



The microbiota gut brain axis: mind altering bugs

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• **Déclaration d'intérêts de Mme/M.** : ...Siobhain O' Mahony.....

➤ **Activités de conseil, fonctions de gouvernance, rédaction de rapports**

*Non / Oui **

Société(s) :Non.....

➤ **Essais cliniques, autres travaux, communications de promotion**

*Non / Oui **

Société(s) :Non.....

➤ **Intérêts financiers (actions, obligations)**

*Non / Oui **

Société(s) :Non.....

➤ **Liens avec des personnes ayant des intérêts financiers ou impliquées dans la gouvernance**

*Non / Oui **

Société(s) :Non.....

➤ **Réception de dons sur une association dont je suis responsable**

*Non / Oui **

Société(s) :Non.....

➤ **Perception de fonds d'une association dont je suis responsable et qui a reçu un don**

*Non / Oui **

Société(s) :Non.....

➤ **Détention d'un brevet, rédaction d'un ouvrage utilisé par l'industrie**

*Non / Oui **

Société(s) :Non.....

* Effacer l'option inadéquate

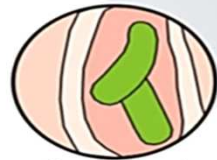
Alimentary Pharmabiotic Centre



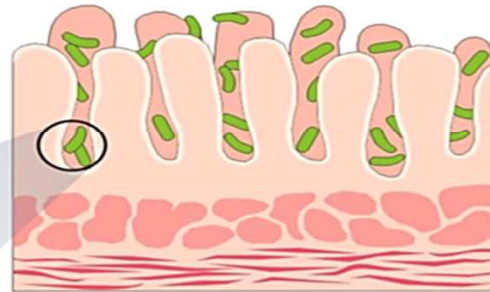
Gut Microbiome



Protective Functions
Pathogen displacement
Nutrient competition
Receptor competition
Production of anti-microbial factors

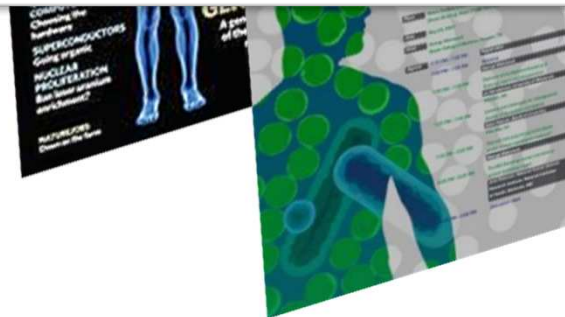


Commensal bacteria



Structural Functions
Barrier fortification
Induction of IgA
Apical tightening of tight junctions
Immune system development

Metabolic Functions
Control of epithelial cell differentiation and proliferation
Metabolism of dietary carcinogens
Synthesis of vitamins
Fermentation of non-digestible dietary residue and epithelial-derived mucus
Ion absorption
Salvage of energy



Gut-Brain axis



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Pharmabiotic Centre
<http://apc.ucc.ie>



Available on
SciVe

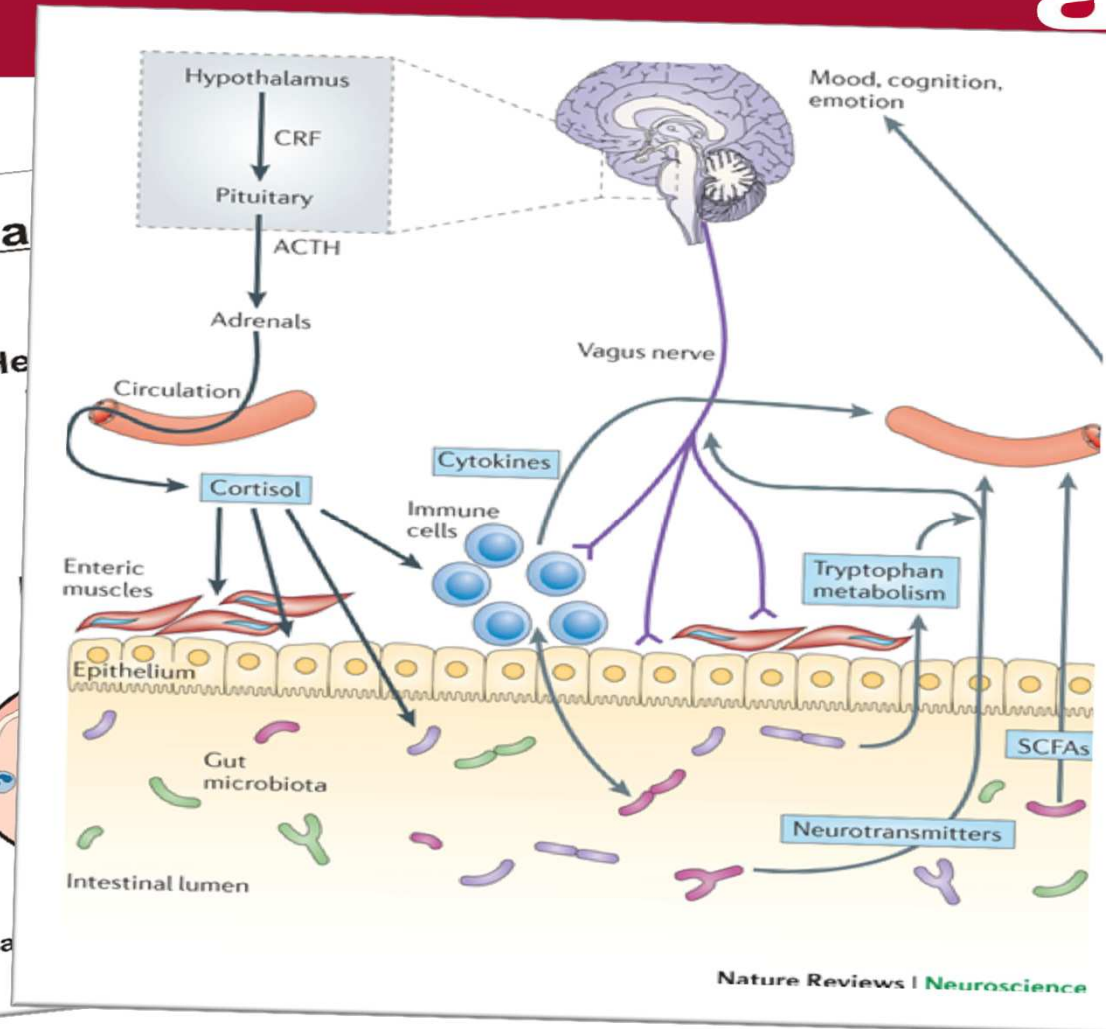
**Communication between
nervous system**
Javier A Bravo¹, Marcela Ju
Timothy G Dinan^{6,8}, John B



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infla



“Mind-Altering Bugs”

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Science NOW UP TO THE MINUTE NEWS FROM SCIENCE

Mind-Altering Bugs
by Greg Miller on 29 August 2011, 3:00 PM | 7 Comments

ScienceDaily
Your source for the latest research news

Science News
Mind & Brain

Mind-Altering Microbes: Probiotic Bacteria May Lessen Anxiety and Depression
ScienceDaily (Aug. 30, 2011) — Probiotic bacteria have the potential to alter brain neurochemistry and treat anxiety and depression-related disorders according to research published in the *Proceedings of the National Academy of Sciences*.

See Also:

- Health & Medicine**
 - Psychology Research
 - Brain Tumor
- Mind & Brain**
 - Disorders and Syndromes
 - Anxiety
- Plants & Animals**
 - Mice
 - Bacteria

Reference

The research, carried out by Dr Javier Bravo, and Professor John Cryan at the Alimentary Pharmabiotech Centre in University College Cork, along with collaborators from the Brain-Body Institute at McMaster University in Canada, demonstrated that mice fed with *Lactobacillus rhamnosus* JB-1 showed significantly fewer stress, anxiety and depression-related behaviours than those fed with just broth. Moreover, ingestion of the bacteria resulted in significantly lower levels of the stress-induced hormone, corticosterone.

"This study identifies potential brain targets and a pathway through which certain gut organisms can alter

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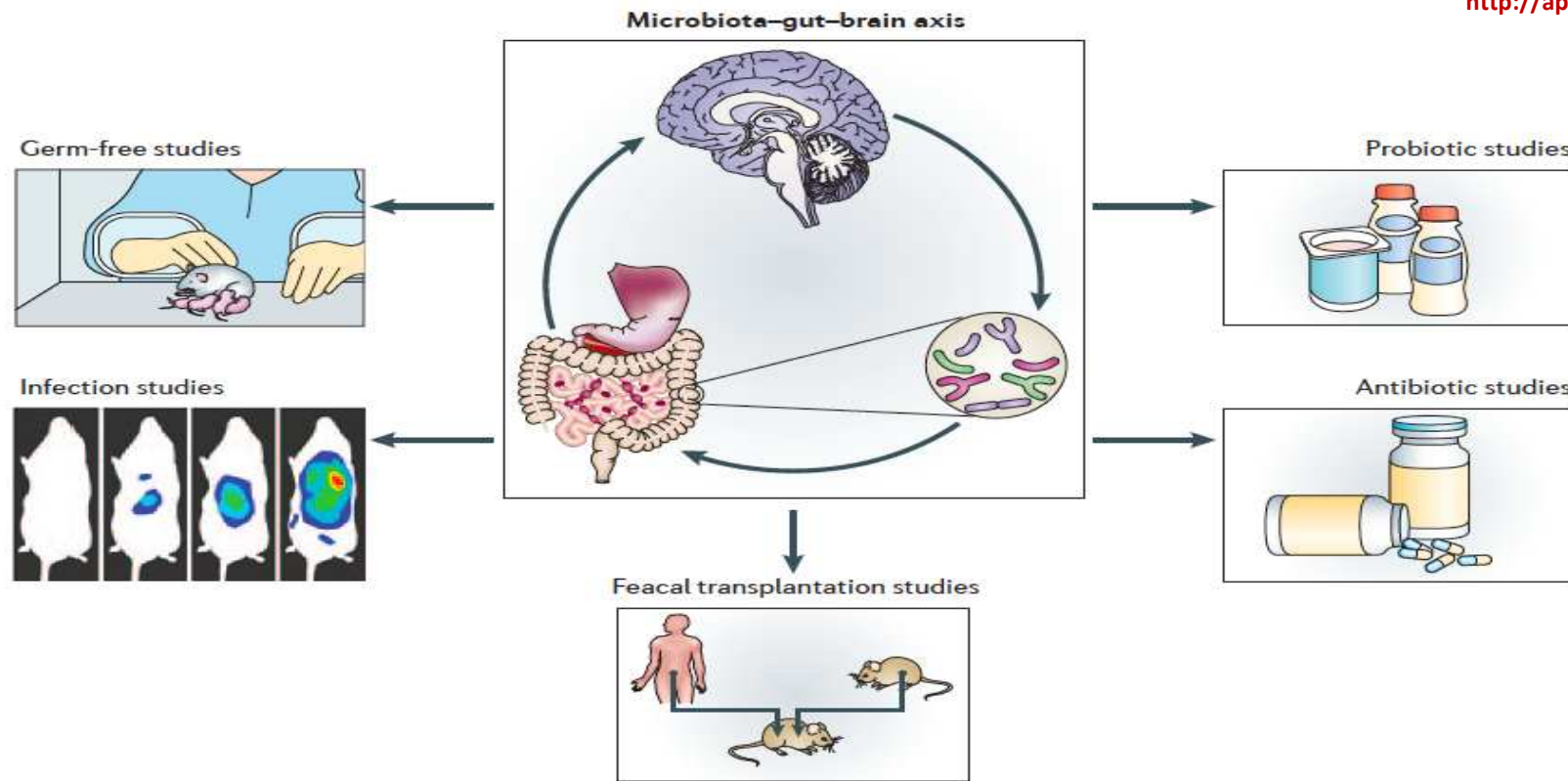
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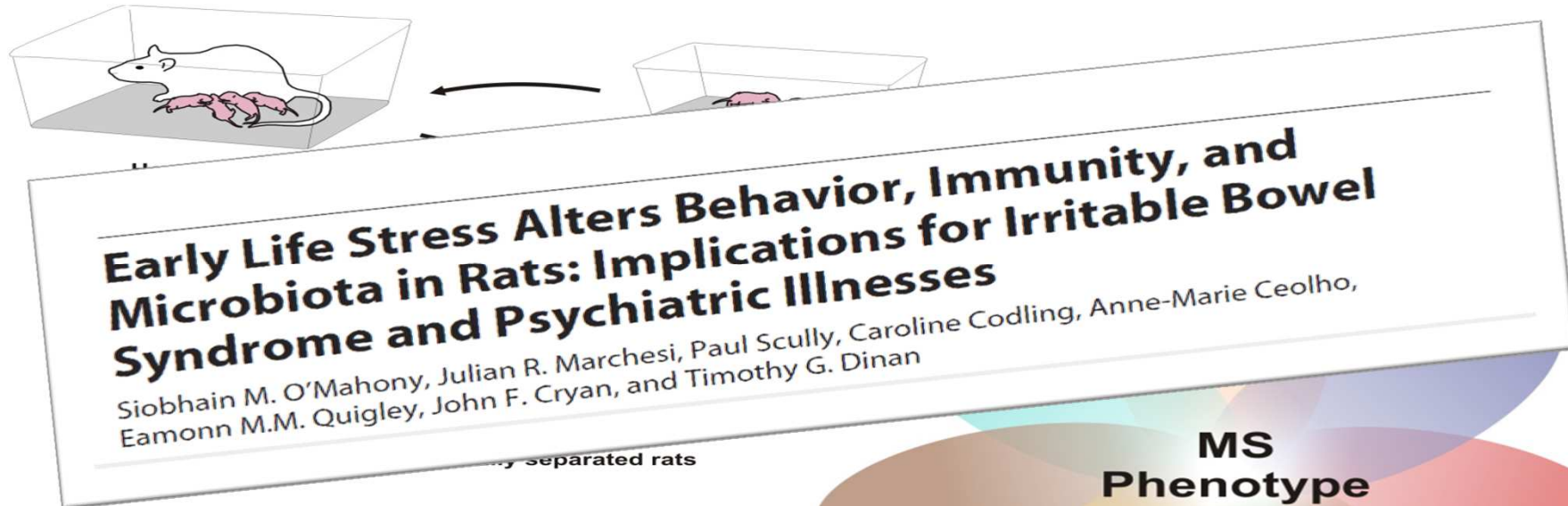
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Investigating the Microbiome-Gut-Brain axis



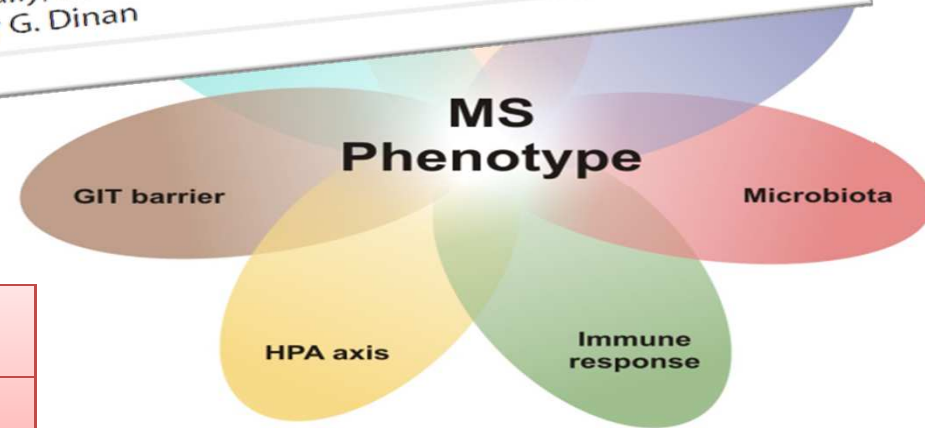
Cryan JF, Dinan TG. (2012). Mind-altering microorganisms: the impact of the gut microbiota on brain and behaviour. *Nat Rev Neurosci.*:13(10):701-12

Investigating the Microbiome-Gut-Brain axis



Diversity of Microbiota

Group	Mean Similarity %	SEM
Non Separated	75.2	16.8
Maternally Separated	59.9 *	21.0



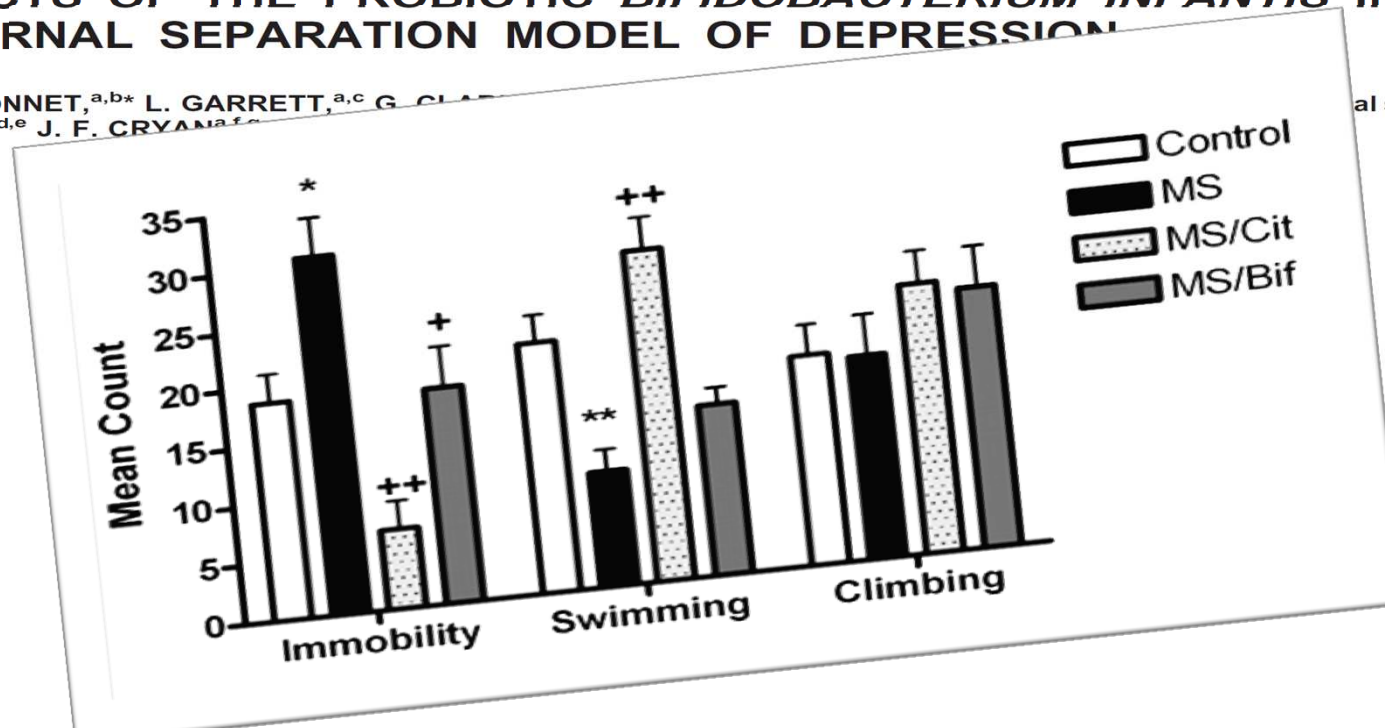
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Neuroscience 170 (2010) 1179–1188

EFFECTS OF THE PROBIOTIC *BIFIDOBACTERIUM INFANTIS* IN THE MATERNAL SEPARATION MODEL OF DEPRESSION

L. DESBONNET,^{a,b,*} L. GARRETT,^{a,c} G. CLARKE,^a
B. KIELY,^{d,e} J. F. CRYAN^{a,f,g}

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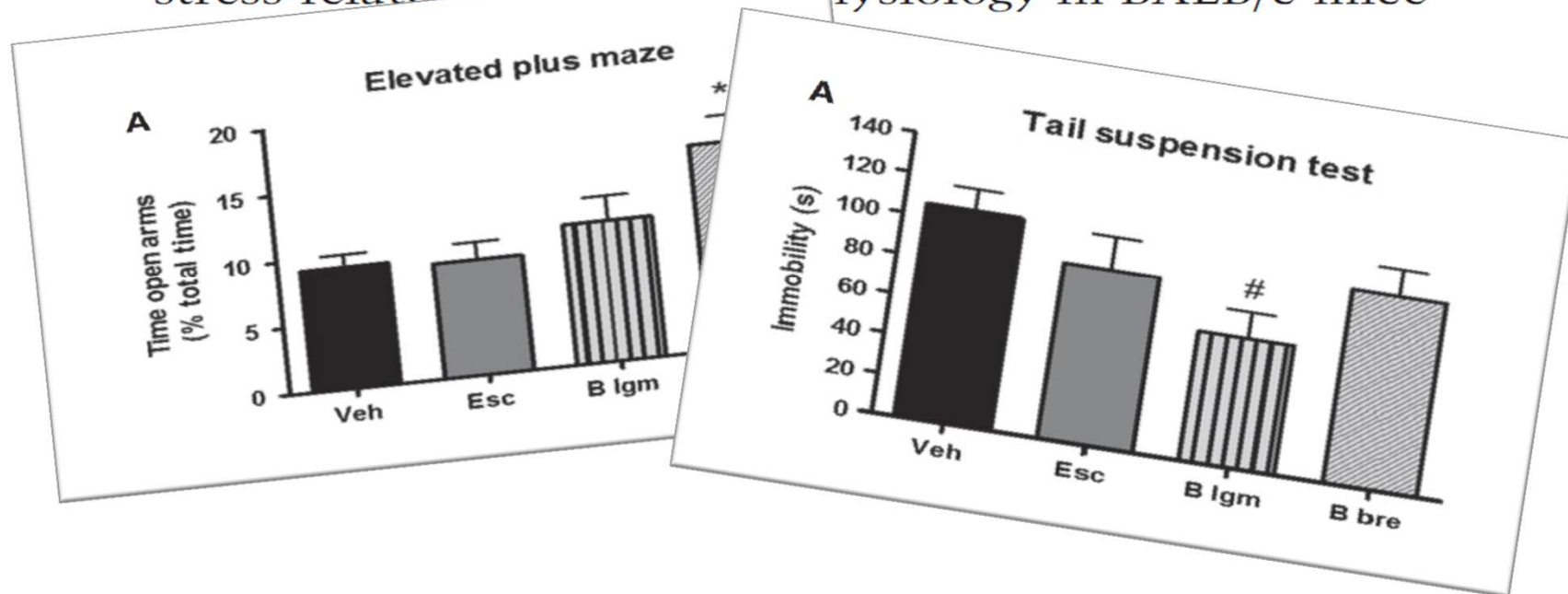
Investigating the Microbiome-Gut-Brain axis

Neurogastroenterology & Motility

Neurogastroenterol Motil (2014)

doi: 10.1111/nmo.12427

Bifidobacteria exert strain-specific effects on stress-related behaviour and physiology in BALB/c mice

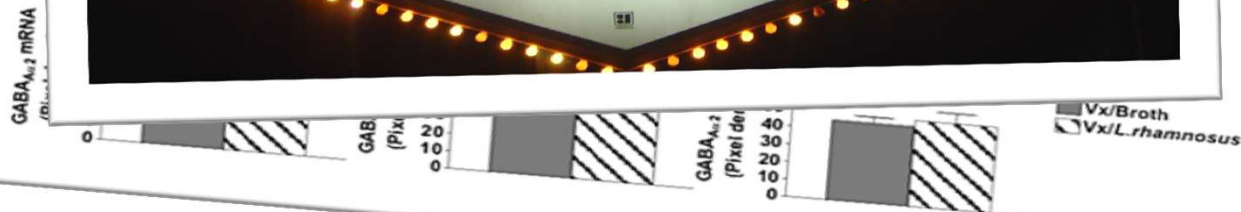
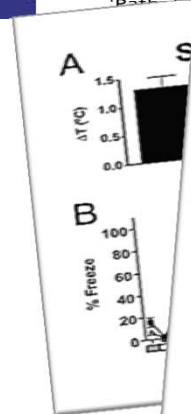


Investigating the Microbiome-Gut-Brain axis

Ingested *Lactobacillus* strain regulates emotional behavior in mice

Javier A. ...
Timothy ...
^aLaboratory of ...
College of ...
Pathology

PNAS



(JB-1)
(JB-1)

rhamnosus

Vx/Broth
Vx/L.rhamnosus

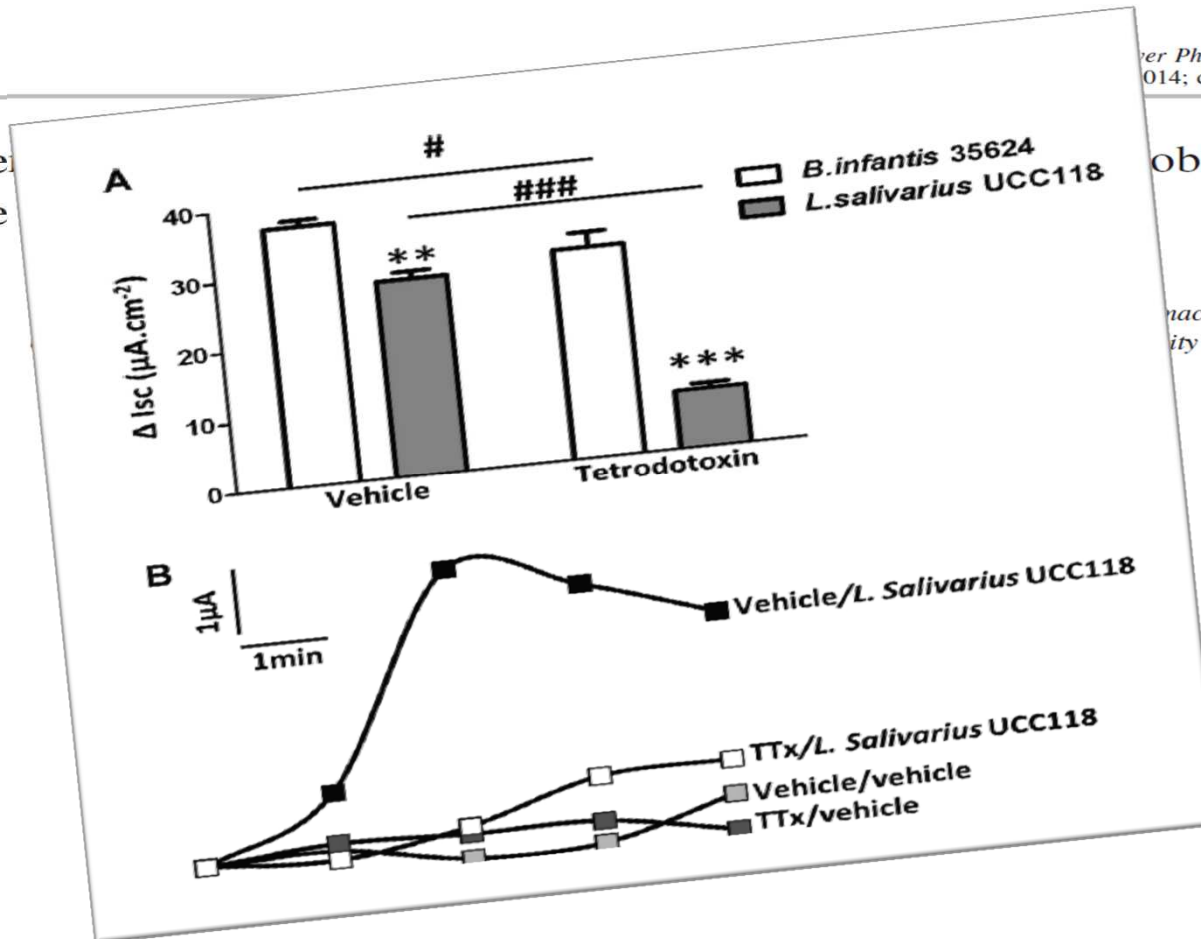
Investigating the Microbiome-Gut-Brain axis

Am J Physiol 307: G241–G247, 2014.
doi:10.1152/ajpgi.00401.2013.

Conve
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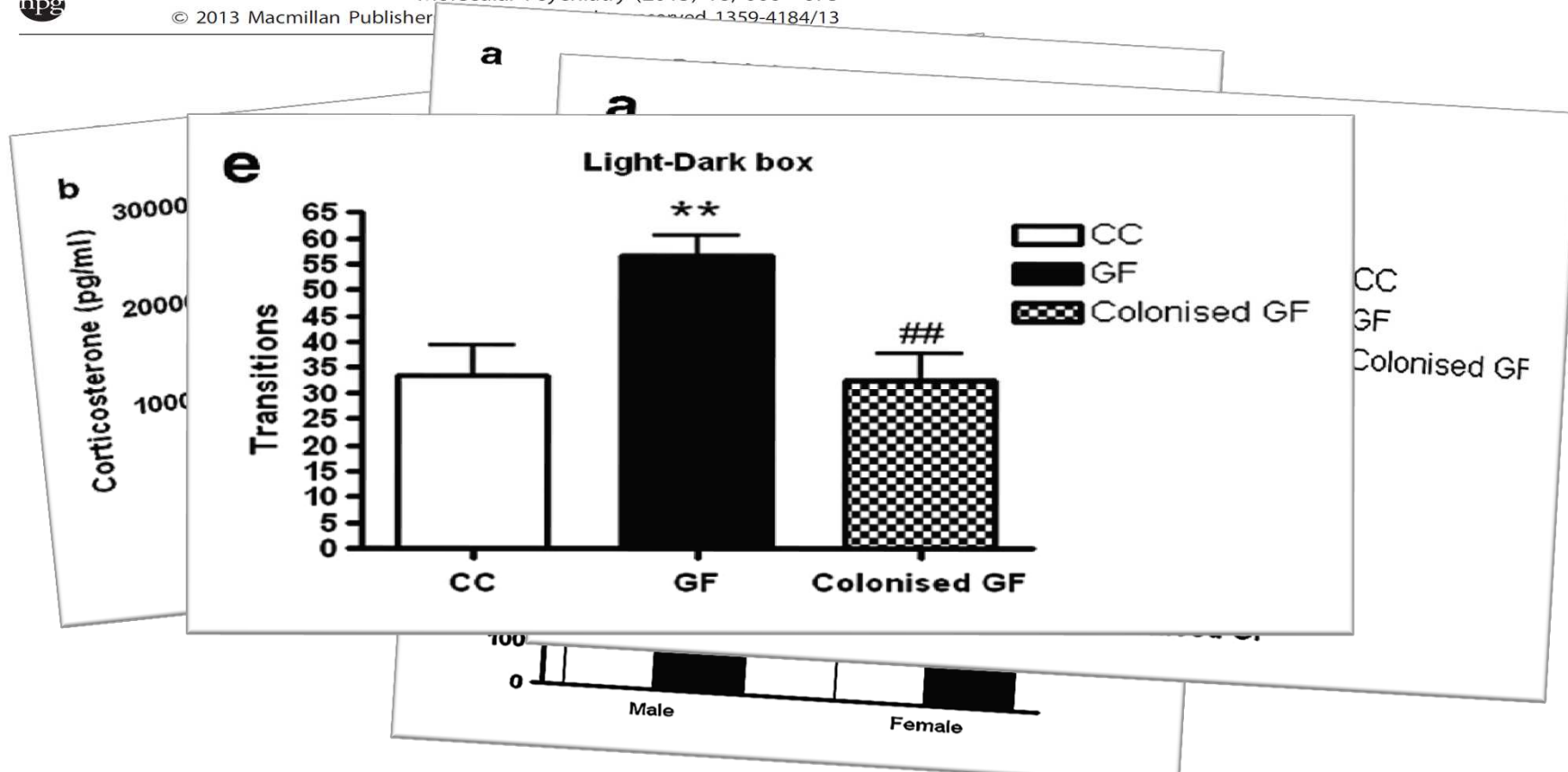
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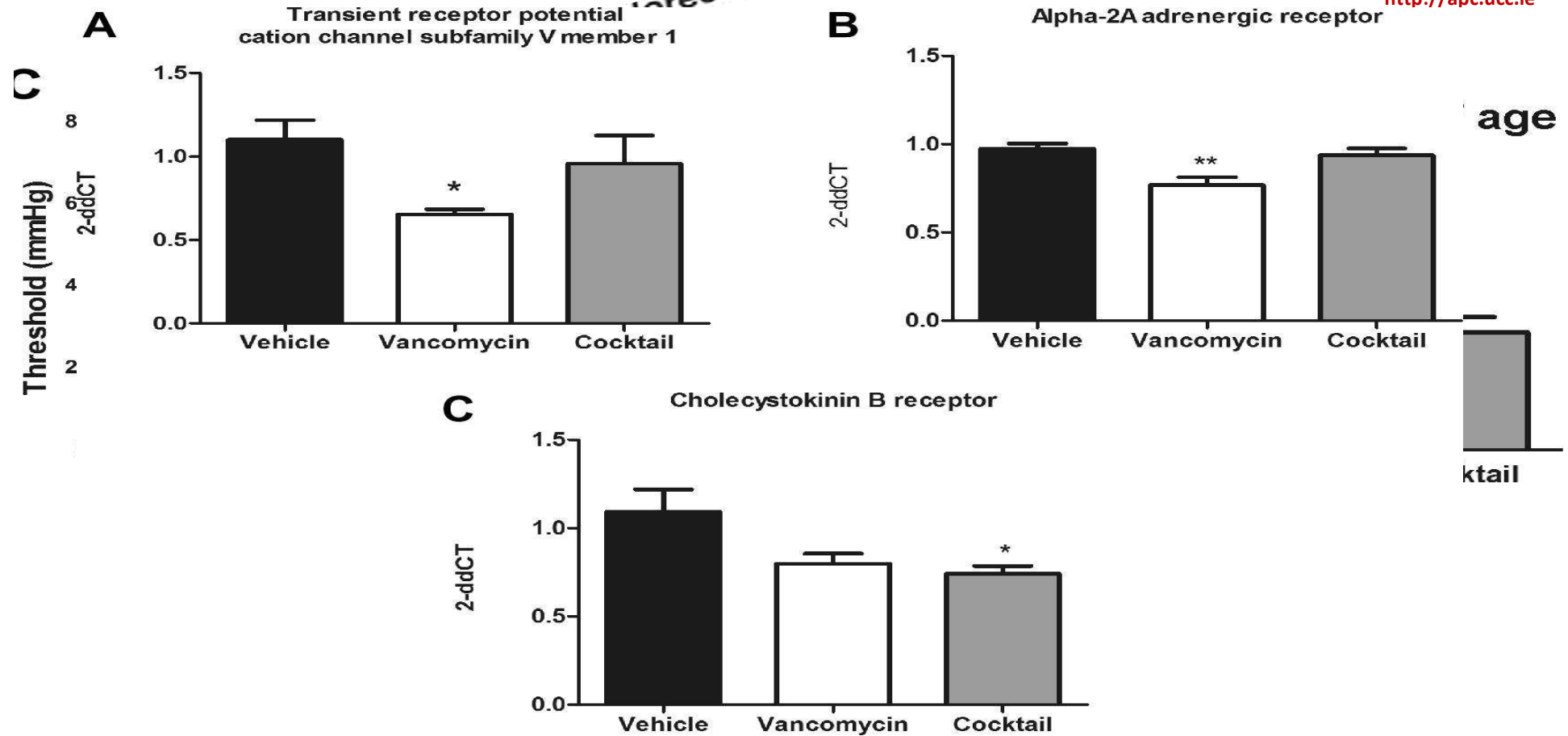
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Molecular Psychiatry (2013) 18, 666–673
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1359-4184/13



Investigating the Microbiome-Gut-Brain axis



Microbiota Modulate Behavioral and Physiological Abnormalities Associated with Neurodevelopmental Disorders

Elaine Y. Hsiao,^{1,2*} Sara W. McBride,¹ Sophia Hsien,¹ Gil Sharon,¹ Janet Chow,¹ Sarah E. Reisman,² Joseph F. Petrosino,³ Paul H. Axelsen,¹ and Jeffrey J. Gold,¹ *et al.*
¹Division of Biology and Biological Engineering, California Institute of Technology
²Division of Chemistry and Chemical Engineering, California Institute of Technology
³Alkek Center for Metagenomics and Microbiome Research, Baylor College of Medicine
^{*}These authors contributed equally to this work
^{*}Correspondence: ehsiao@caltech.edu (E.Y.H.), php@caltech.edu (P.H.P.)



Cell



Germ free

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de
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probiotic treatment of mice with autism features

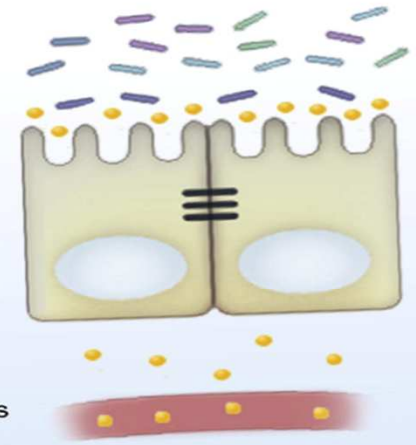
alters the composition of the gut microbiota

improves epithelial barrier integrity

reduces leakage of particular GI metabolites

restores serum metabolites

ameliorates specific autism-related behavioral abnormalities



Investigating the Microbiome-Gut-Brain axis

British Journal of Nutrition (2011), 105, 755–764
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Assessment

Table 2. Effects of the probiotic formulation (PF) (n 26) and placebo (PL) (n 29) on Hopkins Symptom Checklist-90 (HSCL-90) scores at baseline (BL) and follow-up (FU) (Medians with inferior quartile (IQ) and superior quartile (SQ) values)

	PF		PL		Change between BL and FU (%)	
	Median	IQ–SQ	Median	IQ–SQ	Median	IQ–SQ
BL	42	23.5–75.5	32	17.5–55.5	30.7*	5.5–51.8
FU	5.5	3–8.5	5	1–8.5	25*	0–57.5
Change between BL and FU (%)	8.5	4–13	5.5	3–8	28.6	–3.4–55
BL	4	3–9.5	6	1.5–7.5	20.8	–25–55.6
FU	2	4–11.5	2	2–11.5	25*	–10.7–50
Change between BL and FU (%)	2.6	2–6	0	0–1	33.3*	0–76.4
BL	44.4	22.6–64.2	32	17.5–55.5	30.7*	0–62.5
FU	11.4	3.5–7.5	5	1–8.5	25*	0–100
Change between BL and FU (%)	66.7	6.7–56.7	6	1–4	66.7	–20–60.6
BL	4	3–9.5	2	0–1	33.3	2.8–84.3
FU	2	4–11.5	2	0–5	50	0–54.2
Change between BL and FU (%)	2.6	2–6	0	0–1	26.1	0–54.2

Table 3. Effects of the probiotic formulation (PF) (n 26) and placebo (PL) (n 29) on Hospital Anxiety and Depression Scale (HADS), HADS-anxiety (HADS-A), HADS-depression (HADS-D) and Perceived Stress Scale (PSS) scores at baseline (BL) and follow-up (FU) (Medians with inferior quartile (IQ) and superior quartile (SQ) values)

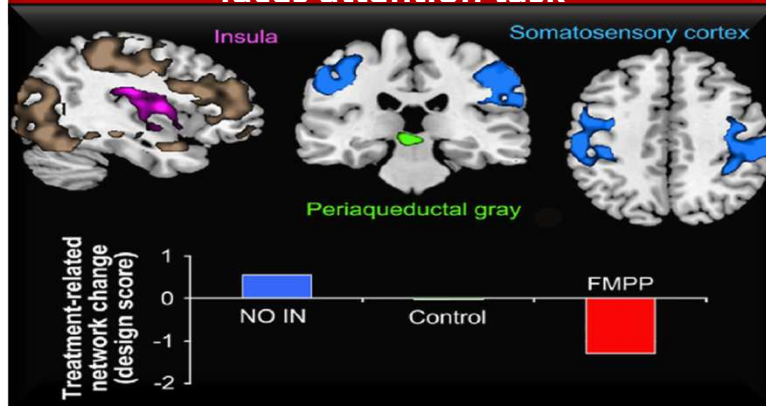
	PF				PL				Change between BL and FU (%)	
	BL		FU		BL		FU		Median	IQ–SQ
	Median	IQ–SQ	Median	IQ–SQ	Median	IQ–SQ	Median	IQ–SQ	Median	IQ–SQ
HADS	14	12–18	9	7–14	12	11–15.3	9	8–13.5	18.8**	–8.5–36.6
HADS-A	8	7–10	6	4–7	8	6–10.3	6	4–8	25*	–2.8–38
HADS-D	6	3–7	3.5***	2–7	5	3–6	4	2–6	16.7	–27.8–50
PSS	43	38–45	36.5	29–39	16.5	5.3–29.5	35	30.5–40	13	4.9–19.9

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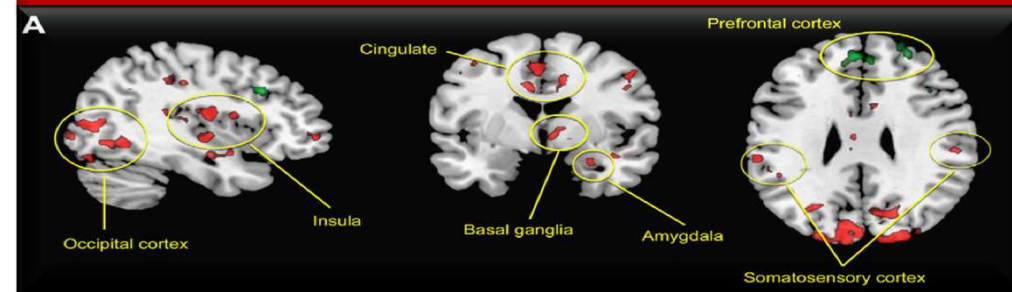
Consumption of Fermented Milk Product With Probiotic Modulates Brain Activity

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. MAYER¹

A distributed network of brain regions showing decreases during an emotional faces attention task



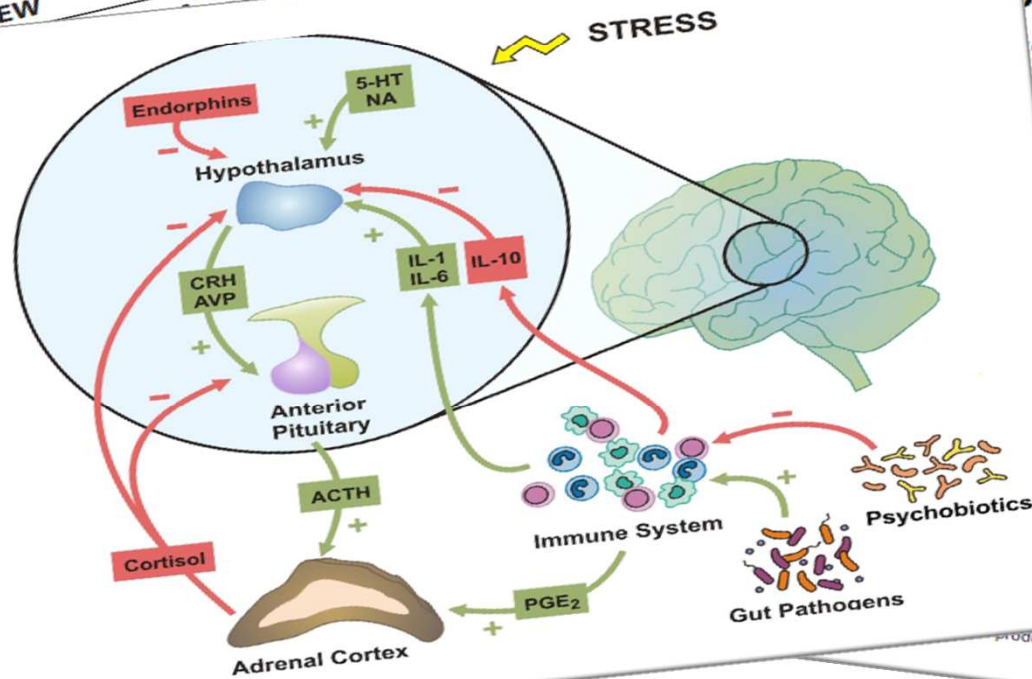
A resting state midbrain centered is negatively correlated with midbrain activity after FMPP



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REVIEW

A Novel Class of Psychotropic



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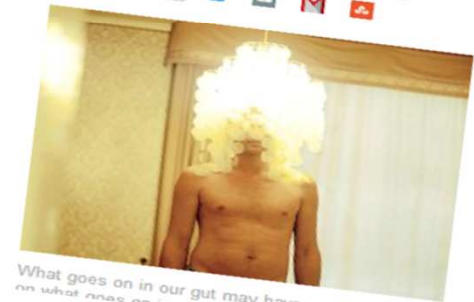
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new ways to relieve
stressing professors

our emotions. Just
it is becoming
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ered, raising the
orders such as

live in an
acteria in your
of your brain.
producing hundreds if



What goes on in our gut may have profound effects
on what goes on in our mind. *Amara Swan*



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