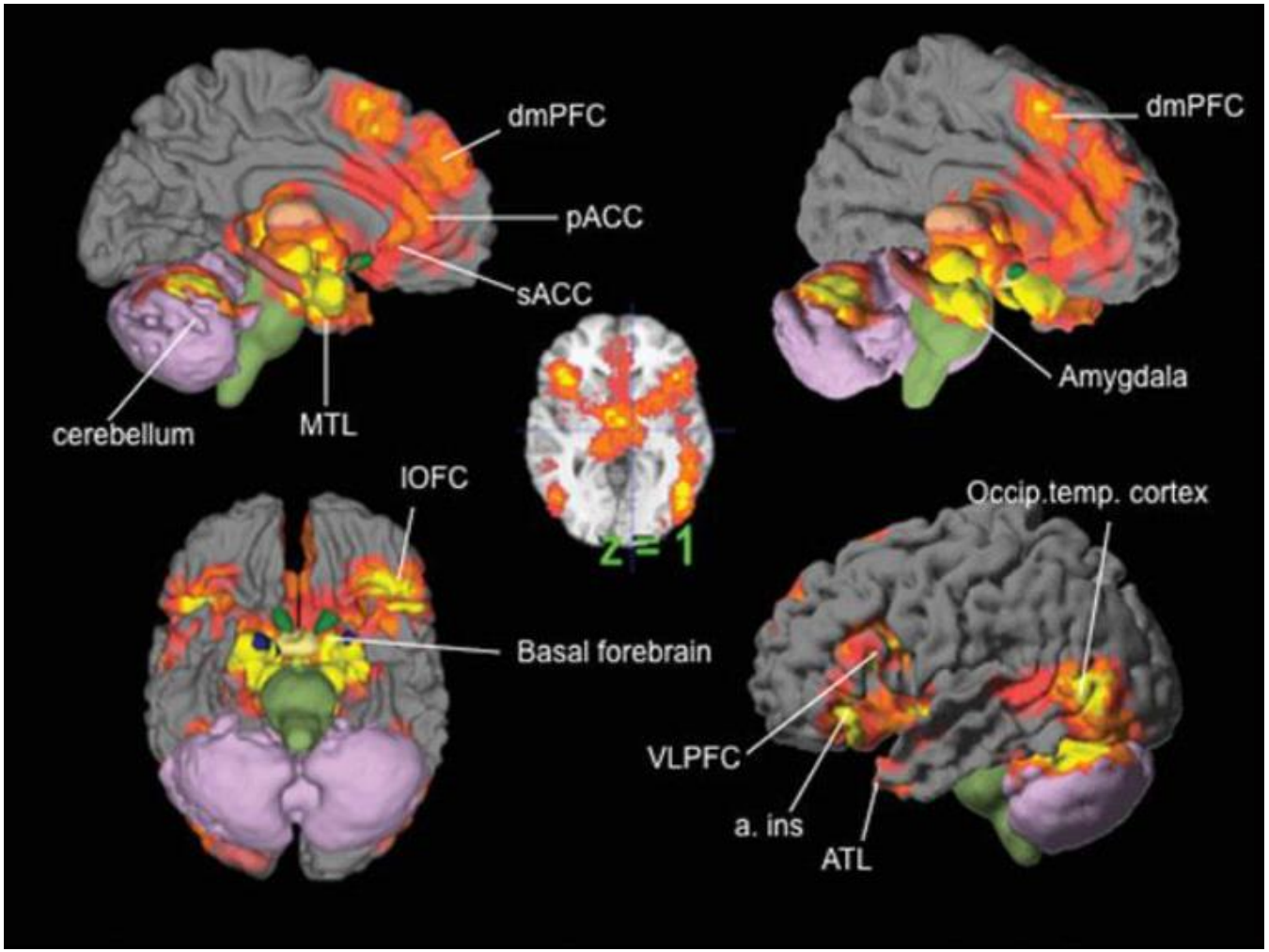


El aumento en la activación de la corteza visual se produjo cuando los participantes realizaban tareas con métodos visuales (por ejemplo, ver imágenes, rostros, etc.). Por lo tanto, no es de extrañar que la corteza visual y otras regiones encargadas en el procesamiento sensorial aumenten su actividad en tareas de este tipo.

Lindquist, K., Wager, T., Kober, H., Bliss-Moreau, E. (2012). The brain bases of emotion: A meta-analytic review. Behavioral and brain sciences, 35, 121-202.

4. EMOCIONES: Resumen bases cerebrales

Regiones cerebrales activadas en todos los estudios evaluativos de la experiencia o la percepción de ira, asco, miedo, felicidad y tristeza. Las regiones cerebrales en amarillo superaron el umbral de p<0.05; las regiones naranjas superaron el umbral de p<0.01, y las regiones en rosa y magenta no cuentan con una significación tan evidente. La corteza cerebral es de color gris, el núcleo accumbens azul y el cerebelo púrpura (Lindquist et al., 2012).



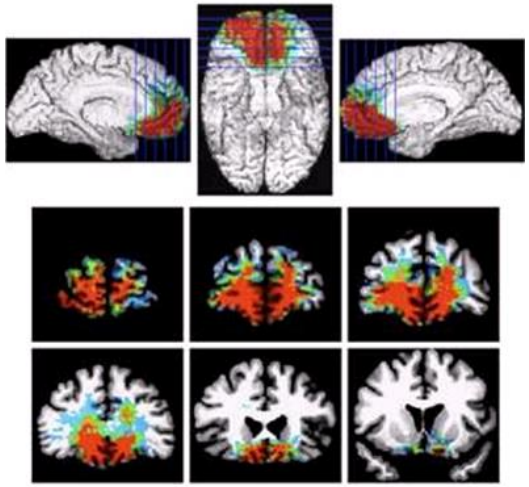
Lindquist, K., Wager, T., Kober, H., Bliss-Moreau, E. (2012). The brain bases of emotion: A meta-analytic review. Behavioral and brain sciences, 35, 121-202.

5. DECISIONES Y MEMORIA EMOCIONAL

5. EMOCIONES Y TOMA DE DECISIONES

***-Neurociencia**: Importancia de las emociones en la toma de decisiones*
-Marcador somático: vg. condicionamiento clásico alimentario + o –
-La señal emocional no es un sustituto del razonamiento adecuado. Posee un papel auxiliar, que aumenta la eficiencia del proceso de razonamiento y lo acelera (v.g. listas de pros y contras vs. emoción en la compra de un coche)

*-Bechara (2004): Rendimiento en pacientes con daño cerebral en la región ventromedial bilateral del córtex prefrontal (grupo experimental) y en pacientes con daño en el córtex occipital bilateral o temporal lateral (grupo control) mientras realizaban la Iowa Gambling Task (imposibilidad en la vida real para decidir de manera ventajosa en situaciones que implican la elección entre una recompensa inmediata o a largo plazo, o un castigo: **miopía del futuro**)*



http://www.dailymotion.com/video/xqeaen_phineas-gage-decisiones-emocionales-lobulo-frontal_school

http://www.dailymotion.com/video/xp5fe1_decisiones-inconscientes-iowa-gambling-task_school

http://www.dailymotion.com/video/xq0v4c_cerebro-y-miopia-para-el-futuro-a-bechara-lobulo-frontal-y-adicciones_school

Bechara, A. (2004). The role of emotion in decision-making: Evidence from neurological patients with orbitofrontal damage. Brain and Cognition, 55, 30–40.

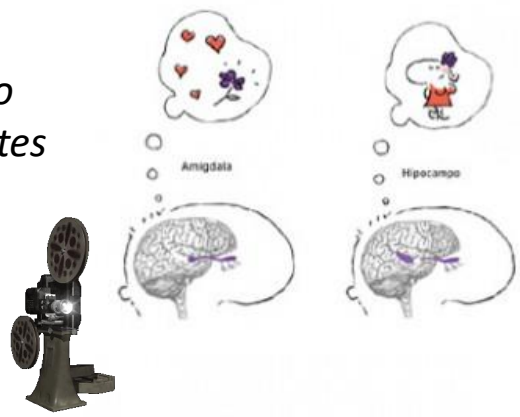
5. EMOCIONES: MEMORIA EMOCIONAL

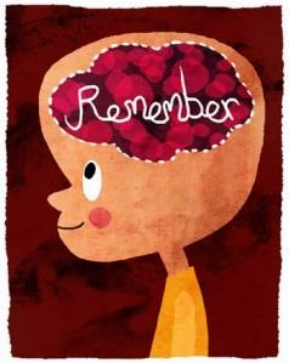
*El **aprendizaje y memoria emocional** es la capacidad de adquirir, almacenar y recuperar información relacionada con la emoción.*

*-El psicólogo suizo **Édouard Claparède** describe un caso que ayuda a comprender el significado de la memoria emocional Paciente con amnesia anterógrada que solo recordaba durante 30 segundos: **alfiler** en su mano derecha (la paciente seguía sin recordar quién era Claparède, pero había un notable cambio: la paciente se negaba a estrecharle la mano al psicólogo)*

*-El conocimiento explícito de las situaciones depende del hipocampo, mientras que la **memoria emotiva dependería de la amígdala**.*

-El recuerdo, ya sea consciente o inconsciente, de situaciones emocionalmente significativas tiene como finalidad protegernos frente a situaciones amenazantes





http://www.dailymotion.com/video/x8mtwq_cerebro-y-emociones-memoria-emocion_school

http://www.dailymotion.com/video/xwghvx_envejecimiento-y-memoria-emocional-selectiva-laura-carstensen_school

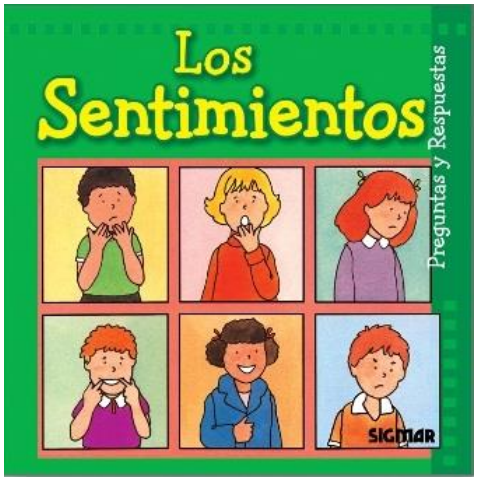
Bechara, A. (2004). The role of emotion in decision-making: Evidence from neurological patients with orbitofrontal damage. Brain and Cognition, 55, 30–40.


ENVEJECIMIENTO
MEMORIA-APRENDIZAJE
Y EMOCIONES
(DOPAMINA)
3:37

6. LOS SENTIMIENTOS

6. LOS SENTIMIENTOS

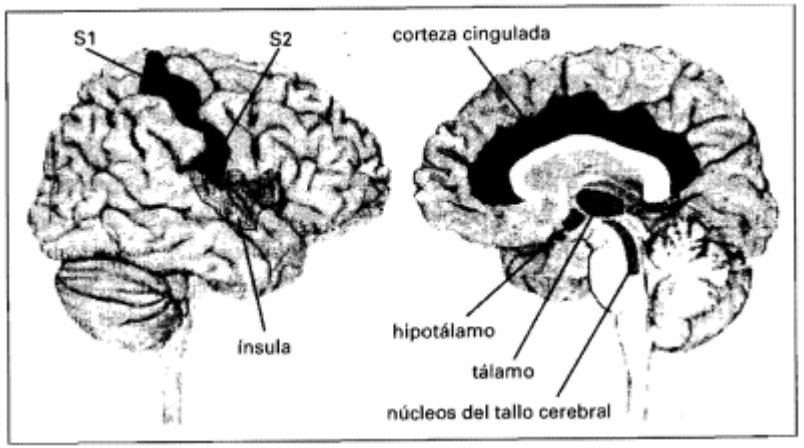
-Damasio (2003) define los ***sentimientos*** *como la* ***percepción de un determinado estado del cuerpo junto con la percepción de un determinado modo de pensar*** *(percepción o cognitivización de la emoción a un nivel consciente).*



-Los sentimientos surgen cuando la acumulación absoluta de detalles cartografiados por el cerebro alcanza una fase determinada (el sustrato de sentimientos es el conjunto de patrones neurales que cartografían el estado corporal y del que puede surgir una imagen mental del estado del cuerpo).

-En resumen, el sentimiento implica la ***percepción de un determinado estado corporal y la de un determinado estado mental acompañante****.*

-Marcadores somáticos: Cortex somatosensorial primario, Insulas, corteza cingulada y nn. Troncoencefálicos (la elaboración de sentimientos requiere de la integridad de todas estas estructuras cerebrales



Damasio, A. (2003). En busca de Spinoza. Neurobiología de la emoción y los sentimientos. Barcelona: Booket.

El amor romántico: ¿Un trastorno?

Psicopatología

1. Estar enamorado: ¿un trastorno?

"*Trastorno mental transitorio por enamoramiento*"

Trastorno emocional positivo, de carácter transitorio, que cursa con al menos 3 de estos síntomas durante al menos los últimos 6 meses y debido a la interacción con otra persona:

-Alteración perceptiva
-Trastorno atencional
-Trastorno ejecutivo (planificación)
-Impulsividad e hiperactividad
-Síntomas somáticos: Trastornos del sueño, alteraciones de la ingesta, trastornos neuroendocrinos/neuroquímicos y gastroint.
-Duración media: 900 dias
-No se debe a ninguna alteración orgánica cerebral ni causada por drogas de abuso

INTRODUCCIÓN: PB del enamoramiento

SÍNTOMATOLOGÍA

FÍSICOS

- Temblor, sudoración
- Palidez o ruborización
- Tartamudeo
- Aumento del ritmo cardiaco
- Insomnio
- Pérdida de apetito

Tennov, 1979

PSICOLÓGICOS

- Pensamientos intrusivos
- Pérdida de control (emociones)
- Comportamiento obsesivo
- Impulsividad
- Cambios de humor repentinos
- Distorsión de la realidad (magnificación)
- Dependencia de la relación
- Ansiedad
- Síndrome de abstinencia

Fisher, 2005

"El enamoramiento es un estado de miseria mental en que la vida de nuestra conciencia se estrecha, empobrece y paraliza"
"El enamoramiento es un estado de Imbecilidad transitoria". **Ortega y Gasset (1939)**

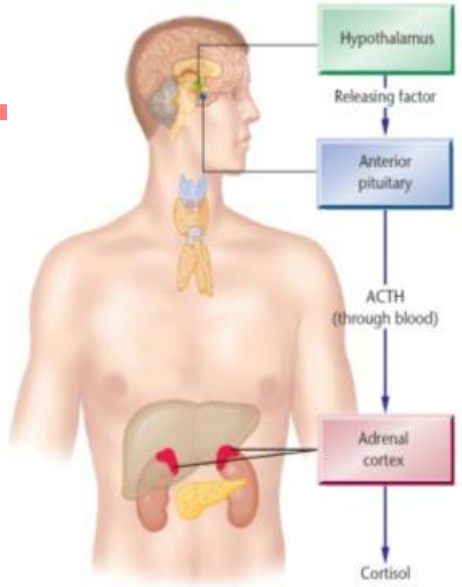
2. FUNDAMENTACIÓN TEÓRICA

NEUROBIOLOGÍA

NOS ENAMORAMOS

SEÑAL DE ALARMA
HIPOTÁLAMO

GLÁNDULAS
SUPRARRENALES



AUMENTO DEL RITMO CARDIACO
TENSIÓN ARTERIAL
Nº DE GLÓBULOS ROJOS
LIBERACIÓN DE AZÚCARES Y GRASAS
CAPACIDAD MUSCULAR (Emanuele, 2011)

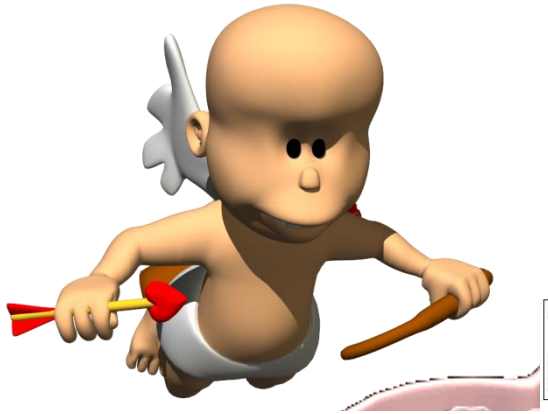
2. FUNDAMENTACIÓN TEÓRICA

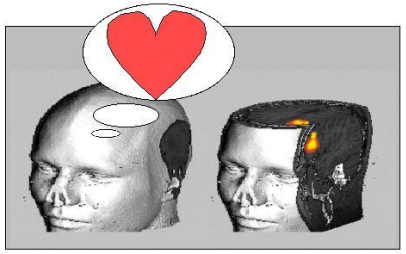
NEUROBIOLOGÍA

FENILETILAMINA

SUTANCIA QUÍMICAS	EFECTO	CONSECUENCIAS
Adrenalina	↑	Incremento frecuencia cardíaca, contrae los vasos sanguíneos, dilata los conductos de aire
Noradrenalina	↑	Alerta, energía, insomnio, pérdida de apetito, + atención para estímulos nuevos, ritmo cardiaco, sudor (Páez, 2006)
Dopamina	↑	Recompensa, deseo, euforia y adicción (Fisher, 2004)
Oxitocina	↑	Reduce el estrés. "hormona de la confianza" (Zeki, 2007)
Vasopresina	↑	Aumenta el miedo a las respuestas, aprendizaje aversivo (Zeki, 2007)
Cortisol	↑	Aumento de actividad del eje HHA
Endorfinas	↑	Paz, seguridad, comodidad, anti-estrés (Esch y Stefano, 2004)
Factor crecimiento nervioso	↑	Reducción de las respuestas de estrés social (Marazziti et al., 2009)
Serotonina	↓	Aparición de pensamientos obsesivos con la pareja: TOC, ansiedad (Tallis, 2005)
Hormonas gonadales	↓ ↑	Testosterona H disminuye, en M aumenta (McIntyre et al.,2006)

Enamoramiento y cerebro





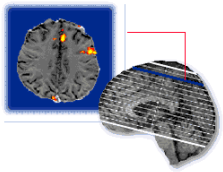
We need your brain!

If you are:	You will get:
- Truly in love (homo- / bi- / heterosexual - willing to spend 2 hours	- pictures of your brain - a free T-shirt - £10 cash.

Contact:
email: abartels@fil.ion.ucl.ac.uk
phone: 0171 380 7316 (ask for Andreas Bartels)

We will take a fMRI (functional magnetic imaging) scan of your brain. This is a modern and harmless technique to measure brain function.
Wellcome Department of Cognitive Neurology, University College London, July 1999.

MOTIVATION, EMOTION, FEEDING, DRINKING NEUROREPORT



The neural basis of romantic love

Andreas Bartels and Semir Zeki

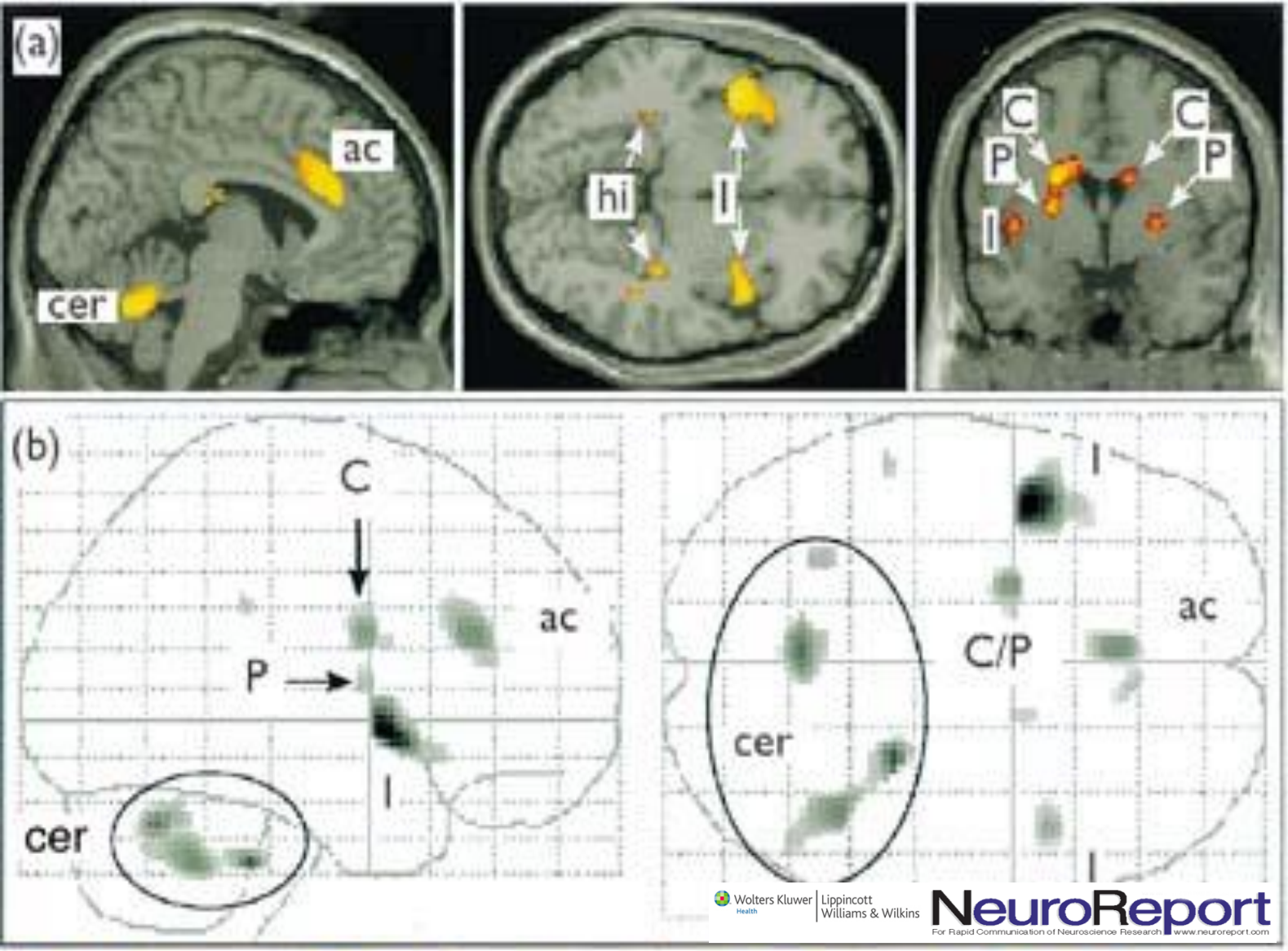
Wellcome Department of Cognitive Neurology, University College London, London WC1E 6BT, UK

Received 5 September 2000; accepted 26 September 2000

The neural correlates of many emotional states have been studied, most recently through the technique of fMRI. However, nothing is known about the neural substrates involved in evoking one of the most overwhelming of all affective states, that of romantic love, about which we report here. The activity in the brains of 17 subjects who were deeply in love was scanned using fMRI, while they viewed pictures of their partners, and compared with the activity produced by viewing pictures of three friends of similar age, sex and duration of friendship as their partners. The activity was restricted to foci in the medial insula and the anterior cingulate cortex and, subcortically, in the caudate nucleus and the putamen, all bilaterally. Deactivations were observed in the posterior cingulate gyrus and in the amygdala and were right-lateralized in the prefrontal, parietal and middle temporal cortices. The combination of these sites differs from those in previous studies of emotion, suggesting that a unique network of areas is responsible for evoking this affective state. This leads us to postulate that the principle of functional specialization in the cortex applies to affective states as well. *NeuroReport* 11:3829–3834 © 2000 Lippincott Williams & Wilkins.

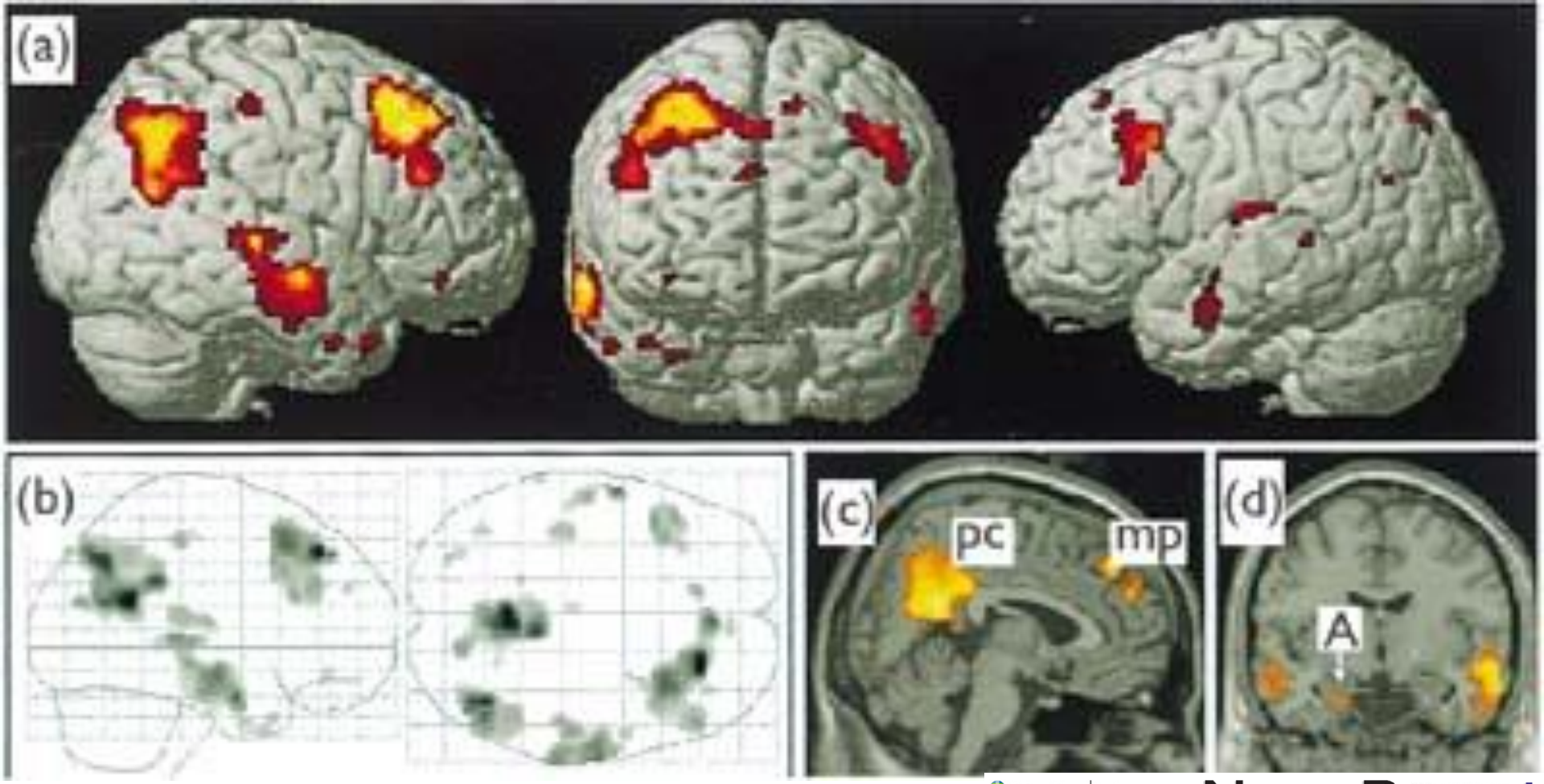
Key words: Anterior cingulate; Attachment; Emotion; fMRI; Friendship; Galvanic skin response; Insula; Love; Striatum


RMf: AMOR Y CEREBRO
4:07



Activity elicited when subjects viewed pictures of their loved partner compared to that produced when they viewed pictures of their friends. The activity, restricted to only a few areas, is shown in sagittal (x = -4 mm), transverse (z = -6 mm), and coronal sections (y = 0 mm) superimposed on slices taken through a template brain in (a) and in glassbrain projections in (b). ac, anterior cingulate; cer, cerebellum; I, insula; hi, posterior hippocampus and the coronal section activity in caudate nucleus (C) and putamen (P). Data are from a SPM random effects group analysis of 17 subjects (glassbrains: $p < 0.001$ ($Z = 3.69$), sections: $p < 0.005$ ($Z = 2.92$), both uncorrected with an extent threshold of 6 voxels. (c) An independent component analysis applied to single subjects isolated activity in the insula and the anterior cingulate cortex separately, and in 9 of 11 the components did not involve any other regions. Shown are two independent components from a single subject, in which the one containing the insula included also a more frontal region

Bartels: Neuroreport, Volume 11(17).November 27, 2000.3829–3834



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NeuroReport
For Rapid Communication of Neuroscience Research www.neuroreport.com

Deactivations revealed by a comparison of brain activity elicited when subjects viewed pictures of their friends with that produced when they viewed pictures of their loved partner. Cortically, deactivations were right-lateralized within the prefrontal cortex, the middle temporal gyrus and the parietal cortex, as is apparent (a) in the projections onto the cortical surfaces in side and front views of a template brain and (b) in glassbrain projections. (c) The sagittal section (x = 4 mm) shows deactivations in the posterior cingulate gyrus (pc) and in the medial prefrontal cortex (mp). (d) The coronal section (y = -8 mm) shows deactivation in the left amygdaloid region (A). Thresholding: as in **Fig. 3**, with (a) thresholded as (b).

Bartels: Neuroreport, Volume 11(17).November 27, 2000.3829–3834

2. FUNDAMENTACIÓN TEÓRICA

NEUROQUÍMICA

DOPAMINA
Alegría, euforia
recompensa
adicción

NORADRENALINA
Sudoración, temblores
alerta, energía, insomnio,
focalización +

ADRENALINA
Ritmo cardiaco

OXITOCINA
Reduce estrés
"Hormona de la confianza
Superación neofobia

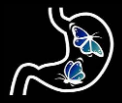
CORTISOL
Ansiedad
estrés

VASOPRESINA
Apego

ENDORFINAS
Paz, seguridad, anti-estrés

SEROTONINA
Pensamientos obsesivos

CORTISOL+ADRENALINA



DOPAMINA+NORADRENALINA

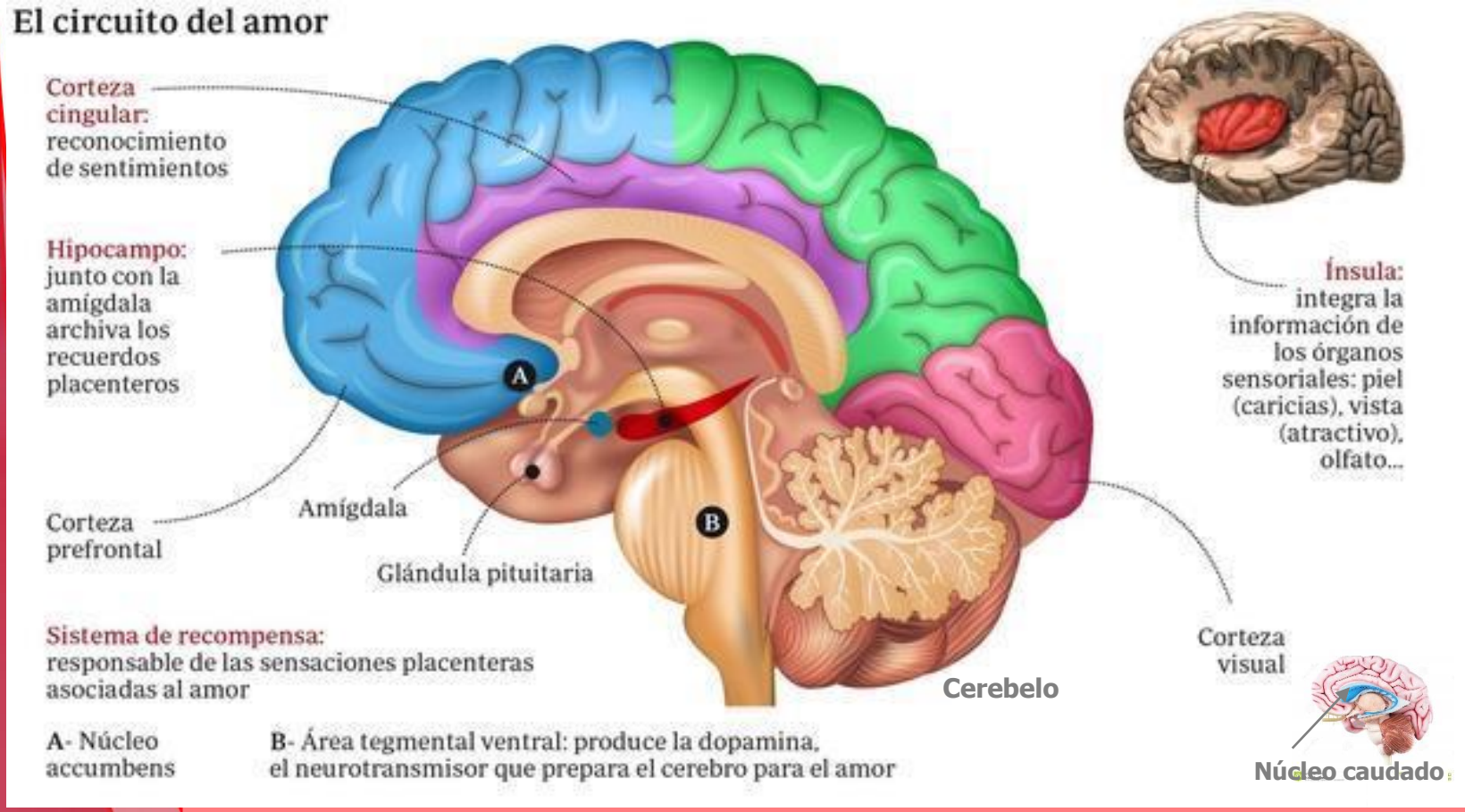
DOPAMINA+ACETILCOLINA
Síndrome de abstinencia

Cardiomiopatía
TAKO-TSUBO

NEUROTROFINAS crecimiento y supervivencia neuronas NGF

FUNDAMENTACIÓN TEÓRICA

ESTRUCTURAS CEREBRALES IMPLICADAS EN EL AMOR ROMÁNTICO



Zonas cerebrales implicadas

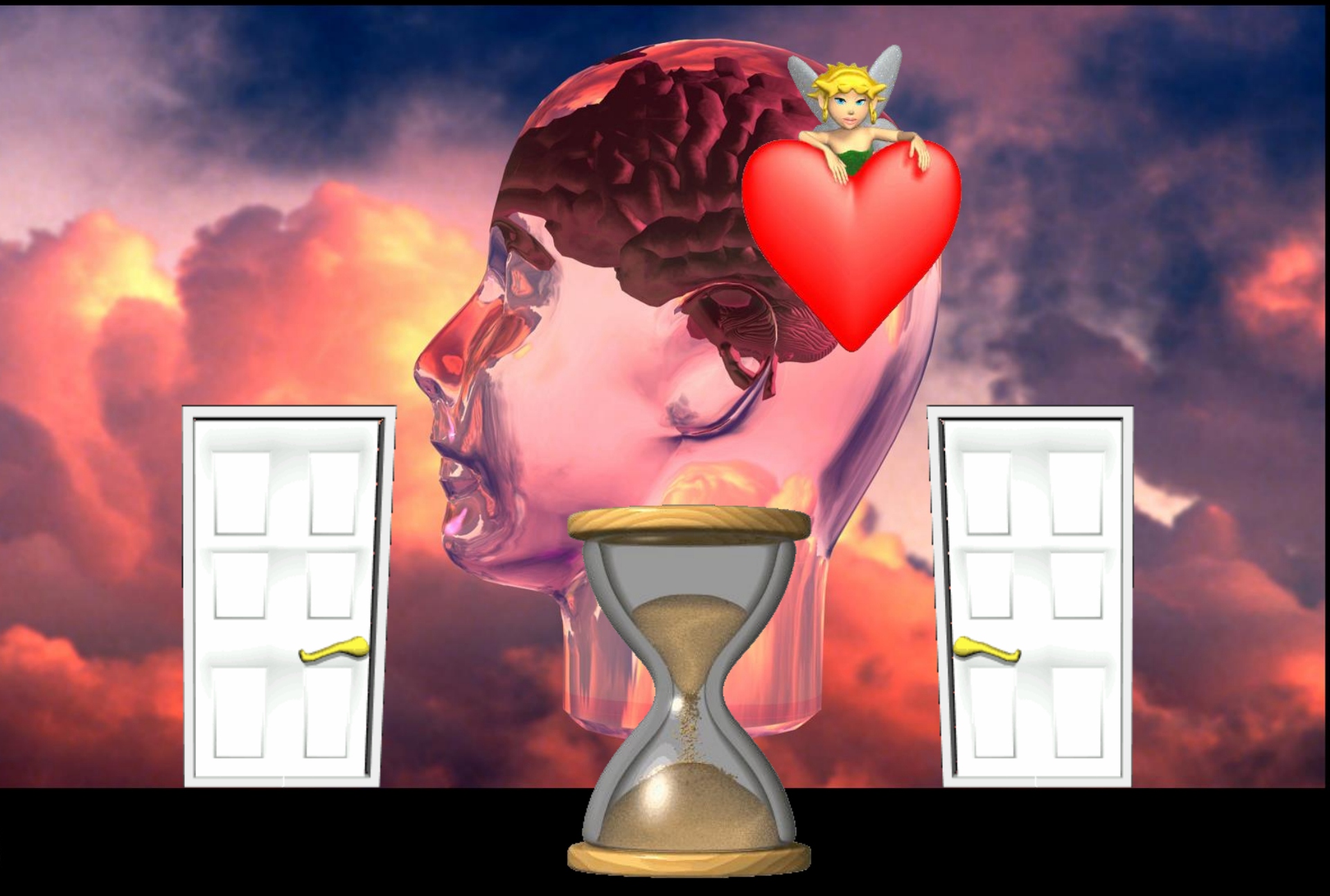
- Insula medial: Relacionada con el drive motivacional (placer)
- Cíngulo anterior: Involucrada en euforia
- Núcleo accumbens y Area Tegmental Ventral
- Núcleo caudado
- Estriado: zona del córtex activa cuando recordamos
- Córtex prefrontal
- Amígdalas: almacena la experiencia amorosa en forma de etiquetas positivas
- Hipotálamo (núcleos laterales y área tuberal medial)

Cerebelo

Neurotransmisores y hormonas implicados

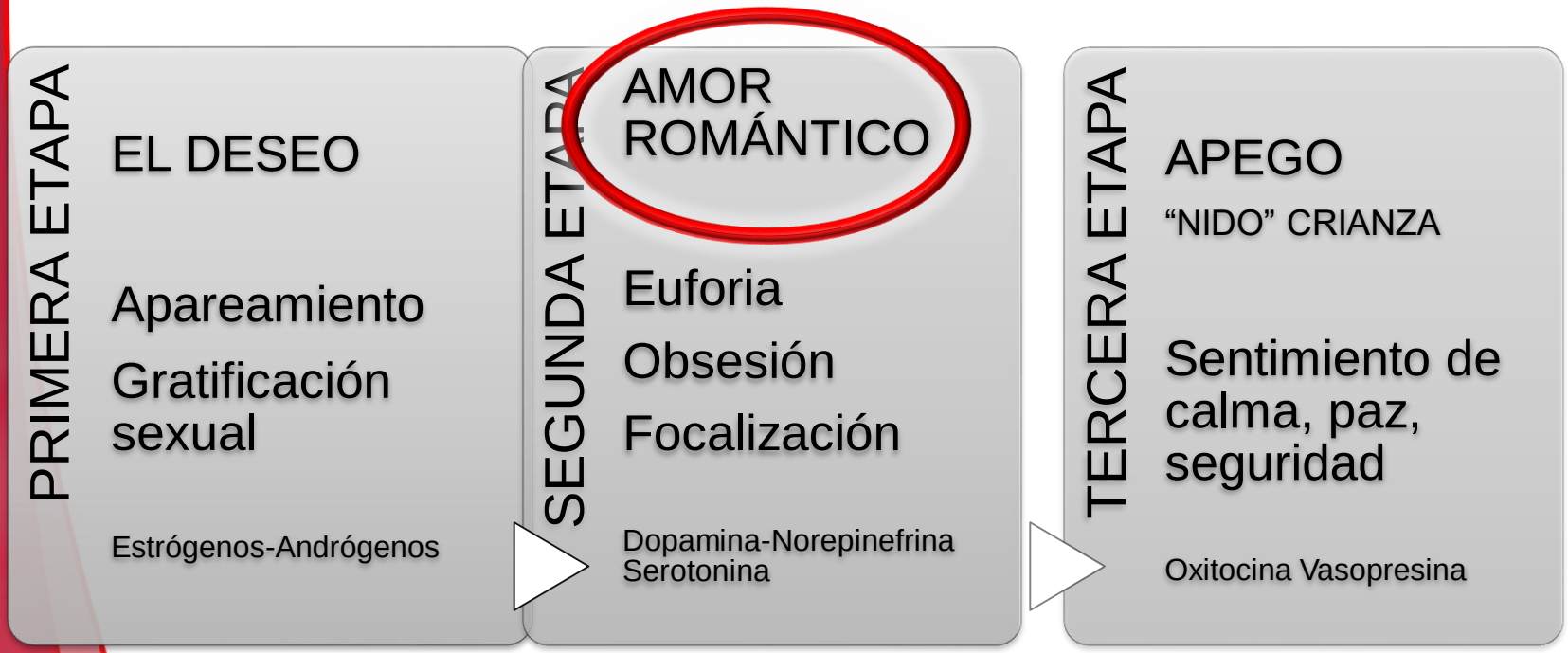
- 1. Testosterona (deseo sexual)
- 2. Estrógenos (aumentan en la mujer enarmorada)
- 3. Feniltelamina (felicidad, bienestar e hiperactividad)
- 4. Noradrenalina (excitación sexual)
- 5. Neurotrofinas (moléculas del amor: 900 días)
- 6. Serotonina (antidepresivo eficaz)
- 7. Dopamina (placer, refuerzo)
- 8. Vasopresina (hormona monogámica)
- 9. Oxitocina (lazos afectivos)

LAS FASES DEL AMOR



INTRODUCCIÓN

ETAPAS DE LA RELACIÓN AMOROSA



EXPIRATION DATE: _/_/_

18 y 30 meses (M=900 días)

Fisher, Aron, Mashek, Li, y Brown (2002); Hazan y Shaver (1987).

6. LAS FASES DEL AMOR

FASE 1: AMOR PASIONAL

No existe una línea recta en el estado de una relación, siempre pasa por diferentes fases.

En la primera fase se da un amor ideal en todos los sentidos, no existen fallos y defectos en el otro, y en el caso de existir se minimizan y compensan con las virtudes. Todo es maravilloso y cada momento común está lleno de felicidad. En los momentos de ausencia, hay añoranzas y pensamientos hacia el otro.

Esta idealización se basa sobre todo en que los contactos no suelen desarrollarse durante todo el día, y se limitan a ciertas horas cada periodo. En los momentos de lejanía los pensamientos se dedican a idealizar aún más, con poco lugar a la realidad. De ahí el dicho de que el amo es ciego, y aunque los amigos y familiares adviertan de inconvenientes, es complicado escucharles. Asimismo, no hay que tomar grandes decisiones por lo que los conflictos se minimizan.

6. LAS FASES DEL AMOR

FASE 1: AMOR PASIONAL (SEXUAL)

Según la profesora Cindy Hazan, de la Universidad de Cornell en Nueva York, "los seres humanos se encuentran biológicamente programados para sentirse apasionados entre 18 y 30 meses". Su afirmación está basada en una entrevista a cinco mil personas de 37 culturas distintas y a partir de ellos determinó que la pasión tiene un tiempo de vida: 900 días de media.

En cuanto al enamoramiento, hay dos elementos a tener en cuenta:

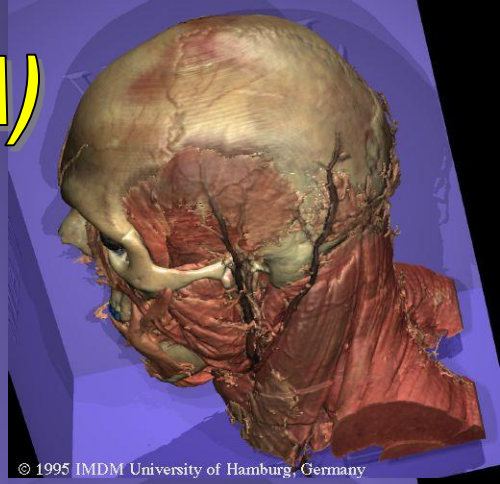
-El primero es el flechazo: cuando se conoce a alguien importante, una serie de cambios químicos y psicológicos tienen lugar en el cuerpo. Surgen entonces una serie de mecanismos de seducción, entre los que el lenguaje del cuerpo juega un rol fundamental.

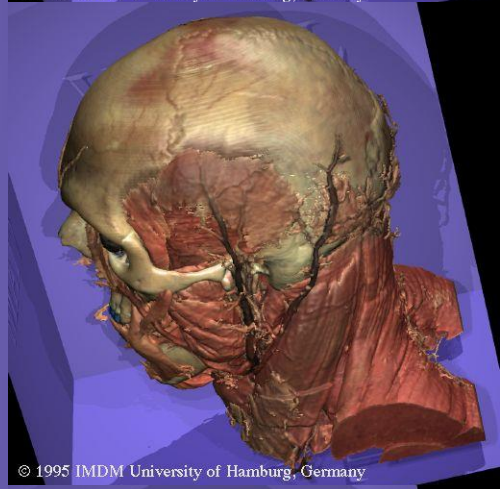
-El segundo es la famosa química que, los psicólogos evolucionistas norteamericanos, apuntan a que el amor, por lo menos en sus primeras fases, se abastece fundamentalmente de esto. Una sustancia en nuestro cerebro denominada feniletilamina obliga la secreción de la dopamina (núcleo caudado) o la norepinefrina, que por sus efectos se parecen a las "anfetaminas", las cuales producen un estado de euforia natural cuando estamos con la pareja.

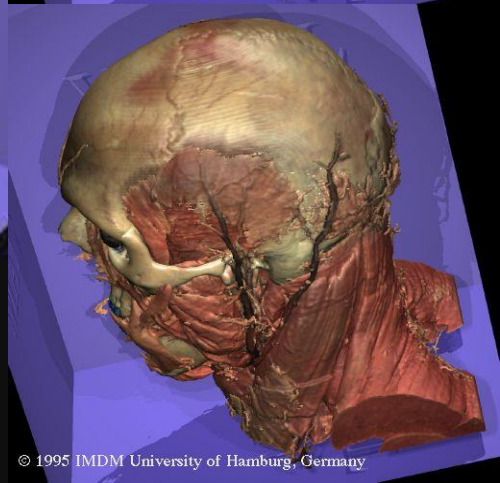

AMOR A PRIMERA
VISTA (EL FLECHAZO)
4:53

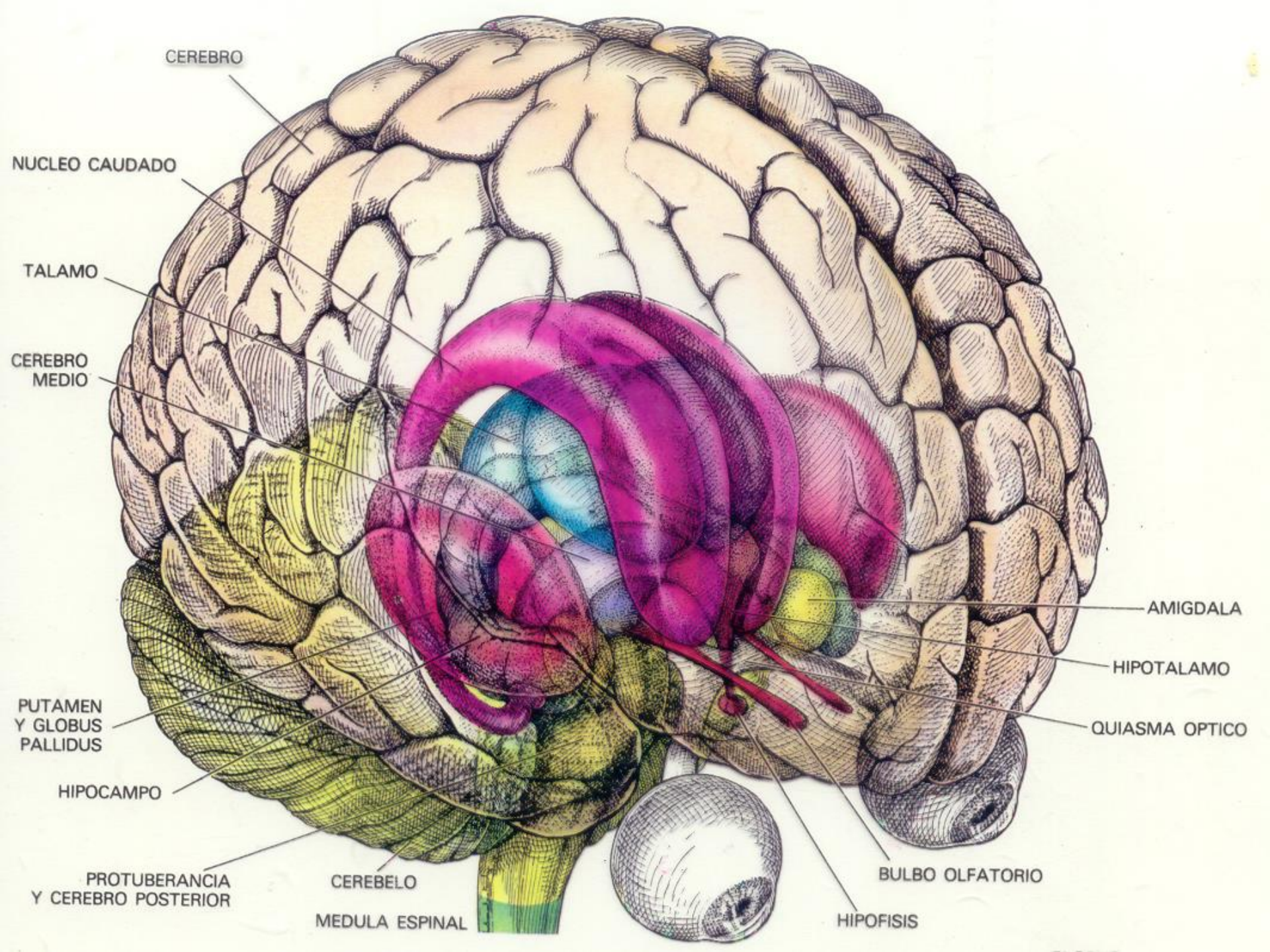

AMOR ROMANTICO:
100 DIAS (CAUDADO)
8:04

EL NUCLEO CAUDADO (DOPAMINA)

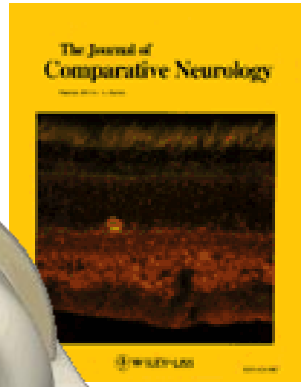







CEREBRO
NUCLEO CAUDADO
TALAMO
CEREBRO MEDIO
AMIGDALA
HIPOTALAMO
QUIASMA OPTICO
PUTAMEN Y GLOBUS PALLIDUS
HIPOCAMPO
PROTUBERANCIA Y CEREBRO POSTERIOR
CEREBELO
MEDULA ESPINAL
BULBO OLFATORIO
HIPOFISIS

THE JOURNAL OF COMPARATIVE NEUROLOGY 493:58–62 (2005)



Romantic Love: An fMRI Study of a Neural Mechanism for Mate Choice

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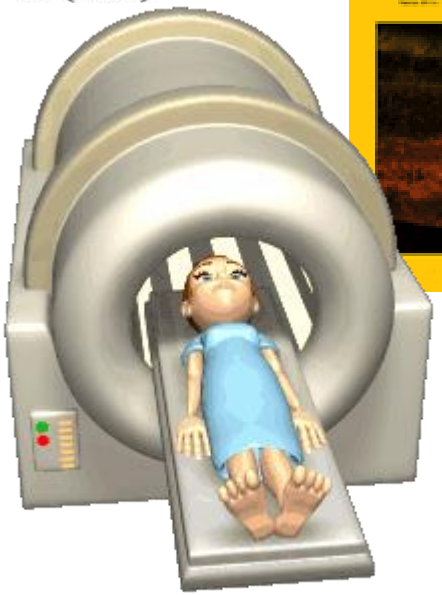
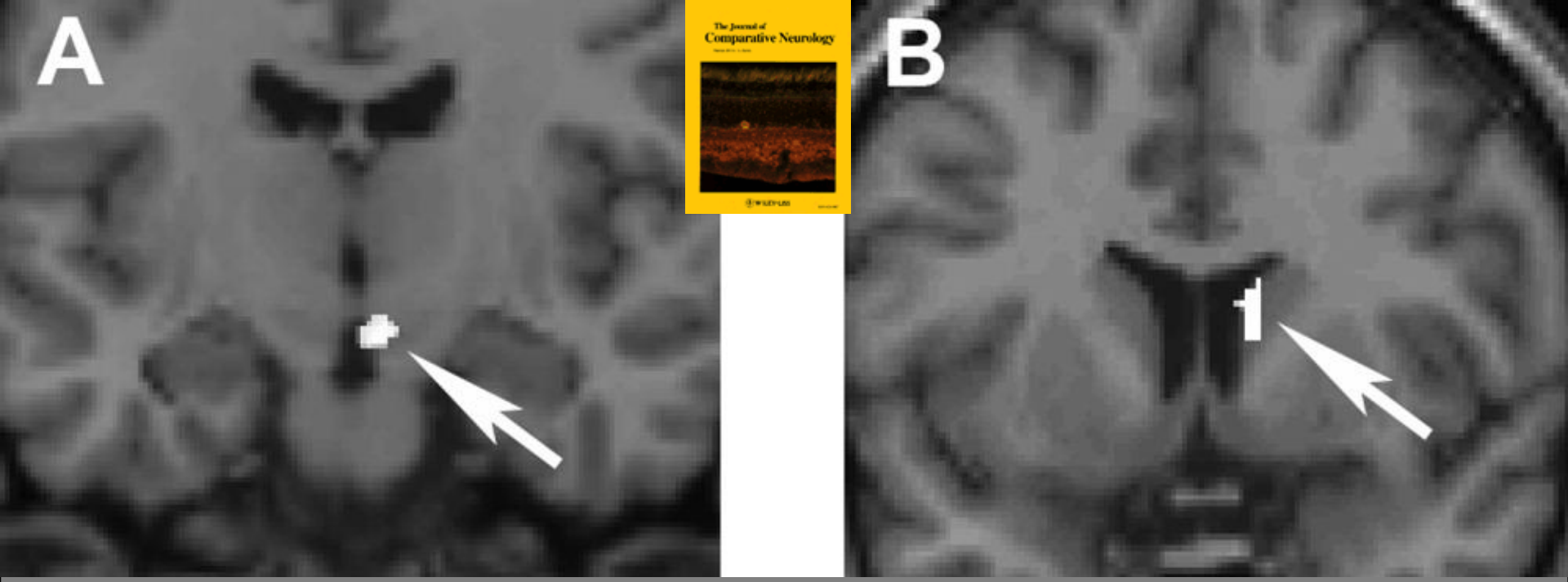


ABSTRACT

Scientists have described myriad traits in mammalian and avian species that evolved to attract mates. But the brain mechanisms by which conspecifics become attracted to these traits is largely unknown. Yet mammals and birds express mate preferences and make mate choices, and data suggest that this "attraction system" is associated with the dopaminergic reward system. It has been proposed that intense romantic love, a cross-cultural universal, is a developed form of this attraction system. To determine the neural mechanisms associated with romantic love we used functional magnetic resonance imaging (fMRI) and studied 17 people who were intensely "in love" (Aron et al. [2005] J Neurophysiol 94:327–337). Activation specific to the beloved occurred in the right ventral tegmental area and right caudate nucleus, dopamine-rich areas associated with mammalian reward and motivation. These and other results suggest that dopaminergic reward pathways contribute to the "general arousal" component of romantic love; romantic love is primarily a motivation system, rather than an emotion; this drive is distinct from the sex drive; romantic love changes across time; and romantic love shares biobehavioral similarities with mammalian attraction. We propose that this attraction mechanism evolved to enable individuals to focus their mating energy on specific others, thereby conserving energy and facilitating mate choice—a primary aspect of reproduction. Last, the corticostriate system, with its potential for combining diverse cortical information with reward signals, is an excellent anatomical substrate for the complex factors contributing to romantic love and mate choice. J. Comp. Neurol. 493:58–62, 2005.

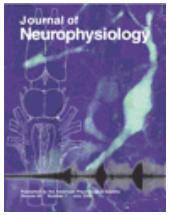
Indexing terms: romantic love; dopamine; fMRI; mate choice



Romantic love: An fMRI study of a neural mechanism for matechoice
Helen Fisher, Arthur Aron, Lucy L. Brown.
J Comp. Neurol. Vol.493, 1 Pages: 58-62

Group activation regions detected as individuals looked at an image of their beloved compared to an image of an acquaintance (see Aron et al., for details). The regions of activation (white) are from anatomically normalized data and are superimposed on a template brain from SPM99.
A: The right ventral tegmental area (arrow) was activated.
B: The right caudate nucleus (arrow) was activated.
Data from other studies of mammals suggest that these regions are involved in reward and motivation functions.

J Neurophysiol 94: 327–337, 2005;
doi:10.1152/jn.00838.2004.



Reward, Motivation, and Emotion Systems Associated With Early-Stage Intense Romantic Love

Arthur Aron,[1,*] Helen Fisher,[3,*] Debra J. Mashek,[1] Greg Strong,[1] Haifang Li,[2] and Lucy L. Brown[4,*]

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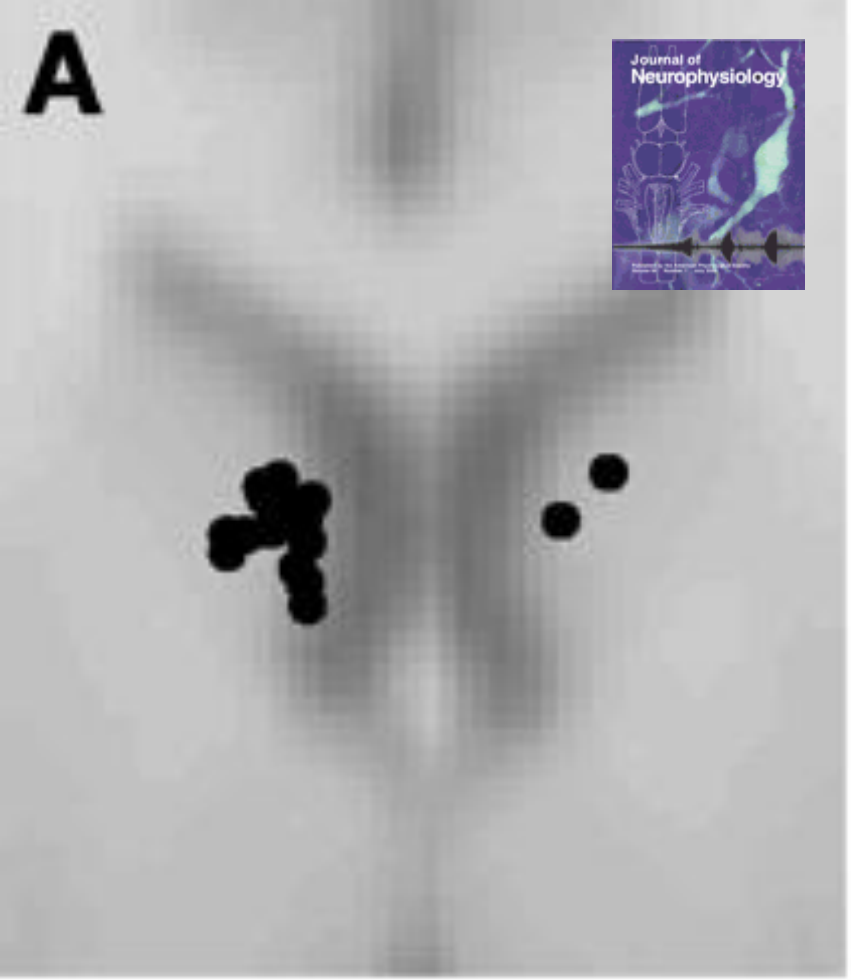
[3]*Department of Anthropology, Rutgers University, New Brunswick, New Jersey; and* [4]*Departments of Neurology and Neuroscience, Albert Einstein College of Medicine, Bronx, New York*

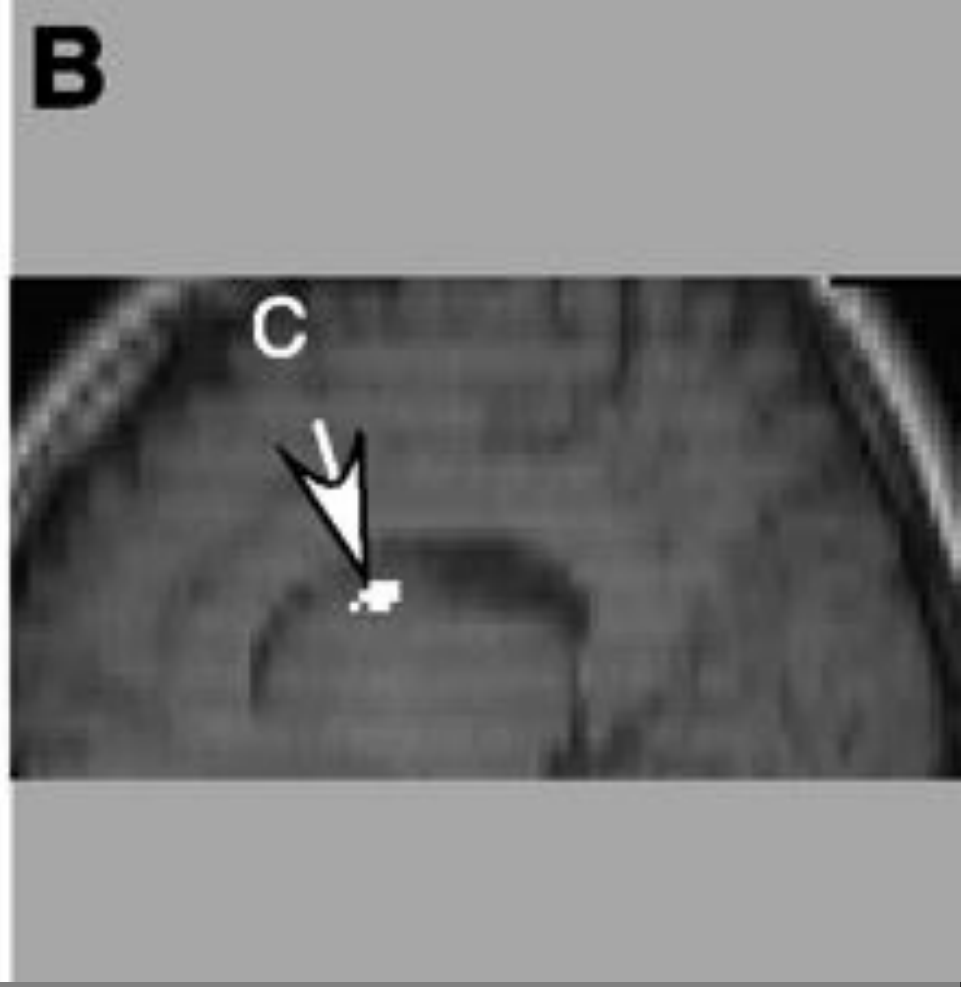
Submitted 16 August 2004; accepted in final form 20 March 2005

Aron, Arthur, Helen Fisher, Debra J. Mashek, Greg Strong, Haifang Li, and Lucy L. Brown. Reward, motivation, and emotion systems associated with early-stage intense romantic love. *J Neurophysiol* 94: 327–337, 2005; doi:10.1152/jn.00838.2004. Early-stage romantic love can induce euphoria, is a cross-cultural phenomenon, and is possibly a developed form of a mammalian drive to pursue preferred mates. It has an important influence on social behaviors that have reproductive and genetic consequences. To determine which reward and motivation systems may be involved, we used functional magnetic resonance imaging and studied 10 women and 7 men who were intensely "in love" from 1 to 17 mo. Participants alternately viewed a photograph of their beloved and a photograph of a familiar individual, interspersed with a distraction-attention task. Group activation specific to the beloved under the two control conditions occurred in dopamine-rich areas associated with mammalian reward and motivation, namely the right ventral tegmental area and the right postero-dorsal body and medial caudate nucleus. Activation in the left ventral tegmental area was correlated with facial attractiveness scores. Activation in the right anteromedial caudate was correlated with questionnaire scores that quantified intensity of romantic passion. In the left insula-putamen-globus pallidus, activation correlated with trait affect intensity. The results suggest that romantic love uses subcortical reward and motivation systems to focus on a specific individual, that limbic cortical regions process individual emotion factors, and that there is localization heterogeneity for reward functions in the human brain.

emotional dependency on and craving for emotional union with this beloved, and increased energy. Tennov (1979) coined the term "limerance" for this special state, and Hatfield and Sprecher (1986) developed a questionnaire scale to measure it. The universality, euphoria, and focused attention of [illegible]tic love suggest that reward and motivation systems in[illegible] brain could be involved (Fisher 1998; Liebowitz [illegible]

In addition, cross-cultural descriptions of ro[illegible] regularly include reward-related images and sugg[illegible] motivation to win a specific mating partner. For exa[illegible]e oldest love poem from Summeria, "Inanna an[illegible]uzi," dating ~4,000 yr ago and found on cuneiform [illegible]the Uruk language is translated, "My beloved, the[illegible]my eyes. . ." (Wolkstein and Kramer 1983). Fro[illegible]of Songs, the Hebrew 10th century poem comes[illegible] more wonderful than wine . . .the sound[illegible]e perfume . . . . I sought the one my soul lo[illegible]stein and Kramer 1983). Furthermore, among[illegible]phies canvassed in the review of Jankowiak and Fische[illegible]2) is one by Harris (1995) who cited evidence of the y[illegible]g for love and the motivation to win the beloved among[illegible]ples of Mangaia, Cook Islands, Polynesia. These pe[illegible]a word for "dying for love." They translate it as[illegible] want anything else; you die for love, but you don't[illegible]you





Reward, Motivation, and Emotion Systems Associated With Early-Stage Intense Romantic Love
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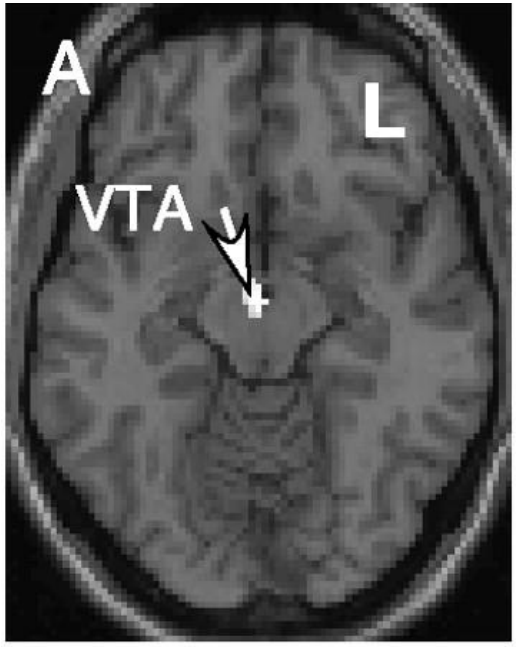
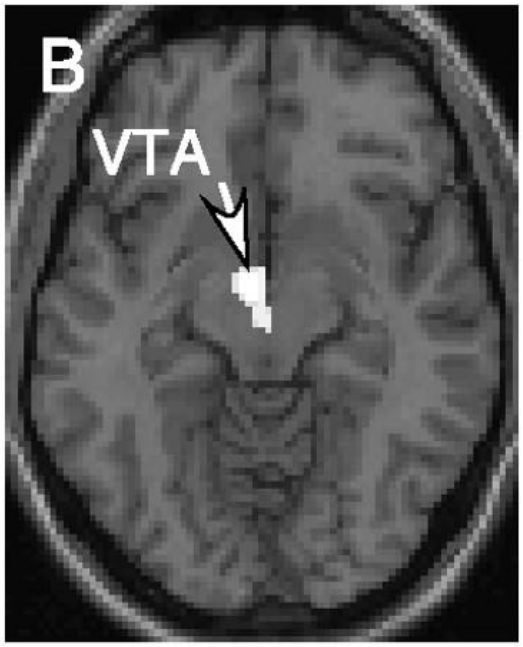
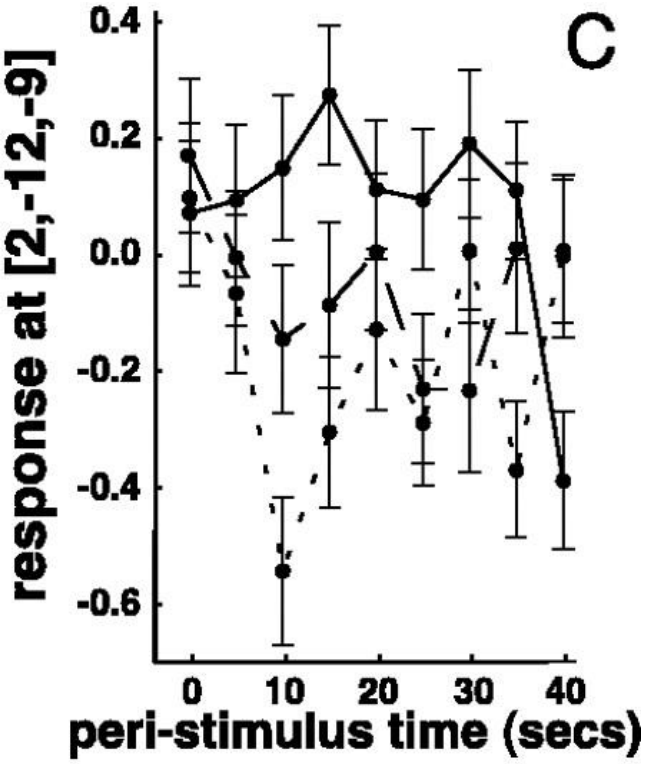
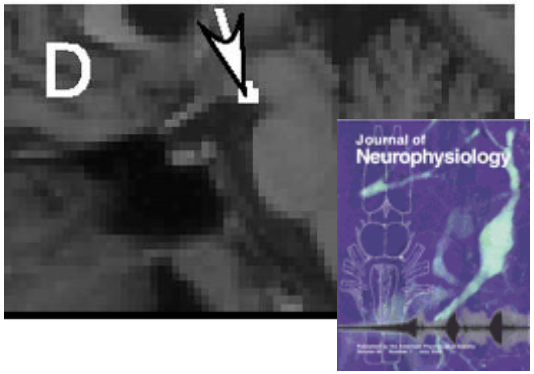
J Neurophysiol 94: 327-337, 2005

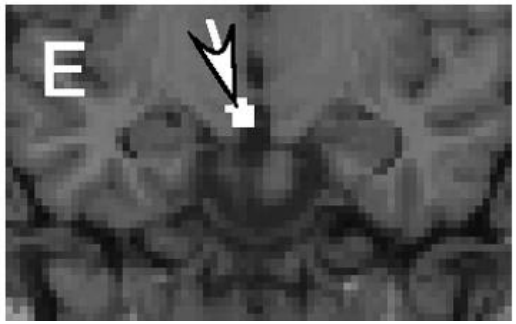
Caudate nucleus activation, positive-minus-neutral contrast. *A*: an enlargement of an axial section through the caudate nucleus from the MNI T1 template that averaged 305 subjects. Black dots show peak activation points for each participant in the present study. Activation points were near the medial edge of the caudate in the vicinity of Talairach coordinates 12, 11, 14 (dark gray areas are lateral ventricles). *B*: a sagittal section from an individual participant shows the extent of the posterior dorsal caudate activation (arrow). Images in this and all following figures are presented in radiologic convention (participants' left on the right side of the image). C, caudate.











Reward, Motivation, and Emotion Systems Associated With Early-Stage Intense Romantic Love

Arthur Aron, Helen Fisher, Debra J. Mashek, Greg Strong, Haifang Li and Lucy L. Brown

***J Neurophysiol* 94: 327-337, 2005**

Group mean data and an individual subject show the localized ventral midbrain effect. *A*: positive-minus-neutral contrast. *B*: positive-minus-countback contrast. Activity in the right VTA region (arrows) specifically increased in response to the positive image compared with both control conditions. The regional activation is highly localized to the medial A10 dopamine cell region with little inclusion of the medial substantia nigra. *C*: time-course of the BOLD response (means ± SE, 0 = mean of all conditions) for a voxel in the right VTA shows that the signal increased to the positive image (solid line) relative to the others; the signal during control stimuli presentations decreased relative to the positive image, especially for the countback task (short-dash line; 40-s countback task shown). Long-dash line, neutral stimulus. *D*: in a single subject, a sagittal view shows the anteroposterior extent of the right VTA activation (arrow). *E*: in the same subject, a coronal view of the right VTA activation (arrow) shows how it is limited to the medial midbrain. Locations of responses shown in the graph are given in Talairach coordinates. L, left side; VTA, ventral tegmental area.

6. LAS FASES DEL AMOR

FASE 1: AMOR PASIONAL

Romantic Love Conceptualized as an Attachment Process

Cindy Hazan and Phillip Shaver
University of Denver

This article explores the possibility that romantic love is an attachment process—a biosocial process by which affectional bonds are formed between adult lovers, just as affectional bonds are formed earlier in life between human infants and their parents. Key components of attachment theory, developed by Bowlby, Ainsworth, and others to explain the development of affectional bonds in infancy, were translated into terms appropriate to adult romantic love. The translation centered on the three major styles of attachment in infancy—secure, avoidant, and anxious/ambivalent—and on the notion that continuity of relationship style is due in part to mental models (Bowlby's "inner working models") of self and social life. These models, and hence a person's attachment style, are seen as determined in part by childhood relationships with parents. Two questionnaire studies indicated that (a) relative prevalence of the three attachment styles is roughly the same in adulthood as in infancy, (b) the three kinds of adults differ predictably in the way they experience romantic love, and (c) attachment style is related in theoretically meaningful ways to mental models of self and social relationships and to relationship experiences with parents. Implications for theories of romantic love are discussed, as are measurement problems and other issues related to future tests of the attachment perspective.

One of the landmarks of contemporary psychology is Bowlby's (1969, 1973, 1980) three-volume exploration of attachment, separation, and loss, the processes by which affectional bonds are forged and broken. Bowlby's major purpose was to describe and explain how infants become emotionally attached to their primary caregivers and emotionally distressed when separated from them, although he also contended that "attachment behavior [characterizes] human beings from the cradle to the grave" (1979, p. 129). In recent years, laboratory and naturalistic studies of infants and children (summarized by Bretherton, 1985, and Maccoby, 1980) have provided considerable support for attachment theory, which was proposed by Bowlby and elaborated by several other investigators. The purpose of this article is to explore the possibility that this theory, designed primarily with infants in mind, offers a valuable perspective on adult romantic love. We will suggest that romantic love is an attachment process (a process of becoming attached), experienced somewhat differently by different people because of variations in their attachment histories.

For our purpose, which is to create a coherent framework for understanding love, loneliness, and grief at different points in the life cycle, attachment theory has several advantages over existing approaches to love (Shaver, Hazan, & Bradshaw, in press). First, although many researchers (e.g., Rubin, 1973; Hatfield & Sprecher, 1985) have attempted to assess love with unidimensional scales, love appears to take multiple forms (e.g., Dion & Dion, 1985; Hendrick & Hendrick, 1986; Lee, 1973; Steck, Levitan, McLane, & Kelley, 1982; Sternberg, 1986; Tennov, 1979). Attachment theory explains how at least some of these forms develop and how the same underlying dynamics, common to all people, can be shaped by social experience to produce different relationship styles. Second, although various authors have portrayed certain forms of love as healthy and others as unhealthy, or at least problematic (e.g., Hindy & Schwarz, 1984; Tennov, 1979), they have not said how the healthy and unhealthy forms fit together in a single conceptual framework. Attachment theory not only provides such a framework, but it also explains how both healthy and unhealthy forms of love originate as reasonable adaptations to specific social circumstances. The portrait of love offered by attachment theory includes negative as well as positive emotions: for example, fear of intimacy (discussed by Hatfield, 1984), jealousy (e.g., Hindy & Schwarz, 1985), and emotional ups and downs (Tennov, 1979) as well as caring (Rubin, 1973), intimacy (Sternberg, 1986), and trust (Dion & Dion, 1985). Third, attachment theory deals with separation and loss and helps explain how loneliness and love are related (Shaver & Rubenstein, 1980; Parkes &

We are grateful to Donna Bradshaw for sharing her expertise in the areas of attachment theory and research, to Marty Meitus for allowing us to conduct Study 1 in the *Rocky Mountain News*, to Kathy Purcell for keypunching, to Rick Canfield for assistance in all phases of the project, and to Mary Ainsworth, John Bowlby, Harry Gollob, Lee Kirkpatrick, Roger Kobak, Anne Peplau, Harry Reis, Judith Schwartz, Arlene Skolnick, and Robert Sternberg for helpful comments on convention presentations and earlier drafts of this article.

Correspondence concerning this article should be addressed to Cindy Hazan or to Phillip Shaver, Department of Psychology, University of Denver, Denver, Colorado 80208-0204.

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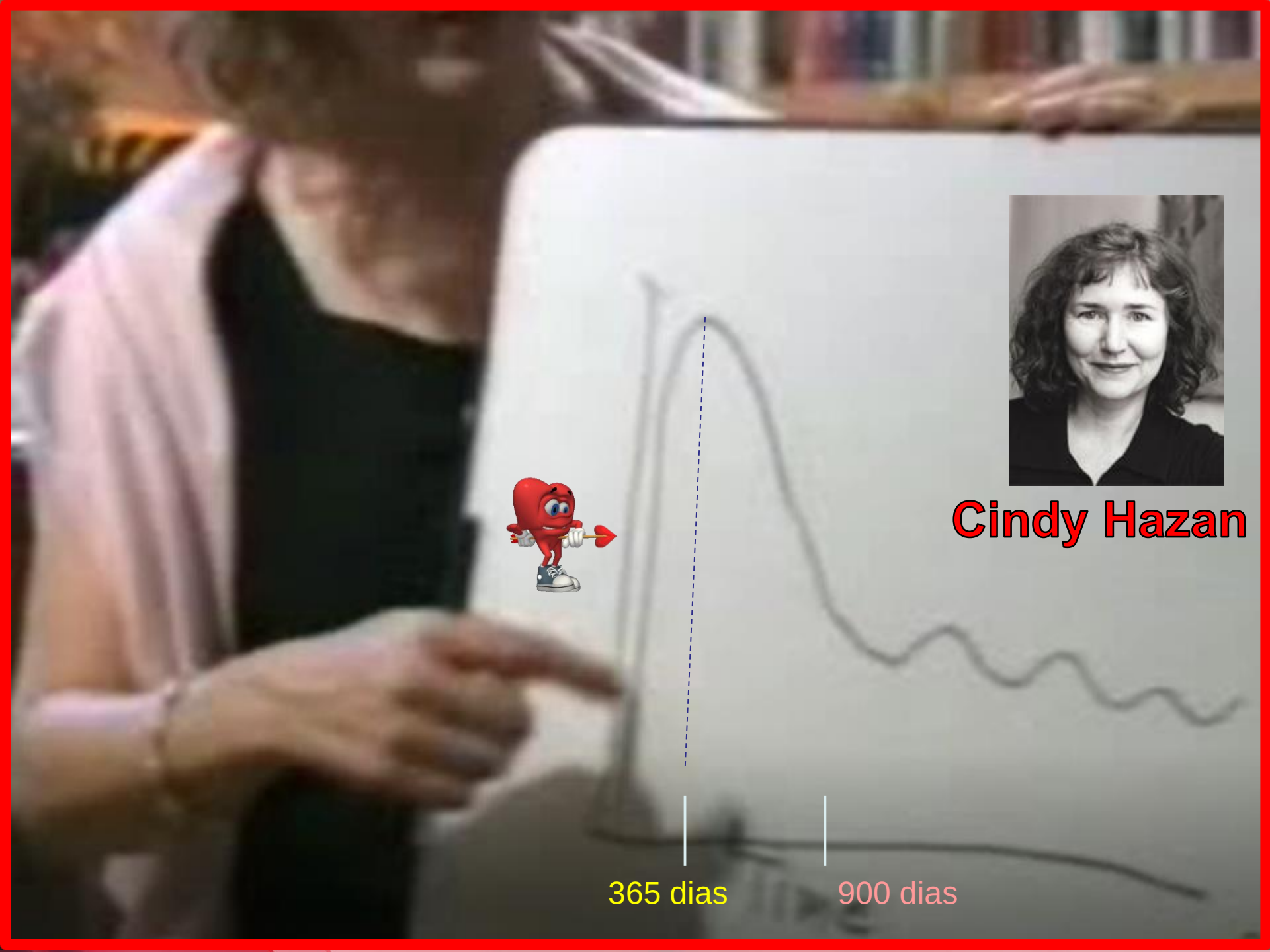
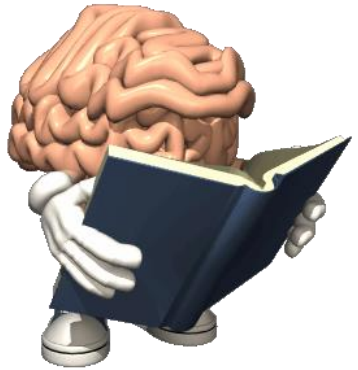

Cindy Hazan
365 dias
900 dias

ESCALA DE AMOR PASIONAL (PLS)

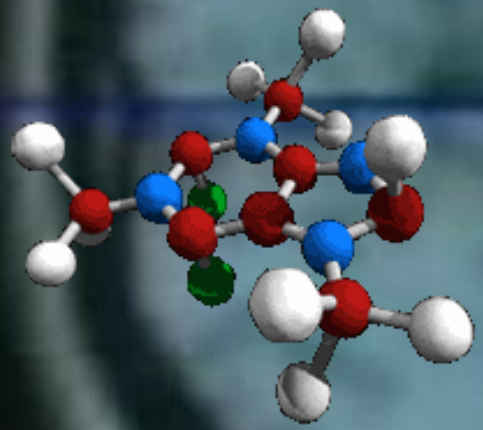


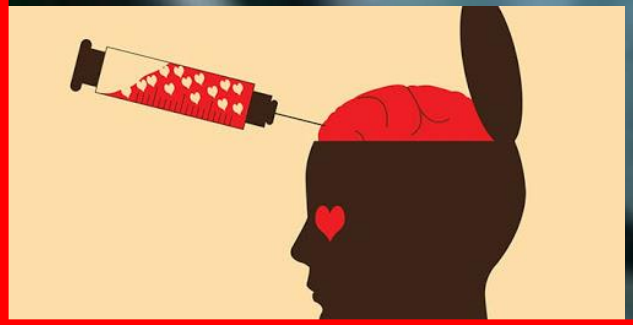
(Hatfield & Sprecher, 1986; *J. Adolescence, 9: 383-410*)

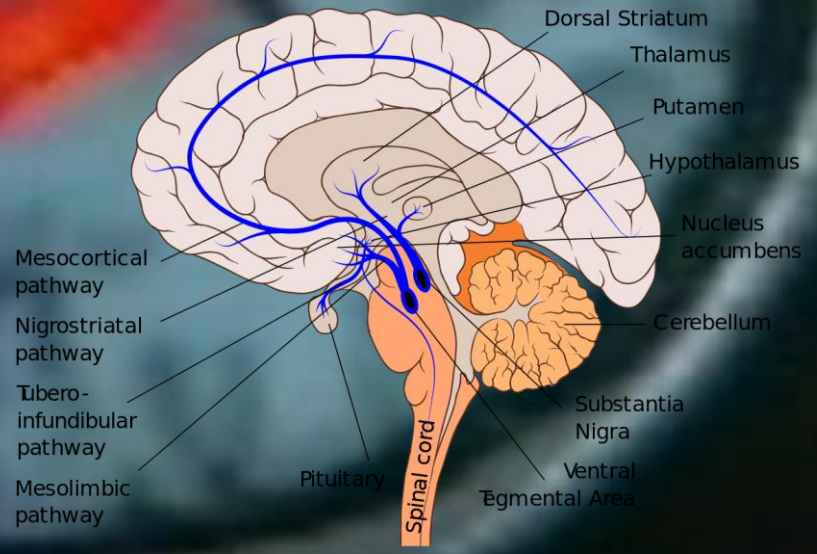
	no si
Me sentiría muy desgraciado/a si _____ me dejara	1 2 3 4 5 6 7 8 9
A veces siento que no puedo controlar mis pensamientos obsesivos respecto a _____	1 2 3 4 5 6 7 8 9
Me siento muy bien cuando estoy haciendo algo que hace feliz a _____	1 2 3 4 5 6 7 8 9
Prefiero estar con _____ más que con cualquier otro/a	1 2 3 4 5 6 7 8 9
Estaría celoso/a al pensar que _____ se está enamorando de otro/a	1 2 3 4 5 6 7 8 9
Me muero de ganas por saberlo todo sobre _____	1 2 3 4 5 6 7 8 9
Tengo unas ganas infinitas de sentirme querido/a por _____	1 2 3 4 5 6 7 8 9
Para mi _____ es el perfecto/a compañero romántico	1 2 3 4 5 6 7 8 9
Siento que mi cuerpo responde cuando _____ me toca	1 2 3 4 5 6 7 8 9
_____ siempre está en mis pensamientos	1 2 3 4 5 6 7 8 9
Quiero que _____ conozca mis pensamientos, miedos y esperanzas	1 2 3 4 5 6 7 8 9
Busco ávidamente signos de que _____ me desea	1 2 3 4 5 6 7 8 9
Siento una profunda atracción por _____	1 2 3 4 5 6 7 8 9
Me siento muy deprimido/a cuando las cosas no van bien en mi relación con _____	1 2 3 4 5 6 7 8 9

Total: _____

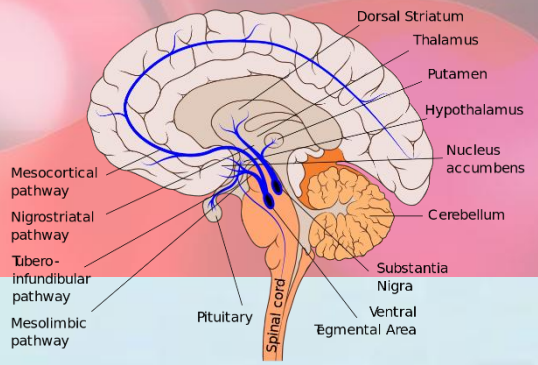
Núcleos caudados (Da): amor a los 100 dias

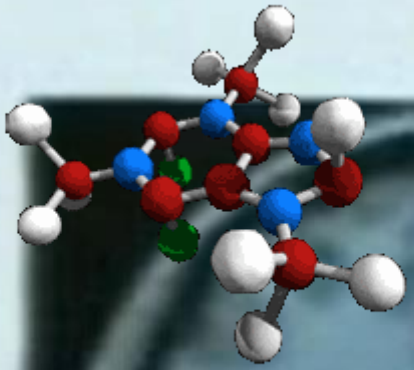






Núcleos caudados (Da): amor a los 365 dias





Amor a los 100 dias

Amor 1 año

6. LAS FASES DEL AMOR

FASE 2: AMOR ROMANTICO

Con el tiempo la relación se complica, se entra en una segunda fase de más cercamiento. Ahora sí que es necesario decidir sobre asuntos de presente y futuro.

Paralelamente se ha alcanzado un grado de conocimiento del otro mayor: se conocen las virtudes, los defectos, las reacciones, las formas de comportarse, los detalles, los comportamientos en casos extremos. La idealización pues ha acabado y la relación es más realista.

Se impone una balanza entre lo bueno y lo malo de la relación, surgen las lógicas dudas y se reflexiona sobre el futuro de la relación. Si la rutina se ha apoderado prematuramente de la pareja se entra en aburrimientos y cansancios. Es el momento de evaluar el estado de la relación: si ha sido algo pasajero e inestable, el final estará cerca. Si hay problemas, es el momento de solucionarlos o acabar.


AMOR: 6 MESES
8:22

6. LAS FASES DEL AMOR

FASE 3: AMOR-APEGO (LONGEVO)

En la tercera fase, la de la madurez, se supone que en vida en común y un compromiso de pareja estable y sin caducidad. Existen problemas que hay que solventar, y estos, si no se solucionan a tiempo pueden convertirse en grandes losas.

Se aprende a vivir con aquellos defectos que más molestan, aunque desagraden. La pasión hace tiempo que no es lo mismo, y la comunicación sexual ha pasado a un cariño costumbrista y tolerante.

El conocimiento mutuo y la anticipación de reacciones es casi completo, sin lugar a demasiadas sorpresas. Existirán enfados sí, pero más bien causados por elementos externos, por el cansancio de la rutina que por novedades de personalidad o comportamiento.

La pareja, ya con años de bagaje llega a la última fase, en el que los dos se han convertido en compañeros de vida, y el cariño prevalece sobre cualquier sentimiento. Es amor en efecto, pero de forma diferente, la pasión se ha reducido al mínimo, y la compañía se hace la reina de la relación.

Es la fase a la que a todas las parejas les gustaría llegar, como las de nuestros abuelos. Tras decenas de años de confianza no hay sorpresas, pero sí resquemores por oportunidades idílicas perdidas de otros amores. Los años han pasado y ese sentimiento de ocasiones no aprovechadas se suele descargar en el otro.


¿CUANTO DURA EL AMOR PASIONAL?
Love is
900 day
Whirlwind
11:25

frontiers in
HUMAN NEUROSCIENCE

ORIGINAL RESEARCH ARTICLE
published: 13 February 2015
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Love-related changes in the brain: a resting-state functional magnetic resonance imaging study

Hongwen Song[1†], Zhiling Zou[1†], Juan Kou[1], Yang Liu[1], Lizhuang Yang[2], Anna Zilverstand[3], Federico d'Oleire Uquillas[3] and Xiaochu Zhang[2,4,5*]*

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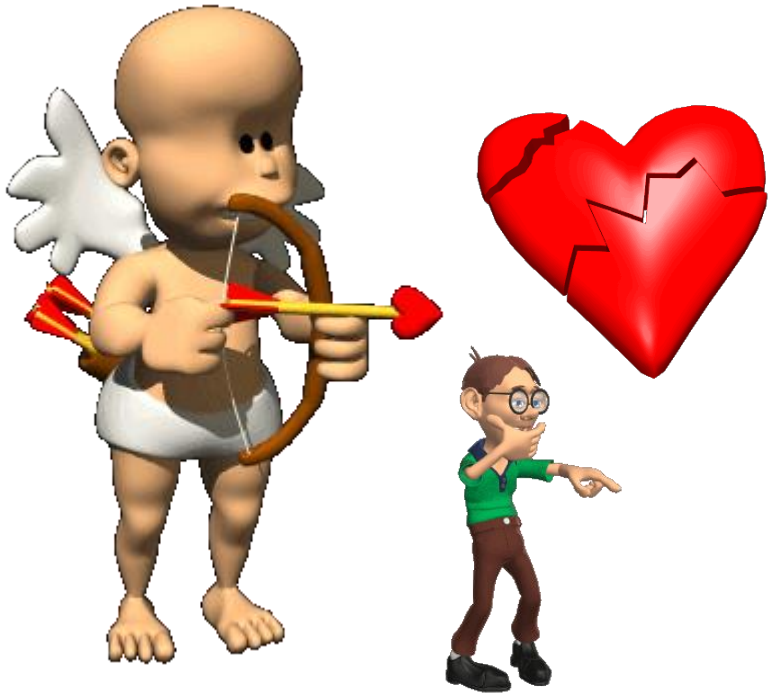
[5] *School of Humanities and Social Science, University of Science and Technology of China, Anhui, China*

Romantic love is a motivational state associated with a desire to enter or maintain a close relationship with a specific other person. Functional magnetic resonance imaging (fMRI) studies have found activation increases in brain regions involved in the processing of reward, motivation and emotion regulation, when romantic lovers view photographs of their partners. However, not much is known about whether romantic love affects the brain's functional architecture during rest. In the present study, resting state functional magnetic resonance imaging (rsfMRI) data was collected to compare the regional homogeneity (ReHo) and functional connectivity (FC) across an "in-love" group (LG, $N = 34$, currently intensely in love), an "ended-love" group (ELG, $N = 34$, ended romantic relationship recently), and a "single" group (SG, $N = 32$, never fallen in love). Results show that: (1) ReHo of the left dorsal anterior cingulate cortex (dACC) was significantly increased in the LG (in comparison to the ELG and the SG); (2) ReHo of the left dACC was positively correlated with length of time in love in the LG, and negatively correlated with the lovelorn duration since breakup in the ELG; (3) FC within the reward, motivation, and emotion regulation network (dACC, insula, caudate, amygdala, and nucleus accumbens) as well as FC in the social cognition network [temporo-parietal junction (TPJ), posterior cingulate cortex (PCC), medial prefrontal cortex (MPFC), inferior parietal, precuneus, and temporal lobe] was significantly increased in the LG (in comparison to the ELG and SG); (4) in most regions within both networks FC was positively correlated with the duration of love in the LG but negatively correlated with the lovelorn duration of time since breakup in the ELG. This study provides first empirical evidence of love-related alterations in brain functional architecture. Furthermore, the results shed light on the underlying neural mechanisms of romantic love, and demonstrate the possibility of applying a resting-state fMRI approach for investigating romantic love.



RESULTADOS

OBJETIVOS: Comparar la conectividad funcional en reposo mediante RMf (DMN) entre un grupo de 34 personas enamoradas (A), 32 con fracaso sentimental reciente (FSR) y 32 solteros/as que nunca se enamoraron (S)

RESULTADOS:

->Actividad en cíngulo anterior izdo. del grupo A

->Conectividad en el grupo A en la red de la emoción, refuerzo y motivación (ínsula, caudado, amígdala y núcleo accumbens).

-> Actividad del grupo A en la red de cognición social (unión T-P, cíngulo posterior, corteza prefrontal medial, parietal inferior, precúneo y lóbulo temporal.

-Una persona enamorada tiene mayor conectividad entre las regiones del cerebro asociadas con la recompensa, la motivación, la regulación de la emoción y la cognición social.

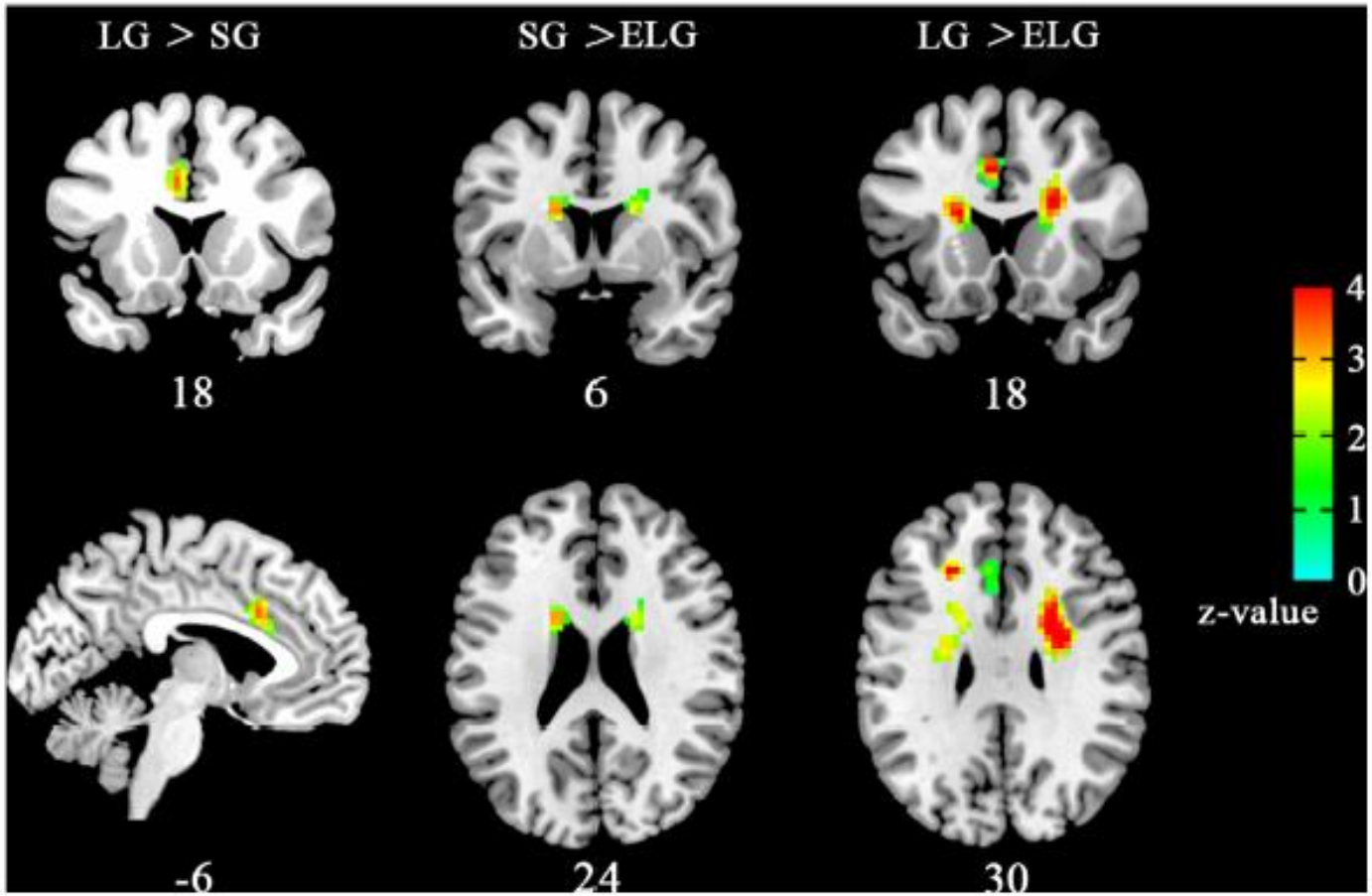


FIGURE 1 | Brain areas with altered ReHo the in-love group (LG) and ended-love group (ELG). Significantly increased regional homogeneity (ReHo) was found in the left dorsal anterior cingulate cortex (dACC; −6,18,33) in the LG (LG > SG), but reduced ReHo was found in the left caudate nucleus [ELG < SG, (−15,9,21); ELG < LG, (−18,9,24)] and the right caudate nucleus [ELG < SG, (18,9,2); ELG < LG, (18,12,18)] in the ELG. All resultants were corrected by FDR correction ($P < 0.05$). *Coordinates in MNI space.

frontiers in HUMAN NEUROSCIENCE

ORIGINAL RESEARCH ARTICLE
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Love-related changes in the brain: a resting-state functional magnetic resonance imaging study

Hongwen Song[1†], Zhiling Zou[1†], Juan Kou[1], Yang Liu[1], Lizhuang Yang[2], Anna Zilverstand[3], Federico d'Oleire Uquillas[3] and Xiaochu Zhang[2,4,5]**

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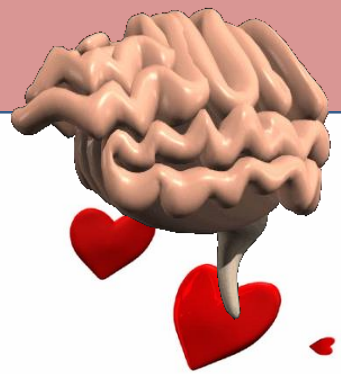
¿Estás recién enamorado/a? (máx. 9 meses)
¿Llevas entre 3 y 10 años con tu pareja?

Si tienes entre 18-40 años, te invitamos a participar en una investigación sobre amor y función cognitiva dirigida por el Dr. Raúl Espert (Dpto. de Psicobiología, UV).

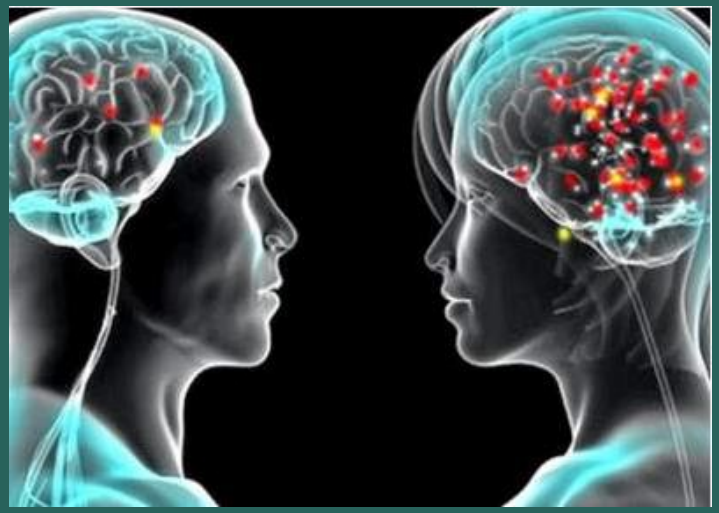
Si estás interesado/a envianos un mail a: tesisamor@gmail.com

Te explicaremos las condiciones del estudio y su privacidad



NEUROPSICOLOGÍA DEL ENAMORAMIENTO: EFECTOS SOBRE EL CONTROL COGNITIVO Y LA MEMORIA

Universidad Católica de Valencia San Vicente Mártir



PRESENTADA POR:
Mª Rosario Villalba Agustín

DIRIGIDA POR:
Dr. Raúl Espert Tortajada
Dra. Mª Dolores Grau Sevilla

FUNDAMENTACIÓN TEÓRICA

NEUROPSICOLOGÍA. ENAMORAMIENTO Y CAMBIOS COGNITIVOS

Motiv Emot
DOI 10.1007/s11031-013-9380-3

ORIGINAL PAPER

Reduced cognitive control in passionate lovers

Henk van Steenbergen · Sandra J. E. Langeslag · Guido P. H. Band · Bernhard Hommel

N=43 (23 mujeres y 20 hombres)
Máximo 6 meses relación
Media edad= 21 años
Inducción amorosa= 10 minutos → PLS → STROOP y Tarea de flancos

CONCLUSIÓN

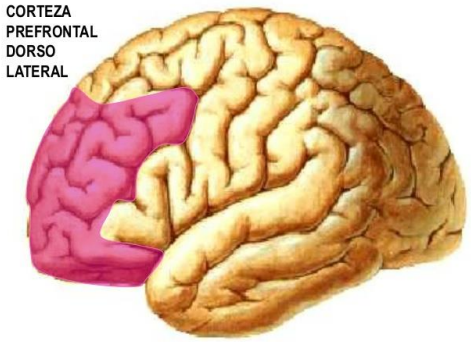
A mayor intensidad de amor romántico, menor control cognitivo

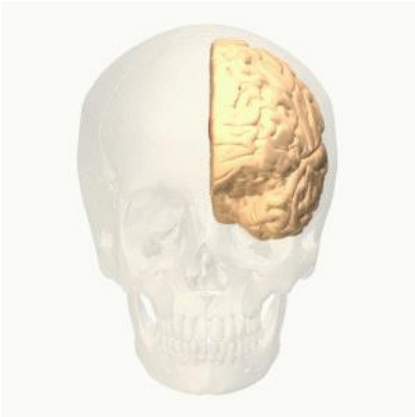
FUNDAMENTACIÓN TEÓRICA

NEUROPSICOLOGÍA

FUNCIONES EJECUTIVAS

Serie de mecanismos implicados en la optimización de recursos cognitivos.
Localización: Cortex prefrontal dorsolateral y cortex cingulado anterior.





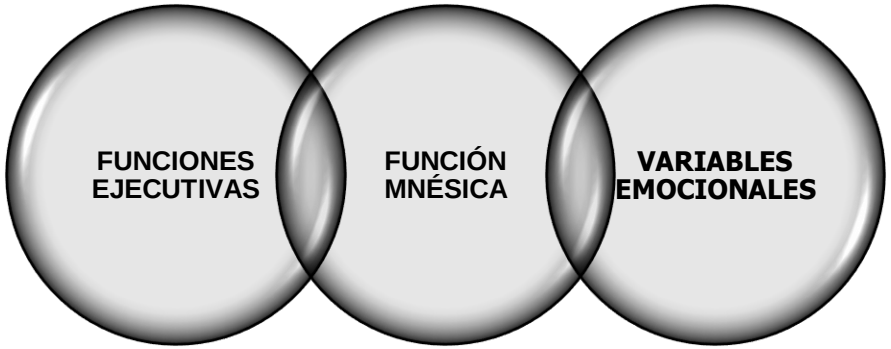
-Procesos de planificación y solución problemas
-Memoria de trabajo
-Flexibilidad cognitiva
-Control inhibitorio
-Secuenciación y seriación
-Sentido de unidad cognitiva: WM y FE demanda tarea
Höller-Wallscheid, Thier, Pomper y Lindner (2017)

3. TRABAJO EMPÍRICO

OBJETIVOS

OBJETIVO GENERAL

Analizar los cambios neuropsicológicos que se producen en las personas que se encuentran en la primera fase del enamoramiento, principalmente relacionados con el control cognitivo, la función ejecutiva, la memoria y variables emocionales.



3. TRABAJO EMPÍRICO

OBJETIVOS E HIPÓTESIS

OBJETIVOS ESPECÍFICOS	HIPÓTESIS	ESTUDIOS
1. Analizar las funciones ejecutivas en personas recién enamoradas y las que tienen una relación > 3 años. 	**H1: Las personas <9 meses tendrán peor rendimiento que las >3 años en las FE:**	
	- ↓ Planificación y resolución de problemas	Bush et al. 2000; Dreisbach y Goschke, 2004; Oaksford, Morris, Grainger y Williams, 1996; Spies, Hesse y Hummitzsch, 1996; Phillips, Smith y Gilhooly (2002)
	- ↓ Atención sostenida, selectiva e inhibición respuesta automática.	Van Steenberg et al. 2014; Pliszka et al.2006 Dreisbach y Goschke, 2004; . MacDonald, Cohen, Stenger y Carter (2000); Cabeza y Nyberg (2000) Phillips, Bull, Adams y Fraser (2002)
	- ↓ Flexibilidad cognitiva.	Bartels y Zeki (2004)
	- ↓ Memoria de trabajo	Ivry y Spencer (2004); Lewis y Miall, 2006; Martin y Kerns, 2011
2.Examinar el rendimiento mnésico (memoria declarativa) en la muestra objeto de estudio.	**H2: Peor rendimiento mnésico <9 meses:** - ↓ Supraspan atencional - ↓ Codificación - ↓ Tarea de interferencia - ↓ Curva de aprendizaje - ↓ Recuerdo inmediato y diferido - ↓ Reconocimiento (sesgos de respuesta)	D'Esposito y Postle, 2002 Höller-Wallscheid, Thier, Pomper y Lindner, 2017 Opitz et al. 2000 Spies et al. 1996 Simons y Spiers, 2003

3. TRABAJO EMPÍRICO

MÉTODO. Obtención de la muestra

CRITERIOS DE INCLUSIÓN

- ✓ Grupo recién enamorados: < 9 meses
- ✓ Grupo relación > 3 años
- ✓ Edad 18-40 años

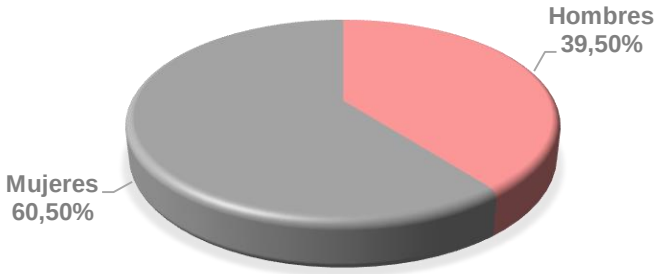
CRITERIOS DE EXCLUSIÓN

- ✓ Trastornos psiquiátricos
- ✓ Daño cerebral
- ✓ Consumo de sustancias tóxicas, psicofármacos y psicoestimulantes
- ✓ No daltónicos

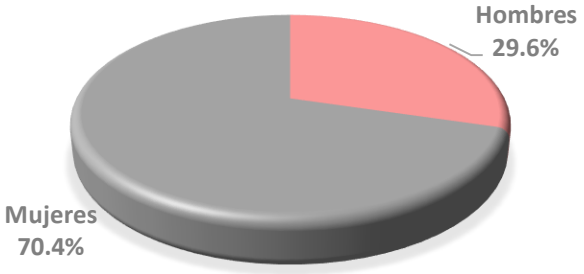
3. TRABAJO EMPÍRICO

MÉTODO. Características de la muestra.

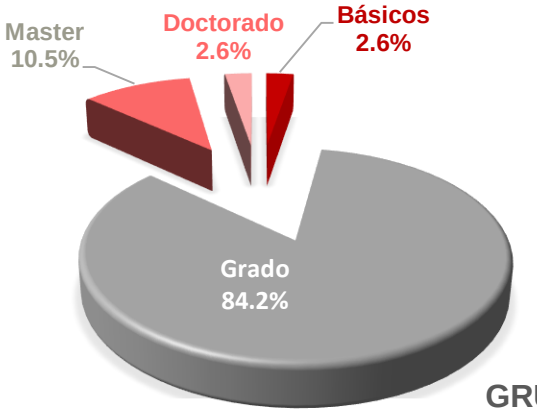
Participantes → N=92 M=61 H=31 ; Edad: 23 (18-40 años)



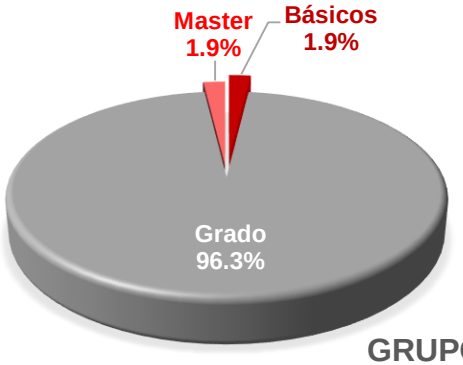
GRUPO < 9 MESES



GRUPO > 3 AÑOS



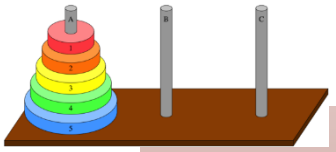
GRUPO < 9 MESES



GRUPO > 3 AÑOS

4. TRABAJO EMPÍRICO

INSTRUMENTOS DE EVALUACIÓN



Torre de Hanoi
(Simon, 1975)

α= 0.92

- Capacidad de planificación
- Generación de estrategias
- Resolución de problemas complejos

STROOP Test de Colores y Palabras (Stroop, 1935)

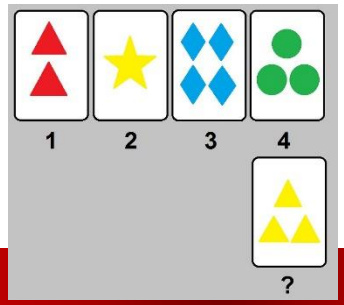
α= 0.86, 0.82 y 0.73

- Atención sostenida y selectiva
- Inhibición cognitiva

Test de Clasificación de Cartas de Wisconsin (Heaton, Chelune, Talley, Kay y Curtis, 1981)

α= 0.87

- Flexibilidad cognitiva

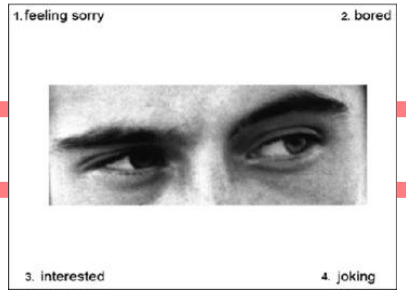


Test de Cronometraje controlado

- Atención
- Memoria de trabajo

4. TRABAJO EMPÍRICO

INSTRUMENTOS DE EVALUACIÓN



Test de aprendizaje verbal España-Complutense (TAVEC)
(Benedet y Alejandre 1998)
α= 0.82

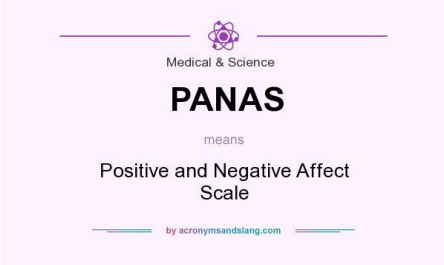
- Procesos mnésicos básicos
- Memoria episódica verbal

Test de la mirada (TdlM)
(Baron-Cohen, Wheelwright, Hill, Raste y Plum, 2001)
Taducción Roman et al. (2012)
α= 0.89

- Teoría de la mente

Escala de Afectividad Positiva y Negativa PANAS SCALE 20
(Watson, Clark y Tellegen, 1988)
α= 0.90 y 0.87

- Emocionalidad



Escala de Amor Pasional Pasional Love Scale (PLS)
(Hatfield y Sprecher,1986)
α= 0.91

- Amor pasional (cognitivo, emocional y comportamental)

OBJETIVO 1: Analizar las diferencias en las funciones ejecutivas
Planificación y resolución de problemas complejos.

Torre de Hanoi

	GRUPO < 9 MESES[a]		GRUPO >3 AÑOS[b]					
	M	SD	M	SD	d	*t*	U	*p*
TH-5 Mov	113,76	52,89	85,22	36,64	0,65	3,06		0,003
TH5 Tiempo	284,29	143,66	182,87	105,86	0,78		588	0,001
TH5 Err	11,50	19,27	5,85	8,59	0,36		813	0,089

Nota. M=media; DE: desviación estándar; *d*: estadístico d de Cohen; t= t de Student; U= U de Mann-Whitney; Mov: número de movimientos; Err: número de errores

[a]*n*=38. [b]*n*=54.

*$p < 0,05$; **$p < 0,01$.

Figura 22. Diagrama de barras según las puntuaciones en la Torre de Hanói y grupo

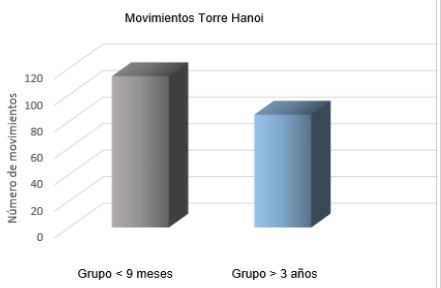


Figura 22. Número de movimientos utilizados para la Torre de Hanoi.

Figura 23. Diagrama de barras según las puntuaciones en la Torre de Hanói y grupo

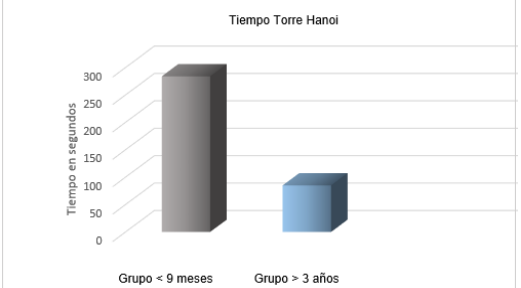


Figura 23. Tiempo utilizado para la realización de la Torre de Hanoi

3. TRABAJO EMPÍRICO

OBJETIVO 2 : Analizar el rendimiento mnésico verbal

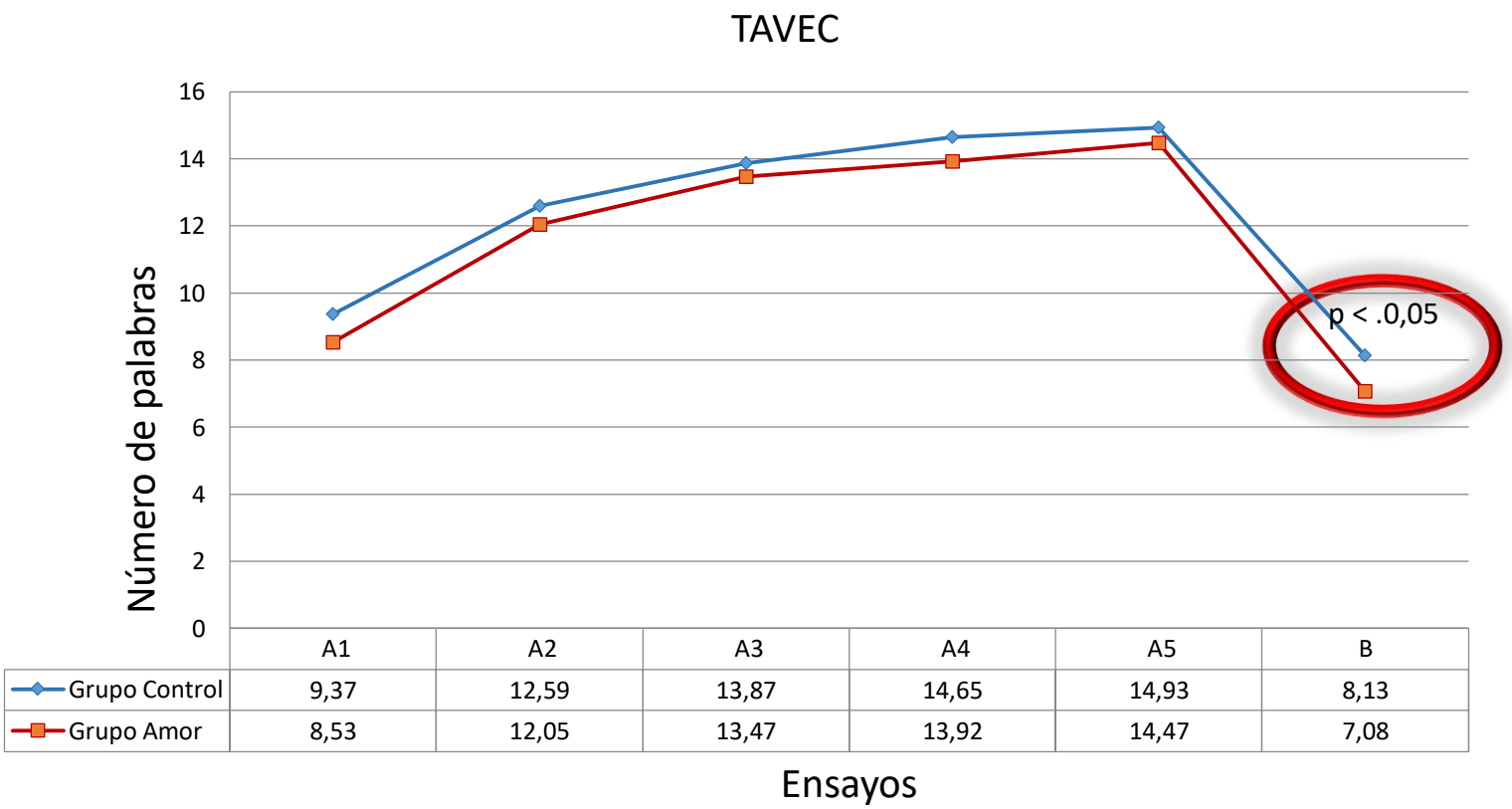
TAVEC	GRUPO < 9 MESES[a]		GRUPO >3 AÑOS[b]				
	M	SD	M	SD	*t*	d	*p*
SP	8,53	1,7	9,37	2,3	1,9	0,4	0,06
CT	62,4	6,4	65,4	6	2,3	0,48	0,025*
CA	5,9	1,8	5,5	2,1	0,92 0,20		0,.36
IF	7,1	2	8,1	1,7	2,7	0,57	0,008**
	M	SD	M	SD	U		p
RI	13,8	1,7	13,9	1,9	962	0,11	0,60
RIC	14	2	14.2	1.5	995.5	0.05	0.80

Nota. SP=Supraspan atencional; CT = Codificación total; CA= Curva de aprendizaje; IF=Interferencia; RI=Recuerdo inmediato; RIC= Recuerdo inmediato con claves; RIF= Recuerdo inmediato facilitado; M= media; SD= desviación estándar.

[a]*n* = 38. [b]*n* =54. *$p < 0,05$; **$p < 0,01$.

3. TRABAJO EMPÍRICO

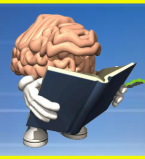
OBJETIVO 2 : Analizar el rendimiento mnésico verbal TAVEC



	A1	A2	A3	A4	A5	B
Grupo Control	9,37	12,59	13,87	14,65	14,93	8,13
Grupo Amor	8,53	12,05	13,47	13,92	14,47	7,08

CONCLUSIONES

7. CONCLUSIONES



1- Las emociones son un conjunto de sensaciones somáticas evaluadas por el cerebro en forma de sentimientos.

2- Existe una extensa red cerebral de marcadores somáticos.

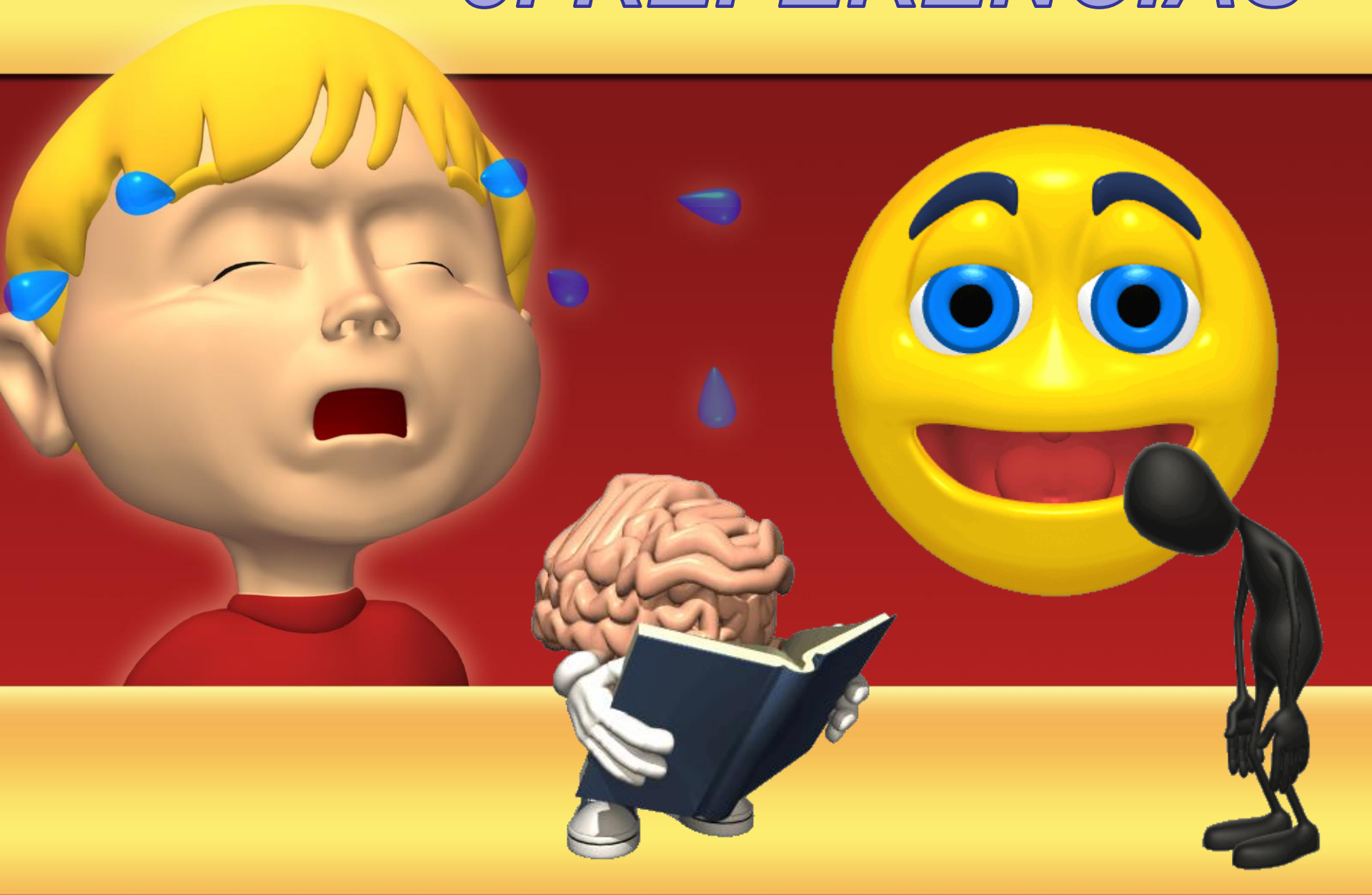
3- Importancia de controlar el estrés y comer sano (pro y prebióticos)

4- Son la sal de la vida y el motor del mundo (vg. AMOR).

5- Todo aprendizaje que se precie de tal debe estar teñido de emociones (educación emocional).

6- Nos permiten entendernos a nosotros y comprender a los demás (Inteligencia emocional).

8. REFERENCIAS



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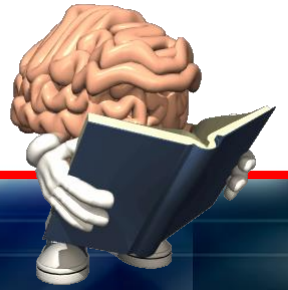
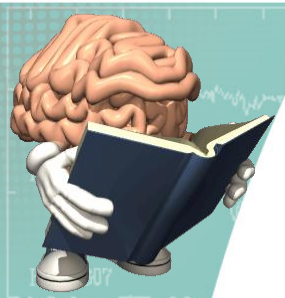




PROBIÓTICOS Y PREBIÓTICOS

https://www.dailymotion.com/video/x6svpa?playlist=x4t2zs

PROBIÓTICOS: Los alimentos probióticos son microorganismos vivos añadidos que permanecen activos en el intestino en cantidad suficiente (a pesar del Ph ácido del estómago) como para alterar la microbiota intestinal del huésped, tanto por implantación como por colonización. Pueden tener efectos beneficiosos cuando son ingeridos en cantidades suficientes. Pueden atravesar el aparato digestivo y recuperarse vivos en los excrementos, pero también se adhieren a la mucosa intestinal.

https://www.dailymotion.com/video/x6yuoac?playlist=x4t2zs

PREBIÓTICOS: Los prebióticos son una clase de alimentos funcionales, definidos como ingredientes de la comida no digeribles (almidón resistente y fibra) que son utilizados por la microbiota intestinal, estimulando el crecimiento de una o más cepas de las bacterias presentes en el tracto intestinal, modificando su composición y actividad, logrando una mejora en la salud y el bienestar del huésped (fibras dietéticas insolubles)

Microbiota Involvement in the Gut–Brain Axis

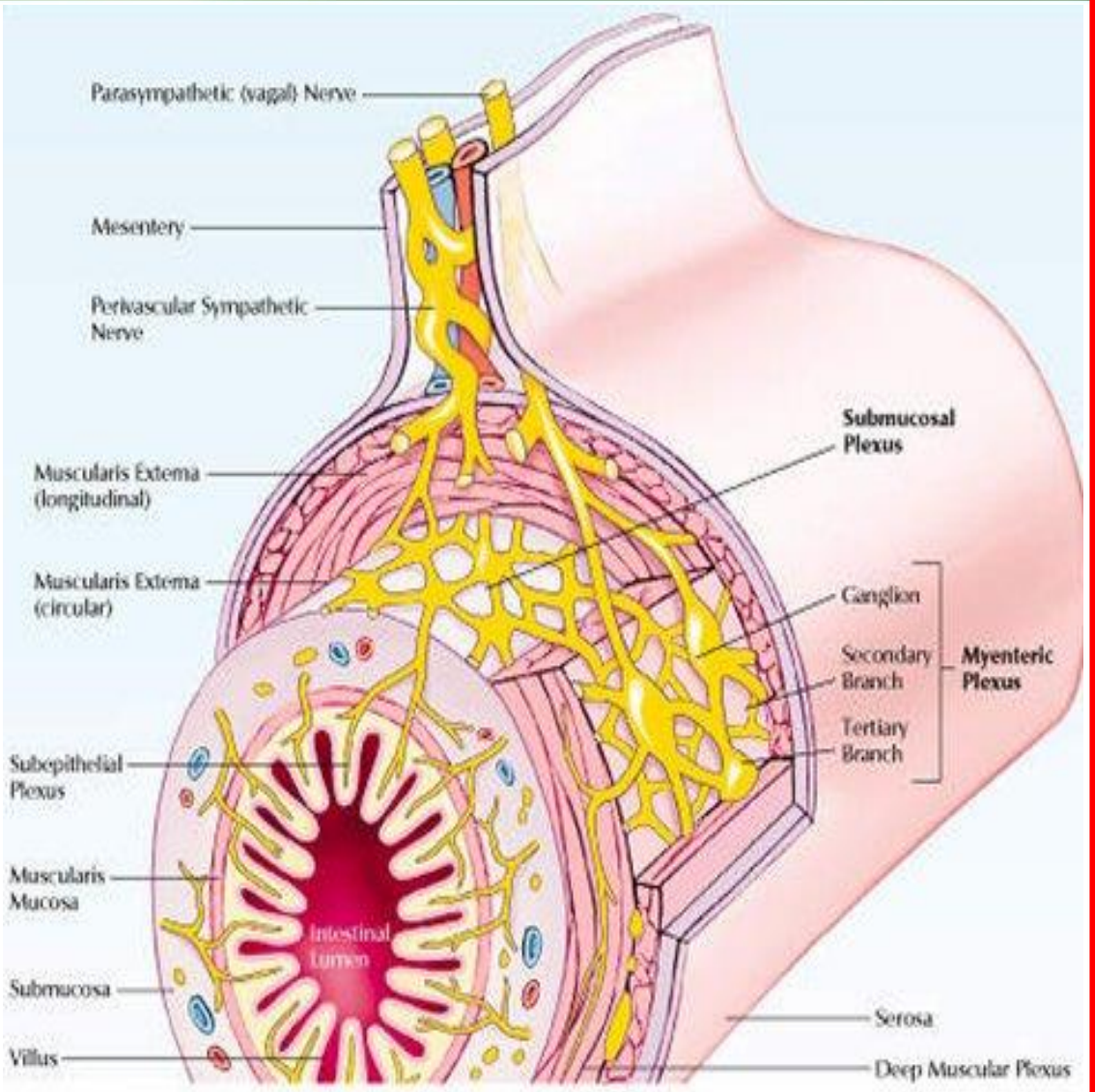
*Flavia Indrio, †Giuseppe Riezzo, ‡Francesco Raimondi, *Antonio Di Mauro, and *Ruggiero Francavilla

JPGN • Volume 57, Supplement 1, December 2013

FIGURE 1. The interaction among the immune, neuronal, and endocrine components of the communication between the central nervous system and the gastrointestinal tract.

1- SISTEMA NERVIOSO ENTÉRICO

- *Es la única agrupación de neuronas fuera del SNC que forma circuitos con actividad autónoma refleja (parte más compleja del SNP)*
- *Está incrustado en la pared del tracto gastrointestinal*
- *Humanos:* ***200 millones de neuronas,*** *de* ***20 tipos diferentes, 8 m****. (400 m2)*
- *"Segundo cerebro": por su tamaño, complejidad, células gliales y afectación en múltiples trastornos congénitos y adquiridos*



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Circuit-specific enteric glia regulate intestinal motor neurocircuits

PNAS 2021 Vol. 118 No. 40

Mohammad M. Ahmadzai[a,b], Luisa Seguella[a,c], and Brian D. Gulbransen[a,1]

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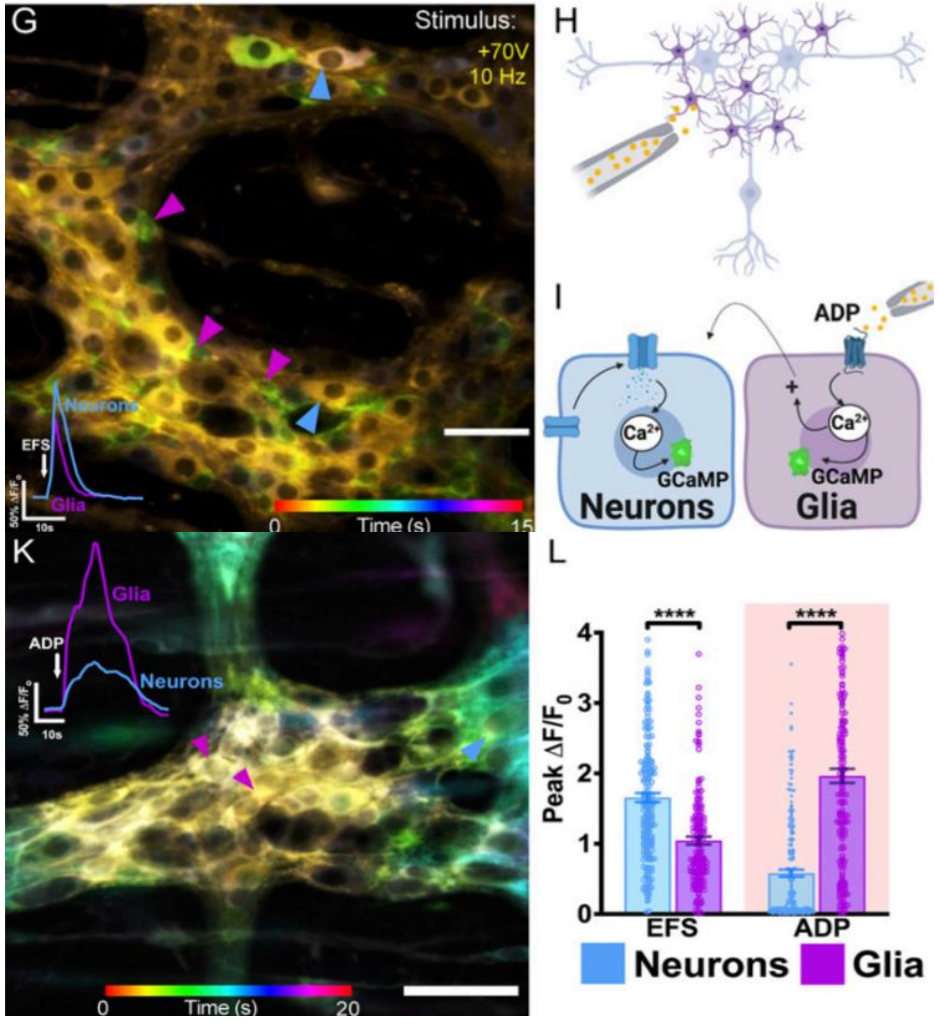
Edited by Mark T. Nelson, University of Vermont, Burlington, VT, and approved August 18, 2021 (received for review December 16, 2020)

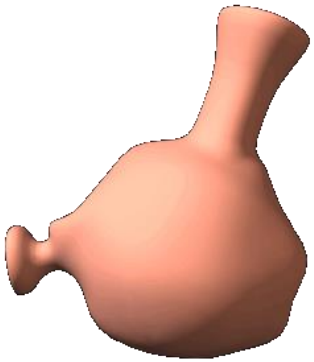
Glia in the central nervous system exert precise spatial and temporal regulation over neural circuitry on a synapse-specific basis, but it is unclear if peripheral glia share this exquisite capacity to sense and modulate circuit activity. In the enteric nervous system (ENS), glia control gastrointestinal motility through bidirectional communication with surrounding neurons. We combined glial chemogenetics with genetically encoded calcium indicators expressed in enteric neurons and glia to study network-level activity in the intact myenteric plexus of the proximal colon. Stimulation of neural fiber tracts projecting in aboral, oral, and circumferential directions activated distinct populations of enteric glia. The majority of glia responded to both oral and aboral stimulation and circumferential pathways, while smaller subpopulations were activated only by ascending and descending pathways. Cholinergic signaling functionally specifies glia to the descending circuitry, and this network plays an important role in repressing the activity of descending neural pathways, with some degree of cross-inhibition imposed upon the ascending pathway. Glial recruitment by purinergic signaling functions to enhance activity within ascending circuit pathways and constrain activity within descending networks. Pharmacological manipulation of glial purinergic and cholinergic signaling differentially altered neuronal responses in these circuits in a sex-dependent manner. Collectively, our findings establish that the balance between purinergic and cholinergic signaling may differentially control specific circuit activity through selective signaling between networks of enteric neurons and glia. Thus, enteric glia regulate the ENS circuitry in a network-specific manner, providing profound insights into the functional breadth and versatility of peripheral glia.

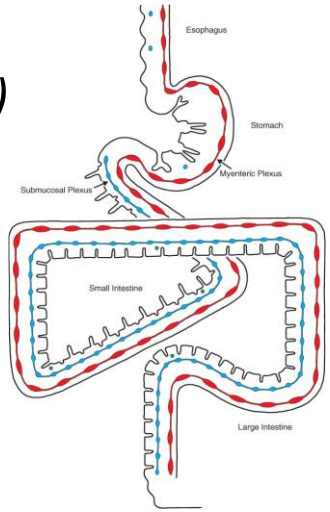


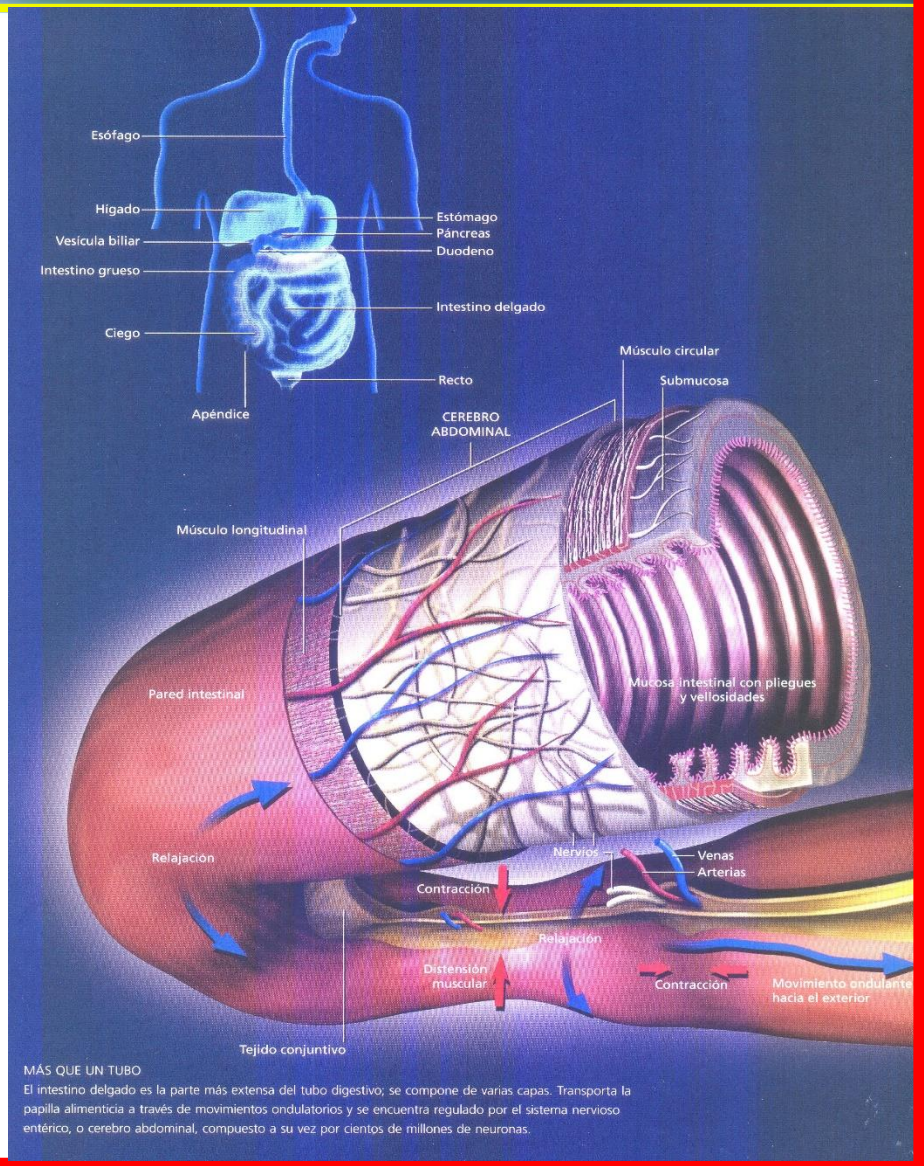
1- SISTEMA NERVIOSO ENTÉRICO

Es el sistema nervioso propio del tubo digestivo: se encuentra en su totalidad en la pared, desde el esófago hasta el ano.

- *Función principal: controlar movimientos y secreciones gastrointestinales*
- *Está formado por dos plexos:*
- *Plexo mientérico (rojo)*
- *Plexo submucoso (azul)*







Eje microbiota-intestino-cerebro (SNE)

1. SISTEMA NERVIOSO ENTÉRICO

SNE está formado por dos plexos:

- *Plexo mientérico o de Auerbach: **movimientos gastrointestinales** (entre capas musculares circular y longitudinal). Cadenas lineales de muchas neuronas interconectadas a lo largo de todo el tubo digestivo (desde el esófago hasta el esfínter anal externo.*
- *Efectos principales de su estimulación: **aumento de la contracción tónica, aumento de la intensidad de las contracciones rítmicas, aumento de la frecuencia de las contracciones…***
- *Pero no es solo excitador, **también tiene neuronas inhibidoras, que relajan algunos esfínteres musculares intestinales para que pasen los alimentos de un segmento del tubo digestivo al siguiente.***
- *Plexo submucoso o de Meissner: **secreción y flujo sanguíneo local** (de cada segmento minúsculo del intestino). Más desarrollado en intestino delgado y grueso. Ej: integra señales sensitivas del epitelio gastrointestinal para efectuar el **control de la secreción intestinal local, la absorción local y la contracción local del músculo submucoso.***

1. SISTEMA NERVIOSO ENTÉRICO

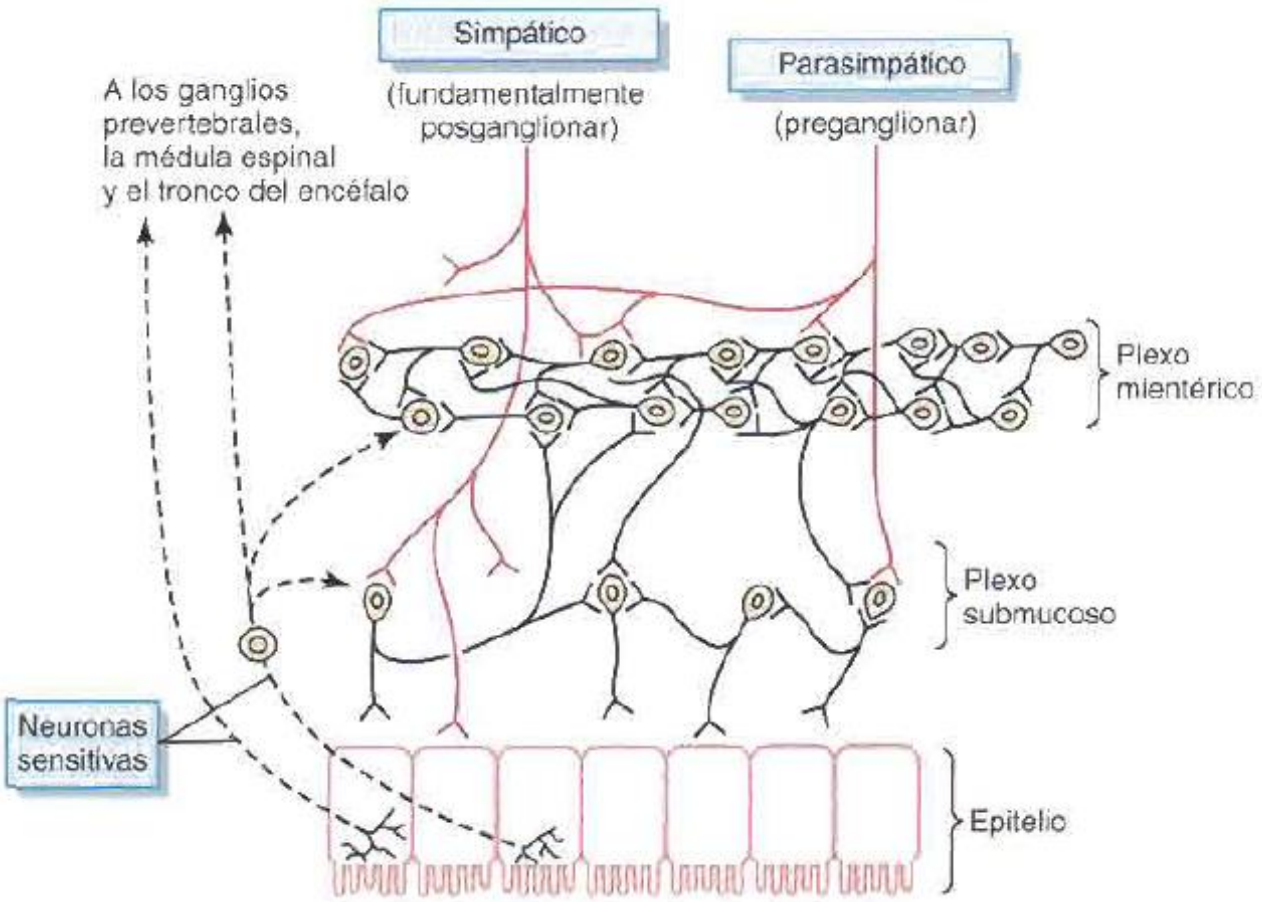


Figura 62-4

Control nervioso de la pared intestinal. Se observan los plexos mientéricos y submucoso *(fibras negras)*, el control extrínseco de estos plexos por los sistemas nerviosos simpático y parasimpático *(fibras rojas)*, y las fibras sensitivas que se dirigen desde el epitelio luminal y la pared intestinal a los plexos entéricos y desde ellos a los ganglios prevertebrales de la médula espinal y luego, directamente, a la médula espinal y al tronco del encéfalo *(fibras intestinales discontinuas)*.

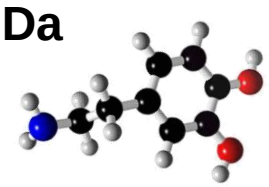
1. SISTEMA NERVIOSO ENTÉRICO

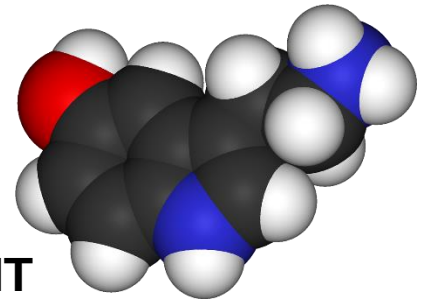
Terminaciones nerviosas sensitivas (originadas en epitelio gastrointestinal o pared intestinal): envían fibras aferentes a ambos plexos del SNE y a:

Ganglios prevertebrales del SN Simpático

Médula espinal

Por el nervio vago, en dirección al troncoencéfalo





Terminaciones nerviosas de las neuronas entéricas liberan más de 12 neurotransmisores, péptidos y hormonas:

Acetilcolina *(estimula actividad gastrointestinal),* ***Noradrenalina*** *(la inhibe), Adrenalina, Trifosfato de adenosina,* ***Serotonina (90%)****,* ***Dopamina****, Colecistocinina, Sustancia P, Polipéptido intestinal vasoactivo, Somatostatina, Leu-encefalina, Metencefalina, Bombesina…*

ESCALA DE HECES DE BRISTOL

	TIPO 1	Trozos duros separados, que pasan con dificultad.	ESTREÑIMIENTO IMPORTANTE
	TIPO 2	Como una salchicha compuesta de fragmentos.	LIGERO ESTREÑIMIENTO
	TIPO 3	Con forma de morcilla con grietas en la superficie.	NORMAL
	TIPO 4	Como una salchicha o serpiente, lisa y blanda.	NORMAL
	TIPO 5	Trozos de masa pastosa con bordes definidos.	FALTA DE FIBRA
	TIPO 6	Fragmentos pastosos, con bordes irregulares.	LIGERA DIARREA
	TIPO 7	Acuosa, sin pedazos sólidos, totalmente liquida.	DIARREA IMPORTANTE

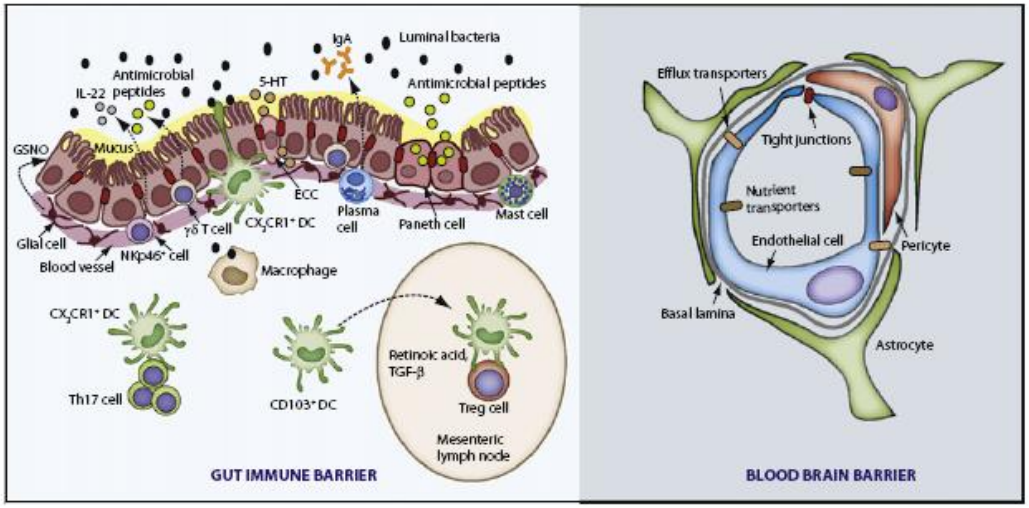
1. SISTEMA NERVIOSO ENTÉRICO (SNE)

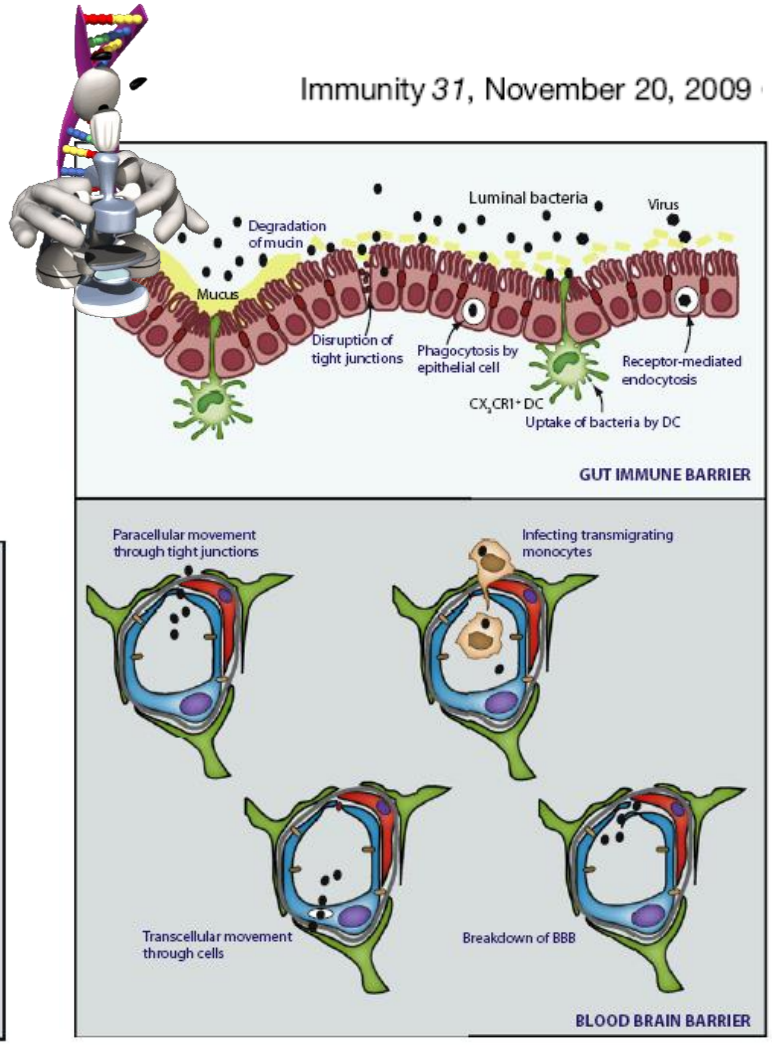
The Gut Immune Barrier and the Blood-Brain Barrier: Are They So Different?

Immunity
Review

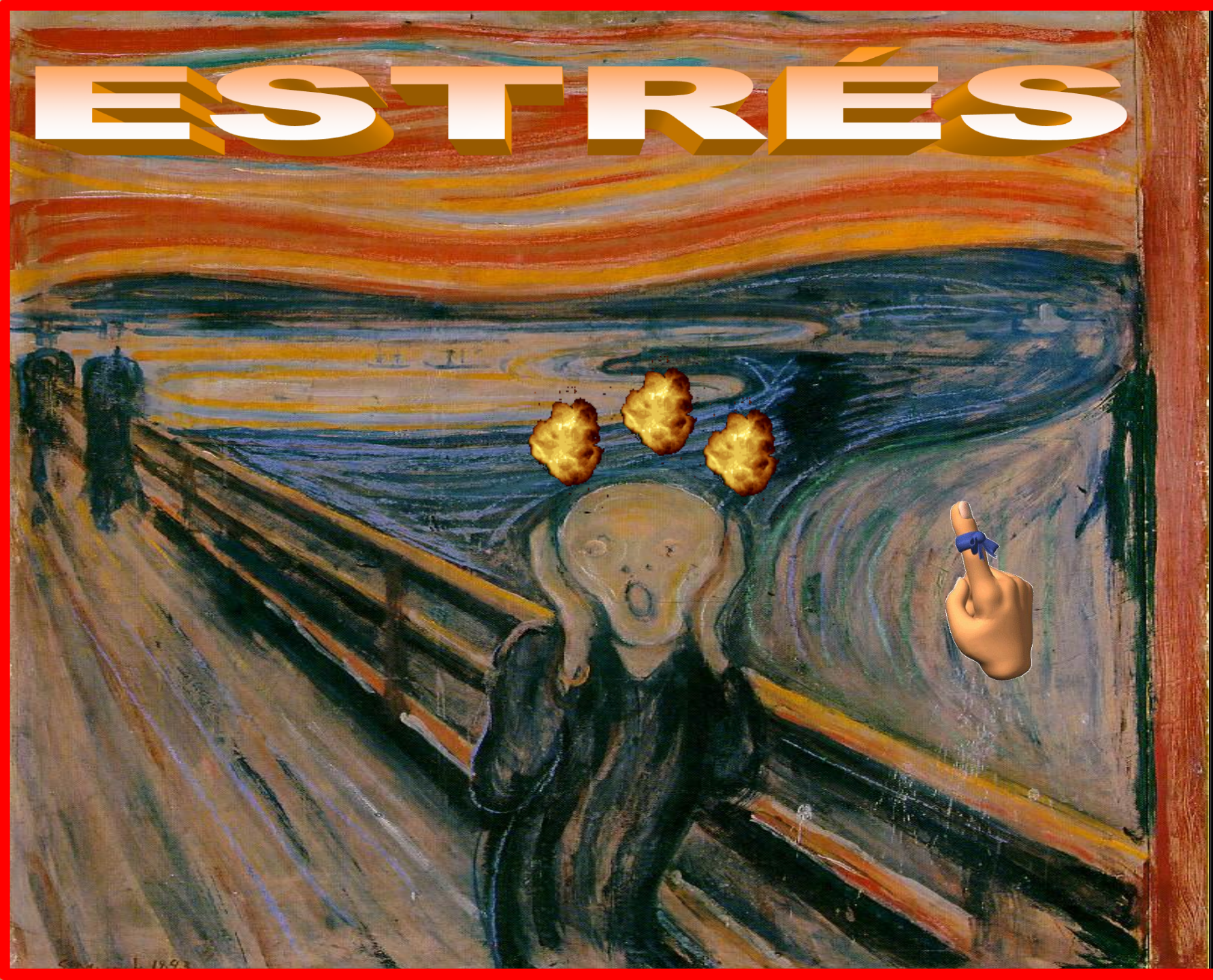
Richard Daneman[1,*] and Maria Rescigno[2,*]
[1]University of California, San Francisco, Department of Anatomy, San Francisco, CA 94143-0452, USA
[2]European Institute of Oncology, Department of experimental Oncology, 20139 Milan, Italy
*Correspondence: richard.daneman@ucsf.edu (R.D.), maria.rescigno@ifom-ieo-campus.it (M.R.)
DOI 10.1016/j.immuni.2009.09.012

In order to protect itself from a diverse set of environmental pathogens and toxins, the body has developed a number of barrier mechanisms to limit the entry of potential hazards. Here, we compare two such barriers: the gut immune barrier, which is the primary barrier against pathogens and toxins ingested in food, and the blood-brain barrier, which protects the central nervous system from pathogens and toxins in the blood. Although each barrier provides defense in very different environments, there are many similarities in their mechanisms of action. In both cases, there is a physical barrier formed by a cellular layer that tightly regulates the movement of ions, molecules, and cells between two tissue spaces. These barrier cells interact with different cell types, which dynamically regulate their function, and with a different array of immune cells that survey the physical barrier and provide innate and adaptive immunity.

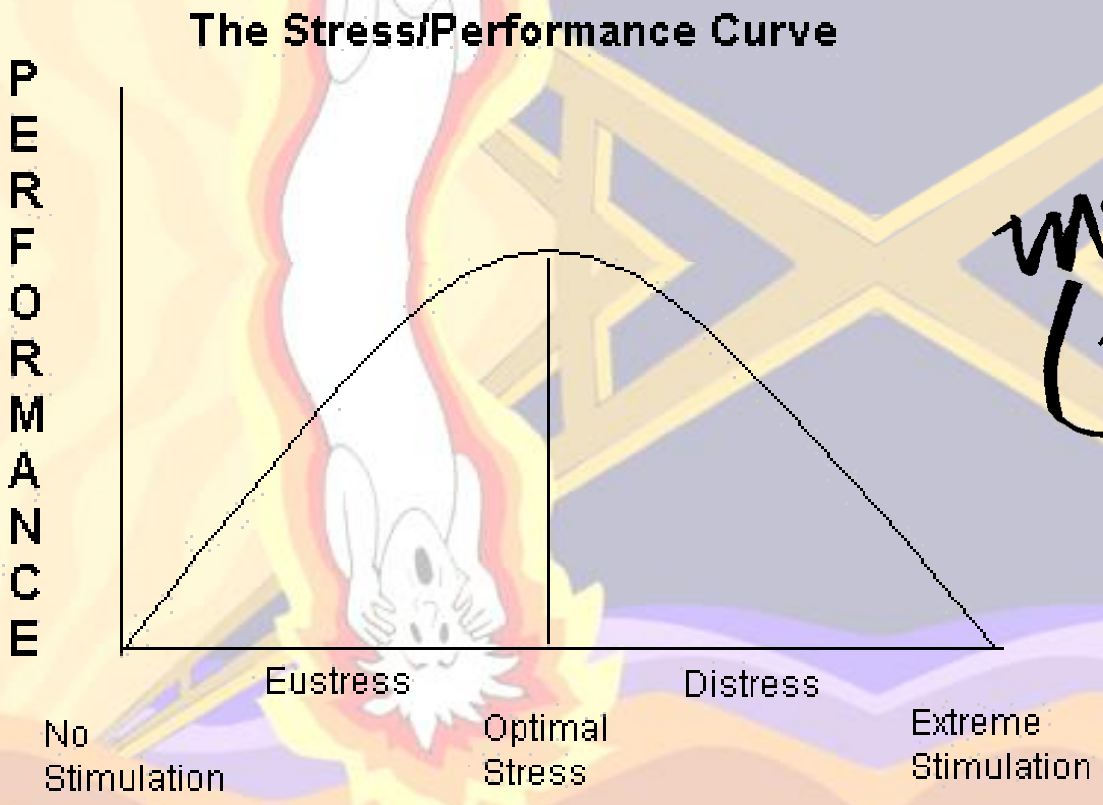




ESTRÉS



Curva de estrés-rendimiento



REVIEWS
NATURE REVIEWS | NEUROSCIENCE
VOLUME 13 | OCTOBER 2012 |

Mind-altering microorganisms: the impact of the gut microbiota on brain and behaviour

John F. Cryan[1,2] and Timothy G. Dinan[1,3]

Abstract | Recent years have witnessed the rise of the gut microbiota as a major topic of research interest in biology. Studies are revealing how variations and changes in the composition of the gut microbiota influence normal physiology and contribute to diseases ranging from inflammation to obesity. Accumulating data now indicate that the gut microbiota also communicates with the CNS — possibly through neural, endocrine and immune pathways — and thereby influences brain function and behaviour. Studies in germ-free animals and in animals exposed to pathogenic bacterial infections, probiotic bacteria or antibiotic drugs suggest a role for the gut microbiota in the regulation of anxiety, mood, cognition and pain. Thus, the emerging concept of a microbiota–gut–brain axis suggests that modulation of the gut microbiota may be a tractable strategy for developing novel therapeutics for complex CNS disorders.

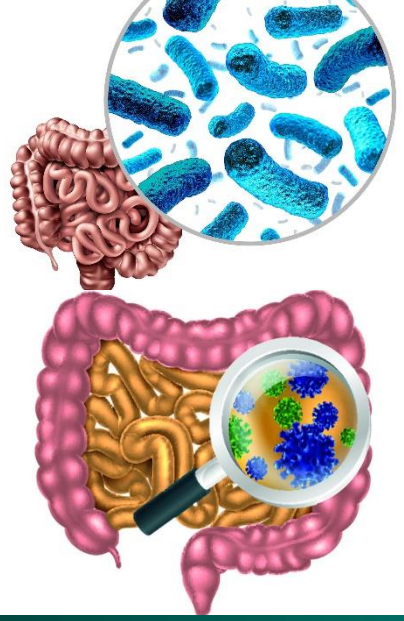
Association of Loneliness and Wisdom With Gut Microbial Diversity and Composition: An Exploratory Study

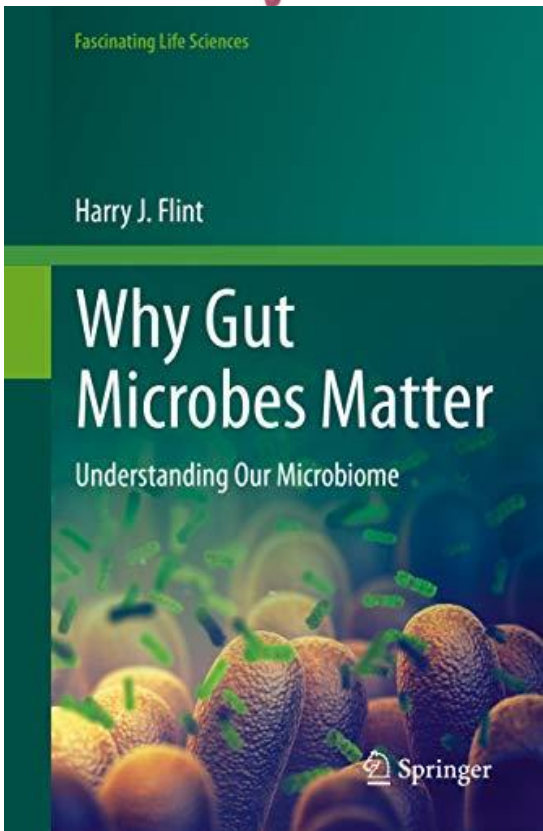
frontiers in Psychiatry

BRIEF RESEARCH REPORT
published: 25 March 2021
doi: 10.3389/fpsyt.2021.648475

Tanya T. Nguyen[1,2,3,4], Xinlian Zhang[5], Tsung-Chin Wu[2,5], Jinyuan Liu[2,5], Collin Le[2], Xin M. Tu[2,5], Rob Knight[4,6,7,8] and Dilip V. Jeste[1,2,4,9]*

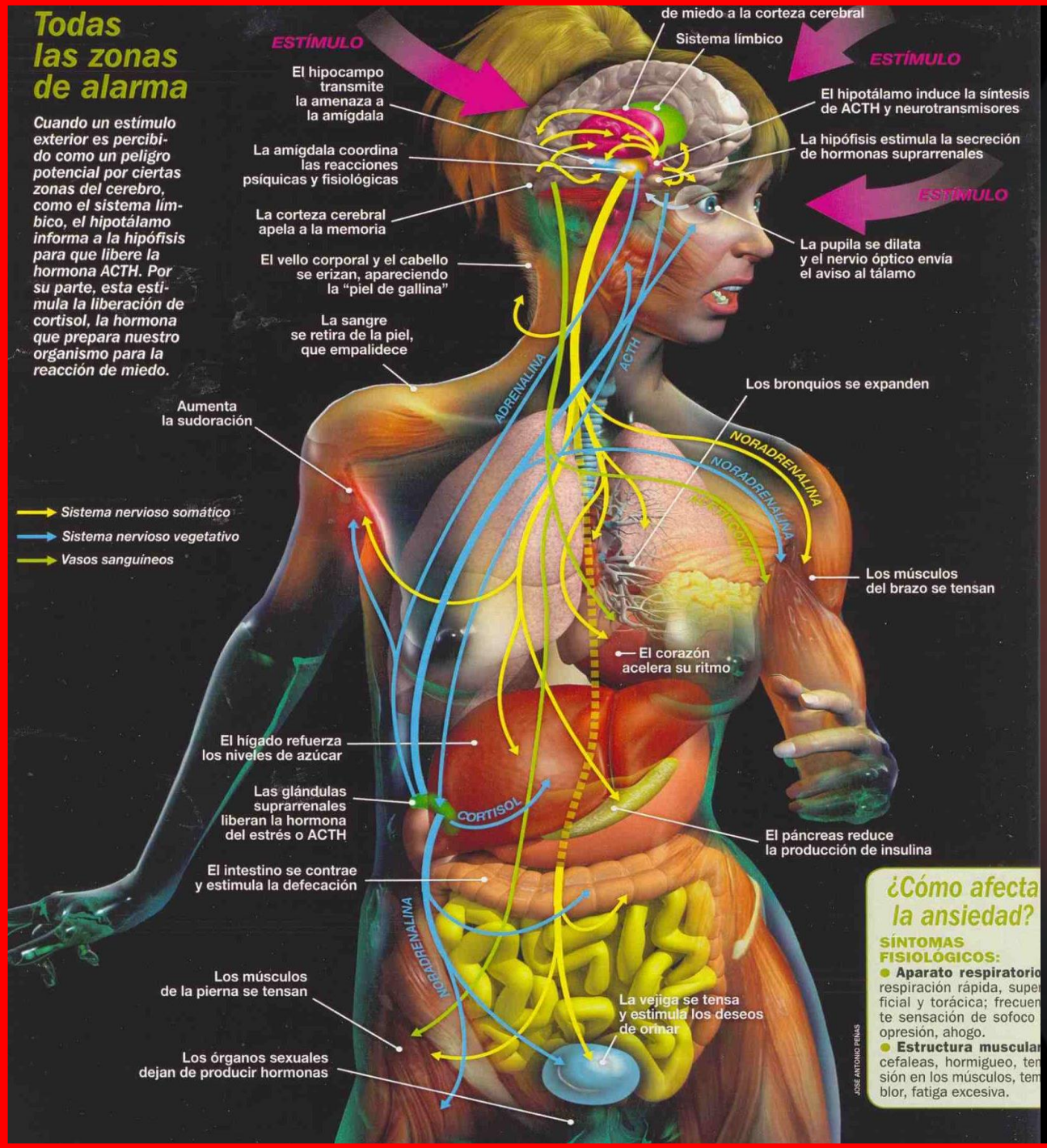
Loneliness and wisdom have opposite effects on health and well-being. Loneliness is a serious public health problem associated with increased morbidity and mortality. Wisdom is associated with better health and well-being. We have consistently found a strong negative correlation between loneliness and wisdom. The present study aimed to investigate the association of loneliness and wisdom with the gut microbiome. One hundred eighty-four community-dwelling adults (28–97 years) completed validated self-report-based measures of loneliness, wisdom, compassion, social support, and social engagement. Fecal samples were collected and profiled using 16S rRNA sequencing. Linear regression analyses, controlling for age and body mass index, revealed that lower levels of loneliness and higher levels of wisdom, compassion, social support, and social engagement were associated with greater phylogenetic richness and diversity of the gut microbiome. Partial least squares (PLS) analysis to investigate multivariate relationships extracted two composite variables. Linear regression model predicting alpha-diversity with PLS components revealed that a linear combination of all psychosocial predictors (with negative loading for loneliness and positive loadings for all others, including wisdom, compassion, social support, and social engagement) was significantly associated with alpha-diversity. For beta-diversity, compassion and wisdom accounted for a significant proportion of variance in overall microbial community composition. Findings may have implications for interventions to reduce loneliness and possibly its health-related adverse consequences. Future research should explore whether increasing compassion and wisdom may improve loneliness and overall well-being as well as microbial diversity.





Todas las zonas de alarma

Cuando un estímulo exterior es percibido como un peligro potencial por ciertas zonas del cerebro, como el sistema límbico, el hipotálamo informa a la hipófisis para que libere la hormona ACTH. Por su parte, esta estimula la liberación de cortisol, la hormona que prepara nuestro organismo para la reacción de miedo.

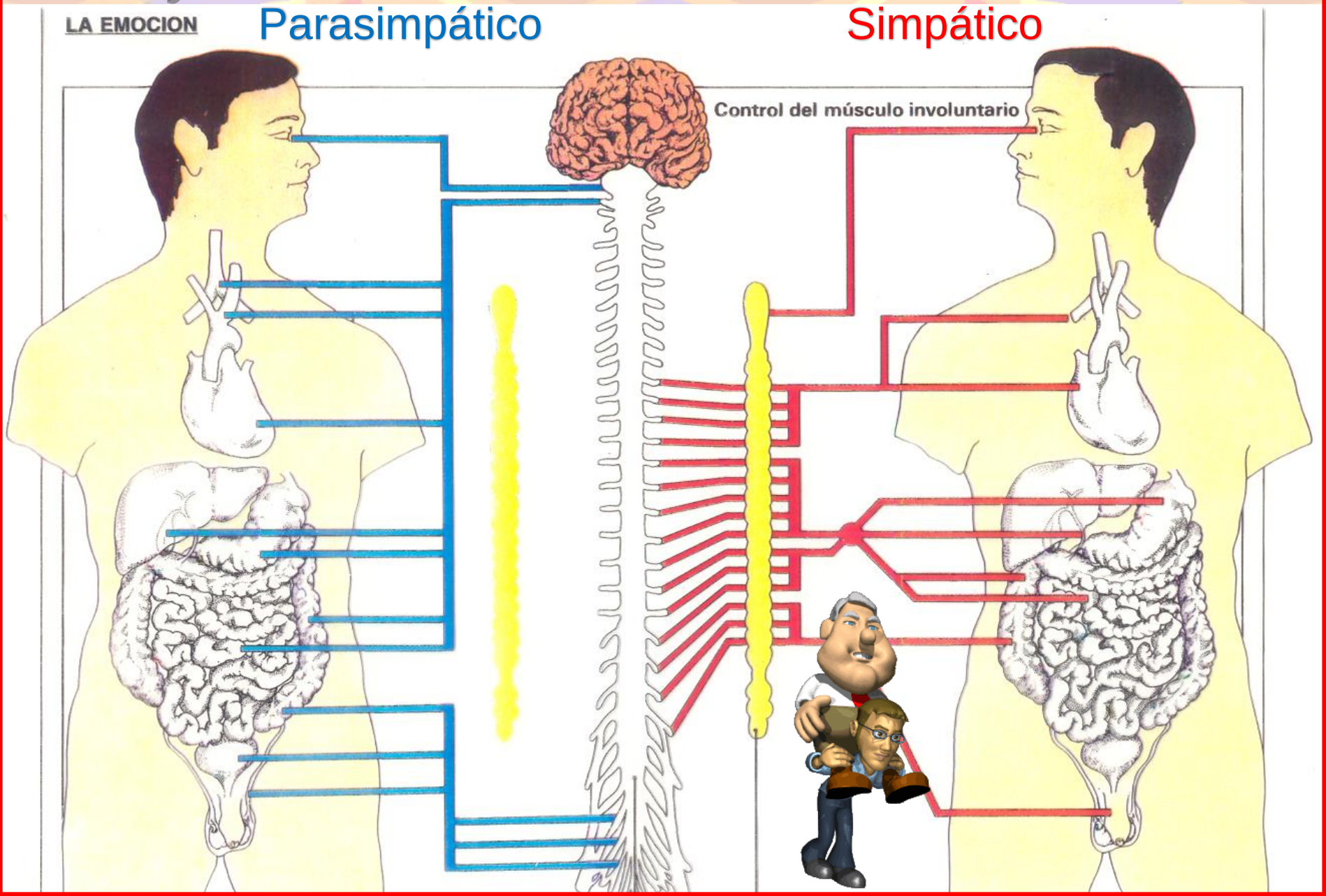


¿Cómo afecta la ansiedad?

SÍNTOMAS FISIOLÓGICOS:

- **Aparato respiratorio** respiración rápida, super ficial y torácica; frecuen te sensación de sofoco opresión, ahogo.
- **Estructura muscular** cefaleas, hormigueo, ten sión en los músculos, tem blor, fatiga excesiva.

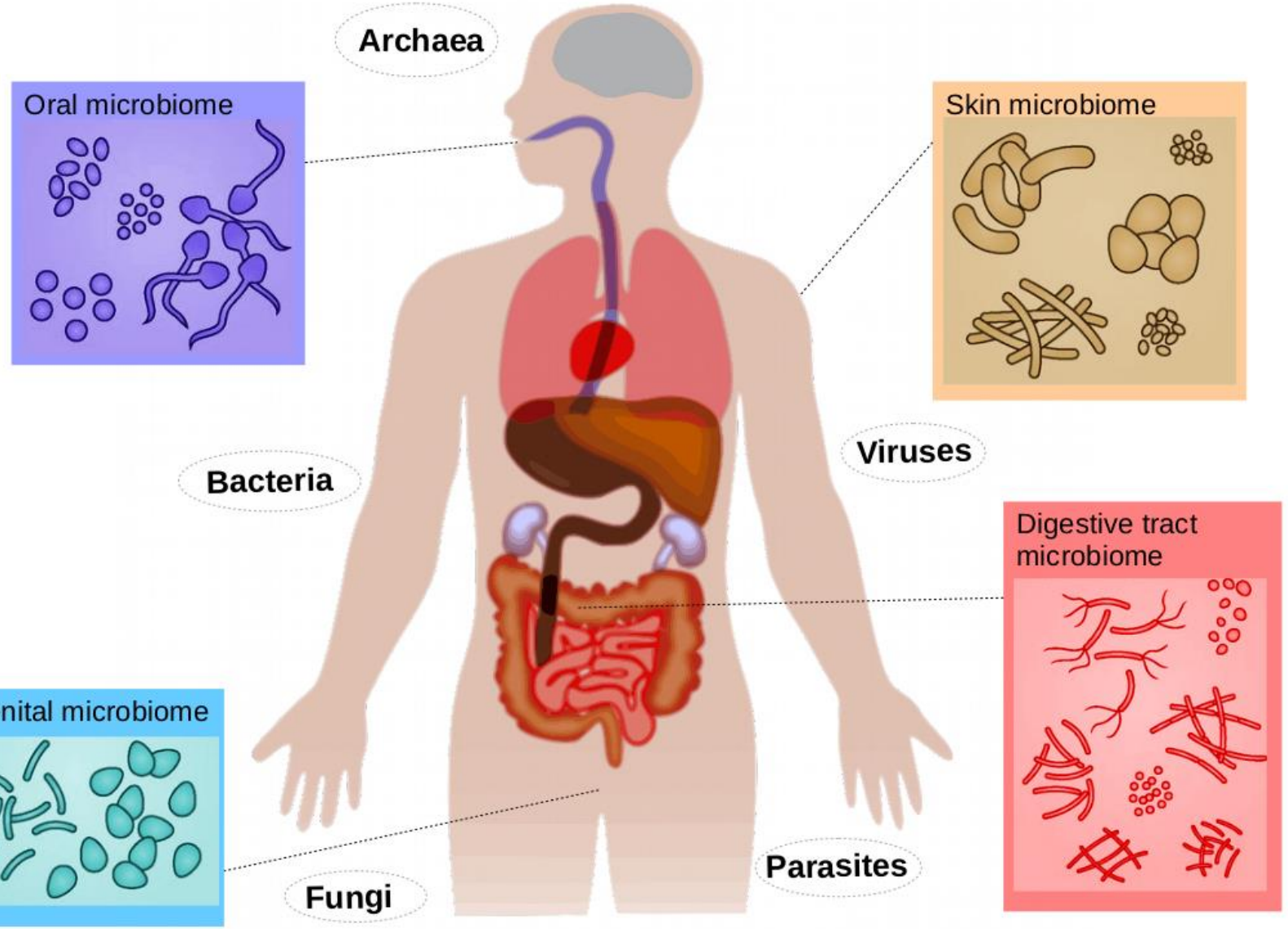
Estrés y Sistema Nervioso Autónomo



3. MICROBIOTA INTESTINAL

Human Microbiome

https://www.dailymotion.com/video/xpe6x6?playlist=x4t2zs



Conoce tu microbiota intestinal

GUT MICROBIOTA WORLDWATCH

Una gran cantidad (cientos de billones) de bacterias y otros microorganismos habitan tus intestinos realizando funciones clave para la salud y el bienestar

La microbiota intestinal puede **pesar** entre

1 y 2 Kg

Meteorismo
(nitrógeno, O2, CO2, metano)

Las bacterias son entre **10 y 50** veces más pequeñas que las células humanas

La superficie del **tracto gastrointestinal** es tan grande como 2 pistas de tenis

400 m²

8 m
(1,5 m el cólon)

En nuestro cuerpo, los **microbios superan en cantidad** a las células humanas en proporción de

10:1

95%

de nuestras bacterias están localizadas en el **tracto gastrointestinal**

Colocadas una al lado de la otra, las bacterias de nuestro cuerpo podrían dar la **vuelta al mundo**

2,5 veces

www.gutmicrobiotawatch.org @gutmicrobiotaww www.facebook.com/GutMicrobiotaWW

https://www.dailymotion.com/video/x5ucu9x?playlist=x4t2zs

¿Quién dijo que estamos solos?

WHY THE MICROBIOME Is So Vital to YOUR HEALTH

1 Your body is mostly microbes

The Importance of the MICROBIOME by the Numbers

90%
Up to 90% of all disease can be raced in some way back to the gut and health of the microbiome

10–100 trillion
Number of symbiotic microbial cells harbored by each person, primarily bacteria in the gut, that make up the human microbiota

>10,000
Number of different microbe species researchers have identified living in the human body

10X
There are 10 times as many outside organisms as there are human cells in the human body

100

100 to 1
The genes in our microbiome outnumber the genes in our genome by about 100 to 1

3.3 million
Number of non-redundant genes in the human gut microbiome

22,000
Approximate number genes in the human gene catalog

99.9%
Percentage individual humans are identical to one another in terms of host genome

80%–90%
Percentage individual humans are different from one another in terms of the microbiome

ARTICLE

NATURE COMMUNICATIONS | (2021)12:2907 |

https://doi.org/10.1038/s41467-021-23029-8 OPEN

Gene-level metagenomic architectures across diseases yield high-resolution microbiome diagnostic indicators

Braden T. Tierney [1,2,3,4], Yingxuan Tan[1], Aleksandar

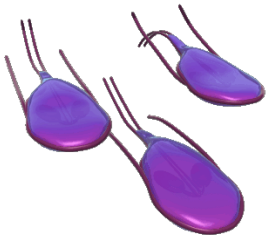
ESTUDIO DE LA UNIVERSIDAD DE HARVARD

Los genes de tus bacterias intestinales podrían enfermarte

Una nueva investigación avanza en el conocimiento de los mecanismos por los que los microorganismos del sistema digestivo promueven afecciones como la enfermedad de las arterias coronarias o la cirrosis hepática

We propose microbiome disease "architectures": linking >1 million microbial features (species, pathways, and genes) to 7 host phenotypes from 13 cohorts using a pipeline designed to identify associations that are robust to analytical model choice. Here, we quantify conservation and heterogeneity in microbiome-disease associations, using gene-level analysis to identify strain-specific, cross-disease, positive and negative associations. We find coronary artery disease, inflammatory bowel diseases, and liver cirrhosis to share gene-level signatures ascribed to the *Streptococcus* genus. Type 2 diabetes, by comparison, has a distinct metagenomic signature not linked to any one specific species or genus. We additionally find that at the species-level, the prior-reported connection between *Solobacterium moorei* and colorectal cancer is not consistently identified across models—however, our gene-level analysis unveils a group of robust, strain-specific gene associations. Finally, we validate our findings regarding colorectal cancer and inflammatory bowel diseases in independent cohorts and identify that features inversely associated with disease tend to be less reproducible than features enriched in disease. Overall, our work is not only a step towards gene-based, cross-disease microbiome diagnostic indicators, but it also illuminates the nuances of the genetic architecture of the human microbiome, including tension between gene- and species-level associations.

Journal of Cardiovascular Nursing
Vol. 29, No. 6, pp 479–481 | Copyright © 2014 Wolters Kluwer Health | Lippincott Williams & Wilkins



20 Things You Didn't Know About the Human Gut Microbiome

Erin P. Ferranti, PhD, MPH, RN; Sandra B. Dunbar, PhD, RN, FAHA, FAAN; Anne L. Dunlop, MD, MPH; Elizabeth J. Corwin, PhD, RN, FAAN

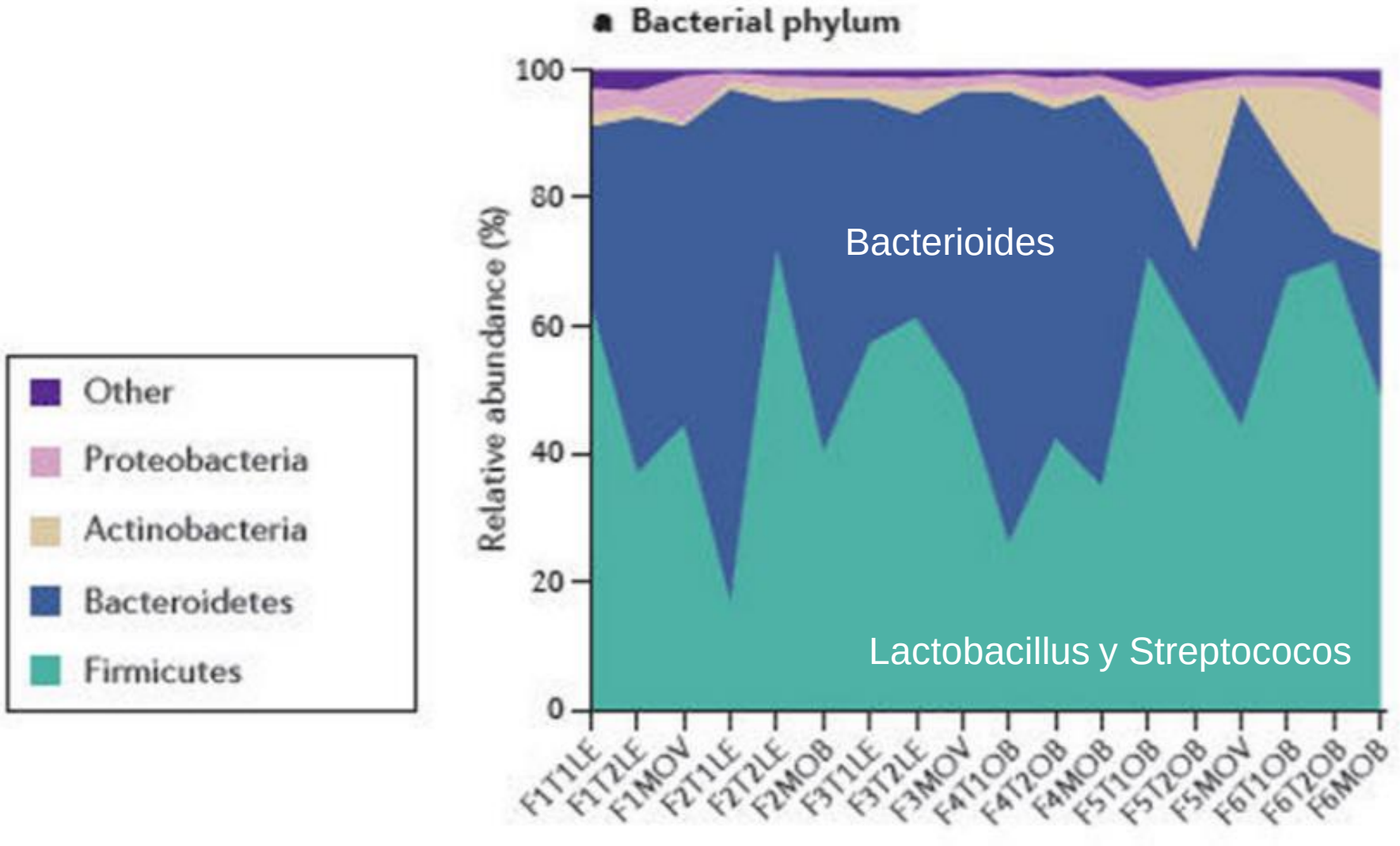
*-El **microbioma (genoma de la microbiota procariota)** se define como el material genético de todas las bacterias, virus, hongos, arqueas y eucariotas que habitan el cuerpo humano denominados colectivamente como el "segundo genoma humano" (ratio 1 celula : 10 microorganismos; 100 trillones de microbios de 10.000 especies, 2-3 kgs).* ***SIMBIOSIS. Proyecto microbioma humano 2007-2015.***

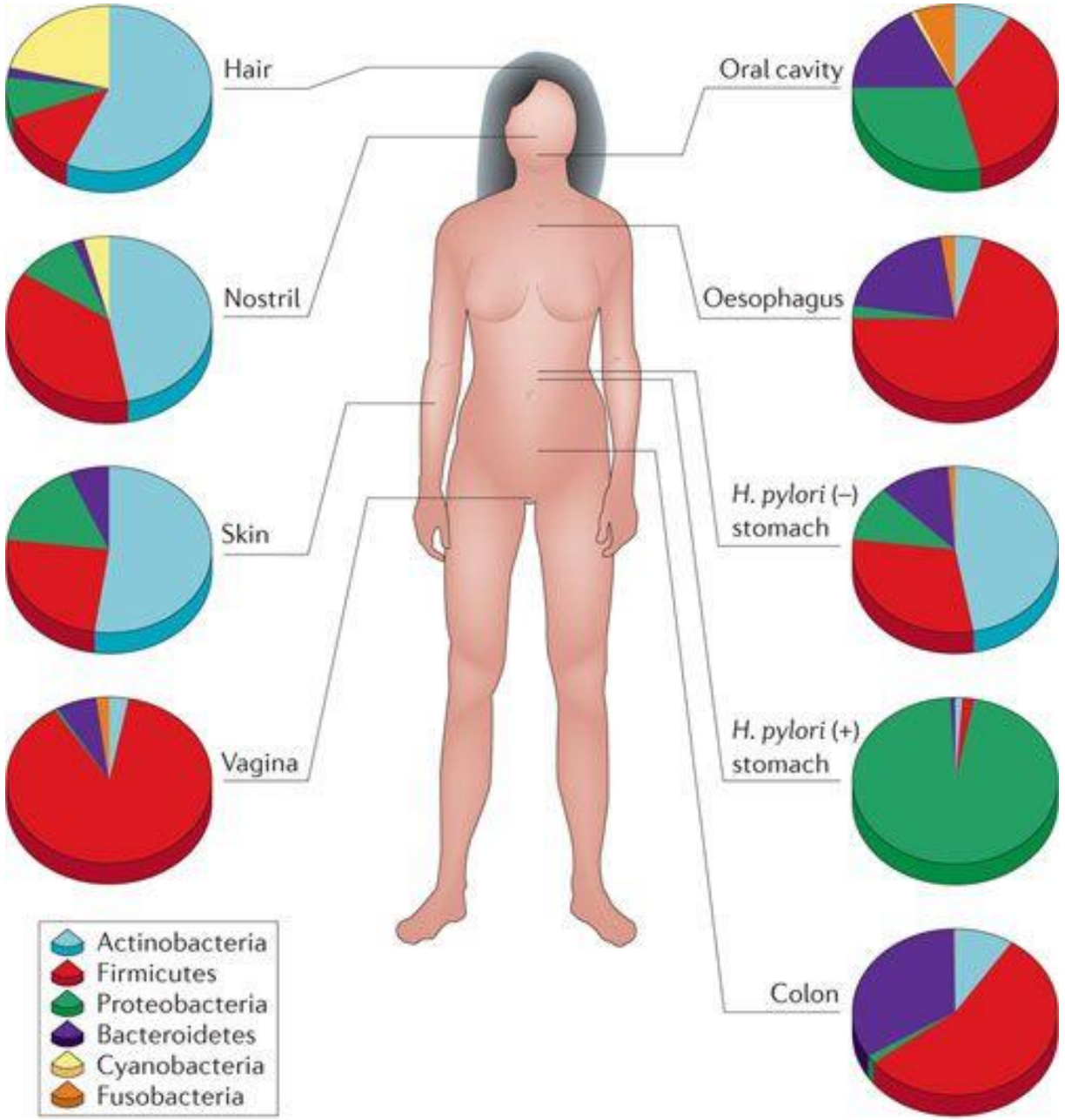
-La microbiota intestinal se considera un órgano separado, con actividad metabólica e inmunológica separada del resto del cuerpo (investigación: taxonomía de microorganismos y la genómica funcional). Otras microbiotas: vagina, piel, boca, nariz, oídos y cuero cabelludo. Todas tienen en común 4 familias de bacterias: Firmicutes, Actinobacteria, Proteobacteria y Bacteroidetes ***(composición única y personal).***

Table 1. Predominating Phyla of Specific Human Habitats

Body Habitat	Predominating Phyla
Mouth	*Firmicutes* (e.g., *Streptococcus*) > *Proteobacteria* (e.g., *Haemophilus*), *Bacteroidetes* (e.g., *Prevotella*)
Gut	*Bacteroidetes* (e.g., *Bacteroides*), *Firmicutes* (e.g., *Streptococcus*)
Skin	*Actinobacteria* (e.g., *Propionibacterium*) > *Firmicutes* (e.g., *Staphylococcus*)
Vagina	*Firmicutes* (e.g., *Lactobacillus*)

EL DELICADO EQUILIBRIO DE LA MICROBIOTA INTESTINAL



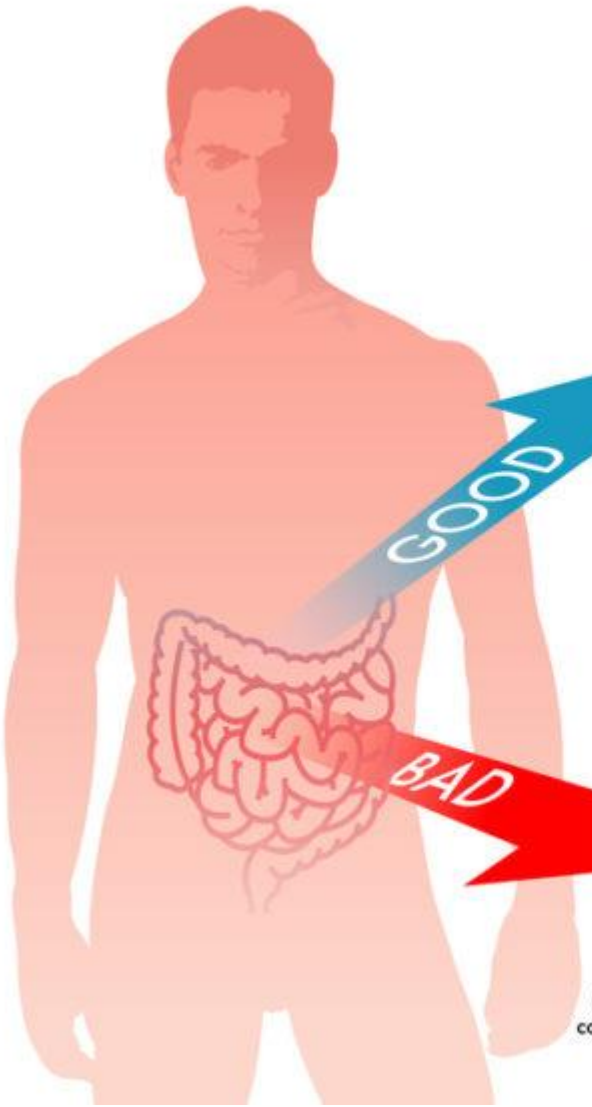


The Human Microbiome: at the interface of health and disease

Ilseung Cho[1,2] and **Martin J. Blaser**[1,2,3,4]
[1]Department of Medicine, NYU Langone Medical Center, New York, NY 10016, USA

Nat Rev Genet. ; 13(4): 260–270. doi:10.1038/nrg3182. *2012*
Nature Reviews | Genetics

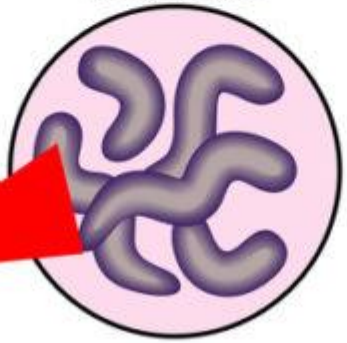
Good and Bad Bacterial Flora



BIFIDOBACTERIA
The various strains help to regulate levels of other bacteria in the gut, modulate immune responses to invading pathogens, prevent tumour formation and produce vitamins.

ESCHERICHIA COLI
Several types inhabit the human gut. They are involved in the production of vitamin K2 (essential for blood clotting) and help to keep bad bacteria in check.
But some strains can lead to illness.

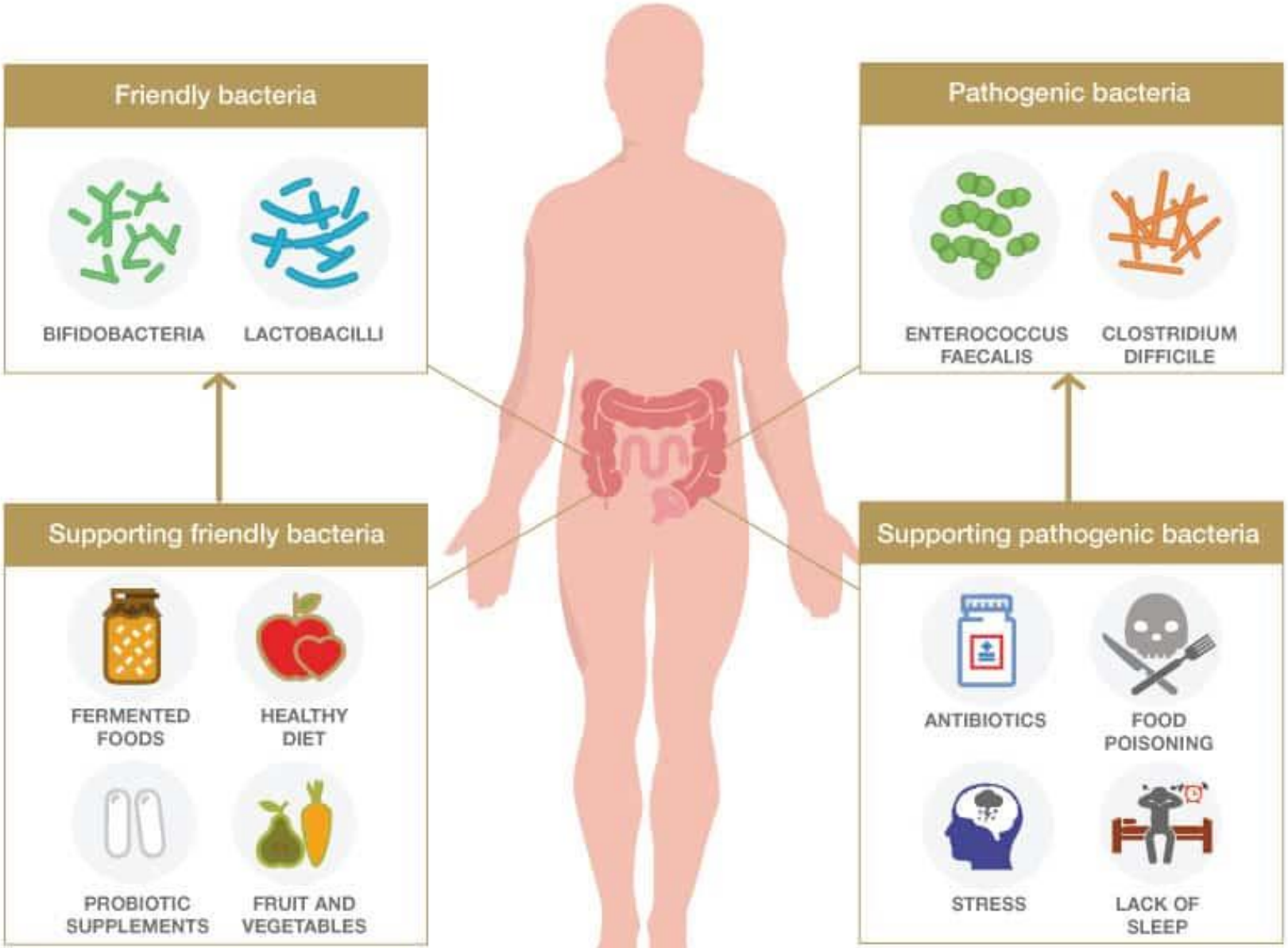
LACTOBACILLI
Beneficial varieties produce vitamins and nutrients, boost immunity and protect against carcinogens.



CAMPYLOBACTER
C Jejuni and C coli are the strains most commonly associated with human disease. Infection usually occurs throught the ingestion of contaminated food.

ENTEROCOCCUS FAECALIS
A common cause of post-surgical infections.

CLOSTRIDIUM DIFFICILE
Most harmfull following a course of antibiotics when it is able to proliferate.


Friendly bacteria
BIFIDOBACTERIA
LACTOBACILLI
Pathogenic bacteria
ENTEROCOCCUS FAECALIS
CLOSTRIDIUM DIFFICILE
Supporting friendly bacteria
FERMENTED FOODS
HEALTHY DIET
PROBIOTIC SUPPLEMENTS
FRUIT AND VEGETABLES
Supporting pathogenic bacteria
ANTIBIOTICS
FOOD POISONING
STRESS
LACK OF SLEEP

Journal of Cardiovascular Nursing
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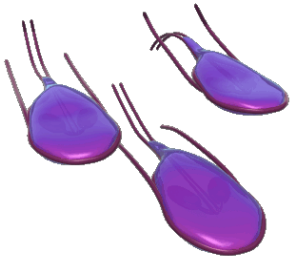

20 Things You Didn't Know About the Human Gut Microbiome

Erin P. Ferranti, PhD, MPH, RN; Sandra B. Dunbar, PhD, RN, FAHA, FAAN; Anne L. Dunlop, MD, MPH; Elizabeth J. Corwin, PhD, RN, FAAN

-Hasta 2005 (Metagenómica) no se pudo medir la microbiota intestinal debido a que son bacterias anaeróbicas mayoritariamente (no crecen a través de cultivos). Ciencia en pañales. Proyecto microbioma humano (2007-2015) (American gut project & National Institutes of Health, USA)

-El microbioma se desarrolla durante la etapa fetal (el meconio no es estéril) y está influido por el tipo de parto (vaginal vs. cesárea) y el tipo de alimentación infantil (lactancia materna vs. leche de fórmula). Hacia los 2-3 años la microbiota es similar a la adulta.

-Los antibióticos durante la etapa temprana (infancia) alteran los patrones de la microbiota intestinal (mayor probabilidad de obesidad, anormalidades metabólicas, y/o enfermedades autoinmunes (ganado con antibióticos).

- La microbiota intestinal "normal" en personas sanas incluye cepas de patógenos como la Escherichia coli y los enterococos y fortalece el sistema inmunitario.

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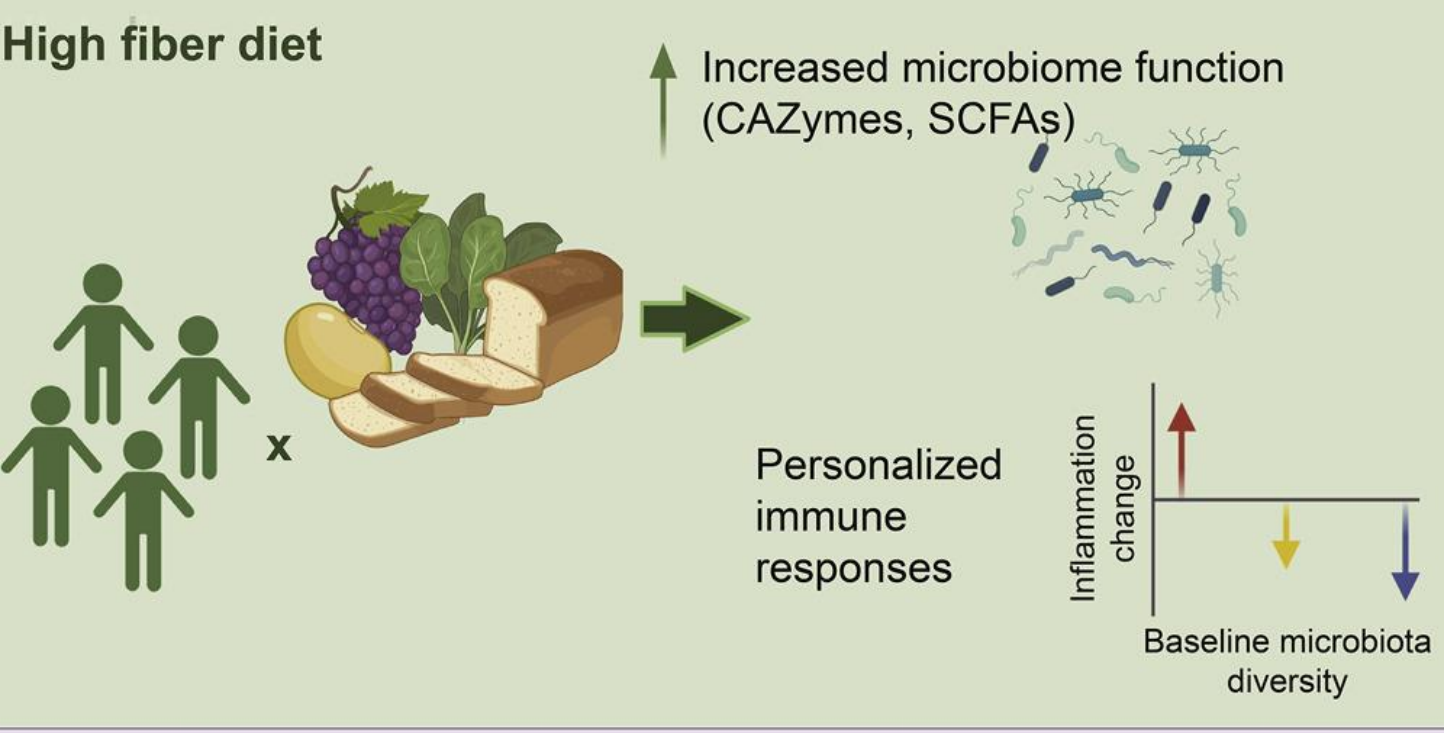

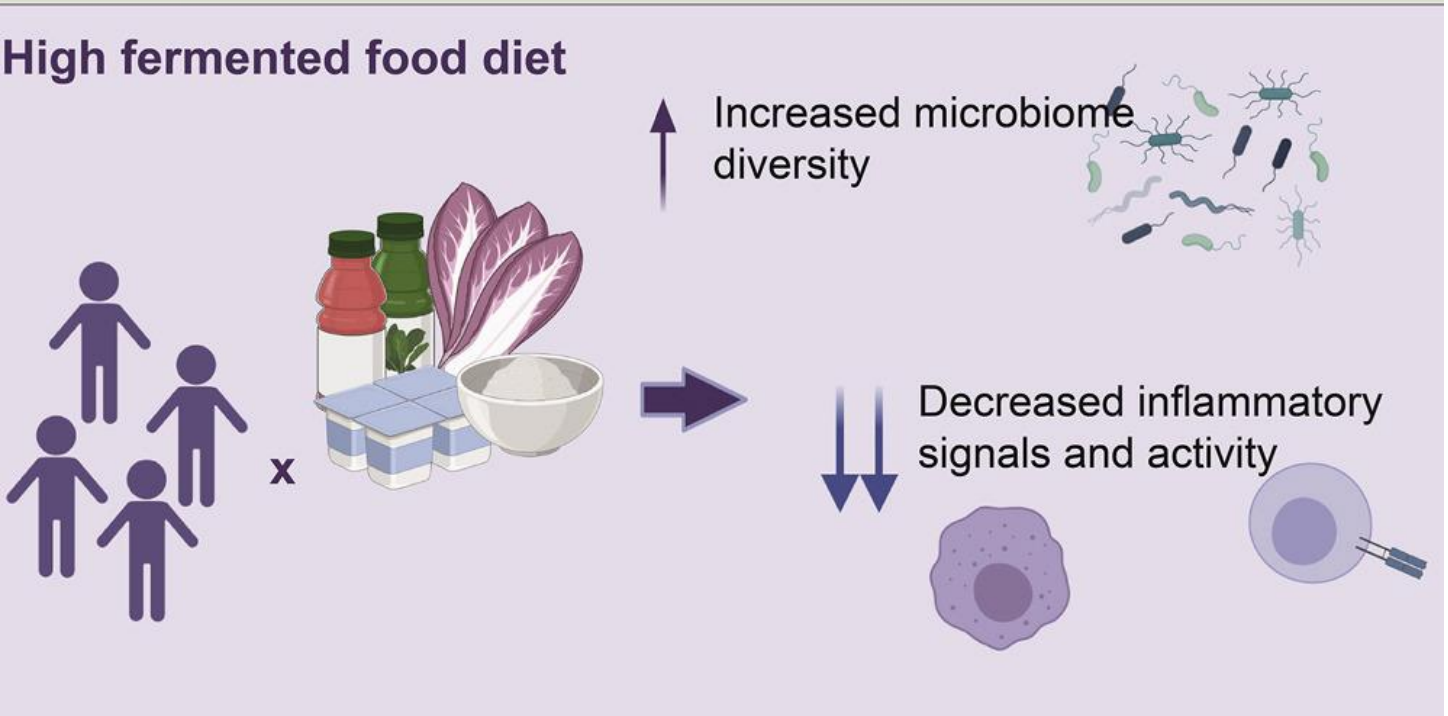

Gut-microbiota-targeted diets modulate human immune status

Hannah C. Wastyk
Gabriela K. Fragiadakis
Dalia Perelman
Erica D. Sonnenburg
Christopher D. Gardner
Justin L. Sonnenburg

•**CELL (2021)**

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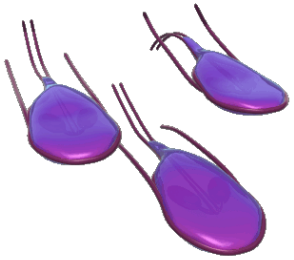
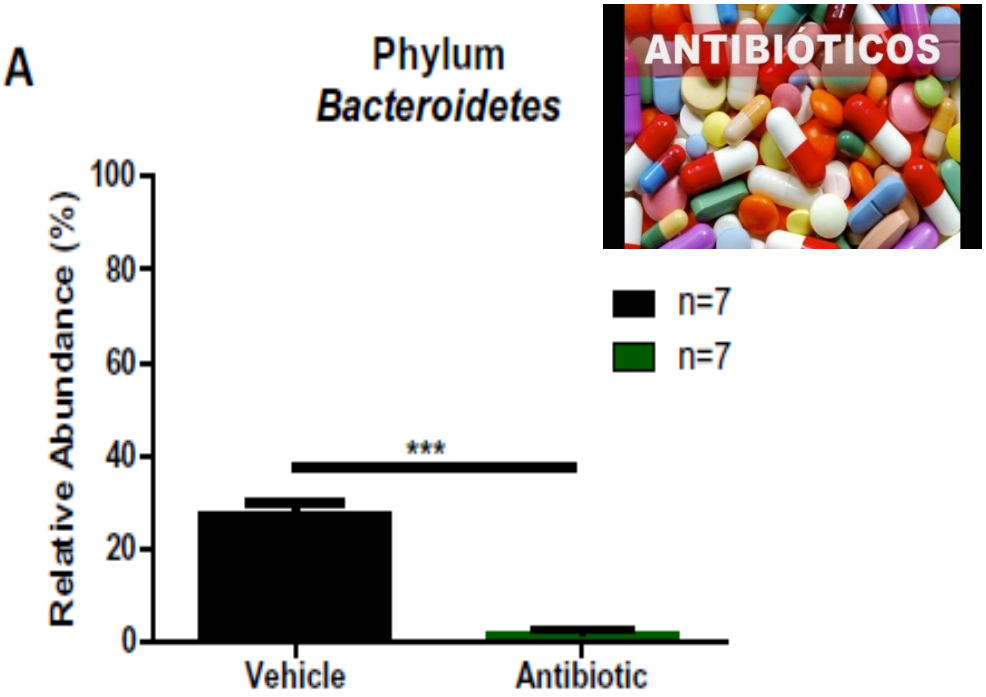
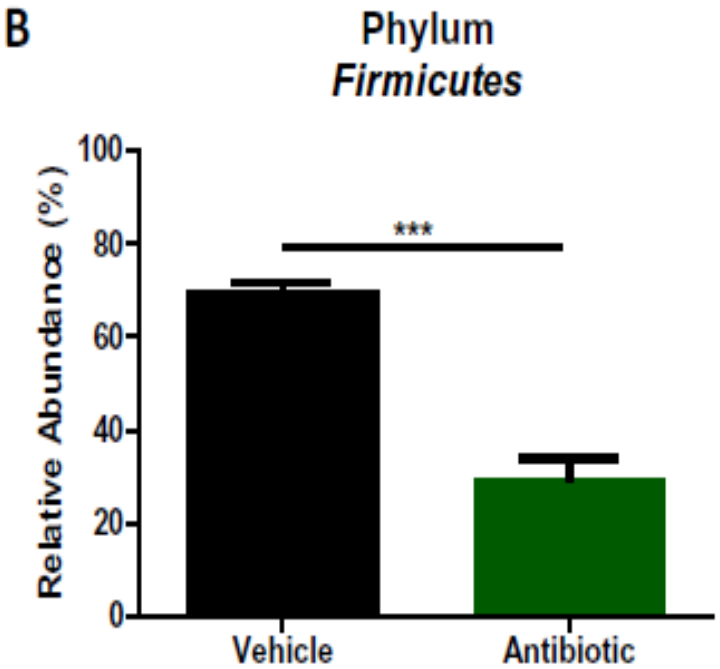


20 Things You Didn't Know About the Human Gut Microbiome

Erin P. Ferranti, PhD, MPH, RN; Sandra B. Dunbar, PhD, RN, FAHA, FAAN; Anne L. Dunlop, MD, MPH; Elizabeth J. Corwin, PhD, RN, FAAN





Tomar antibióticos demasiado pronto podría alterar lo cognitivo y emocional

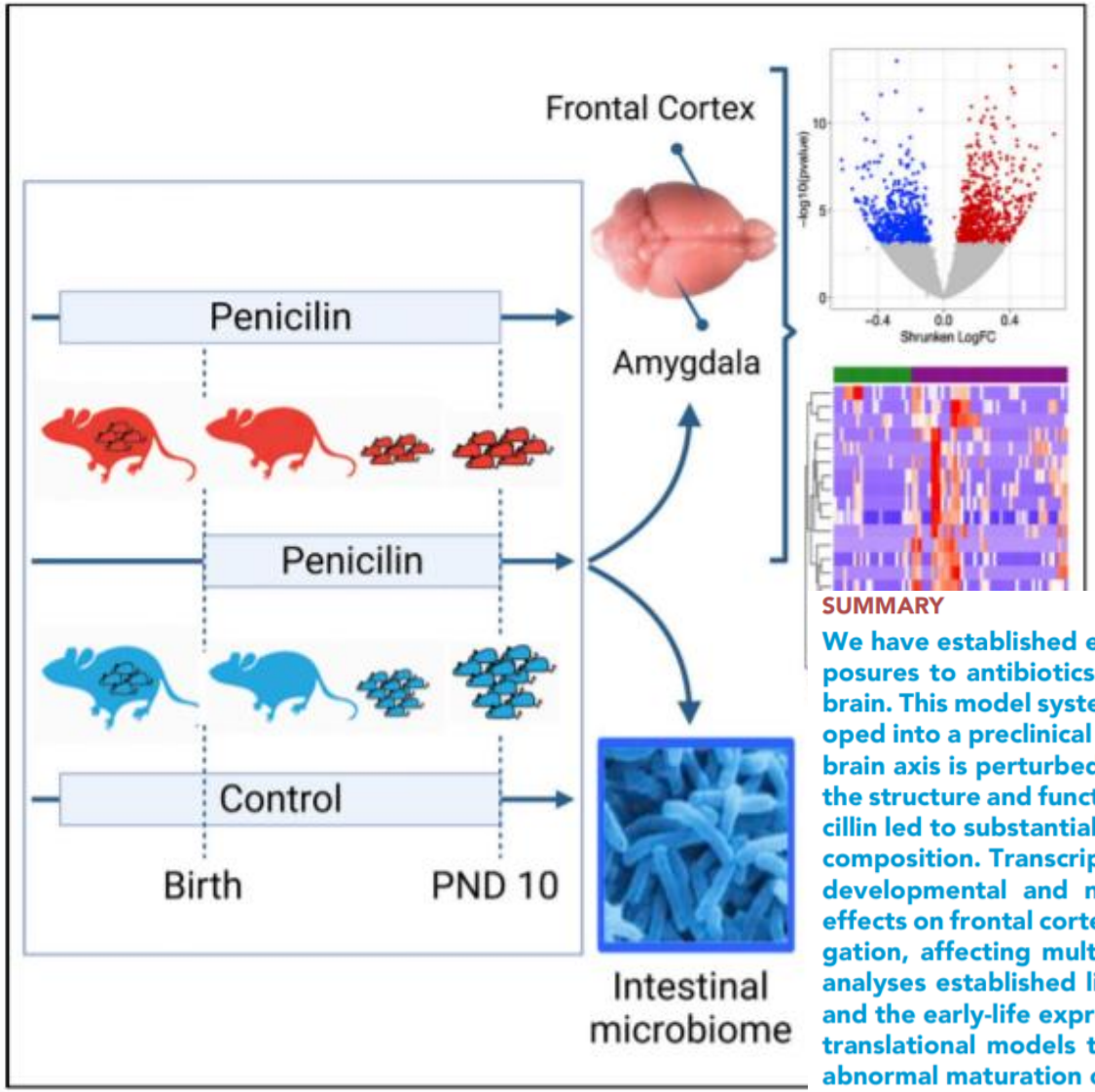
María Cardoso

Barcelona. Sábado, 24 de Julio 2021. 22:24
Actualizado: Lunes, 26 de Julio 2021. 16:45
Tiempo de lectura: 2 minutos

La exposición a antibióticos en una etapa temprana de la vida podría alterar el desarrollo del cerebro humano en zonas responsables de las funciones cognitivas y emocionales. Así queda de manifiesto en un estudio llevado a cabo en el Centro de Biotecnología y Medicina Avanzadas en Rutgers publicado en la revista *iScience*.

Effects of early-life penicillin exposure on the gut microbiome and frontal cortex and amygdala gene expression

iScience *24*, 102797, July 23, 2021



Angelina Volkova, Kelly Ruggles, Anjelique Schulfer, Zhan Gao, Stephen D. Ginsberg, Martin J. Blaser

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martin.blaser@cabm.rutgers.edu (M.J.B.)

Highlights

Low-dose antibiotic exposure perturbs the infant gut mouse microbiome to PND10

SUMMARY

We have established experimental systems to assess the effects of early-life exposures to antibiotics on the intestinal microbiota and gene expression in the brain. This model system is highly relevant to human exposure and may be developed into a preclinical model of neurodevelopmental disorders in which the gut–brain axis is perturbed, leading to organizational effects that permanently alter the structure and function of the brain. Exposing newborn mice to low-dose penicillin led to substantial changes in intestinal microbiota population structure and composition. Transcriptomic alterations implicate pathways perturbed in neurodevelopmental and neuropsychiatric disorders. There also were substantial effects on frontal cortex and amygdala gene expression by bioinformatic interrogation, affecting multiple pathways underlying neurodevelopment. Informatic analyses established linkages between specific intestinal microbial populations and the early-life expression of particular affected genes. These studies provide translational models to explore intestinal microbiome roles in the normal and abnormal maturation of the vulnerable central nervous system.

La microbiota intestinal potencia el desarrollo cerebral

Pablo Javier Piacente hace 3 meses

Una investigación liderada por la Universidad de Alberta, en Canadá, ha verificado que las características de la microbiota intestinal inciden directamente en el desarrollo cerebral de los bebés varones. La diferencia la hacen los bacteroidetes, un tipo de bacteria que genera metabolitos llamados esfingolípidos: los mismos son fundamentales para la formación y estructura de las neuronas en el cerebro.

Los científicos sostienen que luego de realizar un estudio en el que participaron 400 bebés se pudieron obtener evidencias significativas: los niños con una microbiota intestinal que incluía una importante proporción de bacteroidetes mostraron, al pasar un año, **habilidades cognitivas y de lenguaje notablemente mejoradas**. La investigación, publicada en la revista Gut Microbes, concluye que las bacterias intestinales influyen en el desarrollo de las funciones cerebrales.

GUT MICROBES
2021, VOL. 13, NO. 1, e1930875 (17 pages)
https://doi.org/10.1080/19490976.2021.1930875

Taylor & Francis
Taylor & Francis Group

RESEARCH PAPER

Bacteroides-dominant gut microbiome of late infancy is associated with enhanced neurodevelopment

Sukhpreet K. Tamana[a*], Hein M. Tun[b,a*], Theodore Konya[c], Radha S. Chari[d], Catherine J. Field[e], David S. Guttman[f], Allan B. Becker[g], Theo J. Moraes[h], Stuart E. Turvey[i], Padmaja Subbarao[h], Malcolm R. Sears[j], Jacqueline Pei[k], James A. Scott[c], Piush J. Mandhane[a], and Anita L. Kozyrskyj[a]

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ABSTRACT

Dysbiosis of gut microbiota has been retrospectively linked to autism spectrum disorders but the temporal association between gut microbiota and early neurodevelopment in healthy infants is largely unknown. We undertook this study to determine associations between gut microbiota at two critical periods during infancy and neurodevelopment in a general population birth cohort.

Here, we analyzed data from 405 infants (199 females) from the CHILD (Canadian Healthy Infant Longitudinal Development) Cohort Study. Neurodevelopmental outcomes were objectively assessed using the Bayley Scale of Infant Development (BSID-III) at 1 and 2 years of age. Microbiota profiling with 16S rRNA gene sequencing was conducted on fecal samples obtained at a mean age of 4 and 12 months.

Using clustering methods, we identified three groups of infants based on relative abundance of gut microbiota at 12 months: *Proteobacteria*-dominant cluster (22.4% higher abundance at 12 months), *Firmicutes*-dominant cluster (46.0% higher abundance at 12 months) and Bacteroidetes-dominant cluster (31.6% higher abundance at 12 months). Relative to the *Proteobacteria*-dominant cluster, the *Bacteroidetes*-dominant cluster was associated with higher scores for cognitive (4.8 points; FDRp = .02), language (4.2 points; FDRp≤0.001), and motor (3.1 points; FDRp = .03) development at age 2 in models adjusted for covariates. When stratified by sex, only male infants with a *Bacteroidetes*-dominant microbiota had more favorable cognitive (5.9 points, FDRp = .06) and language (7.9 points; FDRp≤0.001) development. Genus *Bacteroides* abundance in gut microbiota was positively correlated with cognitive and language scores at age 2. Fully adjusted linear mixed model analysis revealed a positive association between *Bacteroidetes*-dominant cluster and change in cognitive and language performance from 1 to 2 years, predominantly among males. No associations were evident between 4-month microbiota clusters and BSID-II scores. Noteworthy is that enhanced sphingolipid synthesis and metabolism, and antagonism or competition between *Bacteroides* and *Streptococcus* were characteristic of a *Bacteroidetes*-dominant gut microbiota.

This study found strong evidence of positive associations between Bacteroidetes gut microbiota in late infancy and subsequent neurodevelopment, most prominently among males but not females.

ARTICLE HISTORY
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Accepted 5 May 2021

KEYWORDS
Infant; gut microbiota; neurodevelopment; cognition; bacteroidetes; early colonization; birth cohort

doi: 10.1093/nutrit/nuw069 2017.
Nutrition Reviews® Vol. 75(4):225–240

Feature Article

Intervention strategies for cesarean section–induced alterations in the microbiota-gut-brain axis

Angela Moya-Pérez, Pauline Luczynski, Ingrid B. Renes, Shugui Wang, Yuliya Borre, C. Anthony Ryan, Jan Knol, Catherine Stanton, Timothy G. Dinan, and John F. Cryan

Microbial colonization of the gastrointestinal tract is an essential process that modulates host physiology and immunity. Recently, researchers have begun to understand how and when these microorganisms colonize the gut and the early-life factors that impact their natural ecological establishment. The vertical transmission of maternal microbes to the offspring is a critical factor for host immune and metabolic development. Increasing evidence also points to a role in the wiring of the gut-brain axis. This process may be altered by various factors such as mode of delivery, gestational age at birth, the use of antibiotics in early life, infant feeding, and hygiene practices. In fact, these early exposures that impact the intestinal microbiota have been associated with the development of diseases such as obesity, type 1 diabetes, asthma, allergies, and even neurodevelopmental disorders. The present review summarizes the impact of cesarean birth on the gut microbiome and the health status of the developing infant and discusses possible preventative and restorative strategies to compensate for early-life microbial perturbations.

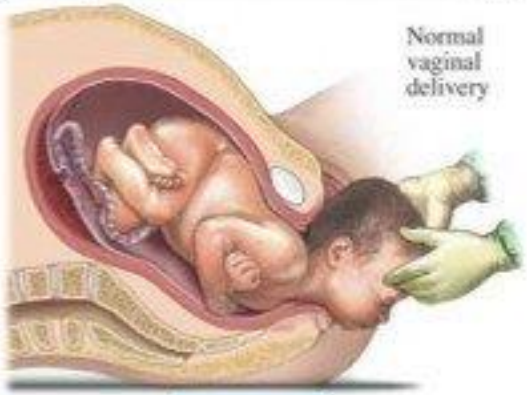
- *Mientras que los fetos pueden nacer casi desprovistos de bacterias en el útero, el proceso de parto natural asegura que un bebé se expone a la inoculación de una gran complejo de microorganismos.*

- *En circunstancias normales, esta exposición ocurre en el canal de parto de la madre (**lactobacillus**). Sin embargo, durante la cesárea los fetos no son expuestos a la microbiota vaginal pero si a la microbiota de la piel (**Staphylococcus**). Los bebés nacidos por vía vaginal, tienen una mayor abundancia relativa de **Bacteroidetes** y **una menor abundancia de Firmicutes** que los niños nacidos a través de cesárea.*

- *En los primeros 2-3 años de vida, se da una progresión de la la microbiota intestinal hacia una microbiota de tipo adulto. Cuando se inicia la dieta sólida aumenta la familia de Bacteroidetes.*

- *El género **Bifidobacterium** es numéricamente dominante a lo largo el primer año debido a **la lactancia materna** (con colonización más lenta de los niños alimentados con biberón). Importante no usar antibióticos durante la primera infancia (3 primeros meses) y especialmente en niños prematuros*

Vaginal Delivery



Introduced to Vaginal Microbes: Lactobacillus

Normal Introduction of Gut Microbes

Normal Development of the Immune System
- Production of specific cytokines for proper immune system development

Richardson; 2013

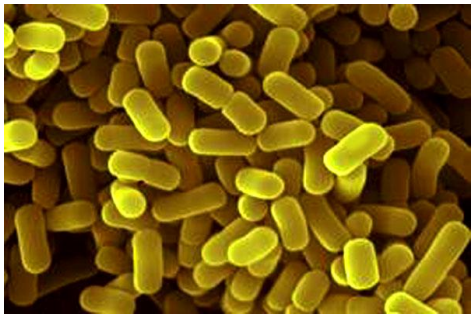
VS.

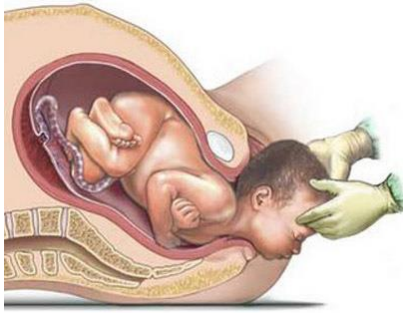
Cesarean Delivery

Introduced to Skin Flora: Staphylococcus

Abnormal Microbial Introduction

Disrupted Intestinal Microbial Colonization
- Increase risk for Atopic Diseases, Asthma, Allergic Rhinitis, and Celiac Disease
- Association: Delayed Onset of Lactation
  - Lack Breast Milk Support for Gut Flora





Obtención de microbiota intestinal

RECIEN NACIDO

Intestino estéril

- ¿ADN bacteriano materno en liquido amniótico?

Parto

- Provenientes

Microbiota intestinal y vaginal

Colonización

L. acidophilus, L. casei, L. fermentum, L. gasseri, L. johnsonii, L. paracasei, L. plantarum, L. reuteri, L. rhamnosus, L. salivarius,

Lactobacilos

Estafilococos
Enterococos
Estreptococos

104 UFC/ml

Leche materna

Microbiota intestinal

- Principal factor en la iniciación, desarrollo y composición

Hernández Hernández A. Pediatr Integral 2015

doi: 10.1093/nutrit/nuw069 2017.
Nutrition Reviews® Vol. 75(4):225–240

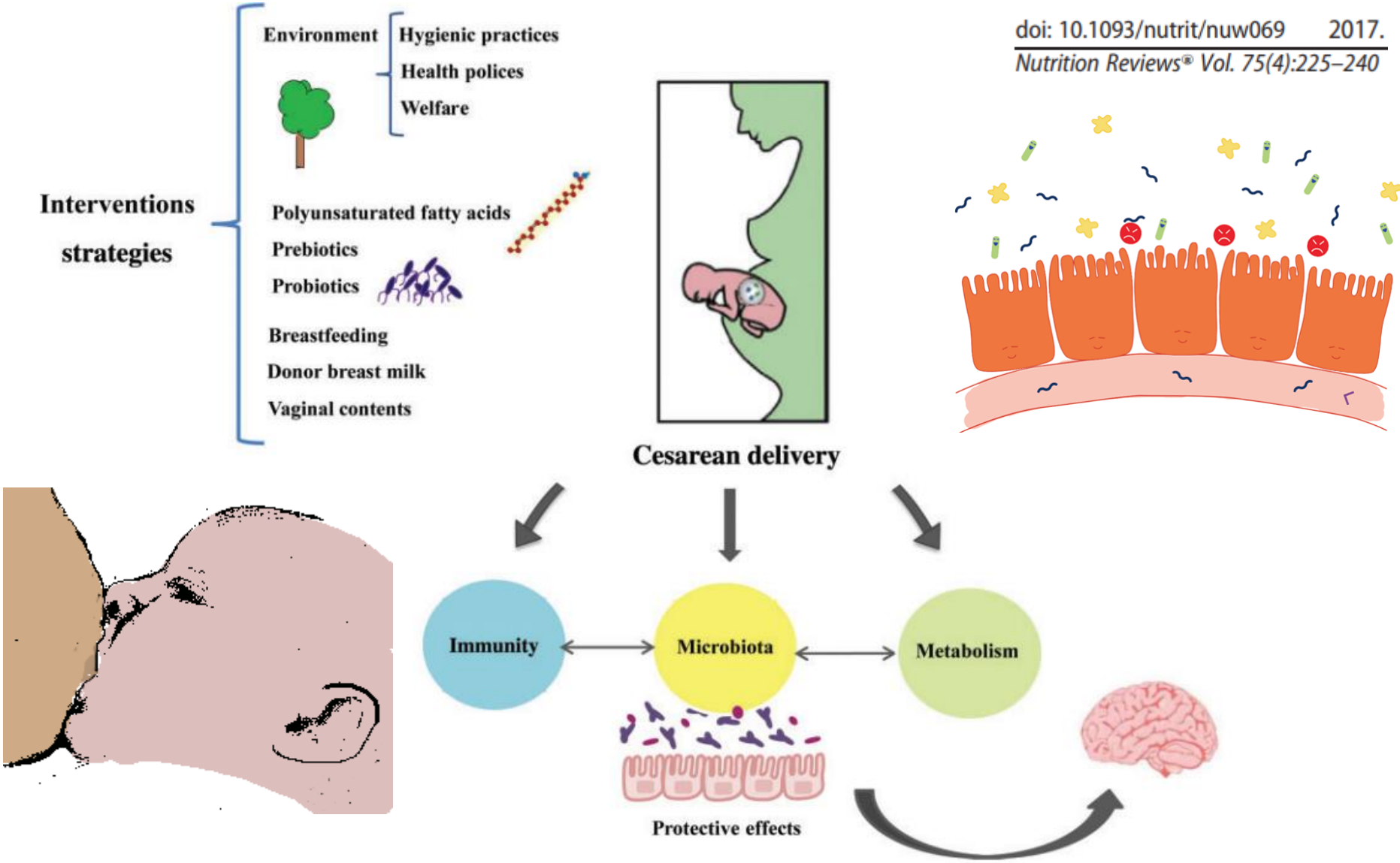


Figure 2 **Schematic representation of the main strategic points of intervention to reverse the effects of cesarean section delivery.** This can be done by improving the environment through different hygienic habits and health practices. Alternatively, the intervention could be focused on the mother herself by using probiotics and/or prebiotics and/or polyunsaturated fatty acids during pregnancy. Finally, the intervention could focus on the newborn with "seeding" approaches: breastfeeding instead of formula feeding or the use of infant formulas enriched and improved with probiotics/prebiotics. This figure summarizes the current modulating therapies to improve the composition of the microbiota and neurodevelopmental health of the infant.

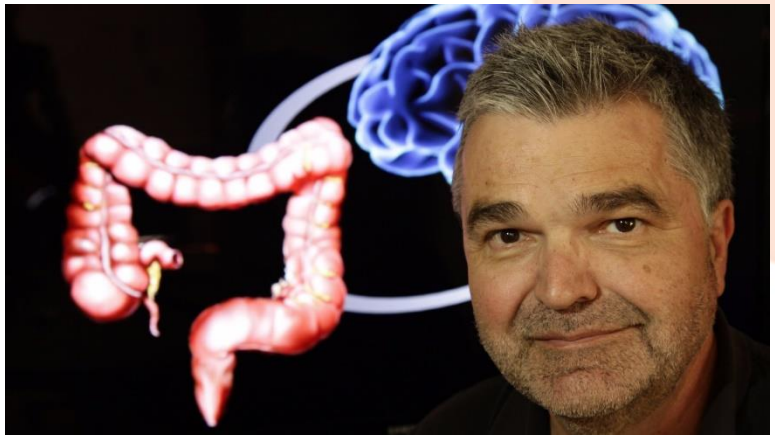
Volume 125 Number 3 March 2015

REVIEW SERIES: ENTERIC NERVOUS SYSTEM

Series Editor: Rodger Liddle

Gut/brain axis and the microbiota

Emeran A. Mayer,[1,2,3,4] Kirsten Tillisch,[1,2,5] and Arpana Gupta[1,2]



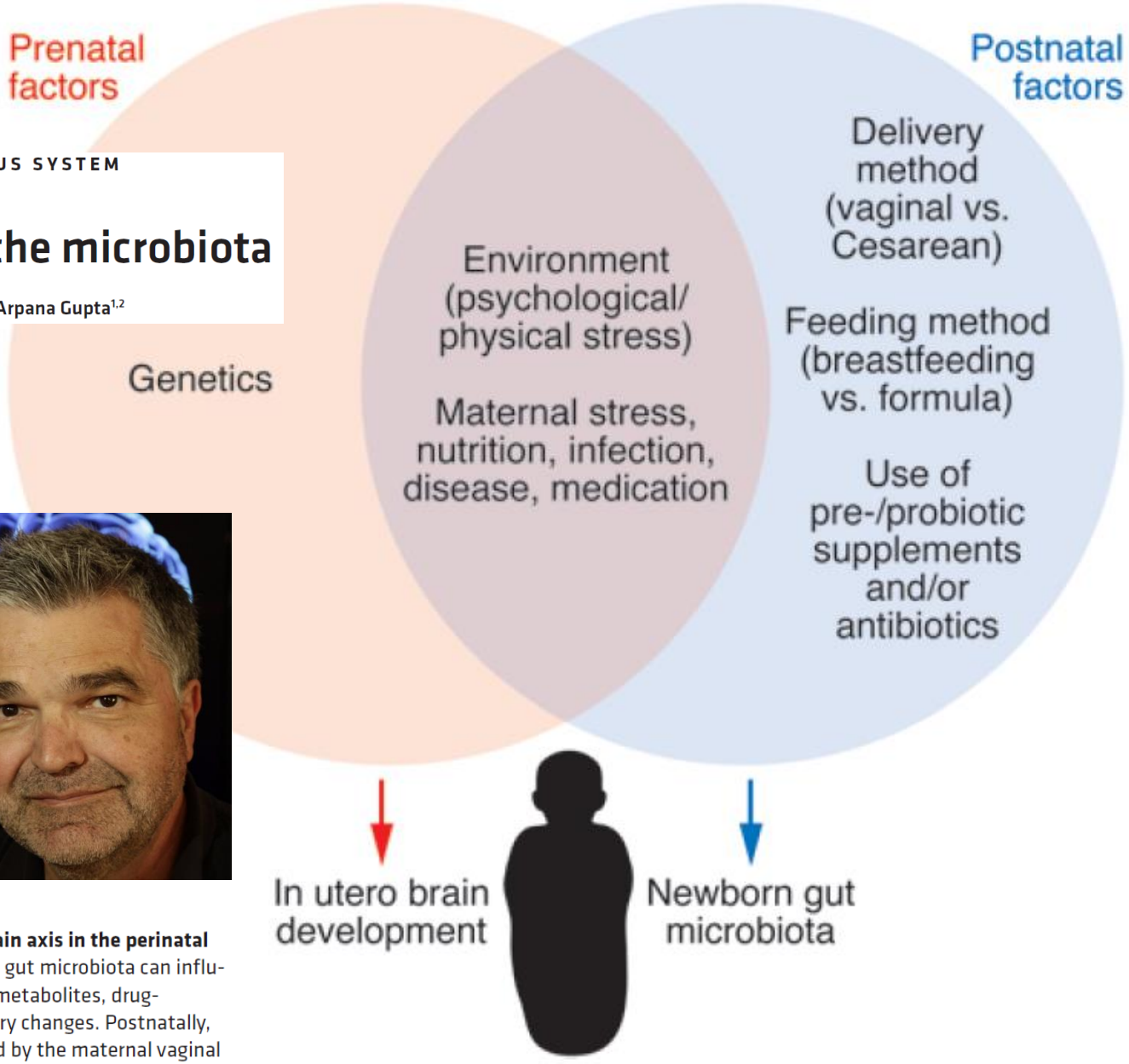


Figure 2. Influences on the gut microbiota/brain axis in the perinatal period. Multiple factors affecting the maternal gut microbiota can influence brain development in utero via microbial metabolites, drug-derived chemical metabolites, and inflammatory changes. Postnatally, the newborn's microbiota is strongly influenced by the maternal vaginal or skin-derived microbiota (depending on the mode of delivery) during birth and by various nutritional factors (breast vs. infant formula feeding).

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-Las bacterias intestinales están involucradas en la obtención de energía de los alimentos, funciones metabólicas, inmunológicas y la fabricación de neurotransmisores (5-HT), enzimas y vitaminaS (K2, antihemorrágica).

-El microbioma intestinal de los occidentales que viven en ciudades es menos diverso que el de los que viven en zonas rurales (mayor exposición a las bacterias del suelo y las de los animales). Niños criados con mascotas (perros) tienen menos probabilidad de alergias e infecciones de vías respiratorias (lametones de perros). (Hipótesis de la higiene)

-La microbiota intestinal difiere en obesos vs. delgados y aquellos con la aterosclerosis, diabetes y el síndrome metabólico, pero se sabe poco del sentido de estas diferencias.

Infant pacifier sanitization and risk of challenge-proven food allergy: A cohort study

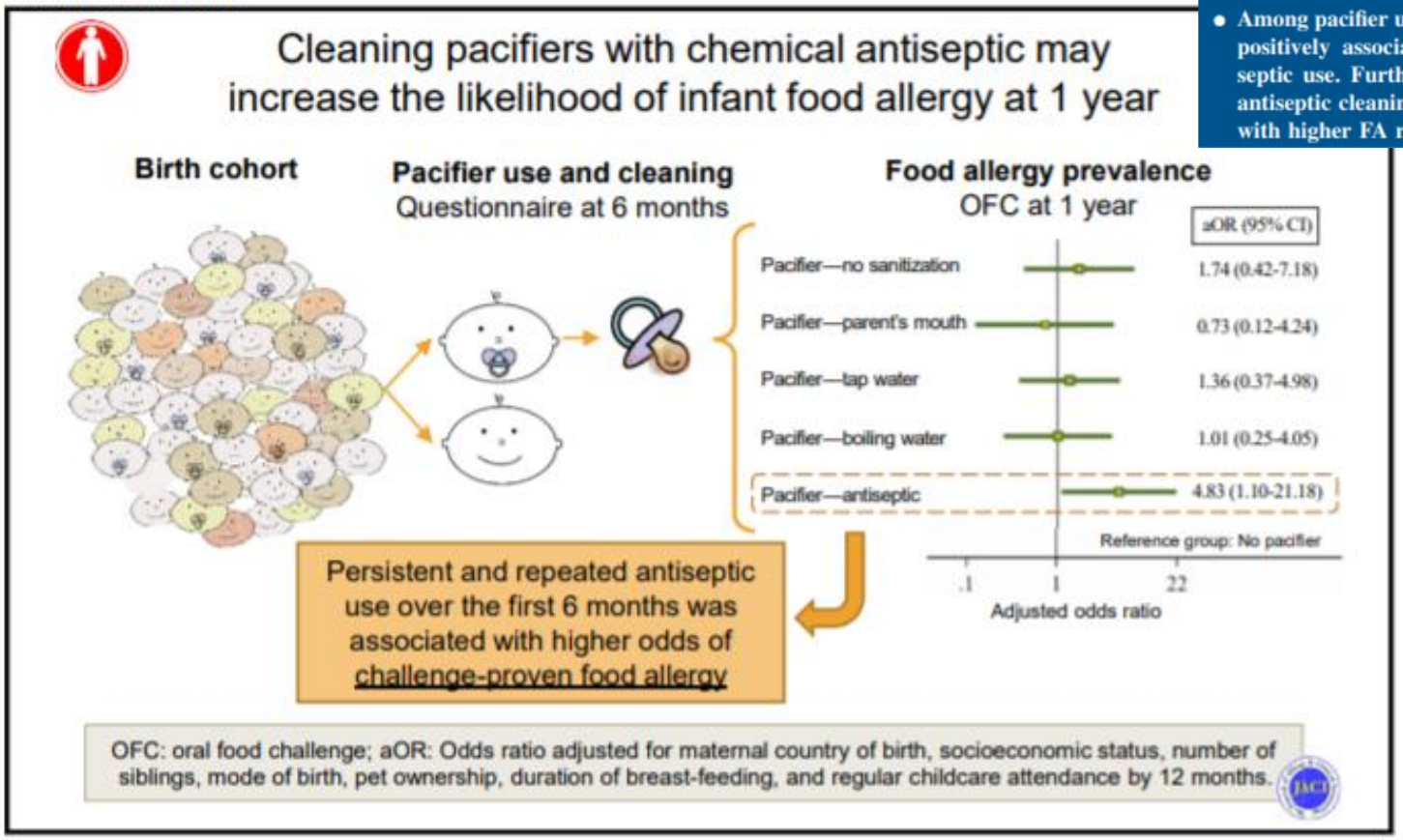
J ALLERGY CLIN IMMUNOL
MAY 2021

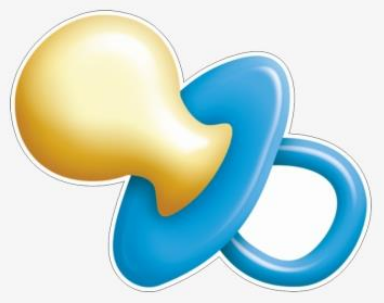
Victoria X. Soriano, BSc,[a,b] Jennifer J. Koplin, PhD,[a,b] Mike Forrester, MD,[c,d,e] Rachel L. Peters, PhD,[a,b] Martin O'Hely, PhD,[c,f] Shyamali C. Dharmage, PhD,[g] Rosemary Wright, MPH,[h] Sarath Ranganathan, MD, PhD,[b,f] David Burgner, PhD,[b,f] Kristie Thompson, BSc,[i] Terence Dwyer, MD,[j,k] Peter Vuillerman, PhD,[c,d,f] Anne-Louise Ponsonby, MBBS, PhD,[f,g,l] and the BIS Investigator Group

Parkville, Geelong, Canberra, and Brisbane, Australia; and Oxford, United Kingdom

- Pacifiers sanitized with antiseptic agents at 6 months were a risk factor for subsequent challenge-proven FA in 1-year-old infants.
- Among pacifier users, antiseptic cleaning at 6 months was positively associated with FA, compared with no antiseptic use. Furthermore, persistent and repeated use of antiseptic cleaning over the first 6 months was associated with higher FA risk ($P = .029$).

GRAPHICAL ABSTRACT



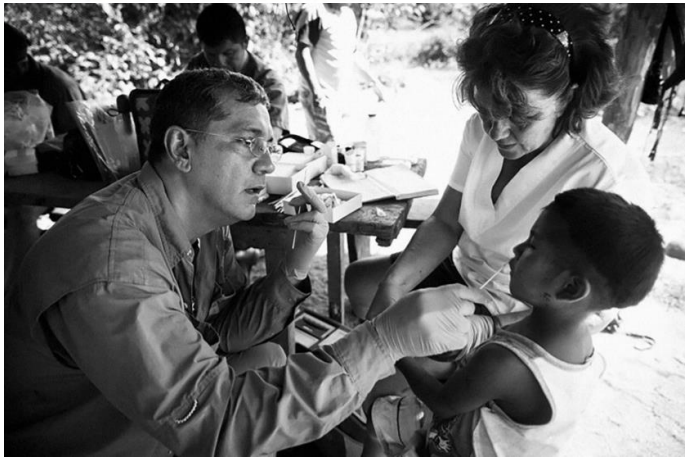


Cell

A Microbial Anthropologist in the Jungle

Maria Gloria Dominguez-Bello

Cell *167*, October 20, 2016



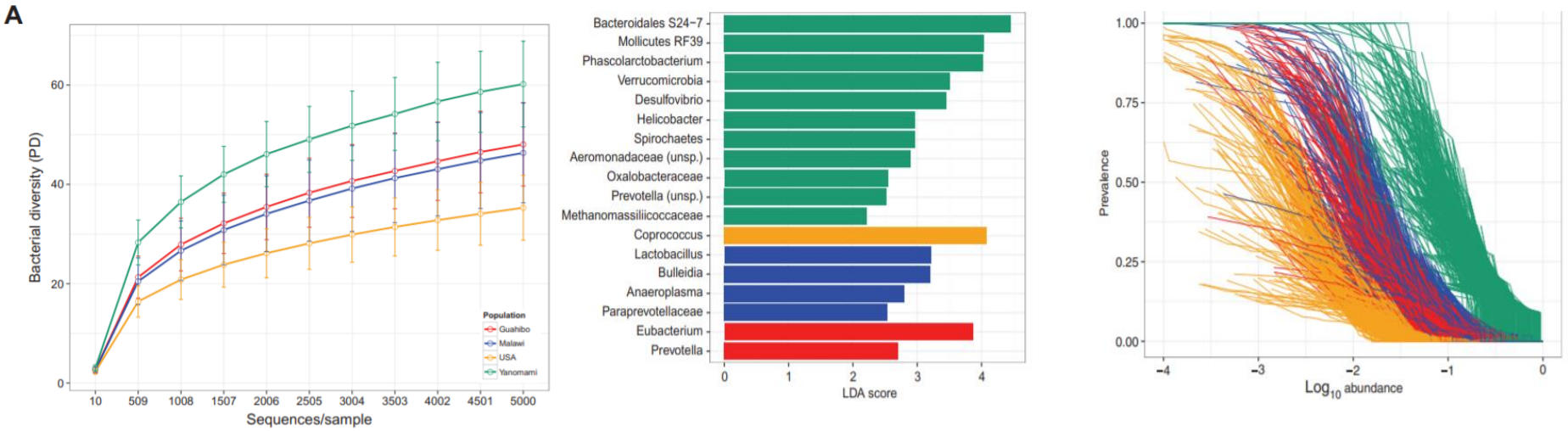
MICROBIAL ECOLOGY

The microbiome of uncontacted Amerindians

10.1126/sciadv.1500183

Jose C. Clemente,[1,2]* Erica C. Pehrsson,[3]* Martin J. Blaser,[4,5] Kuldip Sandhu,[5]† Zhan Gao,[5] Bin Wang,[3] Magda Magris,[6] Glida Hidalgo,[6] Monica Contreras,[7] Óscar Noya-Alarcón,[6] Orlana Lander,[8] Jeremy McDonald,[9] Mike Cox,[9] Jens Walter,[10]‡ Phaik Lyn Oh,[10] Jean F. Ruiz,[11] Selena Rodriguez,[11] Nan Shen,[1] Se Jin Song,[12] Jessica Metcalf,[12] Rob Knight,[12,13]§ Gautam Dantas,[3,14] M. Gloria Dominguez-Bello[5,7,11]¶

Most studies of the human microbiome have focused on westernized people with life-style practices that decrease microbial survival and transmission, or on traditional societies that are currently in transition to westernization. We characterize the fecal, oral, and skin bacterial microbiome and resistome of members of an isolated Yanomami Amerindian village with no documented previous contact with Western people. These Yanomami harbor a microbiome with the highest diversity of bacteria and genetic functions ever reported in a human group. Despite their isolation, presumably for >11,000 years since their ancestors arrived in South America, and no known exposure to antibiotics, they harbor bacteria that carry functional antibiotic resistance (AR) genes, including those that confer resistance to synthetic antibiotics and are syntenic with mobilization elements. These results suggest that westernization significantly affects human microbiome diversity and that functional AR genes appear to be a feature of the human microbiome even in the absence of exposure to commercial antibiotics. AR genes are likely poised for mobilization and enrichment upon exposure to pharmacological levels of antibiotics. Our findings emphasize the need for extensive characterization of the function of the microbiome and resistome in remote nonwesternized populations before globalization of modern practices affects potentially beneficial bacteria harbored in the human body.



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Erin P. Ferranti, PhD, MPH, RN; Sandra B. Dunbar, PhD, RN, FAHA, FAAN; Anne L. Dunlop, MD, MPH; Elizabeth J. Corwin, PhD, RN, FAAN

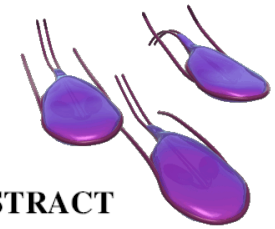
-Trasplante fecal (1000 años, antigua China) fue publicado por vez primera como terapia en 1958. Es un proceso por el que una muestra fecal de una persona sana se trasplanta (mediante enema, colonoscopia o sonda nasogástrica) a una persona enferma (colonizada por la Clostridium difficile resistente a los antibióticos). Http://www.openbiome.org/

-Trasplantes fecales de personas sanas delgadas mejoran la sensibilidad a la insulina de personas con el síndrome metabólico. En diabetes tipo II la microbiota está alterada y es proinflamatoria (mejora con trasplante fecal).

-Dieta: mayor influencia sobre la microbiota intestinal. Alimentos procesados pueden dañar el revestimiento intestinal y producir una inflamación de bajo grado que contribuyen a diabetes y enfermedades cardiovasculares.
Prebióticos: Alimentos fermentados y con fibra soluble e insoluble promocionan la fermentación de una microbiota sana.

TRASPLANTES FECALES

Fecal Microbiota Transplantation: Just a Fancy Trend?



*Yvan Vandenplas, †Denis Pierard, and *Elisabeth De Greef

ABSTRACT

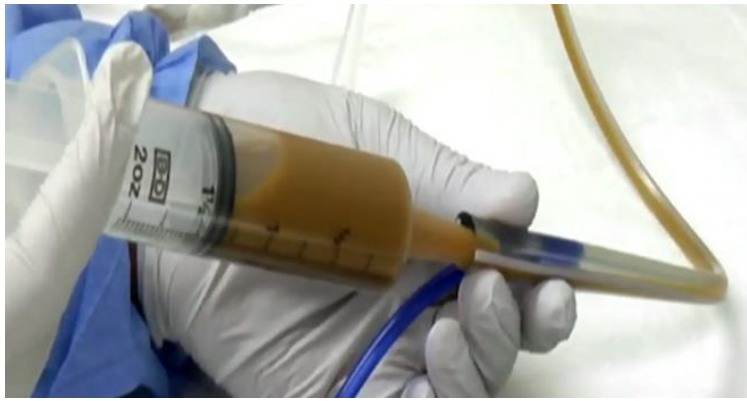
The risks and advantages of the administration of fecal material of healthy people to patients are heavily debated. In adults, recurrent *Clostridium difficile* has become an accepted indication. In addition to all of the possible indications, many other questions need to be answered before pediatric indications and recommendations can be established. Optimal donor selection, fresh versus frozen stools versus capsules containing only microbiota, volume, and route of administration are just a few examples of the areas with missing data to allow in formulating recommendations for fecal microbiota or fecal material administration in children. A careful but not-too-complex regulation is the first priority in order to minimize the risk of administration of fecal slurry from unselected donors at home without medical supervision.

Key Words: *Clostridium difficile*, fecal substance administration, fecal transplant, inflammatory bowel disease, microbial replacement therapy, microbiota

(*JPGN* 2015;61: 4–7)

Bedouins have been giving camel feces to human with dysentery for centuries.

The first publication in recent literature dates back from 1958 in a patient with recurrent *C difficile* in whom the fecal microbiota transplantation (FMT) was given by enema (3). In 2007, it was shown that FMT from a human to germ-free piglets produced a donor-like microbial community with minimal individual variation (4). Two years later, a case series was reported of 15 patients with recurrent *C difficile*–associated diarrhea, of which 11 were cured (5). The first randomized controlled trial was published in 2013 and showed that duodenal infusion of donor feces in patients with recurrent *C difficile* was more than twice as effective in resolving symptoms as antibiotics alone (6). One should not forget that a couple of years earlier a trial with duodenal administration of probiotics in patients with pancreatitis was stopped prematurely, however, because the intervention group was doing much worse than the control group (7).



Journal of Cardiovascular Nursing
Vol. 29, No. 6, pp 479–481 | Copyright © 2014 Wolters Kluwer Health | Lippincott Williams & Wilkins

20 Things You Didn't Know About the Human Gut Microbiome

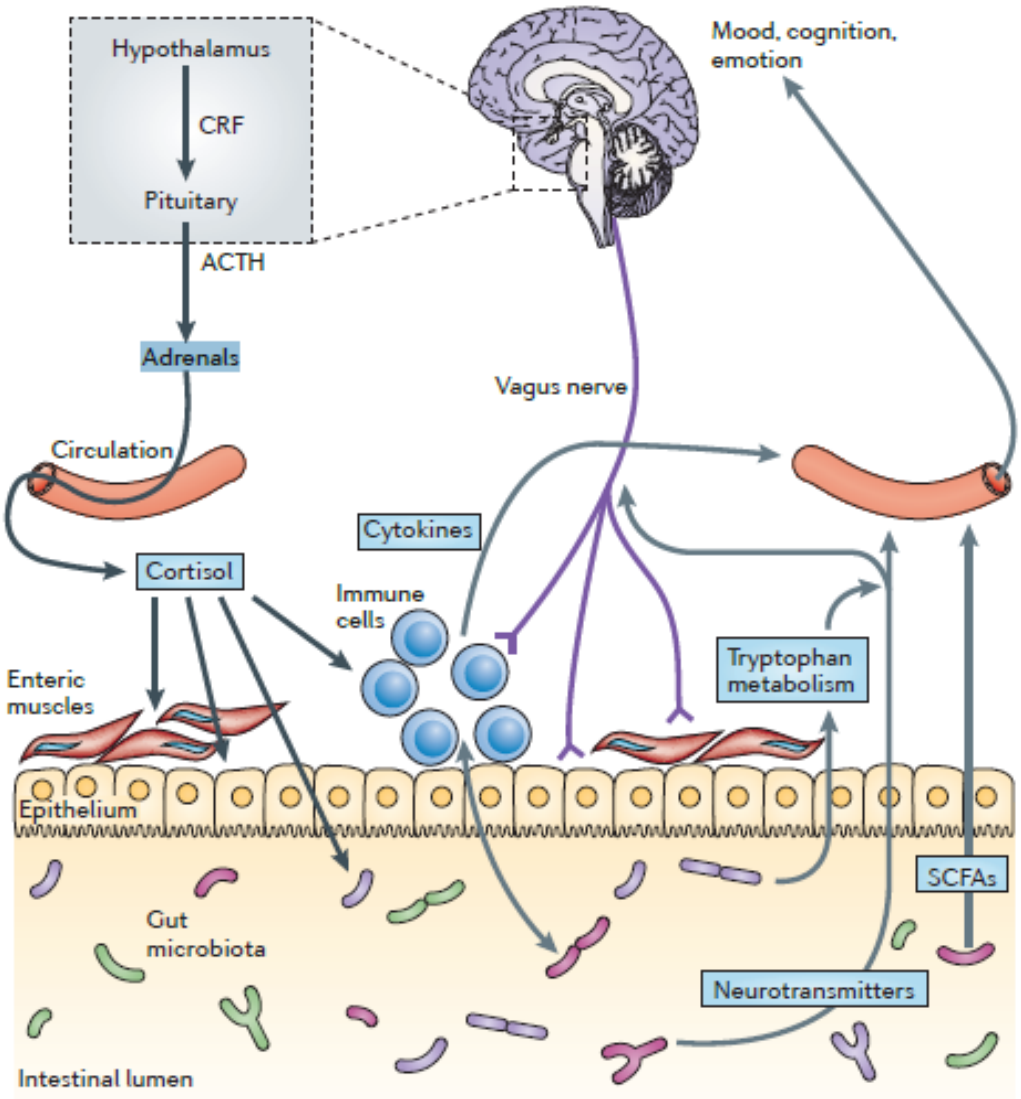
Erin P. Ferranti, PhD, MPH, RN; Sandra B. Dunbar, PhD, RN, FAHA, FAAN; Anne L. Dunlop, MD, MPH; Elizabeth J. Corwin, PhD, RN, FAAN

-Probióticos: Bacterias vivas. Controversia (no se conoce la eficacia de la mayoría de los probióticos de uso comercial, no hay fórmulas estándar o dosificaciones, y algunas fórmulas probióticas incluyen bacterias que pueden ser beneficiosas para algunos problemas pero no otros). La mayoría de especialistas en probióticos no los toman, prefieren prebióticos (dieta variada rica en vegetales frutas con abundante fibra insoluble, alimento para las bacterias y su reproducción).

*-El **envejecimiento** se asocia a una disminución en la diversidad de la microbiota intestinal que correlaciona con el estado nutricional y con las enfermedades inflamatorias.*

-La aterosclerosis está asociada con una microbiota intestinal específica rica en óxido-N-trimetilamina (procedente de componentes de la carne roja como la colina, fosfatidilcolina y la L-carnitina). Nueva área de investigación.

3. MICROBIOTA INTESTINAL



Vías involucradas en la comunicación bidireccional entre la microbiota intestinal y el cerebro: *endocrina (cortisol), inmune (citoquinas) y neural (nervio vago y sistema nervioso entérico).*

Cerebro → Microbiota:

Estrés: cortisol → afecta a las células inmunes (secreción de citoquinas) → alteración de la permeabilidad intestinal y la función de la barrera, y cambio la composición de la microbiota intestinal.

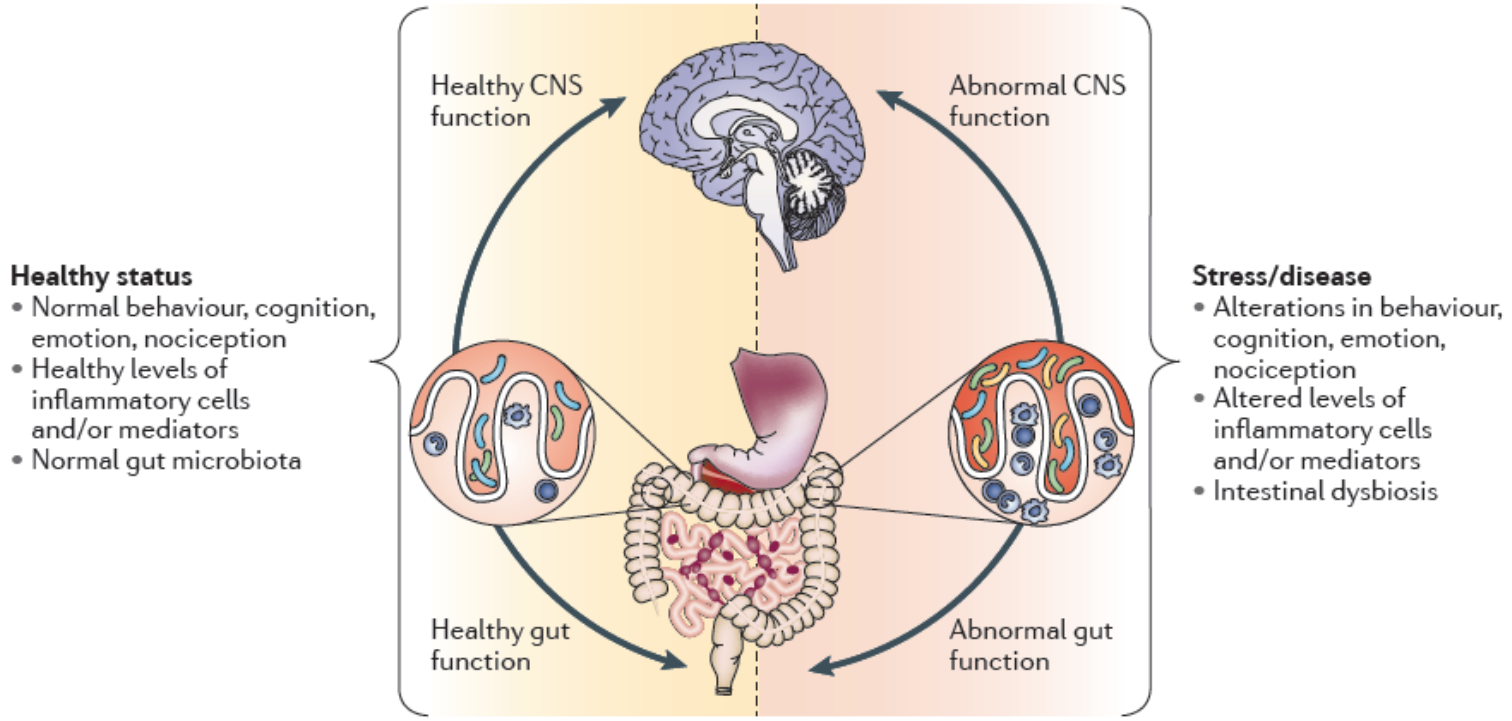
Microbiota → cerebro:

- La microbiota y los agentes probióticos pueden alterar los niveles de citoquinas, lo que afecta a la función cerebral.

- El nervio vago y los niveles de triptófano están fuertemente implicados en la transmisión de la influencia de la microbiota intestinal al cerebro. El 80% de las fibras nerviosas del vago son sensoriales: transmisión de información sobre el estado de los órganos del cuerpo al SNC.

3. MICROBIOTA INTESTINAL

- *La microbiota intestinal estable es esencial para un buen funcionamiento intestinal, y contribuye al funcionamiento apropiado a lo largo del eje intestino-cerebro y, por tanto, al estado saludable de la persona (lado izquierdo).*
- *La disbiosis intestinal puede influir negativamente en el funcionamiento intestinal, dando lugar a una señalización inapropiada del eje intestino-cerebro, asociado a consecuencias para las funciones del SNC que dan lugar a estados de enfermedad (lado derecho)*



Brain, Behavior, and Immunity 38 (2014) 1–12

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Brain, Behavior, and Immunity

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Invited Review

The role of microbiome in central nervous system disorders

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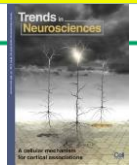
ABSTRACT

Mammals live in a co-evolutionary association with the plethora of microorganisms that reside at a variety of tissue microenvironments. The microbiome represents the collective genomes of these co-existing microorganisms, which is shaped by host factors such as genetics and nutrients but in turn is able to influence host biology in health and disease. Niche-specific microbiome, prominently the gut microbiome, has the capacity to effect both local and distal sites within the host. The gut microbiome has played a crucial role in the bidirectional gut–brain axis that integrates the gut and central nervous system (CNS) activities, and thus the concept of microbiome–gut–brain axis is emerging. Studies are revealing how diverse forms of neuro-immune and neuro-psychiatric disorders are correlated with or modulated by variations of microbiome, microbiota-derived products and exogenous antibiotics and probiotics. The microbiome poises the peripheral immune homeostasis and predisposes host susceptibility to CNS autoimmune diseases such as multiple sclerosis. Neural, endocrine and metabolic mechanisms are also critical mediators of the microbiome–CNS signaling, which are more involved in neuro-psychiatric disorders such as autism, depression, anxiety, stress. Research on the role of microbiome in CNS disorders deepens our academic knowledge about host-microbiome commensalism in central regulation and in practicality, holds conceivable promise for developing novel prognostic and therapeutic avenues for CNS disorders.

Review

Trends in Neurosciences May 2013, Vol. 36, No. 5



Cell PRESS

Gut–brain axis: how the microbiome influences anxiety and depression

Jane A. Foster and Karen-Anne McVey Neufeld

Department of Psychiatry and Behavioural Neurosciences, McMaster University, at St. Joseph's Healthcare, 50 Charlton Ave. E, T3308, Hamilton, ON, L8N 4A6, Canada

Within the first few days of life, humans are colonized by commensal intestinal microbiota. Here, we review recent findings showing that microbiota are important in normal healthy brain function. We also discuss the relation between stress and microbiota, and how alterations in microbiota influence stress-related behaviors. New studies show that bacteria, including commensal, probiotic, and pathogenic bacteria, in the gastrointestinal (GI) tract can activate neural pathways and central nervous system (CNS) signaling systems. Ongoing and future animal and clinical studies aimed at understanding the microbiota–gut–brain axis may provide novel approaches for prevention and treatment of mental illness, including anxiety and depression.

Overview of the microbiome

Early postnatal life in mammals represents a period of bacterial colonization. Resident or commensal microbiota colonize the mammalian gut shortly after birth and remain there throughout life. In humans, the lower intestine contains 10^{14}–10^{15} bacteria, that is, there are 10–100 times more bacteria in the gut than eukaryotic cells in the human body (10^{13}) [1,7,8]. The presence of commensal microbiota is critical to immune function, nutrient processing, and other aspects of host physiology [9–13]. As we discuss here, microbiota are also important in the function of the CNS.

To understand effectively the role of commensal microbiota in health and disease, we must be able to describe the complex ecology of the microbiome. Recently developed

4. LAS EMOCIONES: SISTEMA N. ENTÉRICO (SNE)

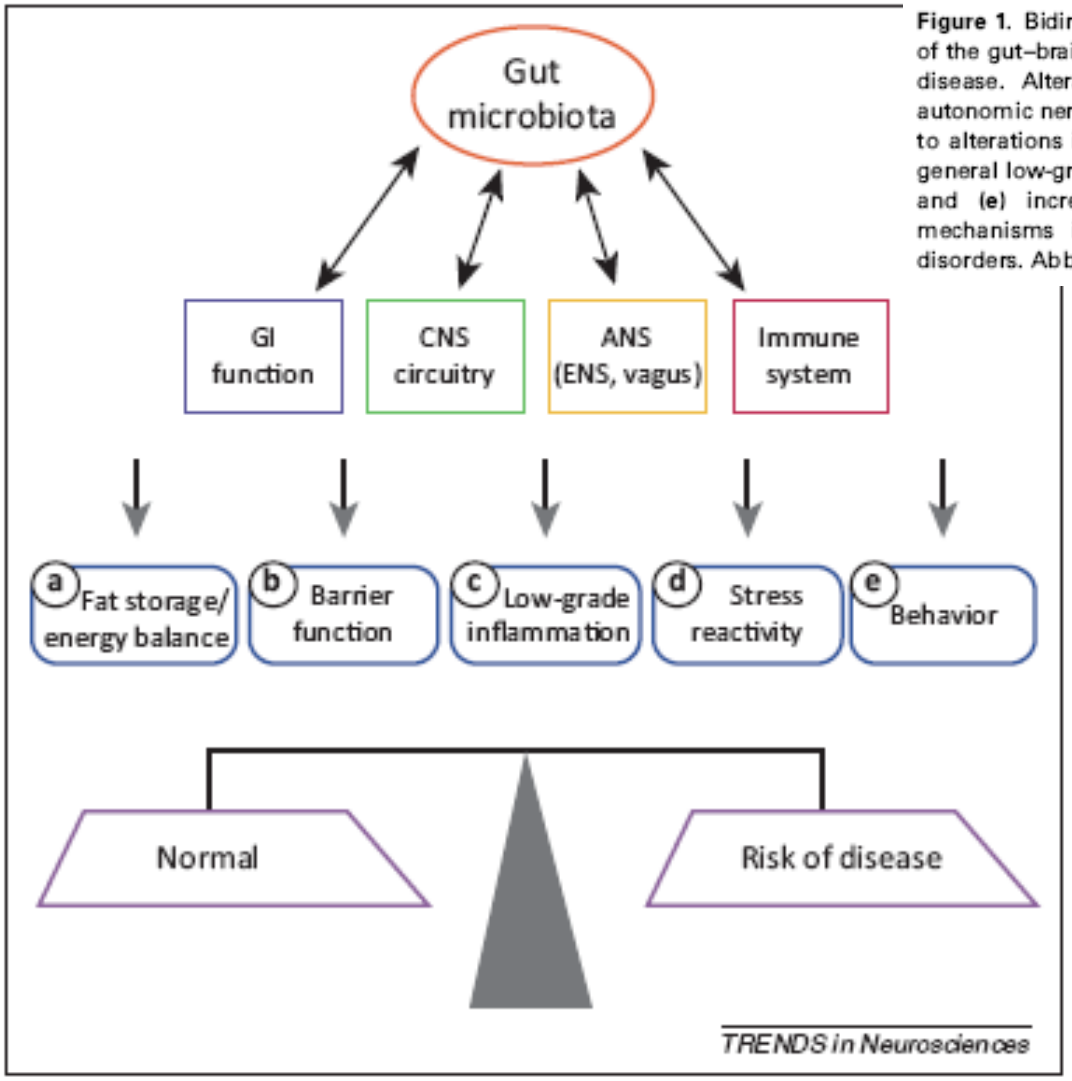
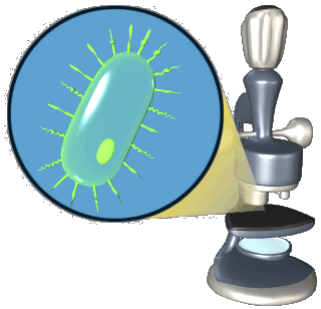


Figure 1. Bidirectional communication between gut microbiota and components of the gut–brain axis influence normal homeostasis and may contribute to risk of disease. Alterations in gastrointestinal (GI), central nervous system (CNS), autonomic nervous system (ANS), and immune systems by microbiota may lead to alterations in **(a)** fat storage and energy balance; **(b)** GI barrier function; **(c)** general low-grade inflammation (GI and systemic); **(d)** increased stress reactivity; and **(e)** increased anxiety and depressive-like behaviors. Each of these mechanisms is implicated in the pathophysiology of mood and anxiety disorders. Abbreviation: ENS, enteric nervous system.



Review

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Trends in Neurosciences May 2013, Vol. 36, No. 5

Eje microbiota-intestino-cerebro (SNE)

4. ESTRÉS, ANSIEDAD Y MICROBIOTA INTESTINAL

Contents lists available at ScienceDirect

Journal of Psychiatric Research

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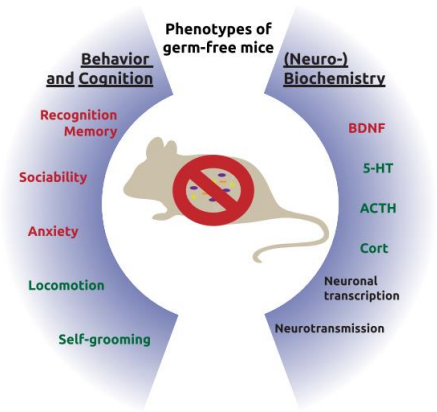
Review

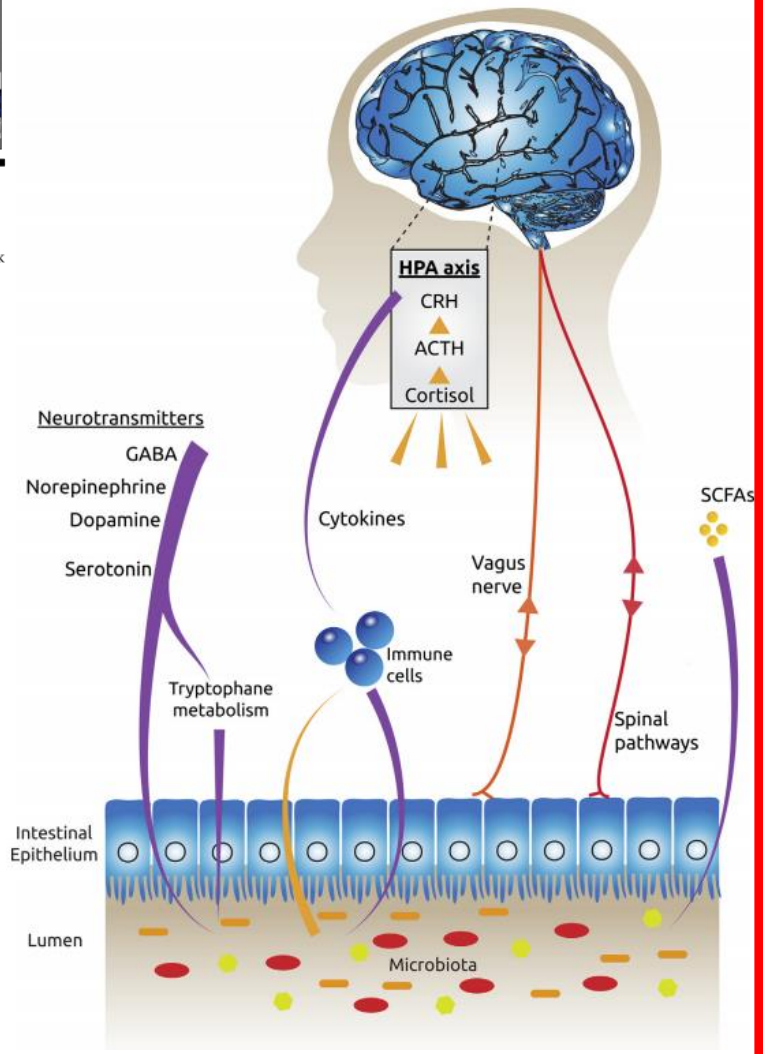
Journal of Psychiatric Research 63 (2015) 1–9

Collective unconscious: How gut microbes shape human behavior

Timothy G. Dinan [a, b, *], Roman M. Stilling [a, d], Catherine Stanton [a, b, c], John F. Cryan [a, d]

The human gut harbors a dynamic and complex microbial ecosystem, consisting of approximately 1 kg of bacteria in the average adult, approximately the weight of the human brain. The evolutionary formation of a complex gut microbiota in mammals has played an important role in enabling brain development and perhaps sophisticated social interaction. Genes within the human gut microbiota, termed the microbiome, significantly outnumber human genes in the body, and are capable of producing a myriad of neuroactive compounds. Gut microbes are part of the unconscious system regulating behavior. Recent investigations indicate that these microbes majorly impact on cognitive function and fundamental behavior patterns, such as social interaction and stress management. In the absence of microbes, underlying neurochemistry is profoundly altered. Studies of gut microbes may play an important role in advancing understanding of disorders of cognitive functioning and social interaction, such as autism.





Eje microbiota-intestino-cerebro (SNE)

4. ESTRÉS, ANSIEDAD Y MICROBIOTA INTESTINAL

INMUNOLOGÍA

Microbiota intestinal y depresión

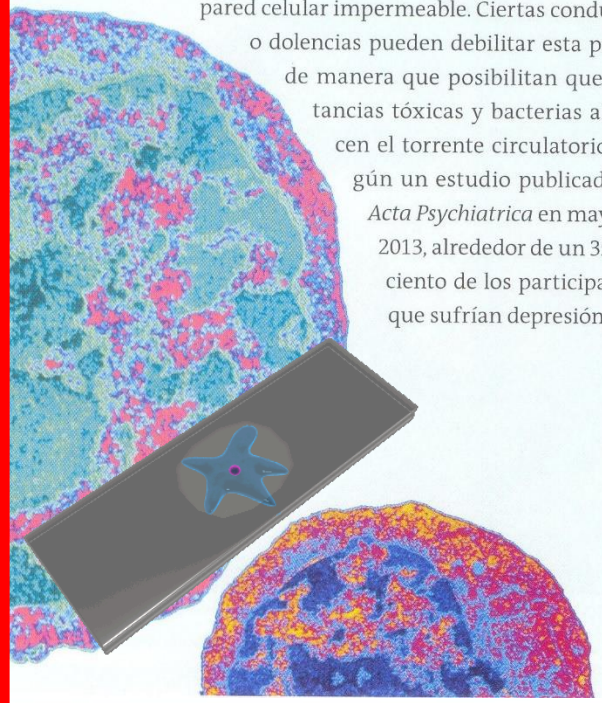
Los microorganismos fugados del tracto digestivo pueden alterar el estado de ánimo

Abundan cada vez más indicios de que el cerebro y el tracto digestivo se encuentran crucialmente vinculados, y de que la dieta y las bacterias intestinales pueden influir en nuestra conducta, pensamiento y estado anímico. En una investigación reciente se han hallado pruebas de translocación bacteriana o «permeabilidad intestinal» en personas con depresión.

El sistema digestivo se encuentra revestido por una pared celular impermeable. Ciertas conductas o dolencias pueden debilitar esta pared, de manera que posibilitan que sustancias tóxicas y bacterias alcancen el torrente circulatorio. Según un estudio publicado en *Acta Psychiatrica* en mayo de 2013, alrededor de un 35 por ciento de los participantes que sufrían depresión presentaban también signos de permeabilidad intestinal, situación que se había detectado previamente a través de un análisis de sangre.

Se ignora todavía la relación entre permeabilidad y depresión, aunque trabajos anteriores ofrecen algunas pistas. Las bacterias desplazadas pueden activar respuestas autoinmunitarias e inflamación, que se sabe están asociadas con la aparición de depresión, decaimiento y cansancio. Michael Maes, autor del artículo e investigador en psiquiatría con afiliaciones en Australia y Tailandia, asegura: «un intestino permeable puede aumentar la inflamación en pacientes deprimidos». De no recibir tratamiento, ello podría exacerbar su sintomatología. En la actualidad, si los cambios en la dieta y la modificación de la conducta no resultan eficaces, la permeabilidad intestinal se trata con una combinación de glutamato, N-acetilcisteína y zinc, sustancias que poseen, se cree, propiedades antiinflamatorias o antioxidantes.

—Tori Rodriguez



Causas de permeabilidad intestinal

- Uso habitual de analgésicos
- Uso habitual de antibióticos
- Infecciones (como el VIH)
- Enfermedades autoinmunitarias
- Abuso del alcohol
- Enfermedad inflamatoria intestinal
- Hipersensibilidad al gluten
- Alergias alimentarias graves
- Tratamientos por radiación
- Trastornos inflamatorios
- Estrés psicológico
- Agotamiento

Eje microbiota-intestino-cerebro (SNE)

3. ESTRÉS, ANSIEDAD Y MICROBIOTA INTESTINAL

Psychoneuroendocrinology (2012) 37, 1369—1378

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REVIEW

Regulation of the stress response by the gut microbiota: Implications for psychoneuroendocrinology

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Received 1 February 2012; received in revised form 7 March 2012; accepted 7 March 2012

KEYWORDS
Brain—gut axis;
Microbiota;
HPA;
Probiotics;
Germ-free;
Stress;
Novel psychotropics

Summary There is now an expanding volume of evidence to support the view that commensal organisms within the gut play a role in early programming and later responsivity of the stress system. The gut is inhabited by 10^{13}—10^{14} micro-organisms, which is ten times the number of cells in the human body and contains 150 times as many genes as our genome. It has long been recognised that gut pathogens such as *Escherichia coli*, if they enter the gut can activate the HPA. However, animals raised in a germ-free environment show exaggerated HPA responses to psychological stress, which normalises with monocolonisation by certain bacterial species including *Bifidobacterium infantis*. Moreover, increased evidence suggests that animals treated with probiotics have a blunted HPA response. Stress induces increased permeability of the gut allowing bacteria and bacterial antigens to cross the epithelial barrier and activate a mucosal immune response, which in turn alters the composition of the microbiome and leads to enhanced HPA drive. Increasing data from patients with irritable bowel syndrome and major depression indicate that in these syndromes alteration of the HPA may be induced by increased gut permeability. In the case of irritable bowel syndrome the increased permeability can respond to probiotic therapy. Detailed prospective studies in patients with mood disorders examining the gut microbiota, immune parameters and HPA activity are required to throw further light on this emerging area. It is however clear that the gut microbiota must be taken into account when considering the factors regulating the HPA.

Eje microbiota-intestino-cerebro (SNE)

Review

Trends in Neurosciences May 2013, Vol. 36, No. 5

Gut–brain axis: how the microbiome influences anxiety and depression

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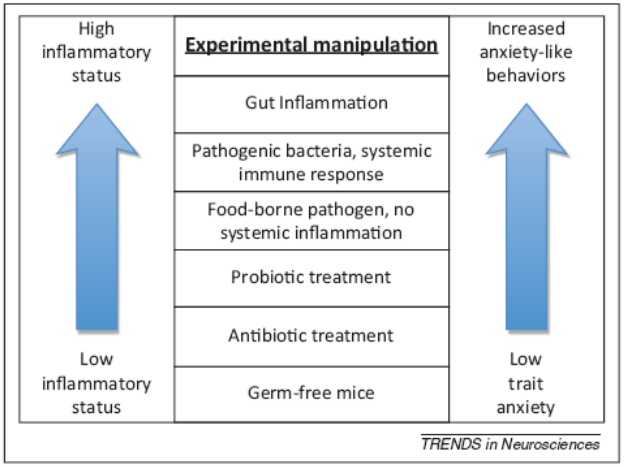


- *La dieta afecta al microbioma y a los sistemas de neurotransmisión y por lo tanto cómo se siente, (capacidad para manejar el estrés y sus niveles de energía).*
- *Cambios en la dieta durante el siglo pasado (agricultura industrial, uso de pesticidas y herbicidas degradación de los nutrientes en los alimentos) están detrás de la depresión y ansiedad*
- *La inflamación intestinal de bajo grado y el estrés oxidativo afecta a los neurotransmisores* ***dopamina, norepinefrina y serotonina****, que controlan el estado de ánimo.*
- *La salud intestinal deficiente contribuye a los problemas del estado de ánimo, y altas cantidades de estrés también causa daños en el intestino y el equilibrio hormonal.*

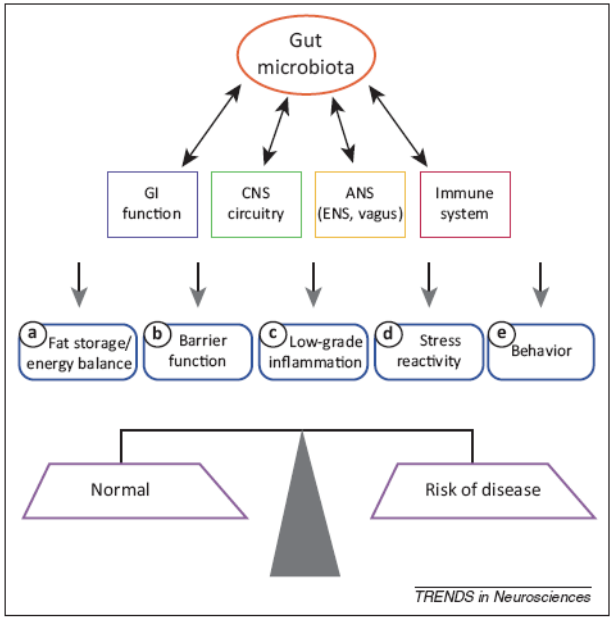
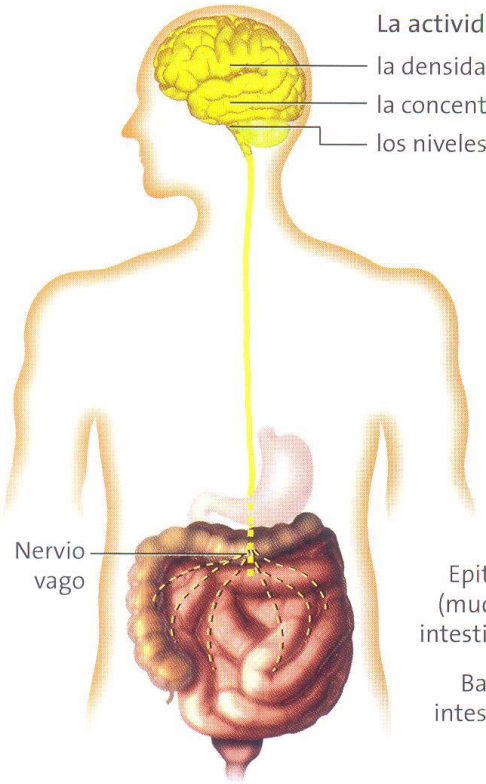
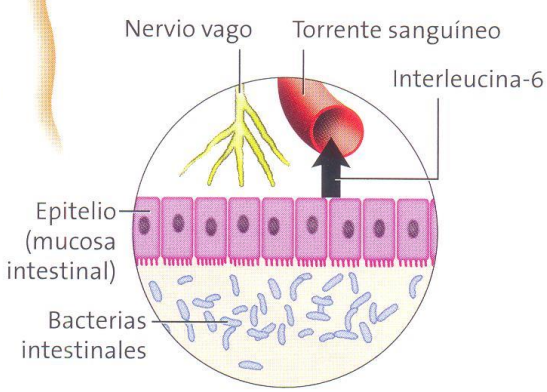
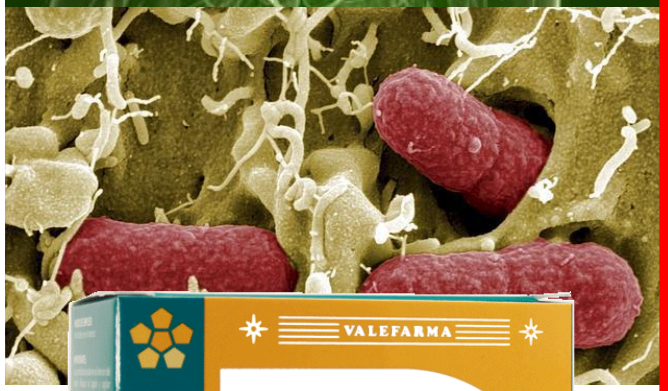


Figure 1. Bidirectional communication between gut microbiota and components of the gut–brain axis influence normal homeostasis and may contribute to risk of disease. Alterations in gastrointestinal (GI), central nervous system (CNS), autonomic nervous system (ANS), and immune systems by microbiota may lead to alterations in **(a)** fat storage and energy balance; **(b)** GI barrier function; **(c)** general low-grade inflammation (GI and systemic); **(d)** increased stress reactivity; and **(e)** increased anxiety and depressive-like behaviors. Each of these mechanisms is implicated in the pathophysiology of mood and anxiety disorders. Abbreviation: ENS, enteric nervous system.

4. ESTRÉS, ANSIEDAD Y MICROBIOTA INTESTINAL







EL NERVIO COMO INTERMEDIARIO

La experimentación con animales ha revelado que las bacterias intestinales transmiten señales al cerebro a través del nervio vago. Los aditivos probióticos alimentarios modifican la concentración de los factores de crecimiento, los mensajeros cerebrales y sus receptores, así como la concentración sanguínea de la interleucina 6.

4. ESTRÉS, ANSIEDAD Y MICROBIOTA INTESTINAL

REVIEW

Regulation of the stress response by the gut microbiota: Implications for psychoneuroendocrinology

Timothy G. Dinan*, John F. Cryan

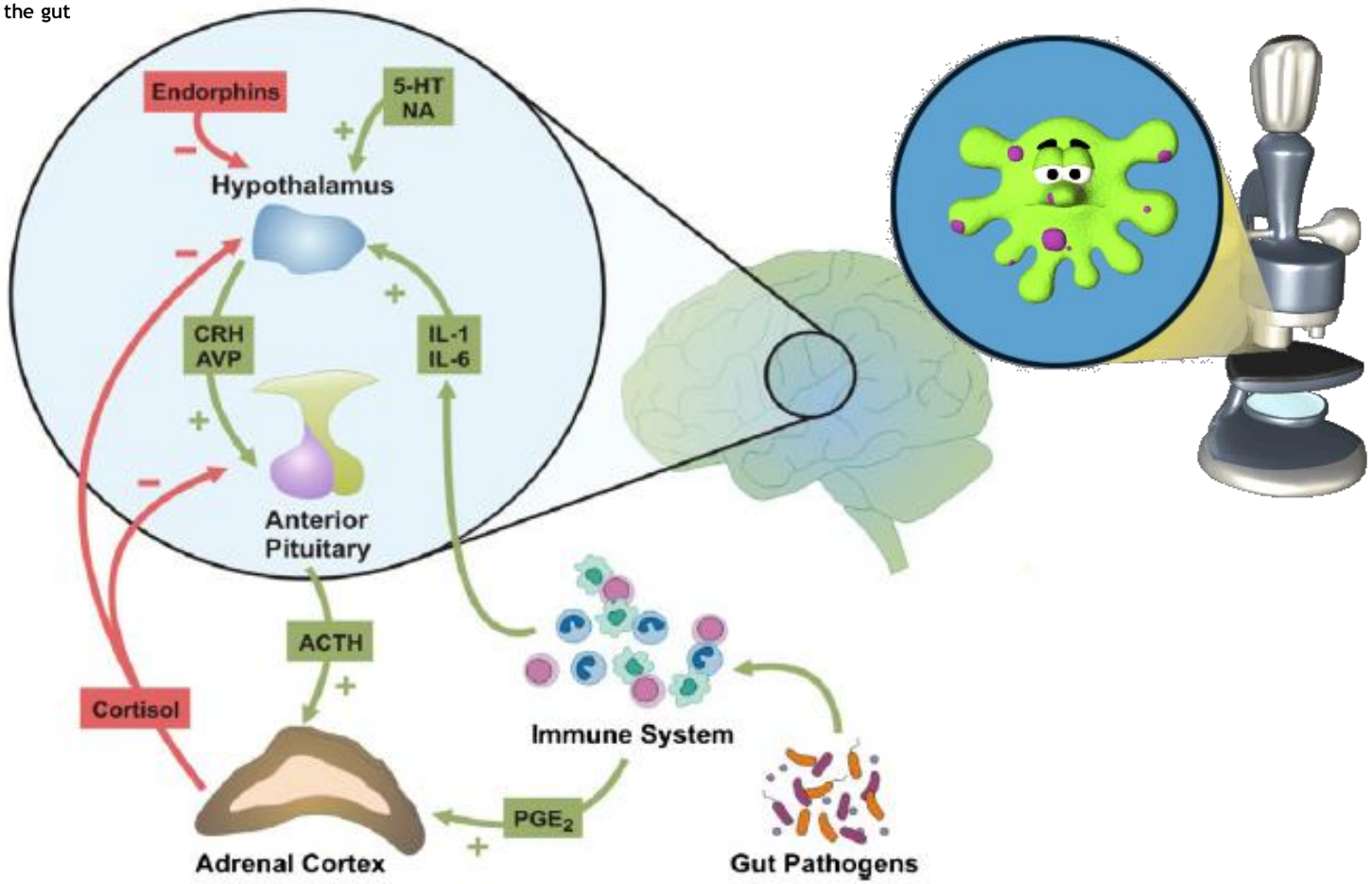


Figure 1 At a hypothalamic level classic neurotransmitters and cytokines regulate corticotrophin releasing hormone (CRH) and vasopressin (AVP) release into the portal vasculature. A series of negative feedback loops controls the forward drive. The adrenal cortex can be directly activated by PGE2 from the immune system stimulated by gut pathogens.

4. ESTRÉS, ANSIEDAD Y MICROBIOTA INTESTINAL

REVIEW

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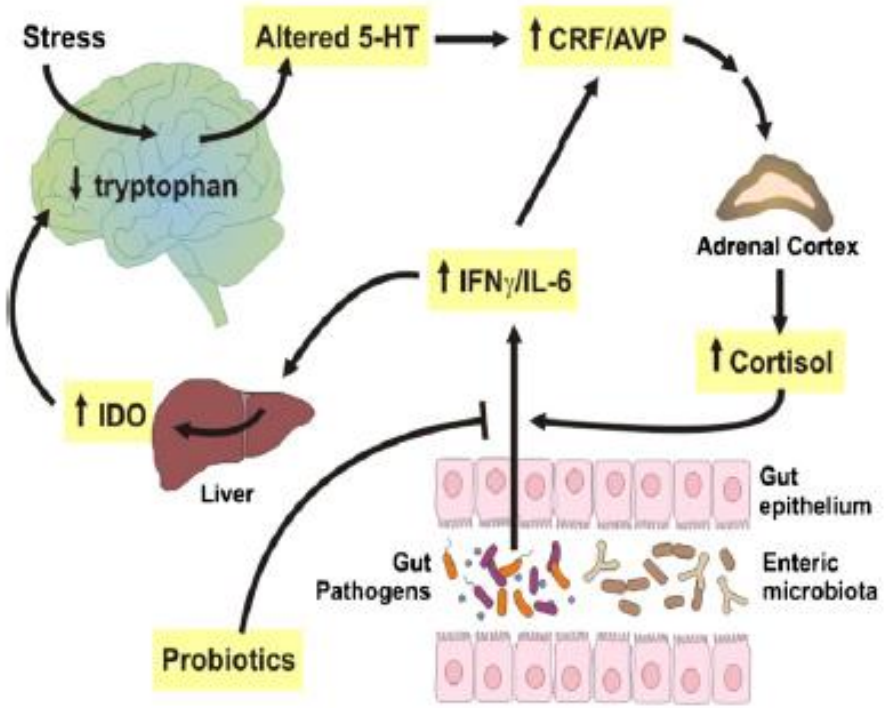

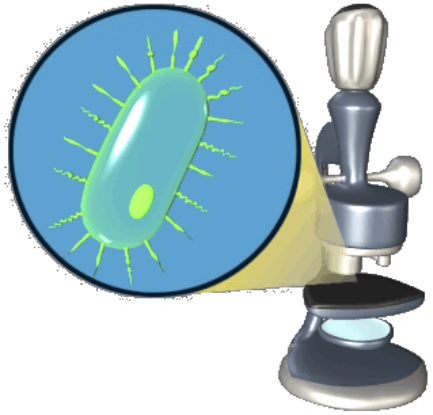

Figure 2 Stress can alter barrier function in the gut increasing gut 'leakiness' and leading to an increase in pro-inflammatory cytokines which in turn can alter indoleamine 2,3-dioxygenase (IDO) activity. This leads to altered tryptophan availability. Pro-inflammatory cytokines such as IL-1 and IL-6 together with 5-HT influence the release of CRF and AVP from the paraventricular nucleus of the hypothalamus. Certain probiotic bacteria can alter gut barrier function and via the vagus may impact on key central neurotransmitter systems.

4. LAS EMOCIONES: SISTEMA N. ENTÉRICO (SNE)

Contents lists available at ScienceDirect

Neurobiology of Stress

journal homepage: http://www.journals.elsevier.com/neurobiology-of-stress/

Neurobiology of Stress 7 (2017) 124–136

Stress & the gut-brain axis: Regulation by the microbiome

Jane A. Foster [a], Linda Rinaman [b, *], John F. Cryan [c, d]

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[b] Department of Neuroscience, University of Pittsburgh, Pittsburgh, PA, United States
[c] APC Microbiome Institute, University College Cork, Cork, Ireland
[d] Department of Anatomy and Neuroscience, University College Cork, Cork, Ireland

The importance of the gut–brain axis in regulating stress-related responses has long been appreciated. More recently, the microbiota has emerged as a key player in the control of this axis, especially during conditions of stress provoked by real or perceived homeostatic challenge. Diet is one of the most important modifying factors of the microbiota-gut-brain axis. The routes of communication between the microbiota and brain are slowly being unravelled, and include the vagus nerve, gut hormone signaling, the immune system, tryptophan metabolism, and microbial metabolites such as short chain fatty acids. The importance of the early life gut microbiota in shaping later health outcomes also is emerging. Results from preclinical studies indicate that alterations of the early microbial composition by way of antibiotic exposure, lack of breastfeeding, birth by Caesarean section, infection, stress exposure, and other environmental influences - coupled with the influence of host genetics - can result in long-term modulation of stress-related physiology and behaviour. The gut microbiota has been implicated in a variety of stress-related conditions including anxiety, depression and irritable bowel syndrome, although this is largely based on animal studies or correlative analysis in patient populations. Additional research in humans is sorely needed to reveal the relative impact and causal contribution of the microbiome to stress-related disorders. In this regard, the concept of psychobiotics is being developed and refined to encompass methods of targeting the microbiota in order to positively impact mental health outcomes. At the 2016 Neurobiology of Stress Workshop in Newport Beach, CA, a group of experts presented the symposium "The Microbiome: Development, Stress, and Disease". This report summarizes and builds upon some of the key concepts in that symposium within the context of how microbiota might influence the neurobiology of stress.

Eje microbiota-intestino-cerebro (SNE)

4. ESTRÉS, ANSIEDAD Y MICROBIOTA INTESTINAL

Neurobiology of Stress 4 (2016) 23–33

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Neurobiology of Stress

journal homepage: http://www.journals.elsevier.com/neurobiology-of-stress/

The microbiome: A key regulator of stress and neuroinflammation

Kieran Rea [a], Timothy G. Dinan [a, b], John F. Cryan [a, c, *]

There is a growing emphasis on the relationship between the complexity and diversity of the microorganisms that inhabit our gut (human gastrointestinal microbiota) and health/disease, including brain health and disorders of the central nervous system. The microbiota-gut-brain axis is a dynamic matrix of tissues and organs including the brain, glands, gut, immune cells and gastrointestinal microbiota that communicate in a complex multidirectional manner to maintain homeostasis. Changes in this environment can lead to a broad spectrum of physiological and behavioural effects including hypothalamic-pituitary-adrenal (HPA) axis activation, and altered activity of neurotransmitter systems and immune function. While an appropriate, co-ordinated physiological response, such as an immune or stress response are necessary for survival, a dysfunctional response can be detrimental to the host contributing to the development of a number of CNS disorders.

In this review, the involvement of the gastrointestinal microbiota in stress-mediated and immune-mediated modulation of neuroendocrine, immune and neurotransmitter systems and the consequential behaviour is considered. We also focus on the mechanisms by which commensal gut microbiota can regulate neuroinflammation and further aim to exploit our understanding of their role in stress-related disorders as a consequence of neuroinflammatory processes.

4. ESTRÉS, ANSIEDAD Y MICROBIOTA INTESTINAL

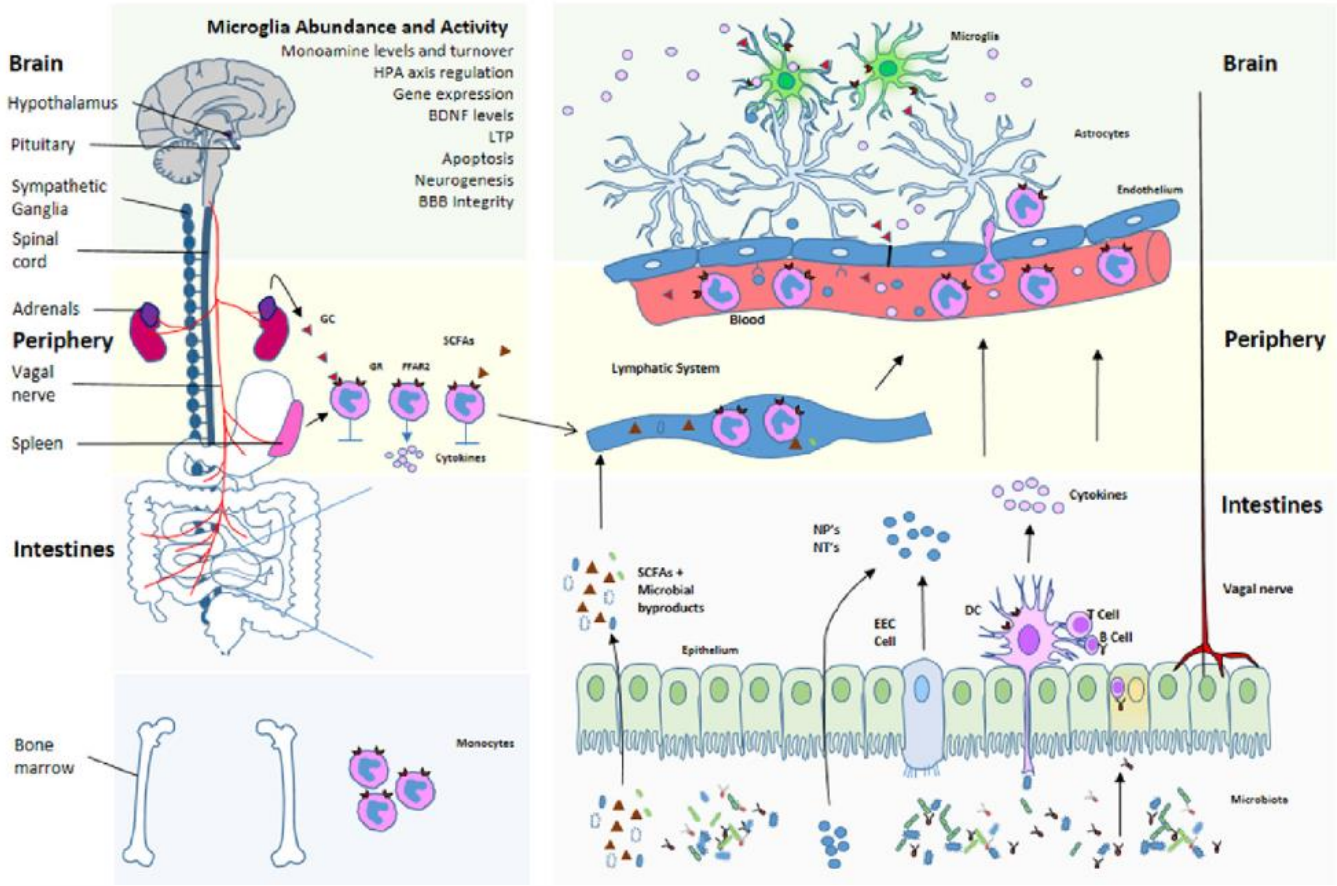


Fig. 1. Schematic for microbiota regulation of neuroinflammation and HPA axis activity. Communication within the microbiota-gut-brain axis involves the complex co-ordination of a number of factors and systems. The microbiota can govern events in the periphery and CNS by various means of communication including vagal nerve activation, cytokine production, neuropeptide and neurotransmitter release, SCFA release and microbial by-products, and by utilising the lymphatic and systemic circulation. Once these signals penetrate the blood brain barrier and reach the brain, they can influence the maturation and activation state of the microglia. Once activated, microglia play a key role in immune surveillance, synaptic pruning and clearance of debris. They also facilitate a number of everyday functions in the brain, including the regulation of HPA axis activation state. The release of glucocorticoids (cortisol) as a consequence of HPA axis activation can in turn regulate the activation state of brain microglia, as well as influence cytokine release and trafficking of monocytes from the periphery to the brain. HPA Hypothalamic-Pituitary-Adrenal; BDNF Brain derived neurotrophic factor; LTP Long term potentiation; BBB Blood-brain barrier; GC Glucocorticoids; GR Glucocorticoid receptor; FFAR Free fatty acid receptor; SCFA Short chain fatty acid; NP Neuropeptide; NT Neurotransmitter; DC Dendritic cell; EEC Enteroendocrine cell.

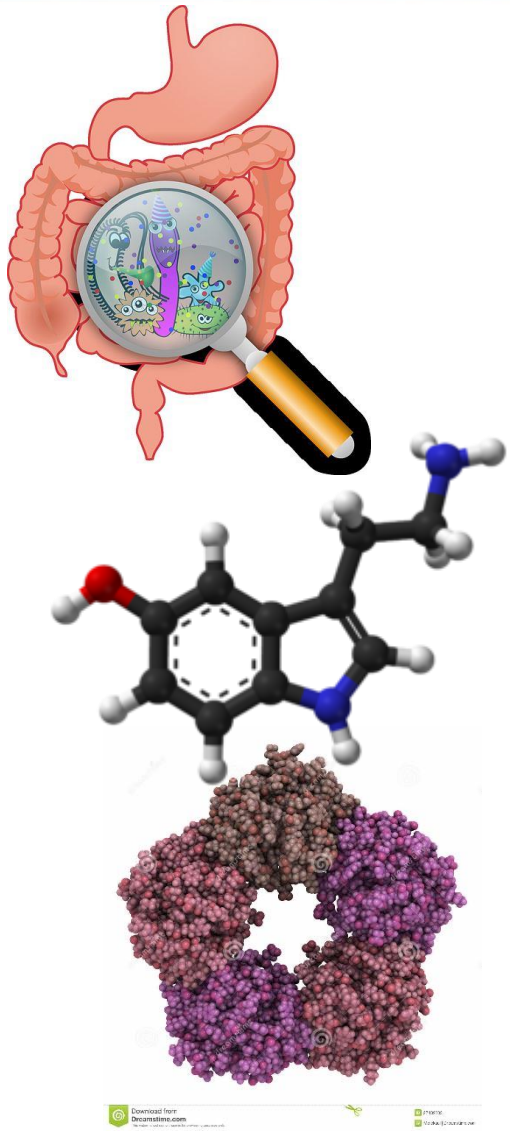
Eje microbiota-intestino-cerebro (SNE)

4. ESTRÉS, ANSIEDAD Y MICROBIOTA INTESTINAL

Los microbios gobiernan el ánimo

Los hallazgos más recientes demuestran, además de la existencia de comunicaciones intensas entre el intestino y el cerebro, la influencia de la flora intestinal en el estado de ánimo, es decir, del número incontable de microorganismos del intestino que, entre otras funciones, contribuyen a la descomposición de los alimentos. En este sentido, la flora intestinal varía en su composición de una persona a otra: es tan única como la huella digital. A pesar de que apenas se conoce cuál es su influencia sobre el cerebro, se sabe que las bacterias intestinales potencian la liberación de sustancias activadoras de la inflamación, como la proteína C reactiva (PCR). Esta reduce los niveles de serotonina (la «hormona de la felicidad»), lo que explicaría por qué los pacientes con enfermedades intestinales crónicas suelen encontrarse deprimidos durante las fases inflamatorias. La industria alimentaria promueve alimentos probióticos que regulan la flora intestinal y, en teoría, mejoran la sensación de bienestar. De hecho, los productos probióticos poseen una función positiva en el tratamiento del síndrome del intestino irritable y de las enfermedades inflamatorias intestinales crónicas. En este sentido, se ha comprobado que los lactobacilos y las bifidobacterias de la alimentación influyen en el estado de ánimo, así como en la percepción del estrés.

(«Assessment of psychotropic-like properties of a probiotic formulation (Lactobacillus helveticus *R0052 and* Bifidobacterium longum *R0175) in rats and human subjects». M. Messaoudi et al. en* The British Journal of Nutrition, *vol. 105, págs. 755-764, 2011.)*



Eje microbiota-intestino-cerebro (SNE)

5. ENVEJECIMIENTO, ALIMENTACIÓN Y MICROBIOTA INTESTINAL (covid-19)

Dr. RAUL ESPERT
DPTO. PSICOBIOLOGIA (UV)

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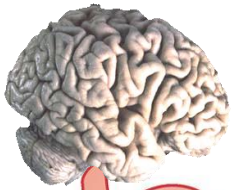

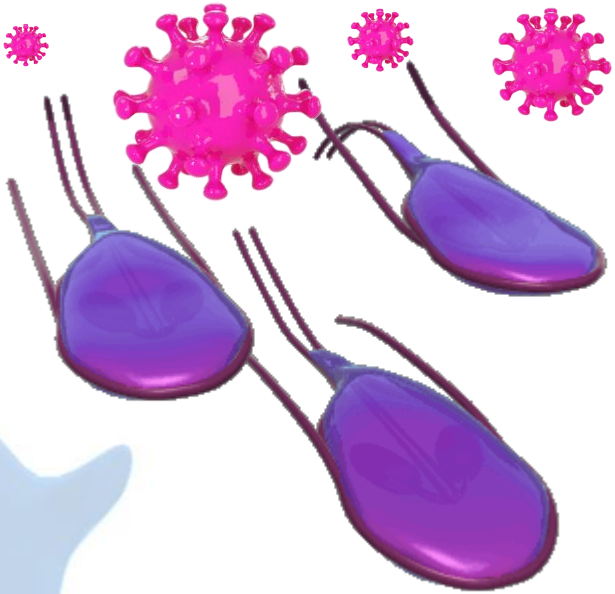

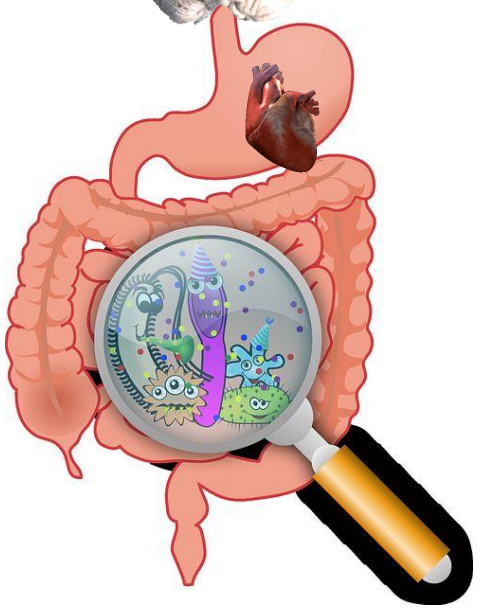

Vol. 31. Num. 3. November 2020. Pages 165 - 169

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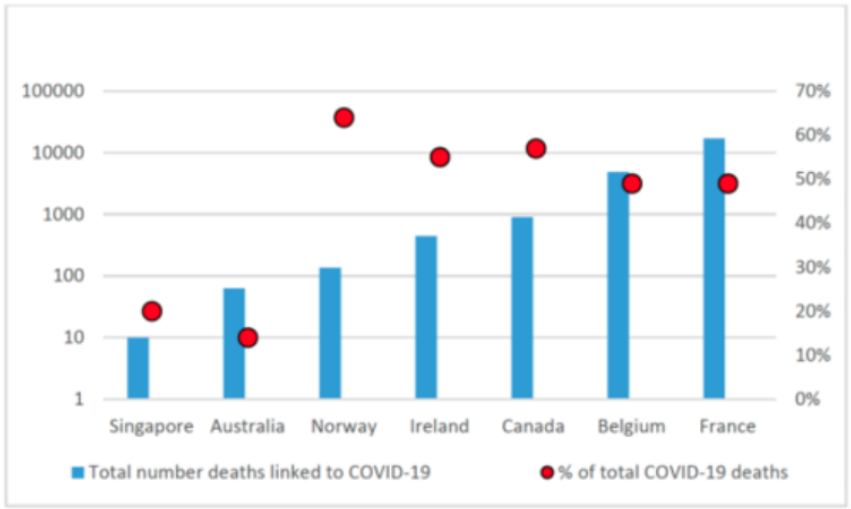
Investigación Empírica en Psicología
Colegio Oficial de la Psicología de Madrid
ISSN: 1130-5274

Impacto del COVID-19 en Personas Mayores en España: Algunos Resultados y Reflexiones

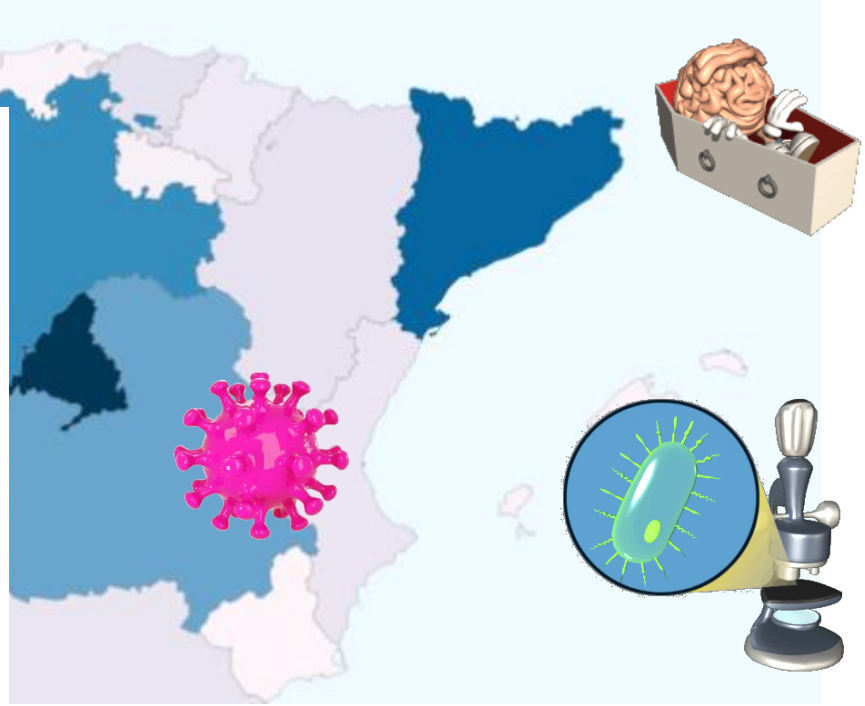
Rocío Fernández-Ballesteros[1] y Macarena Sánchez-Izquierdo Alonso[2]

[1]Universidad Autónoma de Madrid, Madrid, España; [2]Universidad Pontificia Comillas, Madrid, España

España: 62.000 de los 87.132 fallecidos por COVID-19 son mayores de 75 años en gerorresidencias (68%)



Comas-Herrera et al. 2020, articule in LTCcovid.org



THE LANCET

Leucopenia: **Disminución del número de leucocitos en la sangre, por debajo de 4 000 por milímetro cúbico.**

CORRESPONDENCE | VOLUME 395, ISSUE 10229, P1033-1034, MARCH 28, 2020

PDF [55 KB]

COVID-19: consider cytokine storm syndromes and immunosuppression

Puja Mehta • Daniel F McAuley • Michael Brown • Emilie Sanchez • Rachel S Tattersall • Jessica J Manson • et al.

Show all authors

Published: March 16, 2020 • DOI: https://doi.org/10.1016/S0140-6736(20)30628-0

Journal Pre-proof

Cytokine Storm in COVID-19 and Treatment

Qing Ye MD , Bili Wang MS , Jianhua Mao MD

PII: S0163-4453(20)30165-1
DOI: https://doi.org/10.1016/j.jinf.
Reference: YJINF 4511

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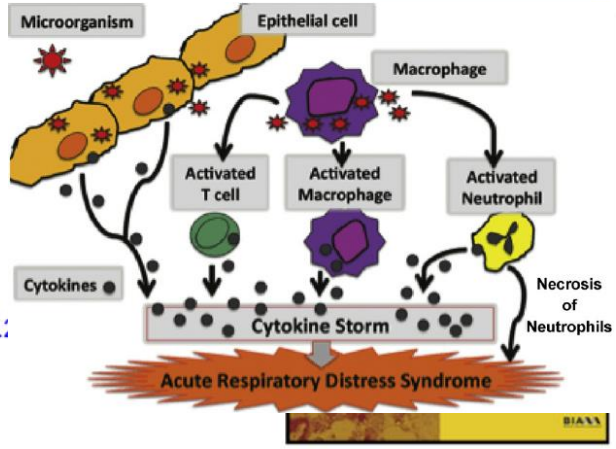
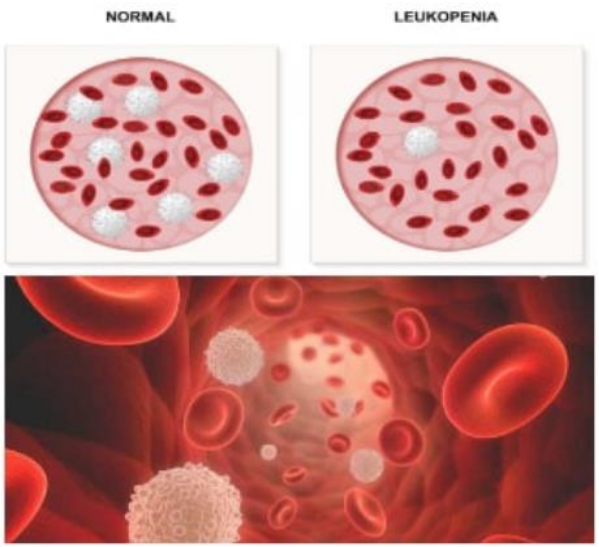
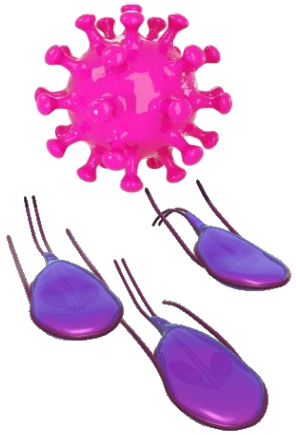




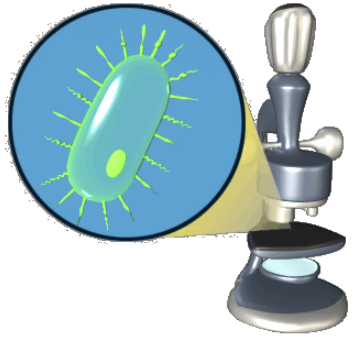


Directo

La última hora de la crisis del coronavirus

OPINIÓN

¿Podrían haberse reducido las muertes por Covid en residencias de anciano con una microbiota sana?

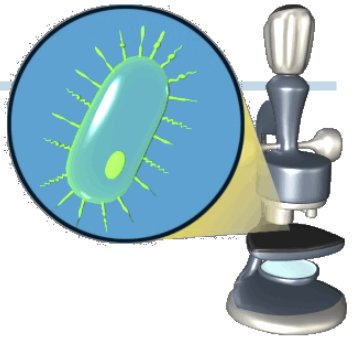


FRANCISCO GUARNER

FRANCISCO GUARNER, INVESTIGADOR VALL D'HEBRON INSTITUT DE RECERCA (VHIR)

27/04/2020 15:45 | Actualizado a 27/04/2020 16:21

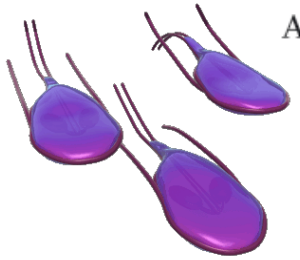
Focus Article



The role of the microbiota in ageing: current state and perspectives

Denise B. Lynch,[1,2†] Ian B. Jeffery[1,2†] and Paul W. O'Toole[1,2*]

Since the application of high-throughput technologies to investigate complex microbial communities, alterations in the human gut microbiota have been associated with an increasing number of diseases and conditions. This field of research has developed into an area of intense study which is quite different to the microbial investigations that have preceded it in terms of both the broadness of the area of research and the complexity of the analyses. In this review, we discuss gut microbiota changes observed in ageing in the context of the physiological changes that accompany senescence, examine what correlations can be established or inferred, and we discuss what key questions remain to be answered in the field.

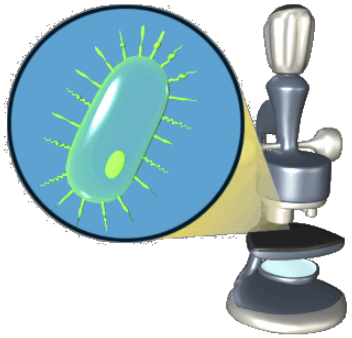


How to cite this article:
WIREs Syst Biol Med 2015, 7:131–138. doi: 10.1002/wsbm.1293

La microbiota intestinal es muy estable en la vida adulta, pero hay una serie de etapas y condiciones de vida durante el cual la microbiota cambia en su composición.

-El primero de ellos es la fase temprana establecimiento de la microbiota. Una vez plenamente establecida, la microbiota es relativamente estable desde la infancia hasta la edad adulta (desde los 3 a.)

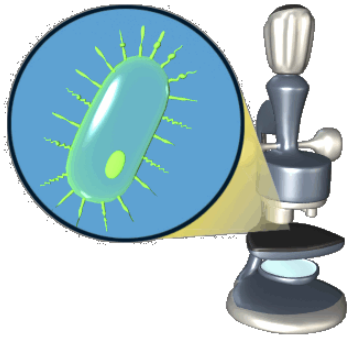
*-Durante el **envejecimiento**, hay un cambio de la composición de la microbiota que está asociada con deterioro de la salud y cambios en la dieta.*



-Ratones libres de gérmenes pueden sobrevivir sin una microbiota, sin embargo sufren de problemas de comportamiento y una serie de problemas morfológicos e inmunológicos debidos a la alteración del metabolismo, el desarrollo, y la fisiología, incluyendo el desarrollo de órganos (morfogénesis).

The Microbiota and Microbiome in Aging: Potential Implications in Health and Age-Related Diseases

Heidi J. Zapata, MD, PhD, and Vincent J. Quagliarello, MD



Advances in bacterial deoxyribonucleic acid sequencing allow for characterization of the human commensal bacterial community (microbiota) and its corresponding genome (microbiome). Surveys of healthy adults reveal that a signature composite of bacteria characterizes each unique body habitat (e.g., gut, skin, oral cavity, vagina). A myriad of clinical changes, including a basal proinflammatory state (inflamm-aging), that directly interface with the microbiota of older adults and enhance susceptibility to disease accompany aging. Studies in older adults demonstrate that the gut microbiota correlates with diet, location of residence (e.g., community dwelling, long-term care settings), and basal level of inflammation. Links exist between the microbiota and a variety of clinical problems plaguing older adults, including physical frailty, *Clostridium difficile* colitis, vulvovaginal atrophy, colorectal carcinoma, and atherosclerotic disease. Manipulation of the microbiota and microbiome of older adults holds promise as an innovative strategy to influence the development of comorbidities associated with aging. **J Am Geriatr Soc 63:776–781, 2015.**

Key words: microbiome; older adults; infection

microbes (e.g., bacterial microorganisms) cannot be cultured using conventional methods.[1,2] In 1977, it was proposed that the 16S ribosomal ribonucleic acid (RNA) subunit can classify bacteria, including commensal microbial flora.[3] This small RNA subunit is evolutionarily conserved in prokaryotes, but it contains nine hypervariable regions (V1–V9) useful for phylogenetic analysis. Ongoing advances in next-generation sequencing of 16S ribosomal RNA genes and whole-genome shotgun sequencing allow for large-scale analysis and characterization of the human bacterial community (the microbiota); the genome of the microbiota is referred to as the microbiome.[4,5] It is estimated that there are approximately 100 trillion bacteria associated with humans that outnumber human cells by a factor of 10.[6] Therefore, this second prokaryotic genome of microbes supplements the primary eukaryotic genome of humans.[7] This represents a paradigm shift for medicine in which our relationship with microbes is now viewed as a complex symbiosis instead of a potential source of clinical infectious disease. The purpose of this review is to highlight the role of the microbiota and microbiome in health and disease and its potential clinical relevance to older adults.

- *Los estudios en adultos mayores demuestran que la microbiota intestinal se correlaciona con la dieta, el lugar de residencia (casa vs. centros geriátricos a largo plazo).*

- *Existen vínculos entre la microbiota intestinal y problemas clínicos de los adultos mayores:* ***fragilidad física, colitis por Clostridium difficile, neumonía, infecciones urinarias, atrofia vulvovaginal, carcinoma colorrectal, aterosclerosis y neurodegeneración.***

- *La manipulación de la microbiota de los adultos mayores es una estretegia prometedora e innovadora para influir el desarrollo de comorbilidades asociadas con envejecimiento.*

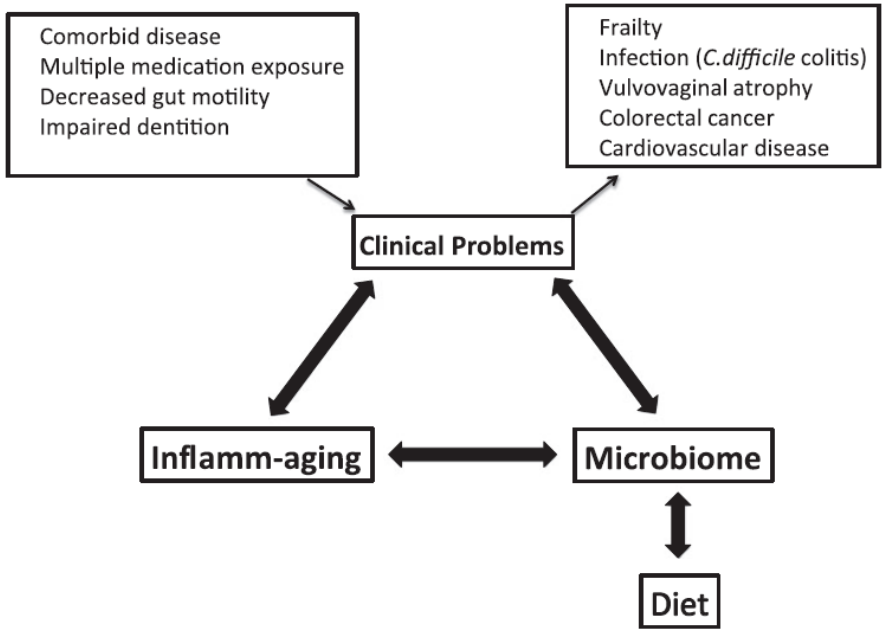


Figure 1. Association between the microbiome and clinical problems affecting older adults.

GERIATRIC BIOSCIENCES

The Microbiota and Microbiome in Aging: Potential Implications in Health and Age-Related Diseases

Heidi J. Zapata, MD, PhD, and Vincent J. Quagliarello, MD

Advances in bacterial deoxyribonucleic acid sequencing allow for characterization of the human commensal bacterial community (microbiota) and its corresponding genome (microbiome). Surveys of healthy adults reveal that a signature composite of bacteria characterizes each unique body habitat (e.g., gut, skin, oral cavity, vagina). A myriad of clinical changes, including a basal proinflammatory state (inflamm-aging), that directly interface with the microbiota of older adults and enhance susceptibility to disease accompany aging. Studies in older adults demonstrate that the gut microbiota correlates with diet, location of residence (e.g., community dwelling, long-term care settings), and basal level of inflammation. Links exist between the microbiota and a variety of clinical problems plaguing older adults, including physical frailty, *Clostridium difficile* colitis, vulvovaginal atrophy, colorectal carcinoma, and atherosclerotic disease. Manipulation of the microbiota and microbiome of older adults holds promise as an innovative strategy to influence the development of comorbidities associated with aging. J Am Geriatr Soc 63:776–781, 2015.

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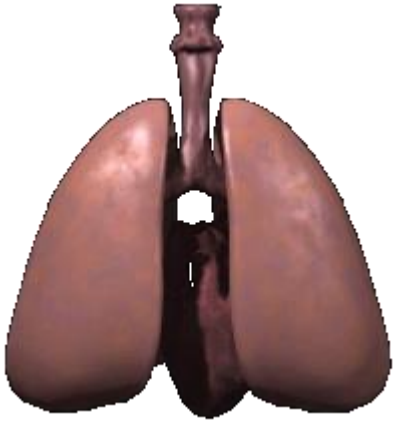
- *Los adultos mayores (≥ 65 años) tienen una alta prevalencia de patologías de forma concomitante a la polifarmacia (incluyendo **antibióticos:** > prob. de colitis por clostridium difficile posterior a la antibioterapia (transplantes fecales).*

- *El envejecimiento del tracto alimentario está sujeto a una variedad de cambios: deterioro de la dentición y función salivar, menos peristaltismo (estreñimiento), divertículos en colon y cambios dietéticos → cambios en la microbiota intestinal (> susceptibilidad de enfermedades infecciosas): "**inflamm-aging**" **(altas concentraciones de citoquinas proinflamatorias y > respuesta inmune a los patógenos).** La Microbiota intestinal regula el sistema inmunitario.*

- ***>** Probabilidad de infección por citomegalovirus, niveles altos de lipopolisacáridos en sangre y de subproductos microbianos en orina.*



Composition, variability, and temporal stability of the intestinal microbiota of the elderly

4586–4591 | PNAS | March 15, 2011 | vol. 108 | suppl. 1

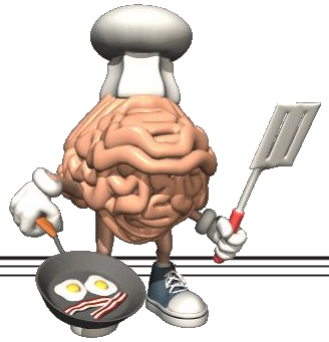
Marcus J. Claesson[a,b], Siobhán Cusack[a], Orla O'Sullivan[c], Rachel Greene-Diniz[a], Heleen de Weerd[d], Edel Flannery[e], Julian R. Marchesi[b,f], Daniel Falush[g], Timothy Dinan[b,h], Gerald Fitzgerald[a,b], Catherine Stanton[b,c], Douwe van Sinderen[a,b], Michael O'Connor[i,j], Norma Harnedy[i,j], Kieran O'Connor[j,k,l], Colm Henry[k,l], Denis O'Mahony[i,j,m], Anthony P. Fitzgerald[e,n], Fergus Shanahan[b,m], Cillian Twomey[i,j,m], Colin Hill[a,b], R. Paul Ross[b,c], and Paul W. O'Toole[a,b,1]

[a]Department of Microbiology, University College, Cork, Ireland; [b]Alimentary Pharmabiotic Centre, University College, Cork, Ireland; [c]Teagasc, Moorepark Food Research Centre, Moorepark, Fermoy, County Cork, Ireland; [d]Wageningen University and Research Centre for Plant Breeding, 6708 PB, Wageningen, The Netherlands; [e]Department of Statistics, University College, Cork, Ireland; [f]School of Biosciences, Cardiff University, Cardiff CF10 3AT, United Kingdom; [g]Environmental Research Institute, University College, Cork, Ireland; [h]Department of Psychiatry, University College, Cork, Ireland; [i]Cork University Hospital, Wilton, Cork, Ireland; [j]St. Finbarr's Hospital, Cork, Ireland; [k]Mercy University Hospital, Cork, Ireland; [l]South Infirmary, Victoria University Hospital, Cork, Ireland; [m]Department of Medicine, University College, Cork, Ireland; and [n]Department of Epidemiology and Public Health, University College, Cork, Ireland

Edited by Jeffrey I. Gordon, Washington University School of Medicine, St. Louis, MO, and approved June 1, 2010 (received for review February 5, 2010)

- *El consorcio **ELDERMET** (2007) caracterizó la microbiota intestinal de adultos mayores.*
- *En 2011, estudiaron muestras fecales de 161 adultos irlandeses mayores de 65 años (un subgrupo de 26 sujetos se vuelve a muestrear 3 meses después). 9 sujetos más jóvenes sirvieron como controles.*
- *La especie Bacteroidetes fue dominante en el 57% de los adultos mayores en comparación con 40% para el filo Firmicutes.*
- *Por el contrario, Firmicutes estaba más presente en las muestras fecales de los más jovenes (51%) en comparación con la especie Bacteroidetes (41%).*
- *La exposición a antibióticos se asoció con mayores niveles de Bacteroidetes y menores niveles de Firmicutes, Actinobacterias y Proteobacterias.*

ARTICLE



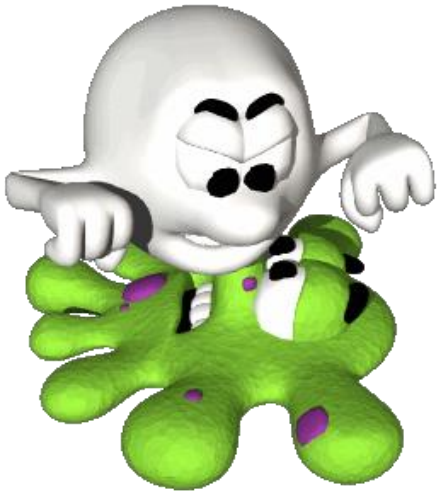
doi:10.1038/nature11319

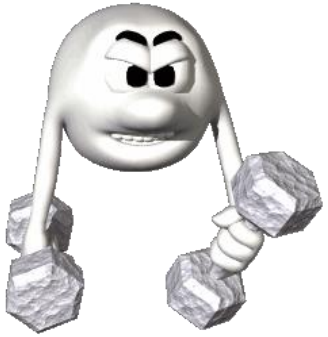
Gut microbiota composition correlates with diet and health in the elderly

Marcus J. Claesson[1,2]*, Ian B. Jeffery[1,2]*, Susana Conde[3], Susan E. Power[1], Eibhlís M. O'Connor[1,2], Siobhán Cusack[1], Hugh M. B. Harris[1], Mairead Coakley[4], Bhuvaneswari Lakshminarayanan[4], Orla O'Sullivan[4], Gerald F. Fitzgerald[1,2], Jennifer Deane[1], Michael O'Connor[5,6], Norma Harnedy[5,6], Kieran O'Connor[6,7,8], Denis O'Mahony[5,6,8], Douwe van Sinderen[1,2], Martina Wallace[9], Lorraine Brennan[9], Catherine Stanton[2,4], Julian R. Marchesi[10], Anthony P. Fitzgerald[3,11], Fergus Shanahan[2,12], Colin Hill[1,2], R. Paul Ross[2,4] & Paul W. O'Toole[1,2]

Alterations in intestinal microbiota composition are associated with several chronic conditions, including obesity and inflammatory diseases. The microbiota of older people displays greater inter-individual variation than that of younger adults. Here we show that the faecal microbiota composition from 178 elderly subjects formed groups, correlating with residence location in the community, day-hospital, rehabilitation or in long-term residential care. However, clustering of subjects by diet separated them by the same residence location and microbiota groupings. The separation of microbiota composition significantly correlated with measures of frailty, co-morbidity, nutritional status, markers of inflammation and with metabolites in faecal water. The individual microbiota of people in long-stay care was significantly less diverse than that of community dwellers. Loss of community-associated microbiota correlated with increased frailty. Collectively, the data support a relationship between diet, microbiota and health status, and indicate a role for diet-driven microbiota alterations in varying rates of health decline upon ageing.

- *¿**Afecta el estado inmunológico del individuo a la microbiota, o afecta la microbiota al estado inmunológico del individuo**? Ambas…*
- *ANCIANOS: > presencia de Moléculas proinflamatorias. Modulación de la microbiota por la dieta: Problemas para masticar, tragar, pérdida de los dientes, de olfato y el gusto (desnutrición) junto con incremento de consumo de azúcar y grasas saturadas y la ingesta de menos fibra.*
- *La producción **de butirato y otros ácidos grasos de cadena corta** (AGCC) por parte de algunas bacterias mantiene la función de barrera del epitelio mucoso, evitando que bacterias potencialmente dañinas pasen al torrente sanguíneo.*
- *La **microbiota disbiótica** aumenta la probabilidad de enfermedad celíaca, enfermedad inflamatoria del intestino, diabetes tipo I, la artritis reumatoide, cáncer colorrectal, gástrico, cánceres de próstata y los trastornos cardiovasculares y metabólicos.*
- *> número de **Genotoxinas**, compuestos cancerígenos producidos por la dieta, cascadas inflamatorias locales y sistémicas que resultan en inflamación crónica de bajo grado que daña los tejidos y órganos afectados.*
- *Esta barrera epitelial controla la microbiota a través de la producción de antimicrobianos y secretores de IgA (sIgA), y permite el paso de los fagocitos y linfocitos si se rompe dicha barrera.*





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REVIEW ARTICLE
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Diet and the development of the human intestinal microbiome

Noah Voreades, Anne Kozil and Tiffany L. Weir*

Department of Food Science and Human Nutrition, Colorado State University, Fort Collins, CO, USA

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Carl James Yeoman, Montana State University, USA
Franck Carbonero, University of Arkansas, USA

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The important role of the gut microbiome in maintaining human health has necessitated a better understanding of the temporal dynamics of intestinal microbial communities as well as the host and environmental factors driving these dynamics. Genetics, mode of birth, infant feeding patterns, antibiotic usage, sanitary living conditions and long term dietary habits contribute to shaping the composition of the gut microbiome. This review focuses primarily on diet, as it is one of the most pivotal factors in the development of the human gut microbiome from infancy to the elderly. The infant gut microbiota is characterized by a high degree of instability, only reaching a state similar to that of adults by 2–3 years of age; consistent with the establishment of a varied solid food diet. The diet-related factors influencing the development of the infant gut microbiome include whether the child is breast or formula-fed as well as how and when solid foods are introduced. In contrast to the infant gut, the adult gut microbiome is resilient to large shifts in community structure. Several studies have shown that dietary changes induce transient fluctuations in the adult microbiome, sometimes in as little as 24 h; however, the microbial community rapidly returns to its stable state. Current knowledge of how long-term dietary habits shape the gut microbiome is limited by the lack of long-term feeding studies coupled with temporal gut microbiota characterization. However, long-term weight loss studies have been shown to alter the ratio of the Bacteroidetes and Firmicutes, the two major bacterial phyla residing in the human gastrointestinal tract. With aging, diet-related factors such as malnutrition are associated with microbiome shifts, although the cause and effect relationship between these factors has not been established. Increased pharmaceutical usage is also more prevalent in the elderly and can contribute to reduced gut microbiota stability and diversity. Foods containing prebiotic oligosaccharide components that nurture beneficial commensals in the gut community and probiotic supplements are being explored as interventions to manipulate the gut microbiome, potentially improving health status.

Keywords: enterotype, gut microbiome, aging, dietary patterns, colonization

- *Microbiota intestinal de 178 adultos mayores de ascendencia irlandesa entre 64-102 años de edad estratificados por su* ***dieta, tipo de residencia y dependencia****.*
- *13 adultos jóvenes (edad media 36 años): grupo de control.*
- *Personas en residencias geriátricas a largo plazo tuvieron una mayor proporción del filo Bacteroidetes en su intestino (>filo firmicutes en casa). Microbiota más diversa en dietas ricas en fibra y pobres en grasa con menores niveles de marcadores inflamatorios intestinales y menor fragilidad y dependencia (índice de Barthel AVD, Escala de Depresión y MMSE).*
- *La residencia y la dieta se asocian con la microbiota intestinal en mayores y correlacionan con la inflamación sistémica y el deterioro funcional.*

Table 2. Correlation of Microbiota, Diet, Inflammation, and Frailty in Older Adults

Association	Long-Term Care (>6 Weeks)	Rehabilitation Care (<6 Weeks)	Day Hospital	Community Dwellers
DG				
1: low fat/high fiber	DG3, DG4 predominate	Variable[a]	DG1, DG2 predominate	DG1, DG2 predominate
2: moderate fat/high fiber				
3: moderate fat/low fiber				
4: high fat/low fiber				
Inflammatory markers (tumor necrosis factor-α, IL-6, IL-8, C-reactive protein)	Highest	Intermediate[b]	Intermediate[b]	Lowest
Functional status and frailty	Impaired function and frailty predominate	Intermediate[c]	Intermediate[c]	Normal function predominate
Microbiota Predominating phyla	*Bacteroidetes* predominate	Variable[d]	Variable[d]	*Firmicutes* predominate

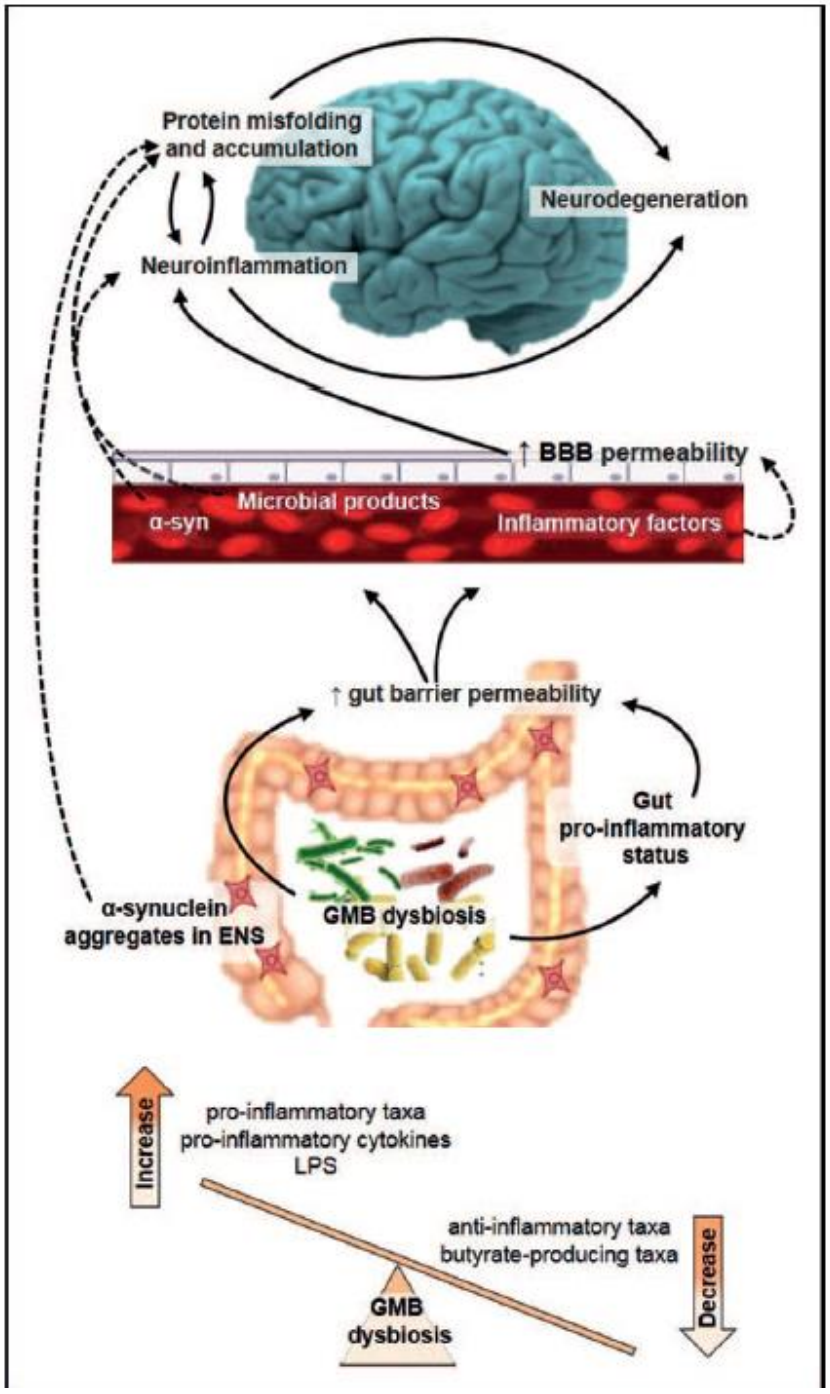

Figure 1. Environmental Factors and the Bidirectional Interaction with Host Organ Systems Shape the Intestinal Microbiome

Studies over the past decade have revealed that many environmental factors, including diet, antibiotic exposure, energy intake (EI), and exercise, can dramatically influence the intestinal microbiome (both membership and functional capacity). In addition to environment, further research has revealed a bidirectional interaction between host organ systems and the intestinal microbiome in shaping host metabolic outcomes.

The gut microbiome: an under-recognised contributor to the COVID-19 pandemic?

Jonathan P. Segal, Joyce W. Y. Mak, Benjamin H. Mullish, James L. Alexander, Siew C. Ng and Julian R. Marchesi

Ther Adv Gastroenterol
2020, Vol. 13: 1–14
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Abstract

The novel coronavirus infection (COVID-19) caused by the SARS-CoV-2 virus has spread rapidly across the globe, culminating in major global morbidity and mortality. As such, there has been a rapid escalation in scientific and clinical activity aimed at increasing our comprehension of this virus. This volume of work has led to early insights into risk factors associated with severity of disease, and mechanisms that underpin the virulence and dynamics involved in viral transmission. These insights ultimately may help guide potential therapeutics to reduce the human, economic and social impact of this pandemic. Importantly, the gastrointestinal (GI) tract has emerged as an important organ influencing propensity to, and potentially severity of, COVID-19 infection. Furthermore, the gut microbiome has been linked to a variety of risk factors for COVID-19 infection, and manipulation of the gut microbiome is an attractive potential therapeutic target for a number of diseases. While data profiling the gut microbiome in COVID-19 infection to date are limited, they support the possibility of several routes of interaction between COVID-19, the gut microbiome, angiotensin converting enzyme 2 (ACE-2) expression in the small bowel and colon and gut inflammation. This article will explore the evidence that implicates the gut microbiome as a contributing factor to the pathogenesis, severity and disease course of COVID-19, and speculate about the gut microbiome's capability as a therapeutic avenue against COVID-19.

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Ciertos perfiles intestinales basales de pacientes con COVID-19 están asociados con un curso de la enfermedad más grave, y el microbioma intestinal afecta el curso de la enfermedad en combinación con varios factores de riesgo que contribuyen a la gravedad de COVID-19. Existe evidencia de **que el microbioma intestinal influye en la expresión del receptor ACE-2 y, por lo tanto, puede influir en la gravedad de la enfermedad.** Además, el microbioma intestinal **juega un papel importante en la regulación inmunológica** y, por lo tanto, puede ser fundamental en su influencia sobre la respuesta inmune al virus del COVID-19

Review

Virus Research 285 (2020)

Gut microbiota and Covid-19- possible link and implications

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ABSTRACT

Covid-19 is a major pandemic facing the world today caused by SARS-CoV-2 which has implications on our understanding of infectious diseases. Although, SARS-Cov-2 primarily causes lung infection through binding of ACE2 receptors present on the alveolar epithelial cells, yet it was recently reported that SARS-CoV-2 RNA was found in the faeces of infected patients. Interestingly, the intestinal epithelial cells particularly the enterocytes of the small intestine also express ACE2 receptors. Role of the gut microbiota in influencing lung diseases has been well articulated. It is also known that respiratory virus infection causes perturbations in the gut microbiota. Diet, environmental factors and genetics play an important role in shaping gut microbiota which can influence immunity. Gut microbiota diversity is decreased in old age and Covid-19 has been mainly fatal in elderly patients which again points to the role the gut microbiota may play in this disease. Improving gut microbiota profile by personalized nutrition and supplementation known to improve immunity can be one of the prophylactic ways by which the impact of this disease can be minimized in old people and immune-compromised patients. More trials may be initiated to see the effect of co-supplementation of personalized functional food including prebiotics/probiotics along with current therapies.

El ARN del SARS-CoV-2 se ha encontrado en los pulmones y en las heces de pacientes infectados. Las células epiteliales intestinales, en particular los enterocitos del intestino delgado, también expresan receptores ACE2 (enzima convertidora de angiotensina) (mayor concentración en los varones). La dieta, los factores ambientales y la genética juegan un papel importante en la configuración de la microbiota intestinal que puede influir en la inmunidad**. La mejora de la diversidad de la microbiota intestinal mediante la nutrición y la suplementación personalizadas puede ser una de las formas profilácticas** porque el impacto de esta enfermedad se puede minimizar en personas mayores y pacientes inmunodeprimidos.

Review

Gut microbiota and Covid-19- possible link and implications

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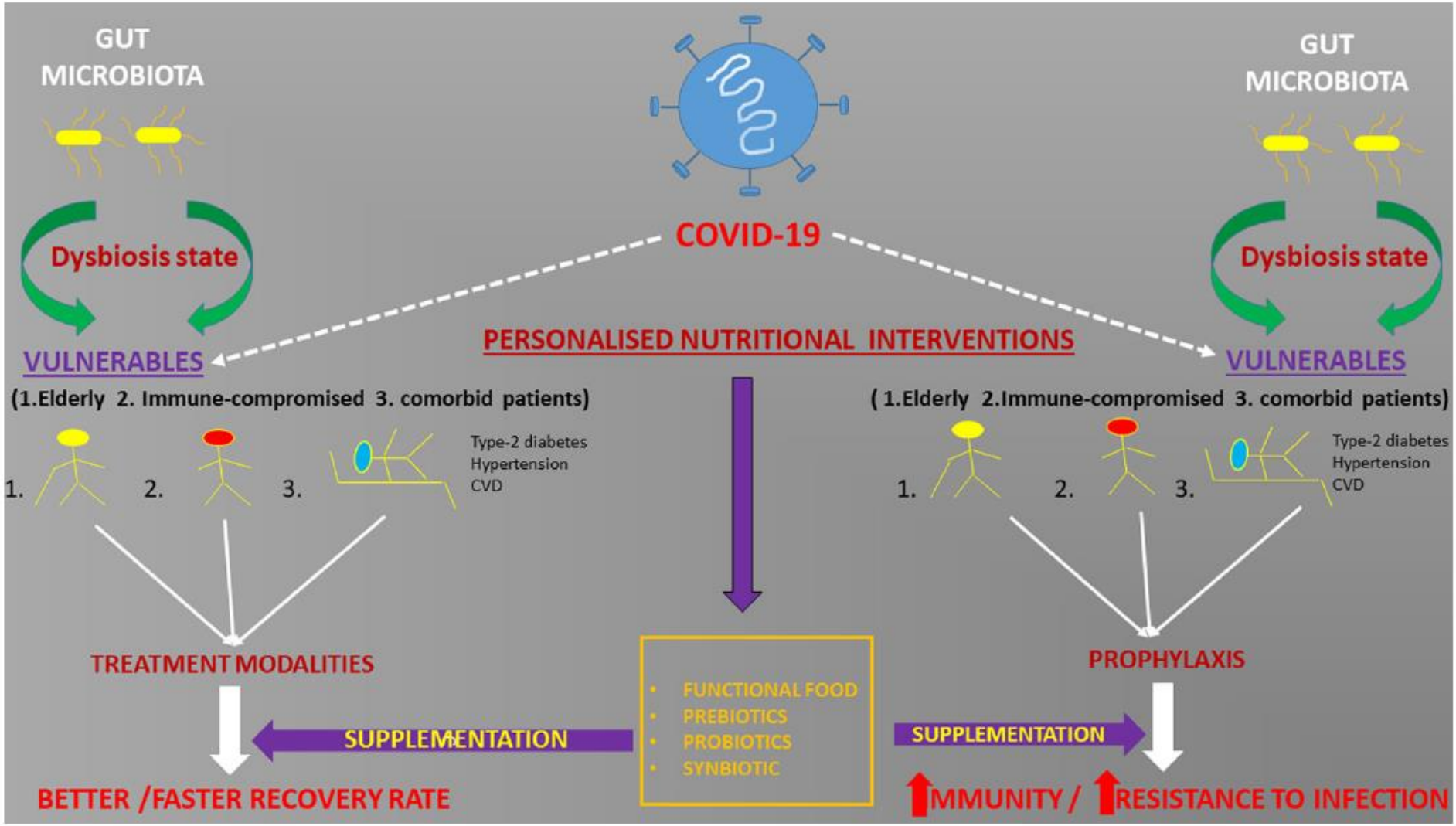
Virus Research 285 (2020)



Translational Research
December 2020

REVIEW ARTICLE

Gastrointestinal symptoms associated with COVID-19: impact on the gut microbiome

SONIA VILLAPOL

HOUSTON, TEXAS; AND NEW YORK

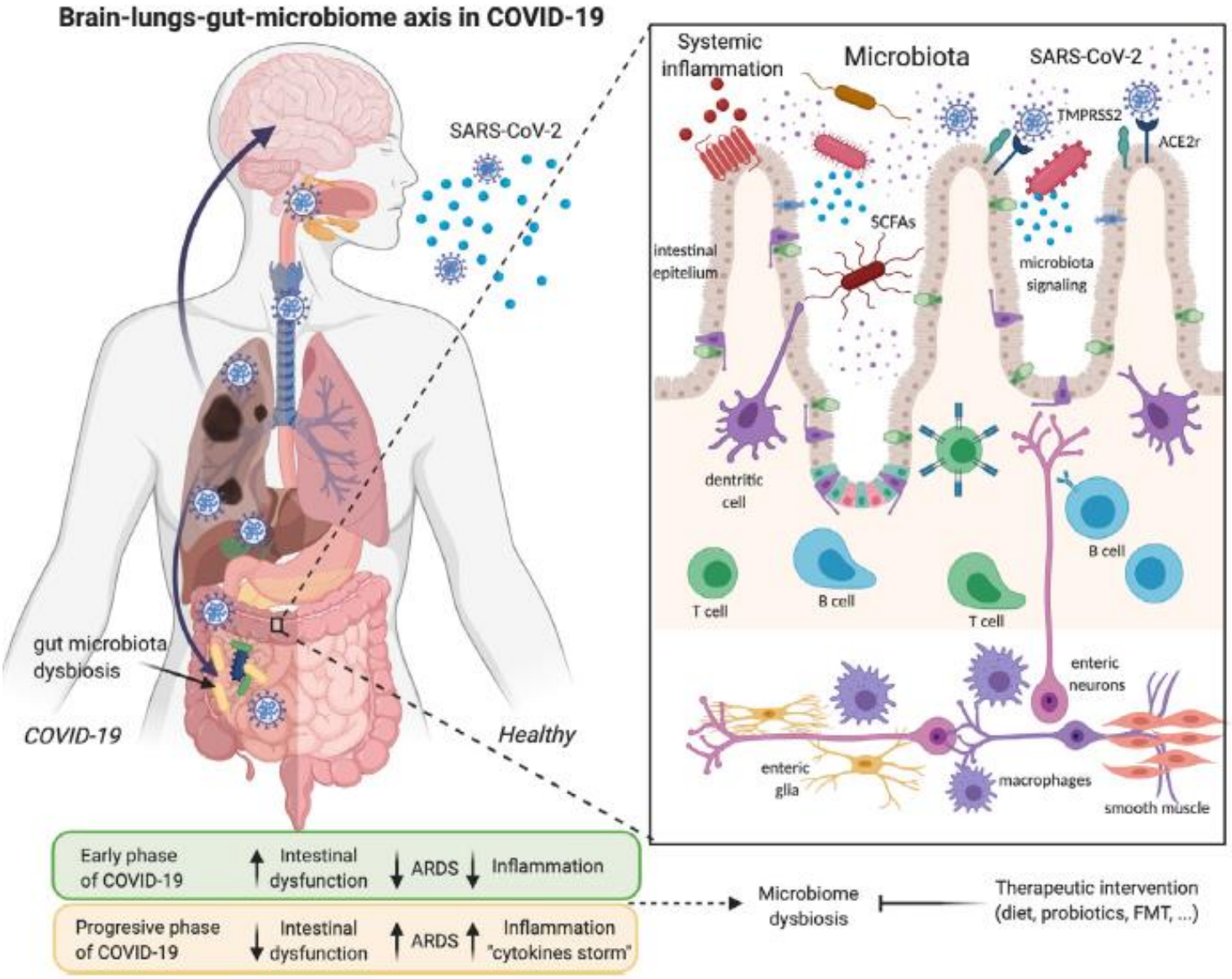
The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has caused the greatest worldwide pandemic since the 1918 flu. The consequences of the coronavirus disease 2019 (COVID-19) are devastating and represent the current major public health issue across the globe. At the onset, SARS-CoV-2 primarily attacks the respiratory system as it represents the main point of entry in the host, but it also can affect multiple organs. Although most of the patients do not present symptoms or are mildly symptomatic, some people infected with SARS-CoV-2 that experience more severe multiorgan dysfunction. The severity of COVID-19 is typically combined with a set of comorbidities such as hypertension, diabetes, obesity, and/or advanced age that seriously exacerbates the consequences of the infection. Also, SARS-CoV-2 can cause gastrointestinal symptoms, such as vomiting, diarrhea, or abdominal pain during the early phases of the disease. Intestinal dysfunction induces changes in intestinal microbes, and an increase in inflammatory cytokines. Thus, diagnosing gastrointestinal symptoms that precede respiratory problems during COVID-19 may be necessary for improved early detection and treatment. Uncovering the composition of the microbiota and its metabolic products in the context of COVID-19 can help determine novel biomarkers of the disease and help identify new therapeutic targets. Elucidating changes to the microbiome as reliable biomarkers in the context of COVID-19 represent an overlooked piece of the disease puzzle and requires further investigation. (Translational Research 2020; 226:57–69)

El SARS-CoV-2 puede causar síntomas gastrointestinales, como **vómitos, diarrea o dolor abdominal durante las primeras fases de la enfermedad**. La disfunción intestinal induce cambios en los microbios intestinales (**disbiosis) y un aumento de las citoquinas inflamatorias.** Descubrir la composición de la microbiota y sus productos metabólicos en el contexto de la infección por COVID-19 puede ayudar a determinar nuevos biomarcadores de la enfermedad y ayudar a identificar nuevas dianas terapéuticas.

Translational Research
December 2020

Gastrointestinal symptoms associated with COVID-19: impact on the gut microbiome

SONIA VILLAPOL



El SARS-CoV-2 activa los receptores **ACE2 intestinales**, induce inflamación (enteritis) y, en última instancia, diarrea. Estos tejidos son los objetivos del SARS-CoV-2, que atraviesa una fase temprana de infección, donde una carga viral alta **induce problemas intestinales**. Al mismo tiempo, se produce la **disbiosis, alterando las células T y B del sistema inmunológico intestinal**, así como la activación del **sistema entérico que envía señales inflamatorias a la corriente circulatoria u otros órganos, incluido el cerebro**. En la segunda fase de COVID-19, donde aparece el síndrome de dificultad respiratoria aguda (SDRA), disminuyen los síntomas intestinales, pero la inflamación de la **tormenta de citocinas aumenta considerablemente.**

frontiers in Medicine

MINI REVIEW
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The Unique Impact of COVID-19 on Human Gut Microbiome Research

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The coronavirus (COVID-19) pandemic has disrupted clinical trials globally, with unique implications for research into the human gut microbiome. In this mini-review, we explore the direct and indirect influences of the pandemic on the gut microbiome and how these can affect research and clinical trials. We explore the direct bidirectional relationships between the COVID-19 virus and the gut and lung microbiomes. We then consider the significant indirect effects of the pandemic, such as repeated lockdowns, increased hand hygiene, and changes to mood and diet, that could all lead to longstanding changes to the gut microbiome at an individual and a population level. Together, these changes may affect long term microbiome research, both in observational as well as in population studies, requiring urgent attention. Finally, we explore the unique implications for clinical trials using faecal microbiota transplants (FMT), which are increasingly investigated as potential treatments for a range of diseases. The pandemic introduces new barriers to participation in trials, while the direct and indirect effects laid out above can present a confounding factor. This affects recruitment and sample size, as well as study design and statistical analyses. Therefore, the potential impact of the pandemic on gut microbiome research is significant and needs to be specifically addressed by the research community and funders.

Keywords: COVID-19, gut microbiome, microbiome research, faecal microbiota transfer, clinical trials

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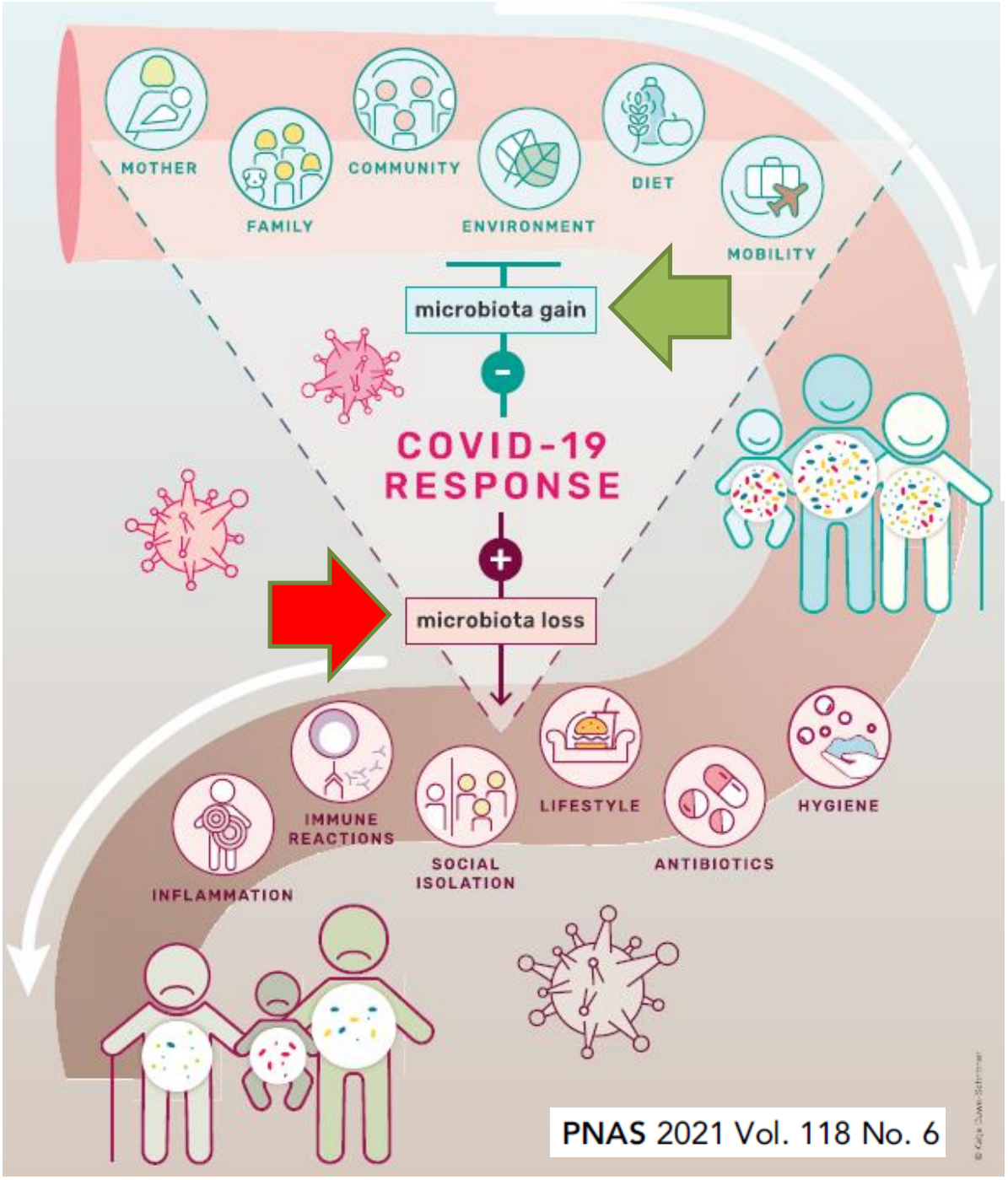
En esta mini revisión, exploramos las influencias directas e indirectas de la pandemia en el microbioma intestinal y cómo estas pueden afectar a la investigación y los ensayos clínicos.

Exploramos las relaciones bidireccionales directas entre el virus COVID-19 y los microbiomas intestinales y pulmonares. Luego consideramos el efectos indirecto de la pandemia, como aumento de la higiene de manos y cambios en el estado de ánimo y la dieta, que podrían conducir a cambios duraderos en el microbioma intestinal a nivel individual y poblacional.



The hygiene hypothesis, the COVID pandemic, and consequences for the human microbiome

B. Brett Finlay[a,b,1], Katherine R. Amato[b,c], Meghan Azad[b,d], Martin J. Blaser[b,e], Thomas C. G. Bosch[b,f], Hiutung Chu[b,g], Maria Gloria Dominguez-Bello[b,h], Stanislav Dusko Ehrlich[b,i], Eran Elinav[b,j,k], Naama Geva-Zatorsky[b,l], Philippe Gros[b,m], Karen Guillemin[b,n], Frédéric Keck[b,o,p], Tal Korem[b,q,r], Margaret J. McFall-Ngai[b,s], Melissa K. Melby[b,t], Mark Nichter[b,u], Sven Pettersson[b,v], Hendrik Poinar[b,w], Tobias Rees[b,x], Carolina Tropini[b,y,z], Liping Zhao[b,h], and Tamara Giles-Vernick[b,aa,1]

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The COVID-19 pandemic has the potential to affect the human microbiome in infected and uninfected individuals, having a substantial impact on human health over the long term. This pandemic intersects with a decades-long decline in microbial diversity and ancestral microbes due to hygiene, antibiotics, and urban living (the hygiene hypothesis). High-risk groups succumbing to COVID-19 include those with preexisting conditions, such as diabetes and obesity, which are also associated with microbiome abnormalities. Current pandemic control measures and practices will have broad, uneven, and potentially long-term effects for the human microbiome across the planet, given the implementation of physical separation, extensive hygiene, travel barriers, and other measures that influence overall microbial loss and inability for reinoculation. Although much remains uncertain or unknown about the virus and its consequences, implementing pandemic control practices could significantly affect the microbiome. In this Perspective, we explore many facets of COVID-19–induced societal changes and their possible effects on the microbiome, and discuss current and future challenges regarding the interplay between this pandemic and the microbiome. Recent recognition of the microbiome's influence on human health makes it critical to consider both how the microbiome, shaped by biosocial processes, affects susceptibility to the coronavirus and, conversely, how COVID-19 disease and prevention measures may affect the microbiome. This knowledge may prove key in prevention and treatment, and long-term biological and social outcomes of this pandemic.

COVID-19 | microbiome | hygiene hypothesis

Esta pandemia ha debutado coincidiendo con un declive de décadas en la diversidad microbiana y los microbios ancestrales debido a la higiene, la dieta y los antibióticos. Los grupos de alto riesgo que sucumben al COVID-19 incluyen aquellos con diabetes y obesidad, que también están asociadas con anomalías de la microbiota intestinal. La implementación de la **separación física, la higiene de manos, barreras de viaje y otras medidas contra el COVID-19 influyen en la pérdida de la diversidad microbiana general.**

Ind J Clin Biochem (July-Sept 2021) 36(3):266–277
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REVIEW ARTICLE

COVID-19 and Gut Microbiota: A Potential Connection

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Abstract Currently, world is facing a global outbreak causing a pandemic threat known as COVID-19. This infectious disease is triggered by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). Gut microbiota harbours multi species community with a strong impact on host immune homeostasis. However, our knowledge about this gut microbiota and its symbiotic relationship with immune activation in association with SARS-CoV-2 is limited. Unbalanced bacterial flora with too many opportunistic infections can shift immune system towards a cascade of inflammatory responses leading to multi organ damage. This review will highlight immune-regulation via various mechanisms in SARS-CoV-2 infection. Diet has an unbelievable influence on gut microbiome that allows a new state of homeostasis to be reached through timing, frequency and duration of intake. This review article focuses on gut, lung microbiota and immunomodulation with specific attention on immune activation by gut microbiota.

Esta revisión destaca la regulación inmunológica a través de varios mecanismos en la infección por SARS-CoV-2. **La dieta tiene una influencia increíble en el microbioma intestinal, que permite un nuevo estado de homeostasis que se alcanzará a través del tiempo, frecuencia y duración de la ingesta**. Este artículo de revisión se centra en la microbiota intestinal, pulmonar y la inmunomodulación, con especial atención a la activación inmune a través de la microbiota intestinal. **Eje intestino-pulmón**: La microbiota intestinal **activa las células inmunes que viajan a los pulmones (función antiinflamatoria)**

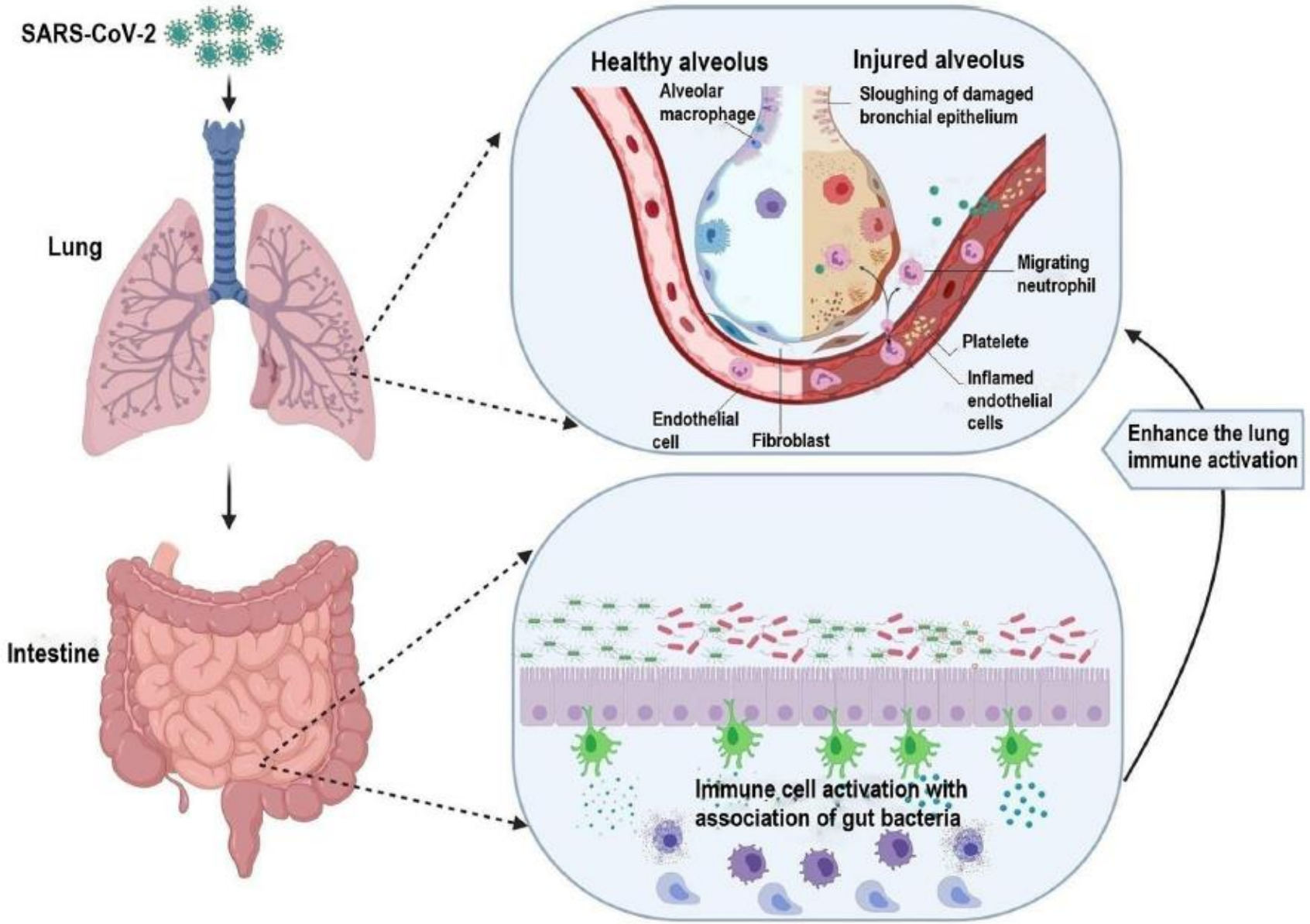

Fig. 1 Shows the gut lung axis. Gut microbiota activates the immune cells enhancing the lung immune activation

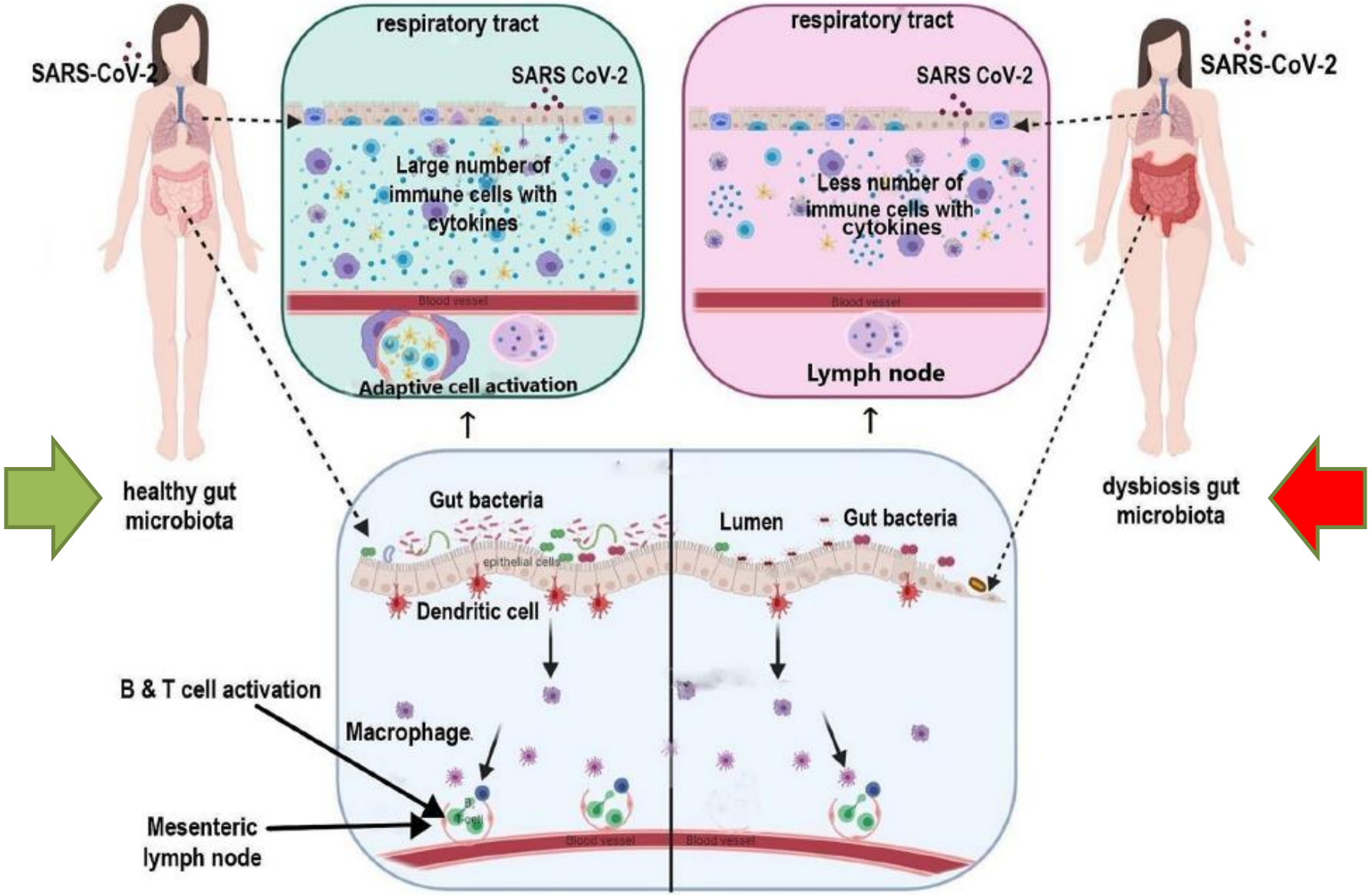

Fig. 3 Shows that how the healthy gut microbiota is able to control the lung infection by SARS-CoV-2 by producing large number of immune cells as compared to a smaller number of immune cells by dysbiosis in gut microbiota

RESEARCH ARTICLE

The human microbiome and COVID-19: A systematic review

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PLOS ONE

June 23, 2021

Background

Human microbiotas are communities of microorganisms living in symbiosis with humans. They play an important role in the host immune response to respiratory viral infection. However, evidence on the human microbiome and coronavirus disease (COVID-19) relationship is insufficient. The aim of this systematic literature review was to evaluate existing evidence on the association between the microbiome and COVID-19 in humans and summarize these data in the pandemic era.

Methods

We conducted a systematic literature review on the association between the microbiome and COVID-19 in humans by searching PubMed, Embase, and the Cochrane Library, CINAHL, and Web of Science databases for articles in English published up to October 31, 2020. The results were analyzed qualitatively. This study is registered with PROSPERO (CRD42020195982).

Results

Of the 543 articles identified by searching databases, 16 in line with the research objectives were eligible for qualitative review: eight sampled the microbiome using stool, four using nasopharyngeal or throat swab, three using bronchoalveolar lavage fluid, and one using lung tissue. Fecal microbiome dysbiosis and increased opportunistic pathogens were reported in COVID-19 patients. Several studies suggested the dysbiosis in the lung microbiome of COVID-19 patients with an abundance of opportunistic pathogens using lower respiratory tract samples. The association between COVID-19 severity and the human microbiome remains uncertain.

Conclusion

The human fecal and respiratory tract microbiome changed in COVID-19 patients with opportunistic pathogen abundance. Further research to elucidate the effect of alternation of the human microbiome in disease pathogenesis is warranted.

Las evidencias sobre la relación entre el microbioma humano y la enfermedad por coronavirus (COVID-19) **es insuficiente** (revisión sistemática). Búsqueda en PubMed, Embase y la Biblioteca Cochrane,CINAHL y bases de datos de Web of Science para artículos en inglés publicados hasta el 31 de octubre de 2020. De los **543 artículos identificados mediante búsquedas en bases de datos, 16 fueron elegidos para la revisión cualitativa**: **ocho tomaron muestras del microbioma usando heces, cuatro usando hisopado nasofaríngeo o faríngeo, tres con líquido de lavado broncoalveolar y uno con tejido pulmonar. Varios estudios sugirieron la disbiosis en el microbioma pulmonar de los pacientes con COVID-19, con abundancia de patógenos oportunistas** que utilizan muestras del tracto respiratorio**. La asociación entre la gravedad de COVID-19 y la microbiota intestinal sigue siendo incierto**. El microbioma del tracto respiratorio y fecal humano cambió en pacientes con COVID-19, con abundancia de patógenos oportunistas. **En cinco estudios observacionales, los pacientes con COVID-19 tenían microbiomas intestinales alterados, en comparación con los grupos de control**. Una evidencia limitada indica que los pacientes con COVID-19 tenían alteraciones intestinales y respiratorias microbiomas del tracto junto con una mayor abundancia de microorganismos oportunistas.

Gut microbiota

Yeoh YK, *et al*. *Gut* 2021;**70**:698–706.

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Original research

Gut microbiota composition reflects disease severity and dysfunctional immune responses in patients with COVID-19

Yun Kit Yeoh ,[1,2] Tao Zuo ,[2,3,4] Grace Chung-Yan Lui,[3,5] Fen Zhang,[2,3,4] Qin Liu,[2,3,4] Amy YL Li,[3] Arthur CK Chung,[2,3,4] Chun Pan Cheung,[2,3,4] Eugene YK Tso,[6] Kitty SC Fung,[7] Veronica Chan,[6] Lowell Ling,[8] Gavin Joynt,[8] David Shu-Cheong Hui,[3,5] Kai Ming Chow ,[3] Susanna So Shan Ng,[3,5] Timothy Chun-Man Li,[3,5] Rita WY Ng,[1] Terry CF Yip,[3,4] Grace Lai-Hung Wong ,[3,4] Francis KL Chan ,[2,3,4] Chun Kwok Wong,[9] Paul KS Chan,[1,2,10] Siew C Ng [2,3,4]

El virus SARS-CoV-2 infecta principalmente las vías del tracto respiratorio, sin embargo, la fisiopatología de COVID-19 puede atribuirse a respuestas inmunológicas aberrantes (tormenta de citoquinas) para eliminar el virus.

Varias líneas de evidencia, tales como la replicación deSARS-CoV-2 en enterocitos humanos, la detección de virus en muestras fecales y la alteración de la composición de la microbiota intestinal en pacientes con COVID-19 **sugiere una afectación del tracto gastrointestinal.**

Los estudios de microbiota intestinal en pacientes con COVID-19 son limitados y no han examinado los vínculos entre la microbiota intestinal y fisiopatología de la enfermedad.

La composición de la microbiota intestinal en pacientes con COVID-19 es concordante con la gravedad de la enfermedad y magnitud de concentraciones plasmáticas de varias quimiocinas inflamatorias y marcadores sanguíneos de daño tisular.

En los pacientes con COVID-19 se redujeron las bacterias como Faecalibacterium prausnitzii, Eubacterium rectale y varias especies de bifidobacterias. **La composición de la microbiota intestinal disbiótica en pacientes con COVID-19 persiste después de la desaparición del virus.**

ABSTRACT

Objective Although COVID-19 is primarily a respiratory illness, there is mounting evidence suggesting that the GI tract is involved in this disease. We investigated whether the gut microbiome is linked to disease severity in patients with COVID-19, and whether perturbations in microbiome composition, if any, resolve with clearance of the SARS-CoV-2 virus.

Methods In this two-hospital cohort study, we obtained blood, stool and patient records from 100 patients with laboratory-confirmed SARS-CoV-2 infection. Serial stool samples were collected from 27 of the 100 patients up to 30 days after clearance of SARS-CoV-2. Gut microbiome compositions were characterised by shotgun sequencing total DNA extracted from stools. Concentrations of inflammatory cytokines and blood markers were measured from plasma.

Results Gut microbiome composition was significantly altered in patients with COVID-19 compared with non-COVID-19 individuals irrespective of whether patients had received medication ($p<0.01$). Several gut commensals with known immunomodulatory potential such as *Faecalibacterium prausnitzii*, *Eubacterium rectale* and bifidobacteria were underrepresented in patients and remained low in samples collected up to 30 days after disease resolution. Moreover, this perturbed composition exhibited stratification with disease severity concordant with elevated concentrations of inflammatory cytokines and blood markers such as C reactive protein, lactate dehydrogenase, aspartate aminotransferase and gamma-glutamyl transferase.

Conclusion Associations between gut microbiota composition, levels of cytokines and inflammatory markers in patients with COVID-19 suggest that the gut microbiome is involved in the magnitude of COVID-19 severity possibly via modulating host immune responses. Furthermore, the gut microbiota dysbiosis after disease resolution could contribute to persistent symptoms, highlighting a need to understand how gut microorganisms are involved in inflammation and COVID-19.

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ARTICLE OPEN

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Altered oral and gut microbiota and its association with SARS-CoV-2 viral load in COVID-19 patients during hospitalization

Yongjian Wu[1,2,3,4,5,7], Xiaomin Cheng[2,7], Guangmin Jiang[1,3,7], Huishu Tang[1,3], Siqi Ming[1,3,5], Lantian Tang[1,3], Jiahai Lu[2]✉, Cheng Guo[6]✉, Hong Shan[3,4]✉ and Xi Huang[1,3,4,5]✉

The human oral and gut commensal microbes play vital roles in the development and maintenance of immune homeostasis, while its association with susceptibility and severity of SARS-CoV-2 infection is barely understood. In this study, we investigated the dynamics of the oral and intestinal flora before and after the clearance of SARS-CoV-2 in 53 COVID-19 patients, and then examined their microbiome alterations in comparison to 76 healthy individuals. A total of 140 throat swab samples and 81 fecal samples from these COVID-19 patients during hospitalization, and 44 throat swab samples and 32 fecal samples from sex and age-matched healthy individuals were collected and then subjected to 16S rRNA sequencing and viral load inspection. We found that SARS-CoV-2 infection was associated with alterations of the microbiome community in patients as indicated by both alpha and beta diversity indexes. Several bacterial taxa were identified related to SARS-CoV-2 infection, wherein elevated *Granulicatella* and *Rothia mucilaginosa* were found in both oral and gut microbiome. The SARS-CoV-2 viral load in those samples was also calculated to identify potential dynamics between COVID-19 and the microbiome. These findings provide a meaningful baseline for microbes in the digestive tract of COVID-19 patients and will shed light on new dimensions for disease pathophysiology, potential microbial biomarkers, and treatment strategies for COVID-19.

npj Biofilms and Microbiomes (2021)7:61 ; https://doi.org/10.1038/s41522-021-00232-5

En este estudio, investigamos la dinámica de la **flora oral e intestinal antes y después del aclaramiento del SARS-CoV-2** en **53 pacientes con COVID-19**, y luego examinado sus alteraciones del microbioma **en comparación con 76 individuos sanos**. Un total de **140 muestras de frotis faríngeo y 81 muestras fecales de estos pacientes con COVID-19 durante la hospitalización, y 44 muestras de frotis de garganta y 32 muestras fecales de sexo y edad se recogieron individuos sanos** y luego se sometieron a secuenciación de ARNr 16S e inspección de carga viral. **Encontramos que la infección por SARS-CoV-2 se asoció con alteraciones de la comunidad del microbioma en los pacientes**. Se identificaron varios taxones bacterianos relacionados con la infección por SARS-CoV-2, en los que Granulicatella y Rothiamucilaginosa se encontraron tanto en el microbioma oral como en el intestinal. La carga viral del SARS-CoV-2 en esas muestras también se calculó para identificar la dinámica potencial entre COVID-19 y el microbioma. Estos hallazgos proporcionan una línea de base significativa para los microbios en el tracto digestivo de los pacientes con COVID-19 y arrojará luz sobre nuevas dimensiones para la patofisiología de la enfermedad, potencial microbianobiomarcadores y estrategias de tratamiento para COVID-19.

Novel bile acid biosynthetic pathways are enriched in the microbiome of centenarians

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Check for updates

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Centenarians have a decreased susceptibility to ageing-associated illnesses, chronic inflammation and infectious diseases[1–3]. Here we show that centenarians have a distinct gut microbiome that is enriched in microorganisms that are capable of generating unique secondary bile acids, including various isoforms of lithocholic acid (LCA): iso-, 3-oxo-, allo-, 3-oxoallo- and isoallolithocholic acid. Among these bile acids, the biosynthetic pathway for isoalloLCA had not been described previously. By screening 68 bacterial isolates from the faecal microbiota of a centenarian, we identified Odoribacteraceae strains as effective producers of isoalloLCA both in vitro and in vivo. Furthermore, we found that the enzymes 5α-reductase (5AR) and 3β-hydroxysteroid dehydrogenase (3β-HSDH) were responsible for the production of isoalloLCA. IsoalloLCA exerted potent antimicrobial effects against Gram-positive (but not Gram-negative) multidrug-resistant pathogens, including *Clostridioides difficile* and *Enterococcus faecium*. These findings suggest that the metabolism of specific bile acids may be involved in reducing the risk of infection with pathobionts, thereby potentially contributing to the maintenance of intestinal homeostasis.

Article | Published: 18 February 2021

Gut microbiome pattern reflects healthy ageing and predicts survival in humans

Tomasz Wilmanski, Christian Diener, Noa Rappaport, Sushmita Patwardhan, Jack Wiedrick, Jodi Lapidus, John C. Earls, Anat Zimmer, Gustavo Glusman, Max Robinson, James T. Yurkovich, Deborah M. Kado, Jane A. Cauley, Joseph Zmuda, Nancy E. Lane, Andrew T. Magis, Jennifer C. Lovejoy, Leroy Hood, Sean M. Gibbons ✉, Eric S. Orwoll ✉ & Nathan D. Price ✉

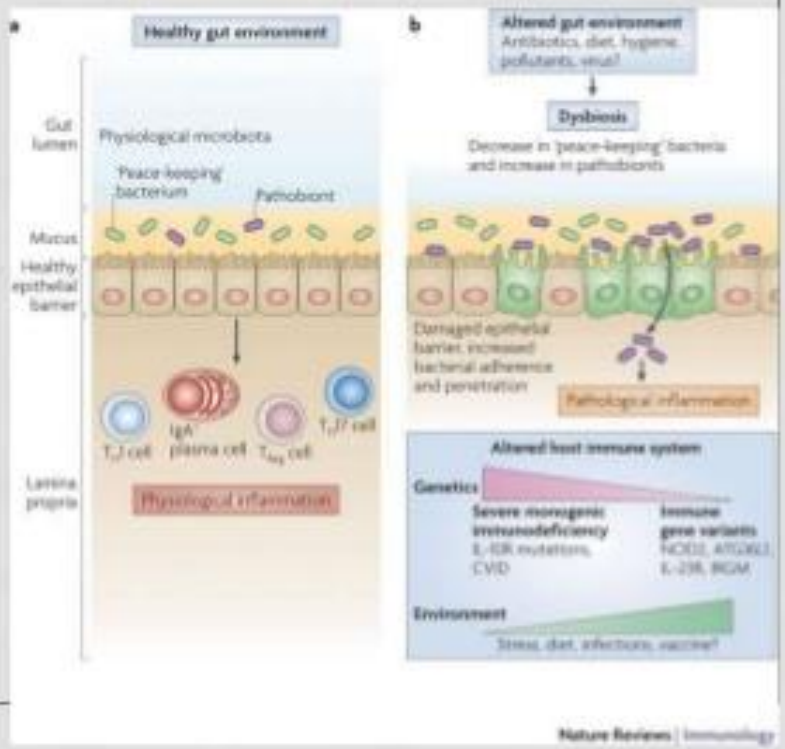
Nature Metabolism **3**, 274–286 (2021) | Cite this article

Abstract

The gut microbiome has important effects on human health, yet its importance in human ageing remains unclear. In the present study, we demonstrate that, starting in mid-to-late adulthood, gut microbiomes become increasingly unique to individuals with age. We leverage three independent cohorts comprising over 9,000 individuals and find that compositional uniqueness is strongly associated with microbially produced amino acid derivatives circulating in the bloodstream. In older age (over ~80 years), healthy individuals show continued microbial drift towards a unique compositional state, whereas this drift is absent in less healthy individuals. The identified microbiome pattern of healthy ageing is characterized by a depletion of core genera found across most humans, primarily *Bacteroides*. Retaining a high *Bacteroides* dominance into older age, or having a low gut microbiome uniqueness measure, predicts decreased survival in a 4-year follow-up. Our analysis identifies increasing compositional uniqueness of the gut microbiome as a component of healthy ageing, which is characterized by distinct microbial metabolic outputs in the blood.

ENFERMEDADES RELACIONADAS CON LA MICROBIOTA

- DESEQUILIBRIO EN LA MICROBIOTA (DISBIOSIS) PUEDE CAUSAR VARIAS ENFERMEDADES



- OBESIDAD
- DIABETES
- ENFERMEDAD DEL INTESTINO IRRITABLE
- COLITIS
- ENFERMEDAD DE CROHN
- AUTISMO

Cáncer cólon
Esquizofrenia
Alzheimer
Parkinson
Aterosclerosis
Atrofia vaginal
Alergia y asma
DCL

The Human Microbiome: at the interface of health and disease

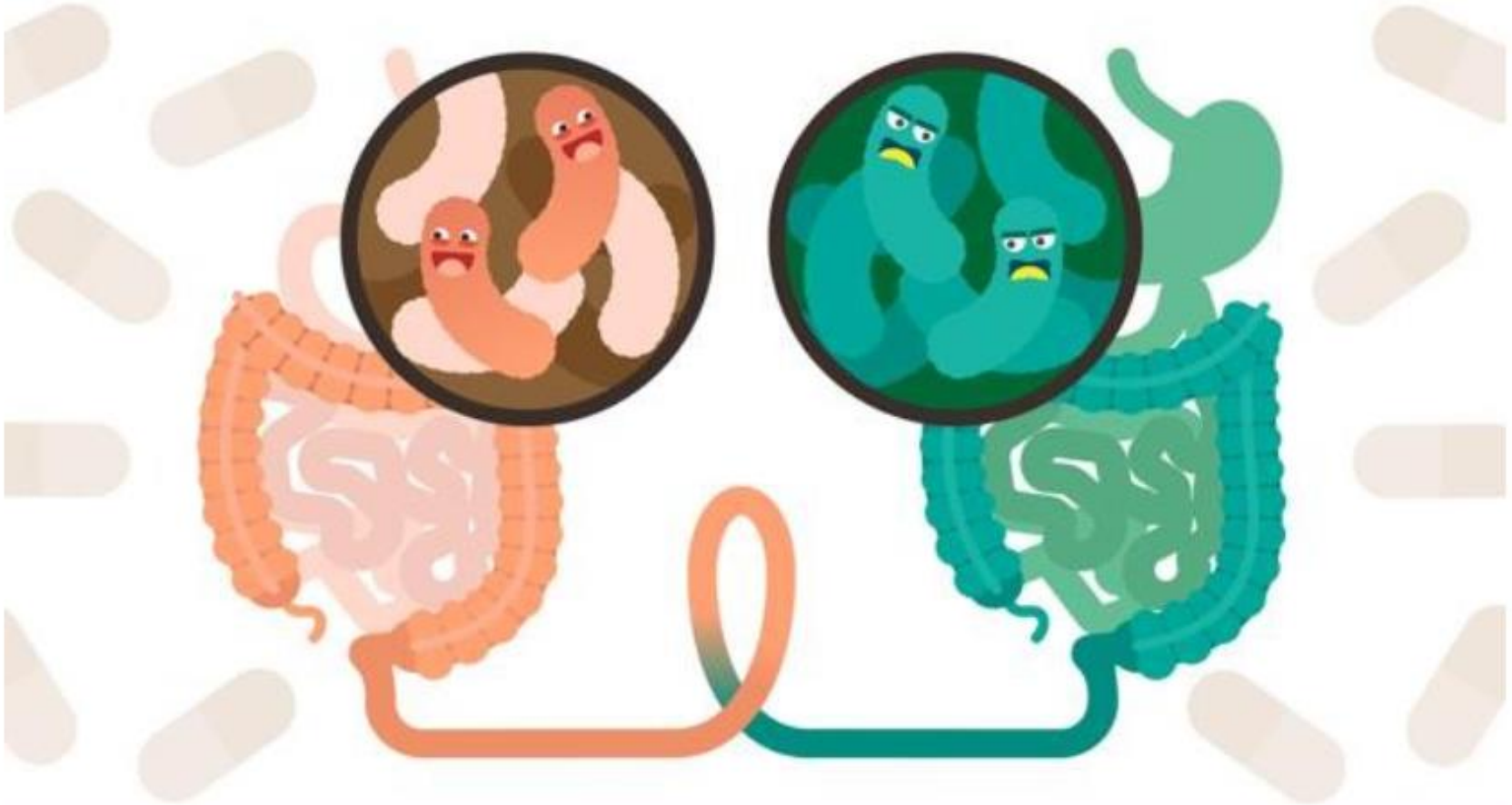
Ilseung Cho[1,2] and **Martin J. Blaser**[1,2,3,4]
[1]Department of Medicine, NYU Langone Medical Center, New York, NY 10016, USA

Nat Rev Genet. ; 13(4): 260–270. doi:10.1038/nrg3182. *2012*

— Nutrición

La relación entre la microbiota y la tendencia a engordar

- Las bacterias denominadas firmicutes y bacteriodetes, que forman parte de nuestra microbiota, tienen una relación con el peso



Las personas obesas tienen una mayor proporción de firmicutes que las personas delgadas - Adobe Stock

frontiers in Neuroscience

Interplay Between the Gut-Brain Axis, Obesity and Cognitive Function

REVIEW
published: 16 March 2018
doi: 10.3389/fnins.2018.00155

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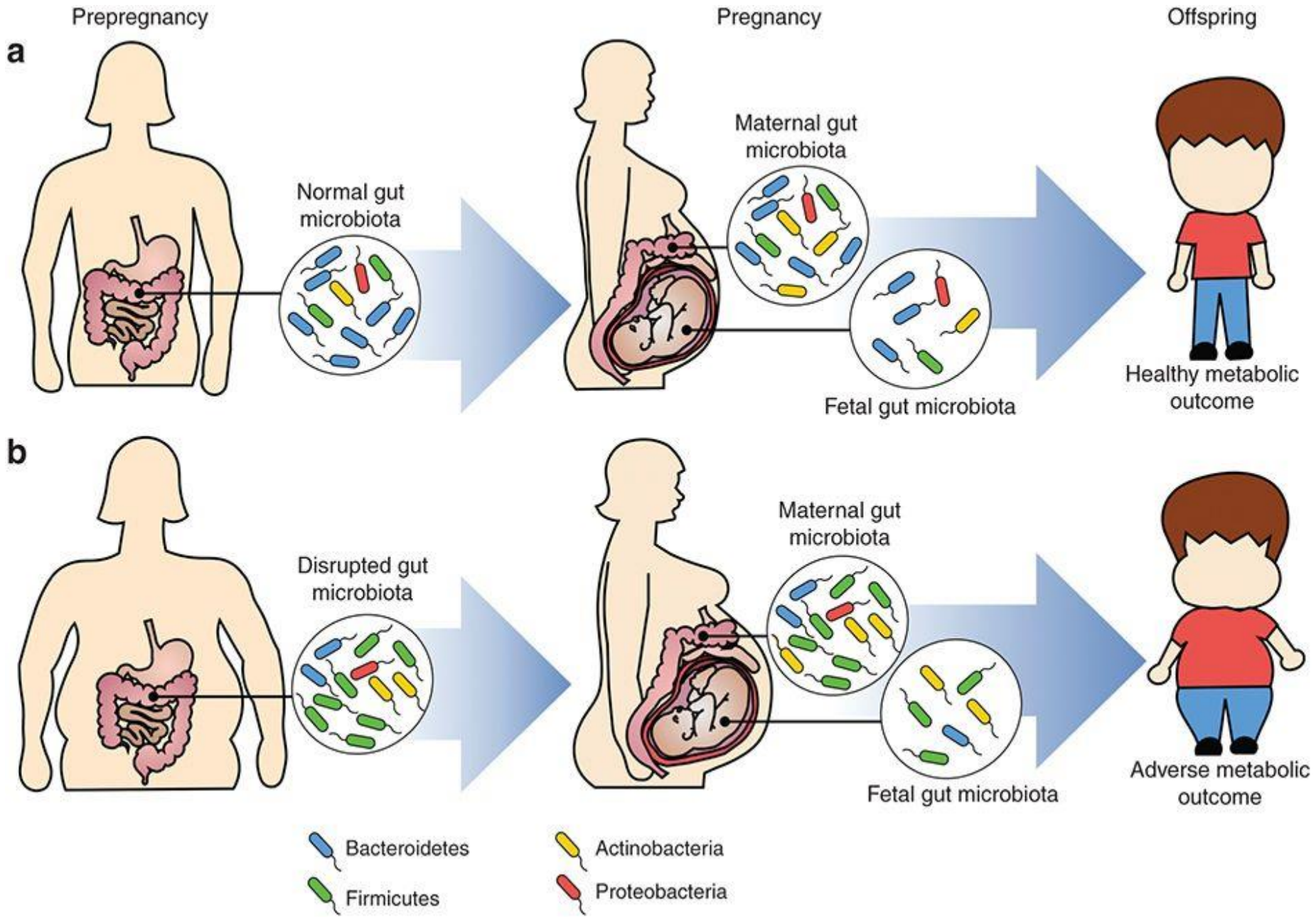
Obesity continues to be one of the major public health problems due to its high prevalence and co-morbidities. Common co-morbidities not only include cardiometabolic disorders but also mood and cognitive disorders. Obese subjects often show deficits in memory, learning and executive functions compared to normal weight subjects. Epidemiological studies also indicate that obesity is associated with a higher risk of developing depression and anxiety, and *vice versa*. These associations between pathologies that presumably have different etiologies suggest shared pathological mechanisms. Gut microbiota is a mediating factor between the environmental pressures (e.g., diet, lifestyle) and host physiology, and its alteration could partly explain the cross-link between those pathologies. Westernized dietary patterns are known to be a major cause of the obesity epidemic, which also promotes a dysbiotic drift in the gut microbiota; this, in turn, seems to contribute to obesity-related complications. Experimental studies in animal models and, to a lesser extent, in humans suggest that the obesity-associated microbiota may contribute to the endocrine, neurochemical and inflammatory alterations underlying obesity and its comorbidities. These include dysregulation of the HPA-axis with overproduction of glucocorticoids, alterations in levels of neuroactive metabolites (e.g., neurotransmitters, short-chain fatty acids) and activation of a pro-inflammatory milieu that can cause neuro-inflammation. This review updates current knowledge about the role and mode of action of the gut microbiota in the cross-link between energy metabolism, mood and cognitive function.

https://www.dailymotion.com/video/xiooc2?playlist=x4t2zs


Prepregnancy
Pregnancy
Offspring
a
Normal gut microbiota
Maternal gut microbiota
Fetal gut microbiota
Healthy metabolic outcome
b
Disrupted gut microbiota
Maternal gut microbiota
Fetal gut microbiota
Adverse metabolic outcome
Bacteroidetes
Firmicutes
Actinobacteria
Proteobacteria

REVIEW
published: 16 March 2018
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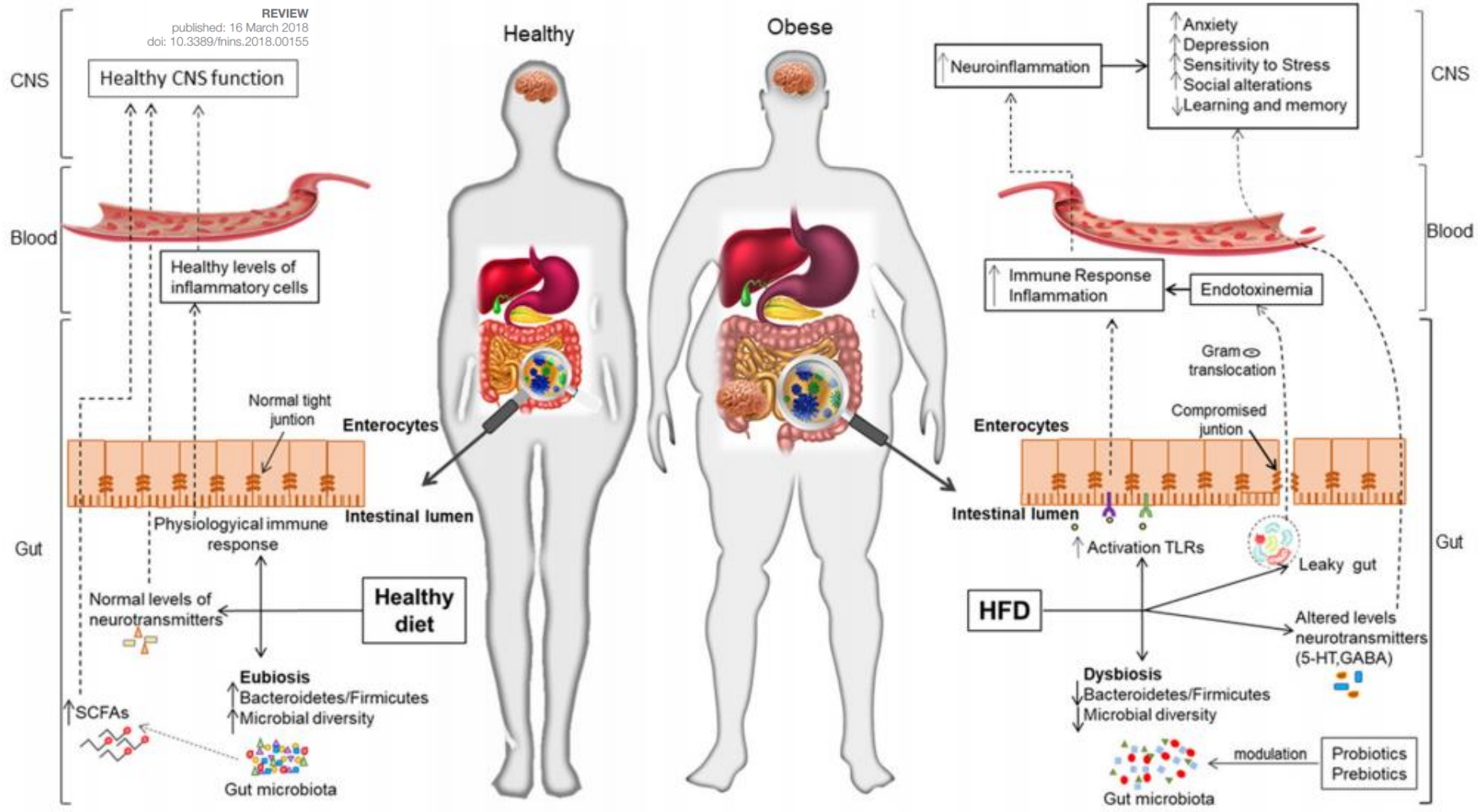

FIGURE 1 | Interplay between the microbiota and the gut-brain axis in obesity and associated mental disorders. Gut microbiota contributes to regulating the gut-brain axis and maintaining health, while its alteration (dysbiosis) due to lifestyle factors (unhealthy diets, stress) is related to obesity and its adverse consequences on mood and cognition. A healthy dietary pattern (e.g., rich in fibers, vegetables, etc.) is thought to increase gut microbiota diversity and, thereby, contribute to epithelial gut integrity, immune homeostasis and normal CNS function through the gut-brain axis. On the contrary, Western-dietary patterns (rich in simple sugars and saturated fat) seem to reduce microbial diversity, promote inflammation and contribute to the *leaky gut* syndrome; this facilitates the translocation of components of Gram-negative bacteria, which increases the peripheral inflammatory tone and produces neuroinflammation and alterations in the CNS. The use of dietary strategies (e.g., probiotics, healthier diets rich in fiber, prebiotics, etc.) could beneficially impact on obesity and mental complications, via restoration of a healthy microbiota and its regulatory role in the gut-brain axis.

REVIEW
published: 16 March 2018
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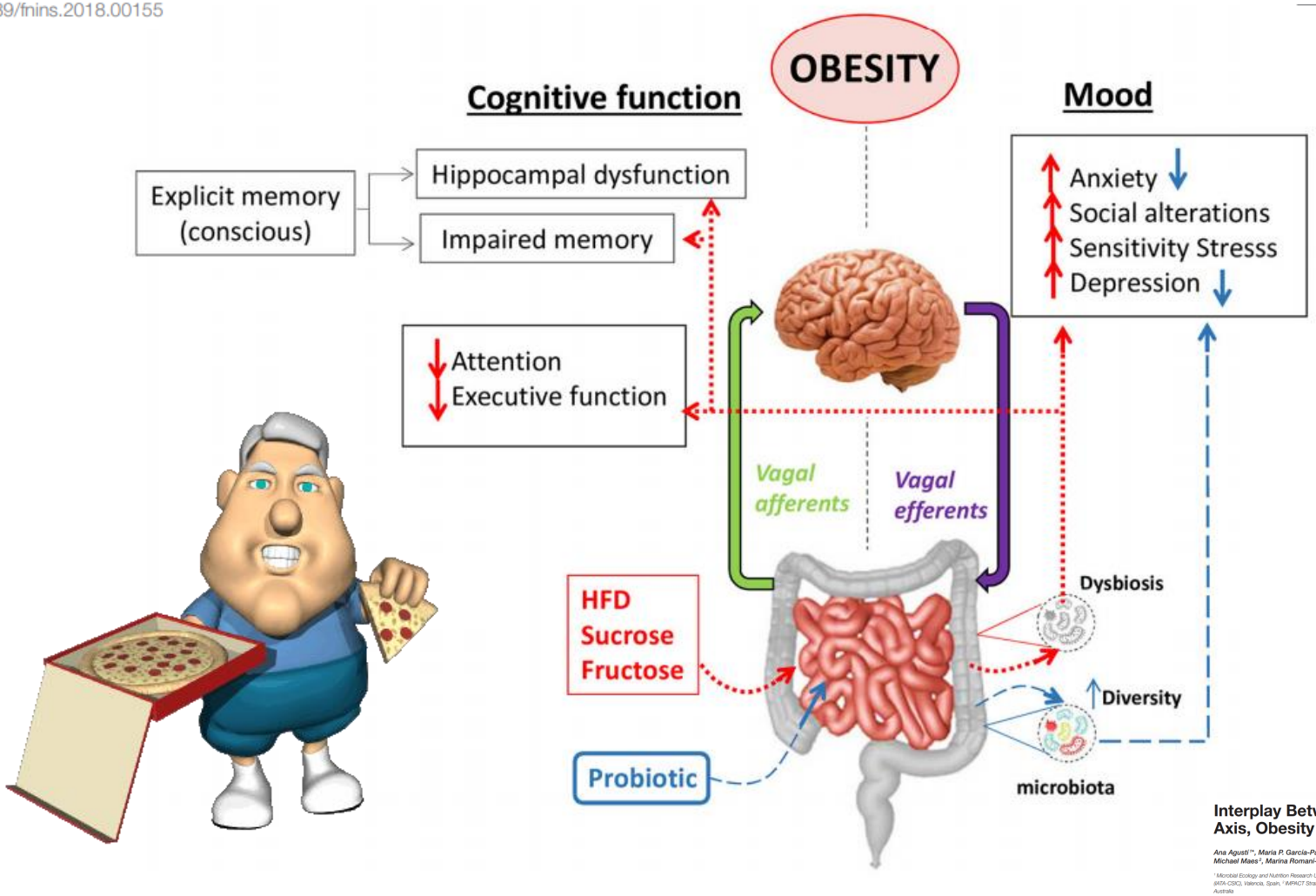

FIGURE 2 | Mood and cognitive alterations in obesity: the role of the gut-brain axis. The diversity and stability of the gut microbiota can be affected by high-fat diets (HFD) or high carb diets leading to dysbiosis, which is a typical alteration observed in obesity. A dysbiotic microbiota is thought to alter the communication between the gut and the brain axis contributing to mood alterations like anxiety, depression, sensitivity to stress, social behavioral alterations and cognitive alterations like hippocampal dysfunction, impaired memory and reduction of attention or the executive function. The use of some probiotics has demonstrated to ameliorate some of the mood alterations like anxiety or depression through different mechanisms in animal models.

Nutrition, the gut microbiome and the metabolic syndrome.
Petia Kovatcheva-Datchary, Tulika Arora · Published in Best practice & research. Clinical... 2013 · DOI: 10.1016/j.bpg.2013.03.017

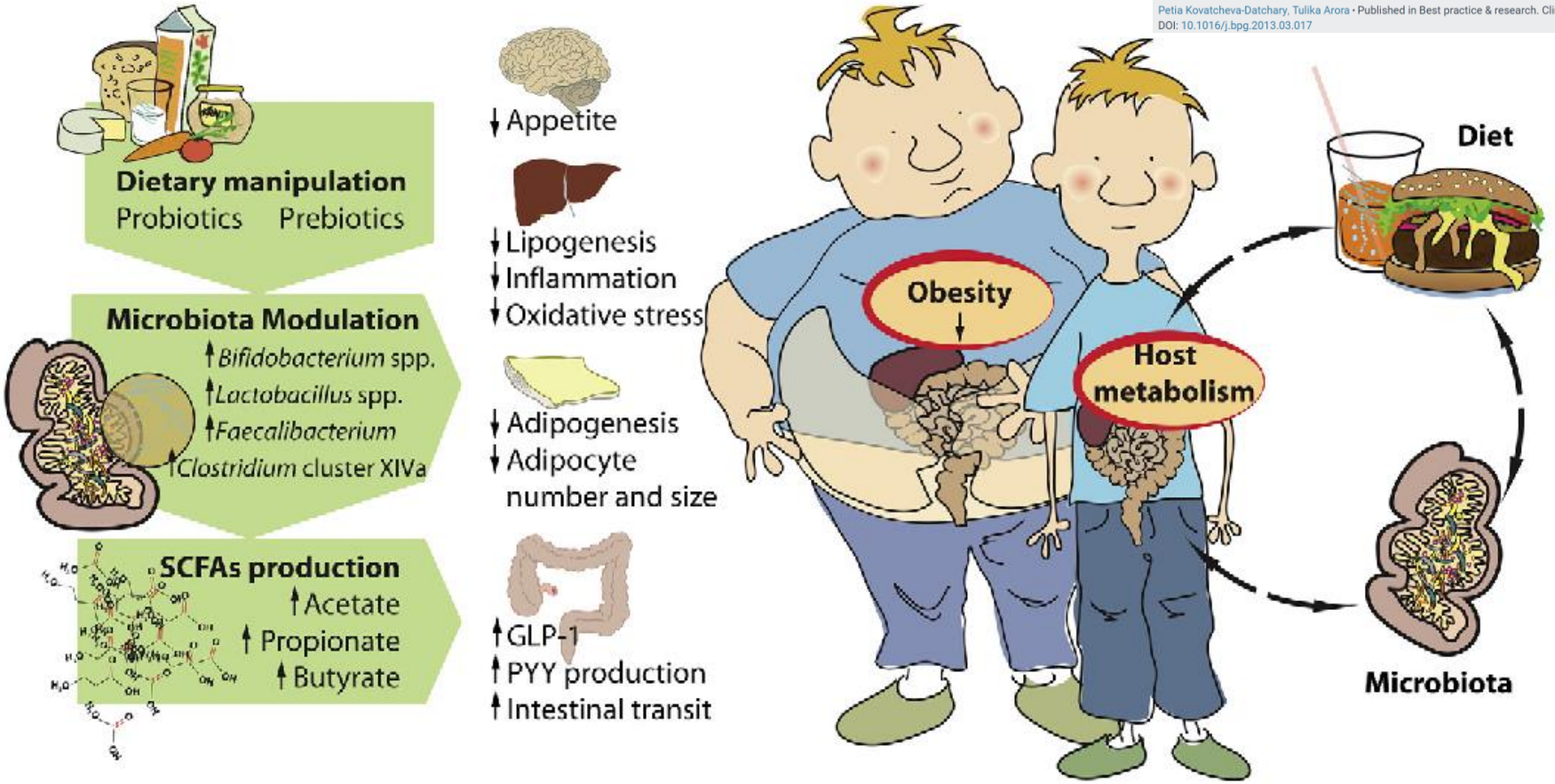

Fig. 1. Interaction between diet and gut microbiota affects host metabolism. Dietary manipulation with probiotics and prebiotics alters the composition and metabolic capacity of gut microbiota. Dietary manipulation in obesity with prebiotics and probiotics changes gut microbiota by favouring bacteria beneficial to the host and enhances the production of short chain fatty acids (SCFAs) – acetate, propionate and butyrate. These result in decreased lipogenesis, reduced inflammation and oxidative stress in liver; decreased adipogenesis, and reduced adipocyte size and number in adipose tissue; increased production of gut hormones and intestinal transit in the large intestine; reduced appetite in the brain. GLP-1: Glucagon like peptide-1, PYY: Peptide YY.

MICROBIOTA

Un probiótico 'made in Spain' salido del intestino de personas delgadas previene la obesidad

Un equipo del IATA-CSIC ha patentado una bacteria que reduce el peso, la grasa corporal y mejora la acción de la insulina. ¿De dónde ha salido esta gran herramienta? De los microorganismos de nuestros intestinos

Específicamente, esta bacteria (llamada **Phascolarctobacterium faecium**) "forma parte de la **microbiota normal de las personas sanas** y está presente en la mayoría de ellas, aunque **disminuye a partir de los 60 años de edad**", detalla la profesora Yolanda Sanz, investigadora del IATA-CSIC y coordinadora del proyecto europeo **MyNewGut**, que ha generado un **biobanco de bacterias intestinales** humanas con potencial para mejorar la salud.

La bacteria del probiótico se identificó en un estudio longitudinal en **niños** que tenían un peso normal al comienzo de la investigación. "A lo largo de cuatro años, medimos los cambios de peso de los menores y al finalizar el trabajo comprobamos que la bacteria se encontraba en **mayor cantidad** en los que se mantuvieron **delgados**, pero estaba reducida en los que desarrollaron sobrepeso u obesidad a lo largo

Desarrollan un probiótico capaz de prevenir enfermedades inflamatorias intestinales

Un estudio realizado por científicos de Estados Unidos ha logrado fabricar un probiótico diseñado para el beneficio de estas patologías

Daniel Saldaña — 02/07/2021 18:00

In Brief | Published: 14 July 2021

MICROBIOTA

Yeast probiotics for the treatment of IBD

Katrina Ray

Nature Reviews Gastroenterology & Hepatology **18**, 594 (2021) | Cite this article

LA REVOLUCIÓN DE LOS PSICOBIÓTICOS

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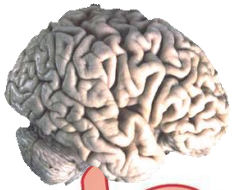
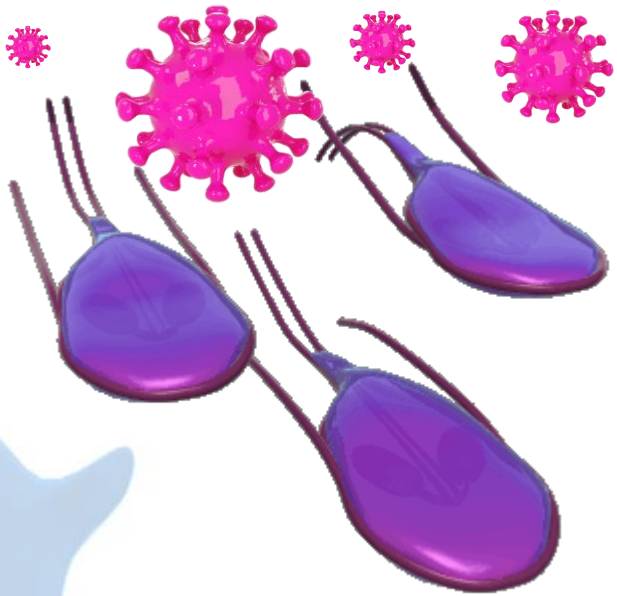
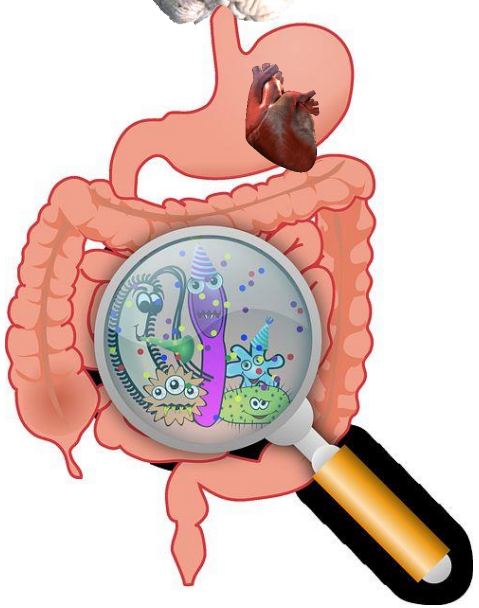






The Central Nervous System and the Gut Microbiome

Gil Sharon,[1,*] Timothy R. Sampson,[1] Daniel H. Geschwind,[2,3,4,5] and Sarkis K. Mazmanian[1,*]
[1]Division of Biology and Biological Engineering, California Institute of Technology, Pasadena, CA 91125, USA

Leading Edge
Review

Cell *167*, November 3, 2016

Neurodevelopment is a complex process governed by both intrinsic and extrinsic signals. While historically studied by researching the brain, inputs from the periphery impact many neurological conditions. Indeed, emerging data suggest communication between the gut and the brain in anxiety, depression, cognition, and autism spectrum disorder (ASD). The development of a healthy, functional brain depends on key pre- and post-natal events that integrate environmental cues, such as molecular signals from the gut. These cues largely originate from the microbiome, the consortium of symbiotic bacteria that reside within all animals. Research over the past few years reveals that the gut microbiome plays a role in basic neurogenerative processes such as the formation of the blood-brain barrier, myelination, neurogenesis, and microglia maturation and also modulates many aspects of animal behavior. Herein, we discuss the biological intersection of neurodevelopment and the microbiome and explore the hypothesis that gut bacteria are integral contributors to development and function of the nervous system and to the balance between mental health and disease.

The Central Nervous System and the Gut Microbiome

Gil Sharon,[1,*] Timothy R. Sampson,[1] Daniel H. Geschwind,[2,3,4,5] and Sarkis K. Mazmanian[1,*]
[1]Division of Biology and Biological Engineering, California Institute of Technology, Pasadena, CA 91125, USA

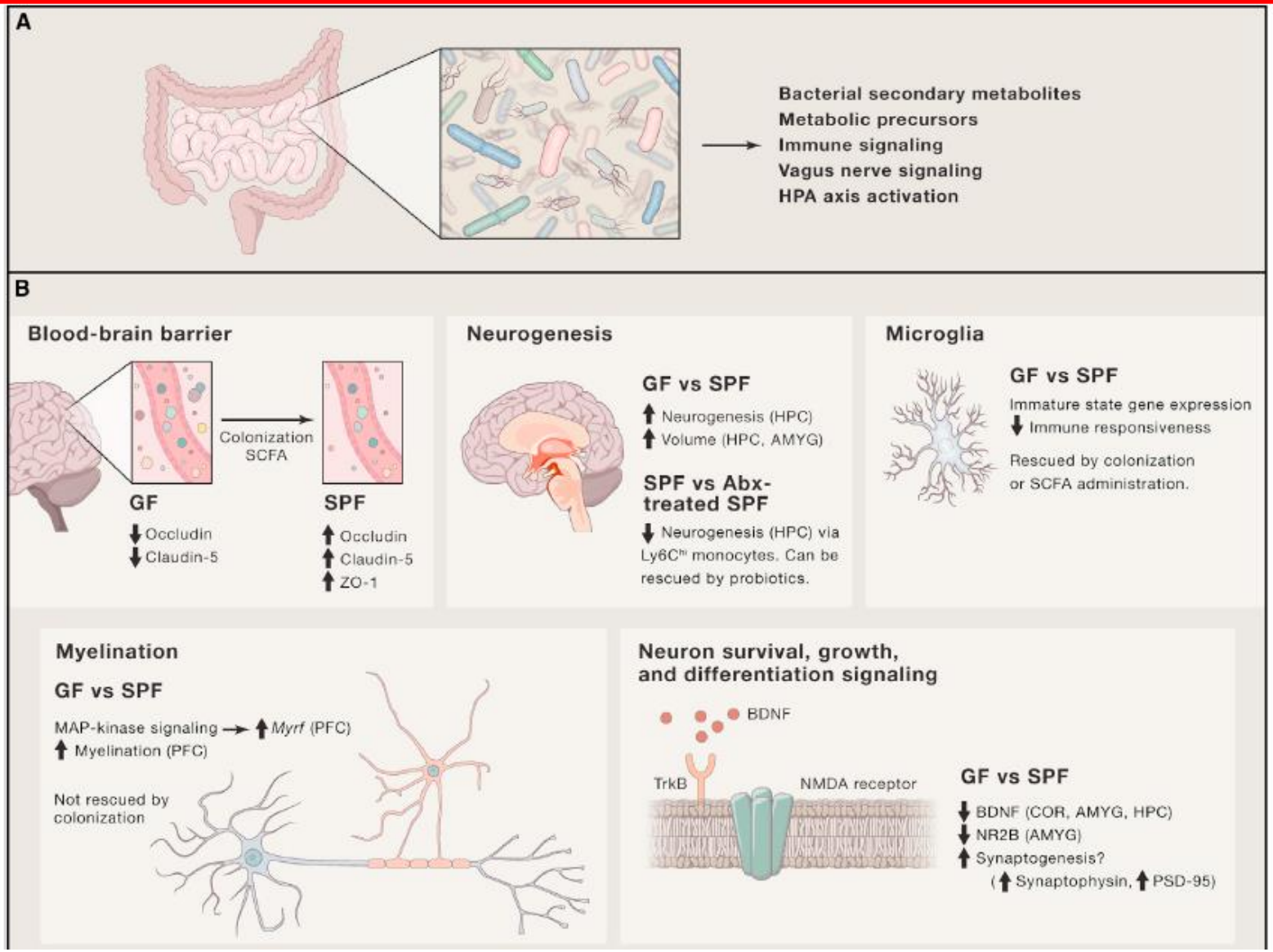
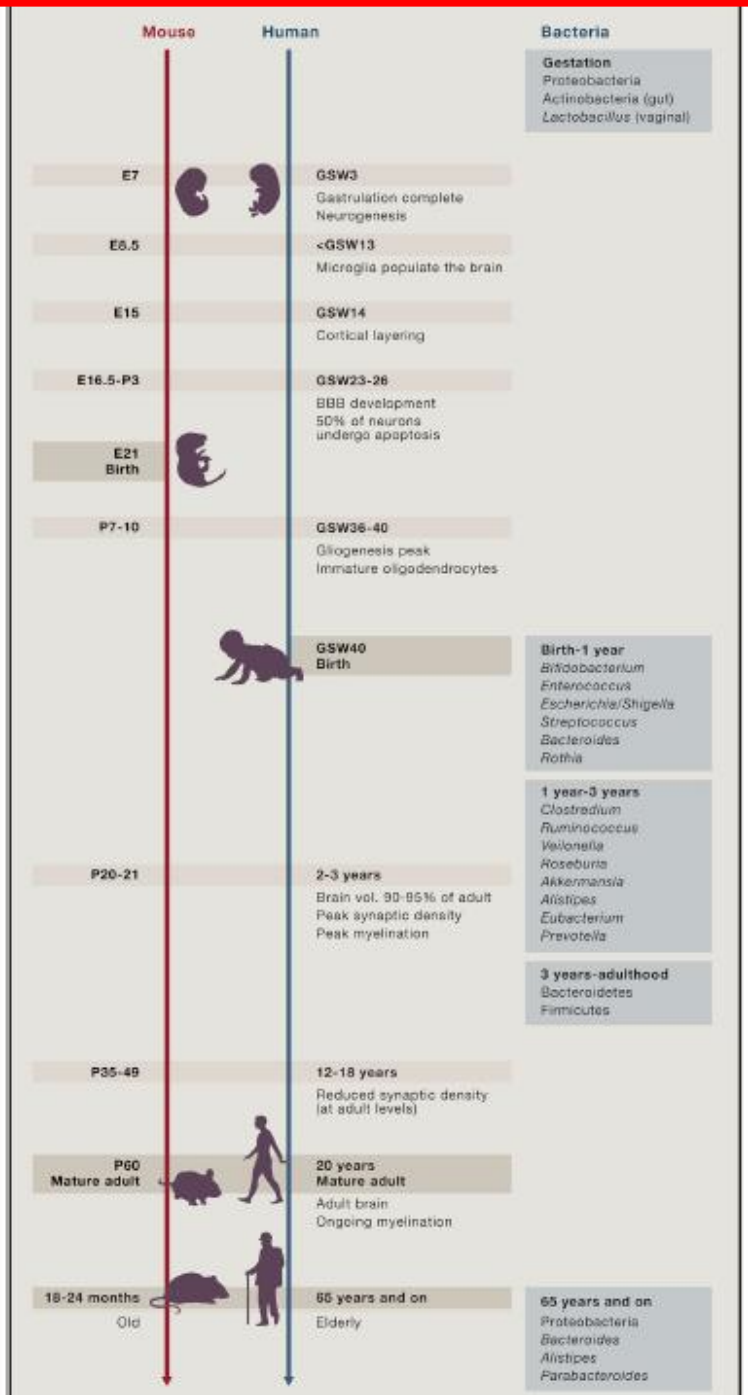


Figure 1. Intersections of Gut Microorganisms and Basic Developmental Processes

Basic developmental processes driven directly or indirectly by gut microbes and their products.

(A) Gut microorganisms relay messages to the brain via various direct and indirect mechanisms.

(B) Basic neurodevelopmental processes are modulated as a result of colonization of GF animals or depletion of gut bacteria by antibiotics. Specifically, the following processes are modulates: blood-brain barrier (BBB) formation and integrity (Braniste et al., 2014), neurogenesis (Möhle et al., 2016; Ogbonnaya et al., 2015), microglia maturation and ramification (Erny et al., 2015; Matcovitch-Natan et al., 2016), myelination (Gacias et al., 2016; Hoban et al., 2016) and expression of neurotrophins (Bercik et al., 2011a, 2011b; Desbonnet et al., 2015), neurotransmitters (Bercik et al., 2011a; O'Mahony et al., 2015), and their respective receptors.

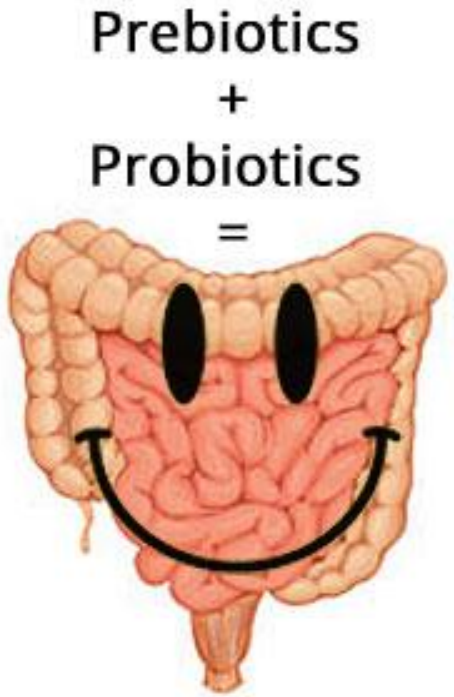


The Central Nervous System and the Gut Microbiome

Gil Sharon,[1,*] Timothy R. Sampson,[1] Daniel H. Geschwind,[2,3,4,5] and Sarkis K. Mazmanian[1,*]
[1]Division of Biology and Biological Engineering, California Institute of Technology, Pasadena, CA 91125, USA

Figure 2. Major Events in Mammalian Brain Development

Developmental trajectories and key neurodevelopmental events in mice and humans (adapted from Knuesel et al., 2014; Pressler and Auvin, 2013; Semple et al., 2013). E, embryonic age; P, postnatal age; GSW, gestational week. Bacterial taxa on the right panel are the dominant ones at each life stage (Bäckhed et al., 2015; Lloyd-Price et al., 2016; Nuriel-Ohayon et al., 2016).

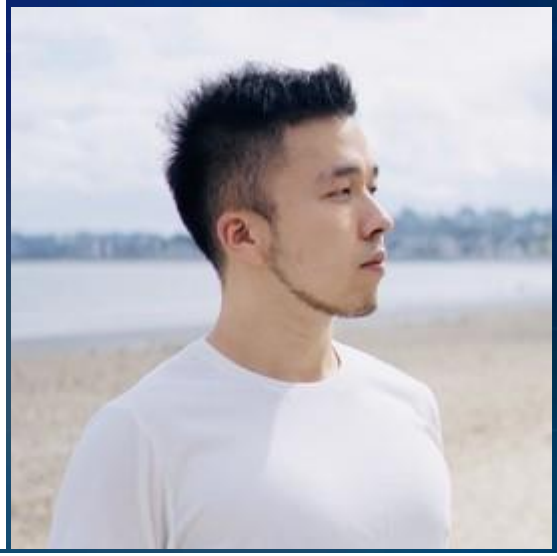


REVIEW Open Access

The progress of gut microbiome research related to brain disorders

Sibo Zhu[1,2,3], Yanfeng Jiang[1,2], Kelin Xu[1,2,4], Mei Cui[5], Weimin Ye[6], Genming Zhao[4], Li Jin[1,2,7] and Xingdong Chen[1,2,7*]

Zhu *et al. Journal of Neuroinflammation* (2020) 17:25



Abstract

There is increasing evidence showing that the dynamic changes in the gut microbiota can alter brain physiology and behavior. Cognition was originally thought to be regulated only by the central nervous system. However, it is now becoming clear that many non-nervous system factors, including the gut-resident bacteria of the gastrointestinal tract, regulate and influence cognitive dysfunction as well as the process of neurodegeneration and cerebrovascular diseases. Extrinsic and intrinsic factors including dietary habits can regulate the composition of the microbiota. Microbes release metabolites and microbiota-derived molecules to further trigger host-derived cytokines and inflammation in the central nervous system, which contribute greatly to the pathogenesis of host brain disorders such as pain, depression, anxiety, autism, Alzheimer's diseases, Parkinson's disease, and stroke. Change of blood–brain barrier permeability, brain vascular physiology, and brain structure are among the most critical causes of the development of downstream neurological dysfunction. In this review, we will discuss the following parts:

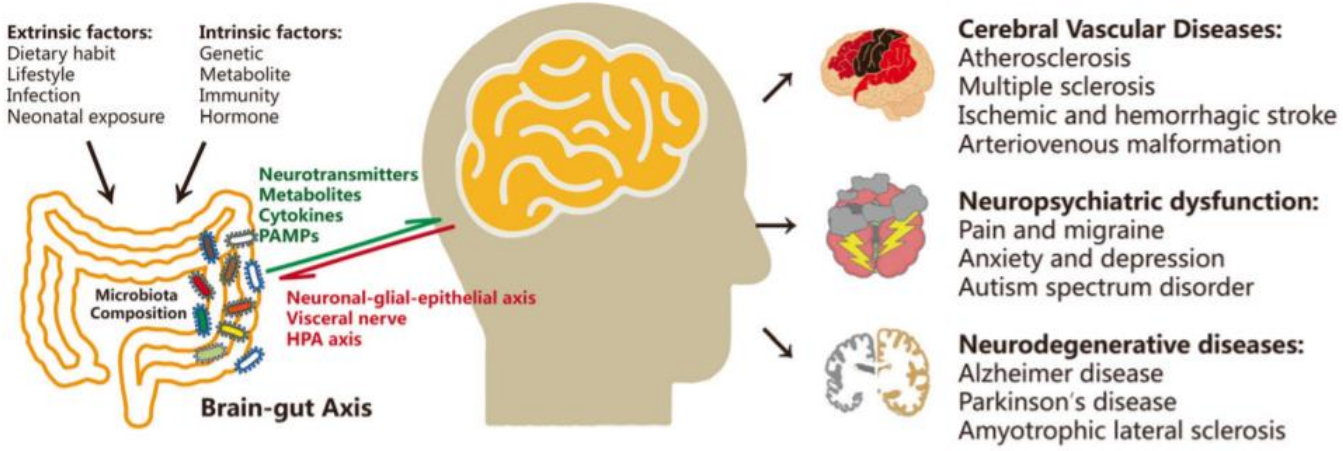


Fig. 1 Dysregulation of the gut microbiota in brain disorders. Extrinsic and intrinsic factors shape the composition of gut microbiota and further contribute to brain disorders, including cognitive dysfunction, neurodegeneration, and cerebrovascular diseases

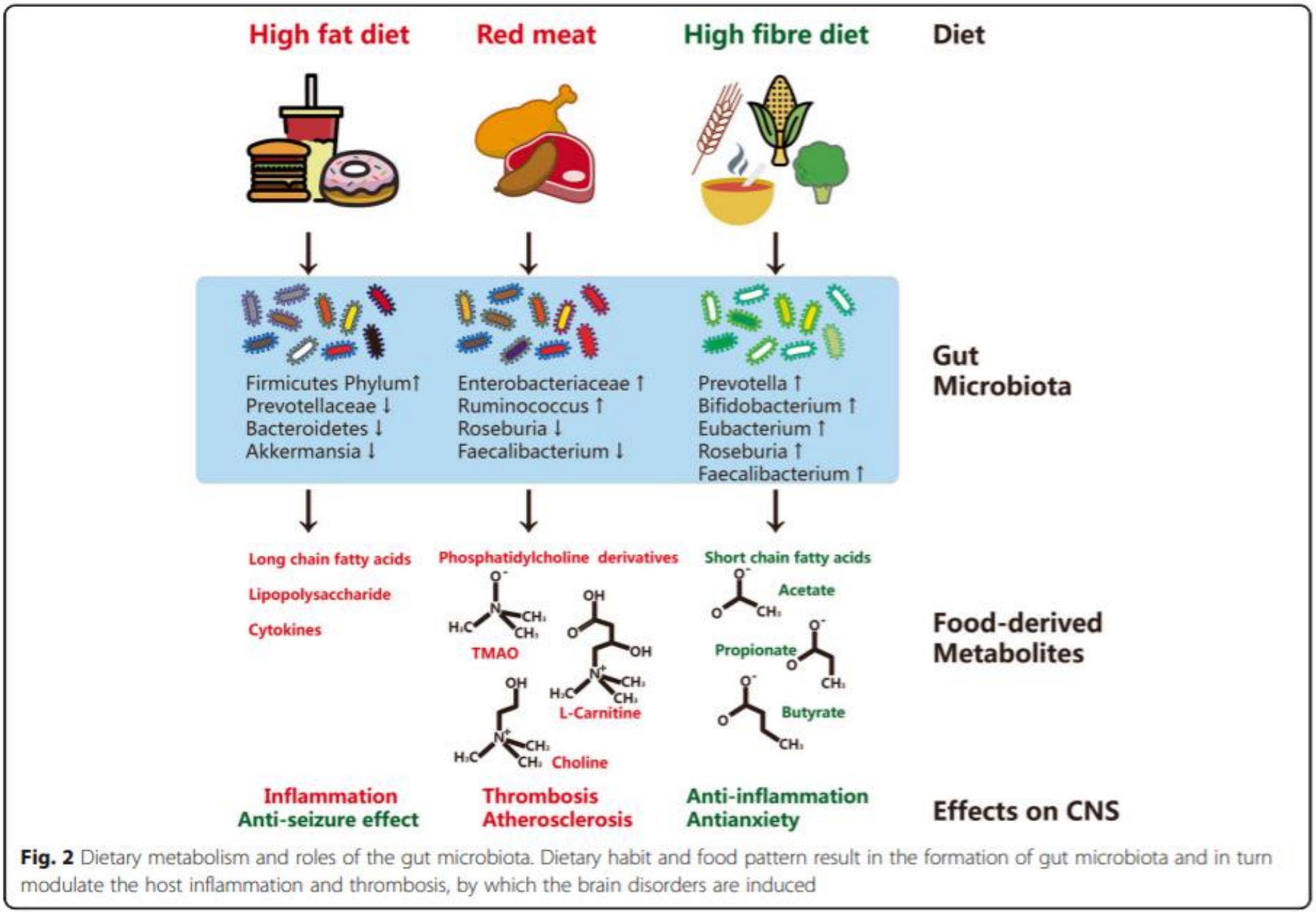


Fig. 2 Dietary metabolism and roles of the gut microbiota. Dietary habit and food pattern result in the formation of gut microbiota and in turn modulate the host inflammation and thrombosis, by which the brain disorders are induced

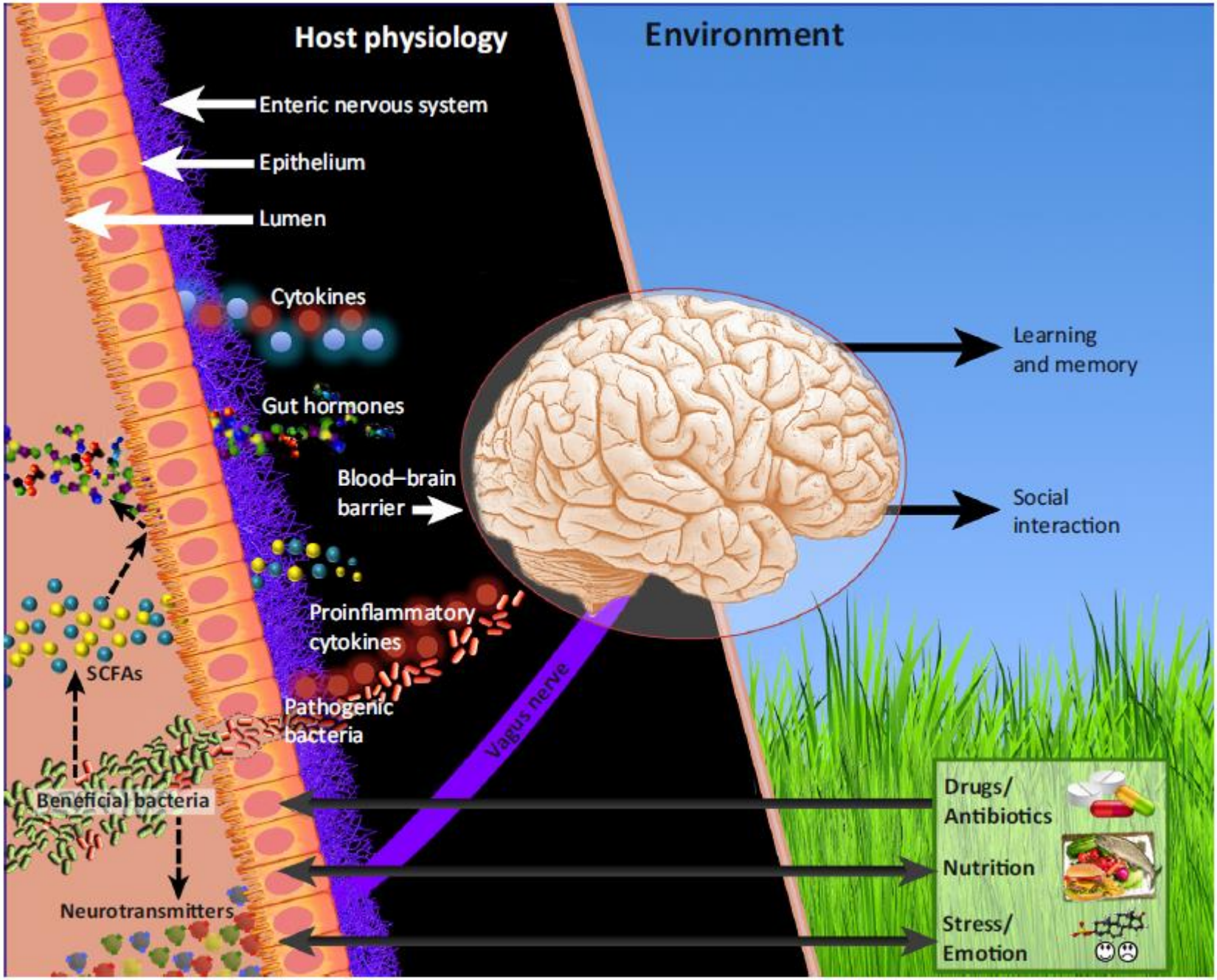
Trends in Cognitive Sciences

The Microbiome in Psychology and Cognitive Neuroscience

Trends in Cognitive Sciences, July 2018, Vol. 22, No. 7

Amar Sarkar,[1,2,3,*] Siobhán Harty,[1,4] Soili M. Lehto,[5,6,7] Andrew H. Moeller,[8] Timothy G. Dinan,[9,10] Robin I.M. Dunbar,[1] John F. Cryan,[10,11] and Philip W.J. Burnet[12]

Psychology and microbiology make unlikely friends, but the past decade has witnessed striking bidirectional associations between intrinsic gut microbes and the brain, relationships with largely untested psychological implications. Although microbe–brain relationships are receiving a great deal of attention in biomedicine and neuroscience, psychologists have yet to join this journey. Here, we illustrate microbial associations with emotion, cognition, and social behavior. However, despite considerable enthusiasm and potential, technical and conceptual limitations including low statistical power and lack of mechanistic descriptions prevent a nuanced understanding of microbiome–brain–behavior relationships. Our goal is to describe microbial effects in domains of cognitive significance and the associated challenges to stimulate interdisciplinary research on the contribution of this hidden kingdom to psychological processes.


Host physiology
Environment
Enteric nervous system
Epithelium
Lumen
Cytokines
Gut hormones
Blood–brain barrier
Proinflammatory cytokines
Pathogenic bacteria
SCFAs
Beneficial bacteria
Neurotransmitters
Vagus nerve
Learning and memory
Social interaction
Drugs/ Antibiotics
Nutrition
Stress/ Emotion

CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION
2019, VOL. 59, NO. 8, 1230–1236
https://doi.org/10.1080/10408398.2017.1399860

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Psychobiotics: A new approach for treating mental illness?

Snigdha Misra [a] and Debapriya Mohanty[b]

ABSTRACT

Gut microbiomes may have a significant impact on mood and cognition, which is leading experts towards a new frontier in neuroscience. Studies have shown that increase in the amount of good bacteria in the gut can curb inflammation and cortisol level, reduces symptoms of depression and anxiety, lowers stress reactivity, improves memory and even lessens neuroticism and social anxiety. This shows that, probably the beneficial gut bacteria or probiotics function mechanistically as delivery vehicles for neuroactive compounds. Thus, a psychobiotic is a live organism, when ingested in adequate amounts, produces a health benefit in patients suffering from psychiatric illness. Study of these novel class of probiotics may open up the possibility of rearrangement of intestinal microbiota for effective management of various psychiatric disorders.

Table 1. Gut microbes having psychotropic properties.

Lactobacillus spp	*Bifidobacterium* spp
L. acidophilus	*B. infantis,*
L. casei	*B. longum,*
L. rhamnosus	*B. bifidum*
L. helveticus	*B. lactis*
L. plantarum	*B. breve*
L pentosus	
L casei Shirota	
L. hilgardii,	

CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION
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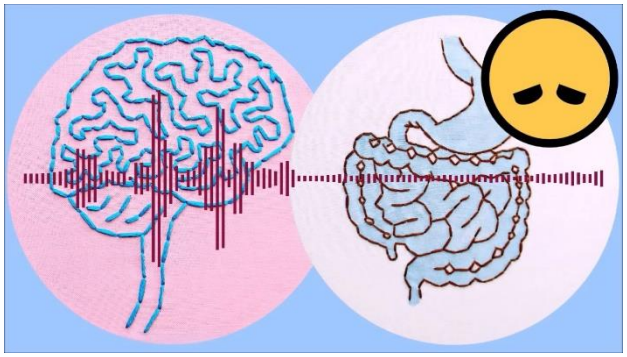
Psychobiotics: A new approach for treating mental illness?

Snigdha Misra [a] and Debapriya Mohanty[b]



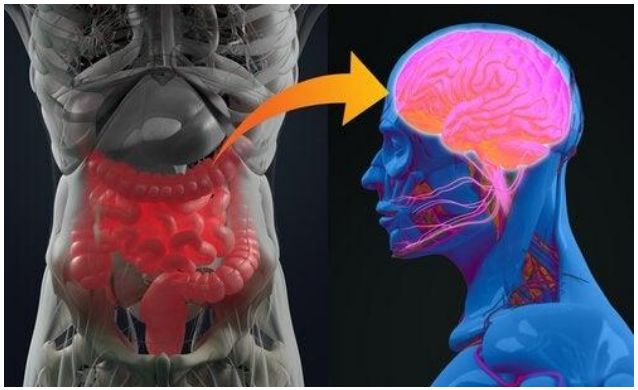


Table 2. Pyscobiotics used in different neurological conditions.

Neurological Condition	Gut microbes	Psychobiotic Strains
Anxiety	*Lactobacillus* spp	*L. fermentum* NS9,
		Lactobacillus casei Shirota,
		L. rhamnosus JB-1
		L. helveticus ROO52
	Bifidobacterium spp	*B. breve* 1205
		B. infantis
		B. longum 1714
		B. longum NCC3001
		B. longum R0175
Depression	*Lactobacillus* spp	*L. acidophilus*
		L. acidophilus W37
		L. brevis W63
		L. casei
		L. casei Shirota
		L. casei W56
		L. gasseri OLL2809
		L. helveticus NS8
	Lactococcus	*L. lactis* W19
		L.lactis W58
	Bifidobacterium spp	*B. infantis*
		B. bifidum
		B. bifidum W23
		B. lactis W52
		B. longum R0175
Stress	*Lactobacillus* spp	*L. casei Shirota*
		L. helveticus
		L. helveticus R0052
		L. plantarum PS128
		L. rhamnosus
	Bifidobacterium spp	*B. infantis*
		B. longum R0175

medical sciences

Med. Sci. 2019, 7, 21

MDPI

Review

Therapeutic Potential of the Microbiome in the Treatment of Neuropsychiatric Disorders

Alper Evrensel [1,2,*], Barış Önen Ünsalver [3] and Mehmet Emin Ceylan [4]

Abstract: The search for rational treatment of neuropsychiatric disorders began with the discovery of chlorpromazine in 1951 and continues to evolve. Day by day, new details of the intestinal microbiota–brain axis are coming to light. As the role of microbiota in the etiopathogenesis of neuropsychiatric disorders is more clearly understood, microbiota-based (or as we propose, "fecomodulation") treatment options are increasingly discussed in the context of treatment. Although their history dates back to ancient times, the importance of psychobiotics and fecal microbiota transplantation (FMT) has only recently been recognized. Despite there being few preclinical and clinical studies, the evidence gathered to this point suggests that consideration of the microbiome in the treatment of neuropsychiatric disorders represents an area of significant therapeutic potential. It is increasingly hoped that such treatment options will be more reliable in terms of their side effects, cost, and ease of implementation. However, there remains much to be researched. Questions will be answered through germ-free animal experiments and randomized controlled trials. In this article, the therapeutic potential of microbiota-based options in the treatment of neuropsychiatric disorders is discussed in light of recent research.

nutrients Review 20 April 2019 MDPI

Review

From Probiotics to Psychobiotics: Live Beneficial Bacteria Which Act on the Brain-Gut Axis

Luis G. Bermúdez-Humarán [1,*], Eva Salinas [2], Genaro G. Ortiz [3], Luis J. Ramirez-Jirano [3], J. Alejandro Morales [4] and Oscar K. Bitzer-Quintero [3,*]

Abstract: There is an important relationship between probiotics, psychobiotics and cognitive and behavioral processes, which include neurological, metabolic, hormonal and immunological signaling pathways; the alteration in these systems may cause alterations in behavior (mood) and cognitive level (learning and memory). Psychobiotics have been considered key elements in affective disorders and the immune system, in addition to their effect encompassing the regulation of neuroimmune regulation and control axes (the hypothalamic-pituitary-adrenal axis or HPA, the sympathetic-adrenal-medullary axis or SAM and the inflammatory reflex) in diseases of the nervous system. The aim of this review is to summarize the recent findings about psychobiotics, the brain-gut axis and the immune system. The review focuses on a very new and interesting field that relates the microbiota of the intestine with diseases of the nervous system and its possible treatment, in neuroimmunomodulation area. Indeed, although probiotic bacteria will be concentrated after ingestion, mainly in the intestinal epithelium (where they provide the host with essential nutrients and modulation of the immune system), they may also produce neuroactive substances which act on the brain-gut axis.

Neuropsychiatric Disease and Treatment

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REVIEW

Psychobiotics and the gut–brain axis: in the pursuit of happiness

Prebióticos y Probióticos

This article was published in the following Dove Press journal:
Neuropsychiatric Disease and Treatment
16 March 2015
Number of times this article has been viewed

Linghong Zhou[1]
Jane A Foster[1,2]

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Prebiotics
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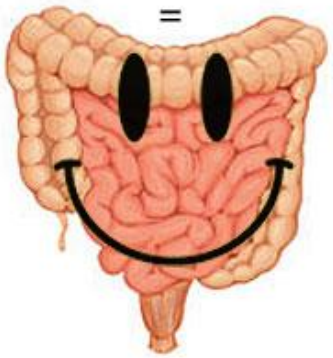


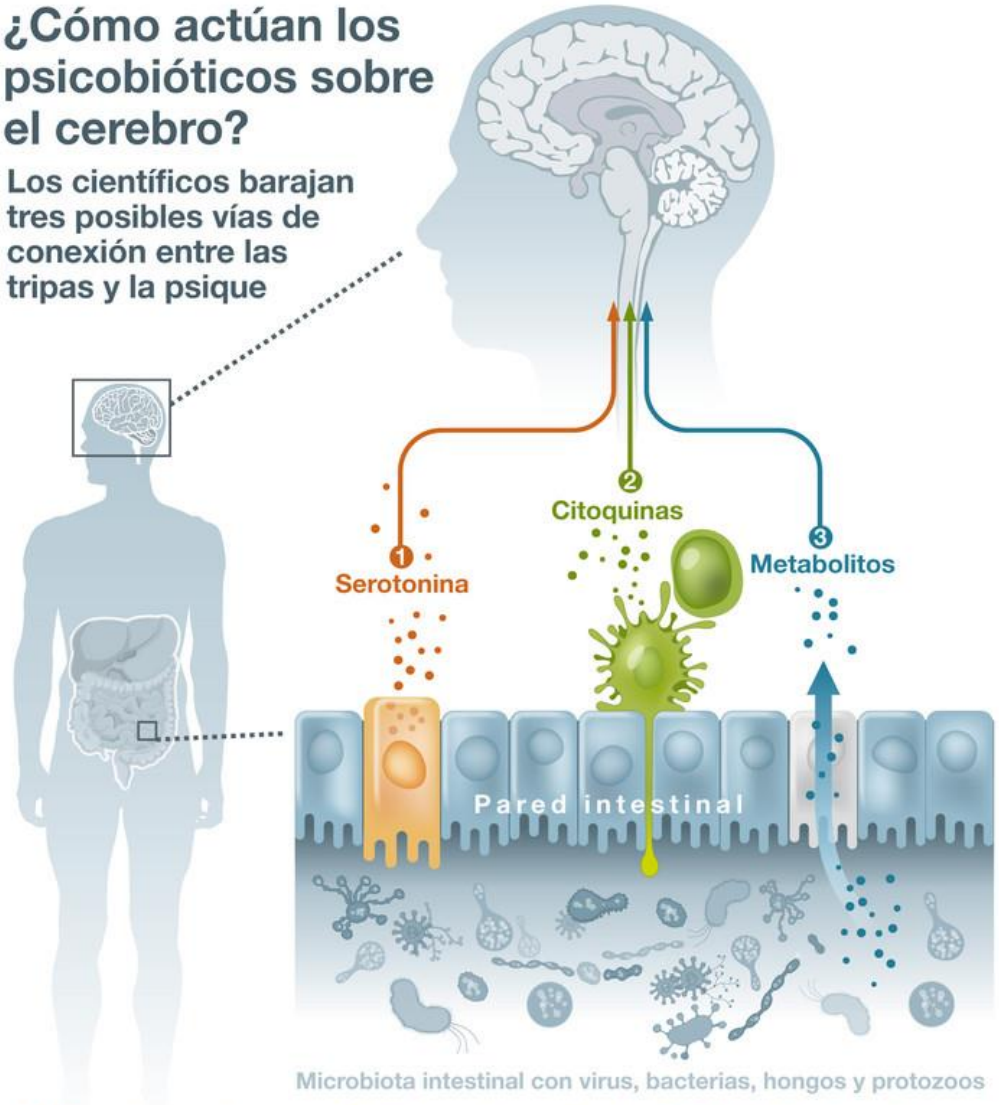
Abstract: The human intestine houses an astounding number and species of microorganisms, estimated at more than 10^{14} gut microbiota and composed of over a thousand species. An individual's profile of microbiota is continually influenced by a variety of factors including but not limited to genetics, age, sex, diet, and lifestyle. Although each person's microbial profile is distinct, the relative abundance and distribution of bacterial species is similar among healthy individuals, aiding in the maintenance of one's overall health. Consequently, the ability of gut microbiota to bidirectionally communicate with the brain, known as the gut–brain axis, in the modulation of human health is at the forefront of current research. At a basic level, the gut microbiota interacts with the human host in a mutualistic relationship – the host intestine provides the bacteria with an environment to grow and the bacterium aids in governing homeostasis within the host. Therefore, it is reasonable to think that the lack of healthy gut microbiota may also lead to a deterioration of these relationships and ultimately disease. Indeed, a dysfunction in the gut–brain axis has been elucidated by a multitude of studies linked to neuropsychological, metabolic, and gastrointestinal disorders. For instance, altered microbiota has been linked to neuropsychological disorders including depression and autism spectrum disorder, metabolic disorders such as obesity, and gastrointestinal disorders including inflammatory bowel disease and irritable bowel syndrome. Fortunately, studies have also indicated that gut microbiota may be modulated with the use of probiotics, antibiotics, and fecal microbiota transplants as a prospect for therapy in microbiota-associated diseases. This modulation of gut microbiota is currently a growing area of research as it just might hold the key to treatment.

Keywords: gut microbiota, mental illness, disease, modulation, therapy, probiotics

https://www.dailymotion.com/video/x1bvhoo?playlist=x4t2zs

¿Cómo actúan los psicobióticos sobre el cerebro?

Los científicos barajan tres posibles vías de conexión entre las tripas y la psique



Microbiota intestinal con virus, bacterias, hongos y protozoos

1. Neurotransmisores

En el intestino, las células del sistema nervioso entérico producen serotonina, un neurotransmisor, que manda señales al cerebro. Los psicobióticos podrían actuar directamente sobre esas células.

2. Sistema inmunitario intestinal

Los psicobióticos pueden hacer que sus células produzcan citoquinas y estas proteínas influyan sobre el cerebro.

3. Moléculas bacterianas

Los microorganismos también pueden producir metabolitos que alteren la actividad en la barrera hematoencefálica y sean beneficiosos para el cerebro.

Distribución normal de la microbiota en el tracto Gastrointestinal

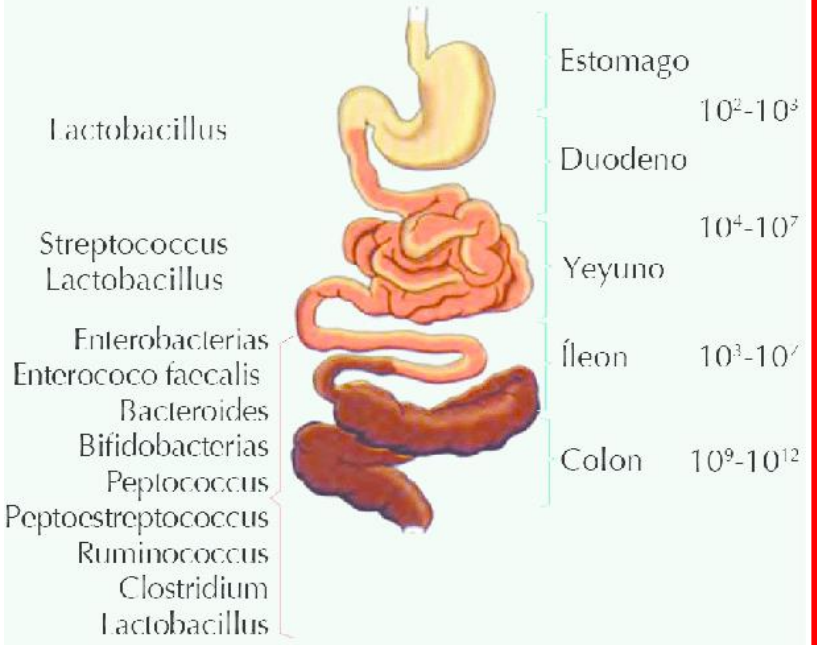
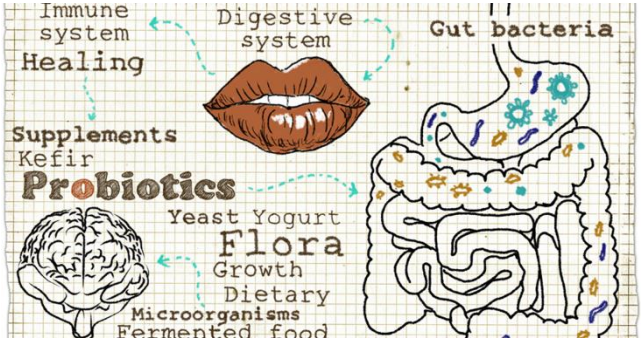
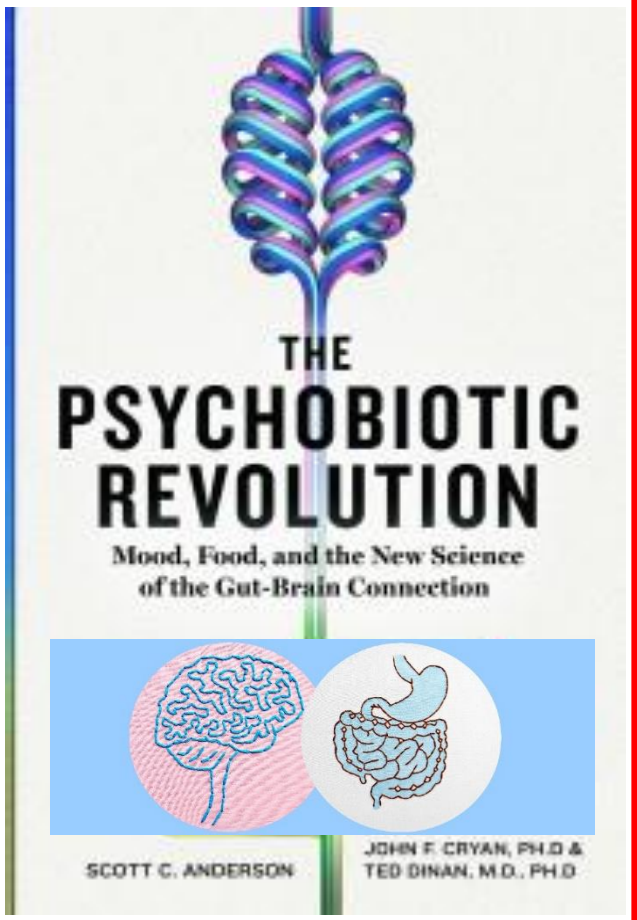


Table 2. Selected Sample of Studies Investigating "Psychobiotics"

Study	Design	Disease	Intervention	Conclusions
Tillisch *et al.*[84]	Clinical; RCT	Healthy Women	Probiotic	Probiotic changed functional connectivity of an emotional recognition network in the brain.
Slykerman *et al.*[85]	Clinical; RCT in pregnancy	Anxiety and Depression	Probiotic	Probiotic significantly lowers postpartum anxiety and depression.
Pinto-Sanchez *et al.*[86]	Clinical; RCT in IBS	Depression	Probiotic	Probiotic reduces depression, increases quality of life; associated with changes in brain activation patterns.
Romijn *et al.*[87]	Clinical; RCT	Depression	Probiotic	No significant effect of probiotic on low mood or inflammatory biomarkers.
Akkasheh *et al.*[88]	Clinical; RCT	Depression	Probiotic	Probiotic reduces depression scores and improves insulin sensitivity.
Takada *et al.*[89]	Clinical; RCT	Stress	Probiotic	Probiotic suppresses cortisol hypersecretion and physical symptoms associated with stress.
Allen *et al.*[90]	Clinical; within-participant placebo controlled trial	Stress	Probiotic	Probiotic reduces stress and improves memory.
Kelly *et al.*[91]	Clinical; RCT	Stress	Probiotic	No significant effect of probiotic on stress.
Ostlund-Lagerstrom *et al.*[92]	Clinical; RCT in older adults	Anxiety and Stress	Probiotic	No significant effect of probiotic on stress.
Schmidt *et al.*[93]	Clinical; RCT	Anxiety	Prebiotic	Prebiotic associated with anxiolytic properties.
Wang *et al.*[94]	Clinical; RCT	Stress	Rifaximin	Rifaximin showed stress-reducing effects.
Burokas *et al.*[95]	Preclinical	Stress	Prebiotic	Prebiotic improves stress-related behaviors.
Desbonnet *et al.*[96]	Preclinical	Depression	Probiotic	Probiotic normalizes markers associated with rat model of depression.
Tarr *et al.*[97]	Preclinical	Anxiety	Prebiotic	Prebiotic improves stressor-induced anxiety behavior.





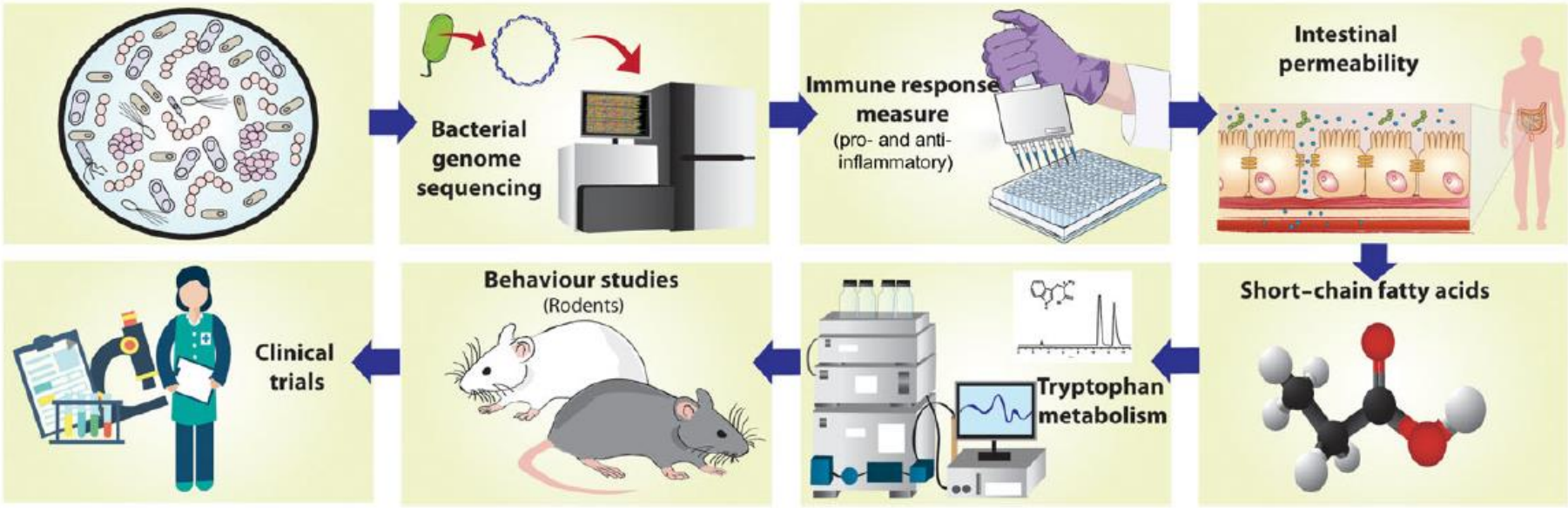
REVIEW ARTICLE

British Journal of Pharmacology (2018) **175** 4430–4438 4430

Finding the needle in the haystack: systematic identification of psychobiotics

Aisling Bambury[1,2], Kiran Sandhu[1], John F Cryan[1,3] and Timothy G Dinan[1,2]

The brain–gut–microbiota axis is increasingly viewed as a novel paradigm in neuroscience with the capacity to generate innovative therapies for patients with psychiatric illnesses. Psychobiotics, defined as live bacteria, which when ingested in adequate amounts, confer mental health benefits, are increasingly of interest, as preclinical trials continue to show promising results. Particularly in stress-related, anxiety and depressive disorders, there is potential for psychobiotics to deliver new therapies. The question of which microbes may prove to be the most promising psychobiotic in delivering such therapies at a clinical level is of great importance. Here we look at the characteristics of psychobiotics, in an attempt to present an outline from which the identification of potential new psychobiotics may be possible.



Review

Trends in Neurosciences

Trends in Neurosciences, November 2016, Vol. 39, No. 11

Psychobiotics and the Manipulation of Bacteria–Gut–Brain Signals

Amar Sarkar,[1] Soili M. Lehto,[2,3] Siobhán Harty,[1] Timothy G. Dinan,[4] John F. Cryan,[5] and Philip W.J. Burnet[6,*]

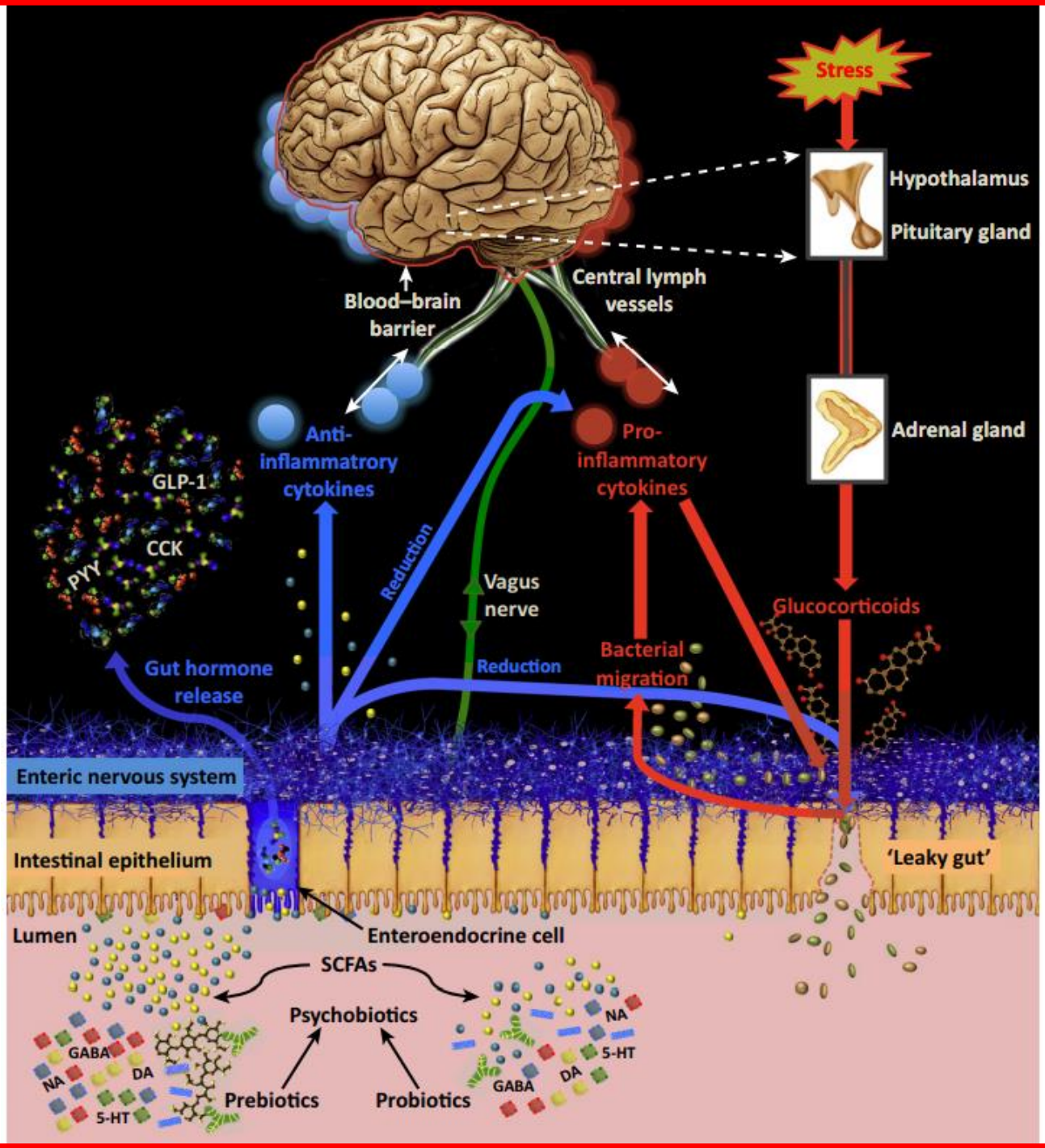
Psychobiotics were previously defined as live bacteria (probiotics) which, when ingested, confer mental health benefits through interactions with commensal gut bacteria. We expand this definition to encompass prebiotics, which enhance the growth of beneficial gut bacteria. We review probiotic and prebiotic effects on emotional, cognitive, systemic, and neural variables relevant to health and disease. We discuss gut–brain signalling mechanisms enabling psychobiotic effects, such as metabolite production. Overall, knowledge of how the microbiome responds to exogenous influence remains limited. We tabulate several important research questions and issues, exploration of which will generate both mechanistic insights and facilitate future psychobiotic development. We suggest the definition of psychobiotics be expanded beyond probiotics and prebiotics to include other means of influencing the microbiome.

Psychobiotics are beneficial bacteria (probiotics) or support for such bacteria (prebiotics) that influence bacteria–brain relationships.

Psychobiotics exert anxiolytic and antidepressant effects characterised by changes in emotional, cognitive, systemic, and neural indices. Bacteria–brain communication channels through which psychobiotics exert effects include the enteric nervous system and the immune system.

Current unknowns include dose-responses and long-term effects.

The definition of psychobiotics should be expanded to any exogenous influence whose effect on the brain is bacterially-mediated.



Outstanding Questions

What are the dose-response functions associated with psychobiotics?

What are the contributions of gut hormones in the mechanisms of action of prebiotics versus probiotics?

How do prebiotics and probiotics differ in terms of their impact on microbiome structure and relative abundance?

Are there undetected psychophysiological costs alongside the observed benefits of psychobiotics?

Does the brain adapt to long-term psychobiotic ingestion?

How do bacteria-derived blood metabolites affect the central nervous system, and how do psychobiotics modulate this relationship?

What is the time-course for emergence of various psychobiotic effects, and how long do they last?

Are there ceiling effects on psychobiotic benefits?

What are the functional implications of altered excitation–inhibition balance (due to alterations in GABA and glutamate concentrations) in specific brain regions?

Why do some strains of probiotic or prebiotic show effects while others do not, and are these linked to dosage?

Do neurotransmitters produced by gut bacteria modulate synaptic transmission in the proximal neurons of the enteric nervous system?

What is the direction of causality between systemic and central changes?

How do factors such as diet, genotype, sex, and age moderate the effects of psychobiotics?

Asian Journal of Psychiatry 22 (2016) 84–85

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Asian Journal of Psychiatry

journal homepage: www.elsevier.com/locate/ajp

Arpit Parmar
Department of Psychiatry, All India Institute of Medical Sciences, New Delhi, India

Editorial

Gut–brain axis, psychobiotics, and mental health

To conclude, change in the microbial content of the gut as a result of consumption of probiotics cause a variety of changes in human body which includes immune, endocrinal and nervous effects. Person's mood, cognition, behavior, and stress reactivity can potentially be altered using such probiotics (or rather pschobiotics). However, there is a dearth of literature to support its use in clinical practice. More detailed knowledge of gut microbiota along with development of specific probiotics will potentially help in developing more effective drug and diet based therapies for mental illnesses.

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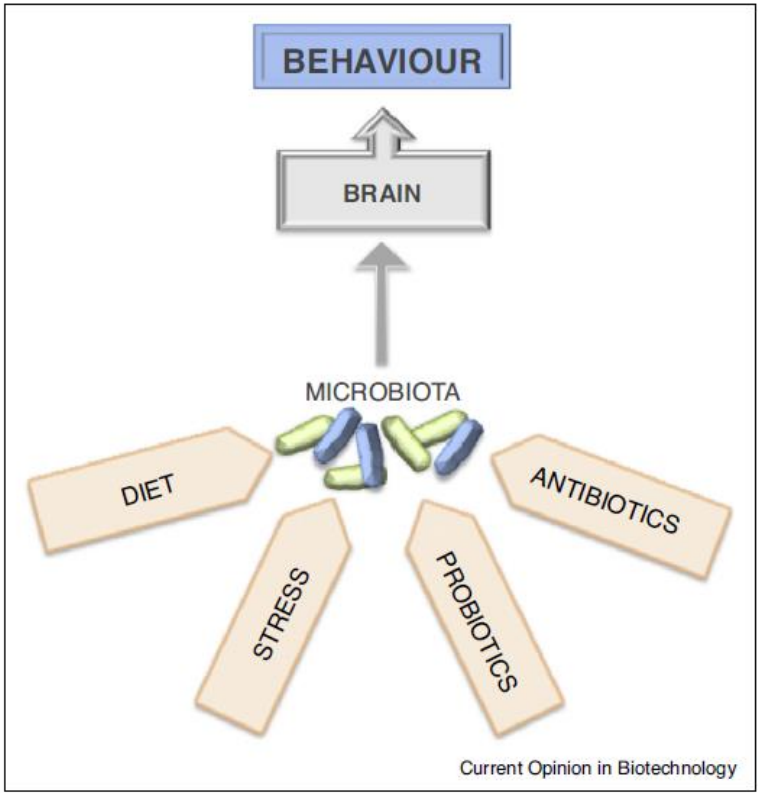
Current Opinion in Biotechnology 2015, 32:35–41

Current Opinion in Biotechnology

Gut brain axis: diet microbiota interactions and implications for modulation of anxiety and depression

Ruth Ann Luna[1,2] and Jane A Foster[3,4]

The human gut microbiome is composed of an enormous number of microorganisms, generally regarded as commensal bacteria. Without this inherent microbial community, we would be unable to digest plant polysaccharides and would have trouble extracting lipids from our diet. Resident gut bacteria are an important contributor to healthy metabolism and there is significant evidence linking gut microbiota and metabolic disorders such as obesity and diabetes. In the past few years, neuroscience research has demonstrated the importance of microbiota in the development of brain systems that are vital to both stress reactivity and stress-related behaviours. Here we review recent literature that examines the impact of diet-induced changes in the microbiota on stress-related behaviours including anxiety and depression.



Factors influencing the gut–brain axis via microbiota. As reviewed in the article, diet, stress, probiotics, and antibiotics can impact gut microbiota community to influence microbiota to brain pathways and thereby impact behaviour.

REVIEW

Psychosomatic Medicine, V 79 • 920-926 October 2017

Brain-Gut-Microbiota Axis and Mental Health

Timothy G. Dinan, MD, PhD, and John F. Cryan, PhD

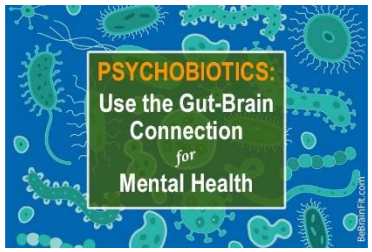
ABSTRACT

Objective: The brain-gut-microbiota axis has been put forward as a new paradigm in neuroscience, which may be of relevance to mental illness. The mechanisms of signal transmission in the brain-gut-microbiota axis are complex and involve bidirectional communications that enable gut microbes to communicate with the brain and the brain to communicate with the microbes. This review assesses the potential usefulness and limitations of the paradigm.

Methods: A selective literature review was conducted to evaluate the current knowledge in clinical and preclinical brain-gut-microbiota interactions as related to psychiatric disorders.

Results: Most published studies in the field are preclinical, and there is so far a lack of clinical studies. Preliminary studies in psychiatric populations support the view of a dysbiosis in some conditions, but studies are often small scale and marred by potential confounding variables. Preclinical studies support the view that psychobiotics ("bacteria which when ingested in adequate amounts have a positive mental health benefit") might be of use in treating some patients with mental health difficulties. To date, we have no well-conducted studies in clinical populations, although there are some studies in healthy volunteers. A cocktail of probiotics has been shown to alter brain activity as monitored by functional magnetic resonance imaging, and *Bifidobacterium longum* was reported to alter brain electrical activity.

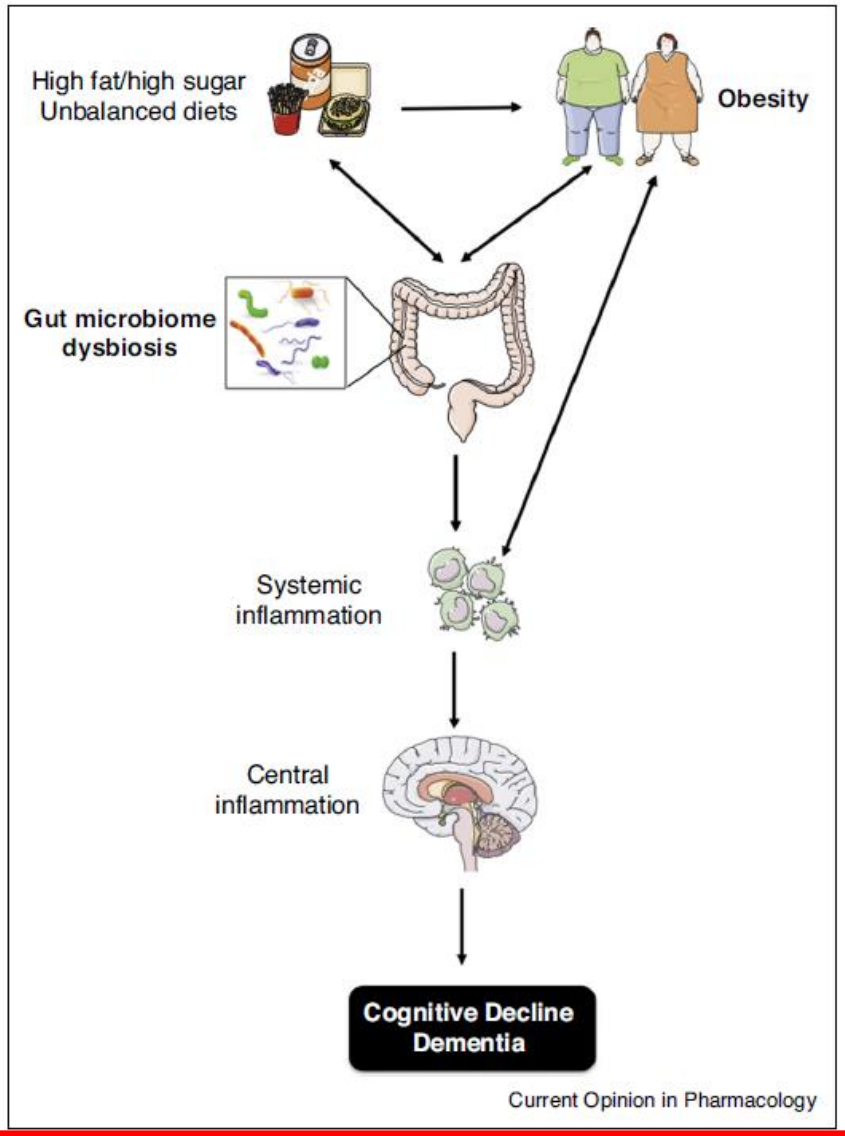
Conclusions: It has yet to be convincingly demonstrated that the exciting findings of psychobiotic efficacy demonstrated in preclinical models of psychiatric illness will translate to patients.

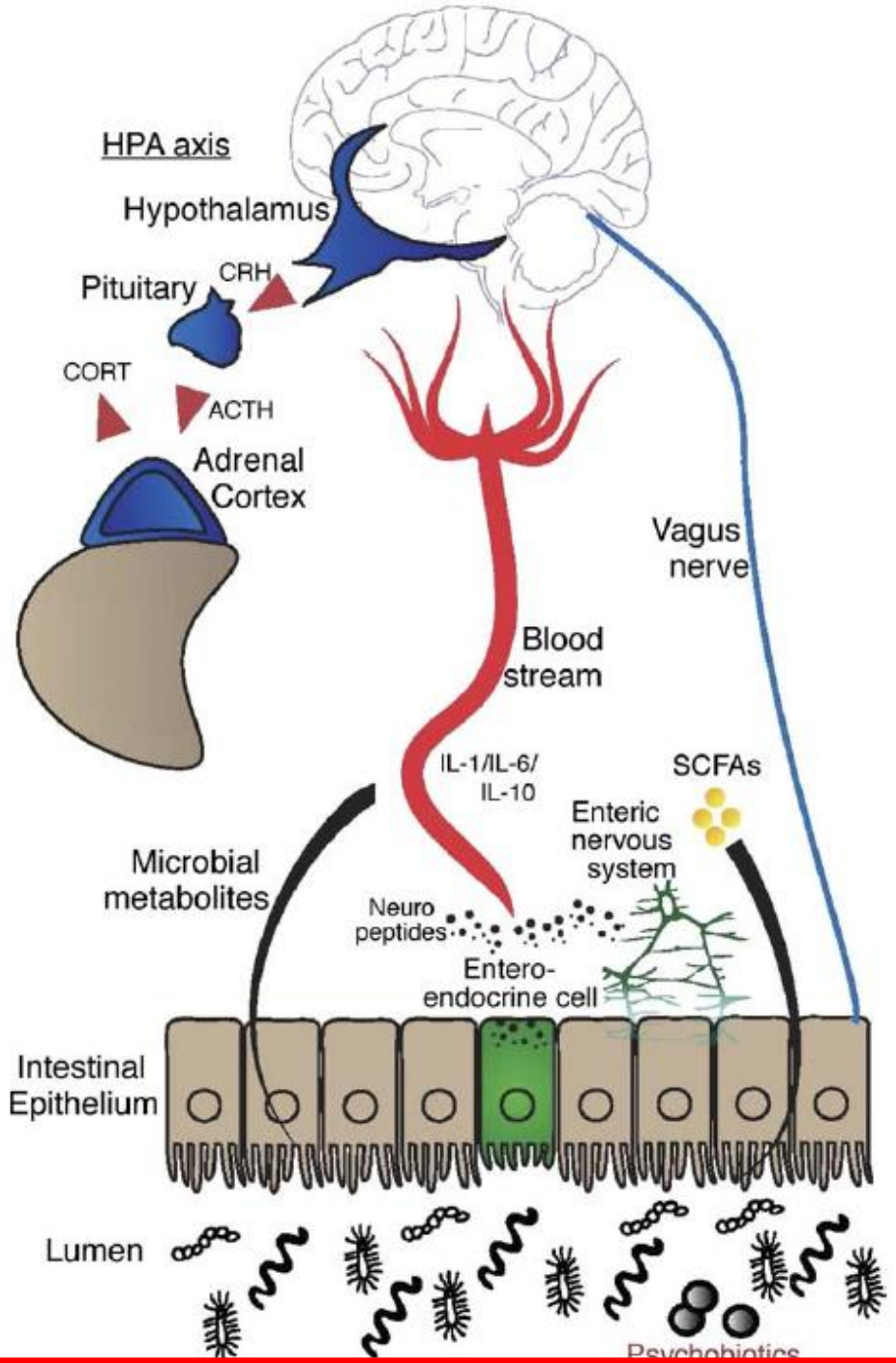


Until February 2017, there were 142 articles focusing on gut microbes and the brain, listed on PubMed. Twenty-three of these articles centered on gut microbes and mental illness, whereas 35 articles focused on psychobiotics. Taking a broader perspective, looking at probiotics and mental health, there were 50 articles. Of the 142 articles on the gut microbiota and the brain, 111 were reviews and 31 were experimental studies, of which only 4 were human studies. This latter fact pinpoints the current weakness of this nascent field.

REVIEW

Psychosomatic Medicine, V 79 • 920-926
October 2017





European Journal of Clinical Nutrition (2007) 61, 355–361

0954-3007/07 $30.00
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ORIGINAL ARTICLE

Impact of consuming a milk drink containing a probiotic on mood and cognition

D Benton, C Williams and A Brown

Department of Psychology, University of Wales Swansea, Wales, UK

Objective: The impact on mood and memory of consuming a probiotic containing milk drink, or a placebo, was examined as, previously, a poor mood has been found to correlate with the frequency of constipation.
Design: A double-blind placebo-controlled trial with random allocation of subjects.
Setting: Subjects went about their normal life in the community apart from three visits to the laboratory.
Subjects: One hundred and thirty-two healthy members of general population, mean age 61.8 years, volunteered in response to local media coverage. One hundred and twenty-four finished the trial.
Intervention: For a 3-week period, either a probiotic containing milk drink, or a placebo, were consumed daily. Mood and cognition were measured at baseline, and after 10 and 20 days of consumption.
Results: At baseline those who reported themselves to be less frequently constipated were more clearheaded, confident and elated. Although the taking of the probiotic did not generally change the mood, this appeared to be a reflection of the generally good mood in this sample. When those in the bottom third of the depressed/elated dimension at baseline were considered, they selectively responded by reporting themselves as happy rather than depressed after taking the probiotic. The intervention did not, however, influence the reported frequency of defaecation, probably a reflection of the initially low incidence of constipation. An unexpected and possibly chance finding was that the consumption of probiotics resulted in a slightly-poorer performance on two measures of memory.
Conclusions: The consumption of a probiotic-containing yoghurt improved the mood of those whose mood was initially poor. This improvement in mood was not, however, associated with an increased frequency of defaecation.
Sponsorship: Funded by Yakult, Japan.
European Journal of Clinical Nutrition (2007) **61**, 355–361. doi:10.1038/sj.ejcn.1602546; published online 6 December 2006

Keywords: constipation; depression; memory; mood; probiotic

Gastroenterology. 2013 June ; 144(7): . doi:10.1053/j.gastro.2013.02.043.

Consumption of Fermented Milk Product With Probiotic Modulates Brain Activity

KIRSTEN TILLISCH[1], JENNIFER LABUS[1], LISA KILPATRICK[1], ZHIGUO JIANG[1], JEAN STAINS[1], BAHAR EBRAT[1], DENIS GUYONNET[2], SOPHIE LEGRAIN–RASPAUD[2], BEATRICE TROTIN[2], BRUCE NALIBOFF[1], and EMERAN A. MAYER[1]

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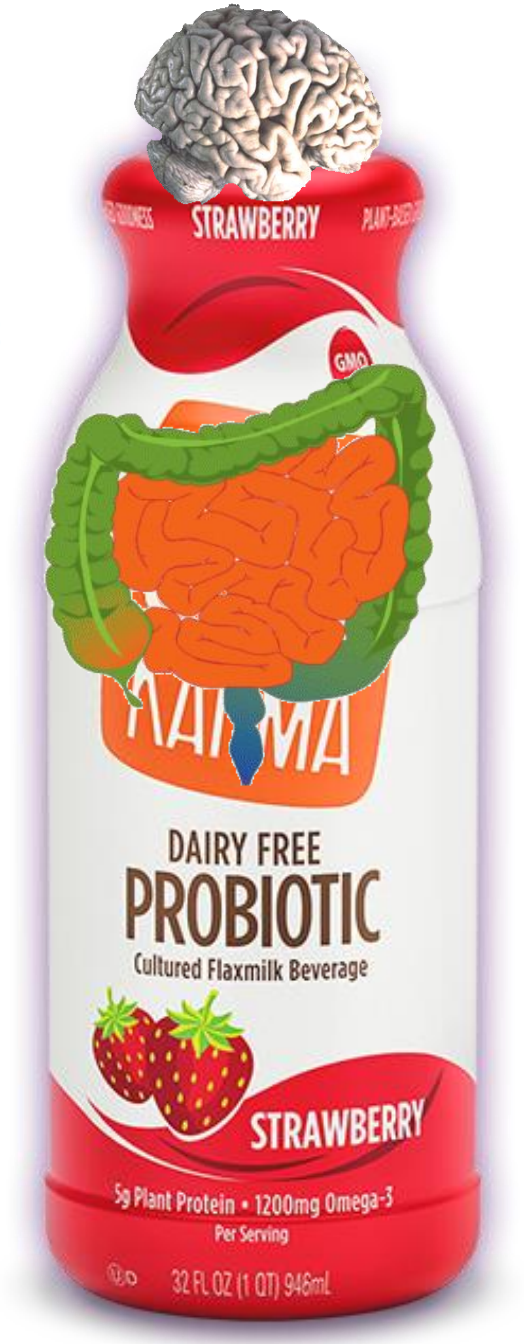

Abstract

BACKGROUND & AIMS—Changes in gut microbiota have been reported to alter signaling mechanisms, emotional behavior, and visceral nociceptive reflexes in rodents. However, alteration of the intestinal microbiota with antibiotics or probiotics has not been shown to produce these changes in humans. We investigated whether consumption of a fermented milk product with probiotic (FMPP) for 4 weeks by healthy women altered brain intrinsic connectivity or responses to emotional attention tasks.

METHODS—Healthy women with no gastrointestinal or psychiatric symptoms were randomly assigned to groups given FMPP (n = 12), a nonfermented milk product (n = 11, controls), or no intervention (n = 13) twice daily for 4 weeks. The FMPP contained *Bifidobacterium animalis* subsp *Lactis*, *Streptococcus thermophiles*, *Lactobacillus bulgaricus*, *and Lactococcus lactis* subsp *Lactis*. Participants underwent functional magnetic resonance imaging before and after the intervention to measure brain response to an emotional faces attention task and resting brain activity. Multivariate and region of interest analyses were performed.

RESULTS—FMPP intake was associated with reduced task-related response of a distributed functional network (49% cross-block covariance; $P = .004$) containing affective, viscerosensory, and somatosensory cortices. Alterations in intrinsic activity of resting brain indicated that ingestion of FMPP was associated with changes in midbrain connectivity, which could explain the observed differences in activity during the task.

CONCLUSIONS—Four-week intake of an FMPP by healthy women affected activity of brain regions that control central processing of emotion and sensation.

Gastroenterology. 2013 June ; 144(7): . doi:10.1053/j.gastro.2013.02.043.

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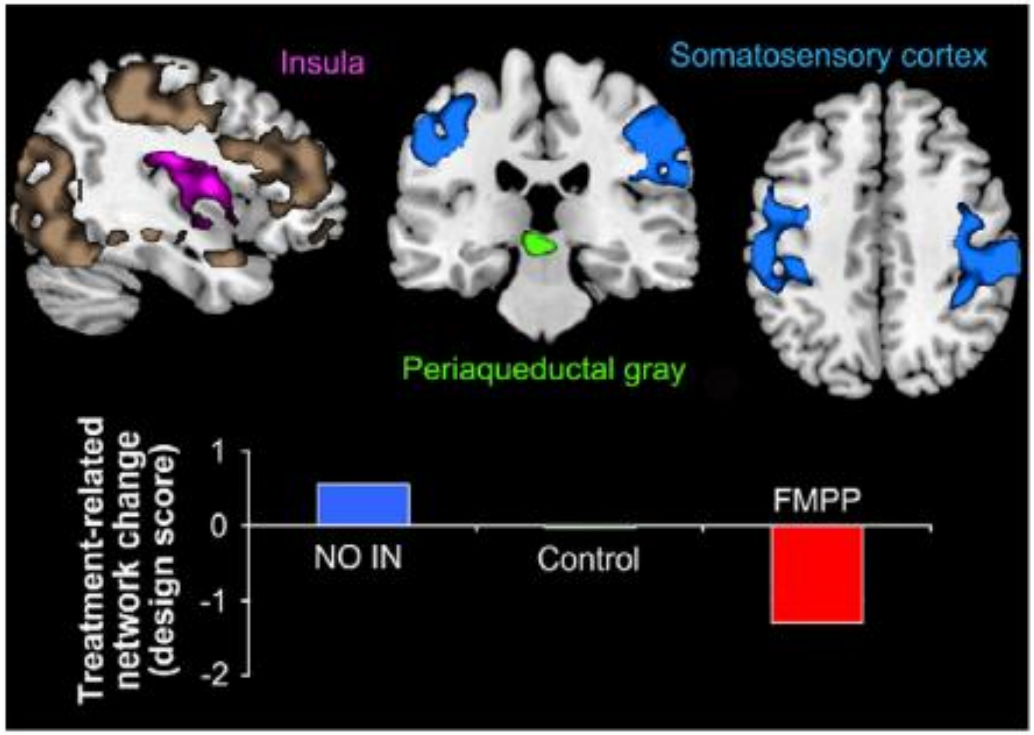
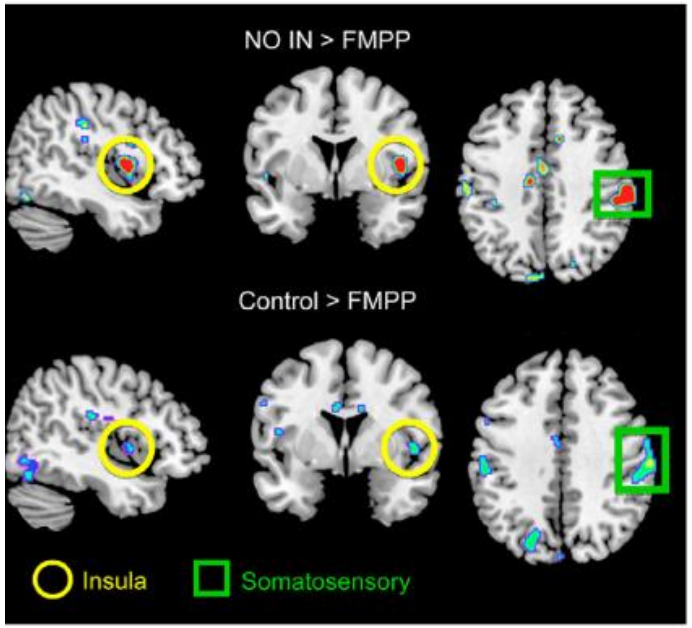
KIRSTEN TILLISCH[1], JENNIFER LABUS[1], LISA KILPATRICK[1], ZHIGUO JIANG[1], JEAN STAINS[1], BAHAR EBRAT[1], DENIS GUYONNET[2], SOPHIE LEGRAIN–RASPAUD[2], BEATRICE TROTIN[2], BRUCE NALIBOFF[1], and EMERAN A. MAYER[1]





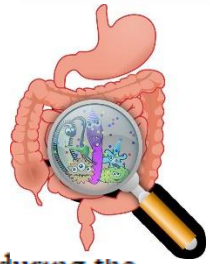


Figure 1.

A distributed network of brain regions showing decreases in the FMPP group during the emotional faces attention task is shown in the shaded regions. Three regions of interest selected from the network for study in the resting state are highlighted in *pink* (insula), *green* (periaqueductal gray), and *blue* (somatosensory regions). The change in network strength with intervention is depicted graphically.

Schroeder et al., 2018, Cell Host & Microbe *23*, 27–40
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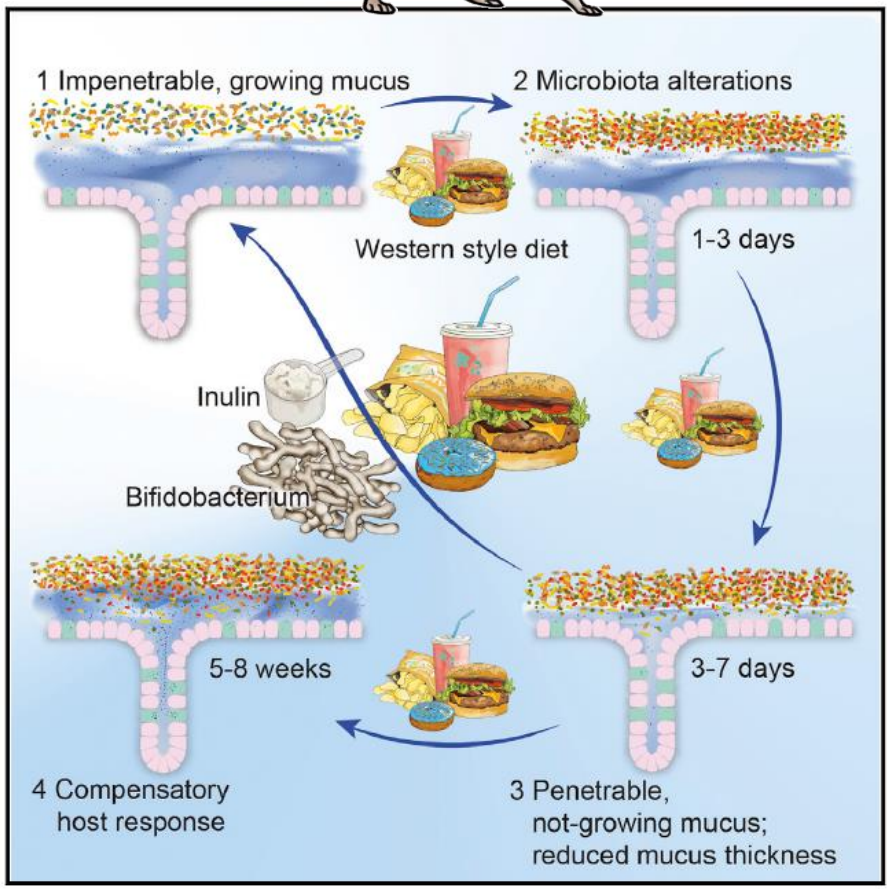
Bifidobacteria or Fiber Protects against Diet-Induced Microbiota-Mediated Colonic Mucus Deterioration

Bjoern O. Schroeder,[1] George M.H. Birchenough,[2] Marcus Ståhlman,[1] Liisa Arike,[2] Malin E.V. Johansson,[2] Gunnar C. Hansson,[2,*] and Fredrik Bäckhed[1,3,4,*]

SUMMARY

Diet strongly affects gut microbiota composition, and gut bacteria can influence the colonic mucus layer, a physical barrier that separates trillions of gut bacteria from the host. However, the interplay between a Western style diet (WSD), gut microbiota composition, and the intestinal mucus layer is less clear. Here we show that mice fed a WSD have an altered colonic microbiota composition that causes increased penetrability and a reduced growth rate of the inner mucus layer. Both barrier defects can be prevented by transplanting microbiota from chow-fed mice. In addition, we found that administration of *Bifidobacterium longum* was sufficient to restore mucus growth, whereas administration of the fiber inulin prevented increased mucus penetrability in WSD-fed mice. We hypothesize that the presence of distinct bacteria is crucial for proper mucus function. If confirmed in humans, these findings may help to better understand diseases with an affected mucus layer, such as ulcerative colitis.



www.nature.com/scientificreports/

Gut microbiota modulation accounts for the neuroprotective properties of anthocyanins

27 July 2018

Cláudia Marques[1,2], Iva Fernandes[3], Manuela Meireles[1,4], Ana Faria[1,2,5], Jeremy P. E. Spencer[6], Nuno Mateus[3] & Conceição Calhau[1,2]

High-fat (HF) diets are thought to disrupt the profile of the gut microbiota in a manner that may contribute to the neuroinflammation and neurobehavioral changes observed in obesity. Accordingly, we hypothesize that by preventing HF-diet induced dysbiosis it is possible to prevent neuroinflammation and the consequent neurological disorders. Anthocyanins are flavonoids found in berries that exhibit anti-neuroinflammatory properties in the context of obesity. Here, we demonstrate that the blackberry anthocyanin-rich extract (BE) can modulate gut microbiota composition and counteract some of the features of HF-diet induced dysbiosis. In addition, we show that the modifications in gut microbial environment are partially linked with the anti-neuroinflammatory properties of BE. Through fecal metabolome analysis, we unravel the mechanism by which BE participates in the bilateral communication between the gut and the brain. BE alters host tryptophan metabolism, increasing the production of the neuroprotective metabolite kynurenic acid. These findings strongly suggest that dietary manipulation of the gut microbiota with anthocyanins can attenuate the neurologic complications of obesity, thus expanding the classification of psychobiotics to anthocyanins.

Brain, Behavior, and Immunity 56 (2016) 140–155

Contents lists available at ScienceDirect

Brain, Behavior, and Immunity

journal homepage: www.elsevier.com/locate/ybrbi

Full-length Article

Cognitive impairment by antibiotic-induced gut dysbiosis: Analysis of gut microbiota-brain communication

Esther E. Fröhlich [a,*], Aitak Farzi [a], Raphaela Mayerhofer [a], Florian Reichmann [a], Angela Jačan [a], Bernhard Wagner [b], Erwin Zinser [b], Natalie Bordag [c], Christoph Magnes [d], Eleonore Fröhlich [e], Karl Kashofer [f], Gregor Gorkiewicz [f,g,h], Peter Holzer [a,*]

Emerging evidence indicates that disruption of the gut microbial community (dysbiosis) impairs mental health. Germ-free mice and antibiotic-induced gut dysbiosis are two approaches to establish causality in gut microbiota-brain relationships. However, both models have limitations, as germ-free mice display alterations in blood-brain barrier and brain ultrastructure and antibiotics may act directly on the brain. We hypothesized that the concerns related to antibiotic-induced gut dysbiosis can only adequately be addressed if the effect of intragastric treatment of adult mice with multiple antibiotics on (i) gut microbial community, (ii) metabolite profile in the colon, (iii) circulating metabolites, (iv) expression of neuronal signaling molecules in distinct brain areas and (v) cognitive behavior is systematically investigated. Of the antibiotics used (ampicillin, bacitracin, meropenem, neomycin, vancomycin), ampicillin had some oral bioavailability but did not enter the brain. 16S rDNA sequencing confirmed antibiotic-induced microbial community disruption, and metabolomics revealed that gut dysbiosis was associated with depletion of bacteria-derived metabolites in the colon and alterations of lipid species and converted microbe-derived molecules in the plasma. Importantly, novel object recognition, but not spatial, memory was impaired in antibiotic-treated mice. This cognitive deficit was associated with brain region-specific changes in the expression of cognition-relevant signaling molecules, notably brain-derived neurotrophic factor, N-methyl-D-aspartate receptor subunit 2B, serotonin transporter and neuropeptide Y system. We conclude that circulating metabolites and the cerebral neuropeptide Y system play an important role in the cognitive impairment and dysregulation of cerebral signaling molecules due to antibiotic-induced gut dysbiosis.

General Psychiatry

Effects of regulating intestinal microbiota on anxiety symptoms: A systematic review

General Psychiatry 2019;

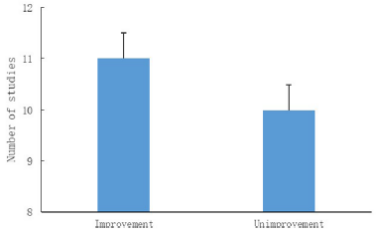
Beibei Yang, Jinbao Wei, Peijun Ju, Jinghong Chen

Background Anxiety symptoms are common in mental diseases and a variety of physical disorders, especially in disorders related to stress. More and more basic studies have indicated that gut microbiota can regulate brain function through the gut-brain axis, and dysbiosis of intestinal microbiota was related to anxiety. However, there is no specific evidence to support treatment of anxiety by regulating intestinal microbiota.

Aims To find evidence supporting improvement of anxiety symptoms by regulation of intestinal microbiota.

Methods This systematic review of randomised controlle trials was searched based on the following databases: PubMed, EMBASE, the Cochrane Library, OVID, Web of Knowledge, China National Knowledge Infrastructure (CNKI), Wanfang Data, VIP databases and SinoMed. The retrieval time dated back to 25 July 2018. Then we screened research literatures based on established inclusion and exclusion criteria. Quality evaluation for each included study was done using the Cochrane risk of bias and the Jadad scale.

Results A total of 3534 articles were retrieved and 21 studies were included which contained 1503 subjects. In the 21 studies, 14 chose probiotics as interventions to regulate intestinal microbiota and six chose non-probiotic ways such as adjusting daily diets. Probiotic supplements in seven studies contained only one kind of probiotic, two studies used a product that contained two kinds of probiotics and the supplements used in the other five studies included at least three kinds of probiotics. In the studies that used treatment as usual plus interventions regulating intestinal flora (IRIF) as interventions (five studies), only non-probiotic ways were effective (two studies), which means 40% of studies were effective; in the studies that used IRIF alone (16 studies, 11 studies used probiotic ways and 5 studies used non-probiotic ways), 56% of studies could improve anxiety symptoms, and 80% of studies that conducted the non-probiotic interventions were effective, while 45% of studies that used probiotic supplementations had positive effects on anxiety symptoms. Overall, 11 studies showed a positive effect on anxiety symptoms by regulating intestinal microbiota, which indicated 52% of the 21 studies were effective, and there were five studies that used probiotic supplements as interventions and six used non-probiotic interventions. In addition, it should be noted that six of seven studies showed that regulation of intestinal microbiota could treat anxiety symptoms, the rate of efficacy was 86%.



Conclusions We find that more than half of the studies included showed it was positive to treat anxiety symptoms by regulation of intestinal microbiota. There are two kinds of interventions (probiotic and non-probiotic interventions) to regulate intestinal microbiota, and it should be highlighted that the non-probiotic interventions were more effective than the probiotic interventions. More studies are needed to clarify this conclusion since we still cannot run meta-analysis so far.

International Journal of Food Microbiology 130 (2009) 117–121

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Impact of coffee consumption on the gut microbiota: A human volunteer study

Muriel Jaquet, Isabelle Rochat, Julie Moulin, Christophe Cavin, Rodrigo Bibiloni *

A B S T R A C T

The impact of a moderate consumption of an instant coffee on the general composition of the human intestinal bacterial population was assessed in this study. Sixteen (16) healthy adult volunteers consumed a daily dose of 3 cups of coffee during 3 weeks. Faecal samples were collected before and after the consumption of coffee, and the impact of the ingestion of the product on the intestinal bacteria as well as the quantification of specific bacterial groups was assessed using nucleic acid-based methods. Although faecal profiles of the dominant microbiota were not significantly affected after the consumption of the coffee (Dice's similarity index = 92%, $n = 16$), the population of *Bifidobacterium* spp. increased after the 3-week test period ($P = 0.02$). Moreover, in some subjects, there was a specific increase in the metabolic activity of *Bifidobacterium* spp. Our results show that the consumption of the coffee preparation resulting from water co-extraction of green and roasted coffee beans produce an increase in the metabolic activity and/or numbers of the *Bifidobacterium* spp. population, a bacterial group of reputed beneficial effects, without major impact on the dominant microbiota.

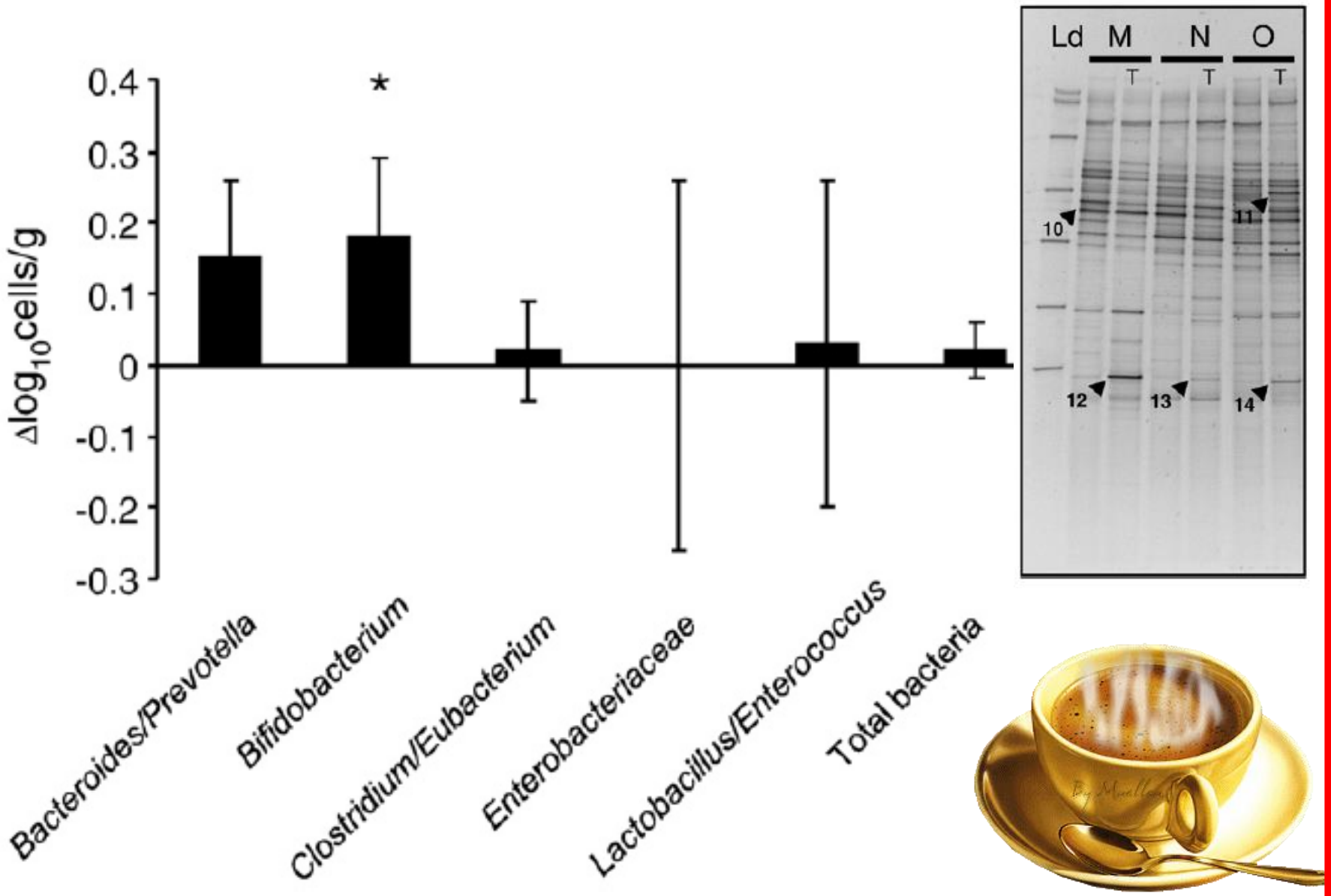


Fig. 2. Increments in bacterial numbers for selected groups after the consumption of coffee. Bacterial counts were determined using FISH technology (P=0.02).

A nuestra microbiota también le gusta el chocolate

El chocolate ocupa un lugar privilegiado entre los alimentos considerados como más tentadores. Este alimento de los dioses, como bien reza su nombre latino Theobroma cacao, atribuido por el ilustre nosólogo sueco Carl Linnaeus en 1753, ha pasado a ostentar

El **chocolate** ocupa un lugar privilegiado entre los alimentos considerados como más tentadores. Este alimento de los dioses, como bien reza su nombre latino *Theobroma cacao*, atribuido por el ilustre nosólogo sueco Carl Linnaeus en 1753, ha pasado a ostentar en muchos países del mundo la categoría de medicamento curativo, delicia culinaria, e incluso moneda de cambio en operaciones comerciales, manteniendo este estatus a lo largo de los siglos. **A ningún otro producto natural se le ha atribuido nunca esa facultad de aliviar males tan diversos como los dolores intestinales o menstruales, o las fiebres y enfermedades cardiovasculares, o incluso potenciar la fuerza de quienes pretendan triunfar militar o sexualmente**. Las crónicas acerca de los beneficios del chocolate para la salud se remontan a las prácticas médicas de los Aztecas y los Mayas, y desde entonces abundan las anécdotas sobre el efecto del chocolate en la salud.

The Journal of Nutritional Biochemistry
Available online 14 September 2021, 108854
In Press, Journal Pre-proof

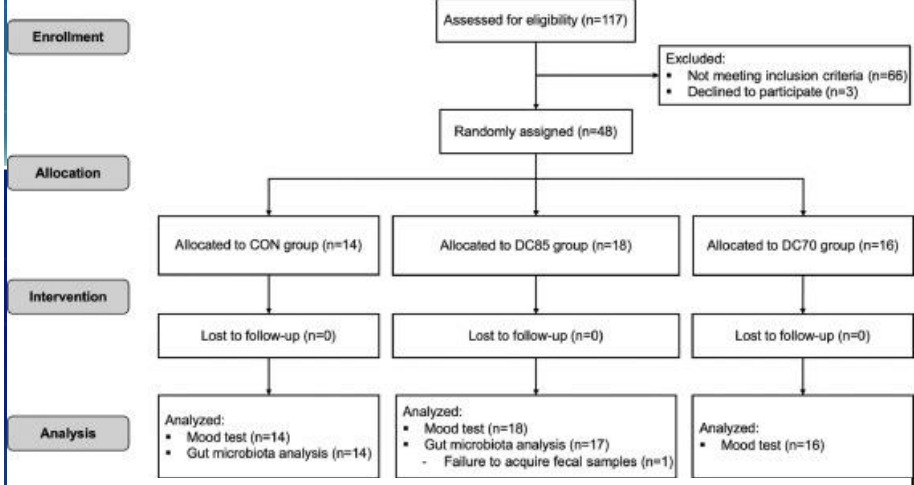
Research Paper

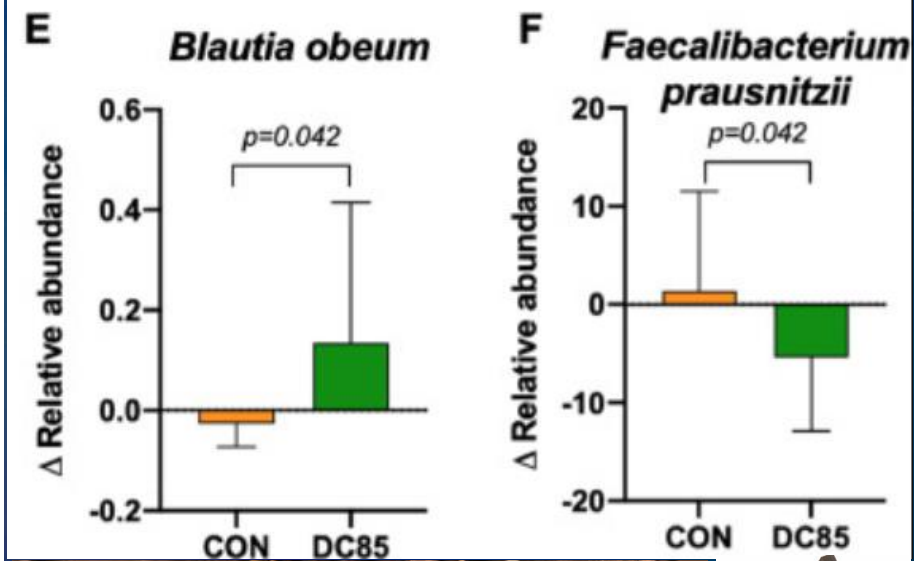
Consumption of 85% cocoa dark chocolate improves mood in association with gut microbial changes in healthy adults: a randomized controlled trial

Ji-Hee Shin [a, b, 1], Chong-Su Kim [a, 1], Lina Cha [a, 1], Sojeong Kim [a], Seokoh Lee [a], Suyeon Chae [a], Woo Young Chun [c] ✉, Dong-Mi Shin [a, d] ✉

Abstract

Dark chocolate has long been recognized for its mood-altering properties; however, the evidence regarding the emotional effects of daily dark chocolate intake is limited. Therefore, we aimed to investigate the effects of dark chocolate intake on mood in everyday life, with special emphasis on the gut-brain axis. Two different dark chocolates (85% and 70% cocoa content) were tested in this study. In a randomized controlled trial, healthy adults (20-30 y) consumed either 30 g/d of 85% cocoa chocolate (DC85, n=18); 70% cocoa chocolate (DC70, n=16); or no chocolate (control group, CON; n=14); for 3 weeks. Mood states were measured using the Positive and Negative Affect Schedule (PANAS). Daily consumption of dark chocolate significantly reduced negative affect in DC85, but not in DC70. To assess the association between the mood-altering effects of dark chocolate and the gut microbiota, we performed fecal 16S rRNA sequencing analysis for the DC85 and CON groups. Gut microbial diversity was significantly higher in DC85 than CON ($p < 0.05$). *Blautia obeum* levels were significantly elevated and *Faecalibacterium prausnitzii* levels were reduced in DC85 compared to CON ($p < 0.05$). Furthermore, we found that the observed changes in negative affect scores were negatively correlated with diversity and relative abundance of *Blautia obeum* ($p < 0.05$). These findings indicate that dark chocolate exerts prebiotic effects, as evidenced by its ability to restructure the diversity and abundance of intestinal bacteria; thus, it may improve negative emotional states via the gut-brain axis.





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Brain, Behavior, and Immunity

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Brain, Behavior, and Immunity 48 (2015) 258–264

A randomized controlled trial to test the effect of multispecies probiotics on cognitive reactivity to sad mood ☆

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Probiotics
Depression
Cognitive reactivi

ABSTRACT

Background: Recent insights into the role of the human microbiota in cognitive and affective functioning have led to the hypothesis that probiotic supplementation may act as an adjuvant strategy to ameliorate or prevent depression. *Objective*: Heightened cognitive reactivity to normal, transient changes in sad mood is an established marker of vulnerability to depression and is considered an important target for interventions. The present study aimed to test if a multispecies probiotic containing *Bifidobacterium bifidum* W23, *Bifidobacterium lactis* W52, *Lactobacillus acidophilus* W37, *Lactobacillus brevis* W63, *Lactobacillus casei* W56, *Lactobacillus salivarius* W24, and *Lactococcus lactis* (W19 and W58) may reduce cognitive reactivity in non-depressed individuals. *Design*: In a triple-blind, placebo-controlled, randomized, pre- and post-intervention assessment design, 20 healthy participants without current mood disorder received a 4-week probiotic food-supplement intervention with the multispecies probiotics, while 20 control participants received an inert placebo for the same period. In the pre- and post-intervention assessment, cognitive reactivity to sad mood was assessed using the revised Leiden index of depression sensitivity scale. *Results*: Compared to participants who received the placebo intervention, participants who received the 4-week multispecies probiotics intervention showed a significantly reduced overall cognitive reactivity to sad mood, which was largely accounted for by reduced rumination and aggressive thoughts. *Conclusion*: These results provide the first evidence that the intake of probiotics may help reduce negative thoughts associated with sad mood. Probiotics supplementation warrants further research as a potential preventive strategy for depression.

MINIREVIEW

Journal of Microbiology (2018) Vol. 56, No. 9, pp. 601–613
DOI 10.1007/s12275-018-8079-2

New perspectives of *Lactobacillus plantarum* as a probiotic: The gut-heart-brain axis

Yen-Wenn Liu[1,2], Min-Tze Liong[3*], and Ying-Chieh Tsai[1,2*]

[1]*Institute of Biochemistry and Molecular Biology, National Yang-Ming University, Taipei 11221, Taiwan*

Lactobacillus plantarum **is a non-gas-producing lactic acid bacterium that is generally regarded as safe (GRAS) with Qualified Presumption of Safety (QPS) status. Although traditionally used for dairy, meat and vegetable fermentation, *L. plantarum* is gaining increasing significance as a probiotic. With the newly acclaimed gut-heart-brain axis, strains of *L. plantarum* have proven to be a valuable species for the development of probiotics, with various beneficial effects on gut health, metabolic disorders and brain health. In this review, the classification and taxonomy, and the relation of these with safety aspects are introduced. Characteristics of *L. plantarum* to fulfill the criteria as a probiotic are discussed. Emphasis are also given to the beneficial functions of *L. plantarum* in gut disorders such as inflammatory bowel diseases, metabolic syndromes, dyslipidemia, hypercholesteromia, obesity, and diabetes, and brain health aspects involving psychological disorders.**

The Role of Nutrition and the Gut-Brain Axis in Psychiatry: A Review of the Literature

Review

Neuropsychobiology
DOI: 10.1159/000492834

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Received: May 19, 2018
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Keywords
Nutrition · Psychiatry · Depression · Diet · Nutrients · Gut microbiome · Gut-brain axis · Mediterranean diet

Abstract

Introduction: Individuals suffering from psychiatric disorders experience high levels of illness burden and a significantly reduced quality of life. Despite targeted psychopharmacological strategies and complementary psychotherapeutic procedures only moderate effects are obtained, and the risk of relapse is high in many patients. Worldwide, psychiatric diseases such as depression are continuously increasing, challenging the personal life of the affected as well as their families, but also whole societies by increasing disability, early retirement and hospitalization. According to current scientific knowledge psychiatric disorders are caused by a multifactorial pathogenesis, including genetics, inflammation and neurotransmitter imbalance; furthermore, also lifestyle-associated factors gain rising importance. In line with this, there is growing evidence that the gut microbiota and nutrition have an impact on the onset and course of psychiatric disorders. ***Aim:*** This narrative review highlights the important role of nutrition in psychiatric care and underlines the significance of nutritional advice in the multifactorial, biopsychosocial treatment of patients. It focuses on current dietary interventions such as the Mediterranean diet, dietary supplements and modifications of the gut microbiota with pre-, pro- and postbiotics. ***Results:*** Recent studies support the connection between the quality of diet, gut microbiota and mental health through regulation of metabolic functions, anti-inflammatory and antiapoptotic properties and the support of neurogenesis. Dietary coaching to improve mental health seems to be an additional, cost-effective, practical, nonpharmacological intervention for individuals with psychiatric disorders. ***Conclusion:*** The use of nutritional interventions in psychiatry equips therapists with a promising tool for both the prevention and treatment of psychiatric disorders. Besides pharmacological therapy, psychotherapy and physical activity, nutritional interventions are an important pillar in the multifactorial, biopsychosocial treatment of psychiatric disease and could be used as a potential therapeutic target.

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journal homepage: www.annalsofepidemiology.org

The Microbiome and Epidemiology

Brain-gut-microbiota axis: challenges for translation in psychiatry

John R. Kelly MD [a,b], Gerard Clarke PhD [a,b], John F. Cryan PhD [a,c], Timothy G. Dinan MD, PhD [a,b,*]

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Gut microbiota
Brain-gut axis
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ABSTRACT

Purpose: The accruing data linking the gut microbiome to the development and function of the central nervous system has been proposed as a paradigm shift in neuroscience. The gut microbiota can communicate with the brain via neuroimmune, neuroendocrine, and neural pathways comprising the brain-gut-microbiota axis. Dysfunctional neuroimmune pathways are implicated in stress-related psychiatric disorders.

Methods: Using depression as our primary example, we review both the preclinical and clinical evidence supporting the possible role played by the gut microbiota in stress-related psychiatric disorders. We consider how this can inform future treatment strategies and outline the challenges and necessary studies for moving the field forward.

Results: The role played by the gut microbiota has not been fully elucidated in psychiatric populations. Although tempting to speculate that psychiatric patients may benefit from therapeutic modulation of the brain-gut-microbiota axis, the translational applications of the results obtained in rodent studies have yet to be demonstrated.

Conclusions: Evidence of altered gut microbiota composition and function in psychiatric patients is limited and cannot be regarded as proven. Moreover the efficacy of targeting the gut microbiota has not yet been established, and needs further investigation.

LA DIETA MEDITERRANEA

Review

Clinical Nutrition

Feeding melancholic microbes: MyNewGut recommendations on diet and mood

Timothy G. Dinan [a, b, *], Catherine Stanton [a, c], Caitriona Long-Smith [a], Paul Kennedy [a], John F. Cryan [a, f], Caitlin S.M. Cowan [a], María Carmen Cenit [d], Jan-Willem van der Kamp [e], Yolanda Sanz [d]

Accepted 12 November 2018

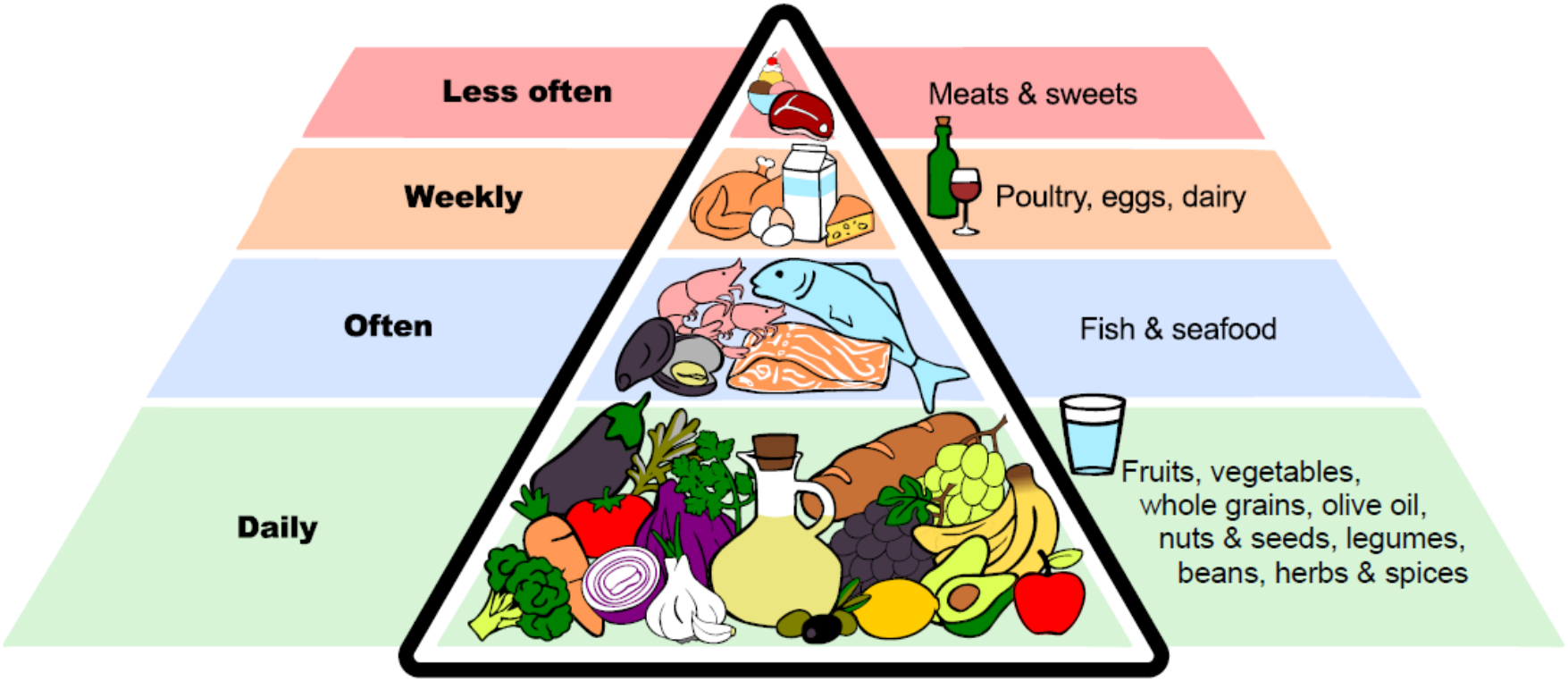


Fig. 2. Illustrates a food pyramid optimal for mental health.

La nueva pirámide alimentaria

Suplementos / complementos dietéticos o nutricionales (vitamina D, folatos, levadura de cerveza, funcionales, etc.): opción individualizada con consejo dietético profesional.

CONSUMO OPCIONAL, OCASIONAL Y MODERADO

- Dulces, bollería, grasas untables, snacks salados
- Carnes rojas, procesadas y embutidos

Bebidas fermentadas: Consumo opcional, moderado y responsable **Adultos**

CONSUMO VARIADO DIARIO

- Lácteos: 2-3 al día
- Pescados, carnes magras, carnes blancas, legumbres, frutos secos, huevos 1-3 al día (alternar)

GRUPOS DE CONSUMO EN CADA COMIDA PRINCIPAL

- Verduras y hortalizas: 2-3 al día
- Frutas: 3-4 al día
- Aceite de oliva virgen extra
- Pan de harina de cereales de grano entero, pasta integral, arroz integral, patatas, castañas, legumbres tiernas **Según grado de actividad física**

Actividad física diaria 60 minutos | Equilibrio emocional | Balance energético | Técnicas culinarias saludables | AGUA: 4-6 vasos al día* * Ingesta de líquidos según la Pirámide de la Hidratación Saludable SENC

- Mantener estilos de vida saludables

SOSTENIBILIDAD

THE MICROBIOME DIET

FOODS TO EAT

Fresh vegetables
beets, carrots, cruciferous veggies, leafy greens, onions, peas, salad greens, sea vegetables, squash

Whole pieces
apples, blackberries, blueb nectarines, oranges, pears, plums, pomegranates

Herbs, spices and teas
turmeric, ginger, basil, oregano, thyme, green tea, organic coffee

Probiotic foods
yogurt, kefir, kombucha, kvass, cultured veggies

Wild-caught fish, cage-free eggs and grass-fed/pasture-raised meat

Healthy fats
grass-fed butter, coconut oil, extra virgin olive oil, nuts/seeds

Ancient grains and legumes/beans
Ansazi beans, adzuki beans, black beans, black-eyed peas, chickpeas, lentils, black rise, amaraneth, buckwheat, quinoa

Red wine and dark chocolate/cocoa
(in moderation)

Tempeh

Skyr

Yogur

Miso

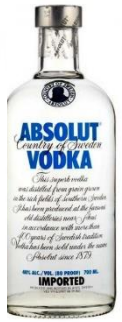
How to Make
Kimchi

FOODS TO AVOID

Refined vegetable oils
canola, corn, soybean

Refined carbohydrates and processed grain products

Pasteurized dairy products



Conventional meat, poultry and eggs

Added sugars
packaged snacks, breads, condiments, canned items, cereals

Trans fats/ hydrogenated fats
packaged/processed products, fried foods

Bolte LA, *et al*. *Gut* 2021;**70**:1287–1298.

OPEN ACCESS

Original research

Long-term dietary patterns are associated with pro-inflammatory and anti-inflammatory features of the gut microbiome

Laura A Bolte ,[1,2] Arnau Vich Vila ,[1,2] Floris Imhann,[1,2] Valerie Collij,[1,2] Ranko Gacesa,[1,2] Vera Peters,[1] Cisca Wijmenga,[2] Alexander Kurilshikov,[2] Marjo J E Campmans-Kuijpers,[1] Jingyuan Fu,[2,3] Gerard Dijkstra,[1] Alexandra Zhernakova,[2] Rinse K Weersma [1]

Significance of this study

How might it impact on clinical practice in the foreseeable future?

- Modulation of gut microbiota through diets enriched in vegetables, legumes, grains, nuts and fish and a higher intake of plant over animal foods, has a potential to prevent intestinal inflammatory processes at the core of many chronic diseases.
- Whole food-based dietary patterns could increase the anti-inflammatory capacity of nutrients through synergistic effects on the gut microbiome.
- Sources of n-3 PUFAs (omega-3 polyunsaturated fatty acids) and polyphenols may be used to potentiate the abundance of SCFA-producers.
- Replacement of animal protein by plant protein has a potential to reduce intestinal inflammatory processes by targeting microbial pathways involved.

Significance of this study

What is already known on this subject?

- Western diet and low-grade intestinal inflammation are implicated in a growing number of immune-mediated inflammatory diseases.
- Diet quantity, content and timing play a major role in shaping gut microbial composition and function.
- Dysbiosis, shifts in metabolites and translocation of microbial products contribute to immune activation.
- Research has been focused on anti-inflammatory properties of isolated compounds, with limited efficacy.

What are the new findings?

- Diet-gut microbiome associations are consistent across patients with intestinal disease (Crohn's disease, UC, IBS) and the general population.
- Higher intake of animal foods, processed foods, alcohol and sugar, corresponds to a microbial environment that is characteristic of inflammation, and is associated with higher levels of intestinal inflammatory markers.
- Plant-based foods are linked to short-chain fatty acid (SCFA)-producers, microbial metabolism of polysaccharides and a lower abundance of pathobionts.

Annals of Epidemiology 30 (2019) 66–70

Contents lists available at ScienceDirect

Annals of Epidemiology

Brief communication

Kombucha: a systematic review of the empirical evidence of human health benefit

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ARTICLE INFO

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Human
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Review

ABSTRACT

Purpose: Kombucha tea, a fermented beverage, has recently become popular in the United States as part of the functional food movement. This popularity is likely driven by its touted health benefits, coupled with the recent scientific movement investigating the role of the microbiome on human health. The purpose of this systematic review is to describe the literature related to empirical health benefits of kombucha as identified from human subjects research.

Methods: In July 2018, we searched the term "kombucha" for all document types in the following databases across all available years: PubMed, Scopus, and Ovid. To identify federal research grants related to kombucha, we searched the National Institutes of Health Research Portfolio Online Reporting Tools. Finally, to identify ongoing human subjects research, we searched clinicaltrials.gov and clinicaltrialsregister.eu. We reviewed a total of 310 articles.

Results: We found one study reporting the results of empirical research on kombucha in human subjects. We found no results for kombucha in Research Portfolio Online Reporting Tools, clinicaltrials.gov, or clinicaltrialsregister.eu.

Conclusions: The nonhuman subjects literature claims numerous health benefits of kombucha; it is critical that these assertions are tested in human clinical trials. Research opportunities are discussed.

Yogurt, cultured fermented milk, and health: a systematic review

Dennis A. Savaiano and Robert W. Hutkins

Consumption of yogurt and other fermented products is associated with improved health outcomes. Although dairy consumption is included in most dietary guidelines, there have been few specific recommendations for yogurt and cultured dairy products. A qualitative systematic review was conducted to determine the effect of consumption of fermented milk products on gastrointestinal and cardiovascular health, cancer risk, weight management, diabetes and metabolic health, and bone density using PRISMA guidelines. English language papers in PubMed were searched, with no date restrictions. In total, 1057 abstracts were screened, of which 602 were excluded owing to lack of appropriate controls, potential biases, and experimental design issues. The remaining 455 papers were independently reviewed by both authors and 108 studies were included in the final review. The authors met regularly to concur, through consensus, on relevance, methods, findings, quality, and conclusions. The included studies were published between 1979 and 2017. From the 108 included studies, 76 reported a favorable outcome of fermented milks on health and 67 of these were considered to be positive or neutral quality according to the Academy of Nutrition and Dietetics' Quality Criteria Checklist. Of the 32 remaining studies, the study outcomes were either not significant (28) or unfavorable (4), and most studies (18) were of neutral quality. A causal relationship exists between lactose digestion and tolerance and yogurt consumption, and consistent associations exist between fermented milk consumption and reduced risk of breast and colorectal cancer and type 2 diabetes, improved weight maintenance, and improved cardiovascular, bone, and gastrointestinal health. Further, an association exists between prostate cancer occurrence and dairy product consumption in general, with no difference between fermented and unfermented products. This article argues that yogurt and other fermented milk products provide favorable health outcomes beyond the milk from which these products are made and that consumption of these products should be encouraged as part of national dietary guidelines.

Systematic review registration: PROSPERO registration no. CRD42017068953.


Mi desayuno pre y
probiótico desde 2010
NATURAL
KEFIR
consum
Zumo DE
Granada
SIN AZÚCAR AÑADIDO
Kombucha
ORGANIC KOMBUCHA
Berryvida
FRUTOS ROJOS

Llega el primer probiótico marino y es español

Es un complemento alimenticio, aliado del sistema digestivo, a base de agua de mar isotónica, cultivos vivos de microorganismos intestinales y calcio. Se vende online

Es un **complemento alimenticio a base de agua de mar isotónica, probióticos y calcio.** Se compone de dos partes fundamentales: una primera de 800 mg mezcla de probióticos; y una segunda con **25 ml de agua de mar isotónica**. La combinación de ambas especialidades en un único suplemento oral lo convierte en el primer probiótico con agua de mar existente en el mercado. Además, las especies probióticas que conforman la mezcla utilizada (Lactobacillus rhamnosus y Kluyveromyces marxianus) han sido **aisladas a partir de la microbiota intestinal de sujetos sanos.**

ALCOHOL RESEARCH: *Current Reviews*

Alcohol and Gut-Derived Inflammation

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Faraz Bishehsari, M.D., Ph.D., is an Assistant Professor; Garth Swanson, M.D., is an Assistant Professor; Vishal Desai, M.D., is a Physician; Robin M. Voigt, Ph.D., is an Assistant Professor; Christopher B. Forsyth, Ph.D., is an Associate Professor; and Ali Keshavarzian, M.D., is a Professor, all in the Department of Internal Medicine, Division of Gastroenterology, Rush University Medical Center, Chicago, Illinois.

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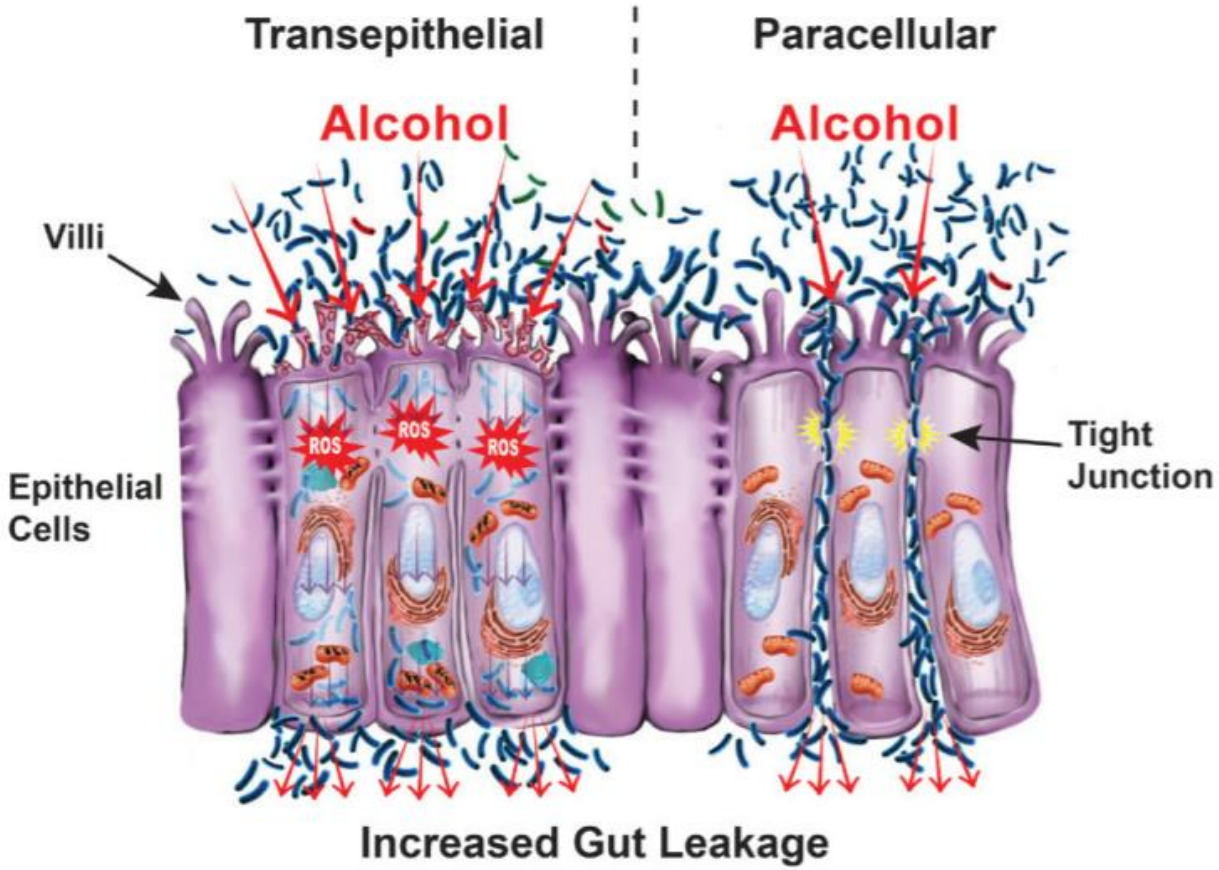
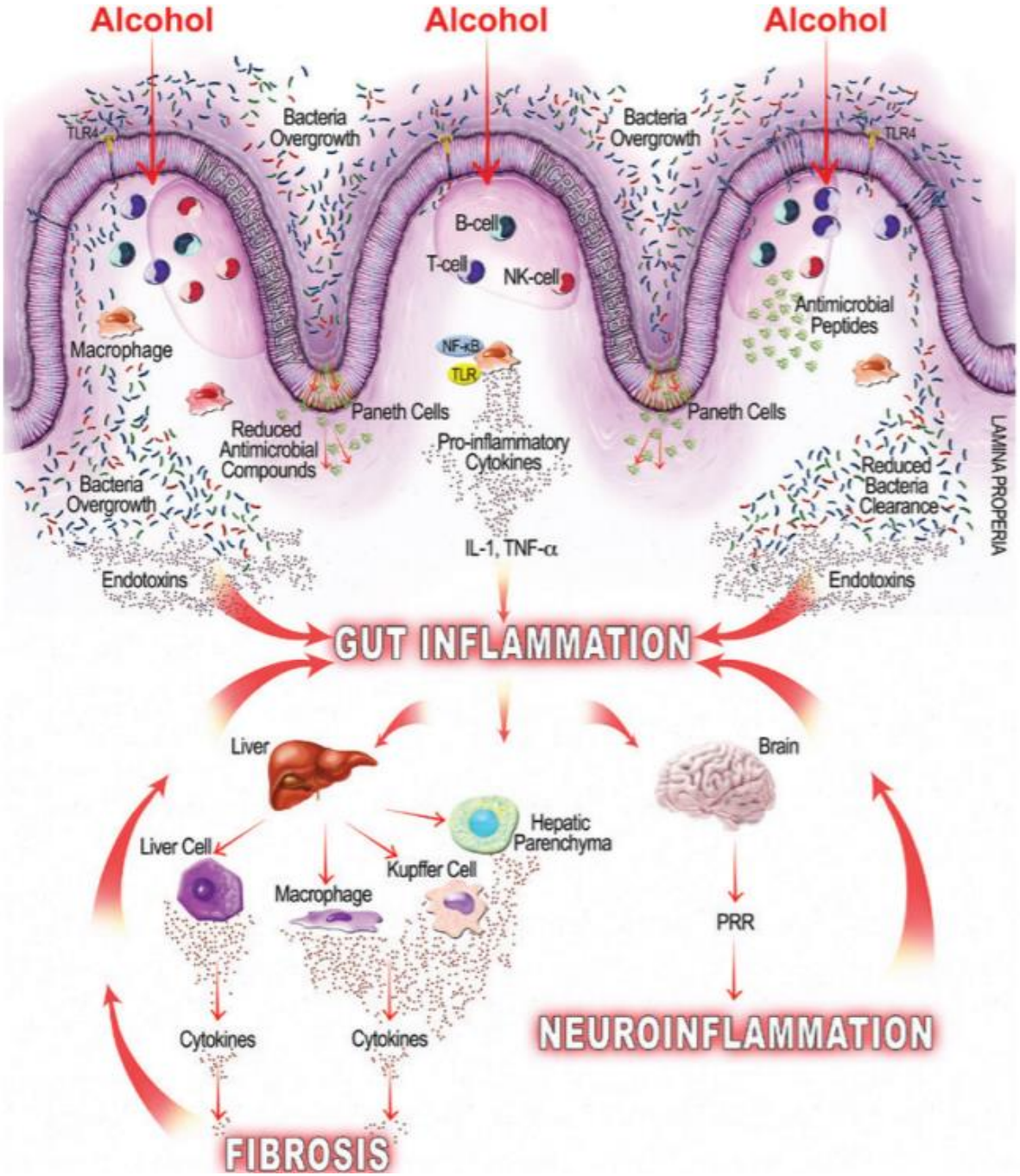
In large amounts, alcohol and its metabolites can overwhelm the gastrointestinal tract (GI) and liver and lead to damage both within the GI and in other organs. Specifically, alcohol and its metabolites promote intestinal inflammation through multiple pathways. That inflammatory response, in turn, exacerbates alcohol-induced organ damage, creating a vicious cycle and leading to additional deleterious effects of alcohol both locally and systemically. This review summarizes the mechanisms by which chronic alcohol intake leads to intestinal inflammation, including altering intestinal microbiota composition and function, increasing the permeability of the intestinal lining, and affecting the intestinal immune homeostasis. Understanding the mechanisms of alcohol-induced intestinal inflammation can aid in the discovery of therapeutic approaches to mitigate alcohol-induced organ dysfunctions.

Key words: Alcohol consumption; alcohol use, abuse, and dependence; chronic alcohol use; organ damage; gastrointestinal (GI) tract; liver; metabolites; gut-derived inflammation; intestinal inflammation; intestinal microbiota



La barrera intestinal regula el paso de materiales entre el interior del intestino y las células y los vasos sanguíneos en el otro lado de la capa de células epiteliales que recubre el interior del intestino. El alcohol interrumpe la barrera intestinal, aumentando su permeabilidad, de dos maneras: a través de mecanismos **transepiteliales** (células a la izquierda), que permiten que el material pasen directamente a través de las células epiteliales y los mecanismos **paracelulares** que permiten que el material pase a través de las uniones entre las células epiteliales.

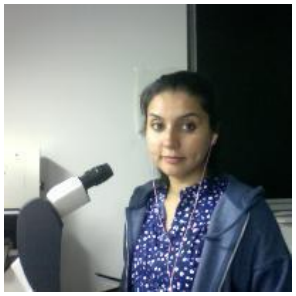
El alcohol y sus metabolitos desencadenan mecanismos transepiteliales al dañar las células directamente y debilitar las membranas celulares a través de varios mecanismos, incluido el estrés oxidativo causado por especies reactivas de oxígeno (ROS). Los metabolitos del alcohol desencadenan mecanismos paracelulares al alterar las proteínas que crean las uniones estrechas que unen las células y las proteínas que estabilizan los citoesqueletos de las células. El aumento de la permeabilidad de la barrera intestinal permite que las bacterias y las toxinas abandonen el intestino y se infiltren en otros órganos a través del torrente sanguíneo.



El alcohol puede inducir inflamación intestinal través de una cascada de mecanismos que posteriormente conducen a la inflamación, en particular en el hígado y el cerebro, permitiendo que las bacterias se filtren y liberen endotoxinas. El alcohol también produce una inmunosupresión de la mucosa colónica, suprimiendo uno de las principales líneas de defensa del intestino contra bacterias (células de Paneth) que secretan compuestos antibacterianos. Las células de Paneth suprimidas secretan menos compuestos antibacterianos, que puede permitir el crecimiento excesivo de bacterias intestinales adicionales y permitir la entrada de endotoxinas a través de la barrera intestinal, causando una liberación de citocinas proinflamatorias. Las endotoxinas y las citocinas pueden ingresar al hígado, interactuando directamente con hepatocitos y con las células inmunes del hígado, lo que provoca la liberación local de citocinas que conduce a la fibrosis y causa adicional inflamación. La inflamación intestinal también puede propagar endotoxinas.

Feeding the microbiota-gut-brain axis: diet, microbiome, and neuropsychiatry

KIRAN V. SANDHU, EOIN SHERWIN, HARRIËT SCHELLEKENS, CATHERINE STANTON, TIMOTHY G. DINAN, and JOHN F. CRYAN



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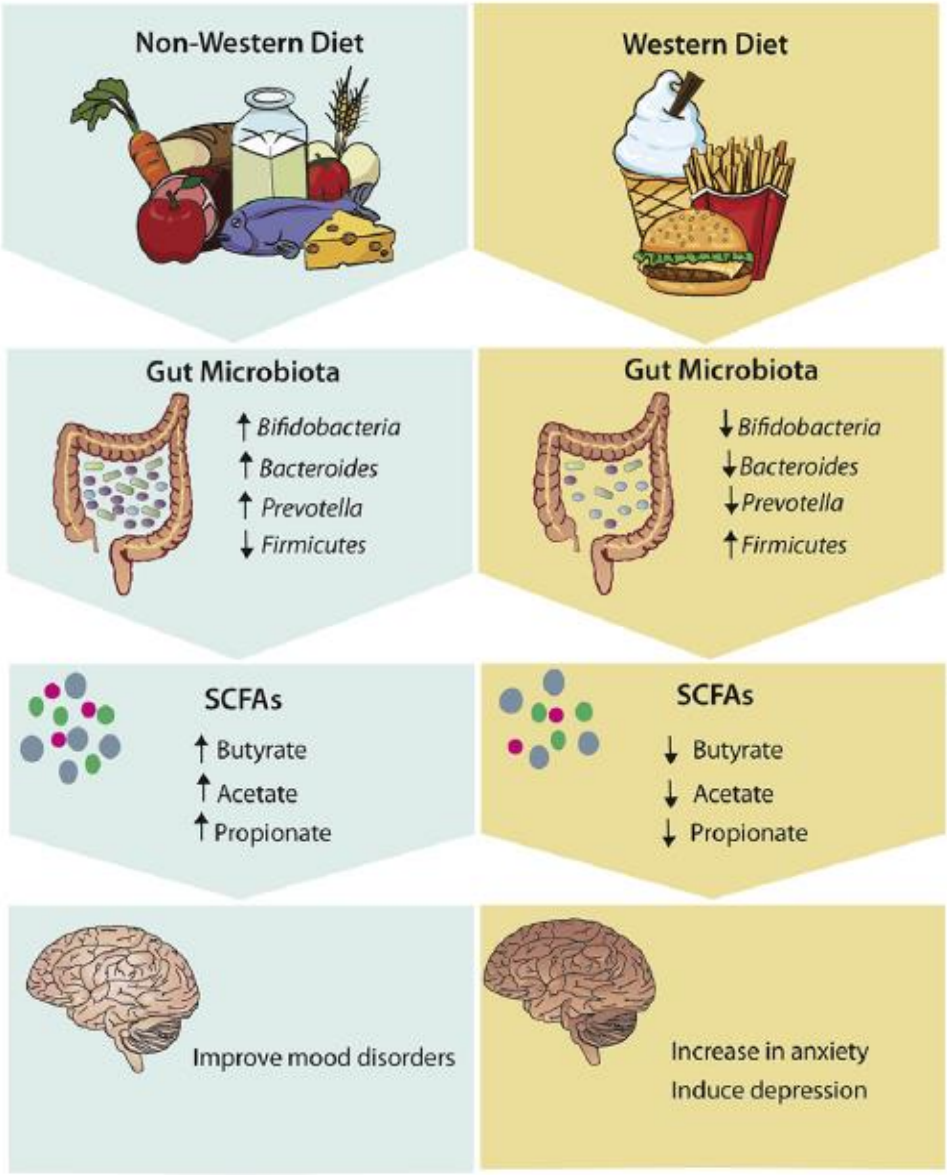
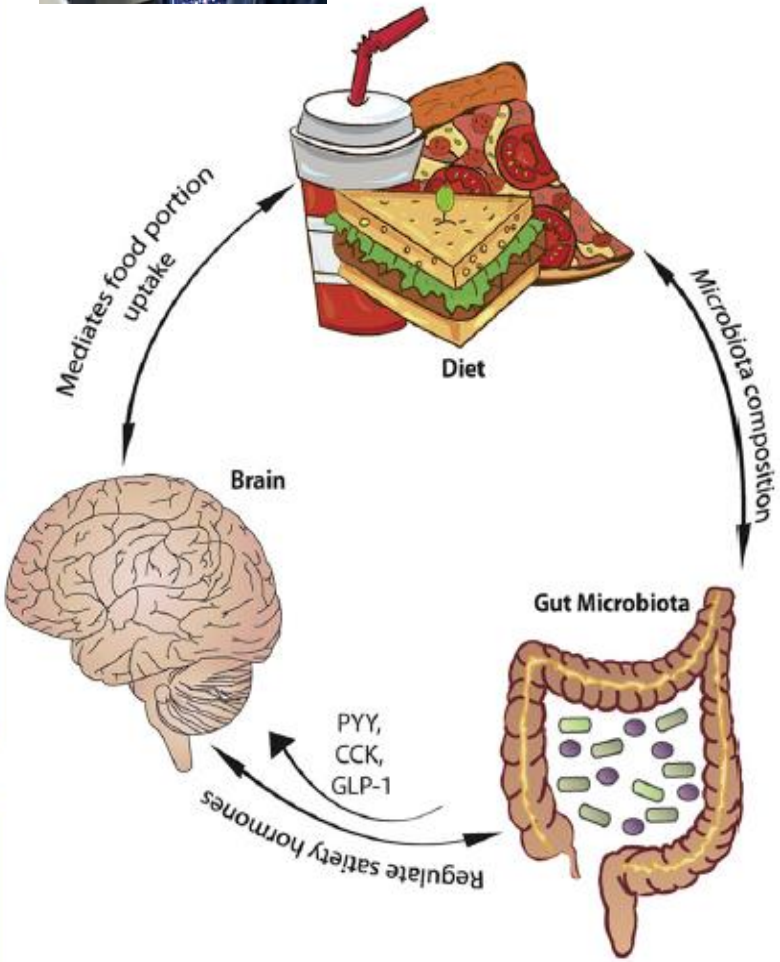
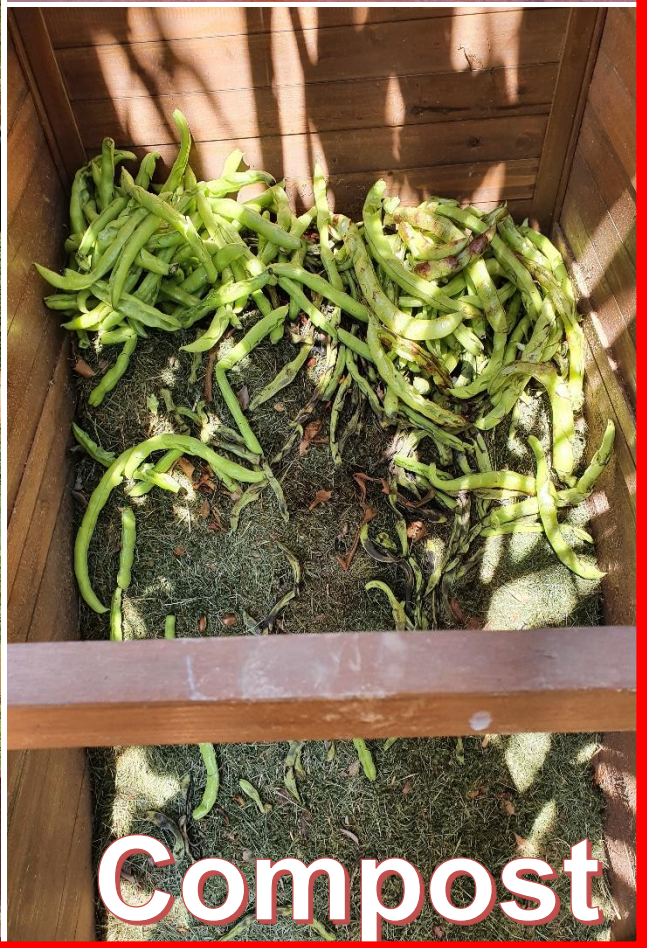




HUERTOS URBANOS
Y MACETOHUERTOS

HUERTOS URBANOS
Y MACETOHUERTOS


Agricultura ecológica


Compost

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ECOLOGY

Global homogenization of the structure and function in the soil microbiome of urban greenspaces

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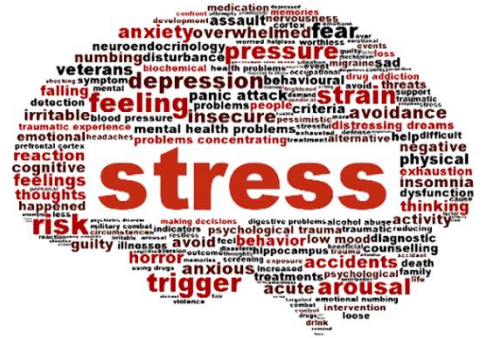
The structure and function of the soil microbiome of urban greenspaces remain largely undetermined. We conducted a global field survey in urban greenspaces and neighboring natural ecosystems across 56 cities from six continents, and found that urban soils are important hotspots for soil bacterial, protist and functional gene diversity, but support highly homogenized microbial communities worldwide. Urban greenspaces had a greater proportion of fast-growing bacteria, algae, amoebae, and fungal pathogens, but a lower proportion of ectomycorrhizal fungi than natural ecosystems. These urban ecosystems also showed higher proportions of genes associated with human pathogens, greenhouse gas emissions, faster nutrient cycling, and more intense abiotic stress than natural environments. City affluence, management practices, and climate were fundamental drivers of urban soil communities. Our work paves the way toward a more comprehensive global-scale perspective on urban greenspaces, which is integral to managing the health of these ecosystems and the well-being of human populations.


Overtime
Sick
Dread
Health
No Time
Tired
Headache
Stress
Bills
Payments
No Sleep
Stress
Debt
Fear
Work
Worry
Job
Anxiety
Retirement
Savings
Anxiety
Overdue
Expectations
Insuran
Time Management
Fear
Late Nights


stress
anxiety
overwhelmed
fear
pressure
depression
feeling
strain
insecure
avoidance
risk
trigger
arousal
horror
accidents
behavior
negative
physical
exhaustion
insomnia
thinking

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Applied nutritional investigation

Probiotic food consumption is associated with lower severity and prevalence of depression: A nationwide cross-sectional study

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ABSTRACT

Objective: It has been suggested that probiotics have beneficial effects on a variety of health problems including immunologic diseases and metabolic disorders, however, the effects on brain function are yet to be fully studied. The aim of this study was to evaluate the association between probiotic food consumption and depression status through a cross-sectional analysis of a nationwide, large population-based data.

Methods: The study population included 26 118 individuals 19 to 64 y of age who participated in the Korean National Health and Nutrition Examination Survey (KNHANES, 2012–2016). A food frequency questionnaire was used to assess probiotic food consumption. Depression status was determined by two different methods including a Patient Health Questionnaire (PHQ-9) and self-reported clinical diagnosis.

Results: Compared with the lowest tertile of probiotic food consumption, the highest tertile had significantly lower odds in PHQ-9 depression severity (odds ratio [OR], 0.48; 95% confidence interval [CI], 0.28–0.81; $P = 0.0065$) and self-reported clinical depression (OR, 0.59; 95% CI, 0.35–0.96; $P = 0.0129$). Although there was no significant association between probiotic food consumption and clinical depression in women (OR, 0.85; 95% CI, 0.47–1.54; $P = 0.3081$), men showed a significantly lower prevalence of clinical depression (OR, 0.24; 95% CI, 0.06–0.92; $P = 0.0256$) in the highest tertile.

Conclusions: These results suggest that probiotic food consumption might have beneficial effects on depression, particularly in men. Further studies are required to identify the mechanistic relations between probiotics and depression.

LA DIETA PRE Y PROBIÓTICA TIENE UN PAPEL CRUCIAL EN NUESTRA SALUD (HUMOR, INMUNOLOGÍA, PSICOPATOLOGÍAS, REGULACIÓN DE 5-HT y PATOLOGÍAS DE LA TERCERA EDAD)

Ensayos preclínicos
Estudios preliminares
Falta investigación con Humanos (nutrigenómica)
¿Dosis? ¿Qué probióticos?
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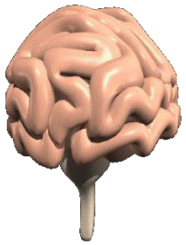
CONCLUSIONES



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