Disclosure Slide

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Wisdom • Learning • Compassion

WINTER CONFERENCE 2018

FROM THE BIOME TO BIPOLAR

15th & 16th NOVEMBER 2018
The BREHON HOTEL / INEC Killarney

*** External CPD credits (Thursday: 7 credits / Friday: 6 credits)

- Speakers Bureau, Janssen
- APC Microbiome Ireland research funded in part by Dupont Nutrition Biosciences APS, Cremo SA, Alkermes Inc., 4D Pharma PLC, Alimentary Health, Mead Johnson Nutrition, Nutricia Danone, Suntory Wellness
- This support has neither influenced nor constrained the content of this presentation

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*** External CPD credits (Thursday: 7 credits / Friday: 6 credits)

Interfacing Food and Medicine

The Little Things that Matter Most in Psychiatry: An Update on Gut Microbes and Their Effects on Brain Function and Host Behaviour

Dr Gerard Clarke

Department of Psychiatry and Neurobehavioural Science

and APC Microbiome Ireland

University College Cork

Killarney November 16th 2018

HRB Health Research Board

HSE

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CoMH College of Medicine and Health UCC

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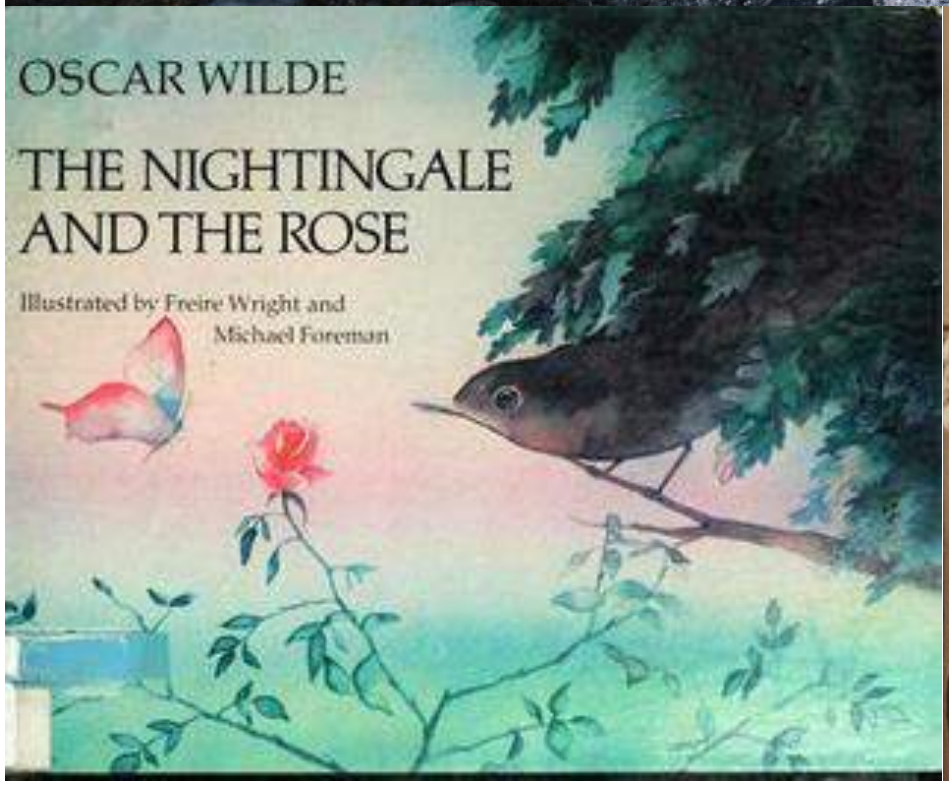
Agriculture and Food Development Authority

Science Foundation Ireland SFI For what's next


Ah, on what little things
does happiness depend.
Oscar Wilde


OSCAR WILDE
THE NIGHTINGALE AND THE ROSE
Illustrated by Freire Wright and Michael Foreman

Gut Feelings

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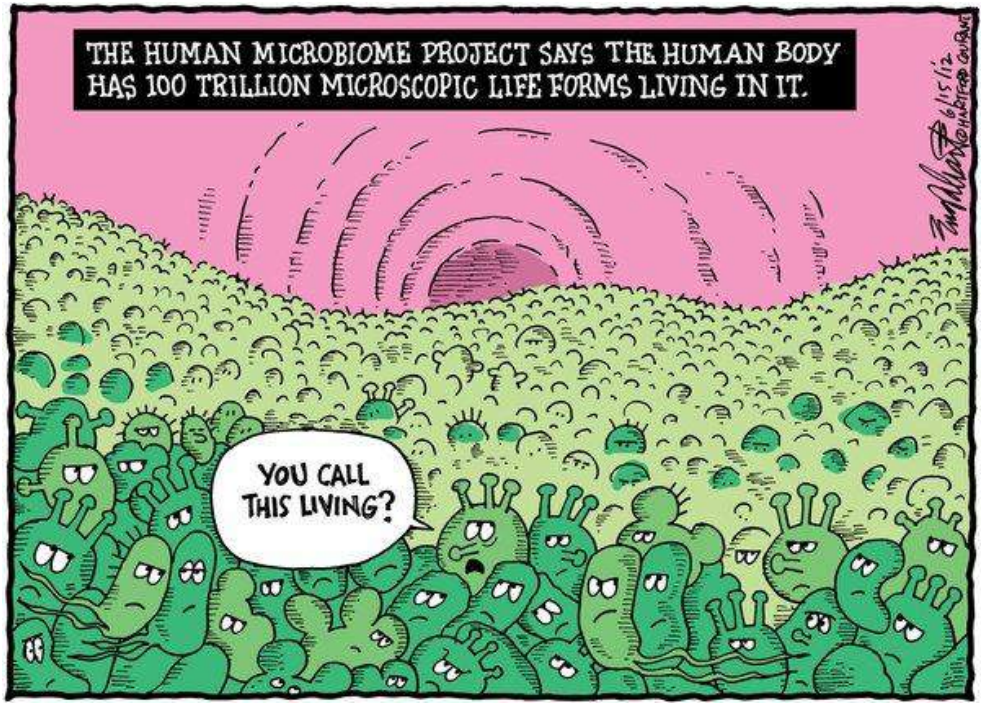
- Brain-Gut-Microbiome Axis
- Health and Disease
- 'Mind altering microbes'
- Anxiety, Depression, Stress and Cognition



- Tryptophan availability and metabolism
- Translational implications and opportunities for intervention?

Brain-Gut-Microbiome Axis

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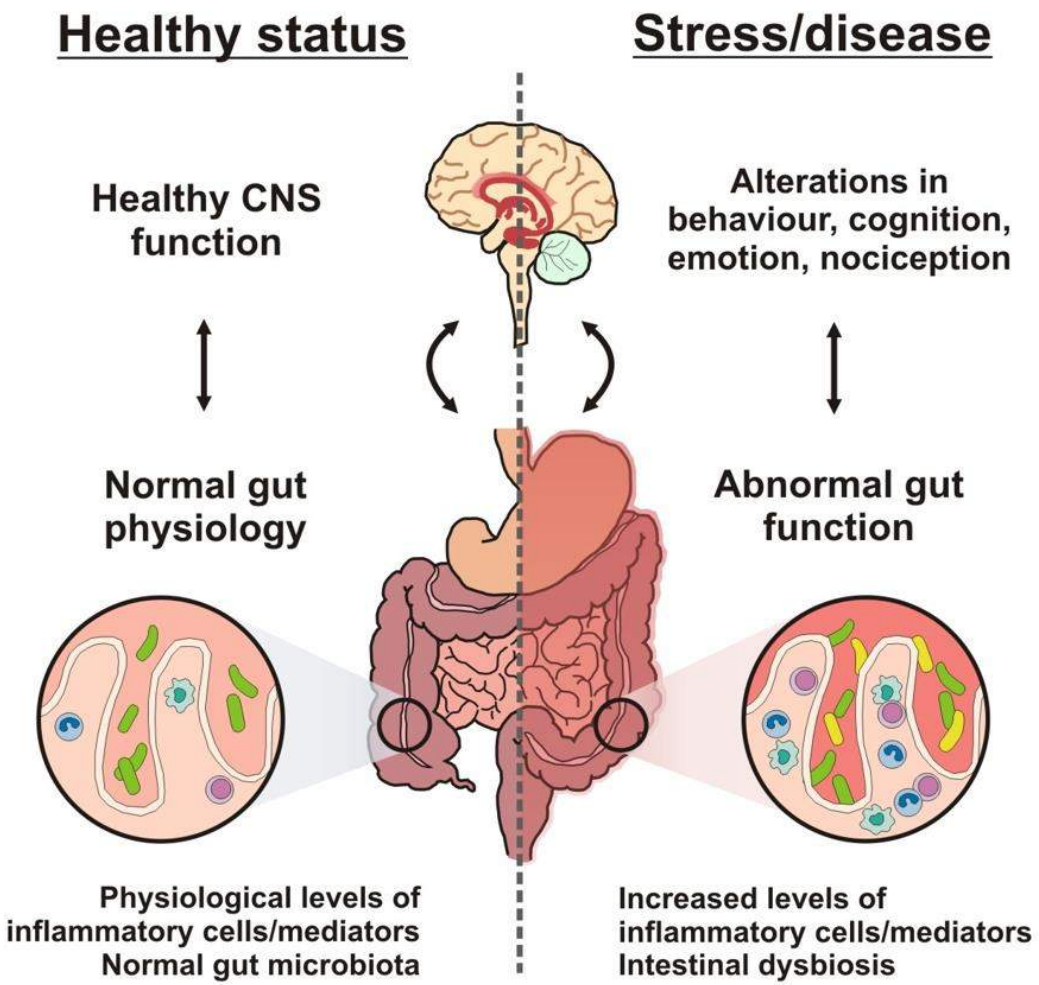

Grenham, Clarke et al., Frontiers in Physiology 2011

Signalling Along the Brain-Gut-Microbiota axis

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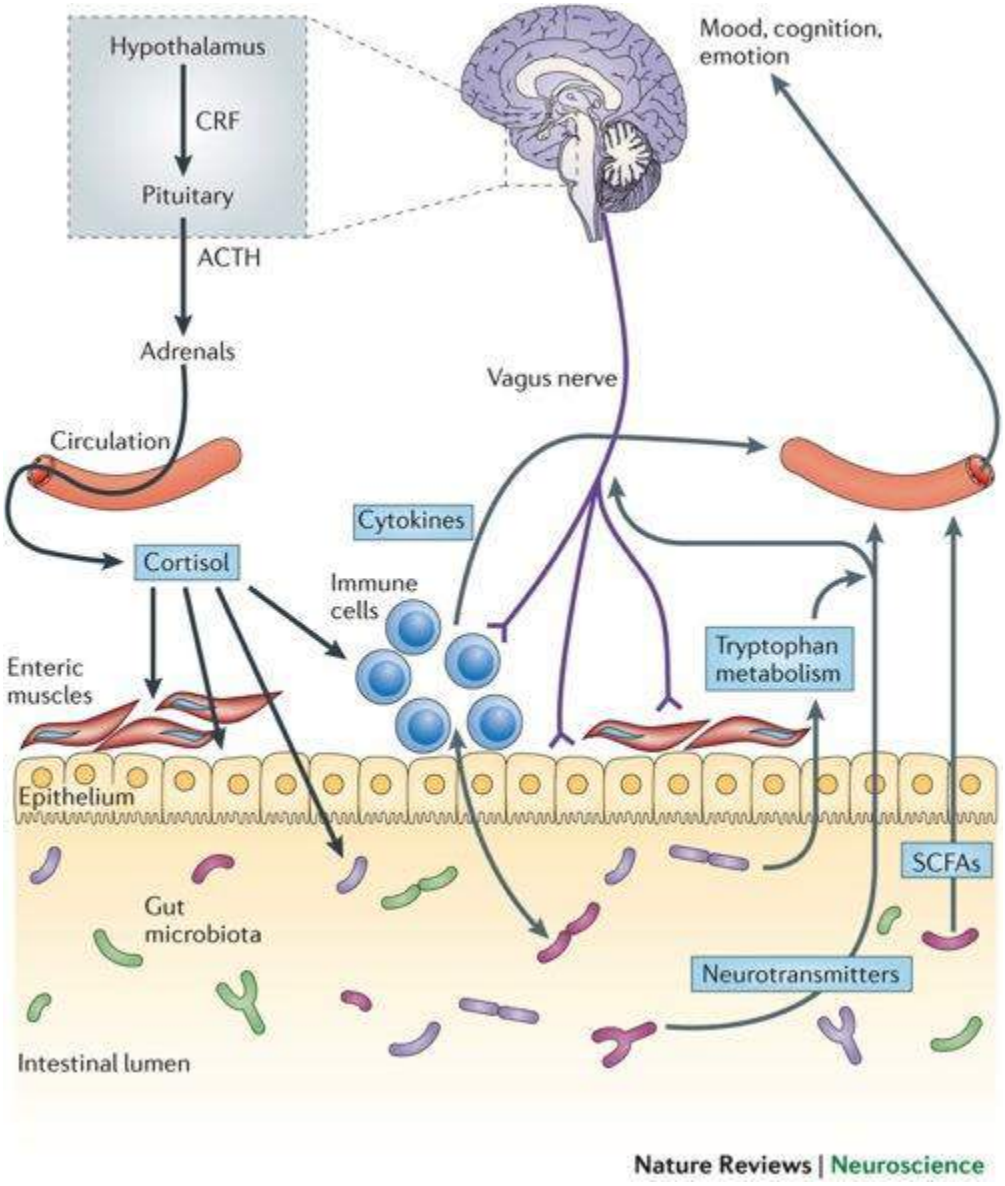

Cryan and Dinan, Nat Rev Neurosci Oct 2012

Where do we get our microbiota from?

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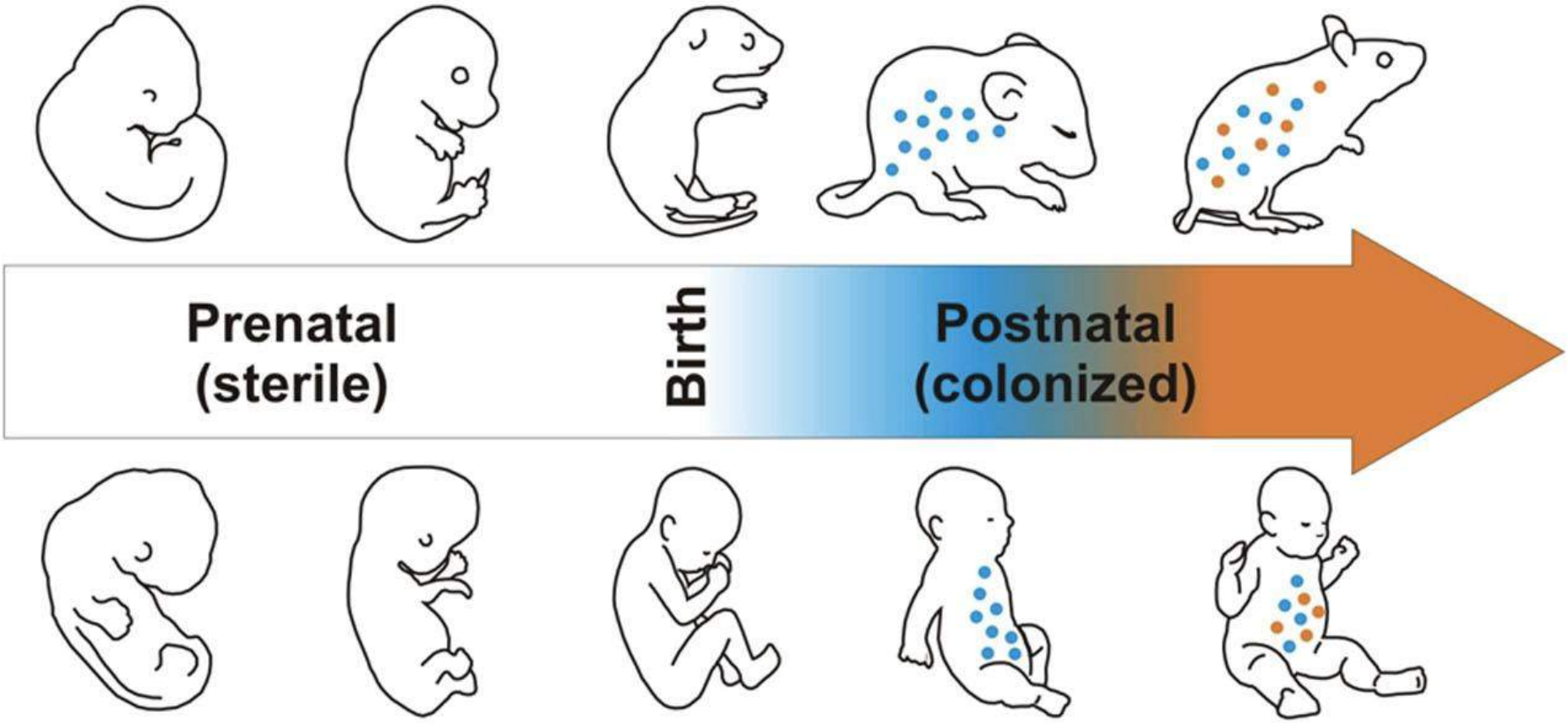
http://apc.ucc.ie



Grenham et al., 2011

What Shapes our Gut Microbiota?

Article

Cell

Medicine

c.ie

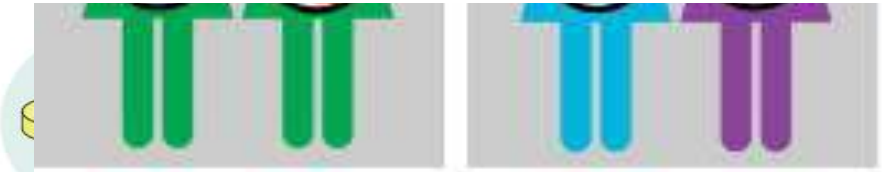
ARTICLE

210 | NATURE | VOL 555 | 8 MARCH 2018

doi:10.1038/nature25973

Environment dominates over host genetics in shaping human gut microbiota

Daphna Rothschild[1,2*], Omer Weissbrod[1,2*], Elad Barkan[1,2*], Alexander Kurilshikov[3], Tal Korem[1,2], David Zeevi[1,2], Paul I. Costea[1,2], Anastasia Godneva[1,2], Iris N. Kalka[1,2], Noam Bar[1,2], Smadar Shilo[1,2], Dar Lador[1,2], Arnau Vich Vila[3,4], Niv Zmora[5,6,7], Meirav Pevsner-Fischer[5], David Israeli[8], Noa Kosower[1,2], Gal Malka[1,2], Bat Chen Wolf[1,2], Tali Avnit-Sagi[1,2], Maya Lotan-Pompan[1,2], Adina Weinberger[1,2], Zamir Halpern[7,9], Shai Carmi[10], Jingyuan Fu[3,11], Cisca Wijmenga[3,12], Alexandra Zhernakova[3], Eran Elinav[5]§ & Eran Segal[1,2]§



MZ twins have a more similar microbiota than DZ twins

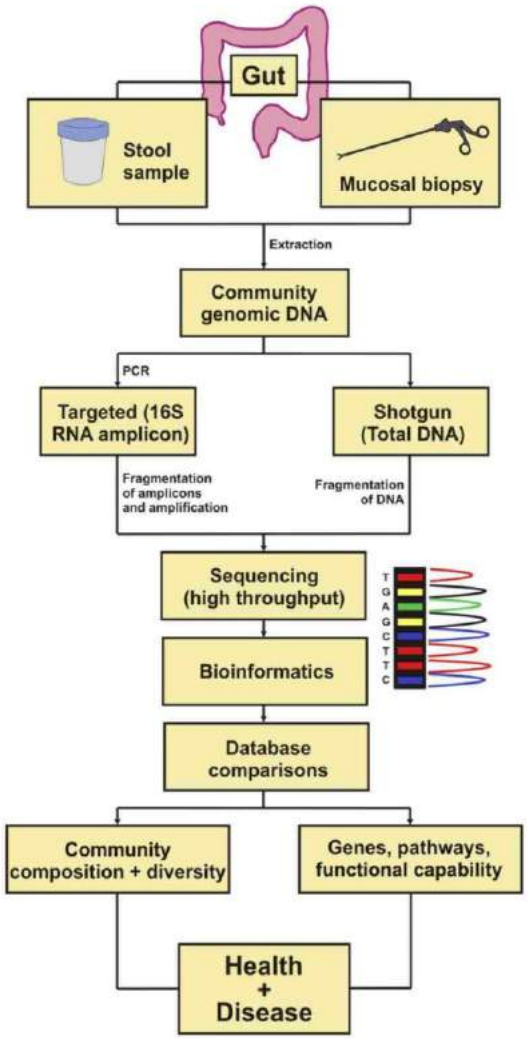
Figure 1 | Factors that can influence the composition and function of the human gut microbiota.

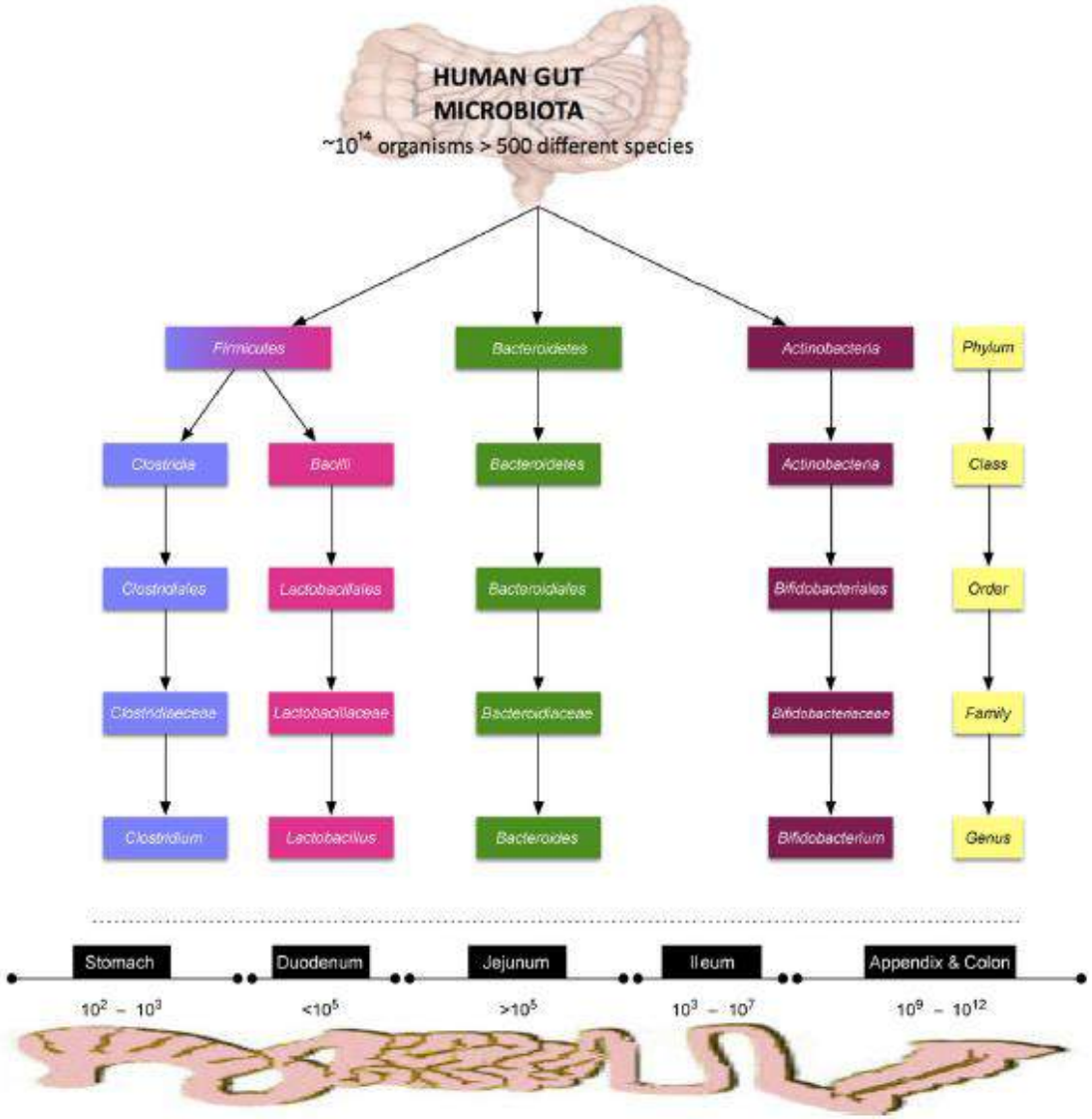
J Physiol 592.14 (2014) pp 2981–2988

REVIEW ARTICLE

It's a gut feeling: How the gut microbiota affects the state of mind

Adam D. Farmer, Holly A. Randall and Qasim Aziz





GI microbiota over lifetime

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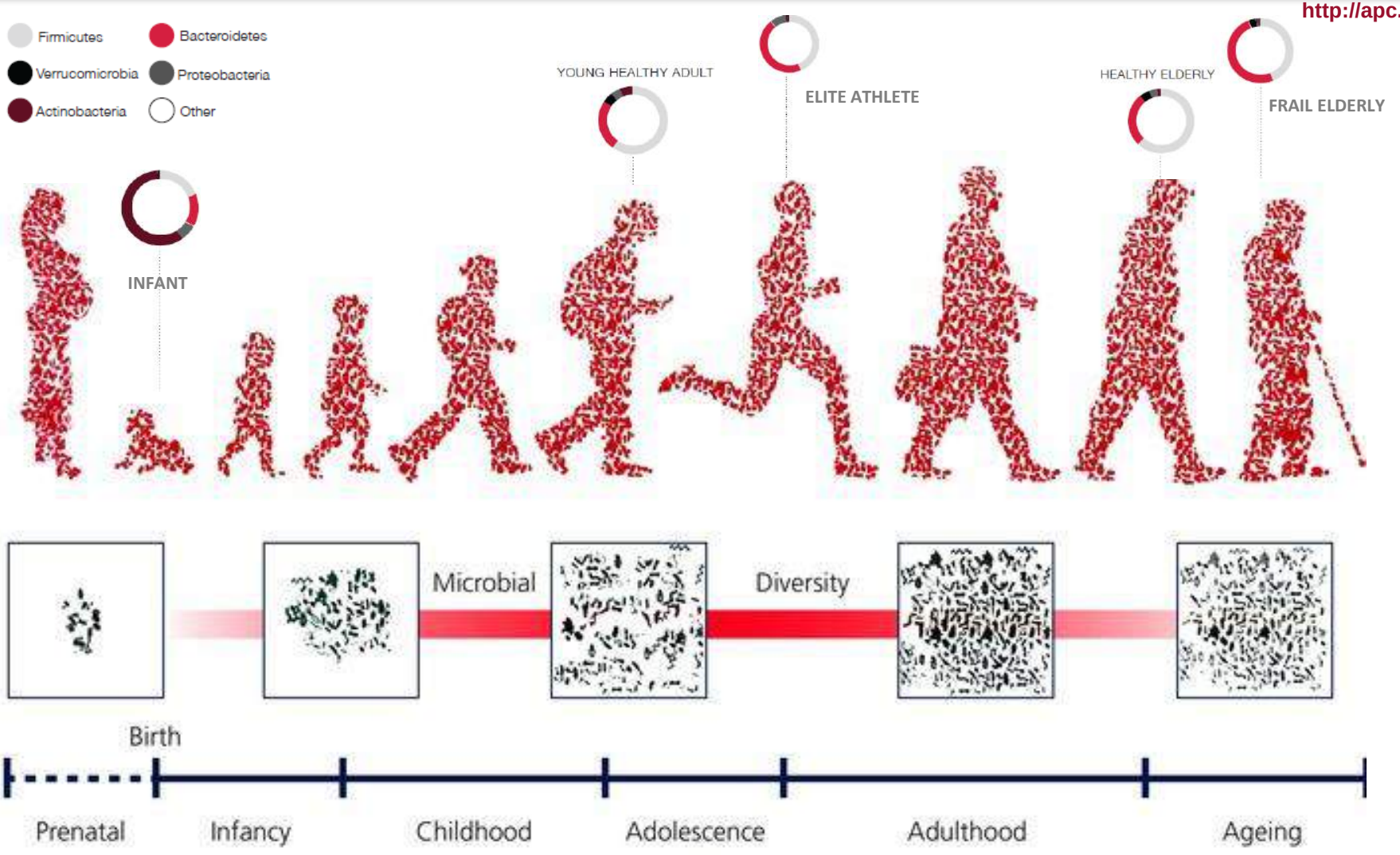
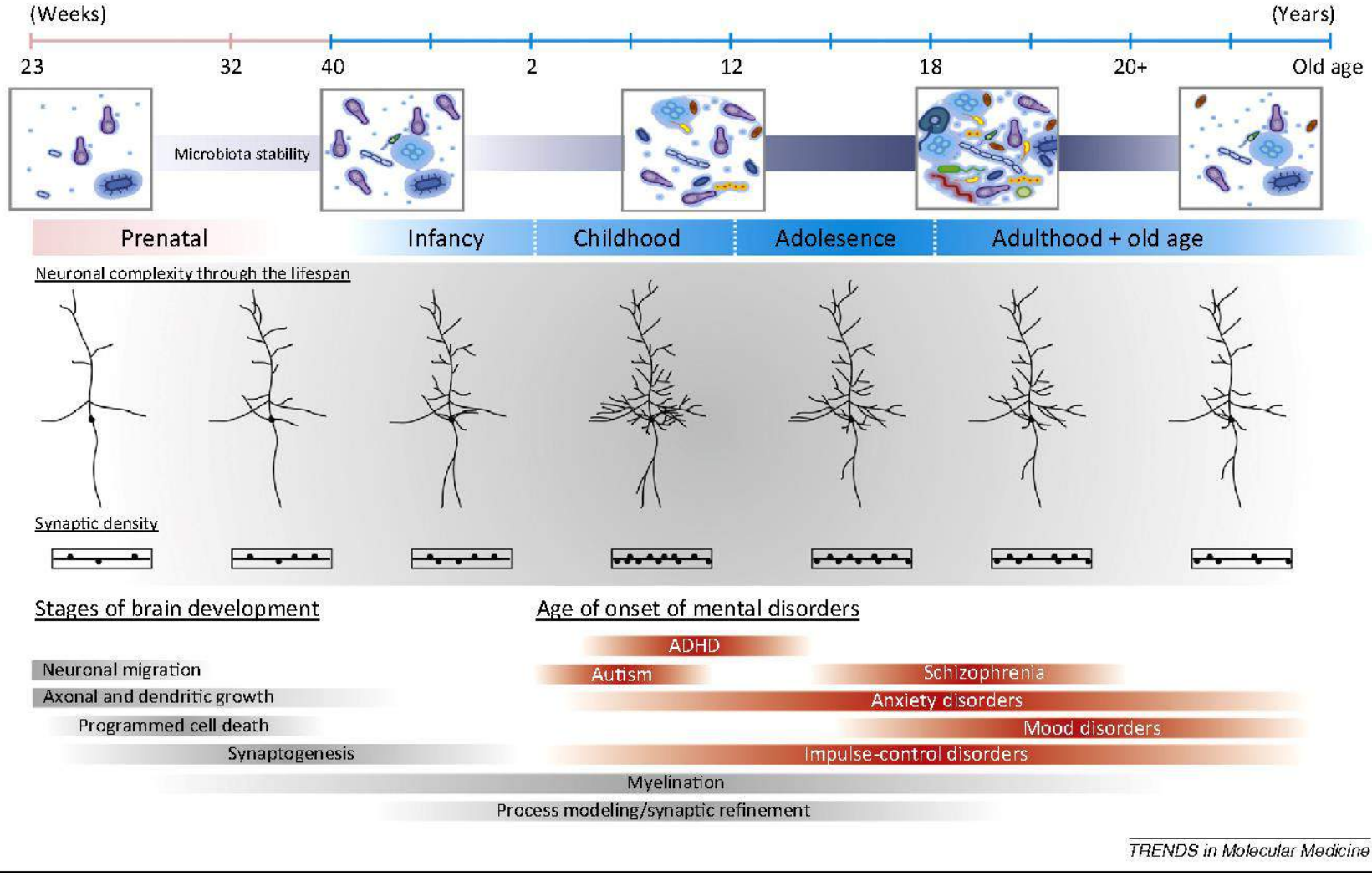


Cryan and Dinan, J Physiology 2017

Stress response
Immune development

Inflammation
Immunosenesence

Microbiota and Neurodevelopment



Borre et al., Trends Molecular Medicine 2014

Microbiota, Brain and Behaviour

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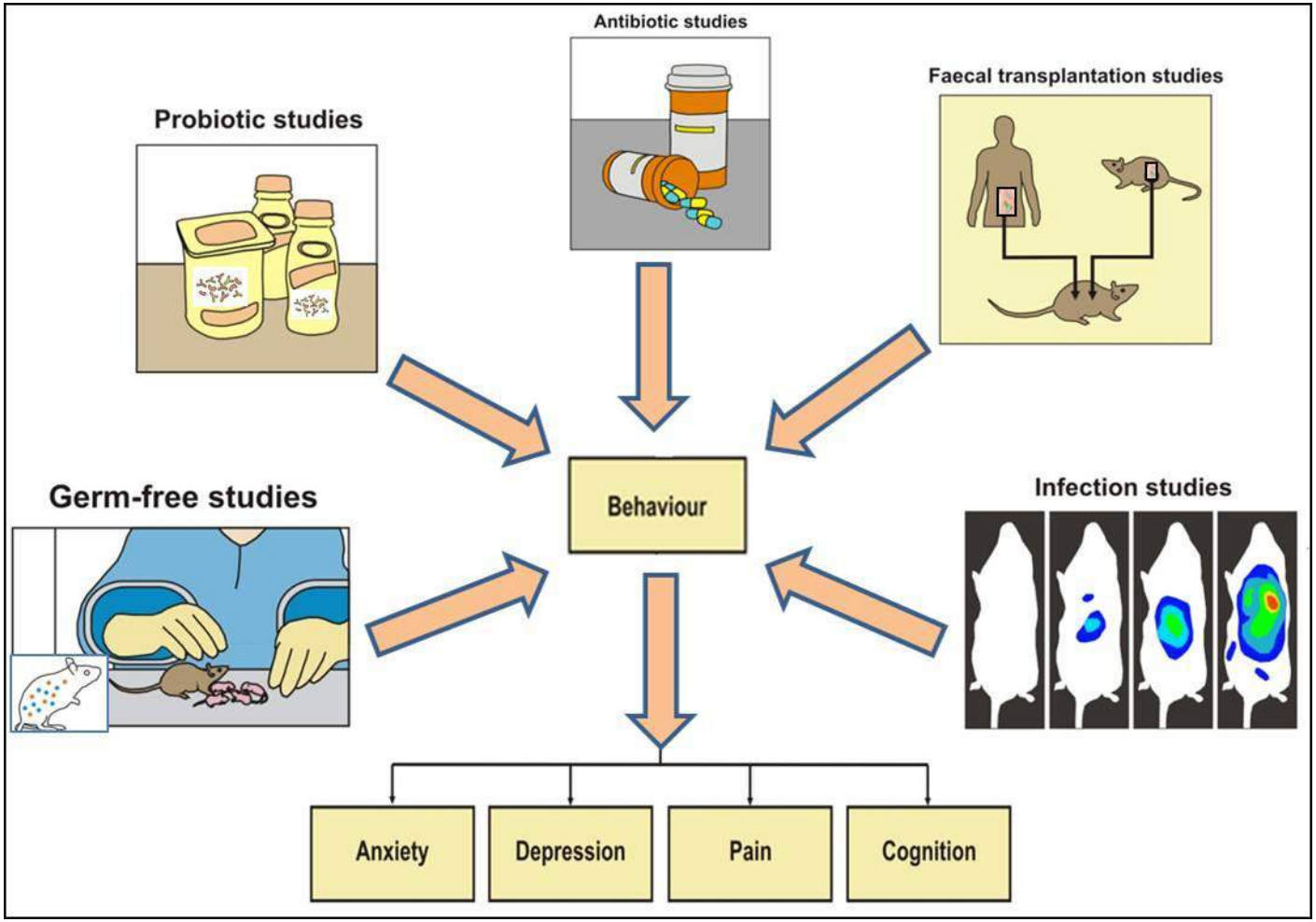

Clarke et al., Encyclopedia Metagenomics 2013

Germ-Free Living?

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Interfacing Food & Medicine
http://apc.ucc.ie

Figure 2. Reyniers's isolator; (1) technician, (2) electrical outlet, (3) air outlet, (4) mobile truck, (5) entrance/exit autoclave, (6) viewing port. *Source:* J. A. Reyniers, P. C. Trexler, and R. F. Ervin, "Rearing Germ-Free Albino Rats," *LOBUND Rep.* 1 (1946): 1–84, 5. © University of Notre Dame. Reprinted with permission.

Kirk, R, Bulletin of the History of Medicine, 2012

weeks after the joyous moment when David stepped out of his bubble for the first time, kissed his mother and felt the loving warmth of a human touch.

He was delivered by Caesarean section under extremely sterile conditions on Sept. 21, 1971, and put into a sterile incubator — the first of a series of plastic homes that grew as he did.

Everything he touched — his clothes, food, toys and books — was sterilized and passed through an airlock into the bubble.

David initially spent most of his time at the hospital, then shared time at home after a bubble was built there, along with one for the family's station wagon.

By 1981, he was spending all but two weeks a year at home. A sixth-grader at the time of his death, he attended school by telephone. He consistently got high grades, and tests showed he was brighter than average.

Stressors

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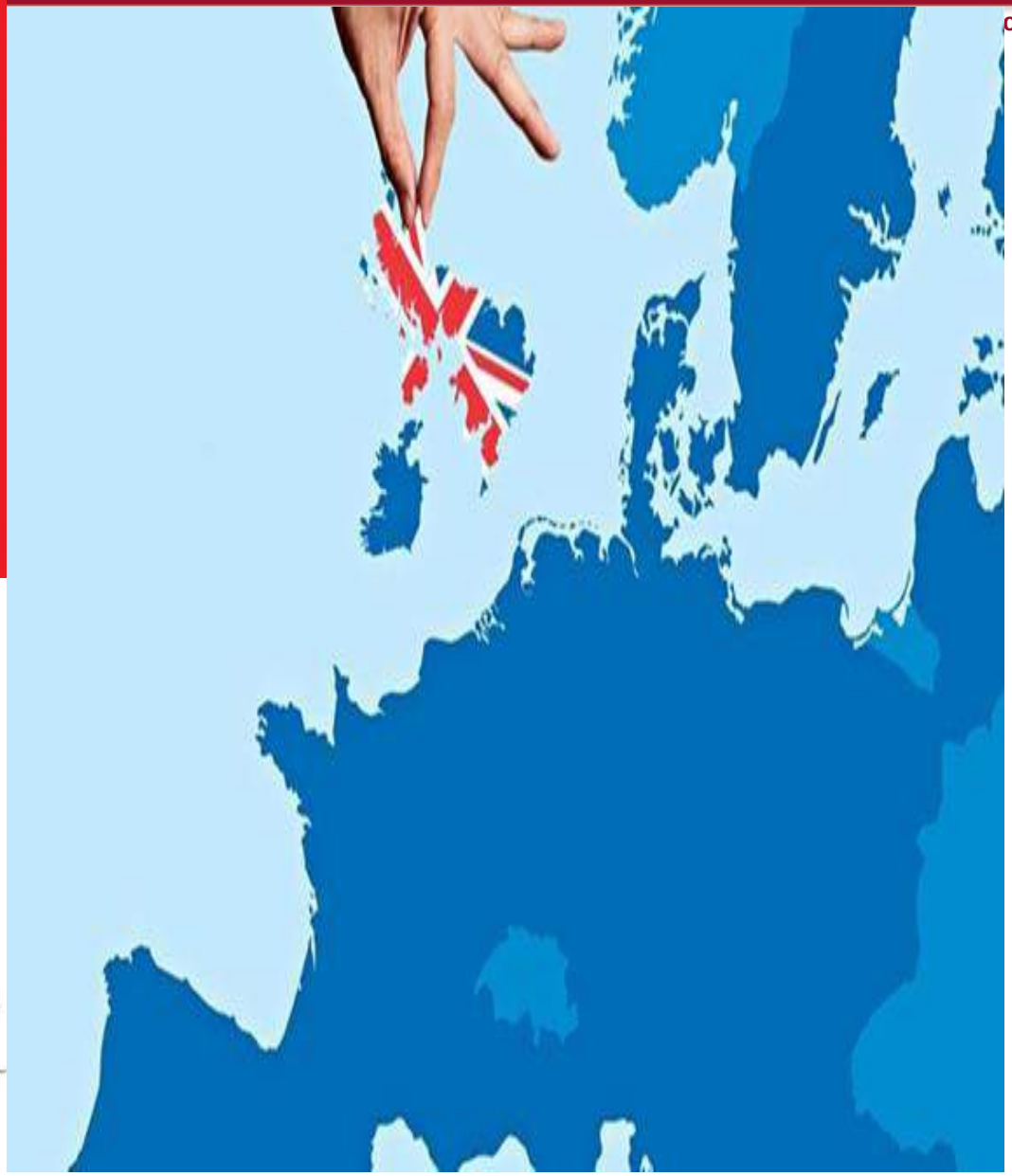


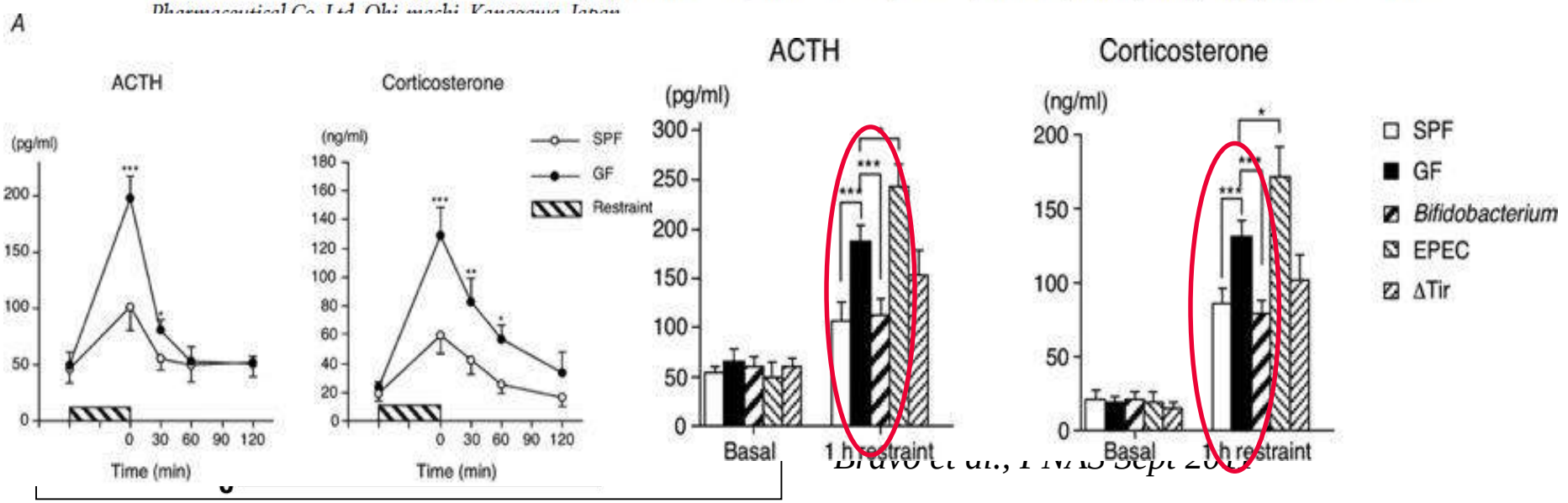
Microbiota Controls Stress Response

J Physiol 558.1 (2004) pp 263–275

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

Nobuyuki Sudo[1,2], Yoichi Chida[1], Yuji Aiba[3,4], Junko Sonoda[1], Naomi Oyama[1], Xiao-Nian Yu[1], Chiharu Kubo[1] and Yasuhiro Koga[3]

[1]Department of Psychosomatic Medicine and [2]Department of Health Care Administration & Management, Graduate School of Medical Sciences, Kyushu University, Fukuoka, Japan, [3]Department of Infectious Diseases, Tokai University School of Medicine, Isehara, Kanagawa, Japan and [4]Wakamoto Pharmaceutical Co. Ltd, Ohi-machi, Kanagawa, Japan



Bravo et al., PNAS Sept 2011

Microbiota Determines Amygdala Volume & Dendritic Morphology

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EJN European Journal of Neuroscience — FENS Federation of European Neuroscience Societies

Research Report

Adult microbiota-deficient mice have distinct dendritic morphological changes: differential effects in the amygdala and hippocampus

Pauline Luczynski[1], Seán O. Whelan[3], Colette O'Sullivan[3], Gerard Clarke[1,2], Fergus Shanahan[1], Timothy G. Dinan[1,2] and John F. Cryan[1,3,*]

DOI: 10.1111/ejn.13291

Issue

European Journal of Neuroscience

Accepted Article (Accepted, unedited articles published online and citable. The final edited and typeset version of record will appear in future.)

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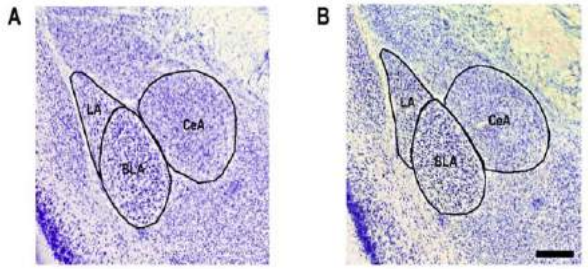
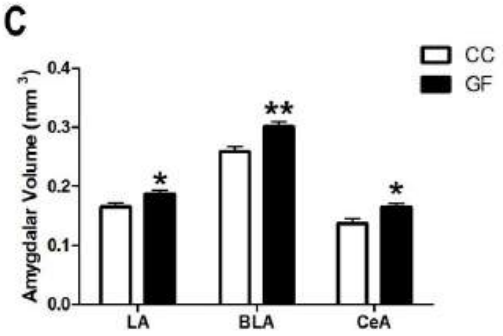
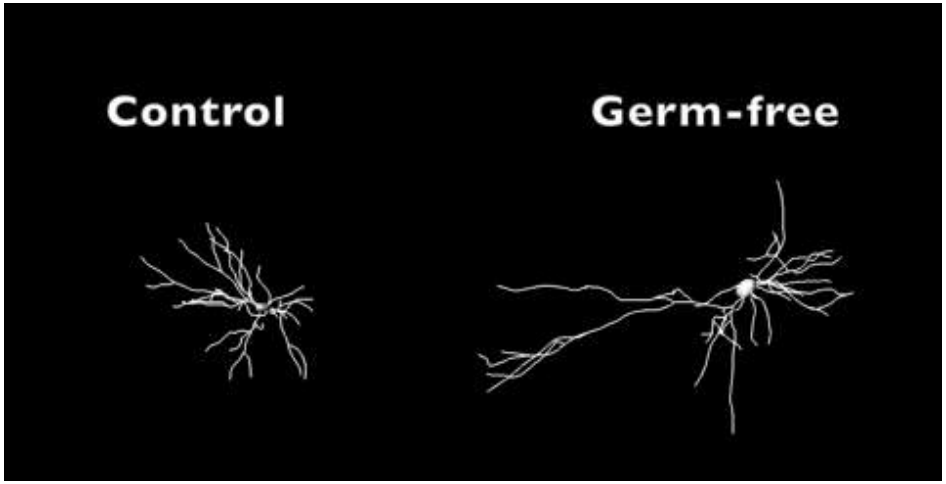
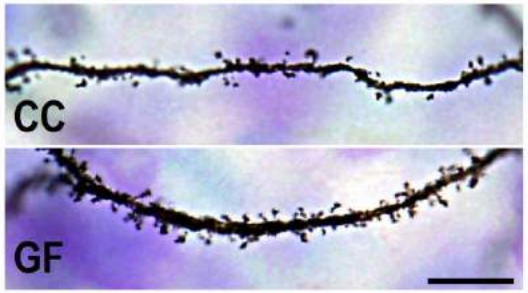




Dendritic Hypertrophy of Basolateral Amygdala Neurons





CC = Conventionally Colonised
GF = Germ Free

OPEN

Molecular Psychiatry (2017) 00, 1–11
www.nature.com/mp

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ORIGINAL ARTICLE

The microbion

AE Hoban[1,2], RM Stilling[1,2], G M

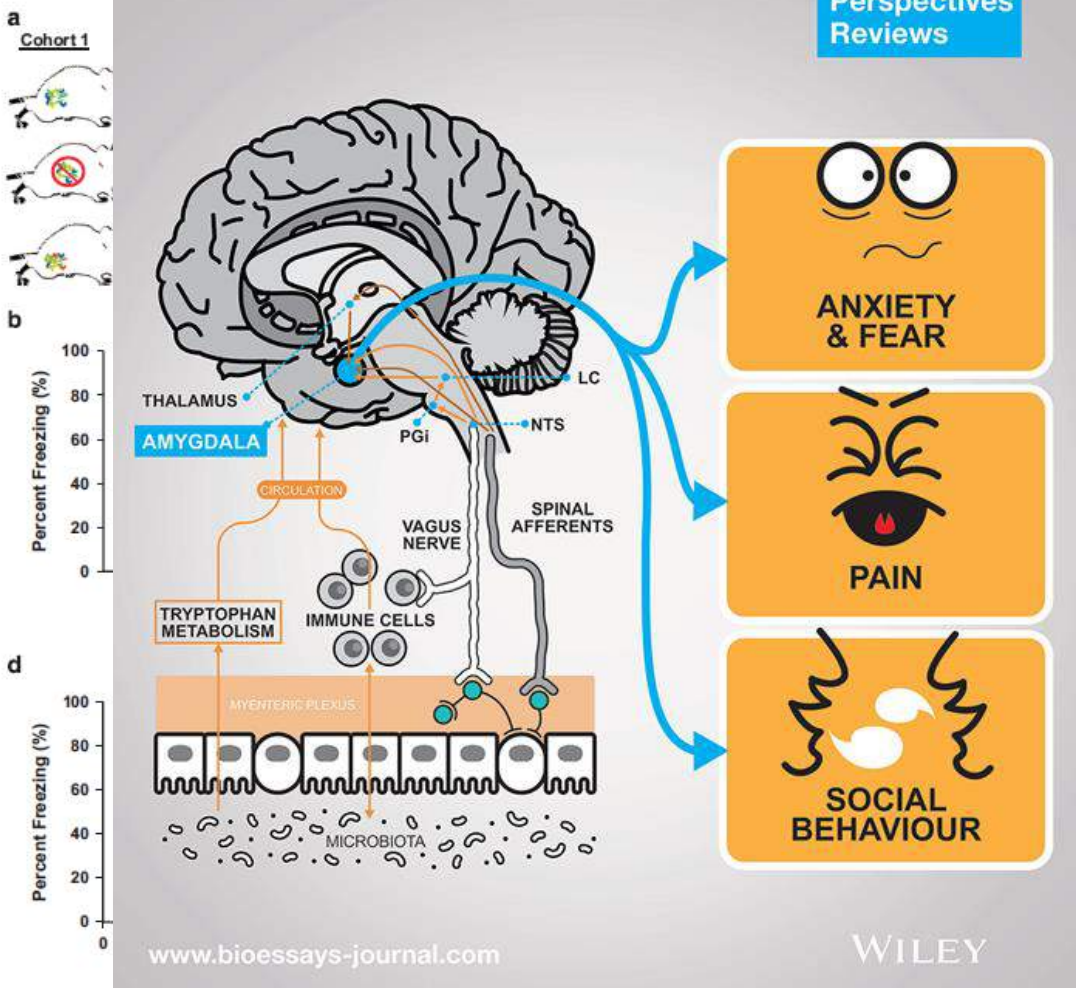
Volume 40 No. 1 January 2018 · ISSN 0265-9247

BioEssays 1/18

Ideas that Push the Boundaries

Hypotheses
Perspectives
Reviews

3



WILEY

Anatomical correlates of abnormal fear and anxiety can be localised to the amygdala in germ-free animals using cued fear conditioning

Signalling Along the Brain-Gut-Microbiota axis

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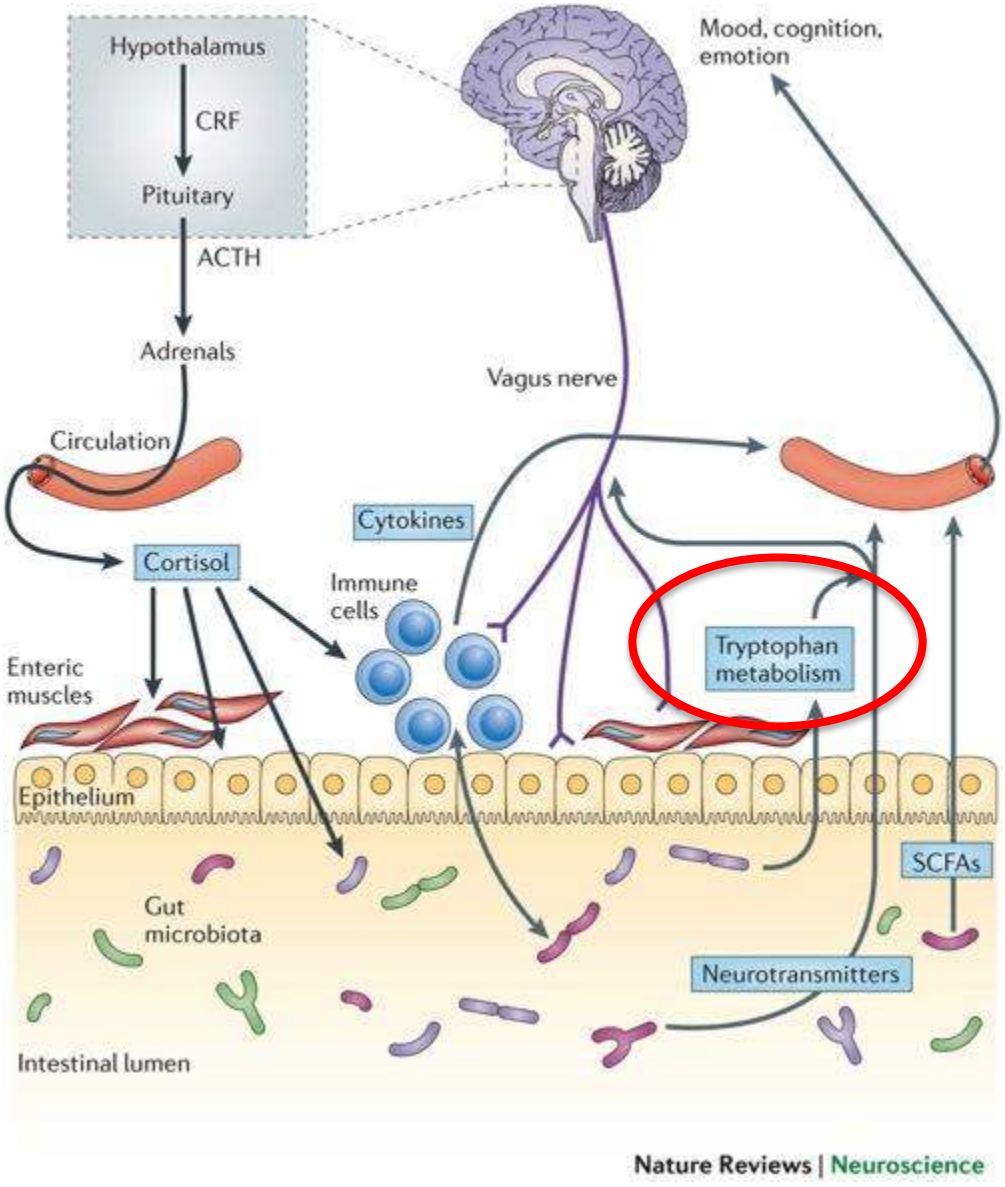


Cryan and Dinan, Nat Rev Neurosci Oct 2012

Behavioural Brain Research 277 (2015) 32–48

Contents lists available at ScienceDirect

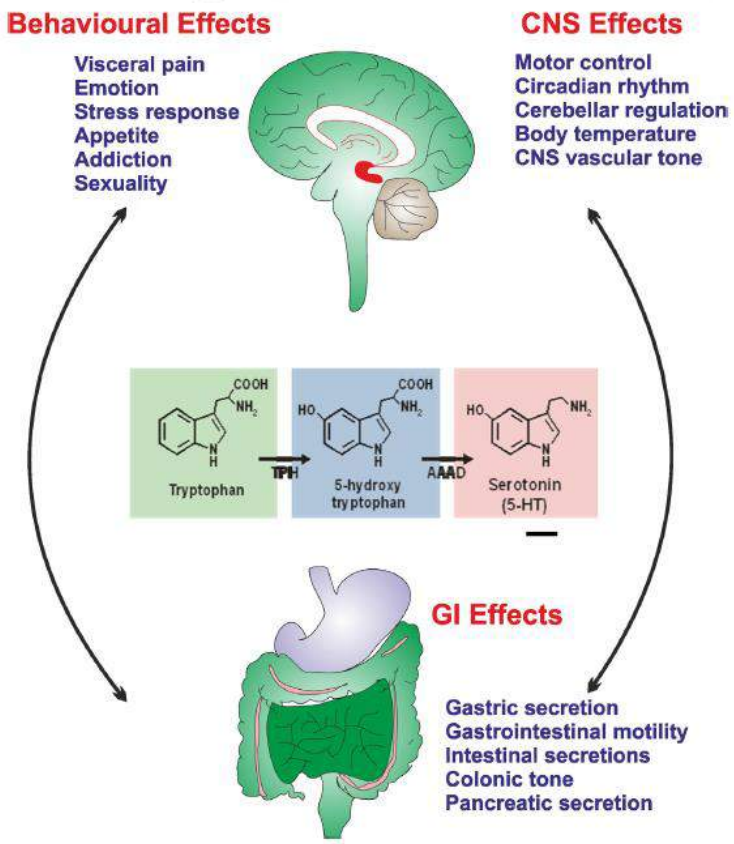
Behavioural Brain Research

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

Review

Serotonin, tryptophan metabolism and the brain-gut-microbiome axis

S.M. O'Mahony[a,b,1], G. Clarke[a,c,*,1], Y.E. Borre[a], T.G. Dinan[a,c], J.F. Cryan[a,b]



"Of course you feel great. These things are loaded with antidepressants."

The Kynurenine Pathway

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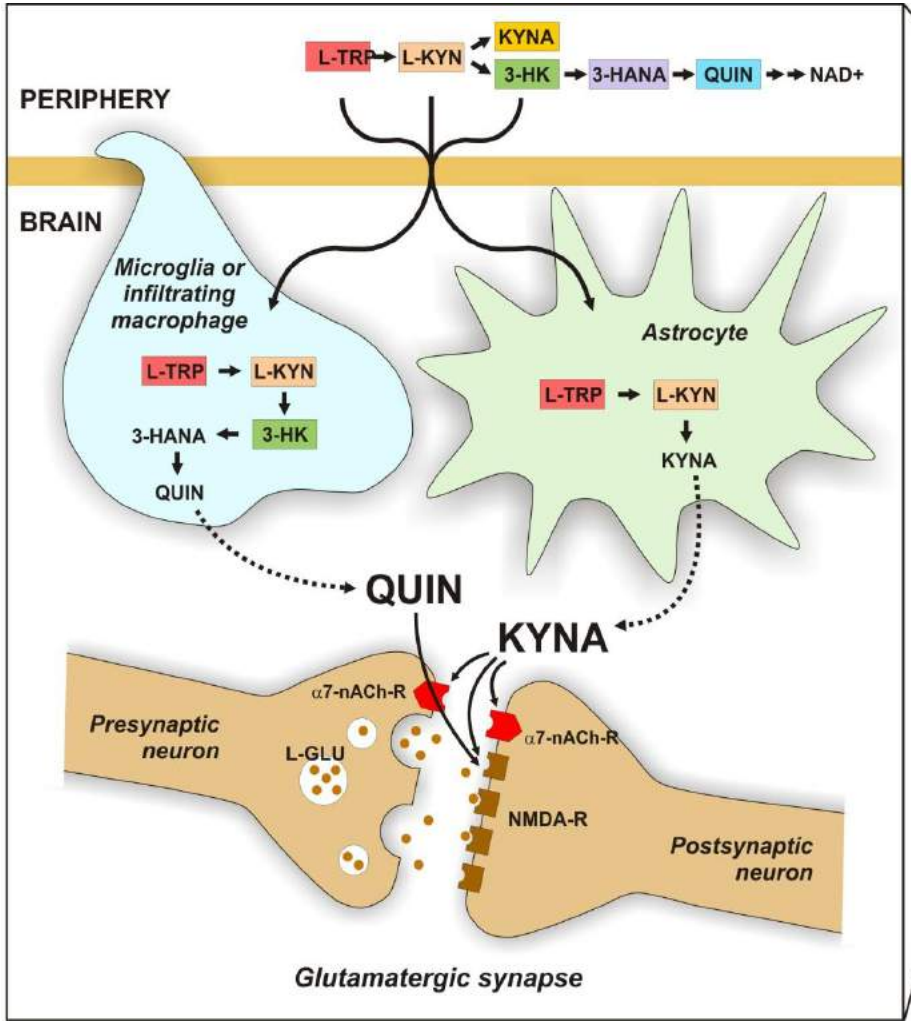


Altered TRP metabolism:

- ↑ Brain IDO
- ↑ Brain/circulating kynurenines
- ↑ L-kynurenine uptake
- Altered levels of brain kynurenic and quinolinic acid

→ **CNS alterations** → **Cognitive deficit**

Stress → Inflammation, Glucocorticoids → Activation of IDO/TDO → ↓ TRP, ↑ KYN → Serotonergic deficiency → **GI alterations**

O'Mahony et al, Behavioural Brain Research 2015

Microbiota Regulates Tryptophan Metabolism

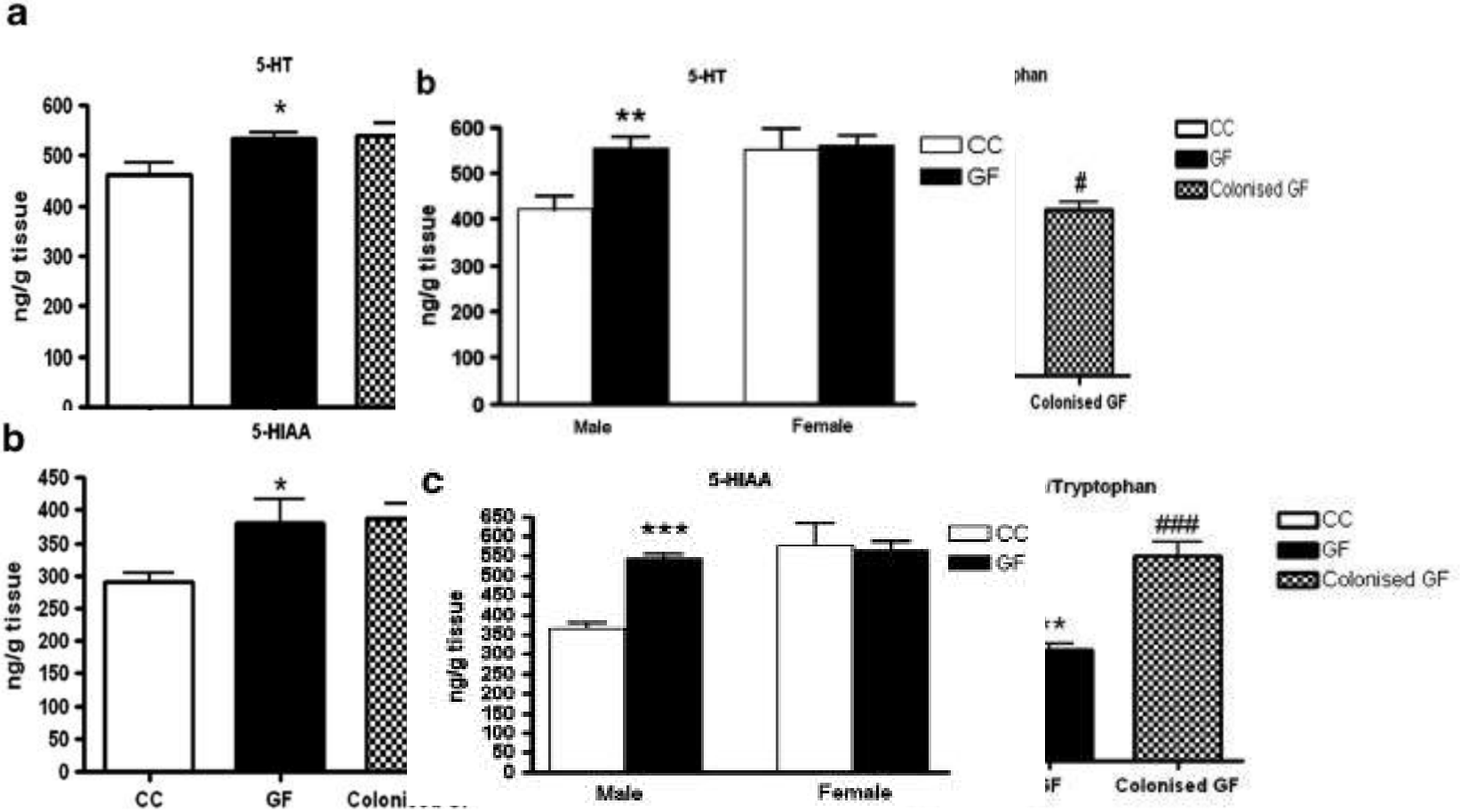
Molecular Psychiatry (2013) 18, 666 – 673

www.nature.com/mp

ORIGINAL ARTICLE

The microbiome-gut-brain axis during early life regulates the hippocampal serotonergic system in a sex-dependent manner

G Clarke[1,2], S Grenham[1], P Scully[1], P Fitzgerald[1], RD Moloney[1], F Shanahan[1,3], TG Dinan[1,2] and JF Cryan[1,4]



SCIENTIFIC REPORTS

OPEN

Received: 11 October 2016
Accepted: 31 January 2017
Published: 07 March 2017

Microbiota alteration is associated with the development of stress-induced despair behavior

Ioana A. Marin[1,2,3], Jennifer E. Goertz[1,2], Tiantian Ren[4], Stephen S. Rich[5], Suna Onengut-Gumuscu[5], Emily Farber[5], Martin Wu[4], Christopher C. Overall[1,2], Jonathan Kipnis[1,2,3,*] & Alban Gaultier[1,2,3,*]

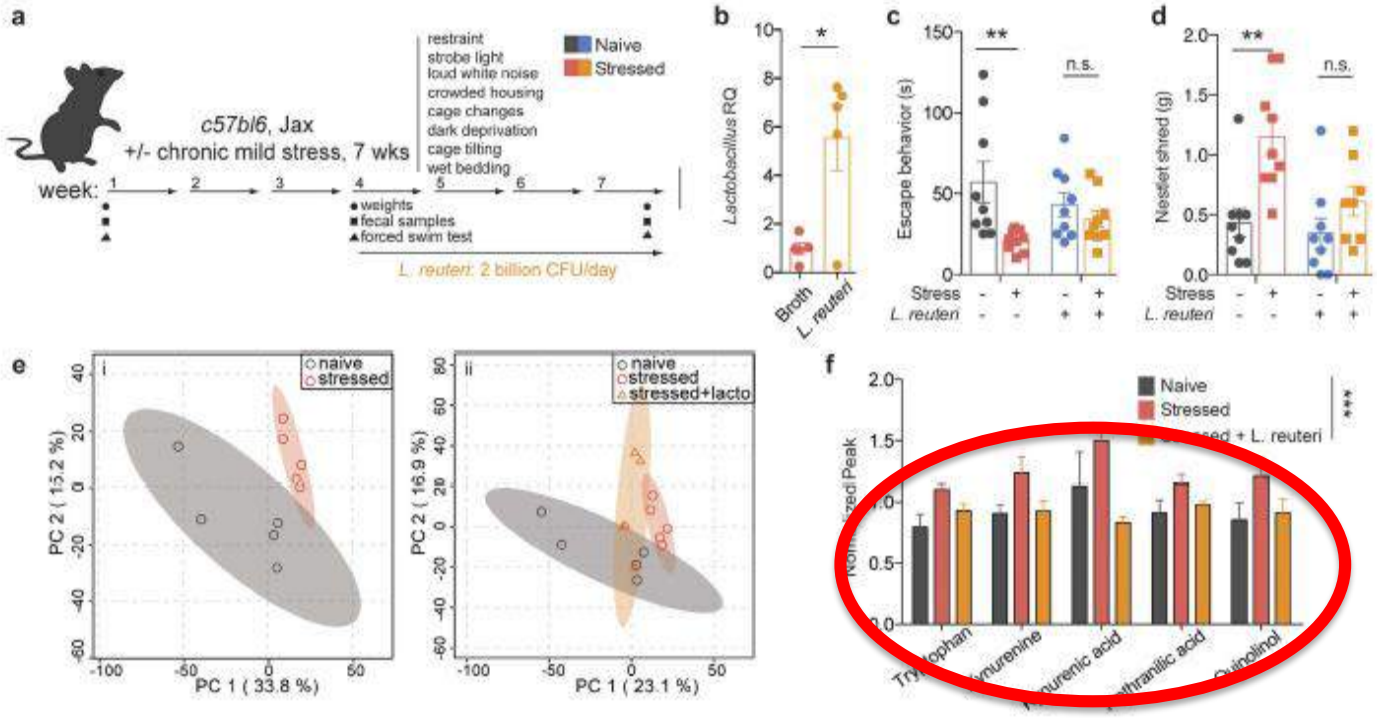


Figure 3. Treatment with probiotic *L. reuteri* ameliorates the escape behavior induced by chronic stress.

Restoring intestinal *Lactobacillus* levels normalized stress-induced behavior and suppressed kynurenine production

Indigenous Bacteria from the Gut Microbiota Regulate Host Serotonin Biosynthesis

Jessica M. Yano,[1] Kristie Yu,[1] Gregory P. Donaldson,[1] Gauri G. Shastri,[1] Phoebe Ann,[1] Liang Ma,[2] Cathryn R. Nagler,[3] Rustem F. Ismagilov,[2] Sarkis K. Mazmanian,[1] and Elaine Y. Hsiao[1,*]

[1]Division of Biology and Biological Engineering, California Institute of Technology, Pasadena, CA 91125, USA

[2]Division of Chemistry and Chemical Engineering, California Institute of Technology, Pasadena, CA 91125, USA

[3]Department of Pathology and Department of Medicine, I

*Correspondence: ehsiao@caltech.edu

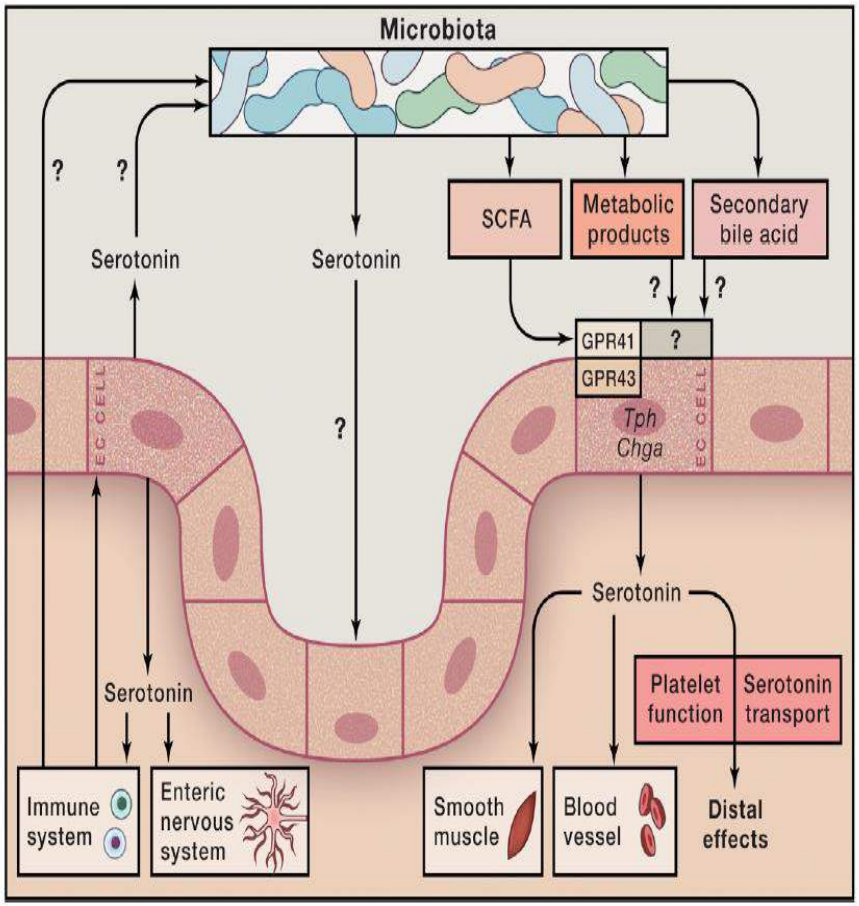
http://dx.doi.org/10.1016/j.cell.2015.02.047

Leading Edge

Previews

Gut Microbiota: The Link to Your Second Brain

Vanessa Ridaura[1,2] and Yasmine Belkaid[1,2,*]



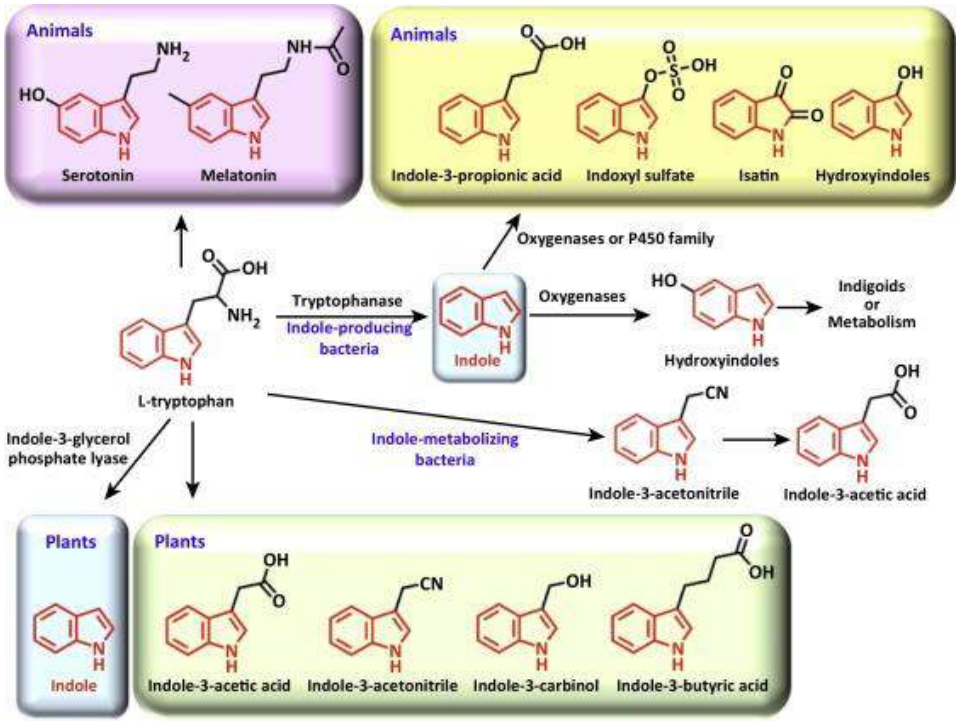
Trends in Microbiology

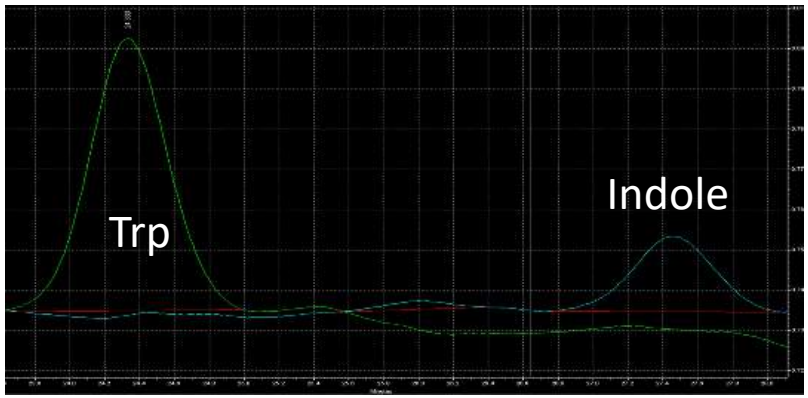
CellPress

Review

Roles of Indole as an Interspecies and Interkingdom Signaling Molecule

Jin-Hyung Lee,[1] Thomas K. Wood,[2] and Jintae Lee[1,*]





Lyte et al., Unpublished data

LETTER

NATURE | www.nature.com/nature

https://doi.org/10.1038/s41586-018-0119-x

Microglial control of astrocytes in response to microbial metabolites

Veit Rothhammer[1], Davis M. Borucki[1], Emily C. Tjon[1], Maisa C. Takenaka[1], Chun-Cheih Chao[1], Alberto Ardura-Fabregat[2], Kalil Alves de Lima[1], Cristina Gutiérrez-Vázquez[1], Patrick Hewson[1], Ori Staszewski[2], Manon Blain[3], Luke Healy[3], Tradite Neziraj[1], Matilde Borio[1], Michael Wheeler[1], Loic Lionel Dragin[4], David A. Laplaud[5], Jack Antel[3], Jorge Ivan Alvarez[4], Marco Prinz[2,6] & Francisco J. Quintana[1,7]*

NEWS & VIEWS | NATURE | 1

https://doi.org/10.1038/d41586-018-05113-0

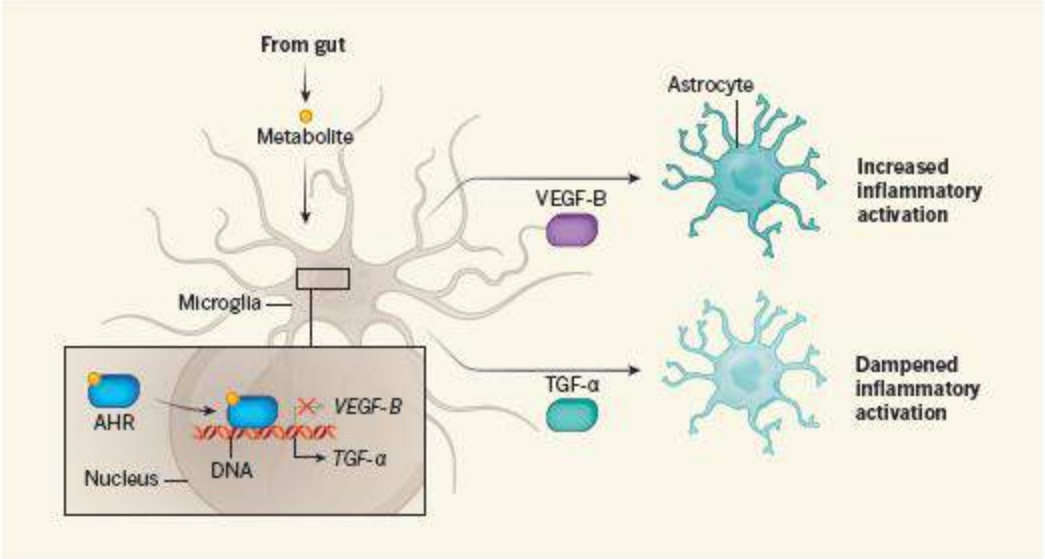
IMMUNOLOGY

Gut molecules control brain inflammation

Metabolite molecules produced by the gut's microbes activate immune cells in the brain called microglia, which signal to astrocyte cells to mediate responses to inflammation in the central nervous system.

HARTMUT WEKERLE

microglia inhibits inflammation in the CNS.



Summary

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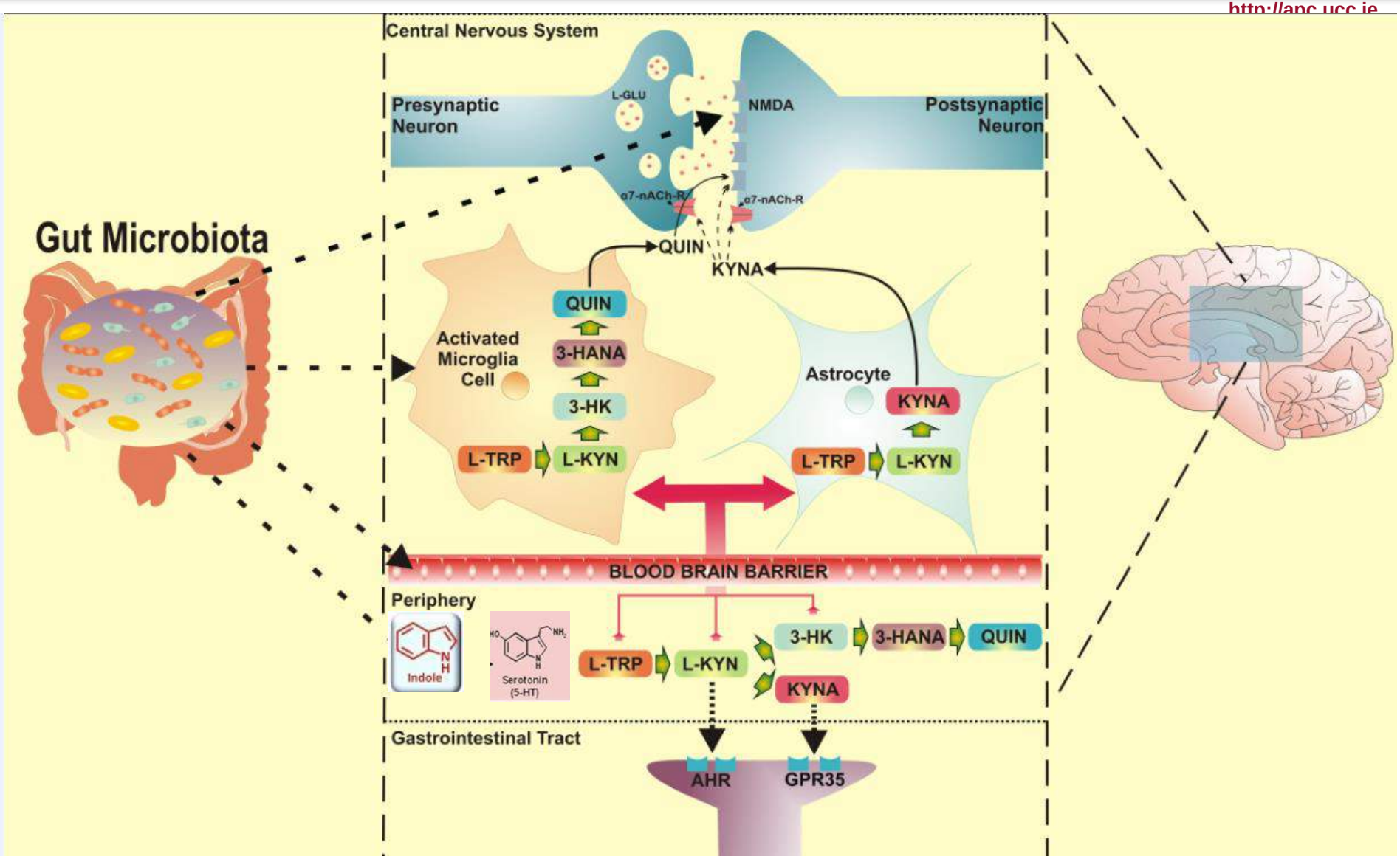

Kennedy et al., Neuropharmacology 2017

Translational Research

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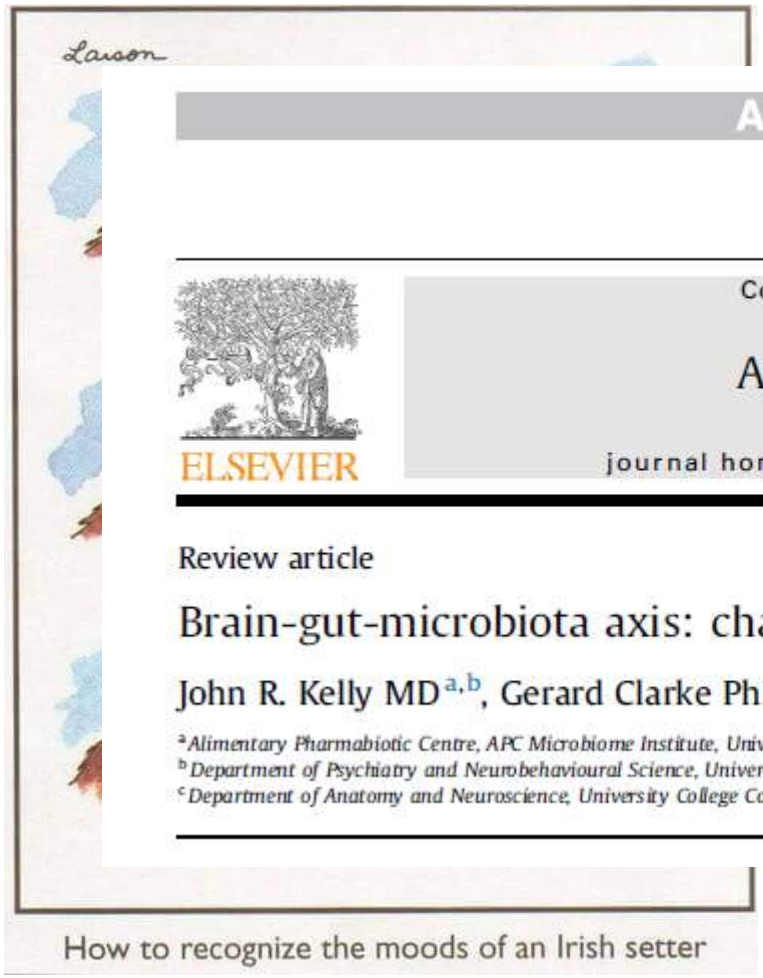

ARTICLE IN PRESS

Annals of Epidemiology xxx (2016) 1–7

Contents lists available at ScienceDirect

Annals of Epidemiology

journal homepage: www.annalsofepidemiology.org

Review article

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,*]

[a] Alimentary Pharmabiotic Centre, APC Microbiome Institute, University College Cork, Cork, Ireland
[b] Department of Psychiatry and Neurobehavioural Science, University College Cork, Cork, Ireland
[c] Department of Anatomy and Neuroscience, University College Cork, Cork, Ireland

Cryan et al., Trends in Pharmacol. Sci. 2002

Gary Larson

Altered Microbiota in Depression

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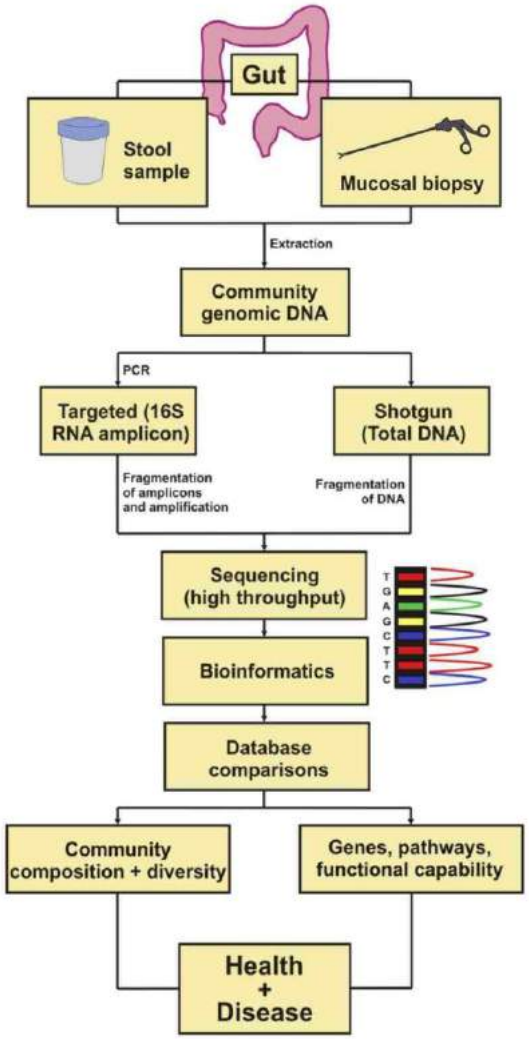
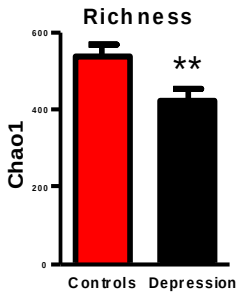
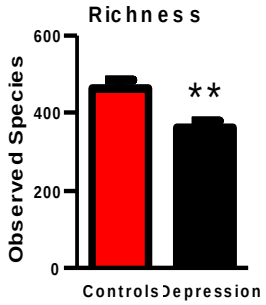
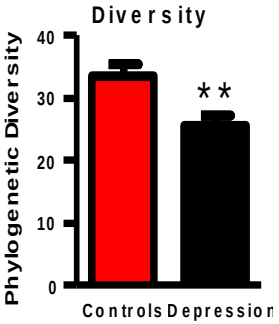
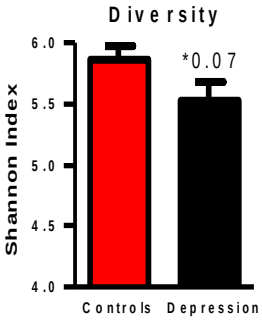
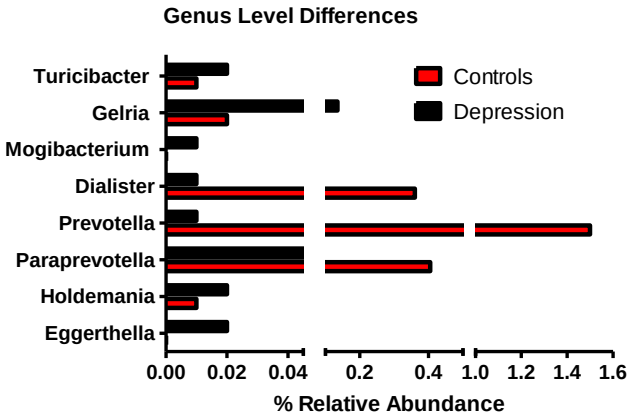










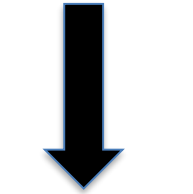


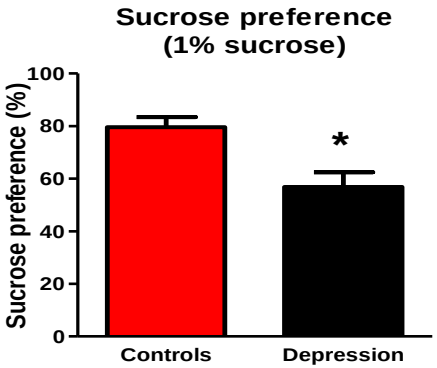
Reduced microbial diversity in depression

Prevotella, a genus of Gram-negative bacteria, is reduced in depression

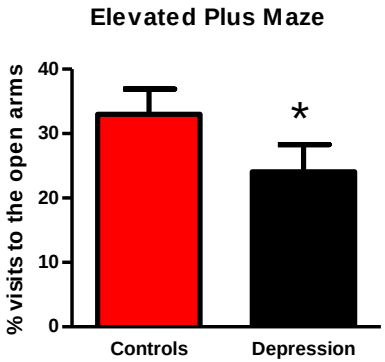
Kelly et al., J Psych Res 2016

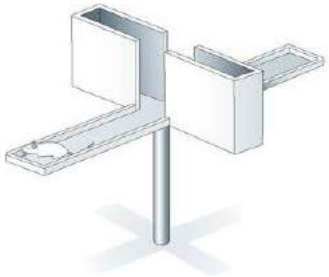
Transfer of Depressive Phenotype



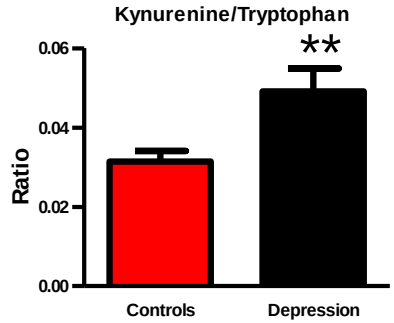


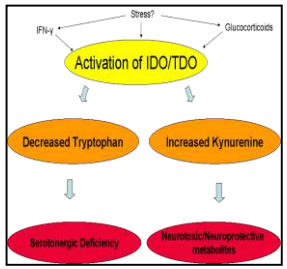
Anhedonia-like behaviours transferred via gut microbiota





Anxiety-like behaviours transferred via gut microbiota





Tryptophan metabolism Profile transferred via gut microbiota

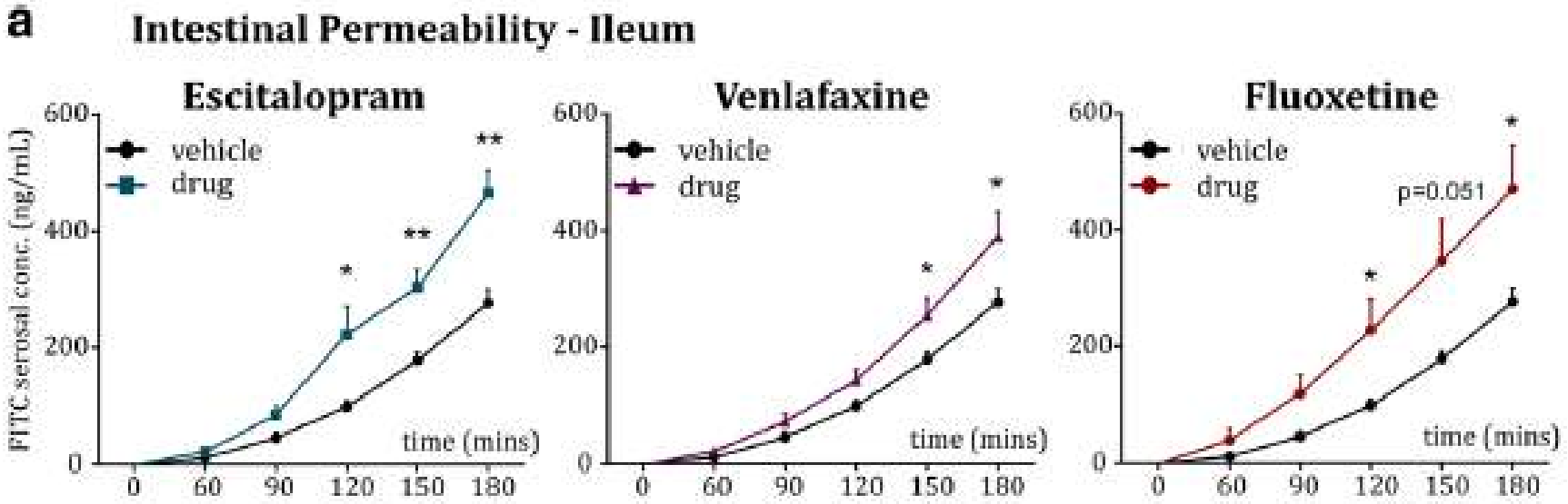
Kelly et al., J Psych Res 2016

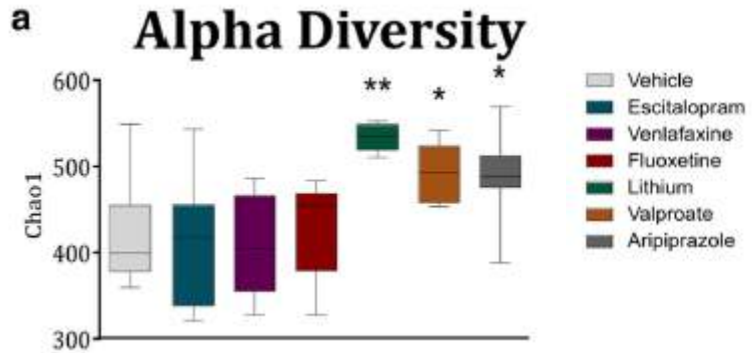
Psychopharmacology
https://doi.org/10.1007/s00213-018-5006-5

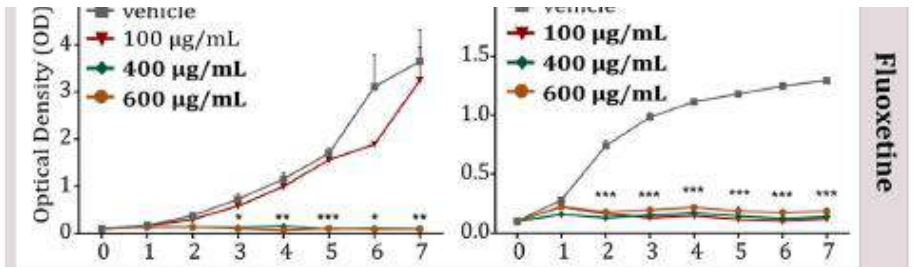
ORIGINAL INVESTIGATION

Differential effects of psychotropic drugs on microbiome composition and gastrointestinal function

Sofia Cussotto[1,2] · Conall R. Strain[1,3] · Fiona Fouhy[1,3] · Ronan G. Strain[1,3] · Veronica L. Peterson[1,2] · Gerard Clarke[1,4] · Catherine Stanton[1,3,4] · Timothy G. Dinan[1,4] · John F. Cryan[1,2]







OPEN

Citation: Transl Psychiatry (2013) 3, e309; doi:10.1038/tp.2013.83

www.nature.com/tp

ORIGINAL ARTICLE

Antipsychotics and the gut microbiome: olanzapine-induced metabolic dysfunction is attenuated by antibiotic administration in the rat

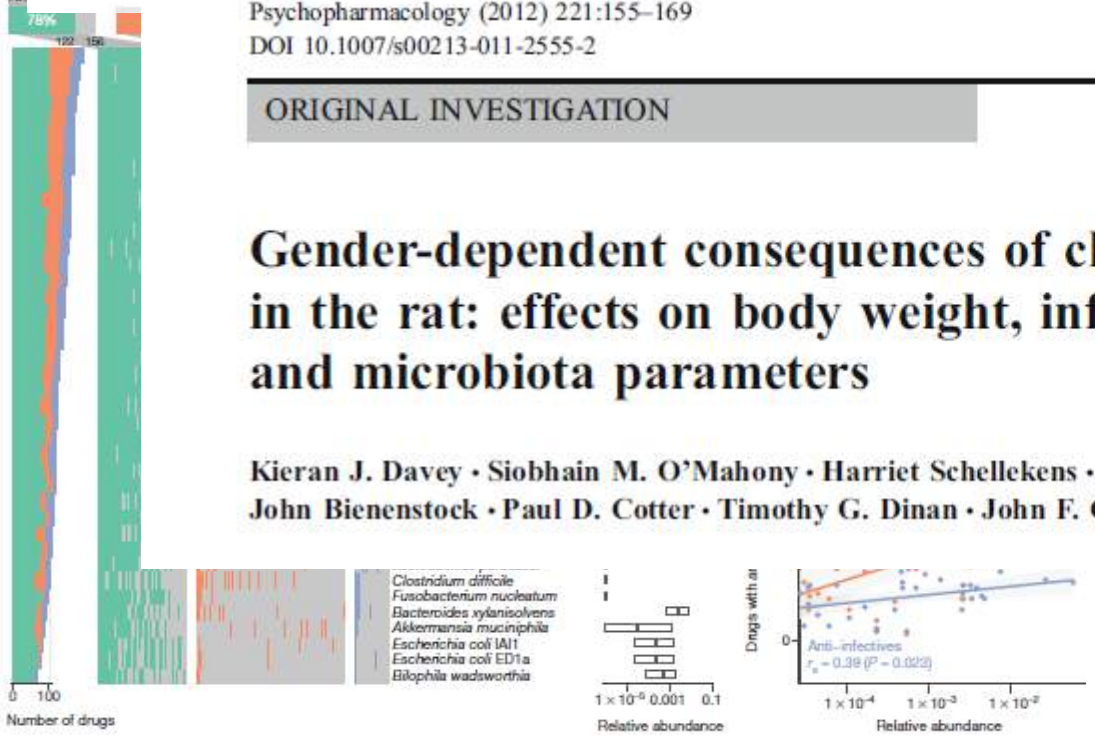
KJ Davey[1,2], PD Cotter[1,3], O O'Sullivan[1,3], F Crispie[3], TG Dinan[1,4], JF Cryan[1,5] and SM O'Mahony[1,5]

Psychopharmacology (2012) 221:155–169
DOI 10.1007/s00213-011-2555-2

ORIGINAL INVESTIGATION

Gender-dependent consequences of chronic olanzapine in the rat: effects on body weight, inflammatory, metabolic and microbiota parameters

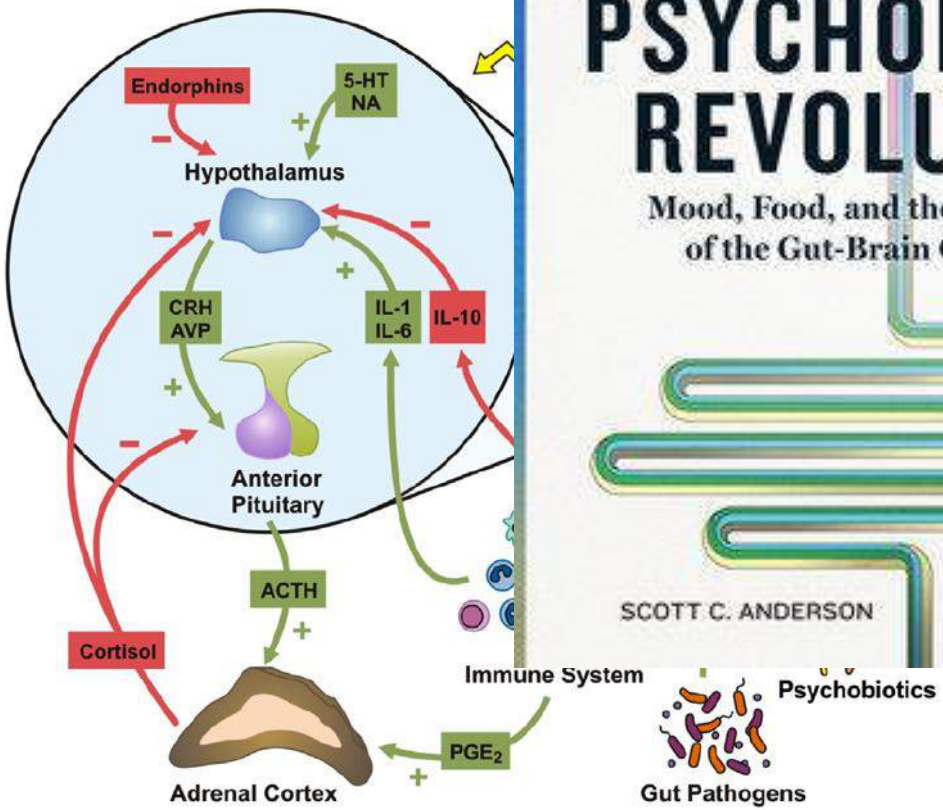
Kieran J. Davey · Siobhain M. O'Mahony · Harriet Schellekens · Orla O'Sullivan · John Bienenstock · Paul D. Cotter · Timothy G. Dinan · John F. Cryan

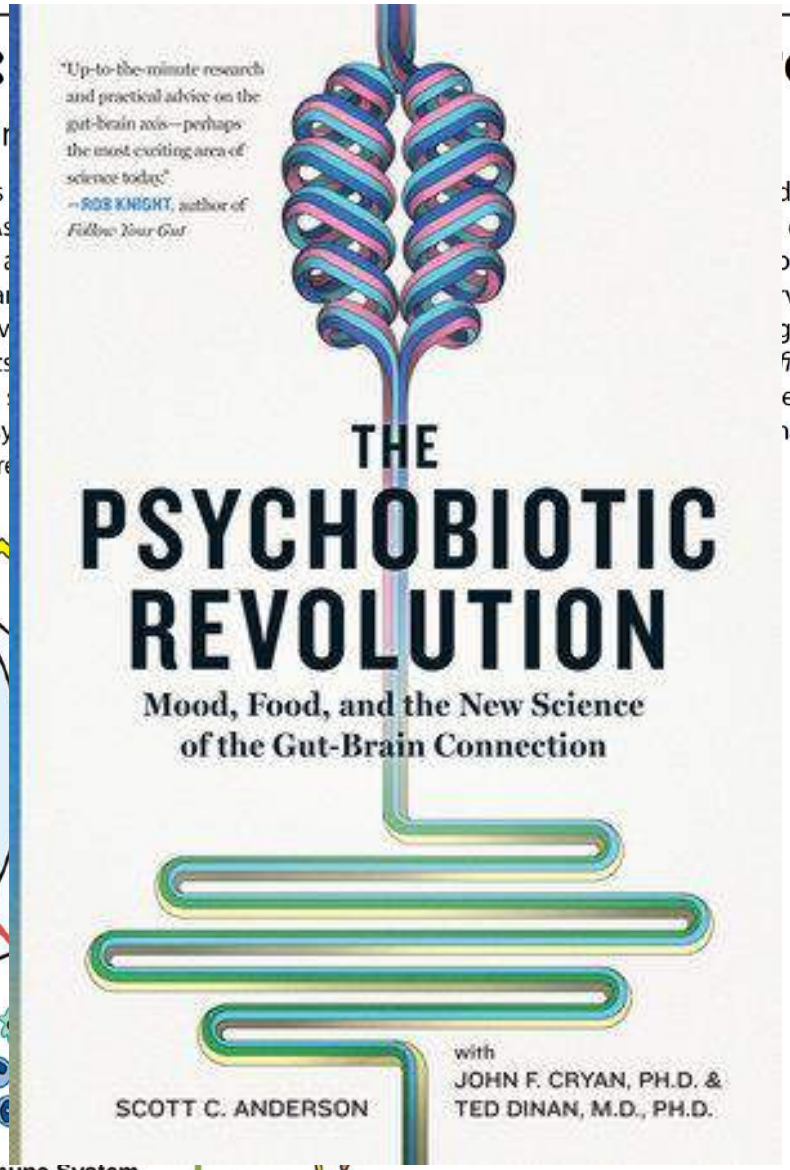


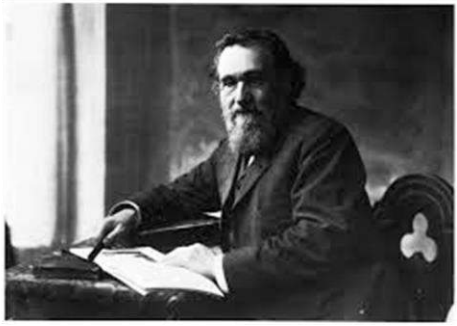
Psychobiotics: opic

Timothy G. Dinan, Catherin

Here, we define a psychobiotic as duces a health benefit in patients suffering from psychiatric illness. As delivering neuroactive substances such as gamma-aminobutyric acid a on in rodents suggests that certain psychobiotics possess antidepressa ve, spinal cord, or neuroendocrine systems. So far, psychobiotics hav in patients with irritable bowel syndrome, where positive benefits idobacterium infantis. Evidence is emerging of benefits in alleviating enefits may be related to the anti-inflammatory actions of certain psy al axis activity. Results from large scale placebo-controlled studies are







Elie Metchnikoff (1845-1916))
Nobel Prize 1908

ARTICLE IN PRESS

Brain, Behavior, and Immunity xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

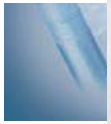
Brain, Behavior, and Immunity

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

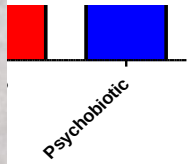
Full-length Article

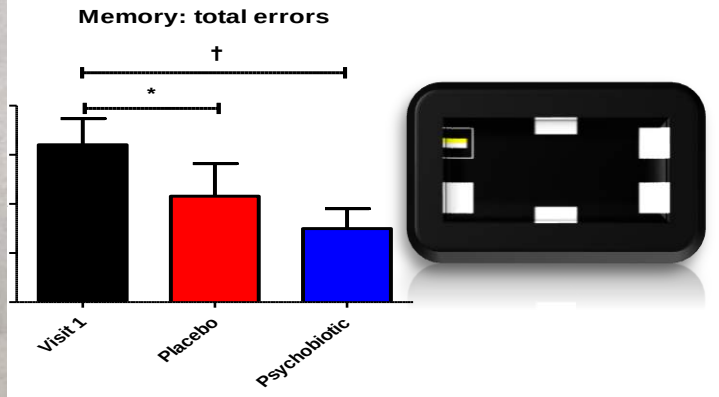
Lost in translation? The potential psychobiotic *Lactobacillus rhamnosus* (JB-1) fails to modulate stress or cognitive performance in healthy male subjects

John R. Kelly [a,b], Andrew P. Allen [a,b], Andriy Temko [c], William Hutch [d], Paul J. Kennedy [a], Niloufar Farid [b], Eileen Murphy [e], Geraldine Boylan [d], John Bienenstock [f], John F. Cryan [a,g], Gerard Clarke [a,b], Timothy G. Dinan [a,b,*]



Fz Mobility (Hz)





Allen et al., *2016*, Trans Psych

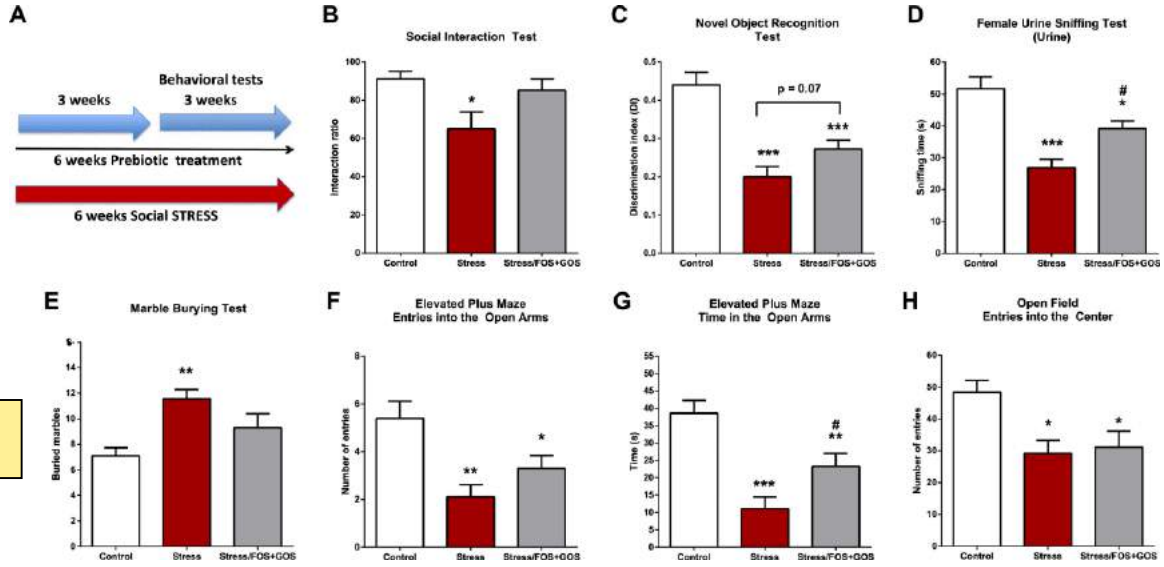
Archival Report

Biological Psychiatry

Targeting the Microbiota-Gut-Brain Axis: Prebiotics Have Anxiolytic and Antidepressant-like Effects and Reverse the Impact of Chronic Stress in Mice

Aurelijus Burokas, Silvia Arboleya, Rachel D. Moloney, Veronica L. Peterson, Kiera Murphy, Gerard Clarke, Catherine Stanton, Timothy G. Dinan, and John F. Cryan

Prebiotic reverses consequences of chronic stress



Social behaviour and cognition

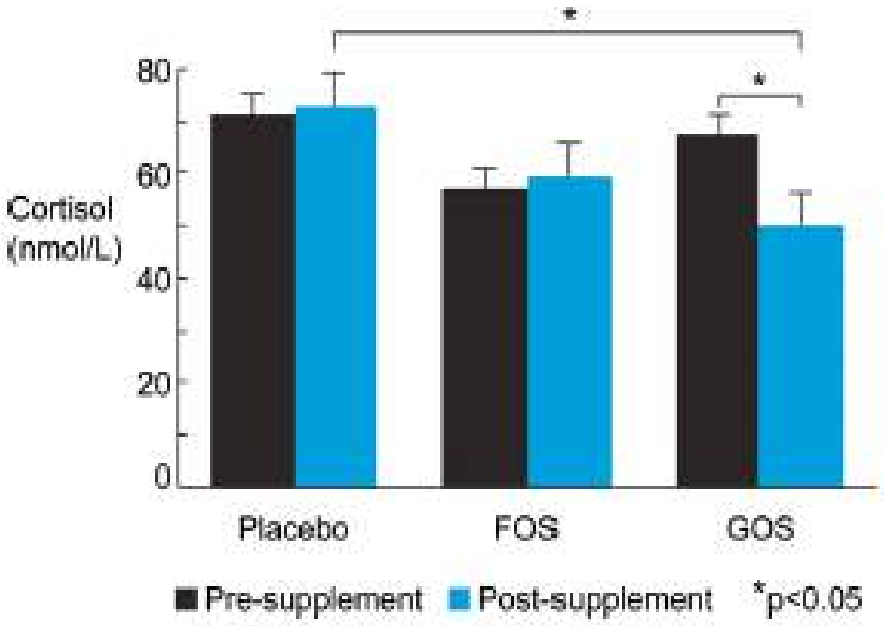
Anxiety

Psychopharmacology
DOI 10.1007/s00213-014-3810-0

ORIGINAL INVESTIGATION

Prebiotic intake reduces the waking cortisol response and alters emotional bias in healthy volunteers

Kristin Schmidt · Philip J. Cowen · Catherine J. Harmer · George Tzortzis · Steven Errington · Philip W. J. Burnet



Kao et al. *Translational Psychiatry* (2018)8:66
DOI 10.1038/s41398-018-0116-8

Translational Psychiatry

ARTICLE Open Access

Prebiotic attenuation of olanzapine-induced weight gain in rats: analysis of central and peripheral biomarkers and gut microbiota

Amy Chia-Ching Kao[1], Sonia Spitzer[1], Daniel C. Anthony[2], Belinda Lennox[1] and Philip W. J. Burnet[1]

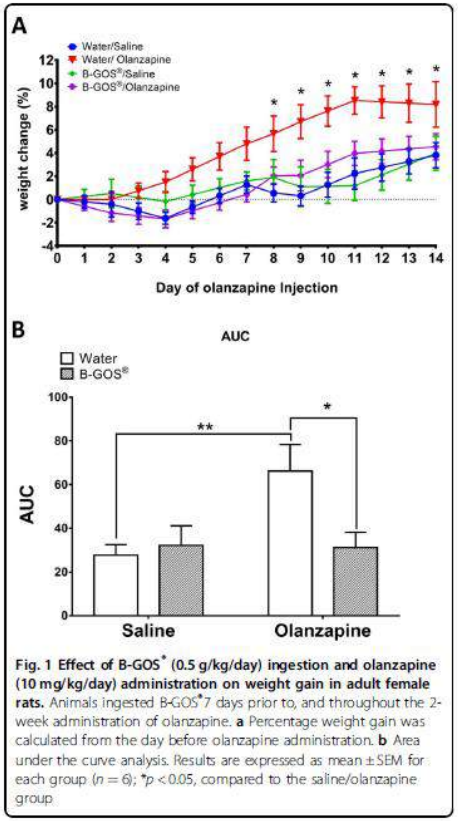


Fig. 1 Effect of B-GOS® (0.5 g/kg/day) ingestion and olanzapine (10 mg/kg/day) administration on weight gain in adult female rats. Animals ingested B-GOS® 7 days prior to, and throughout the 2-week administration of olanzapine. **a** Percentage weight gain was calculated from the day before olanzapine administration. **b** Area under the curve analysis. Results are expressed as mean ± SEM for each group ($n = 6$); *$p < 0.05$, compared to the saline/olanzapine group

Let food be thy medicine

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Translational Research
January 2017

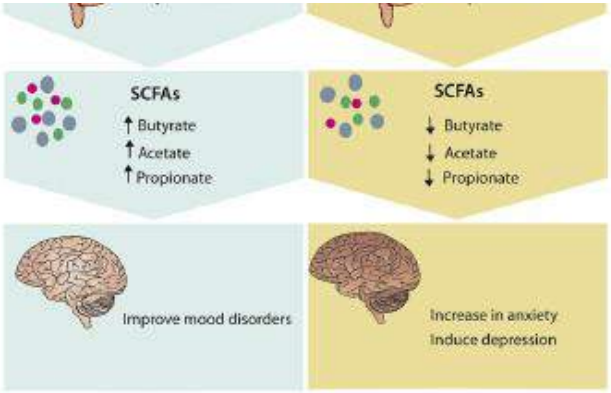
Feeding the microbiota-gut-brain axis: diet, microbiome, and neuropsychiatry

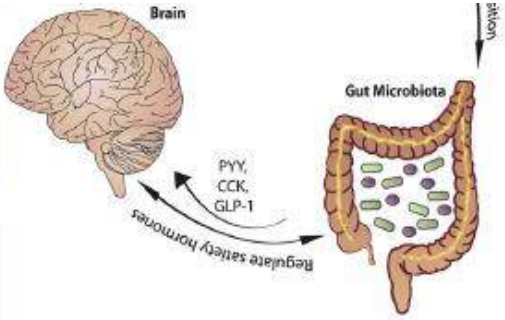
Nutritional medicine as mainstream in psychiatry

Jerome Sarris, Alan C Logan, Tasnime N Akbaraly, G Paul Amminger, Vicent Balanzá-Martínez, Marlene P Freeman, Joseph Hibbeln, Yutaka Matsuoka, David Mischoulon, Tetsuya Mizoue, Akiko Nanri, Daisuke Nishi, Drew Ramsey, Julia J Rucklidge, Almudena Sanchez-Villegas, Andrew Scholey, Kuan-Pin Su, Felice N Jacka, on behalf of The International Society for Nutritional Psychiatry Research

Psychiatry is at an important juncture, with the current pharmacologically focused model having achieved modest

Lancet Psychiatry 2015





Jacka et al. BMC Medicine (2017) 15:23
DOI 10.1186/s12916-017-0791-y

BMC Medicine

Open Access

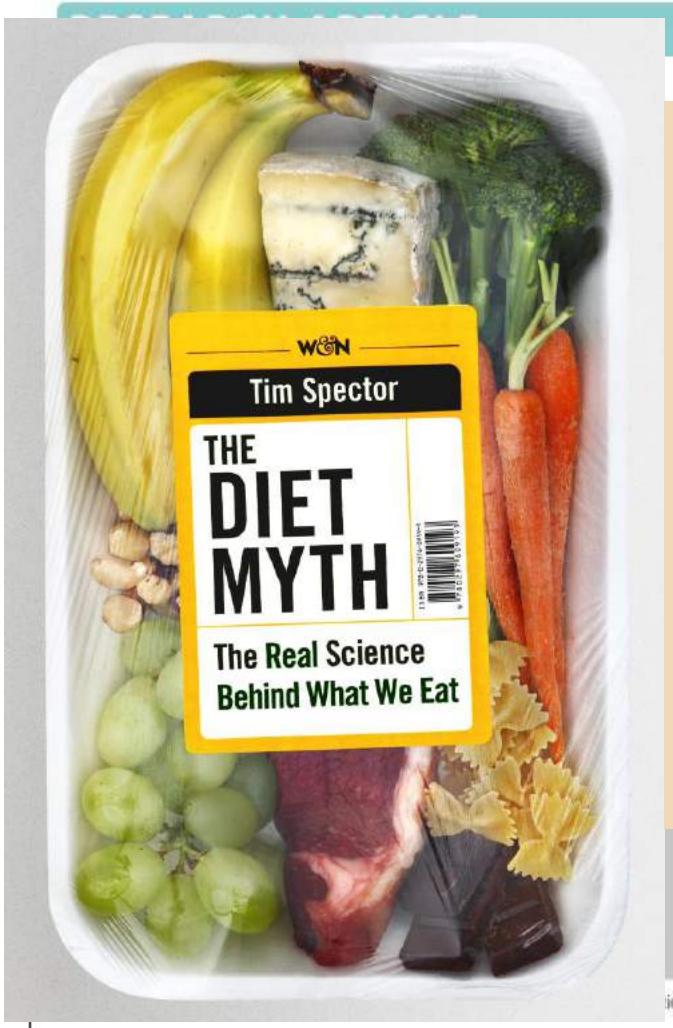


Fig. 2 MADRS scores for dietary support and social support control groups at baseline and endpoint. Effect size: Cohen's $d = -1.16$ (95% CI −1.73, −0.59). Baseline data $n = 67$; 12 week data $n = 56$

Andrea Levy, The Plain

GUT MICROBES
2017, VOL. 8, NO. 3, 253–267
http://dx.doi.org/10.1080/19490976.2017.1293224

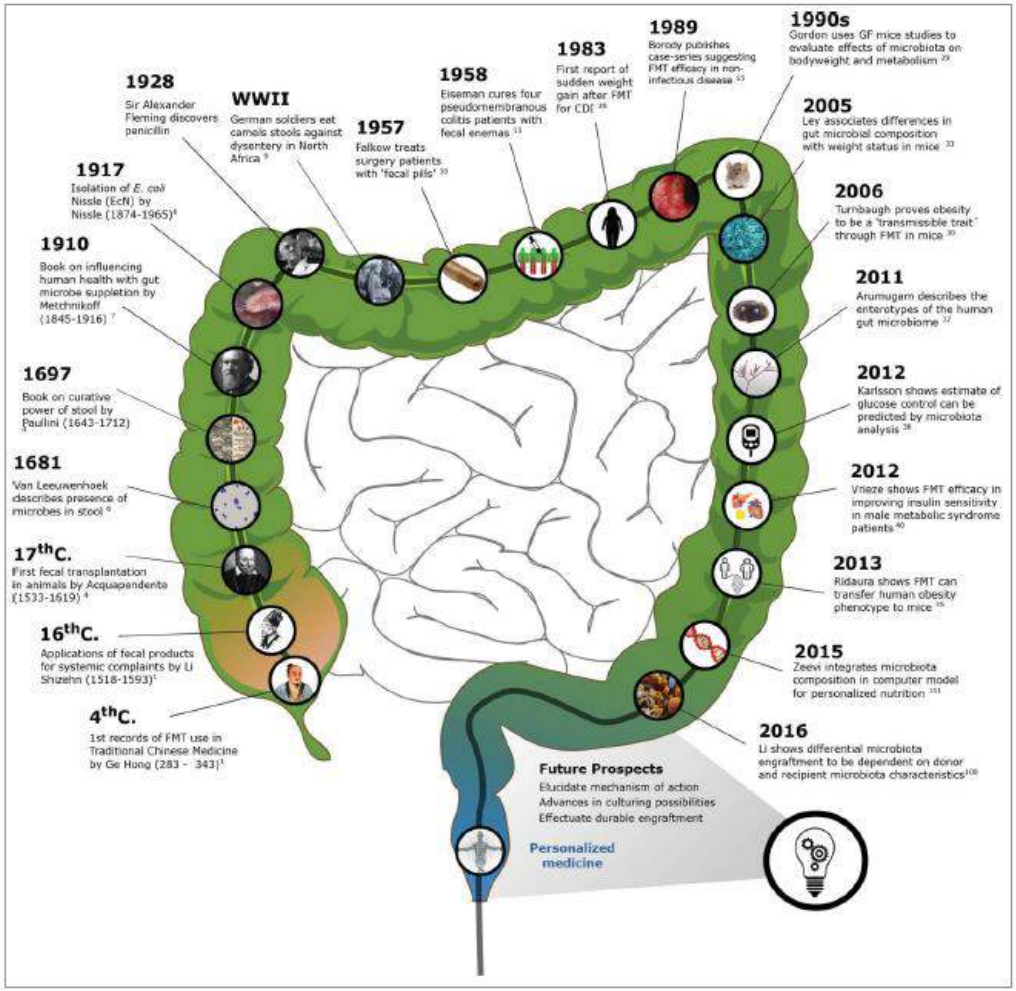
Taylor & Francis
Taylor & Francis Group

REVIEW

OPEN ACCESS

Fecal microbiota transplantation in metabolic syndrome: History, present and future

P. F. de Groot[a], M. N. Frissen[a], N. C. de Clercq[a], and M. Nieuwdorp[a,b,c,d]



The New Yo

HEALTH

A Promising

By PAM BELLUCK OCT. 11, 2014

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ecal transplants?

OPEN ACCESS

European consensus conference on faecal microbiota transplantation in clinical practice

Giovanni Cammarota,[1] Gianluca Ianiro,[1] Herbert Tilg,[2] Mirjana Rajilić-Stojanović,[3] Patrizia Kump,[4] Reetta Satokari,[5] Harry Sokol,[6] Perttu Arkkila,[7] Cristina Pintus,[8] Ailsa Hart,[9] Jonathan Segal,[9] Marina Aloi,[10] Luca Masucci,[11] Antonio Molinaro,[12] Franco Scaldaferri,[1] Giovanni Gasbarrini,[1] Antonio Lopez-Sanroman,[13] Alexander Link,[14] Pieter de Groot,[15] Willem M de Vos,[5,16] Christoph Högenauer,[4] Peter Malfertheiner,[14] Eero Mattila,[17] Tomica Milosavljević,[18] Max Nieuwdorp,[12,15,19] Maurizio Sanguinetti,[11] Magnus Simren,[20] Antonio Gasbarrini,[1] The European FMT Working Group

Box 1 Key issues to select potential donors at the preliminary interview

INFECTIOUS DISEASES
- History of, or known exposure to, HIV, HBV or HCV, syphilis, human T-lymphotropic virus I and II, malaria, trypanosomiasis, tuberculosis
- Known systemic infection not controlled at the time of donation
- Use of illegal drugs
- Risky sexual behaviour (anonymous sexual contacts; sexual contacts with prostitutes, drug addicts, individuals with HIV, viral hepatitis, syphilis; work as prostitute; history of sexually transmittable disease)
- Previous reception of tissue/organ transplant
- Previous (<12 months) reception of blood products
- Recent (<6 months) needle stick accident
- Recent (<6 months) body tattoo, piercing, earring, acupuncture
- Recent medical treatment in poorly hygienic conditions
- Risk of transmission of diseases caused by prions
- Recent parasitosis or infection from rotavirus, *Giardia lamblia* and other microbes with GI involvement
- Recent (<6 months) travel in tropical countries, countries at high risk of communicable diseases or traveller's diarrhoea
- Recent (<6 months) history of vaccination with a live attenuated virus, if there is a possible risk of transmission
- Healthcare workers (to exclude the risk of transmission of multidrug-resistant organisms)
- Individual working with animals (to exclude the risk of transmission of zoonotic infections)

GI, METABOLIC AND NEUROLOGICAL DISORDERS
- History of IBS, IBD, functional chronic constipation, coeliac disease, other chronic GI disorders
- History of chronic, systemic autoimmune disorders with GI involvement
- History of, or high risk for, GI cancer or polyposis
- Recent appearance of diarrhoea, hematochezia
- History of neurological/neurodegenerative disorders
- History of psychiatric conditions
- Overweight and obesity (body mass index >25)

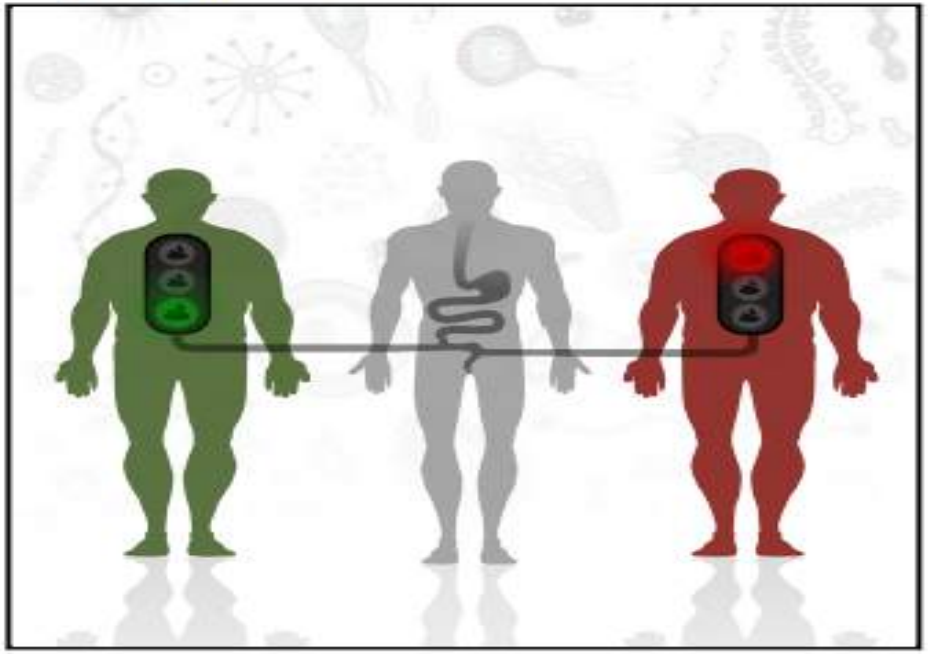
DRUGS THAT CAN IMPAIR GUT MICROBIOTA COMPOSITION
- Recent (<3 months) exposure to antibiotics, immunosuppressants, chemotherapy
- Chronic therapy with proton pump inhibitors

Clinical and Translational Report

Cell Metabolism

Improvement of Insulin Sensitivity after Lean Donor Feces in Metabolic Syndrome Is Driven by Baseline Intestinal Microbiota Composition

Graphical Abstract



Highlights

- Lean donor FMT in obese metabolic syndrome patients improves insulin sensitivity
- Beneficial effects of lean donor FMT are transient
- Improvement in insulin sensitivity is linked to changes in plasma metabolites
- Response to lean donor FMT is driven by baseline fecal microbiota composition

Authors

Ruud S. Kootte, Evgeni Levin, Jarkko Salojärvi, ..., Erik S.G. Stroes, Albert K. Groen, Max Nieuwdorp

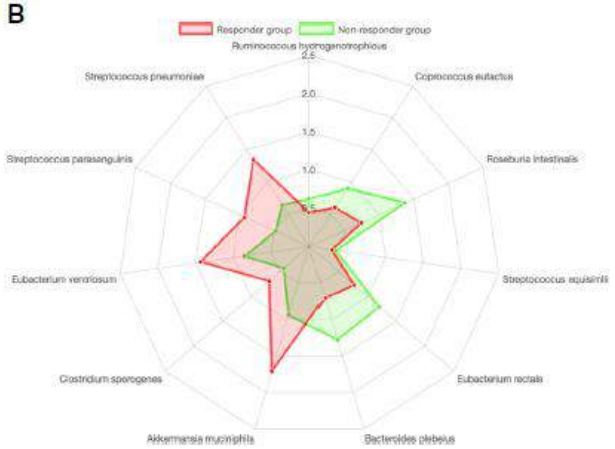
Correspondence

m.nieuwdorp@amc.uva.nl

In Brief

Kootte et al. show that fecal microbiota transplantation from lean donors to obese patients with metabolic syndrome improves insulin sensitivity, a transient effect associated with changes in microbiota composition and fasting plasma metabolites. Baseline fecal microbiota composition in recipients predicts the response to lean donor fecal microbiota transplantation.

B



Early Life Factors

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ACTA PÆDIATRICA
NURTURING THE CHILD

Acta Pædiatrica ISSN 0803-5253

REVIEW ARTICLE

Priming for health: gut microbiota acquired in early life regulates physiology, brain and behaviour

G Clarke (g.clarke@ucc.ie)[1,2]*, SM O'Mahony[1,3]*, TG Dinan[1,2], JF Cryan[1,3]

1.Alimentary Pharmabiotic Centre, University College Cork, Cork, Ireland
2.Department of Psychiatry, University College Cork, Cork, Ireland
3.Department of Anatomy and Neuroscience, University College Cork, Cork, Ireland

Keywords
Behaviour, Brain Development, Breastfeeding, Early Life, Microbiota

Correspondence
G Clarke, Department of Psychiatry/Alimentary Pharmabiotic Centre, 1.15 Biosciences Institute, University College Cork, Cork, Ireland.
Tel: +353 214 901 408 |

ABSTRACT

The infant gut microbiome is dynamic, and radical shifts in composition occur during the first 3 years of life. Disruption of these developmental patterns, and the impact of the microbial composition of our gut on brain and behaviour, has attracted much recent attention. Integrating these observations is an important new research frontier.

Conclusion: Early-life perturbations of the developing gut microbiota can impact on the central nervous system and potentially lead to adverse mental health outcomes.

Drug Discovery Today • Volume 17, Numbers 9/10 • May 2012 REVIEWS

ELSEVIER

Can we vaccinate against depression?

Reviews • GENE TO SCREEN

Graham A.W. Rook[1], Charles L. Raison[2] and Christopher A. Lowry[3]

Summary & Conclusions

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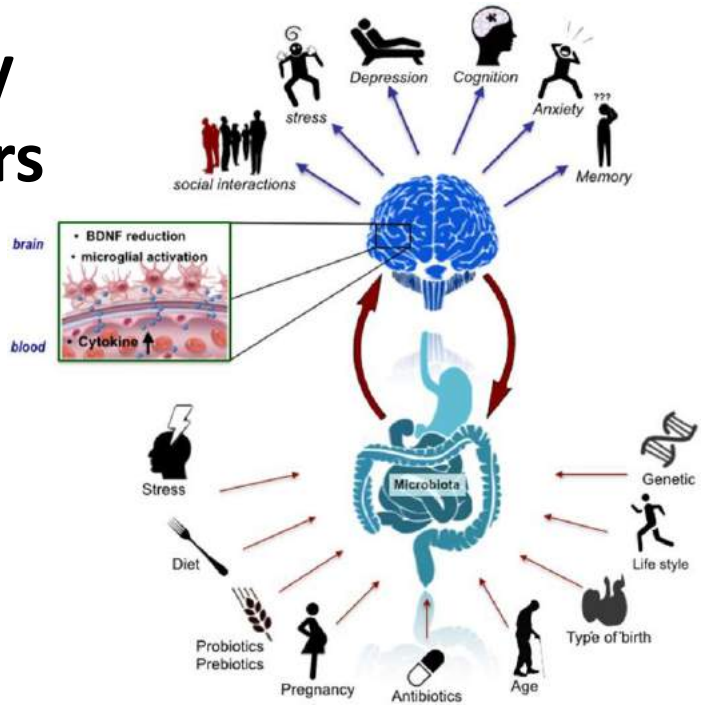
- Gut microbiota is both stress-susceptable and can regulate stress response
- Regulates behaviours and physiology relevant to neuropsychiatric disorders
- Tryptophan availability/Kynurenine metabolism
- Translation to clinic?
- Microbial-based strategies for the treatment of stress-related disorders?



Kelly et al., Frontiers Neuroscience 2017

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Science news you won't read nowhere else

Pope Francis To Award Sainthood To All Microbiome Researchers

Vatican City – Pope Francis announced today that he was going to award automatic sainthood t all microbiome researchers worldwide for "Doing God's Work".

Acknowledgements

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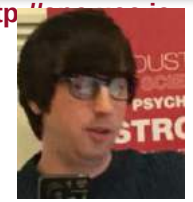





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Thank you

g.clarke@ucc.ie

The Daily Mail, London Sept 2011

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