Disclosure Slide

- Honorarium from Apsen, Janssen and Probi (Invited Speaker)
- Research funding from Pharmavite
- 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
- Content of presentation neither influenced nor constrained by this support

The Little Things that matter most in Psychiatry:

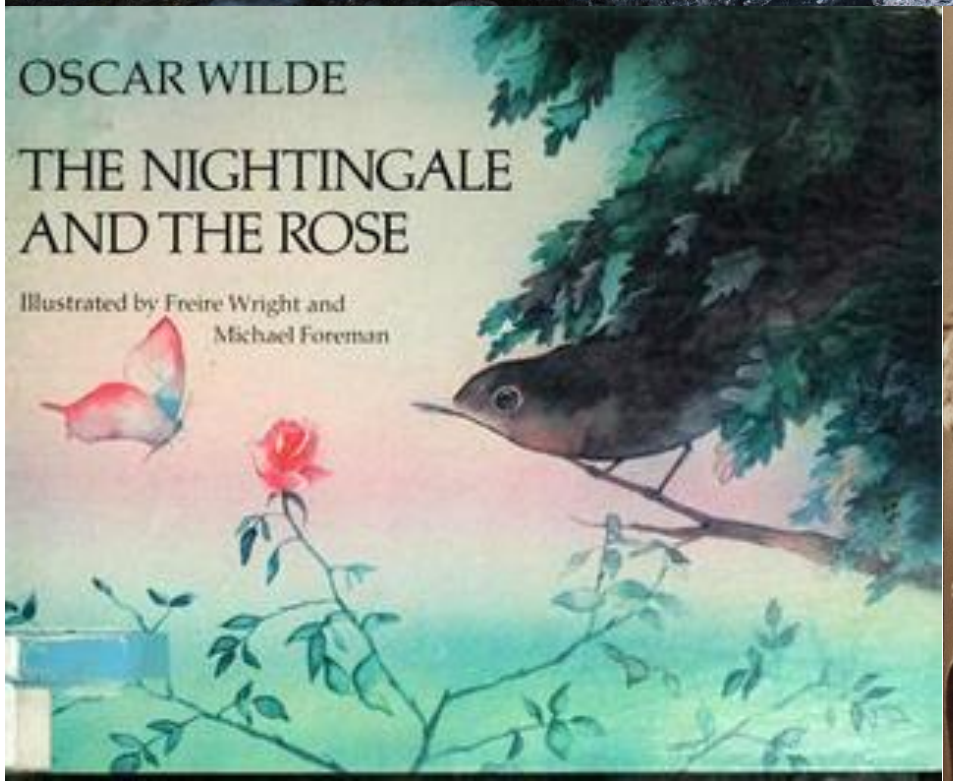
Microbial Regulation of Brain Function and Behaviour

Dr Gerard Clarke

Department of Psychiatry and Neurobehavioural Science &
APC Microbiome Ireland
University College Cork

UCD Academic Child and Adolescent Psychiatry Webinar 23rd July 2021


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


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

Living in a Microbial World....

http://apc.ucc.ie

Microbiome IN NUMBERS

100 Trillion
symbiotic microbes live in and on every person and make up the human microbiota

The human body has more microbes than there are stars in the milky way

95%
of our microbiota is located in the GI tract

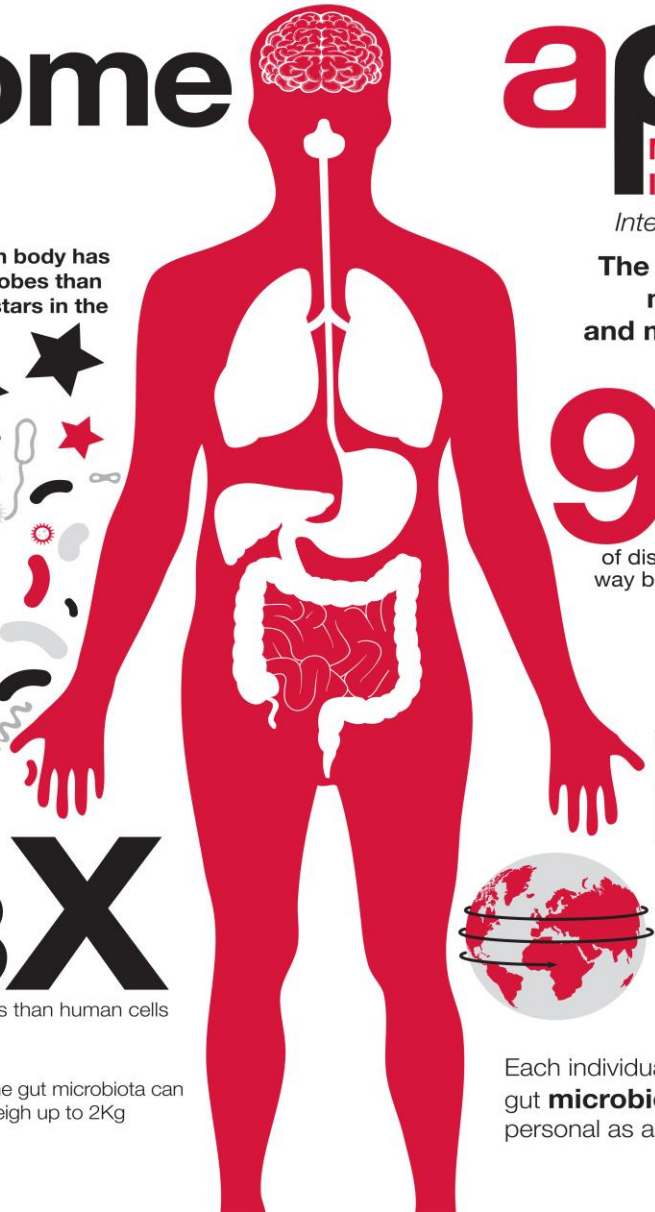
150:1
The genes in your microbiome outnumber the genes in our genome by about 150 to one

The surface area of the **GI tract** is the same size as 2 tennis courts

You have 1.3X
more microbes than human cells

>10,000
Number of different microbial species that researchers have identified living in and on the human body

2kg
The gut microbiota can weigh up to 2Kg



Microbiome Ireland
Interfacing Food & Medicine

The microbiome is more medically accessible and manipulable than the human genome

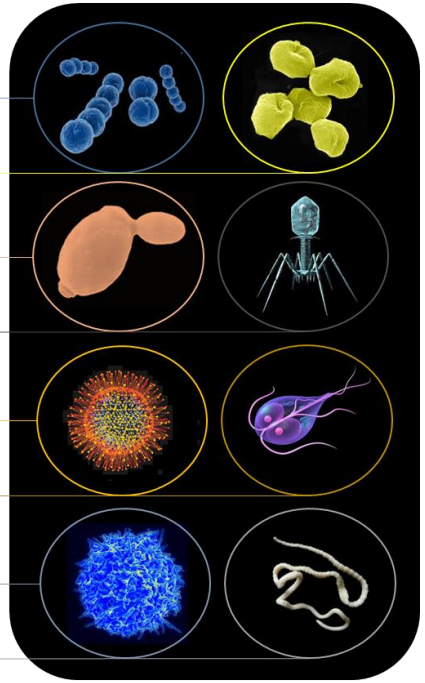
90%
It is thought that of disease can be linked in some way back to the gut and health of the microbiome

5:1
Viruses:Bacteria
in the gut microbiota

2.5
The number of times your body's microbes would circle the earth if positioned end to end

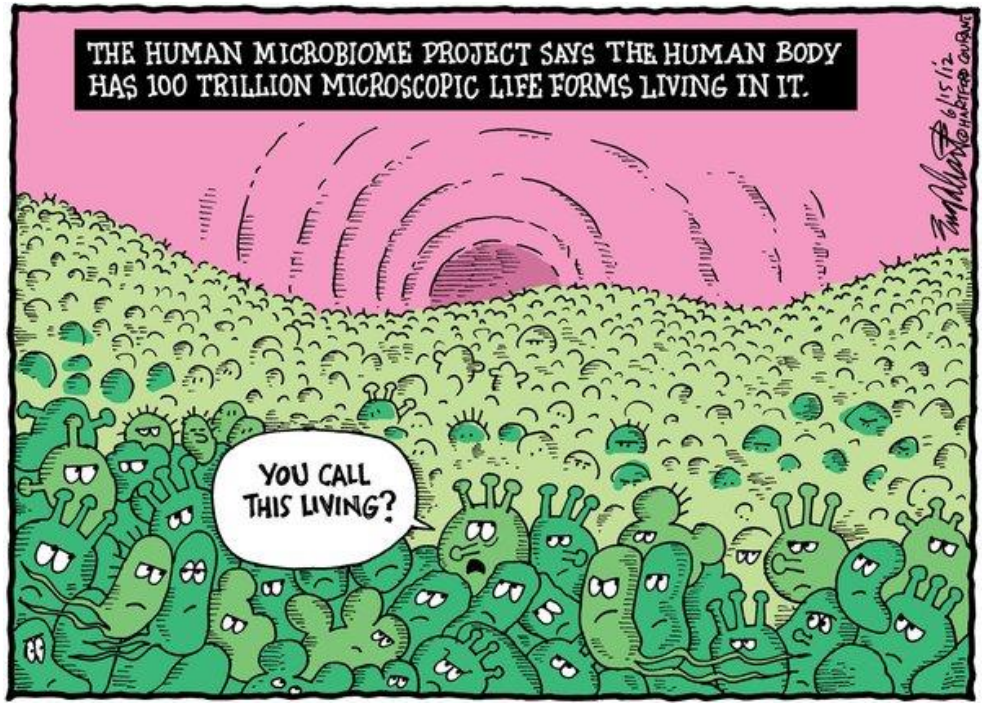
Each individual has a unique gut **microbiota**, as personal as a fingerprint

- Bacteriome
- Archaeome
- Mycobiome
- Phageome
- Euvirome
- Protozome
- Immunome
- Helminthome

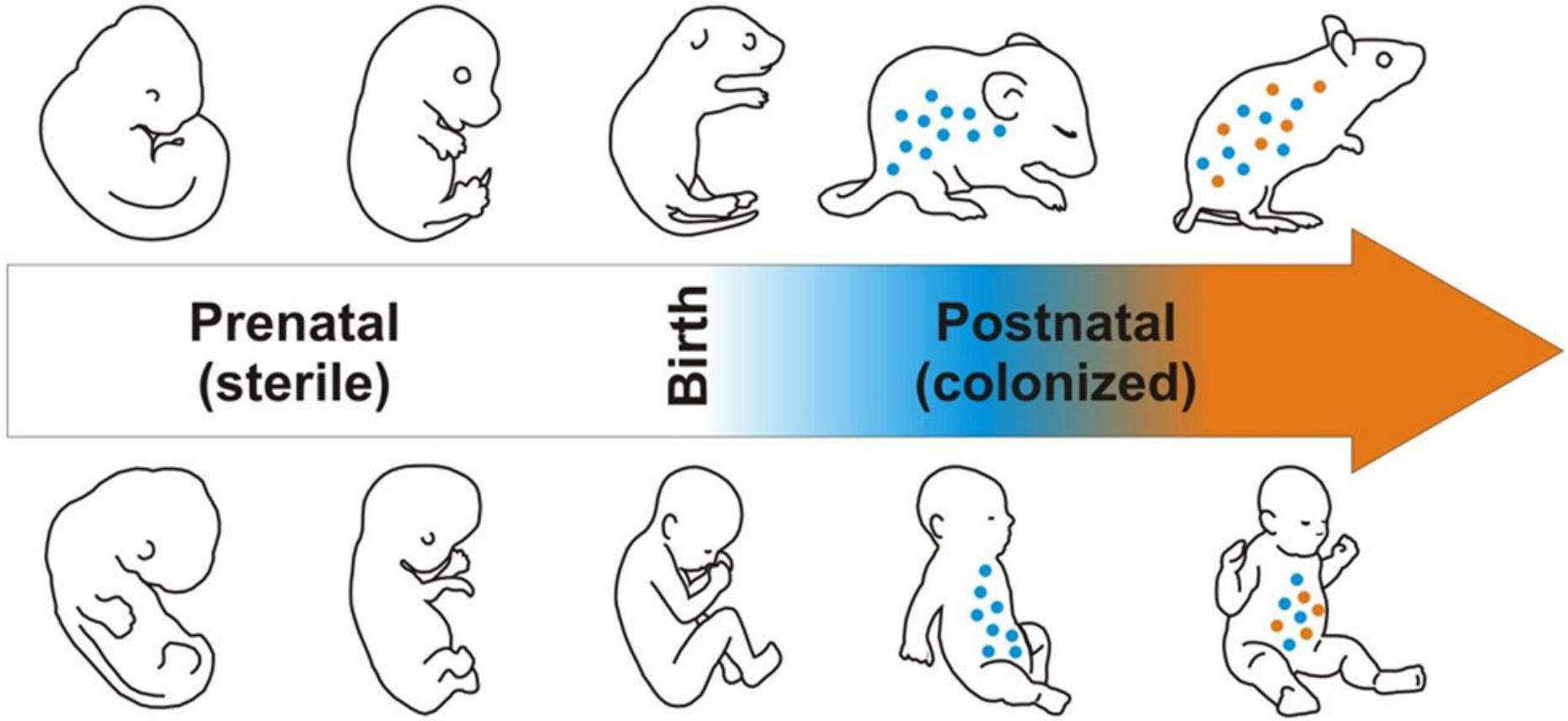


Gut Feelings

- Brain-Gut-Microbiome Axis
- Health and Disease
- Preclinical Research/Signalling Pathways
- Implications for mental health
- Translation from bench to bedside and moving towards mechanisms?
- Therapeutic opportunities?

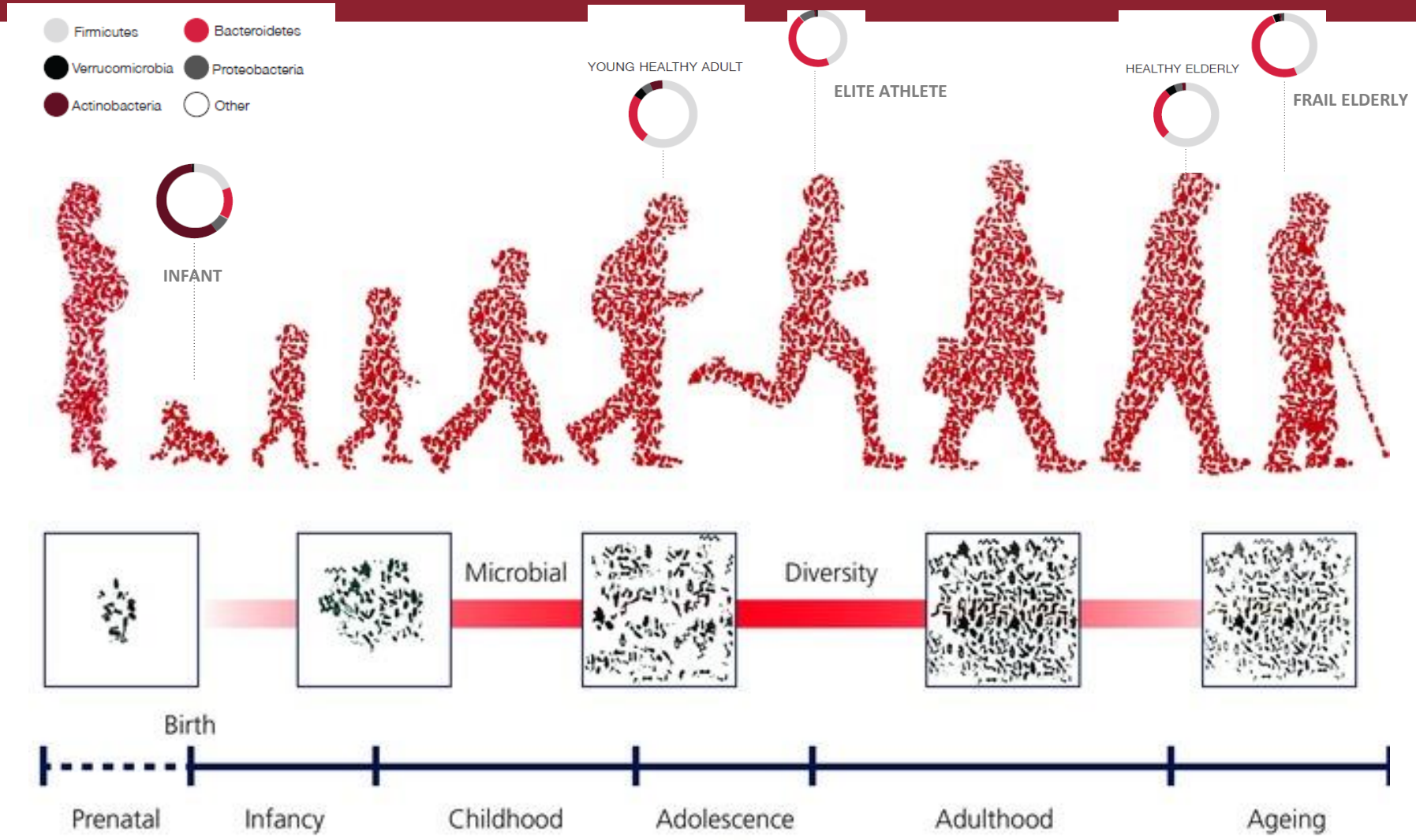


Where do we get our microbiota from?



Grenham et al., 2011

GI microbiota over lifetime



Cryan and Dinan, J Physiology 2017

Stress response
Immune development

Inflammation
Immunosenesence

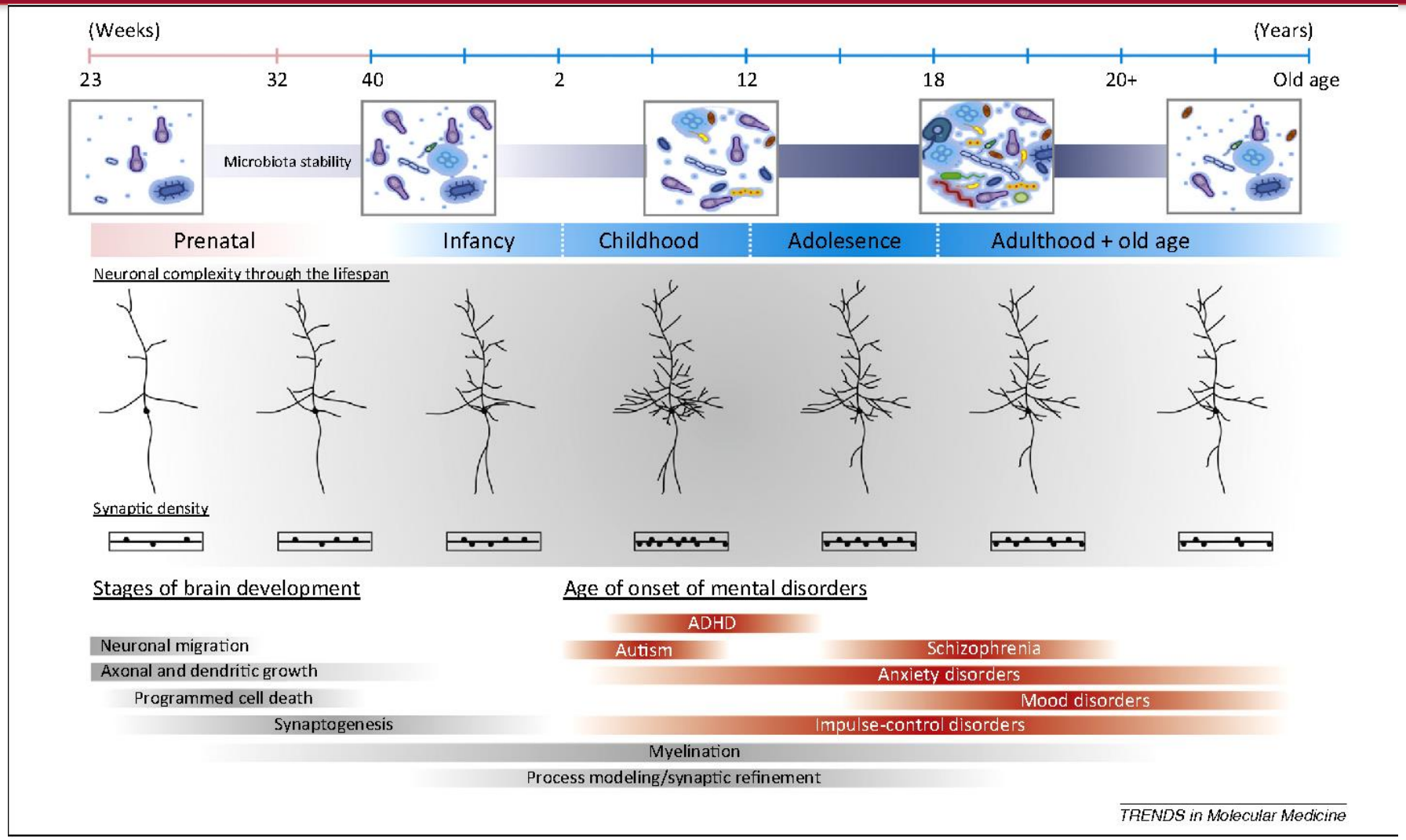
Factors Defining the Gut Microbiome

http://apc.ucc.ie

- Chara
- Stabl
- Diver
- Mod

Clarke et al., Pharmacological Reviews 2019

Microbiota and Neurodevelopment



Borre et al., Trends Molecular Medicine 2014

MICROBIOLOGY

Maternal microbiota in pregnancy and early life

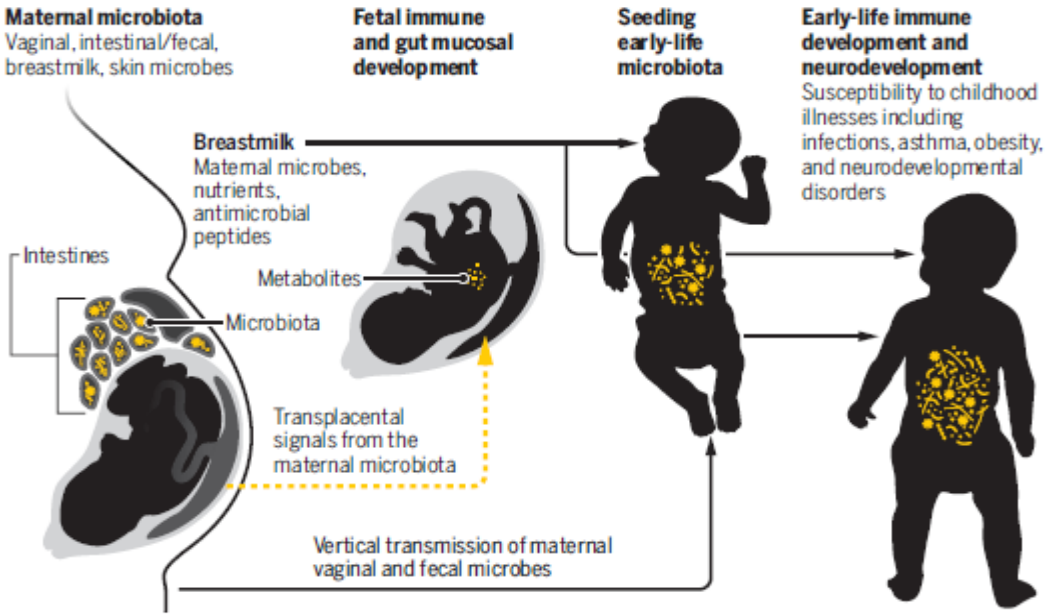
The maternal microbiota shape offspring development, including susceptibility to some illnesses

By **Braedon McDonald**[1] *and* **Kathy D. McCoy**[2]

remains the subject of debate. In support of this, a recent study found that the human pla-

Effects of the maternal microbiota in pregnancy and early life

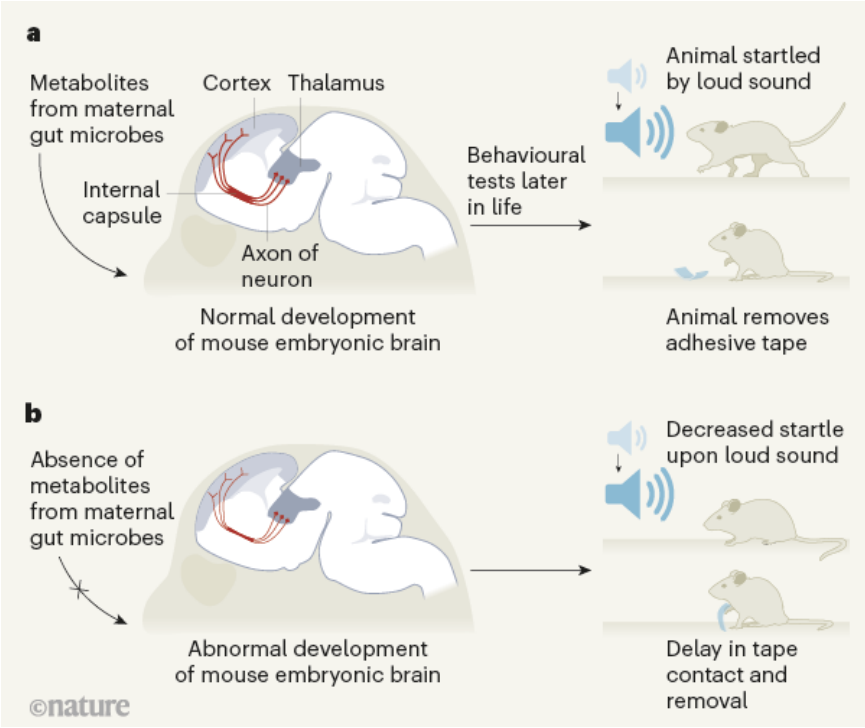
Through effects on early-life colonization, immune development, and neurodevelopment, the maternal microbiota regulates susceptibility to a number of childhood illnesses and can vertically transmit dysbiosis-mediated pathologies.



The maternal microbiome modulates fetal neurodevelopment in mice

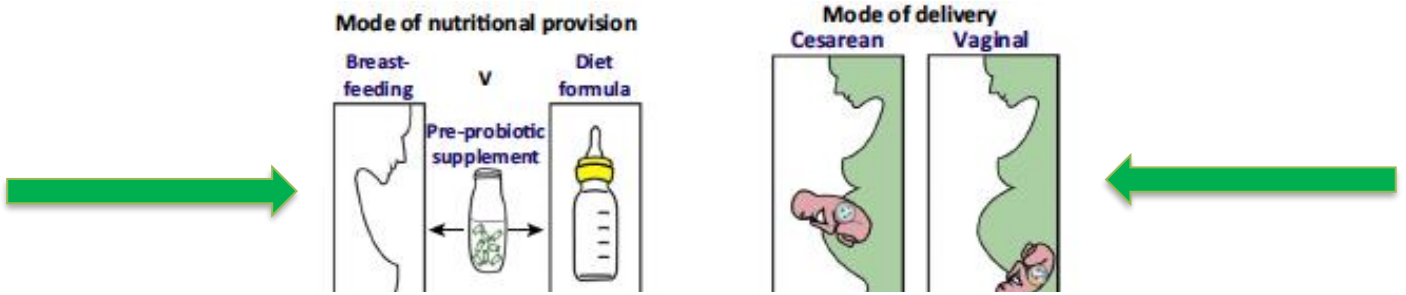
https://doi.org/10.1038/s41586-020-2745-3
Received: 23 July 2019
Accepted: 24 August 2020

Helen E. Vuong[1]✉, Geoffrey N. Pronovost[1], Drake W. Williams[2], Elena J. L. Coley[1], Emily L. Siegler[1], Austin Qiu[1], Maria Kazantsev[1], Chantel J. Wilson[1], Tomiko Rendon[1] & Elaine Y. Hsiao[1]



Meckel and Kiraly, Nature 2020

The Gold Standard



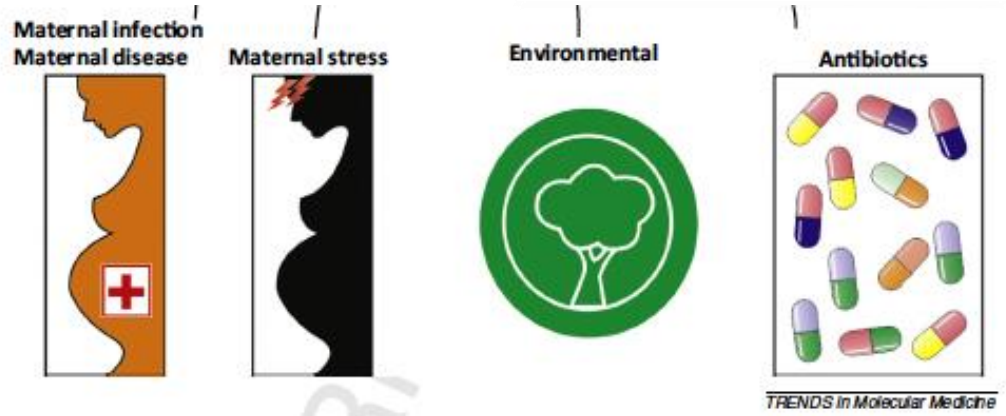
Neuroscience 342 (2017) 37–54

REVIEW

EARLY-LIFE ADVERSITY AND BRAIN DEVELOPMENT: IS THE MICROBIOME A MISSING PIECE OF THE PUZZLE?

S. M. O'MAHONY, [a,b*] G. CLARKE, [b,c] T. G. DINAN [b,c] AND J. F. CRYAN [a,b*]

37



Borre et al. Trends Mol Med 2014

Current Biology 30, 3761–3774, October 5, 2020 © 2020 The Authors. Published by Elsevier Inc. 3761

Current Biology

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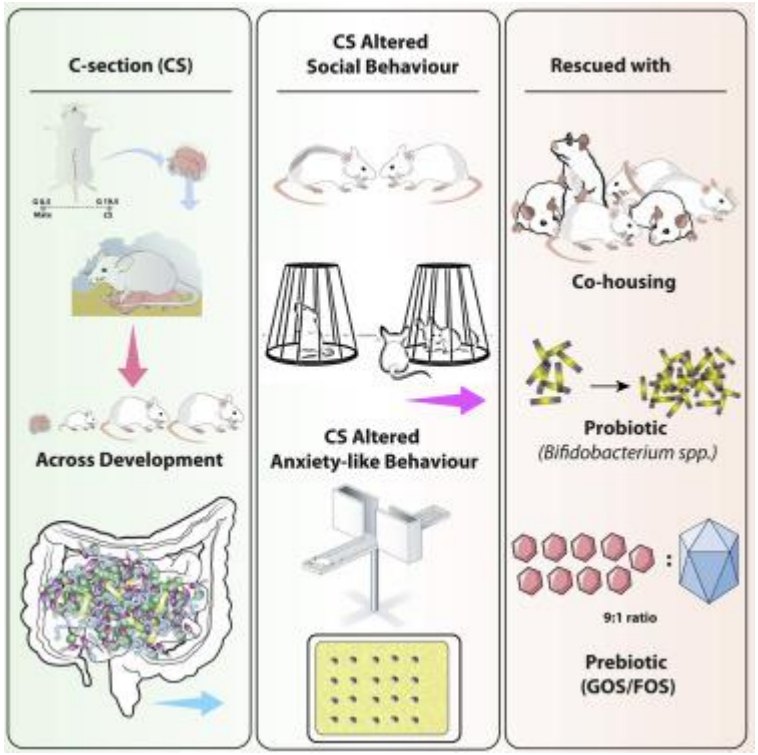
Article

Enduring Behavioral Effects Induced by Birth by Caesarean Section in the Mouse

Livia H. Morais,[1,4,9] Anna V. Golubeva,[1,4] Gerard M. Moloney,[1,4] Angela Moya-Pérez,[1] Ana Paula Ventura-Silva,[1] Silvia Arboleya,[1,3,10] Thomaz F.S. Bastiaanssen,[1,4] Orla O'Sullivan,[1,3] Kieran Rea,[1] Yuliya Borre,[1] Karen A. Scott,[1,11] Elaine Patterson,[1,3,12] Paul Cherry,[1] Roman Stilling,[1,13] Alan E. Hoban,[1,4,14] Sahar El Aidy,[1,15] Ana M. Sequeira,[1] Sasja Beers,[1] Rachel D. Moloney,[1,16] Ingrid B. Renes,[5,6] Shugui Wang,[7] Jan Knol,[5,8] R. Paul Ross,[1,3] Paul W. O'Toole,[1,3] Paul D. Cotter,[1,3] Catherine Stanton,[1,2,3] Timothy G. Dinan,[1,2] and John F. Cryan[1,4,17,*]



Neurobiology of Stress 1 (2015) 81–88

Contents lists available at ScienceDirect

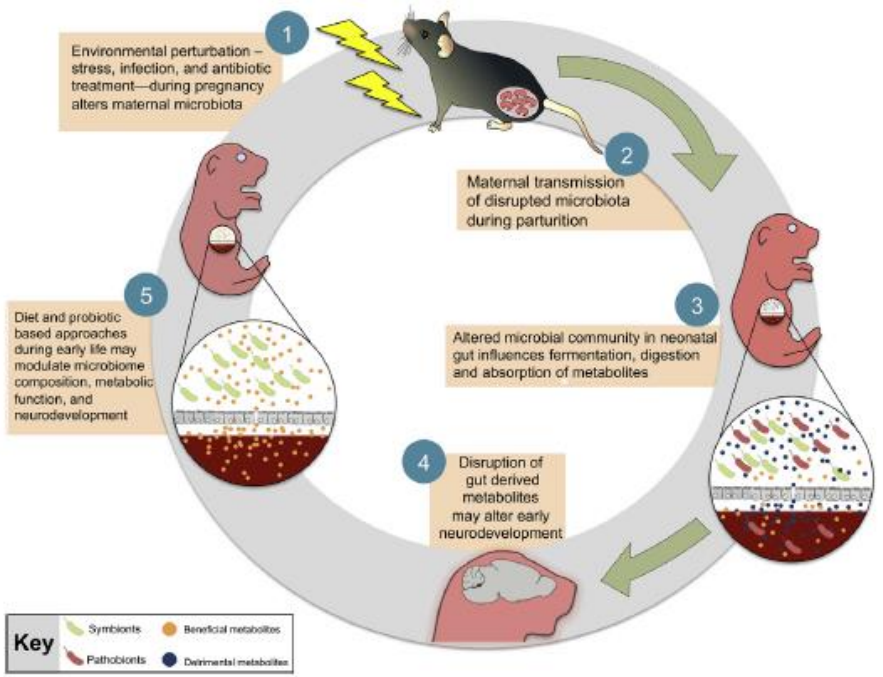
Neurobiology of Stress

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

A novel role for maternal stress and microbial transmission in early life programming and neurodevelopment

Eldin Jašarević, Ali B. Rodgers, Tracy L. Bale*

Department of Animal Biology, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, PA 19104, USA



3 GOOD HEALTH AND WELL-BEING

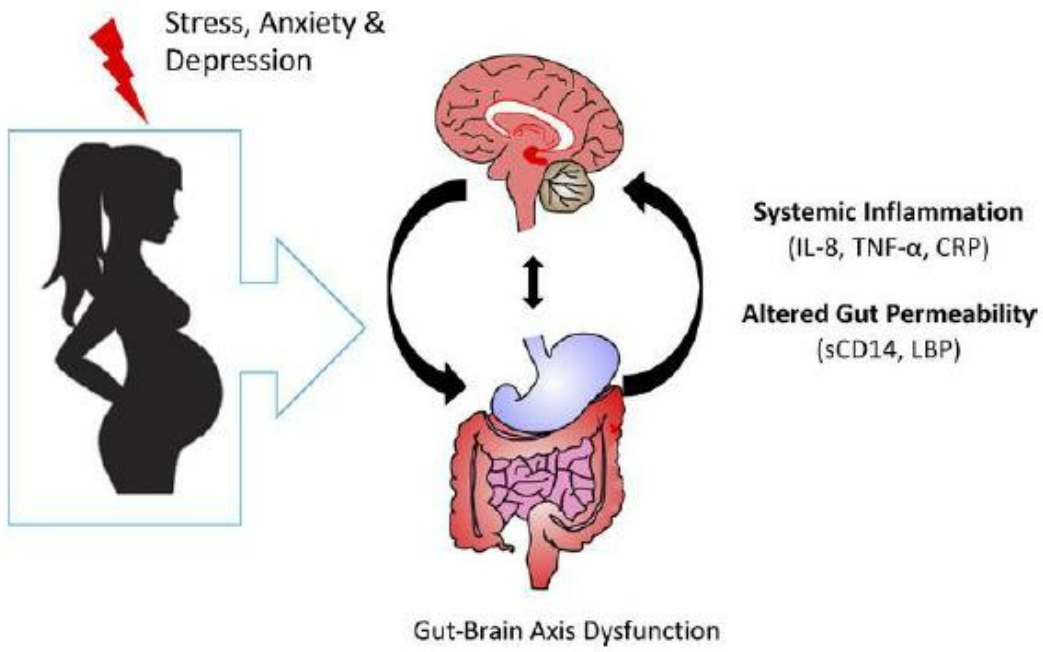
JCI insight

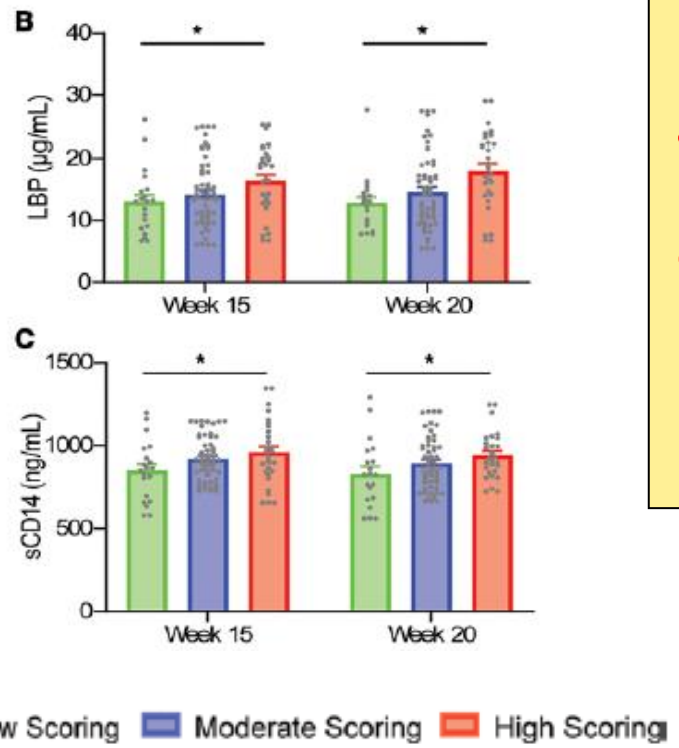
insight.jci.org https://doi.org/10.1172/jci.insight.143007

RESEARCH ARTICLE

Identifying a biological signature of prenatal maternal stress

James M. Keane,[1] Ali S. Khashan,[2,3] Fergus P. McCarthy,[3,4] Louise C. Kenny,[5] James M. Collins,[1,6] Sarah O'Donovan,[1] Jillian Brown,[1] John F. Cryan,[1,6] Timothy G. Dinan,[1,7] Gerard Clarke,[1,3,7] and Siobhain M. O'Mahony[1,6]



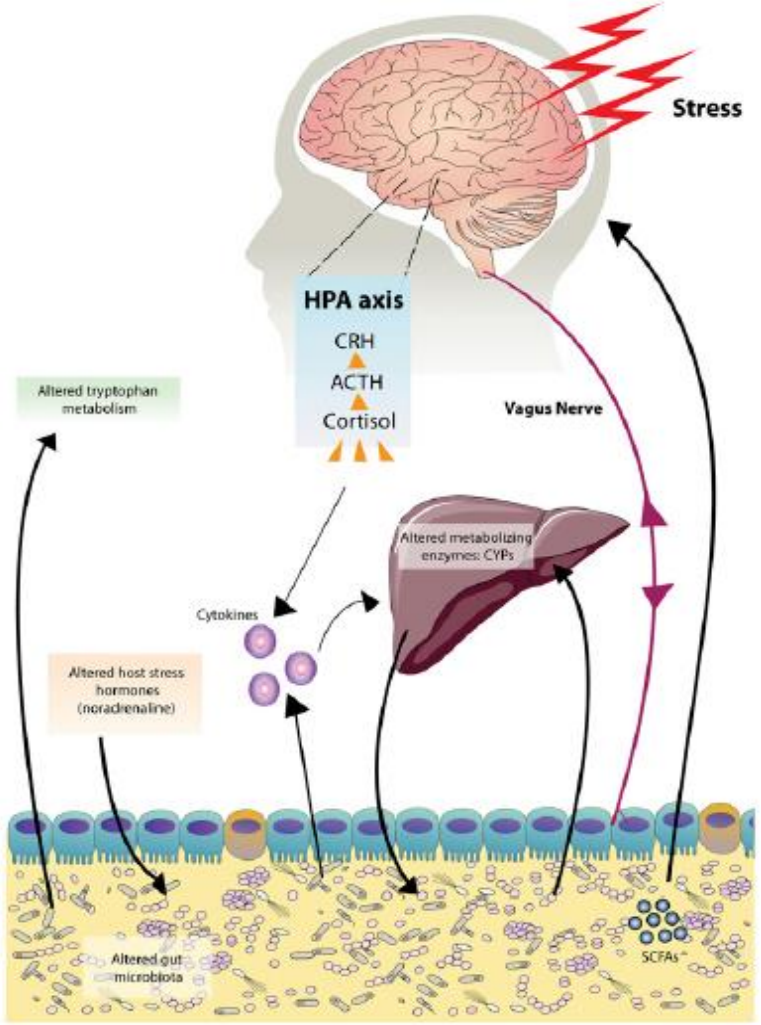


High perceived stress during pregnancy associated with increased gastrointestinal permeability and increased inflammation

The brain-gut –(microbiota) axis

Basic Functions

- Motility
- Secretion
- Permeability
- Mucosal immunity

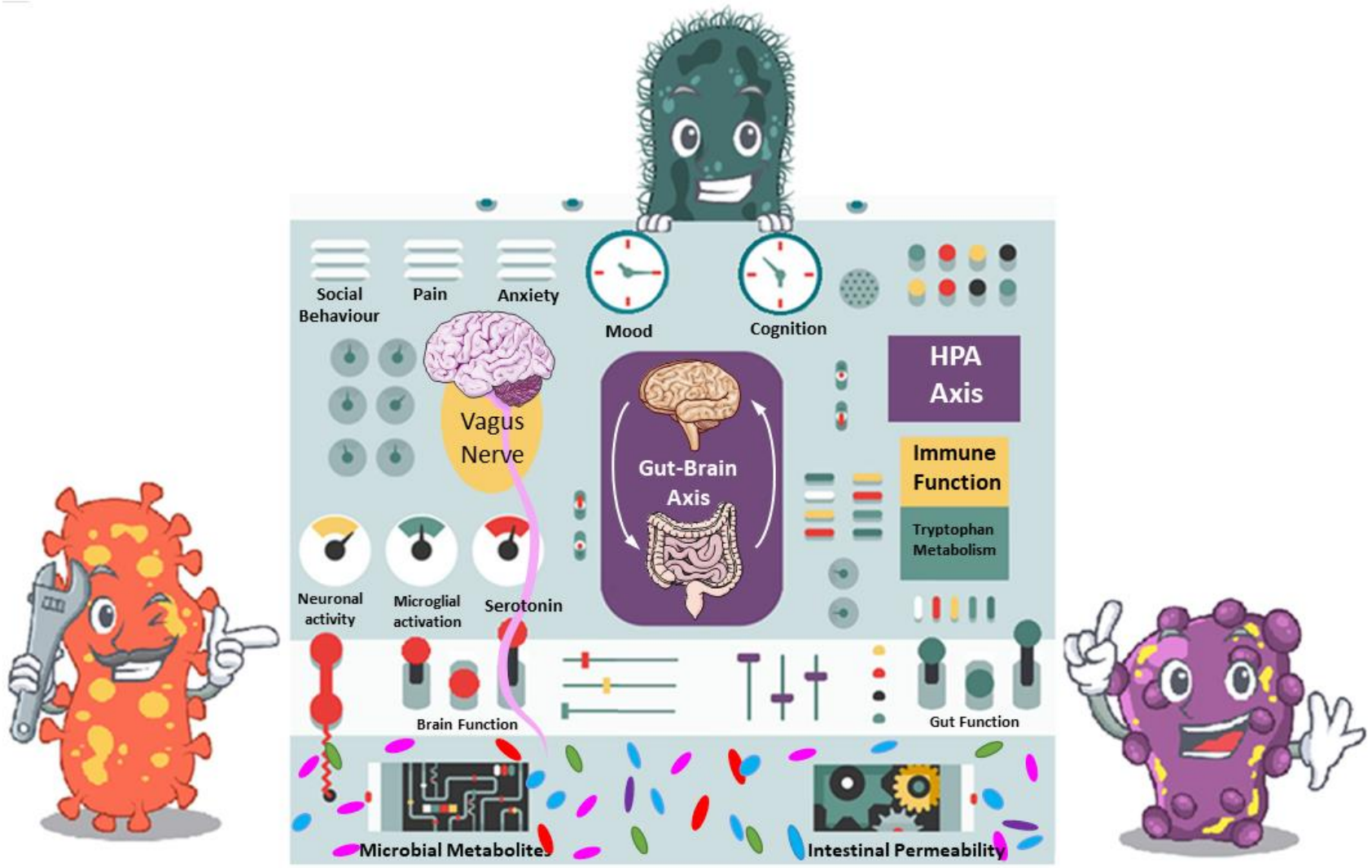


Clarke et al., Pharmacological Reviews 2019

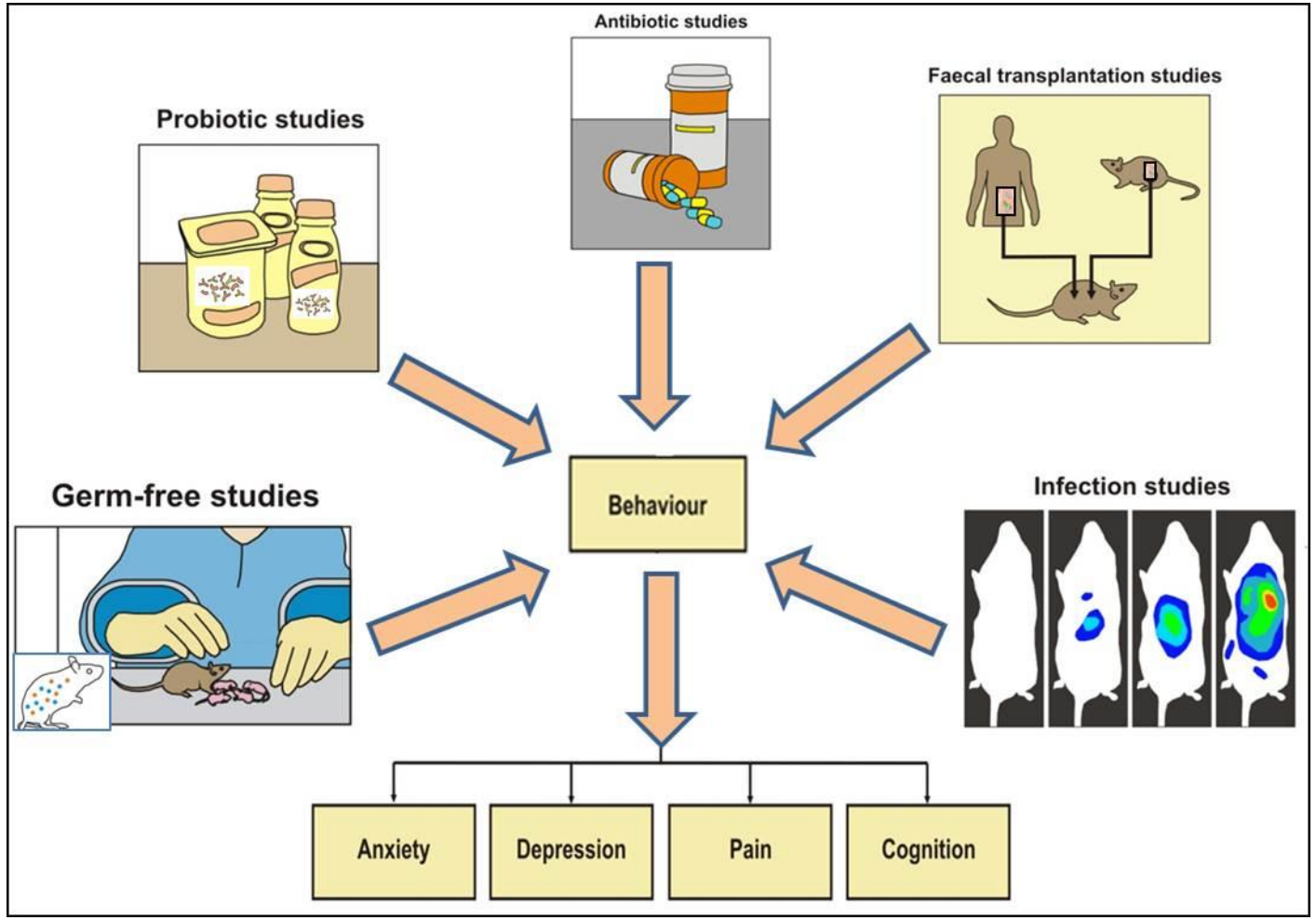
Complex Functions

- Visceral Pain
- Hunger/ satiety
- Mood/ Emotion
- Cognition

Pushing our Buttons and Pulling our Levers



Microbiota, Brain and Behaviour



Clarke et al., Encyclopedia Metagenomics 2013

Germ-Free Living?

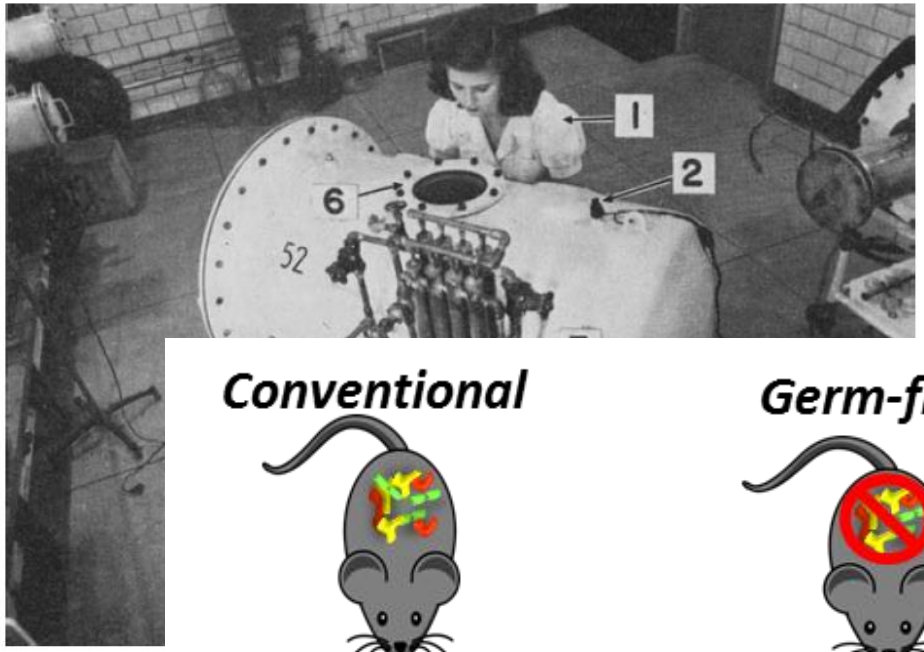


Figure 2. Reyniers's isolator; (1) technician, (2) electrical outlet, (3) air outlet, (4) mobile truck, (5) entrance/exit autoclave, (6) viewing port. *Source:* J. A. Reyniers, P. C. Trexler, and R. F. Ervin, "Rearing Germ-Free Albino Rats," *LOBUND Rep.* 1 (1946): 1–84, 5. © University of Notre Dame.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

Stressors


PRICE $8.99
THE NEW YORKER
MAY 25, 2020
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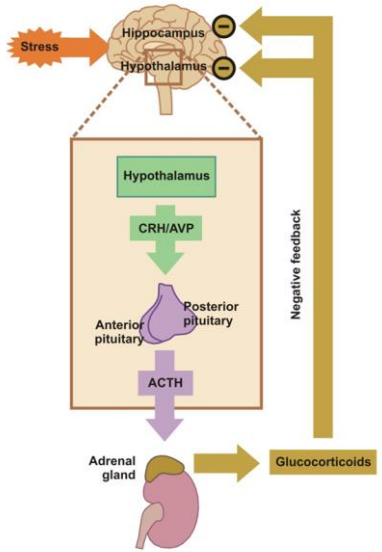
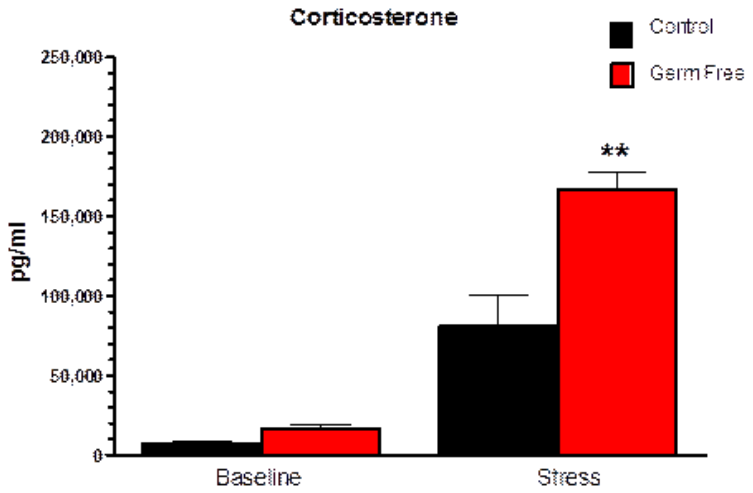
New Scientist
OBESITY AND CANCER
We may finally know what the connection is
THE WELL-BEHAVED HIGGS
And why that is a problem for physics
FIRE AND ICE
Is this the Arctic's worst year ever?
WEEKLY August 15–21, 2020
CORONAVIRUS
WHY CONTACT MATTERS
The surprising impact of social interactions on our health, wealth and happiness
WHO GETS THE VACCINE?
The difficult decisions that are already being made
PLASTIC PANDEMIC
When protection equals pollution
PLUS ANCIENT POISON ARROWS / SNOWBALLS ON JUPITER / ZOMBIE MICROBES / A VACCINE FOR THE COMMON COLD / LONG-NECKED MONSTER / BIRTH AFTER THE MENOPAUSE

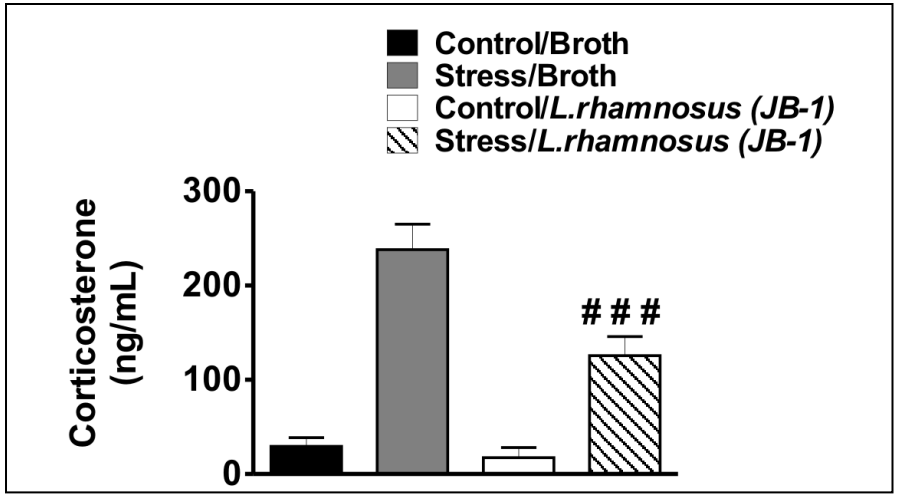
Microbiota Controls Stress Response





Germ-free animals have an exaggerated stress response

Clarke et al., Mol Psych 2013



Probiotic Reduces Stress-induced Corticosterone Levels

Bravo et al., PNAS Sept 2011

Microbiota Determines Amygdala Volume & Dendritic Morphology

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

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,*]

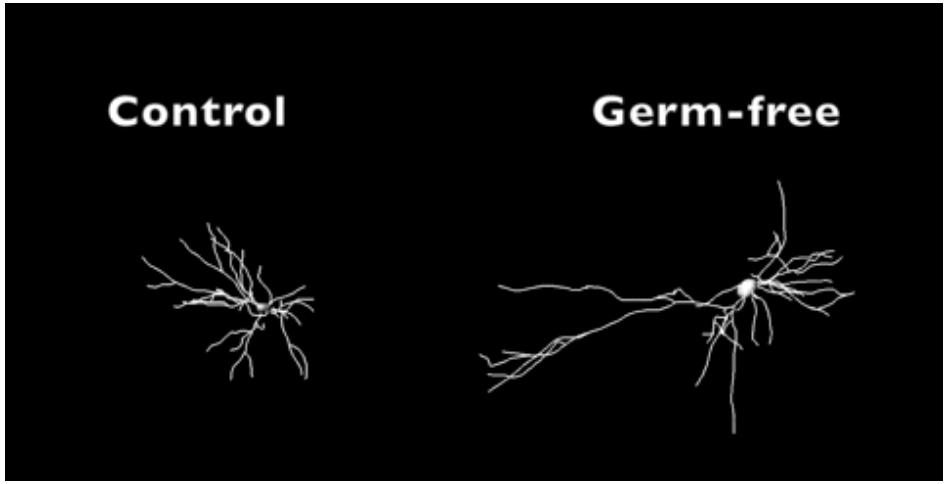
DOI: 10.1111/ejn.13291

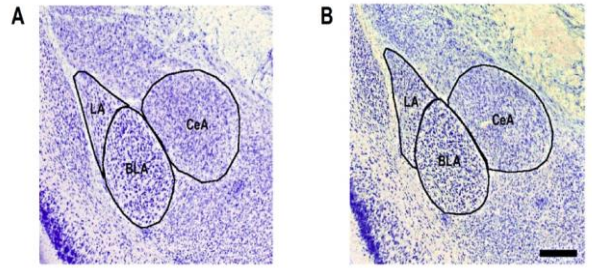
Issue

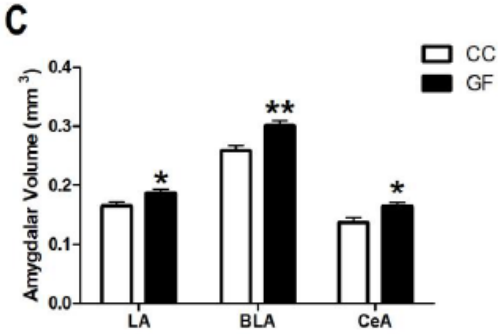
European Journal of Neuroscience

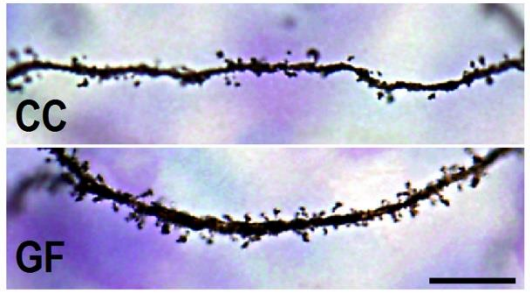
Accepted Article (Accepted, unedited articles published online and citable. The final edited and typeset version of record will appear in future.)

Dendritic Hypertrophy of Basolateral Amygdala Neurons



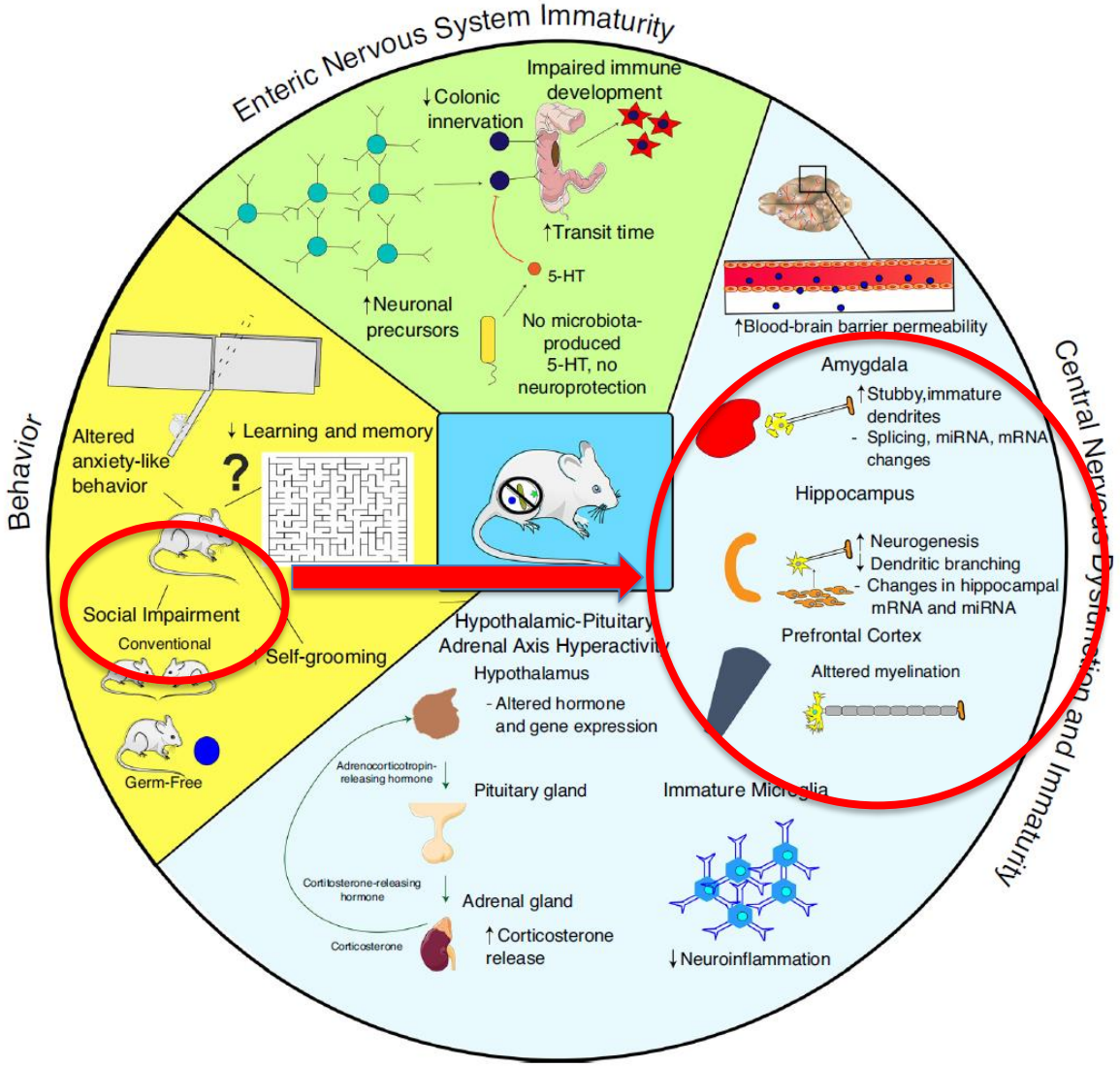






CC = Conventionally Colonised
GF = Germ Free

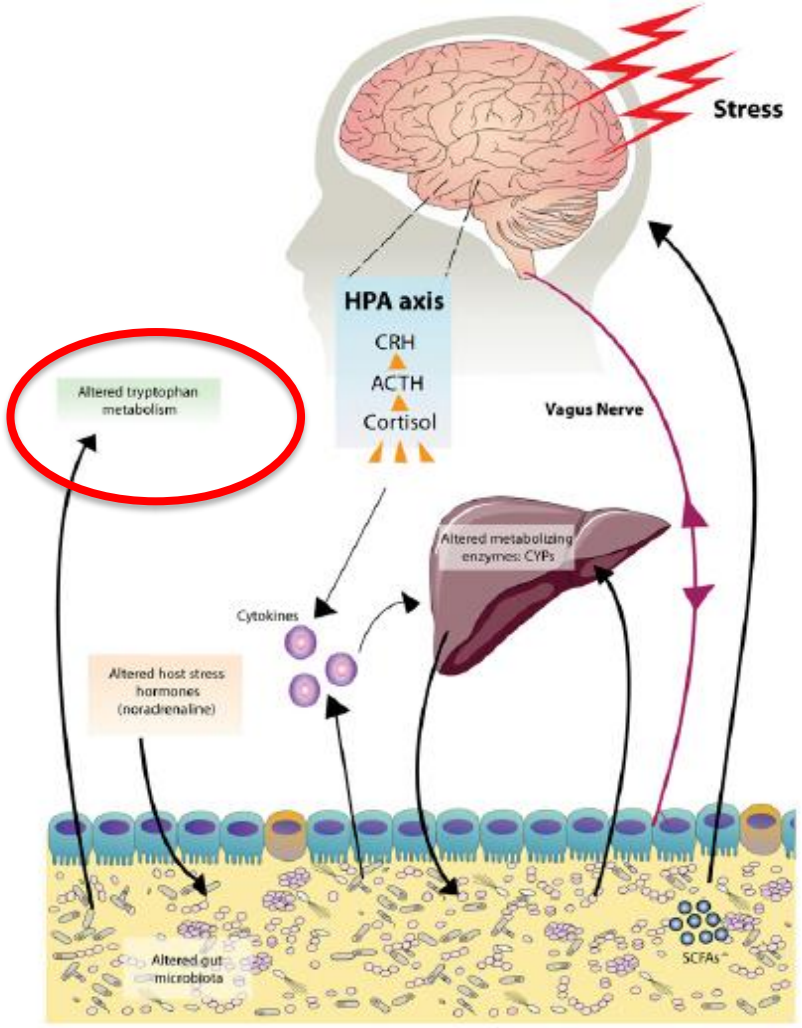
The Germ-free Phenotype

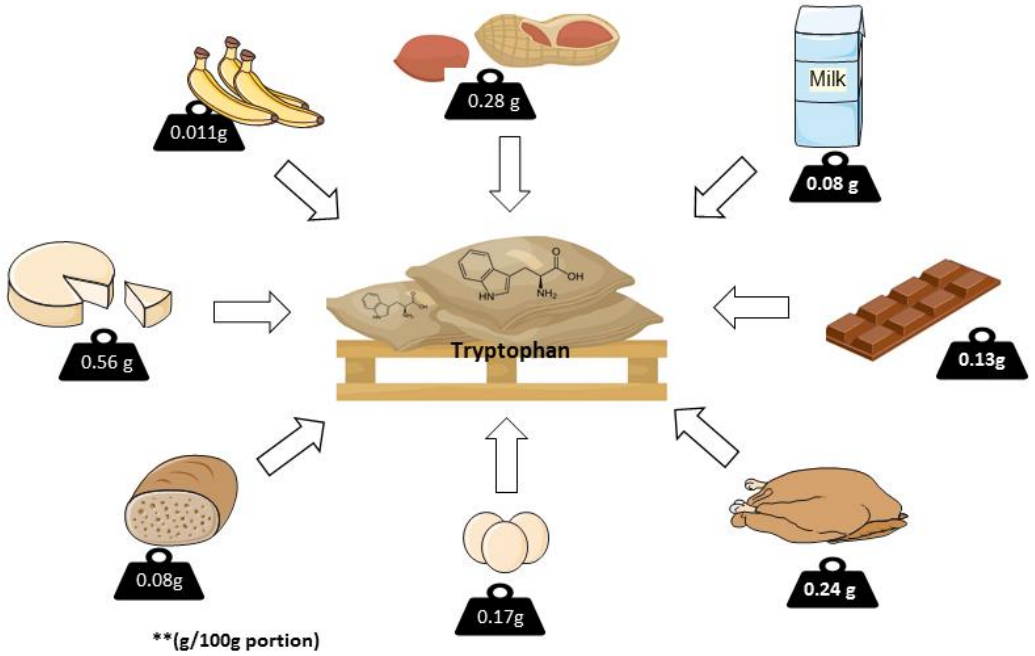


Drug Discovery Today: Disease Models

Spichak et al., Drug Dis Today 2019

Tryptophan – A (microbial) Building Block





Clarke et al., Pharmacological Reviews 2019

Behavioural Brain Research 277 (2015) 32–48

Contents lists available at ScienceDirect

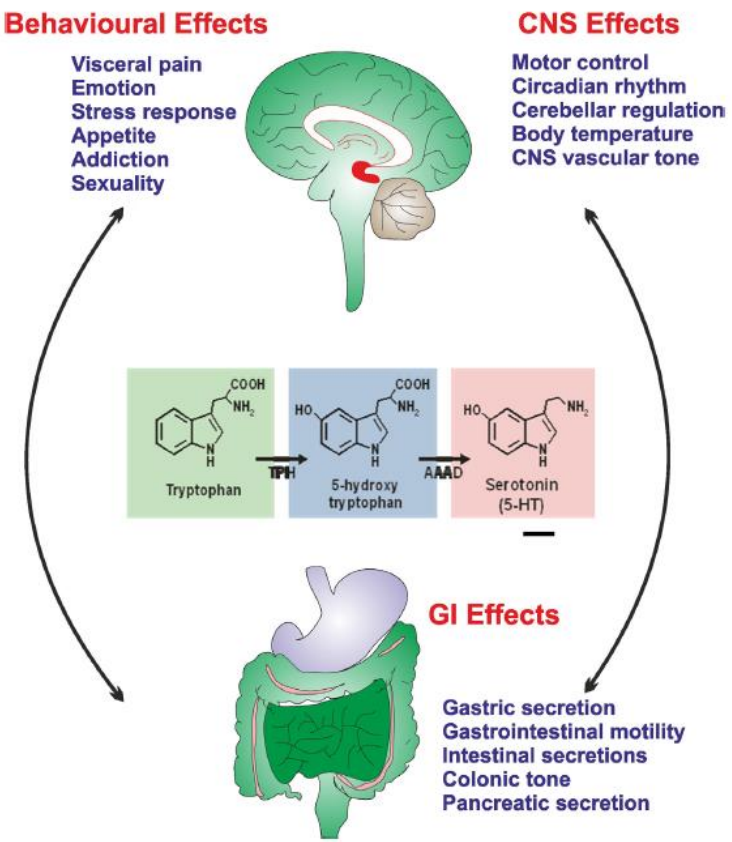
Behavioural Brain Research

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."

Microbiota Regulates Tryptophan Metabolism

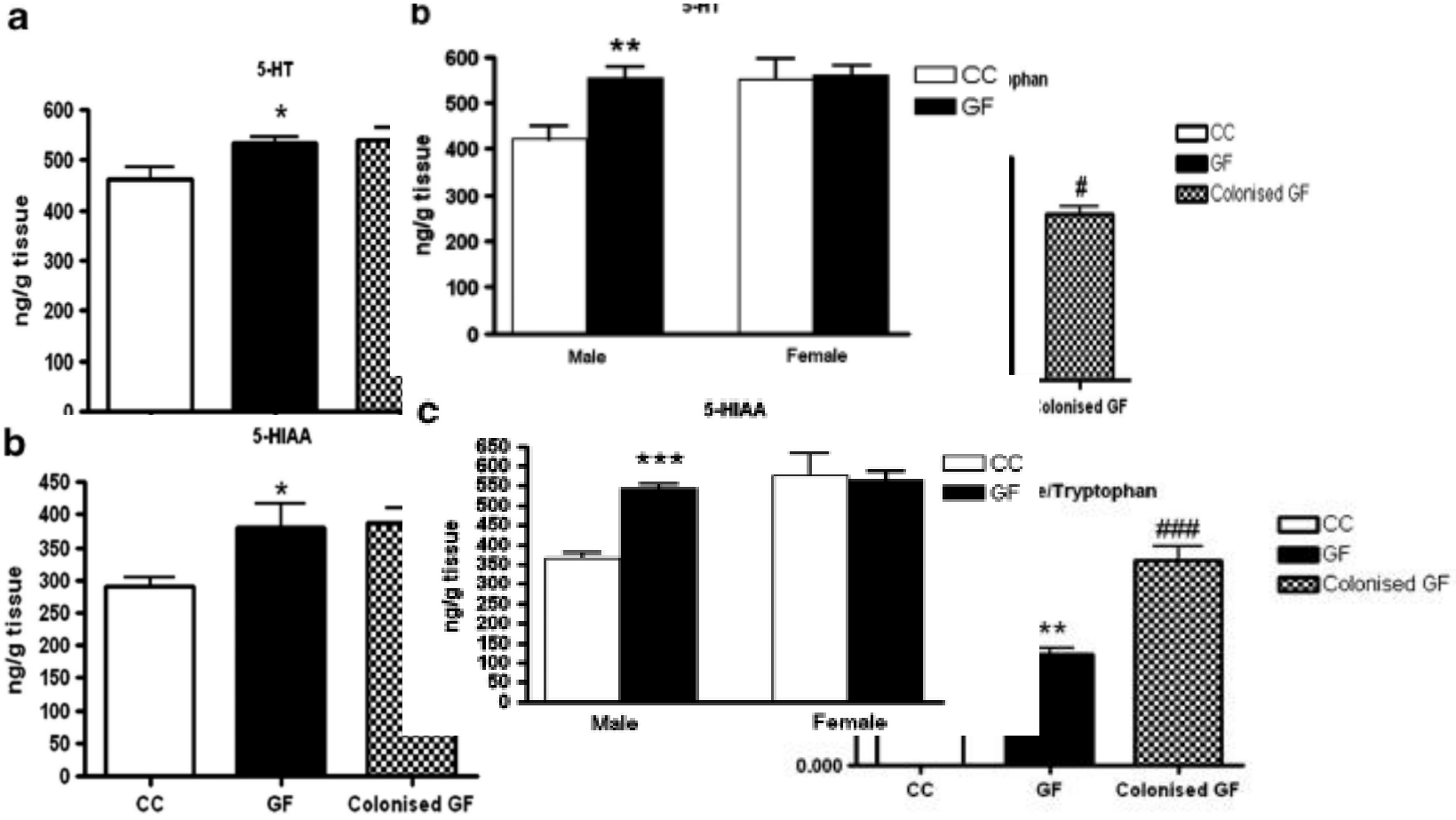
Molecular Psychiatry (2013) 18, 666–673

www.nature.com/mp

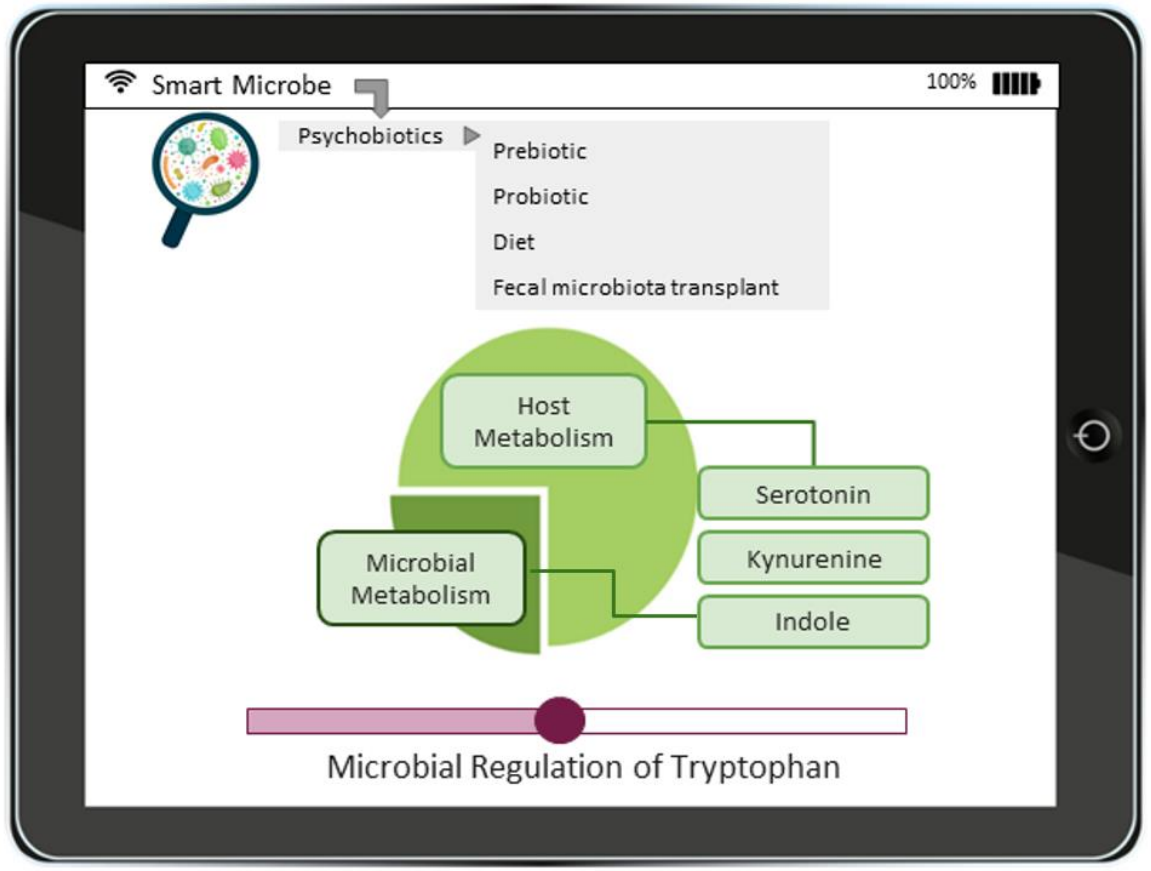
ORIGINAL ARTICLE

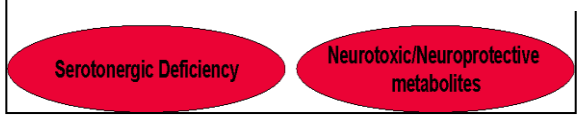
The microbiome-gut-brain axis during early life regulates the hippocampal serotonergic system in a sex-dependent manner

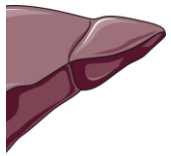
G Clarke[1,2], S Grenham[1], P Scully[1], P Fitzgerald[1], RD Moloney[1], F Shanahan[1,3], TG Dinan[1,2] and JF Cryan[1,4]

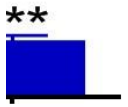


Microbial Regulation of Hepatic Gene Expression





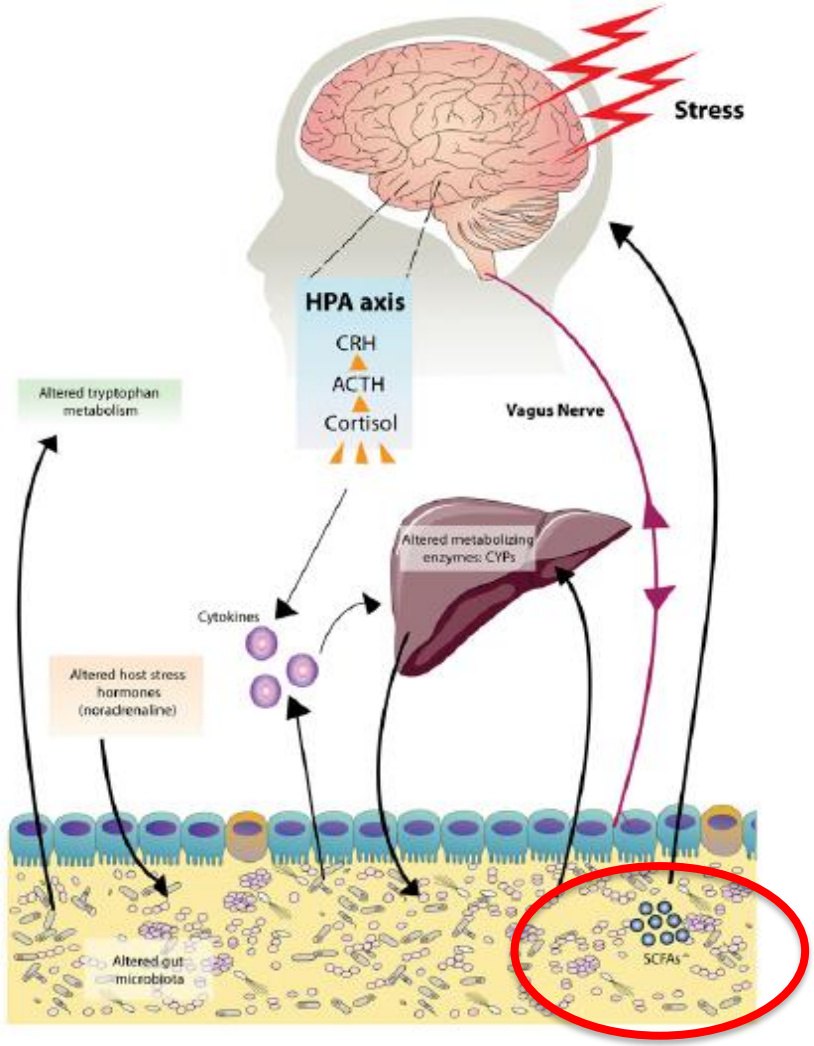


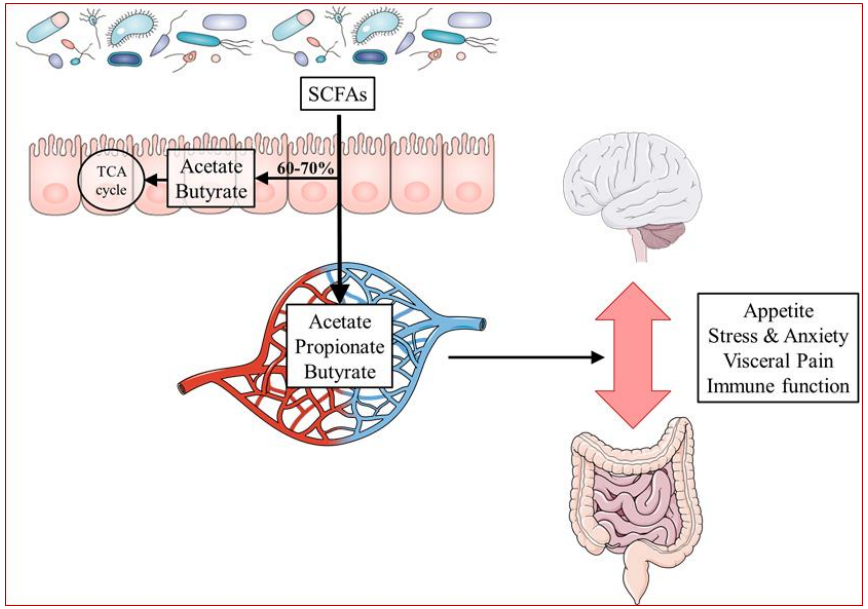


Kennedy et al., World J Gastro 2014

Gheorghe et al, Unpublished data

Signalling Along the Brain-Gut-Microbiota axis





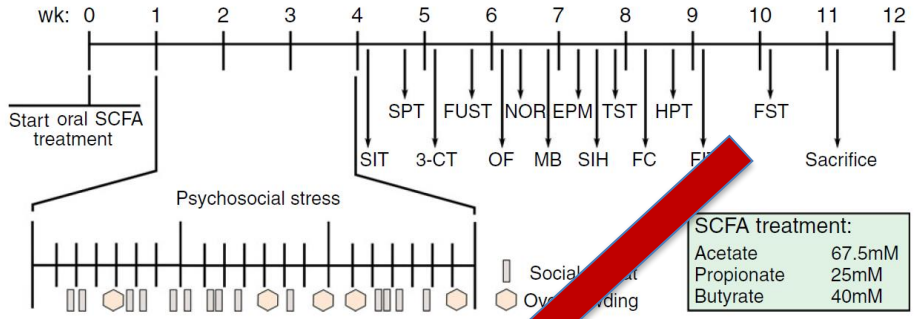
Clarke et al., Pharmacological Reviews 2019

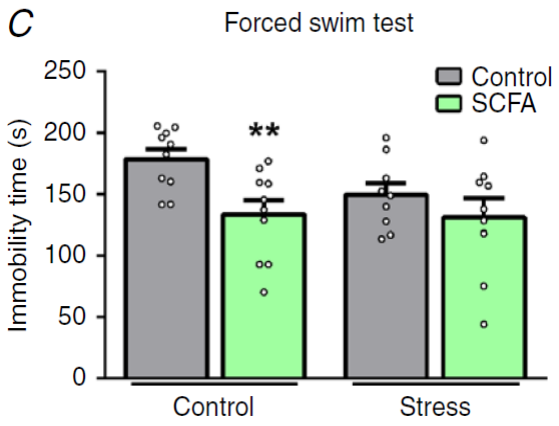
J Physiol 596.20 (2018) pp 4923–4944

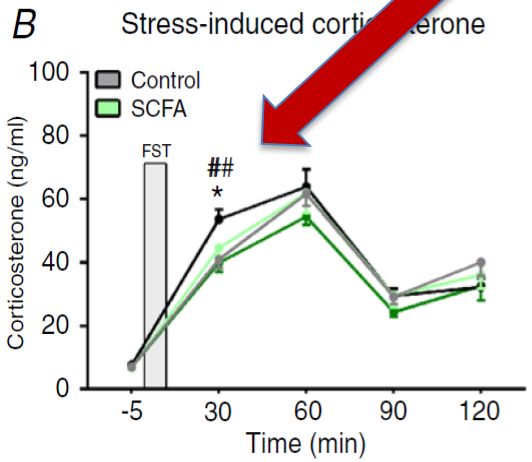
Short-chain fatty acids: microbial metabolites that alleviate stress-induced brain–gut axis alterations

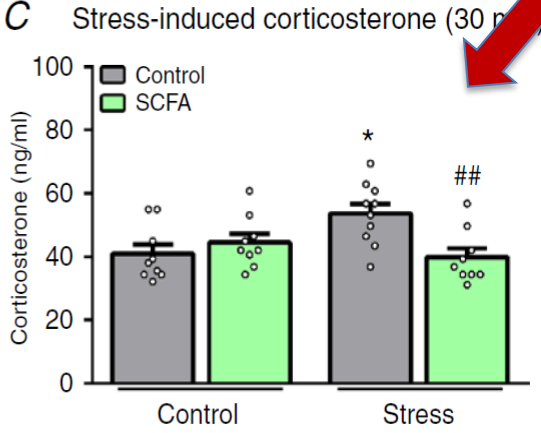
Marcel van de Wouw[1,2], Marcus Boehme[2], Joshua M. Lyte[2], Niamh Wiley[2,4], Conall Strain[2,4], Orla O'Sullivan[2,4], Gerard Clarke[2,3], Catherine Stanton[2,4], Timothy G. Dinan[2,3] and John F. Cryan[1,2,3]

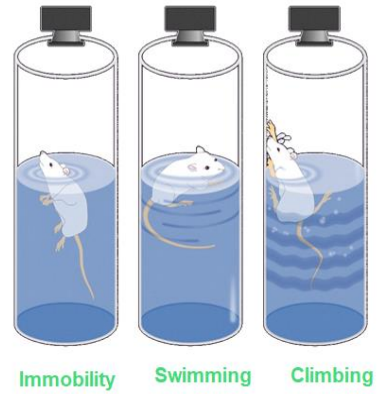
[1]*Department of Anatomy and Neuroscience, University College Cork, Cork, Ireland*
[2]*APC Microbiome Ireland, University College Cork, Cork, Ireland*
[3]*Department of Psychiatry and Neurobehavioral Science, University College Cork, Cork, Ireland*
[4]*Teagasc Food Research Centre, Moorepark, Fermoy, Cork, Ireland*











Cryan et al., Trends Pharmacol Sci, 2002

Neuropsychopharmacology

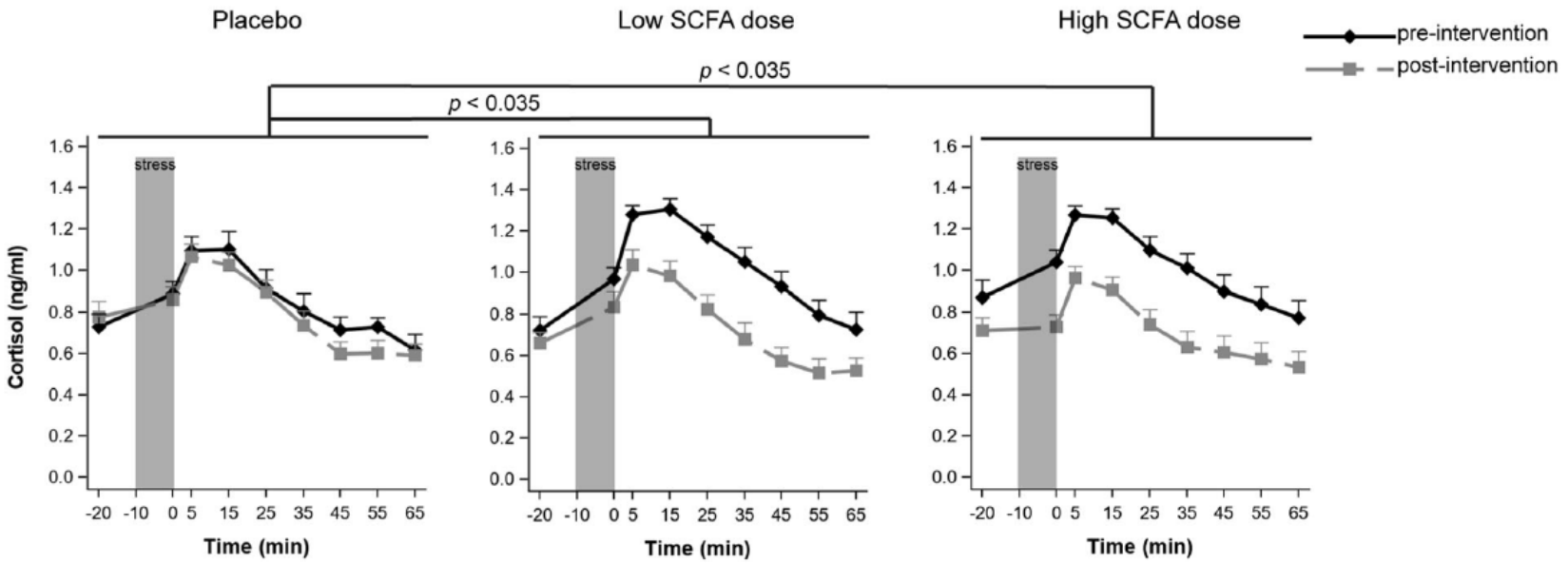
Neuropsychopharmacology (2020) 0:1 – 10

www.nature.com/npp

ARTICLE

Colon-delivered short-chain fatty acids attenuate the cortisol response to psychosocial stress in healthy men: a randomized, placebo-controlled trial

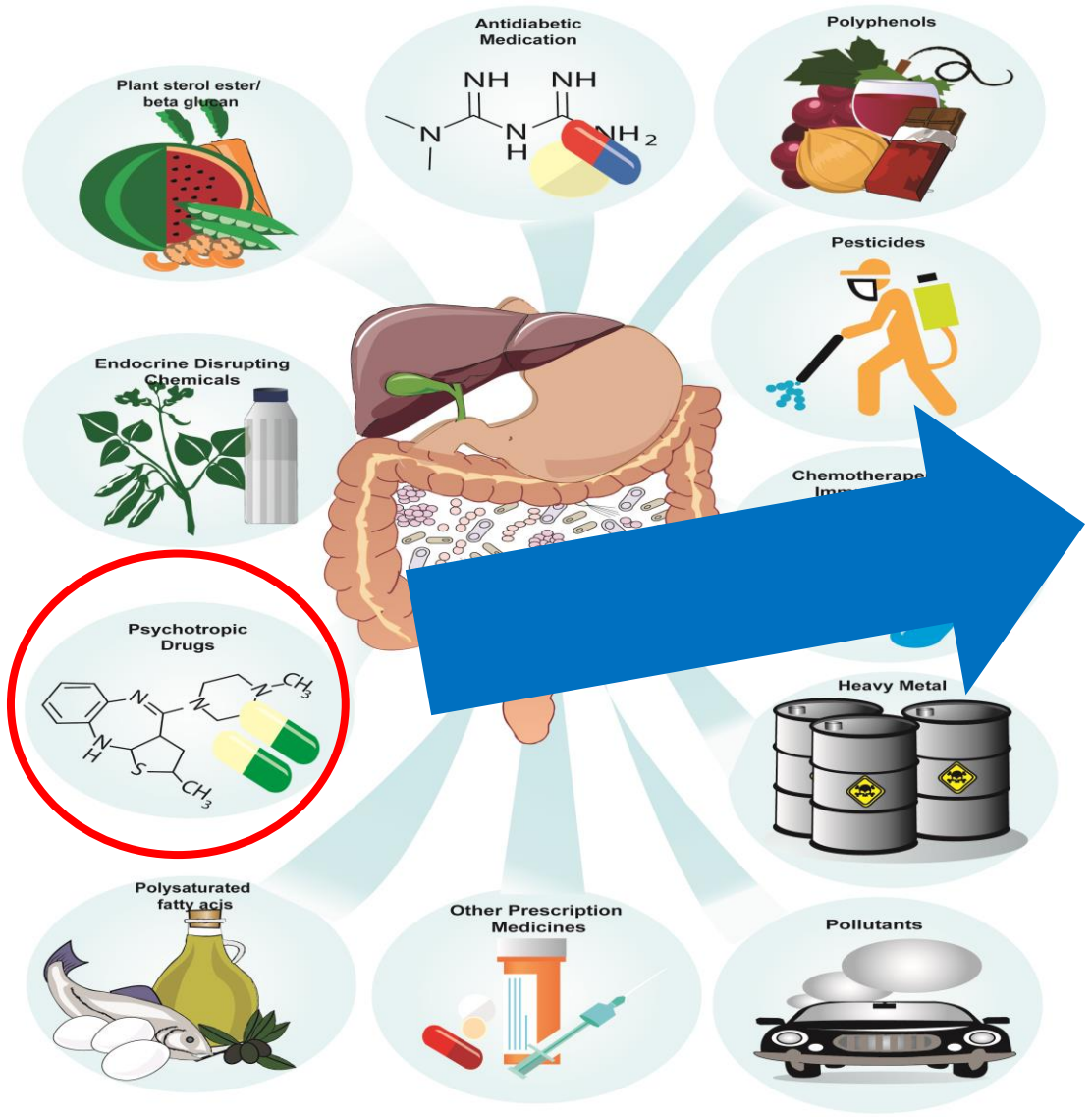
Boushra Dalile[1], Bram Vervliet[2], Gabriela Bergonzelli[3], Kristin Verbeke[1] and Lukas Van Oudenhove[1]

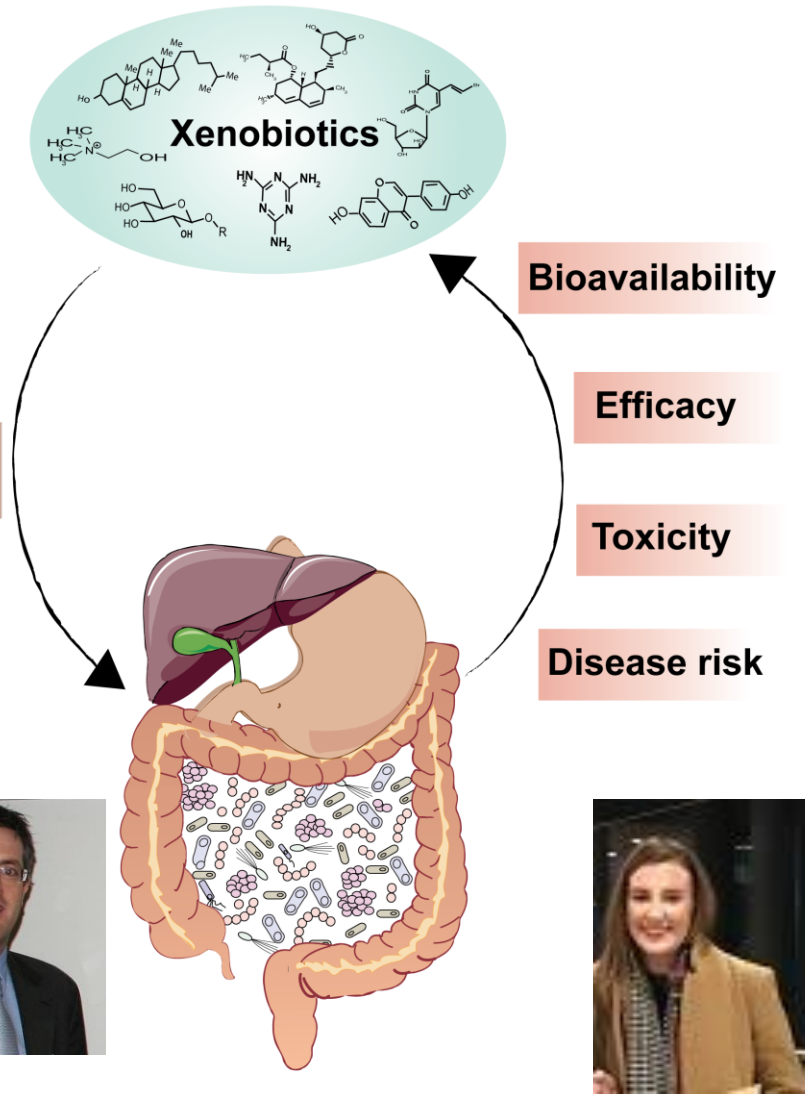


Drug-Microbiome Interactions

3 GOOD HEALTH AND WELL-BEING

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

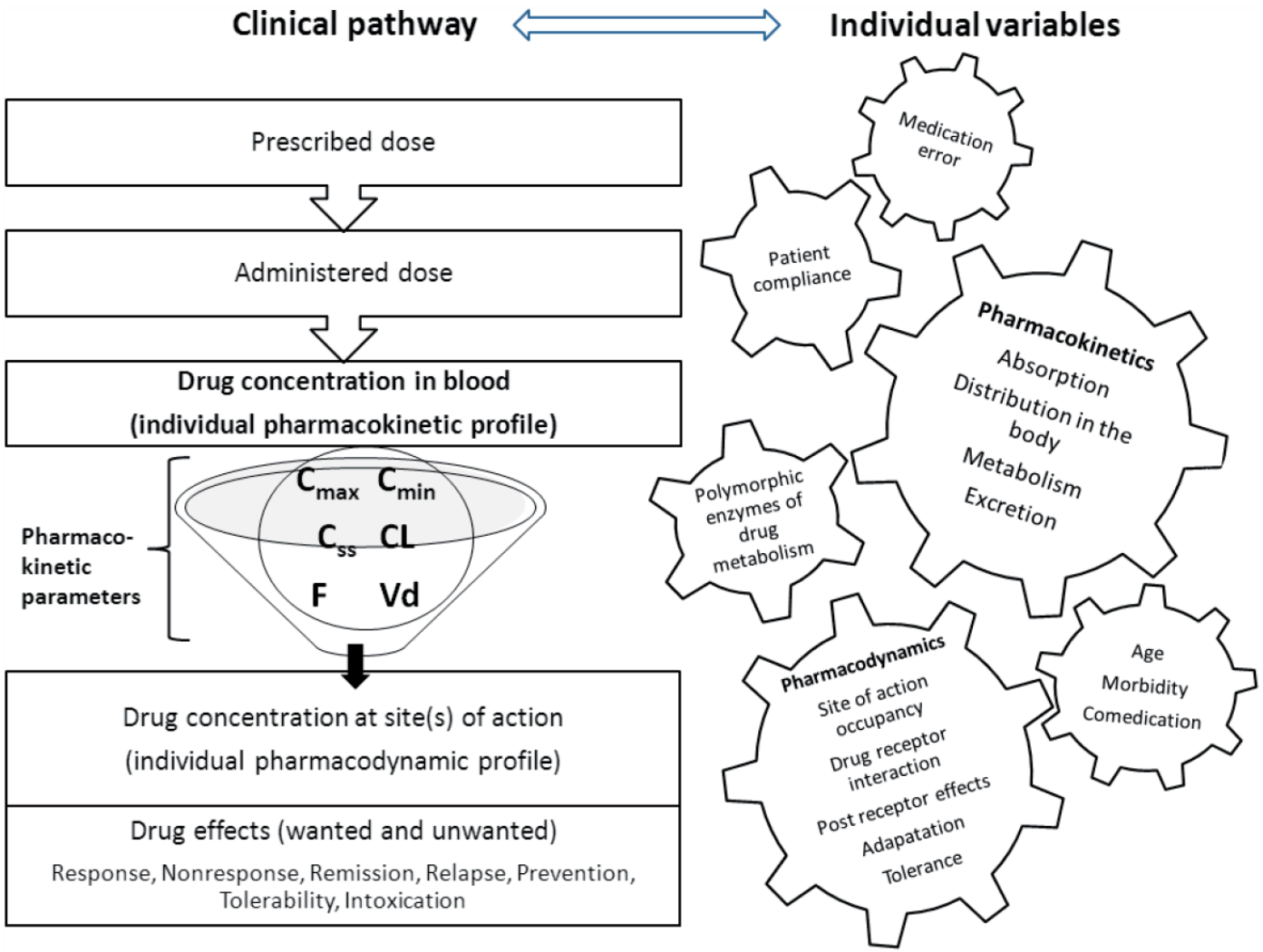




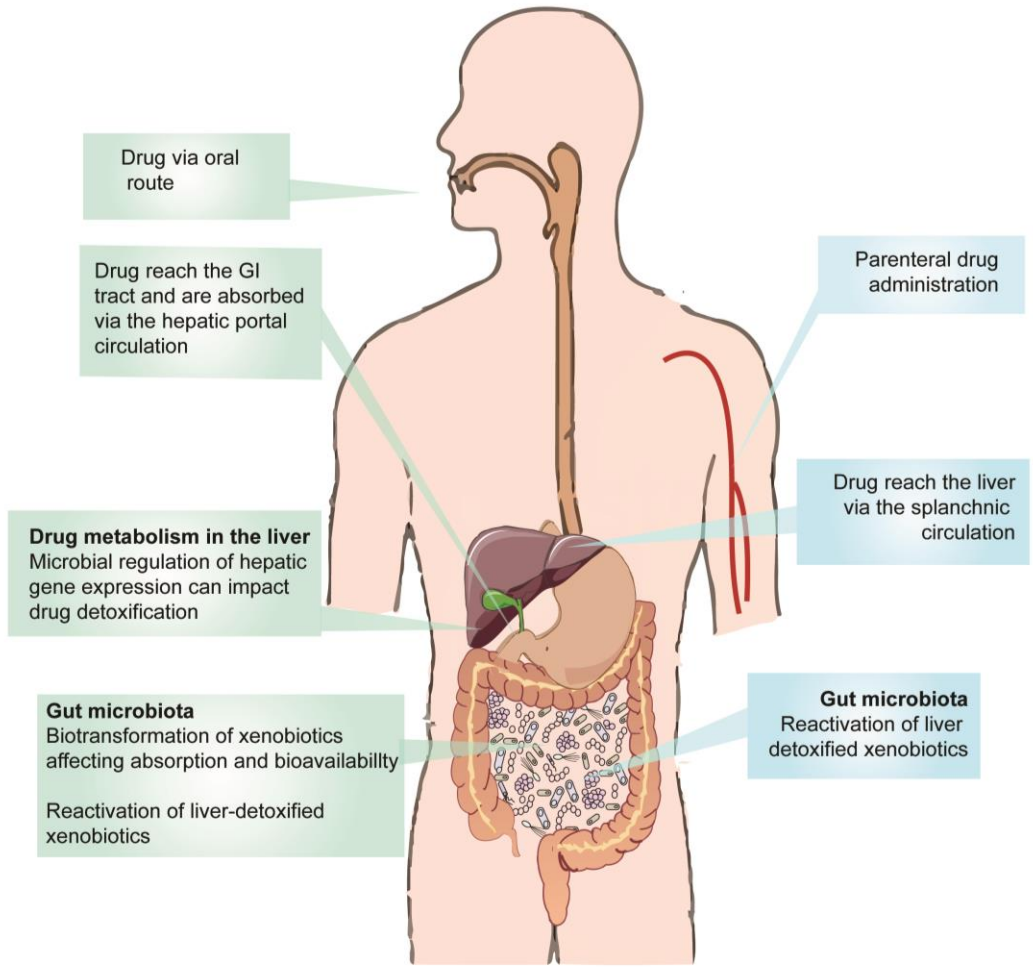
Clarke et al., Pharmacological Reviews 2019

Pharmacokinetics/Pharmacodynamics

http://apc.ucc.ie



Hefner et al., Int Rev Psych 2013



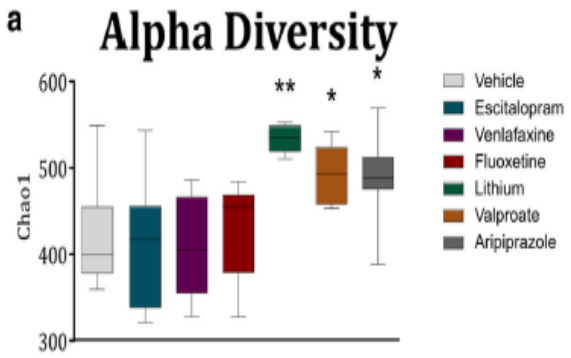
Clarke et al., Pharmacological Reviews 2019

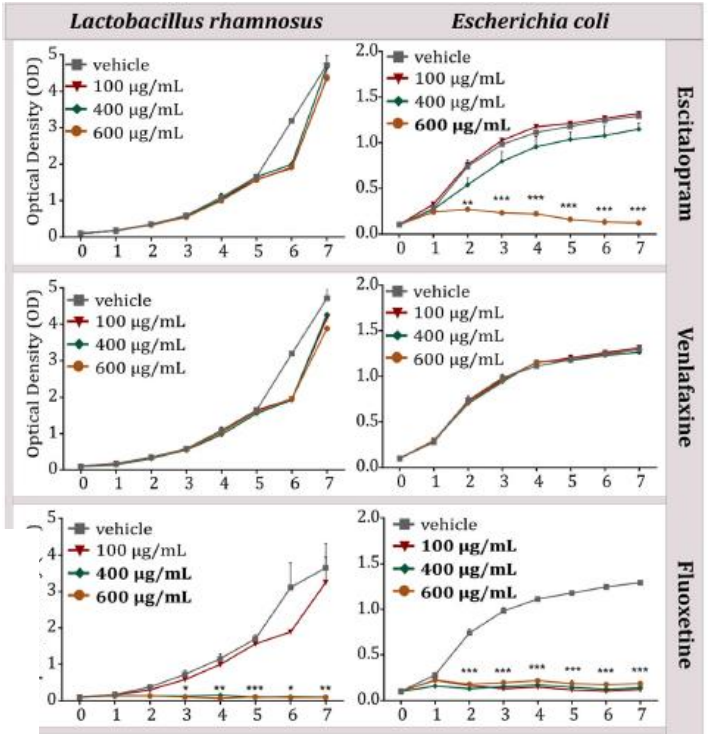
Psychopharmacology
https://doi.org/10.1007/s00213-018-5006-5

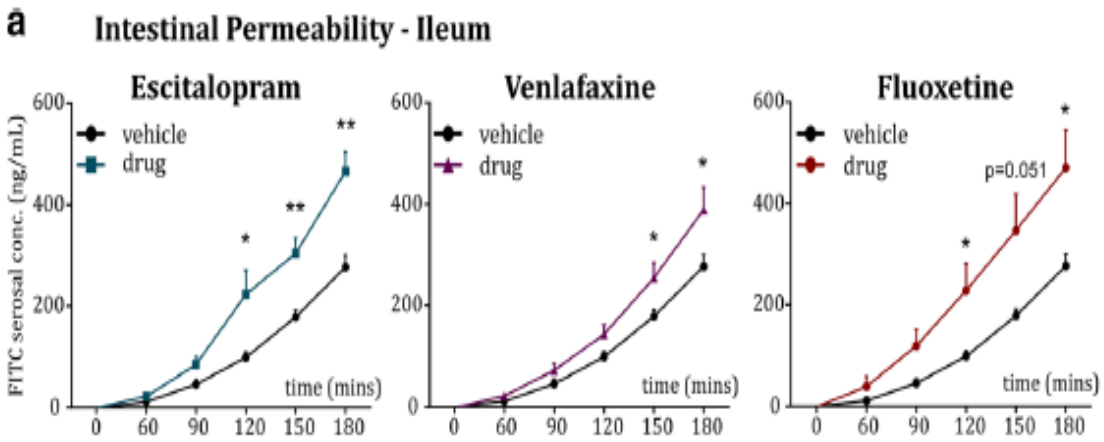
ORIGINAL INVESTIGATION

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]







ARTICLE

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

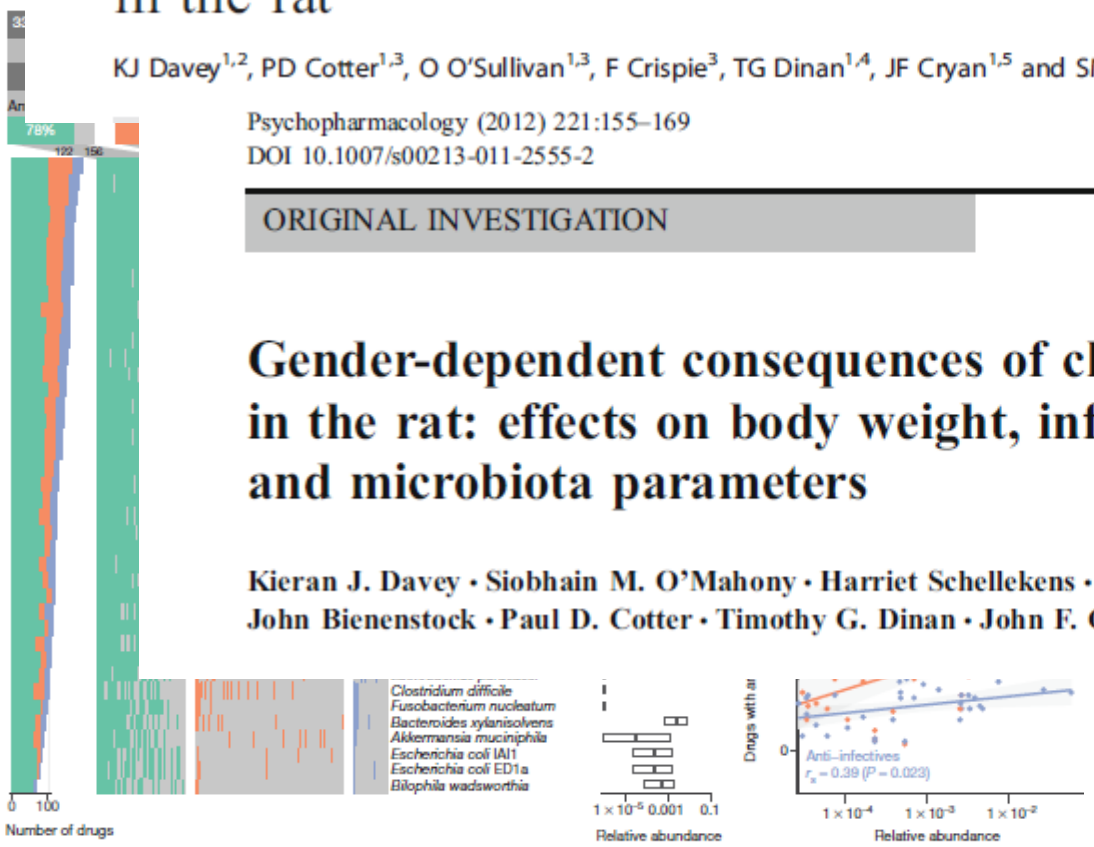
KJ Davey[1,2], PD Cotter[1,3], O O'Sullivan[1,3], F Crispie[3], TG Dinan[1,4], JF Cryan[1,5] and SM O'Mahony[1,5]

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

ORIGINAL INVESTIGATION

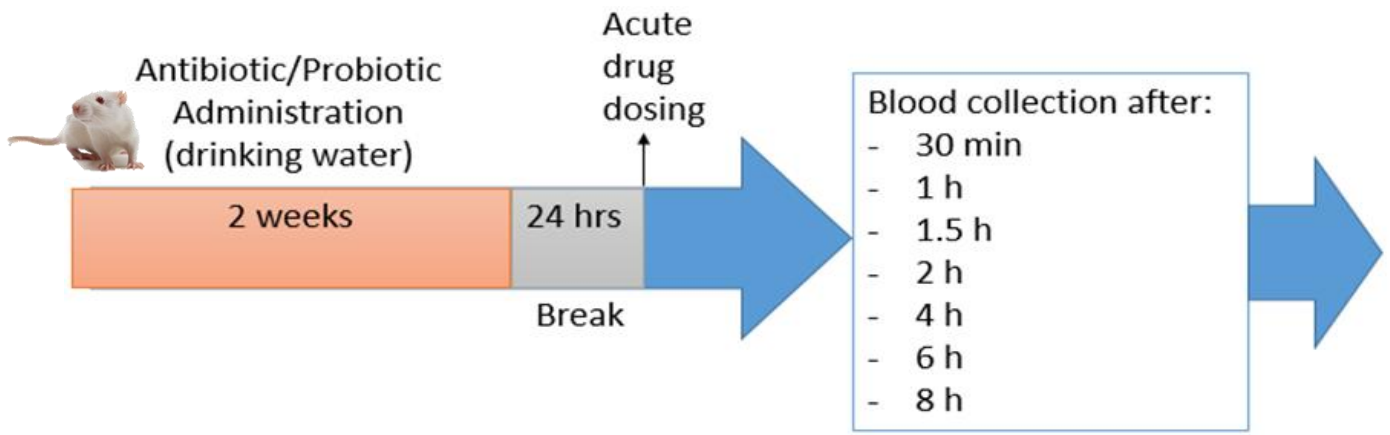
Gender-dependent consequences of chronic olanzapine in the rat: effects on body weight, inflammatory, metabolic and microbiota parameters

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

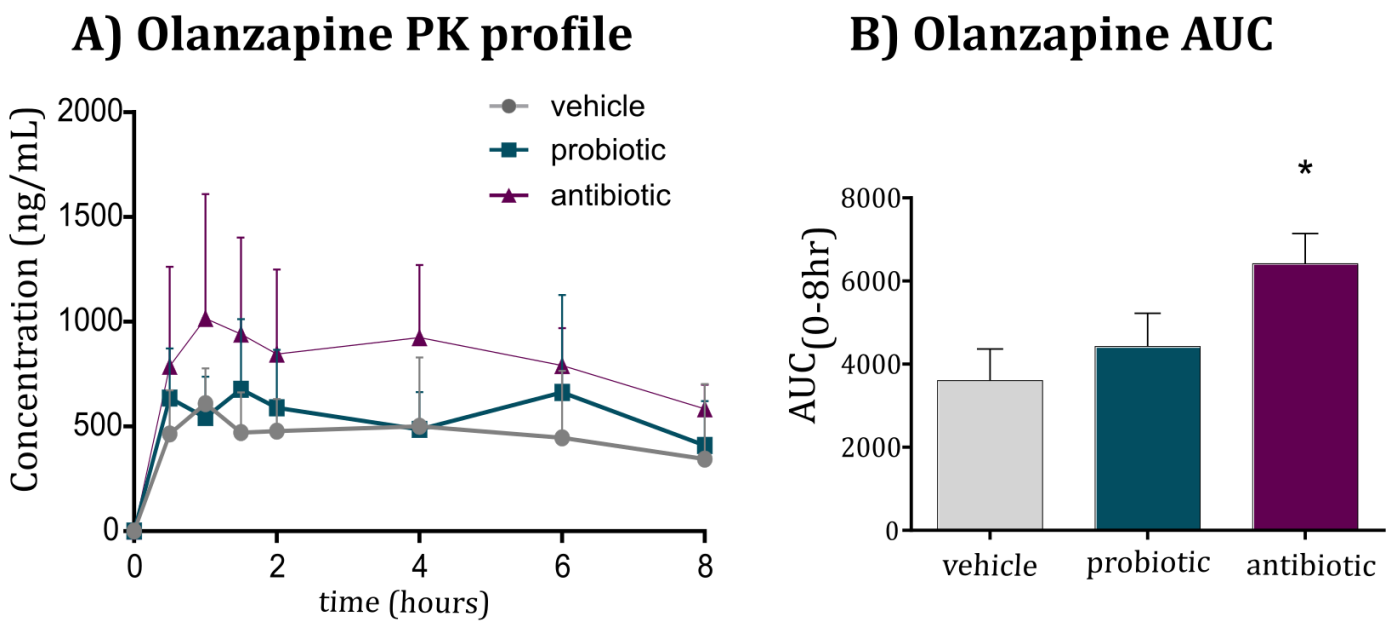


Microbiome Depletion Modifies Olanzapine Pharmacokinetics?

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

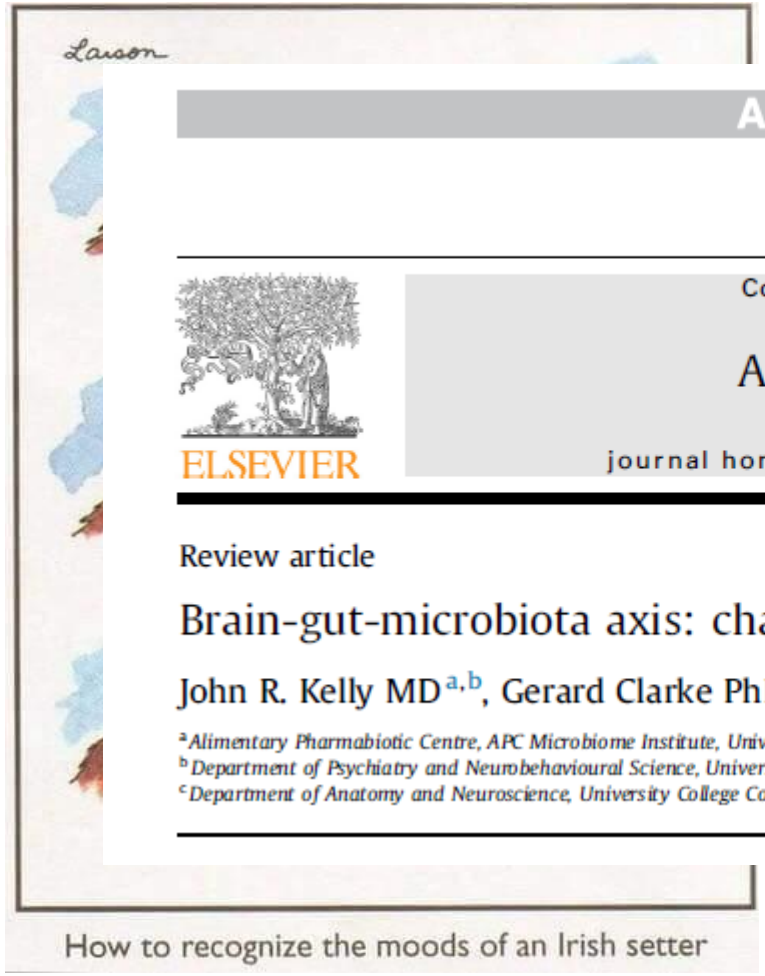


- **Vehicle**
- **Probiotic**: VSL#3 ($5 \cdot 10^{10}$bacteria/kg/day): *L. paracasei*, *L. plantarum*, *L. acidophilus*, *L. delbrueckii* subsp. *Bulgaricus*, *B. longum*, *B. infantis*, *B. breve*, *Streptococcus thermophilus*
- **Antibiotic**: ampicillin 1g/L; vancomycin 500mg/L, imipenem 250mg/L



Cussotto, Walsh et al., eBiomedicine 2021

Translational Research



Gary Larson

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

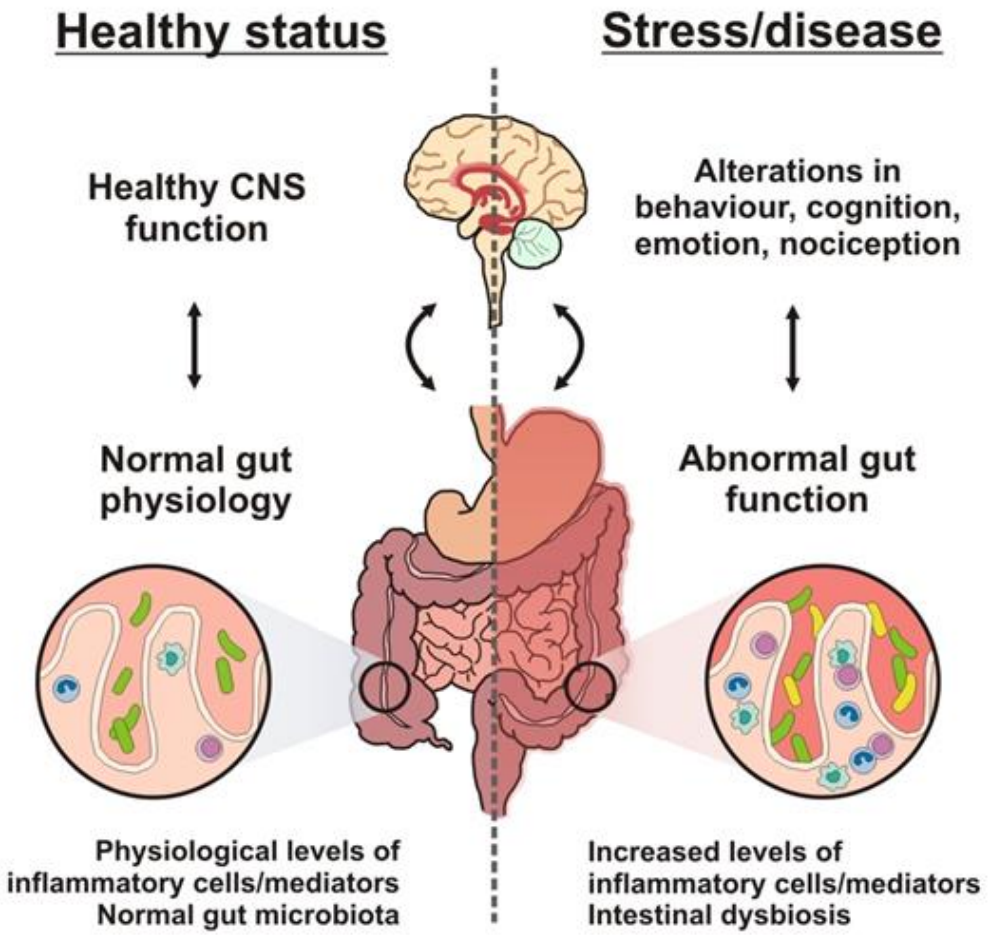
Brain-gut-microbiota axis: challenges for translation in psychiatry

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

Microbiota-Gut-Brain Axis

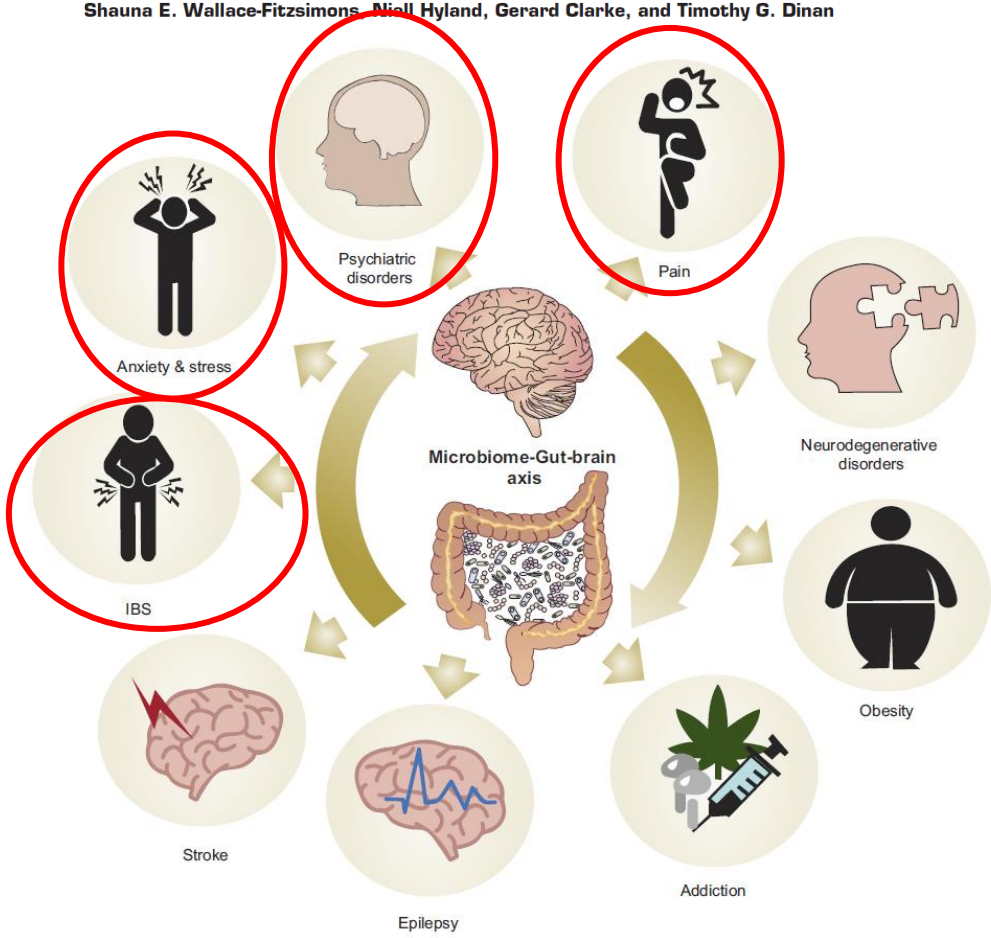


Grenham, Clarke et al., Frontiers in Physiology 2011

Physiol Rev 99: 1877–2013, 2019
Published August 28, 2019; doi:10.1152/physrev.00018.2018

THE MICROBIOTA-GUT-BRAIN AXIS

John F. Cryan, Kenneth J. O'Riordan, Caitlin S. M. Cowan, Kiran V. Sandhu, Thomaz F. S. Bastiaanssen, Marcus Boehme, Martin G. Codagnone, Sofia Cussotto, Christine Fulling, Anna V. Golubeva, Katherine E. Guzzetta, Minal Jaggar, Caitriona M. Long-Smith, Joshua M. Lyte, Jason A. Martin, Alicia Molinero-Perez, Gerard Moloney, Emanuela Morelli, Enrique Morillas, Rory O'Connor, Joana S. Cruz-Pereira, Veronica L. Peterson, Kieran Rea, Nathaniel L. Ritz, Eoin Sherwin, Simon Spichak, Emily M. Teichman, Marcel van de Wouw, Ana Paula Ventura-Silva, Shauna E. Wallace-Fitzsimons, Niall Hyland, Gerard Clarke, and Timothy G. Dinan



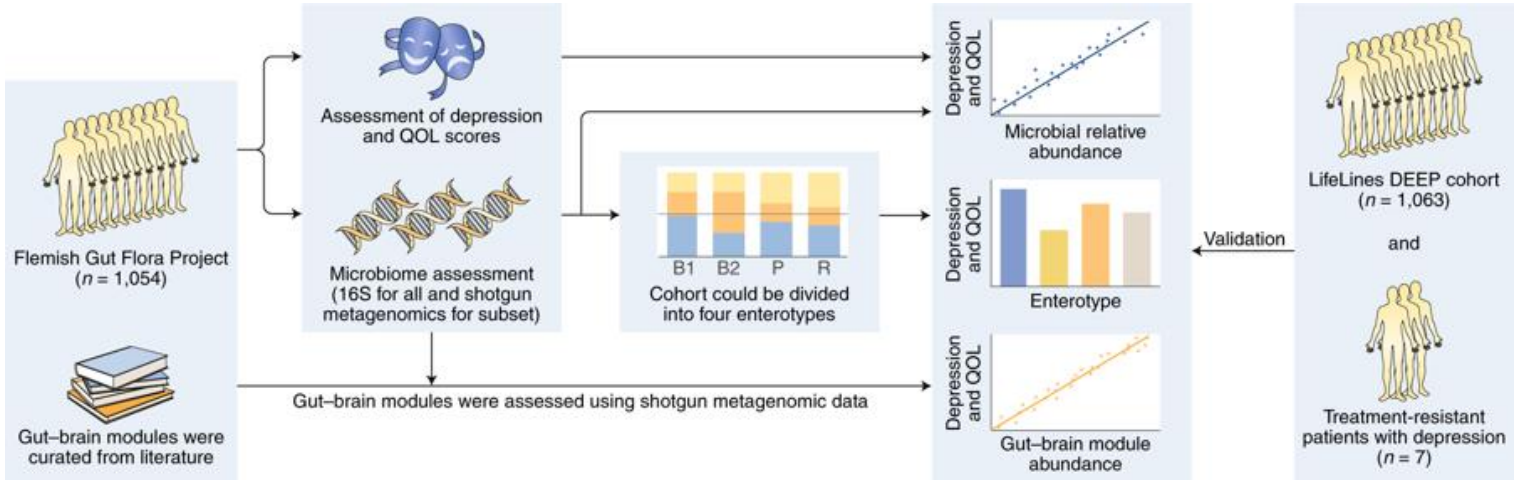
nature microbiology

ARTICLES

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

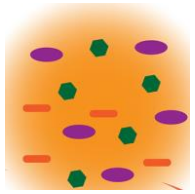
The neuroactive potential of the human gut microbiota in quality of life and depression

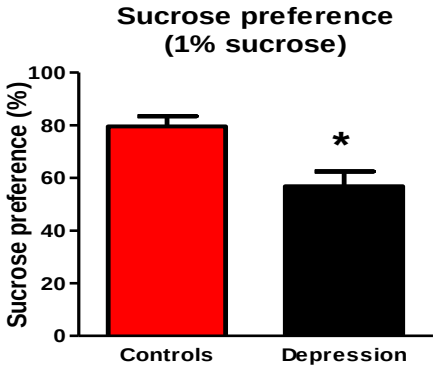
Mireia Valles-Colomer[1,2], Gwen Falony[1,2], Youssef Darzi[1,2], Ettje F. Tigchelaar[3], Jun Wang[1,2], Raul Y. Tito[1,2,4], Carmen Schiweck[5], Alexander Kurilshikov[3], Marie Joossens[1,2], Cisca Wijmenga[3,6], Stephan Claes[5,7], Lukas Van Oudenhove[7,8], Alexandra Zhernakova[3], Sara Vieira-Silva[1,2,9]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



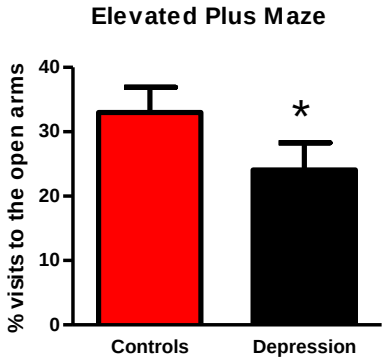
Dinan and Cryan, Nature Microbiology 2019

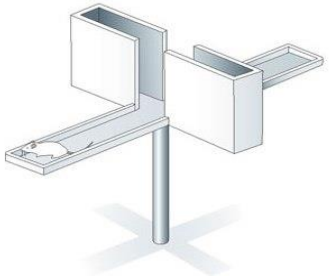
Transfer of Depressive Phenotype



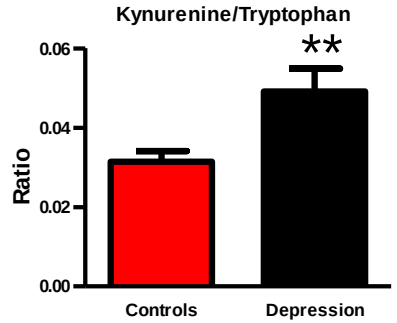


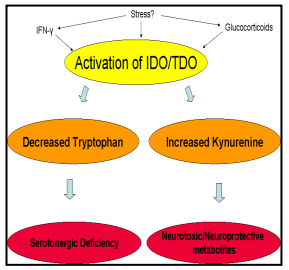
Anhedonia-like behaviours transferred via gut microbiota





Anxiety-like behaviours transferred via gut microbiota



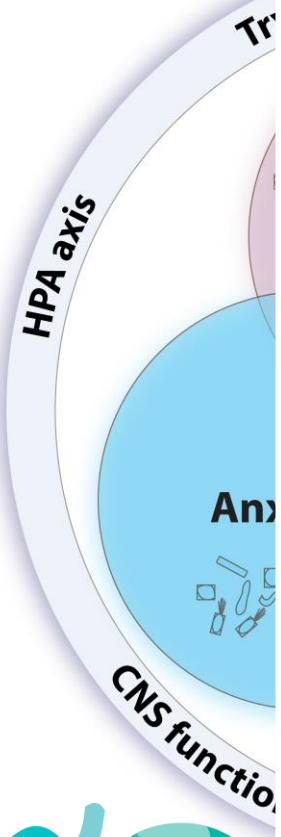


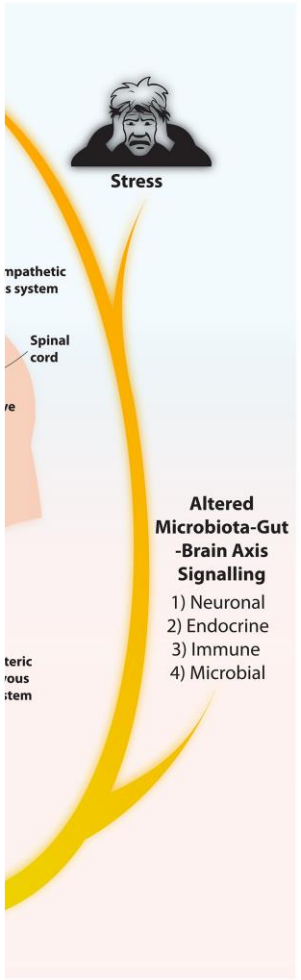
Tryptophan metabolism Profile transferred via gut microbiota

Kelly et al., J Psych Res 2016

3 GOOD HEALTH AND WELL-BEING

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





DISCOVERI

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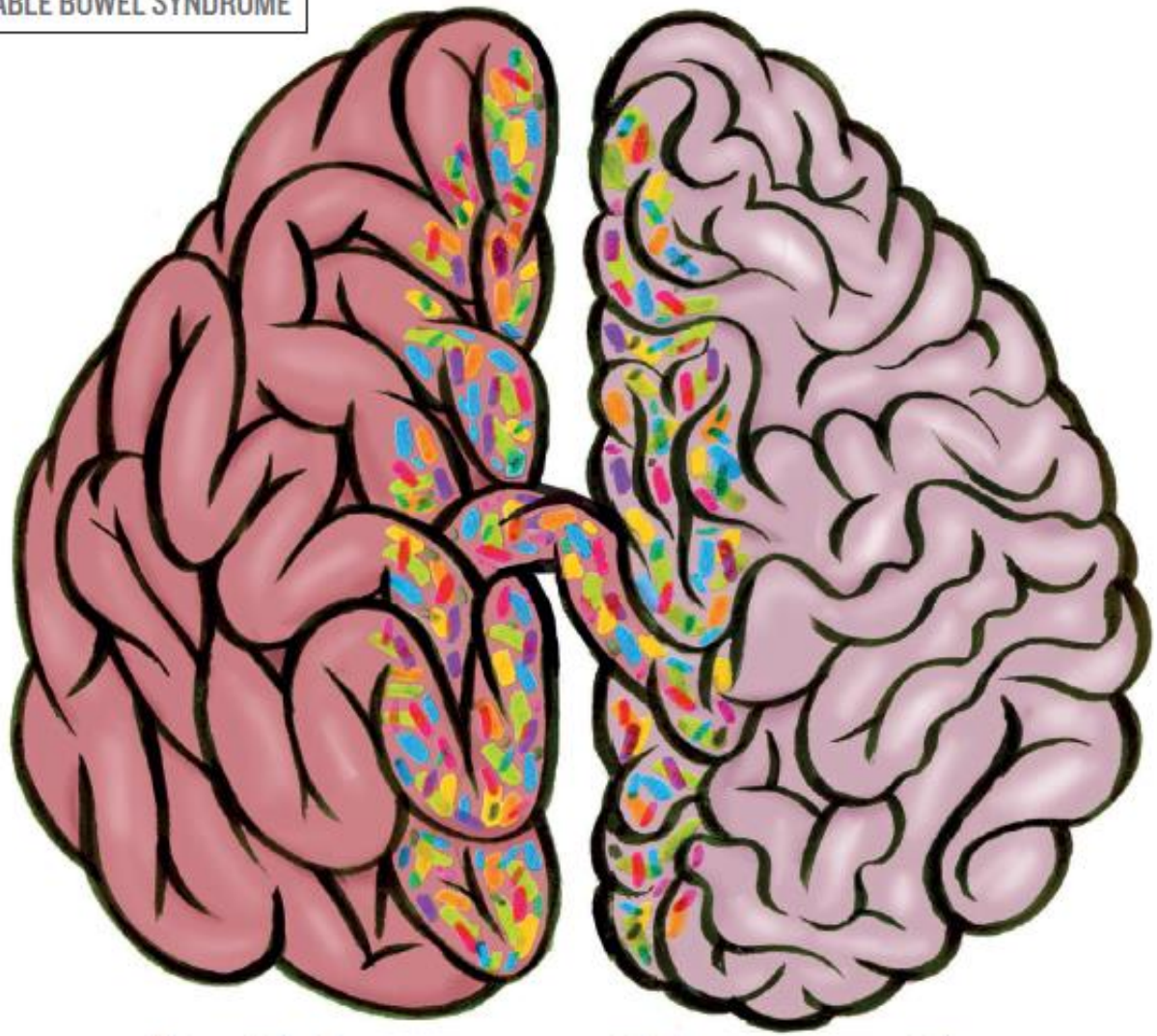
OUTLOOK | IRRITABLE BOWEL SYNDROME



MICROBIOME

Bacterial broadband

The involvement of intestinal bacteria in gut–brain communication could help to explain the mysteries of irritable bowel syndrome, but the search continues for definitive evidence.

3 GOOD HEALTH AND WELL-BEING

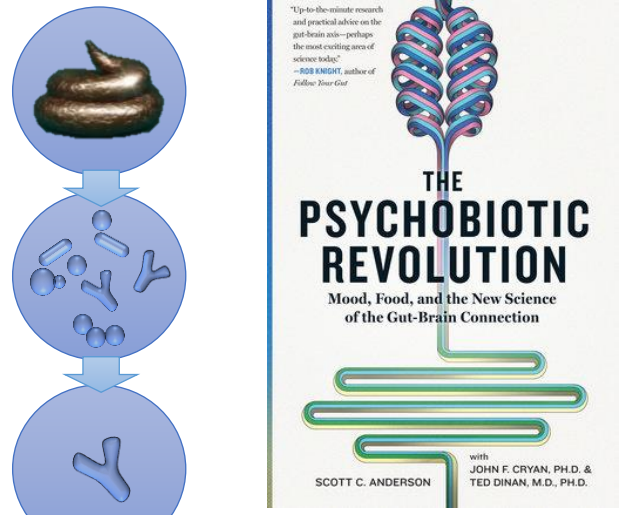
Are Gut Feelings the Real Deal?

Microbiome Ireland

Perspectives

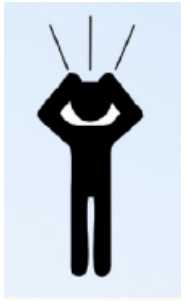
The gut microbiota plays a role in determining mental health - we can mine for, and target with, **psychobiotics**

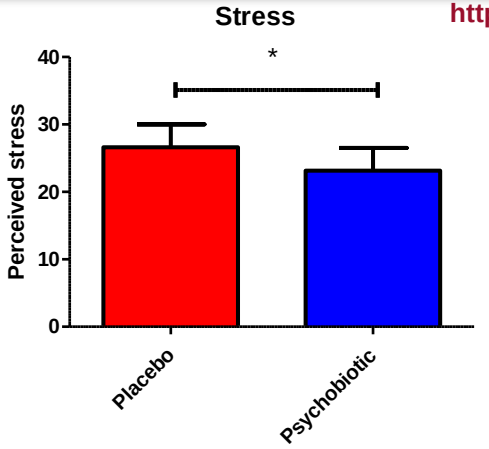
- Probiotics
- Prebiotics
- Diet
- Faecal transplants
- Microbial consortia
- Metabolites

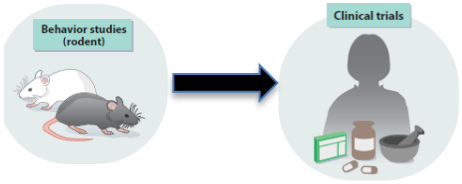


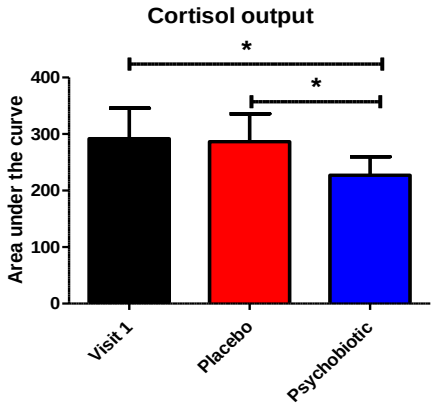
B. longum reduces stress response in healthy human volunteers

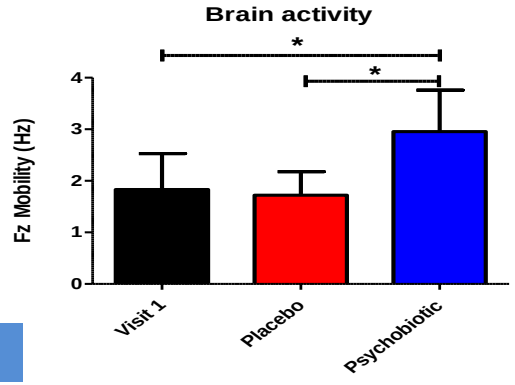
http://apc.ucc.ie

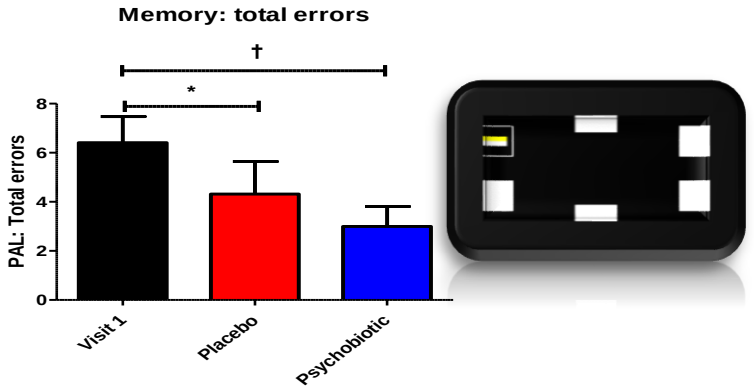












Allen et al., *2016*, Trans Psych

Brain, Behavior, and Immunity 61 (2017) 50–59

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,*]

Static

500-

Ball moving

2000 ms

Psychobiot eural activity and neu red using magnetoe ng social stress

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

Taylor & Francis
Taylor & Francis Group

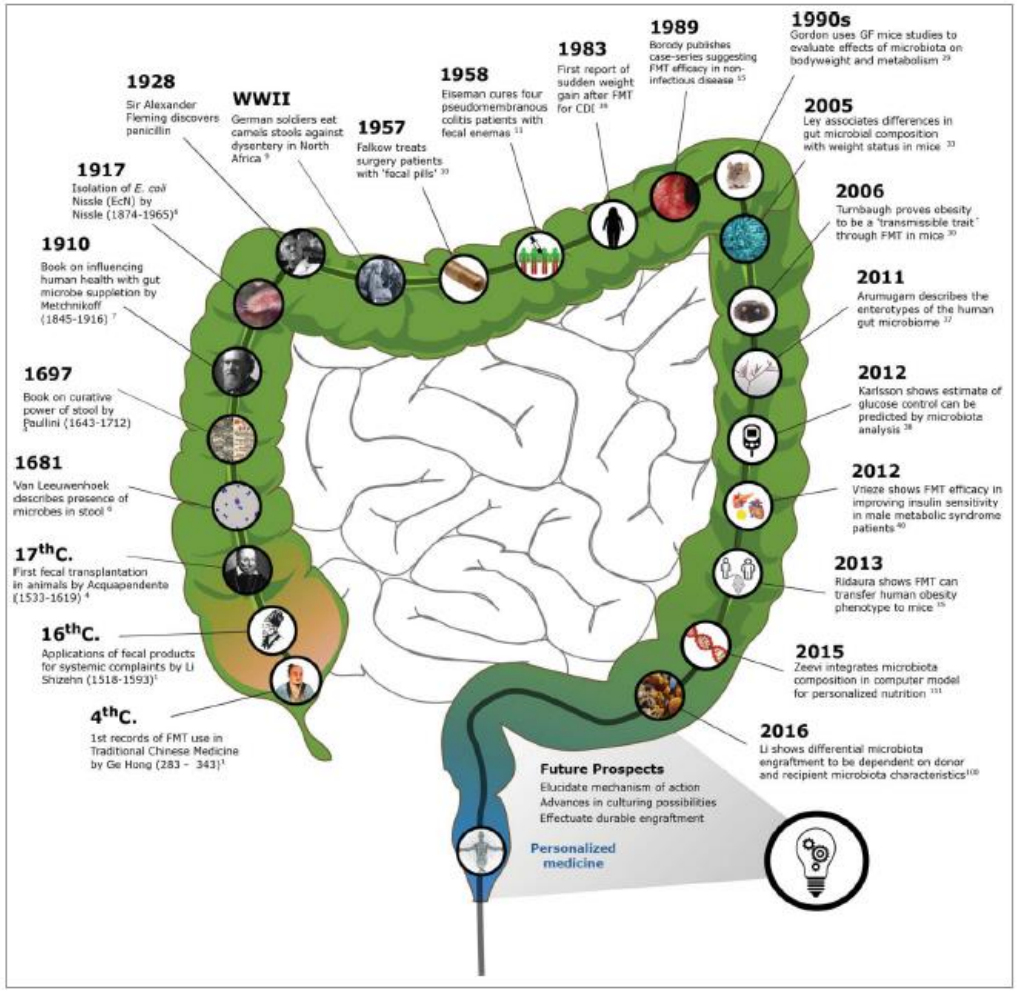
REVIEW

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]

Andrea Levy, The Plain



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The New Yo

HEALTH

A Promising

By PAM BELLUCK OCT. 11, 2014

...om Thursday, October 25, 2012

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...ecal transplants?

Early Life Factors

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]

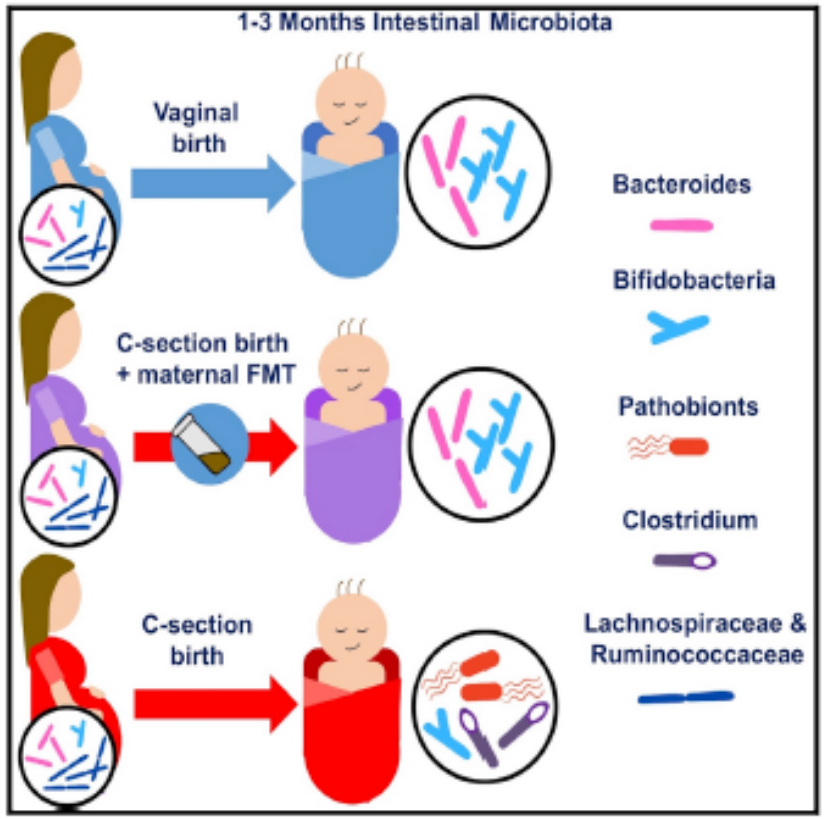
Please cite this article in press as: Korpela et al., Maternal Fecal Microbiota Transplantation in Cesarean-Born Infants Rapidly Restores Normal Gut Microbial Development: A Proof-of-Concept Study, Cell (2020), https://doi.org/10.1016/j.cell.2020.08.047

Cell

Article

Maternal Fecal Microbiota Transplantation in Cesarean-Born Infants Rapidly Restores Normal Gut Microbial Development: A Proof-of-Concept Study

Graphical Abstract



Authors

Katri Korpela, Otto Helve, Kaija-Leena Kolho, ..., Anne Salonen, Sture Andersson, Willem M. de Vos

Correspondence

willem.devos@wur.nl

In Brief

A proof-of-concept safety study shows that oral fecal transplantation can shift the microbiome composition of infants who are born via cesarean section to a profile that is more similar to those born via vaginal delivery.

Let food be thy medicine

Translational Research
January 2017

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

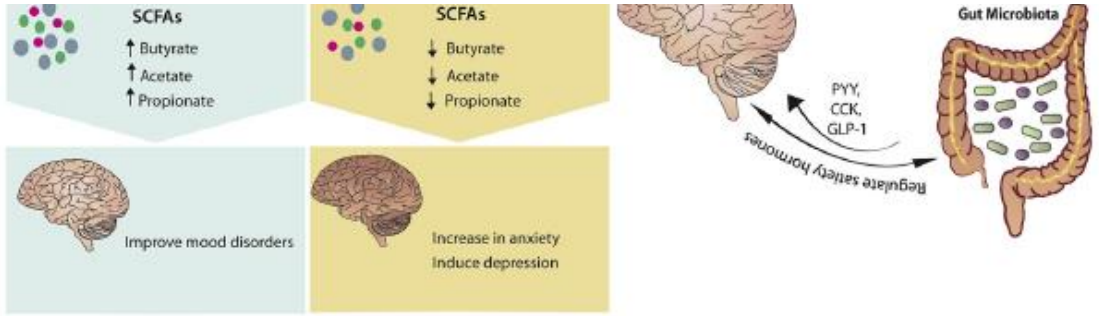
KIRAN V. SANDHU, EOIN SHERWIN, HARRIËT SCHELLEKENS, CATHERINE STANTON,
TIMOTHY G. DINAN, and JOHN F. CRYAN

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

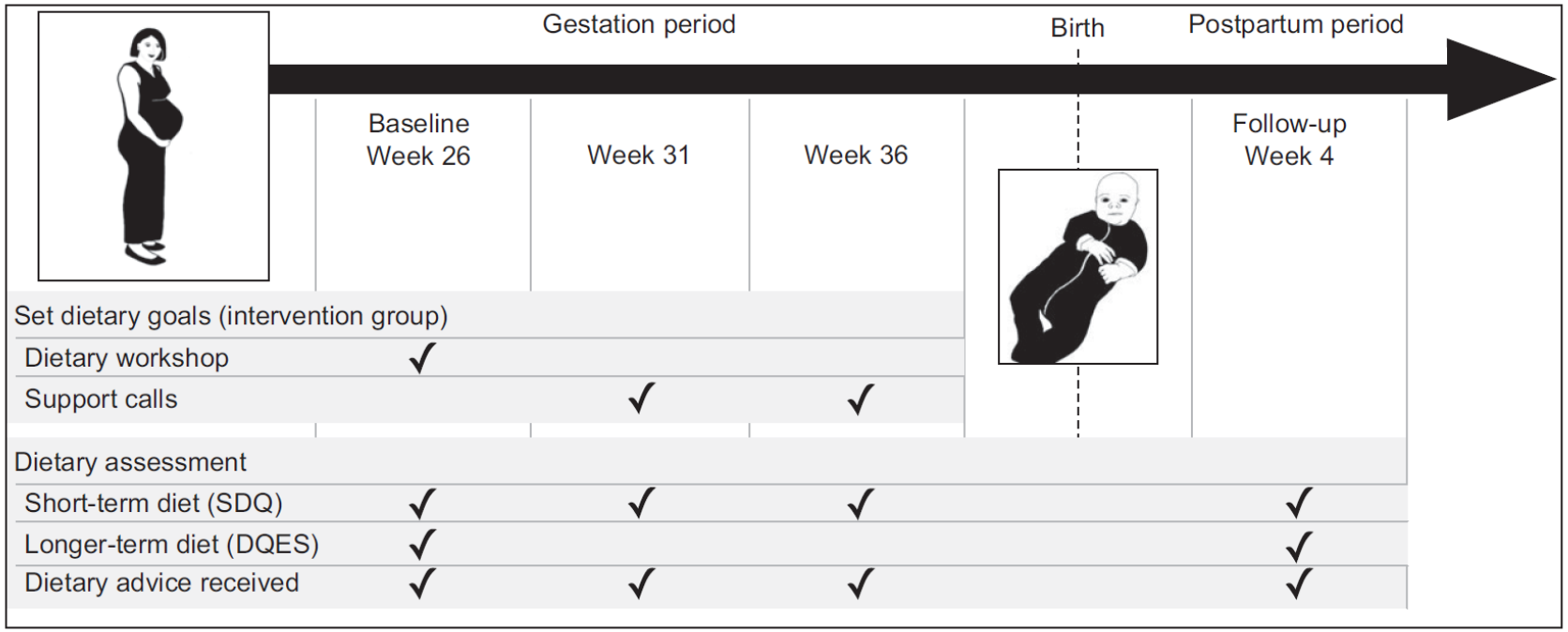
Lancet Psychiatry 2015



Public Health Nutrition: page 1 of 13 doi:10.1017/S1368980020003511

Targeting the perinatal diet to modulate the gut microbiota increases dietary variety and prebiotic and probiotic food intakes: results from a randomised controlled trial

Samantha L Dawson[1,2,*], Mohammadreza Mohebbi[3], Jeffrey M Craig[2,4], Phillip Dawson[5], Gerard Clarke[6,7,8], Mimi LK Tang[9,10] and Felice N Jacka[1,11,12,13]



Lach et al. *Translational Psychiatry* (2020)10:382
https://doi.org/10.1038/s41398-020-01073-0

Translational Psychiatry

Enduring neurobehavioral effects induced by microbiota depletion during the adolescent period

Gilliard Lach[1,6], Christine Fülling[1], Thomaz F. S. Bastiaanssen[1,2], Fiona Fouhy[1,3], Aoife N. O' Donovan[1,3,4], Ana Paula Ventura-Silva[1], Catherine Stanton[1,3], Timothy G. Dinan[1,5] and John F. Cryan[1,2]

Brain, Behavior, and Immunity 87 (2020) 666–678

Contents lists available at ScienceDirect

Brain, Behavior, and Immunity

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

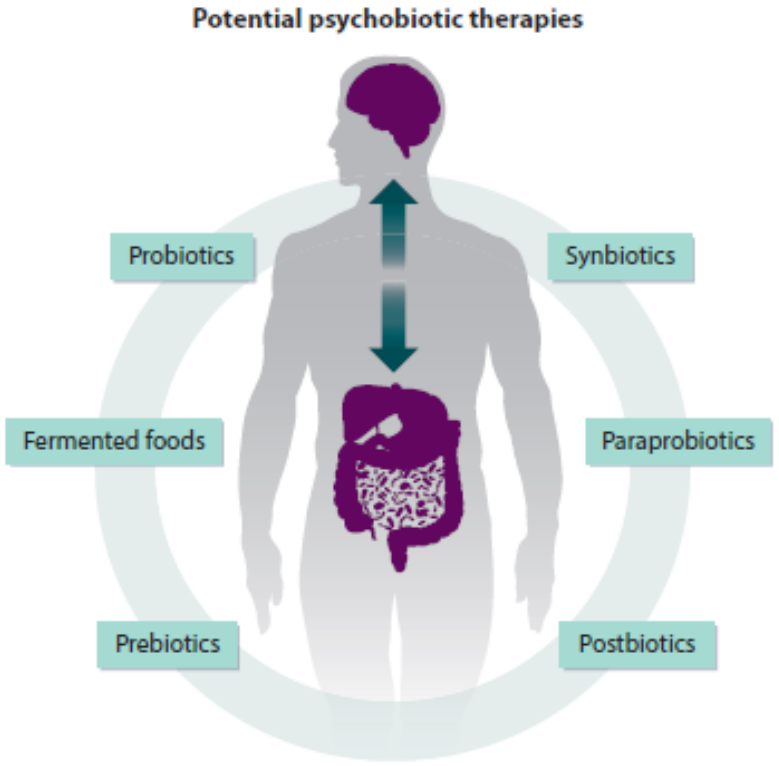
Full-length Article

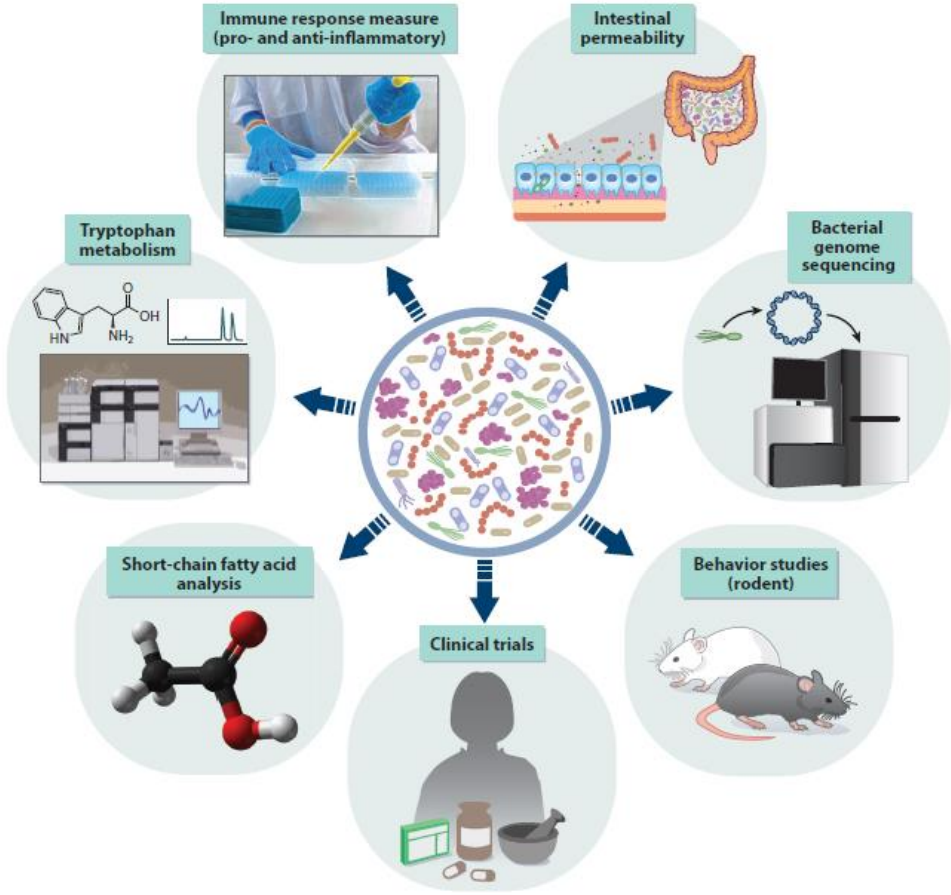
Adolescent dietary manipulations differentially affect gut microbiota composition and amygdala neuroimmune gene expression in male mice in adulthood

Christine Fülling[a,1], Gilliard Lach[a,1,2], Thomaz F.S. Bastiaanssen[a,c], Fiona Fouhy[a,d], Aoife N. O'Donovan[a,d,e], Ana-Paula Ventura-Silva[a], Catherine Stanton[a,d], Timothy G. Dinan[a,b], John F. Cryan[a,c,*]

Towards Psychobiotics: Focus on Mechanisms

The New Yorker





Long-Smith et al 2019, Annual Review Pharmacology and Toxicology

Summary & Conclusions

http://apc.ucc.ie

- Promising preclinical and clinical research
- Regulates behaviours and physiology relevant to psychiatry across the lifespan
- Increasing translational efforts
- Mechanistic insights and focus on causation
- Fact or fiction: Expect some attrition along the way
- Microbial-based strategies for the treatment of stress-related gut-brain axis disorders?

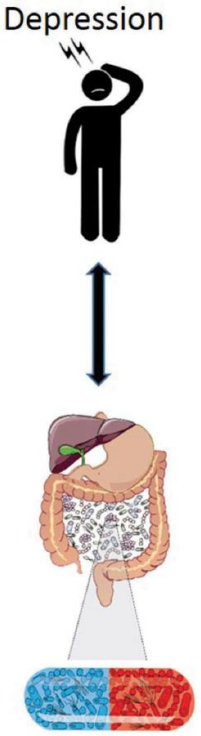

EXPERT REVIEW OF GASTROENTEROLOGY & HEPATOLOGY
https://doi.org/10.1080/17474124.2020.1754796

Taylor & Francis

EDITORIAL

The gut microbiome and depression: finding a way through troubled waters where the river meets the sea

Gerard Clarke



Acknowledgements

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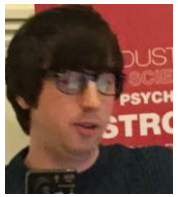

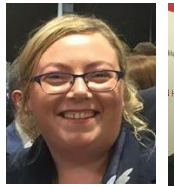


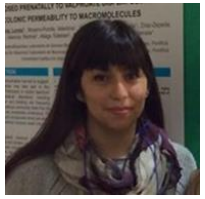


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Thank you

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