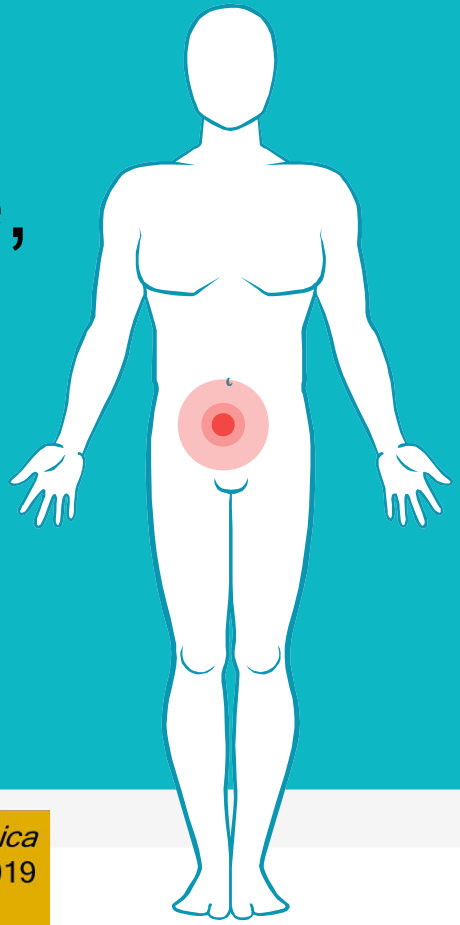
# Gut Brain Axis,MalNutrizione, depressione. What's new?

Dott.ssa Bibiana Lucifora

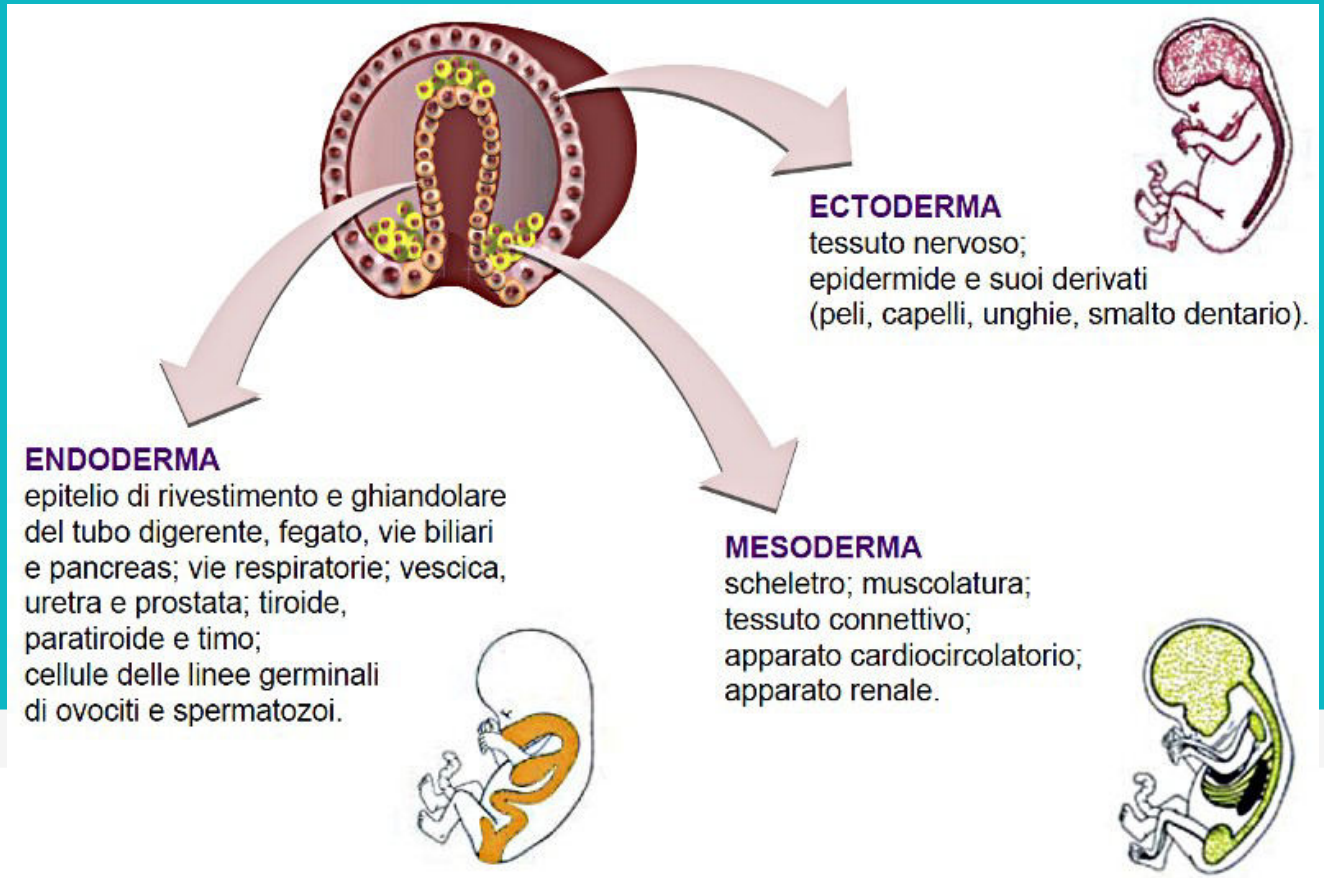


*Giornate Catanesi di Nutrizione Clinica*
10|11 Maggio 2019

«LA NUTRIZIONE E LA MALATTIA»

Inserisci un titolo qui

2



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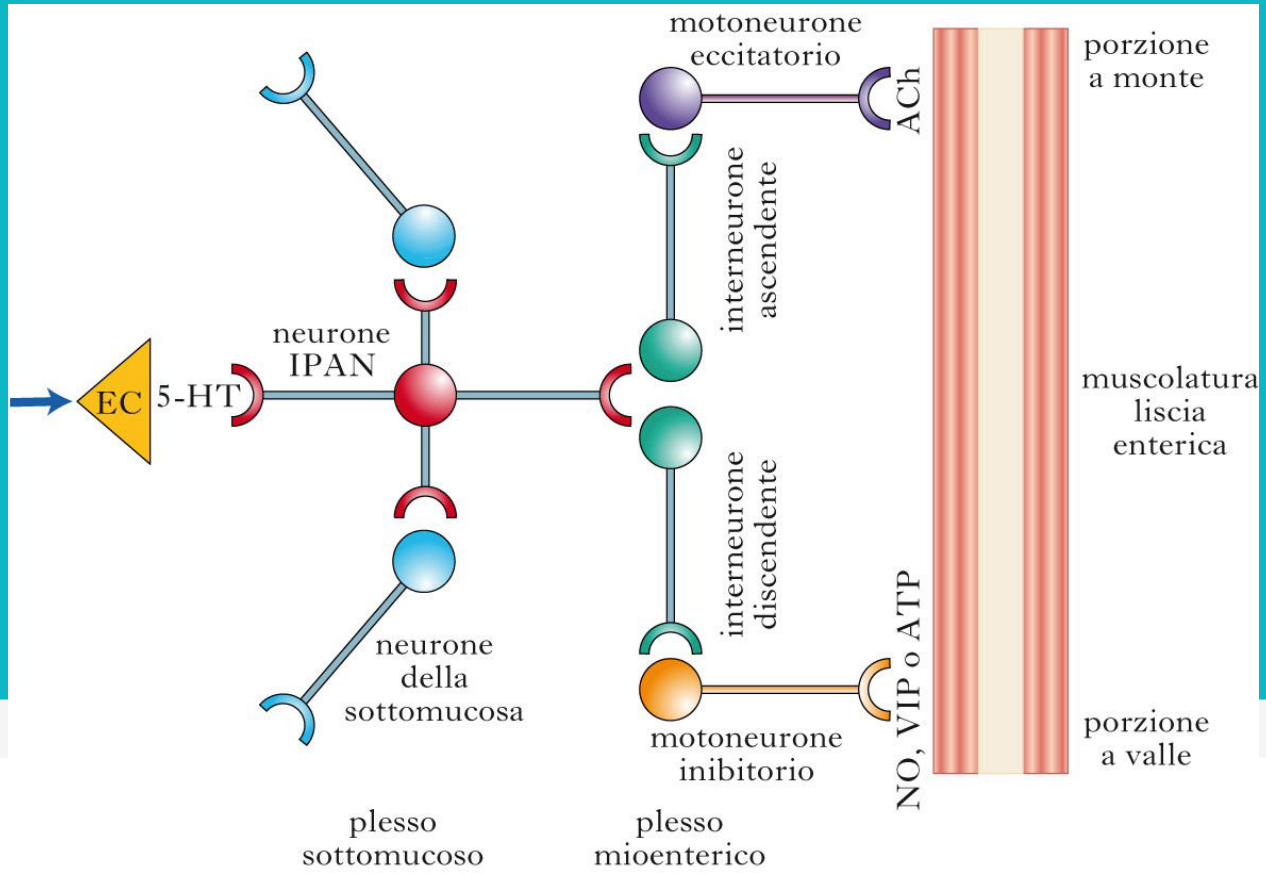
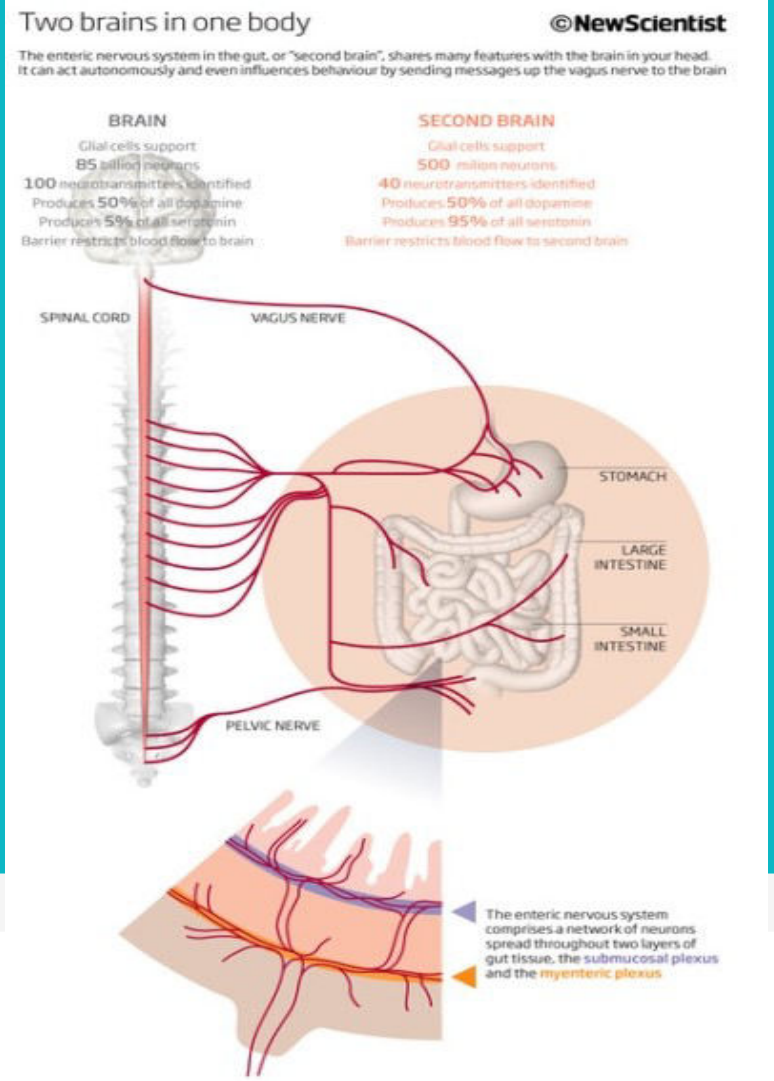


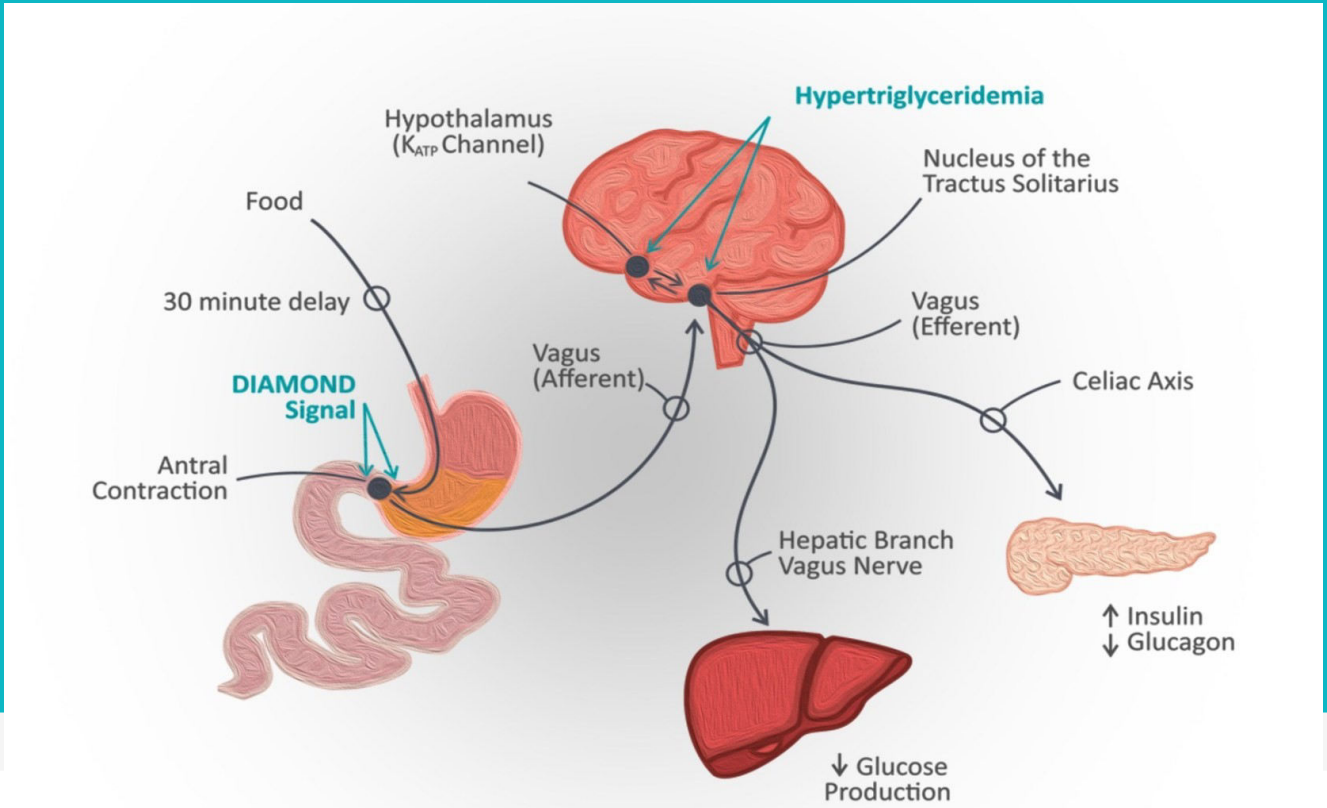
Inserisci un titolo qui

4



Inserisci un titolo qui

5



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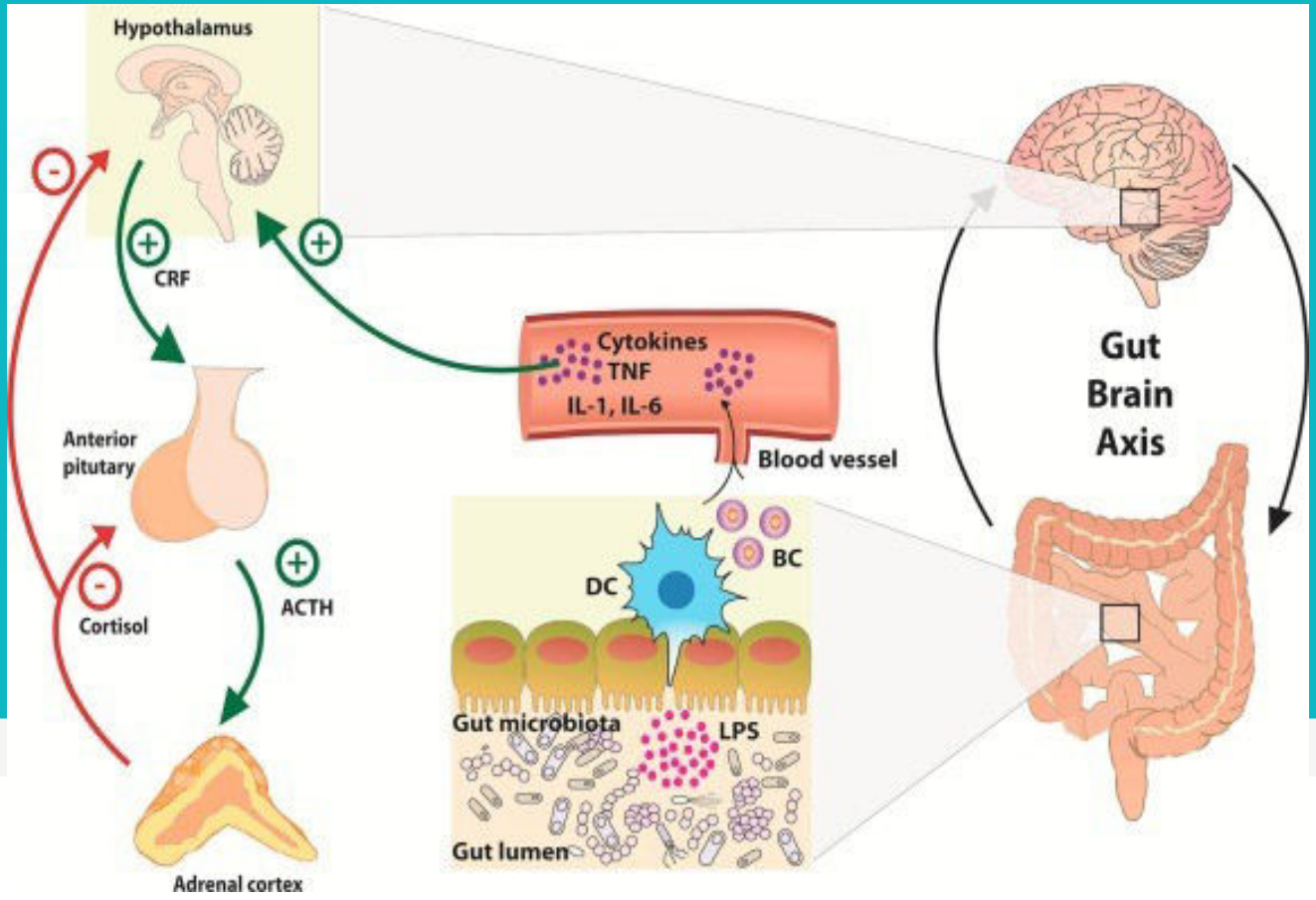
6



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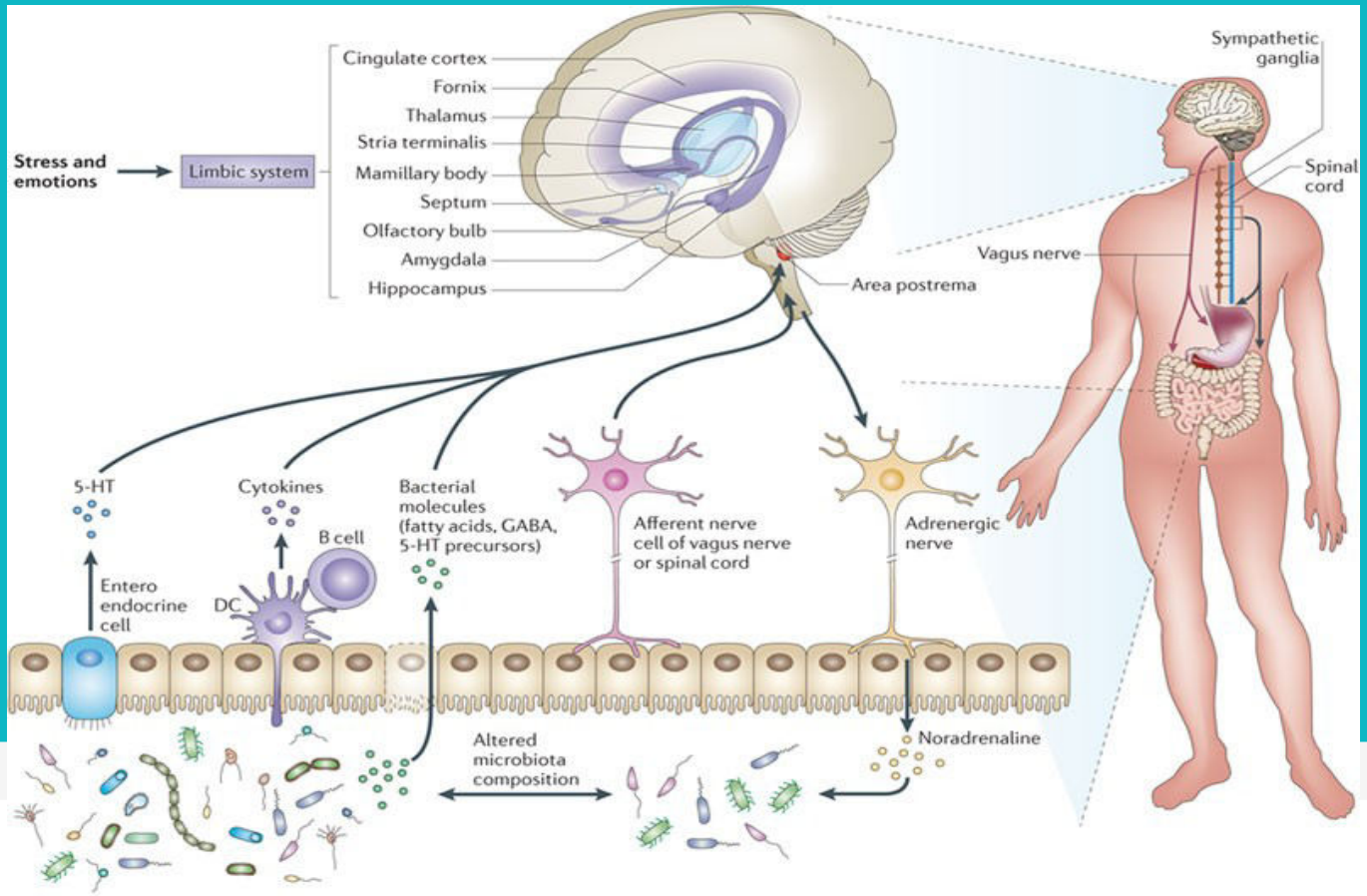
7



**In che modo il microbiota comunica con il SNC?**



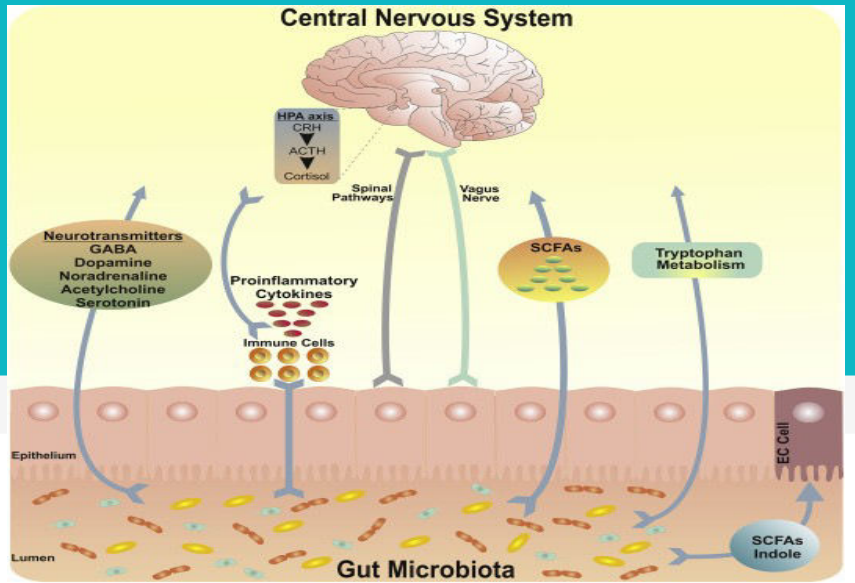
Produzione di serotonina,dopamina,GABA,istamina

Produzione di SCFA

Modulazione risposta infiammatoria (mantenimento risposta Th1, produzione citochine antiinfiammatorie)

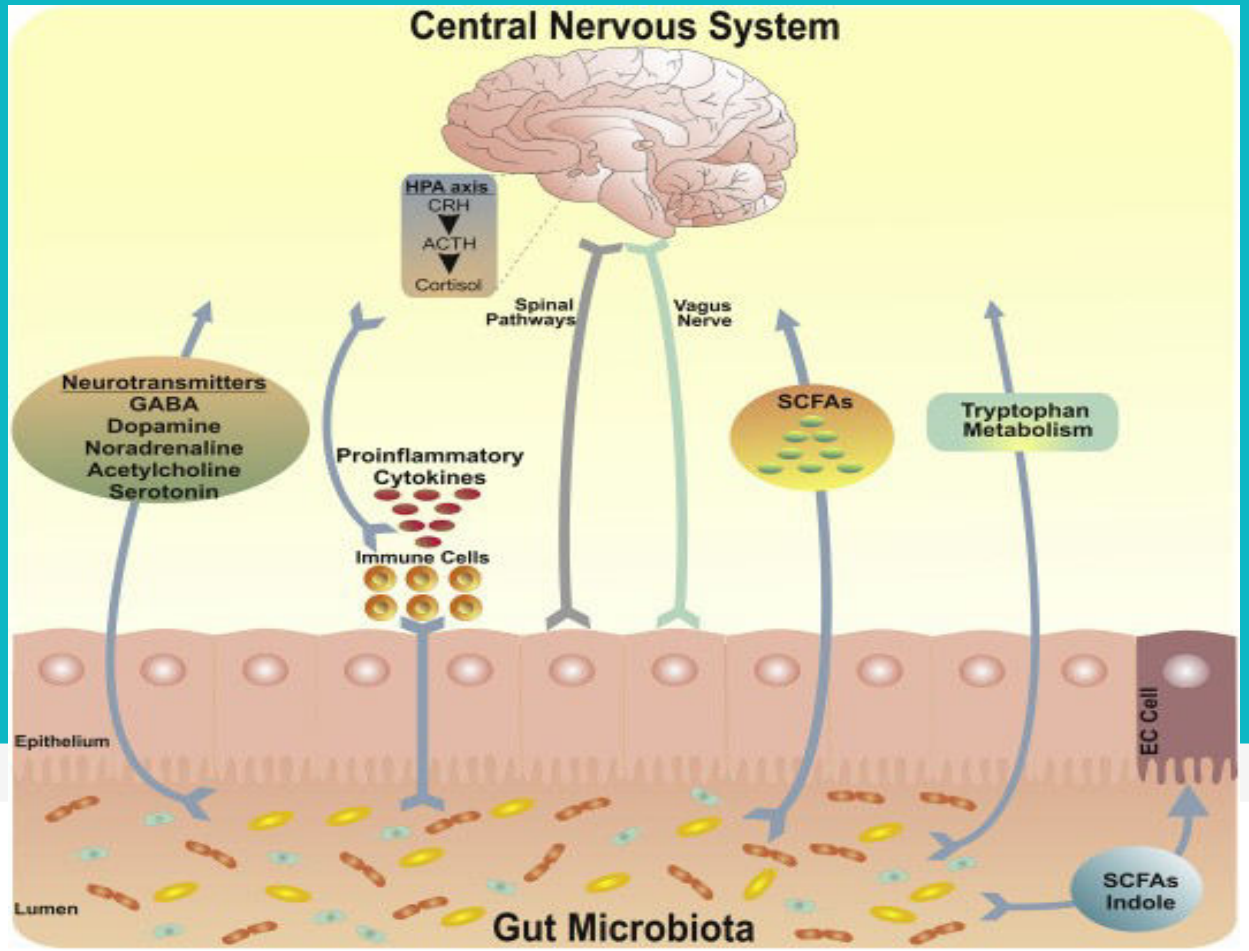
neuromodulazione vagale

Modulazione asse HPA



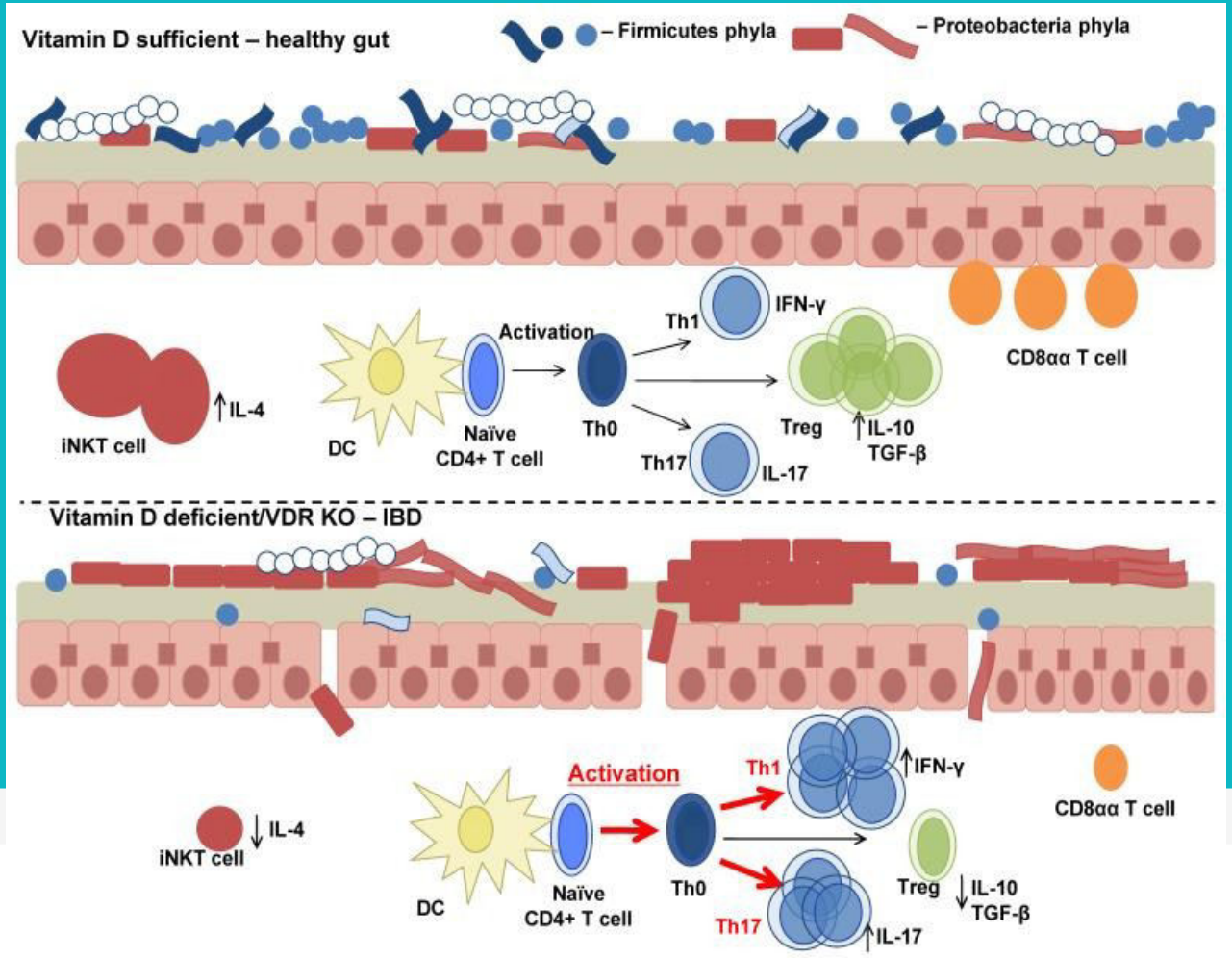
**Titolo**

9


Central Nervous System
HPA axis
CRH
ACTH
Cortisol
Spinal Pathways
Vagus Nerve
Neurotransmitters
GABA
Dopamine
Noradrenaline
Acetylcholine
Serotonin
Proinflammatory Cytokines
Immune Cells
SCFAs
Tryptophan Metabolism
Epithelium
EC Cell
Lumen
SCFAs Indole
Gut Microbiota

**Titolo**

10


Vitamin D sufficient – healthy gut
– Firmicutes phyla
– Proteobacteria phyla
iNKT cell
IL-4
DC
Activation
Naïve
CD4+ T cell
Th0
Th1
IFN-γ
Th17
IL-17
Treg
IL-10
TGF-β
CD8αα T cell
Vitamin D deficient/VDR KO – IBD
iNKT cell
IL-4
DC
Activation
Naïve
CD4+ T cell
Th0
Th1
IFN-γ
Th17
IL-17
Treg
IL-10
TGF-β
CD8αα T cell

Volume 105, Issue 5

14 March 2011 , pp. 755-764

# Assessment of psychotropic-like properties of a probiotic formulation (*Lactobacillus helveticus* R0052 and *Bifidobacterium longum* R0175) in rats and human subjects

Michaël Messaoudi [(a1)], Robert Lalonde [(a2)], Nicolas Violle [(a1)], Hervé Javelot [(a3)] ...

https://doi.org/10.1017/S0007114510004319

Published online: 26 October 2010



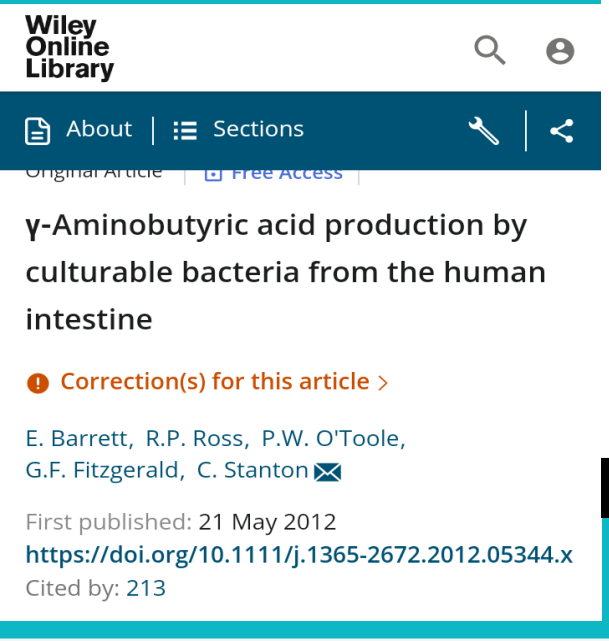
Neuroscience

Volume 246, 29 August 2013, Pages 199-229

Neuroscience Forefront Review

# Inflammatory cytokines in depression: Neurobiological mechanisms and therapeutic implications ☆

J.C. Felger [a] ... F.E. Lotrich [b]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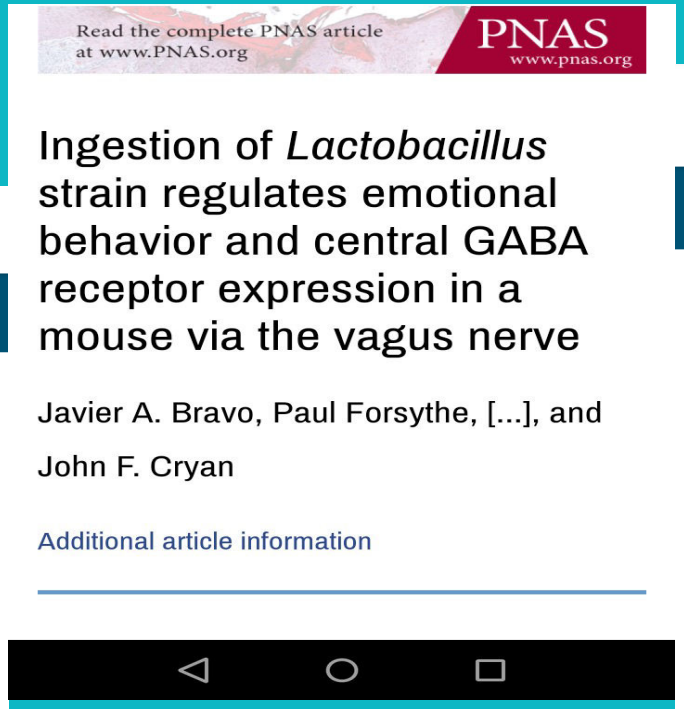
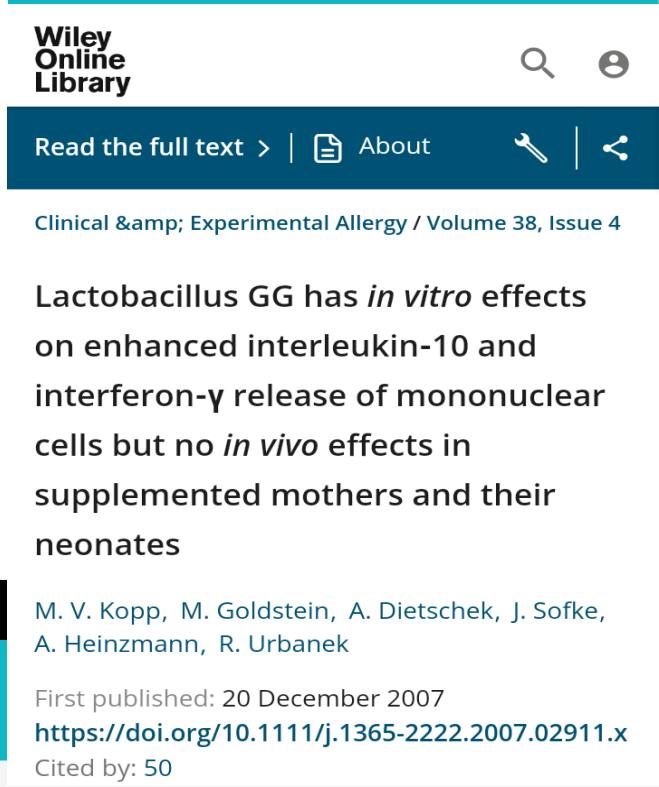
Original Article
Free Access
γ-Aminobutyric acid production by culturable bacteria from the human intestine
Correction(s) for this article
E. Barrett, R.P. Ross, P.W. O'Toole, G.F. Fitzgerald, C. Stanton
First published: 21 May 2012
https://doi.org/10.1111/j.1365-2672.2012.05344.x
Cited by: 213


Read the complete PNAS article at www.PNAS.org
PNAS
www.pnas.org
Ingestion of Lactobacillus strain regulates emotional behavior and central GABA receptor expression in a mouse via the vagus nerve
Javier A. Bravo, Paul Forsythe, [...], and John F. Cryan
Additional article information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About
Clinical & Experimental Allergy / Volume 38, Issue 4
Lactobacillus GG has in vitro effects on enhanced interleukin-10 and interferon-γ release of mononuclear cells but no in vivo effects in supplemented mothers and their neonates
M. V. Kopp, M. Goldstein, A. Dietschek, J. Sofke, A. Heinzmann, R. Urbanek
First published: 20 December 2007
https://doi.org/10.1111/j.1365-2222.2007.02911.x
Cited by: 50

# Titolo

13

Pediatric RESEARCH

Review Article | Published: 25 September 2018

## The contribution of the gut microbiome to neurodevelopment and neuropsychiatric disorders

Barbara B. Warner

*Pediatric Research* **85**, 216–224 (2019) | Download Citation

The Journal of Physiology — A Publication of The Physiological Society — JP

## Postnatal microbial colonization programs the hypothalamic–pituitary–adrenal system for stress response in mice

Nobuyuki Sudo, Yoichi Chida, [...], and Yasuhiro Koga

**Titolo**

14

Brain, Behavior, and Immunity
Volume 48, August 2015, Pages 258-264

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

Laura Steenbergen [a, b] ... Lorenza S. Colzato [a, b]

**Titolo**



intervention assessments.

| | | Pre-intervention | Post-intervention |
|---|---|---|---|
| **LEIDS-r** | | | |
| Aggression | Placebo | 8.80 (0.94) | 8.45 (0.98) |
| | Probiotics** | 8.68 (0.94) | 6.25 (0.98) |
| Control | Placebo | 7.65 (0.80) | 6.70 (0.82) |
| | Probiotics | 7.25 (0.83) | 5.80 (0.82) |
| Hopelessness | Placebo | 5.60 (0.85) | 4.70 (0.74) |
| | Probiotics | 4.75 (0.85) | 4.0 (0.74) |
| Risk aversion | Placebo | 9.50 (0.93) | 9.25 (0.87) |
| | Probiotics | 10.00 (0.93) | 7.95 (0.87) |
| Rumination | Placebo | 11.75 (0.90) | 11.85 (0.93) |
| | Probiotics*** | 11.20 (0.90) | 8.25 (0.93) |
| Acceptance | Placebo | 1.40 (0.34) | 1.35 (0.37) |
| | Probiotics | 0.90 (0.34) | 1.10 (0.37) |
| Total | Placebo | 44.70 (3.24) | 42.30 (3.51) |
| | Probiotics*** | 42.75 (3.24) | 33.35 (3.51) |
| **BDI** | Placebo | 9.10 (1.00) | 9.10 (1.19) |
| | Probiotics | 7.90 (1.00) | 7.25 (1.19) |
| **BAI** | Placebo | 12.21 (1.70) | 11.21 (1.69) |
| | Probiotics | 11.35 (1.66) | 9.95 (1.65) |

* $p < .05$
** $p < .01$.
*** $p < .001$.

**Titolo**

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nature microbiology

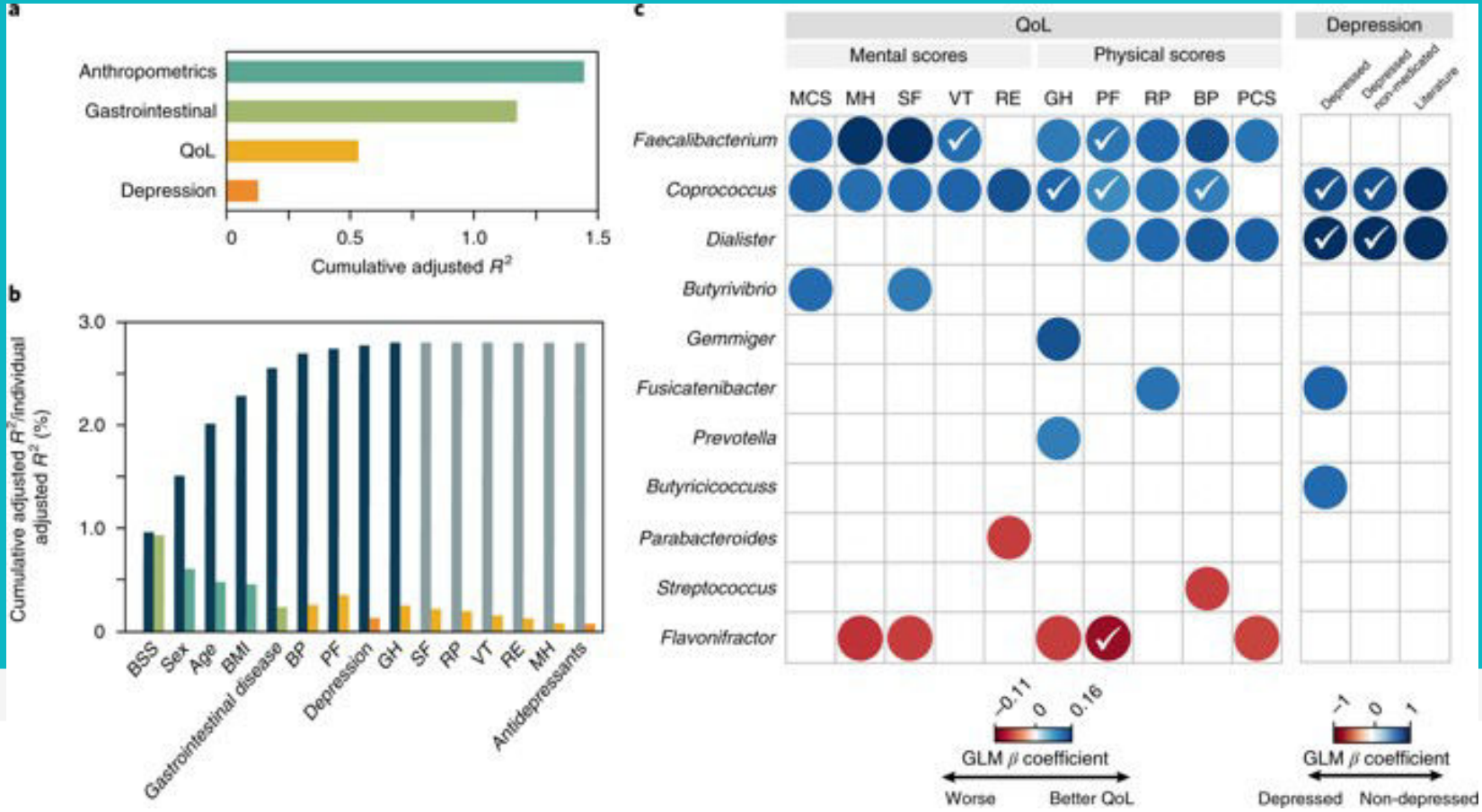
ARTICLES

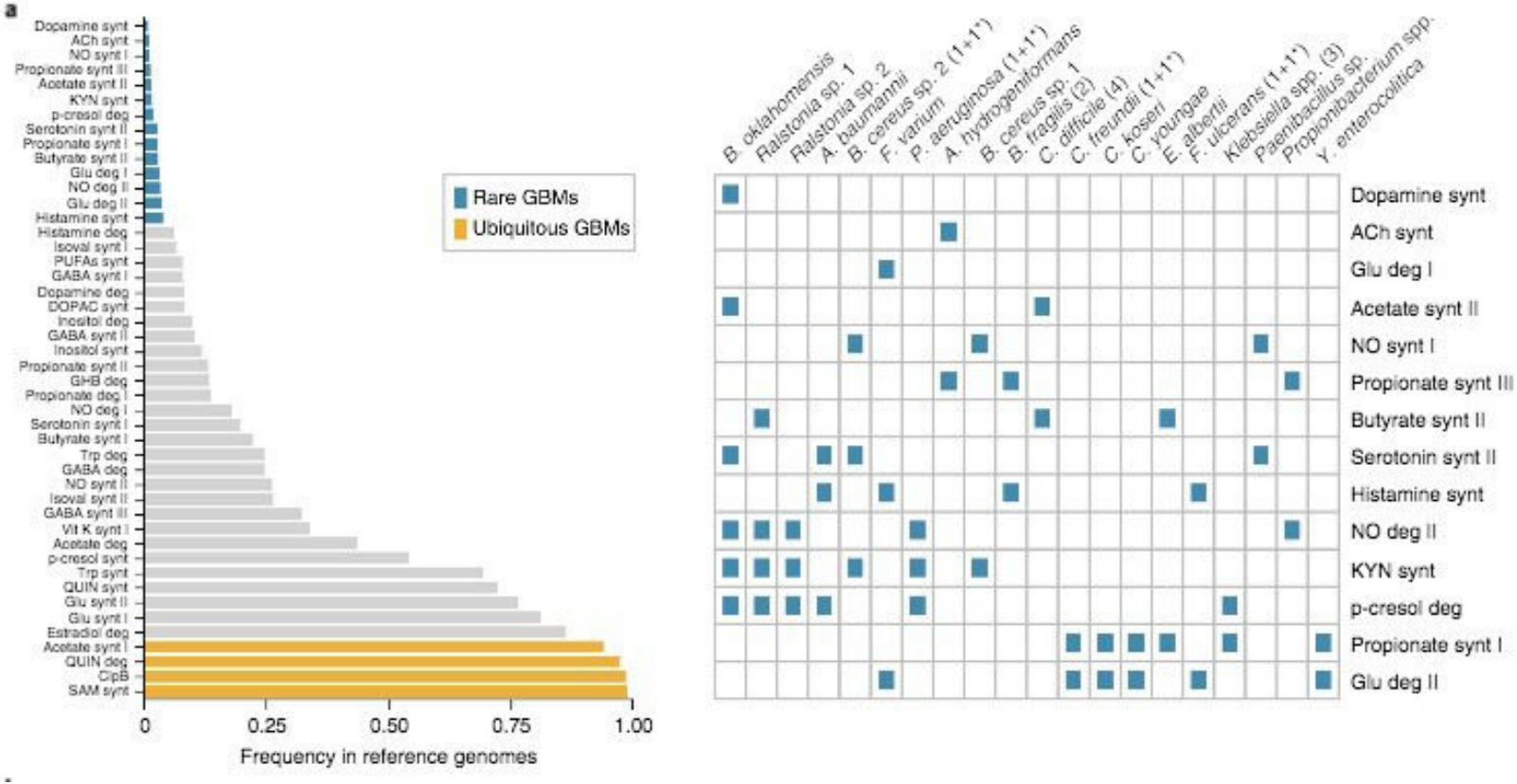
https://doi.org/10.1038/s41564-018-0337-x

# The neuroactive potential of the human gut microbiota in quality of life and depression

Mireia Valles-Colomer[1,2], Gwen Falony[1,2], Youssef Darzi[1,2], Ettje F. Tigchelaar[3], Jun Wang[1,2], Raul Y. Tito[1,2,4], Carmen Schiweck[5], Alexander Kurilshikov[3], Marie Joossens[1,2], Cisca Wijmenga[3,6], Stephan Claes[5,7], Lukas Van Oudenhove[7,8], Alexandra Zhernakova[3], Sara Vieira-Silva[1,2,9] and Jeroen Raes[1,2,9*]

...e relationship ...


a
Anthropometrics
Gastrointestinal
QoL
Depression
0
0.5
1.0
1.5
Cumulative adjusted $R^2$
b
Cumulative adjusted $R^2$/individual adjusted $R^2$ (%)
3.0
2.0
1.0
0
BSS
Sex
Age
BMI
Gastrointestinal disease
BP
PF
Depression
GH
SF
RP
VT
RE
MH
Antidepressants
c
QoL
Depression
Mental scores
Physical scores
MCS
MH
SF
VT
RE
GH
PF
RP
BP
PCS
Depressed
Depressed non-medicated
Literature
Faecalibacterium
Coprococcus
Dialister
Butyrivibrio
Gemmiger
Fusicatenibacter
Prevotella
Butyricicoccuss
Parabacteroides
Streptococcus
Flavonifractor
-0.11
0
0.16
GLM β coefficient
Worse
Better QoL
-1
0
1
GLM β coefficient
Depressed
Non-depressed


a
Dopamine synt
ACh synt
NO synt I
Propionate synt III
Acetate synt II
KYN synt
p-cresol deg
Serotonin synt II
Propionate synt I
Butyrate synt II
Glu deg I
NO deg II
Glu deg II
Histamine synt
Histamine deg
Isoval synt I
PUFAs synt
GABA synt I
Dopamine deg
DOPAC synt
Inositol deg
GABA synt II
Inositol synt
Propionate synt II
GHB deg
Propionate deg I
NO deg I
Serotonin synt I
Butyrate synt I
Trp deg
GABA deg
NO synt II
Isoval synt II
GABA synt III
Vit K synt I
Acetate deg
p-cresol synt
Trp synt
QUIN synt
Glu synt II
Glu synt I
Estradiol deg
Acetate synt I
QUIN deg
ClpB
SAM synt
Rare GBMs
Ubiquitous GBMs
0
0.25
0.50
0.75
1.00
Frequency in reference genomes
B. oklahomensis
Ralstonia sp. 1
Ralstonia sp. 2
A. baumannii
B. cereus sp. 2 (1+1*)
F. varium
P. aeruginosa (1+1*)
A. hydrogeniformans
B. cereus sp. 1
B. fragilis (2)
C. difficile (4)
C. freundii (1+1*)
C. koseri
C. youngae
E. alberti
F. ulcerans (1+1*)
Klebsiella spp. (3)
Paenibacillus sp.
Propionibacterium spp.
Y. enterocolitica
Dopamine synt
ACh synt
Glu deg I
Acetate synt II
NO synt I
Propionate synt III
Butyrate synt II
Serotonin synt II
Histamine synt
NO deg II
KYN synt
p-cresol deg
Propionate synt I
Glu deg II

Titolo

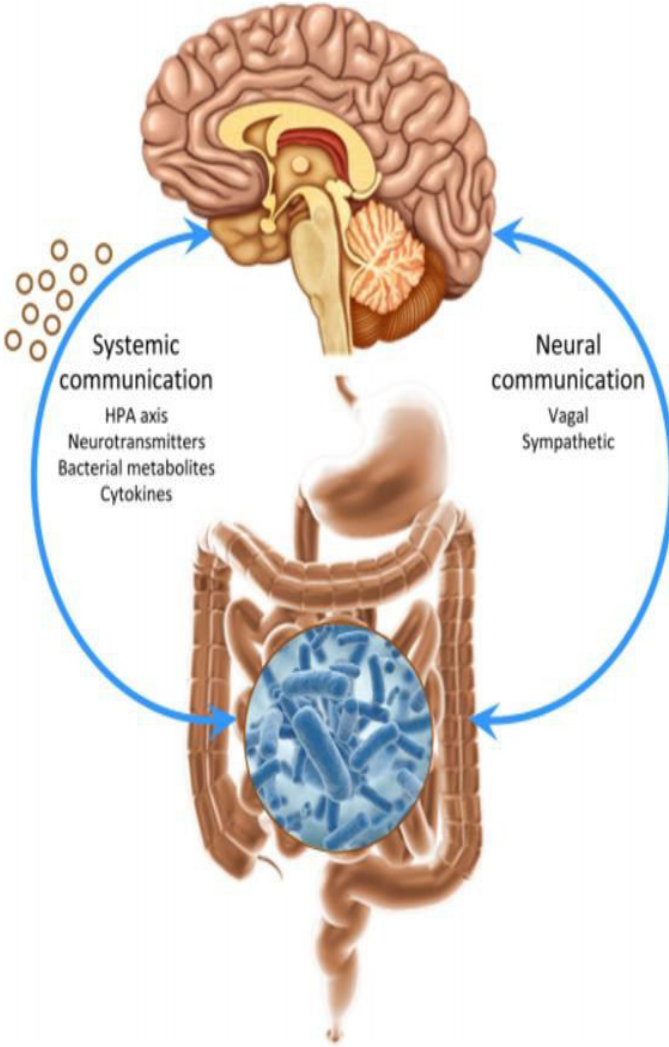


| Clinical Concern | Target Population | Treatm |
|---|---|---|
| **Prebiotics** | | |
| Anxiety and cognition | Healthy volunteers | B-GO |
| **Probiotics** | | |
| Anxiety and Depression | 124 Healthy volunteers | *Lactobacillu* Shirot |
| Anxiety and Depression | 55 Healthy volunteers | *L. helveticus, L* |
| Anxiety and Depression | 70 healthy petrochemi- cal workers | *L. acidophilus L. rhamn L. bulgaricus, B. breve, B. lo thermoph* |
| Cognitive reactivity to sad mood, anxiety and depression | 40 healthy volunteers | *B. bifidum, B L. acidop L. brevis, L L. salivar Lactococcu* |
| IBS severity | 50 IBS patients | *L. case* |
| IBS severity | 74 IBS patients | *L. bulgar S. thermop L. paracc L. acidop* |
| Stress and anxiety | 140 Healthy medical students | *L. casei* Sl |
| Anxiety and Depression | 35 Chronic fatigue syn- drome pa- tients | *L. casei* Sl |

(Table 1) contd....

IPOTESI A: gli stati depressivi preesistenti inducono modificazioni nella varietà del microbiotae, di conseguenza, peggiorano i sintomi della depressione;

IPOTESI B: riduzioni nella popolazione del microbiota precedono alterazioni nei livelli dei neurotrasmettitori a livello cerebrale, e quindi contribuiscono all'insorgenza della depressione.



Titolo

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Nutrients

Volume 10, Issue 5

► Article Menu

*Nutrients* **2018**, *10*(5), 591;
https://doi.org/10.3390/nu10050591

Open Access Review

# Dietary Neurotransmitters: A Narrative Review on Current Knowledge

**Matteo Briguglio [1,*], Bernardo Dell'Osso [2,3], Giancarlo Panzica [4], Antonio Malgaroli [5], Giuseppe Banfi [6], Carlotta Zanaboni Dina [1], Roberta Galentino [1] and Mauro Porta [1]**

**Titolo**

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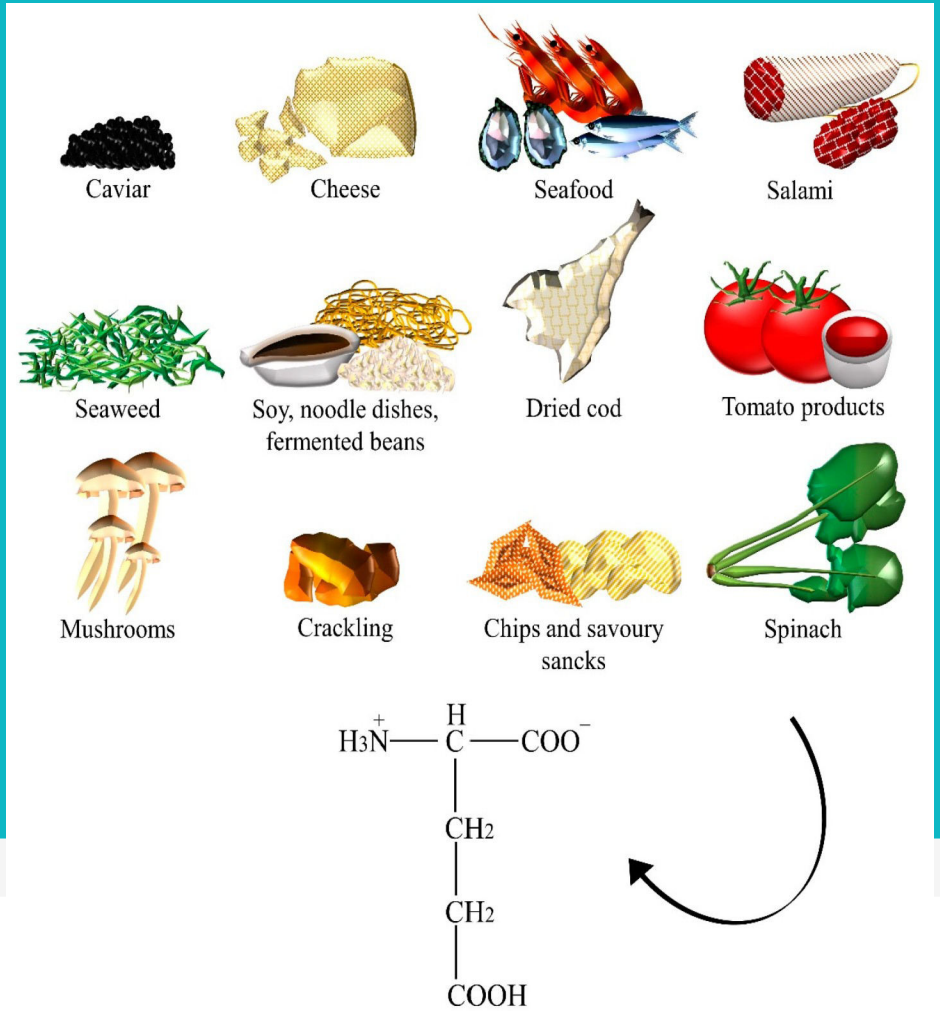
Caviar
Cheese
Seafood
Salami
Seaweed
Soy, noodle dishes, fermented beans
Dried cod
Tomato products
Mushrooms
Crackling
Chips and savoury sancks
Spinach
H3N+
H
C
COO−
CH2
CH2
COOH

**Titolo**

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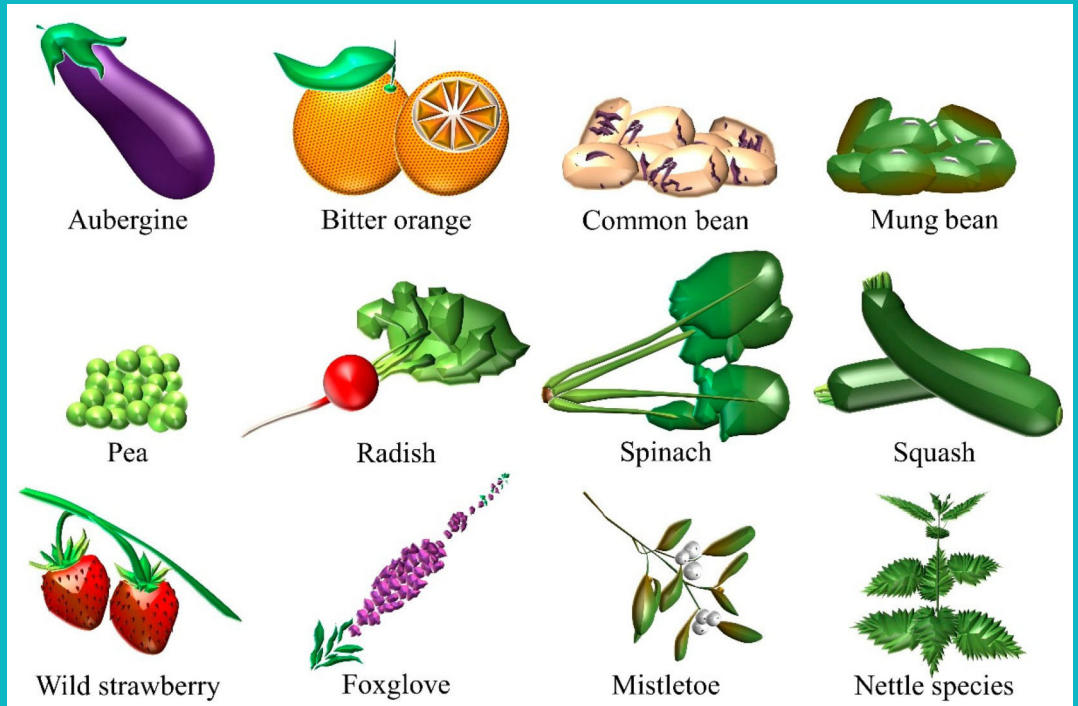
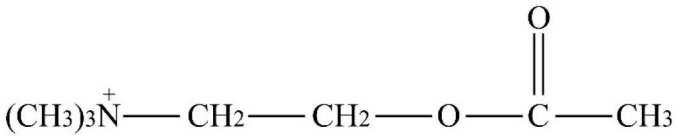

Aubergine
Bitter orange
Common bean
Mung bean
Pea
Radish
Spinach
Squash
Wild strawberry
Foxglove
Mistletoe
Nettle species


(CH3)3N
CH2
CH2
O
C
O
CH3

**Titolo**

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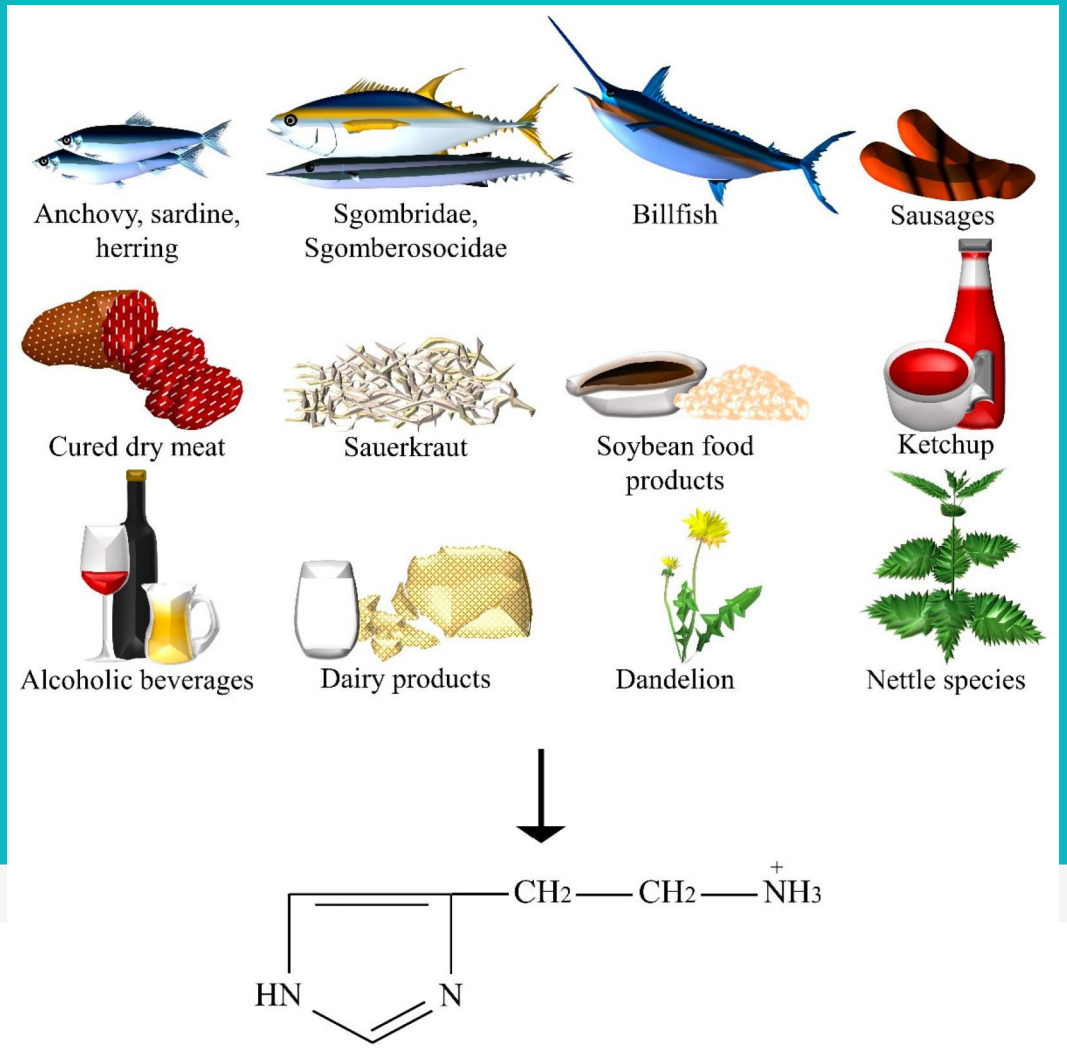
Anchovy, sardine, herring
Sgombridae, Sgomberosocidae
Billfish
Sausages
Cured dry meat
Sauerkraut
Soybean food products
Ketchup
Alcoholic beverages
Dairy products
Dandelion
Nettle species
CH2 — CH2 — NH3+
HN
N

**Titolo**

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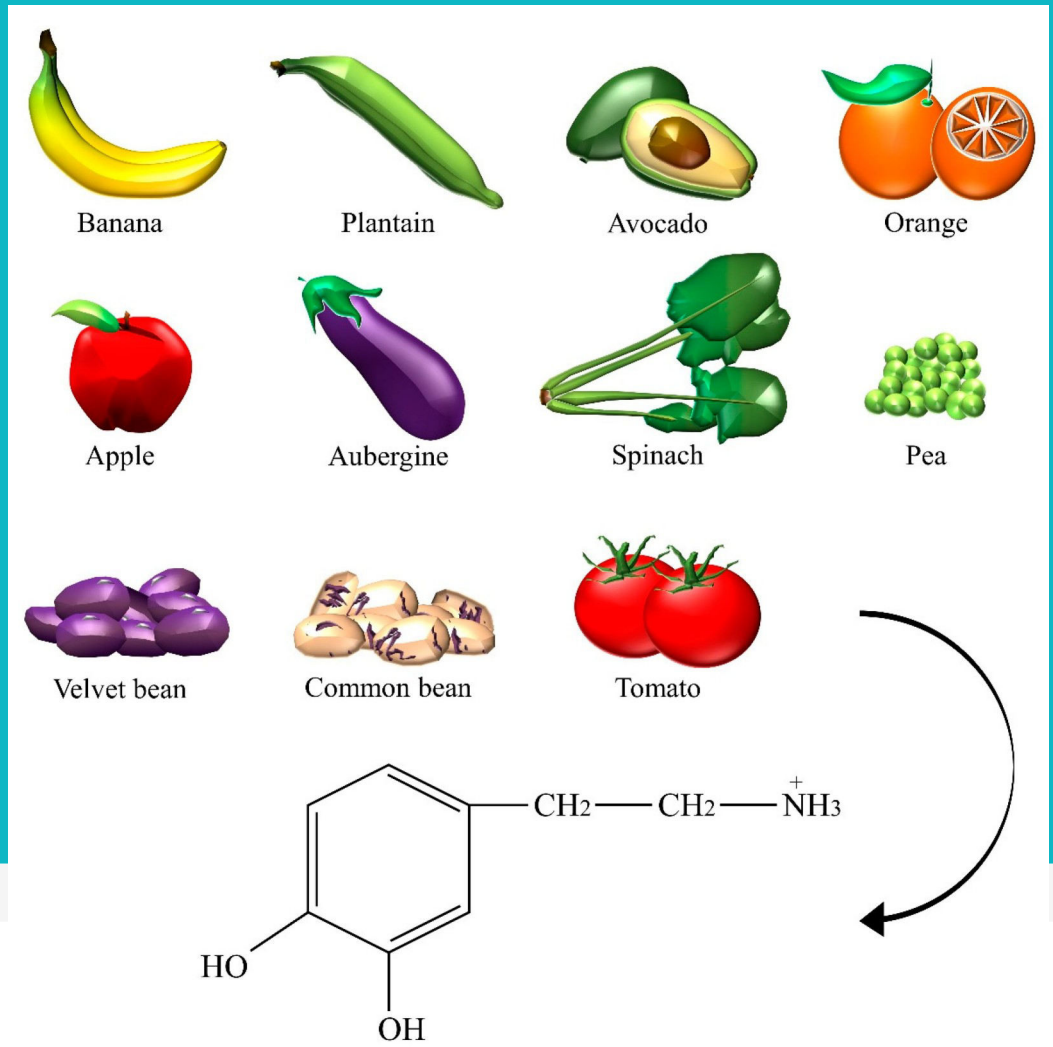
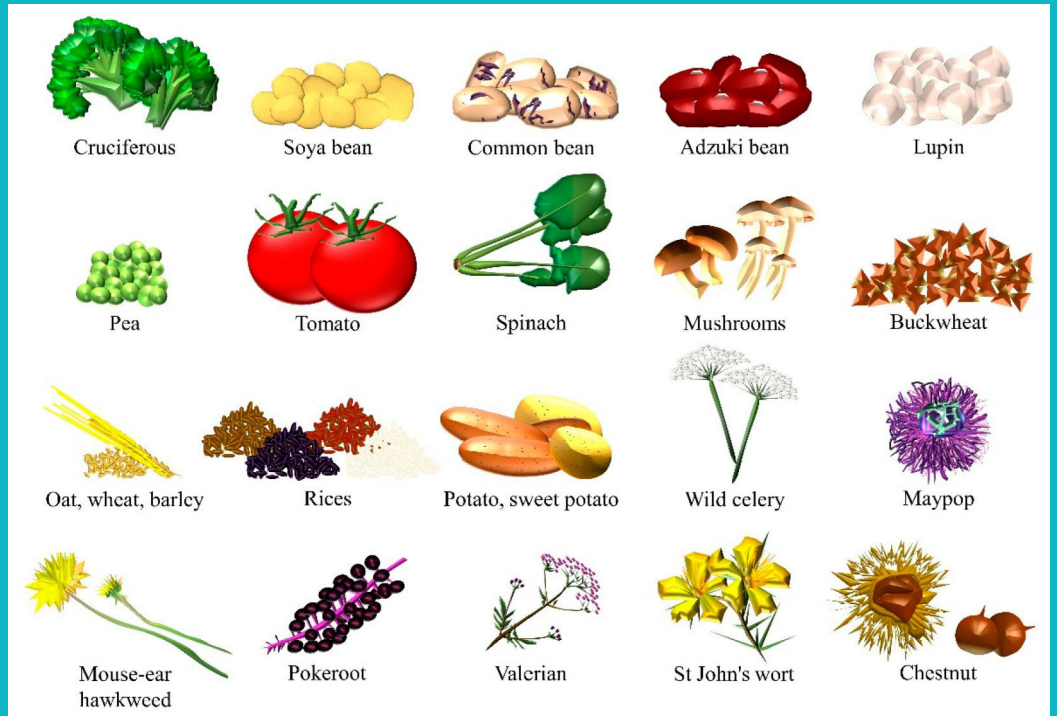
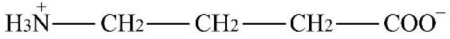

Banana
Plantain
Avocado
Orange
Apple
Aubergine
Spinach
Pea
Velvet bean
Common bean
Tomato
CH2
CH2
NH3
+
HO
OH

# Titolo




Cruciferous
Soya bean
Common bean
Adzuki bean
Lupin
Pea
Tomato
Spinach
Mushrooms
Buckwheat
Oat, wheat, barley
Rices
Potato, sweet potato
Wild celery
Maypop
Mouse-ear hawkweed
Pokeroot
Valerian
St John's wort
Chestnut


H3N+ — CH2 — CH2 — CH2 — COO−

**Titolo**

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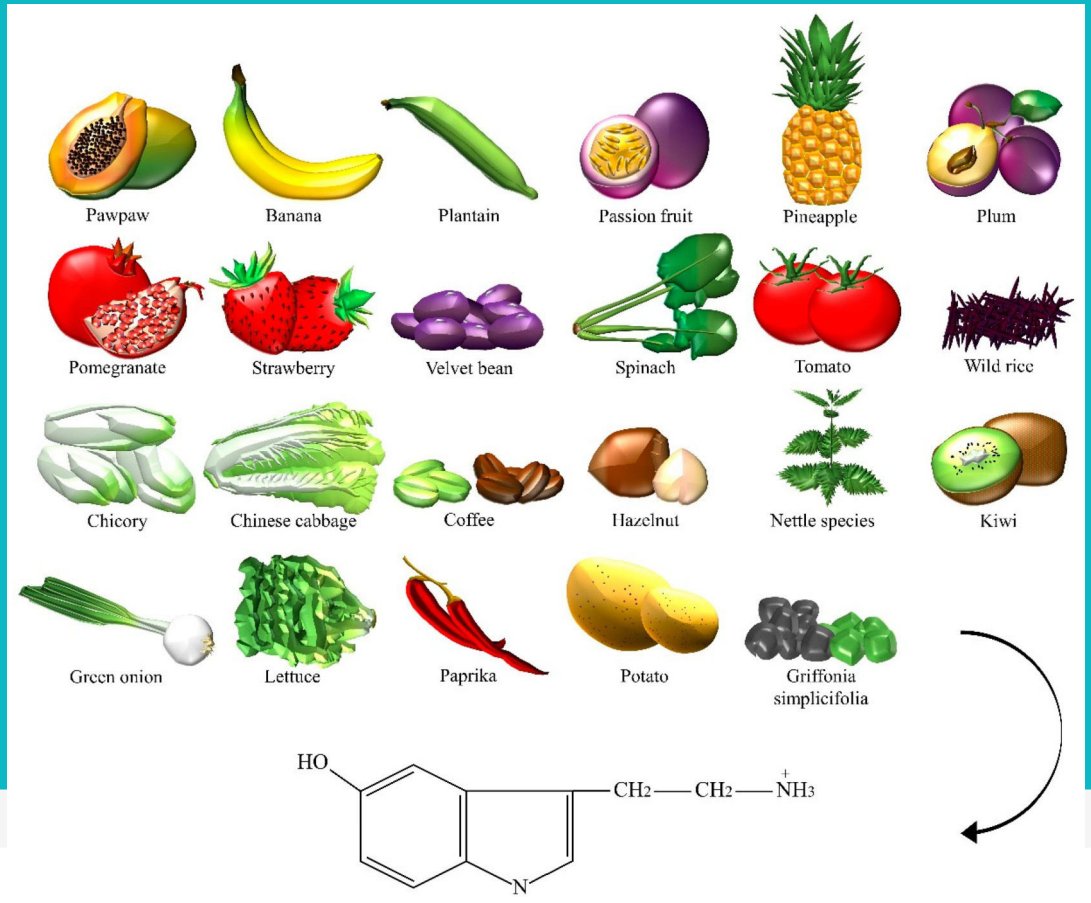
Pawpaw
Banana
Plantain
Passion fruit
Pineapple
Plum
Pomegranate
Strawberry
Velvet bean
Spinach
Tomato
Wild rice
Chicory
Chinese cabbage
Coffee
Hazelnut
Nettle species
Kiwi
Green onion
Lettuce
Paprika
Potato
Griffonia simplicifolia
HO
CH2 — CH2 — +NH3
N

**Titolo**

28

Ridurre al necessario l’impiego di antibiotici

Evitare zuccheri raffinati

Aumentare il consumo di fibre

Limitare il consumo di proteine animali

# Grazie

**bibiana.lucifora@virgilio.it**