Nutrition et douleur

Douleur et microbiote

Une association possible ?

Didier Picat
DMV
CES Diététique Canine & Féline

Lésion du chondrocyte

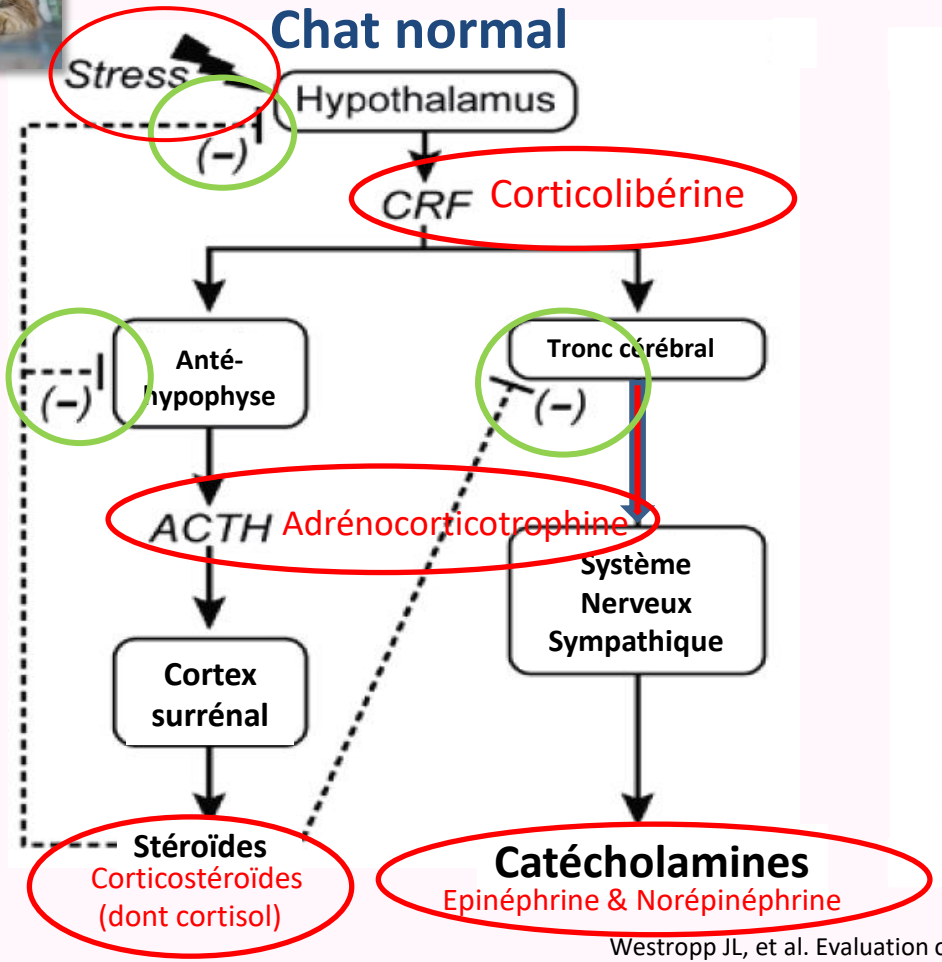
Inflam ation

D dation

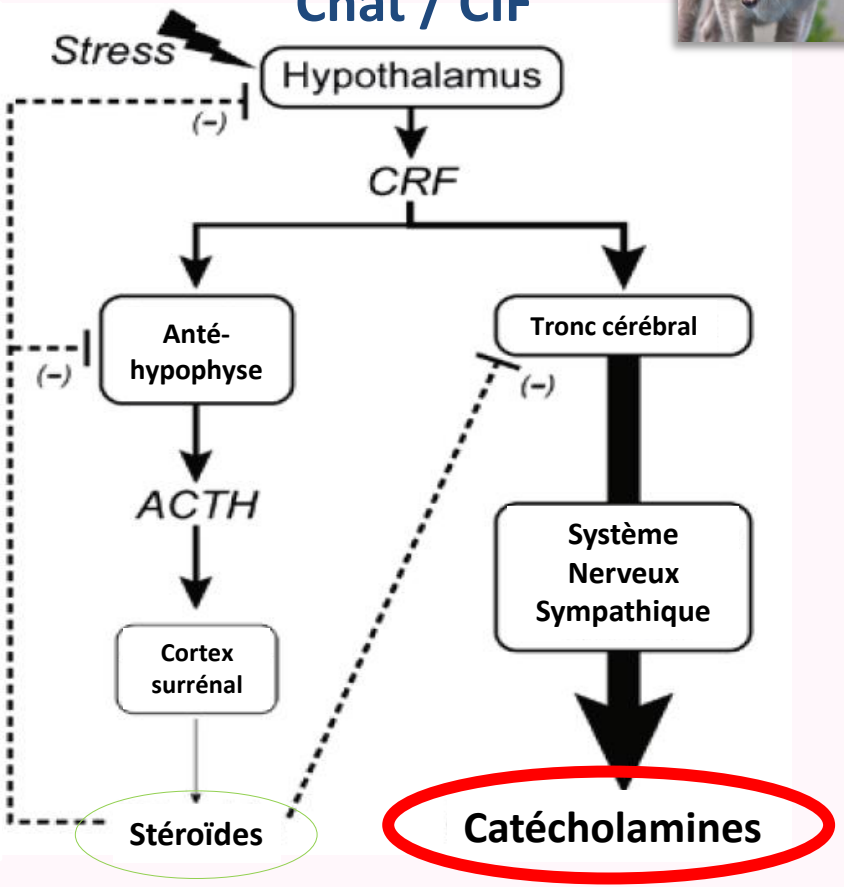
cartila

Une réponse altérée au stress répétitif

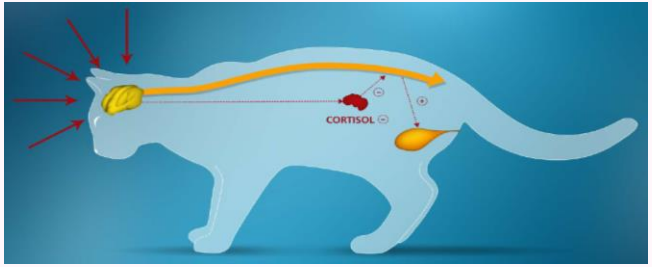
Chat normal



Chat / CIF



Westropp JL, et al. Evaluation of the effects of stress in cats with idiopathic cystitis. *Am J Vet Res* 2006;67:731



Stress chronique

Réponse au stress anormale

Axe Hypothalamus / Hypophyse déréglé
Libération de CRF renforcée
Sécrétion brutale de cortisol

Enrichissement environnemental

Douleur chronique ⇨ aggravation du stress

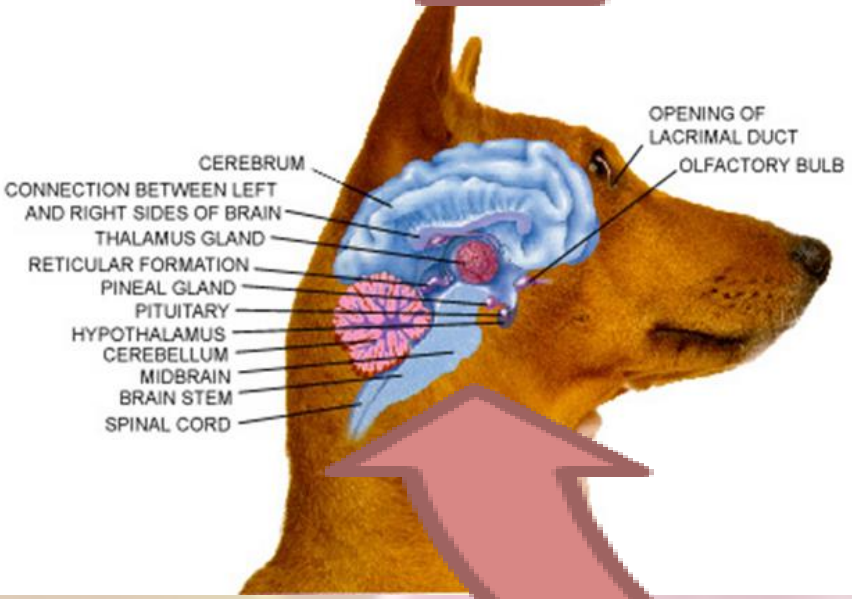
Ingrédients / stress :
LT ⟶ ↑ Sérotonine
HPL ⟶ ↑ GABA

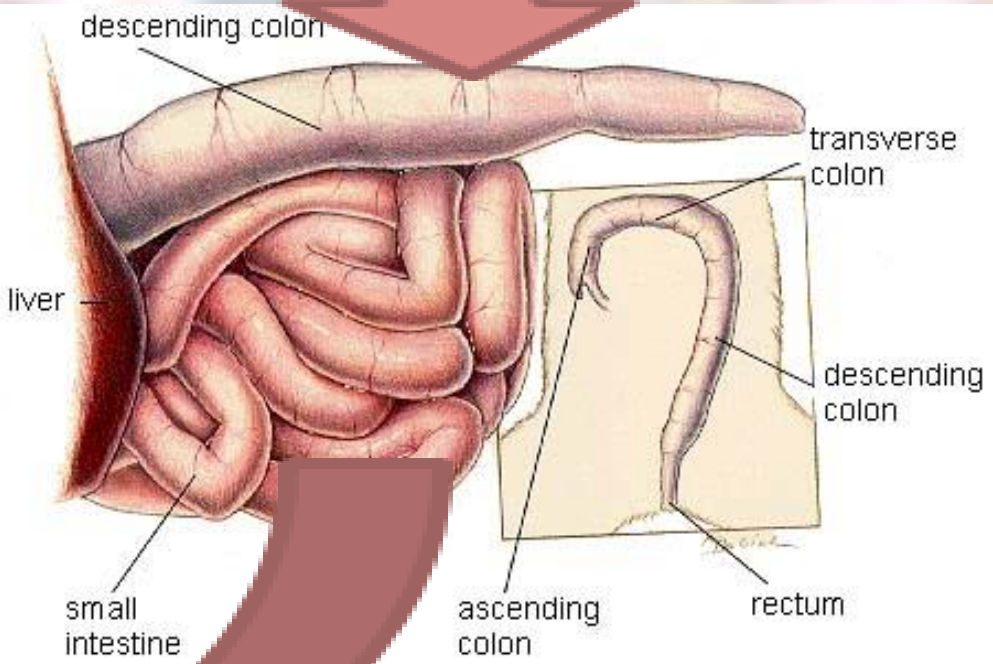
↓ inhibition des stimuli sympathiques
↑ stimulation adrénergique de la vessie
↑ des catécholamines

Inflammation neurogénique de la **vessie**
Elimination urinaire douloureuse / fréquente

Modifications vésicales / CIF
Activation des fibres nerveuses sensitives
↑ perméabilité
↑ teneur en cytokines inflammatoires

Profil nutritionnel / aliment (ω-3)

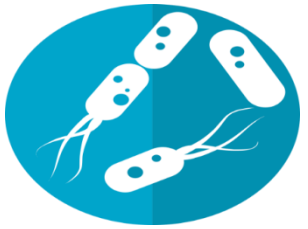

CEREBRUM
CONNECTION BETWEEN LEFT AND RIGHT SIDES OF BRAIN
THALAMUS GLAND
RETICULAR FORMATION
PINEAL GLAND
PITUITARY
HYPOTHALAMUS
CEREBELLUM
MIDBRAIN
BRAIN STEM
SPINAL CORD
OPENING OF LACRIMAL DUCT
OLFACTORY BULB


descending colon
transverse colon
liver
descending colon
small intestine
ascending colon
rectum

Microbiote intestinal

2ème cerveau de l'organisme

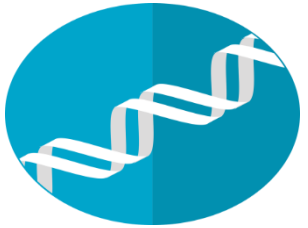
10 X



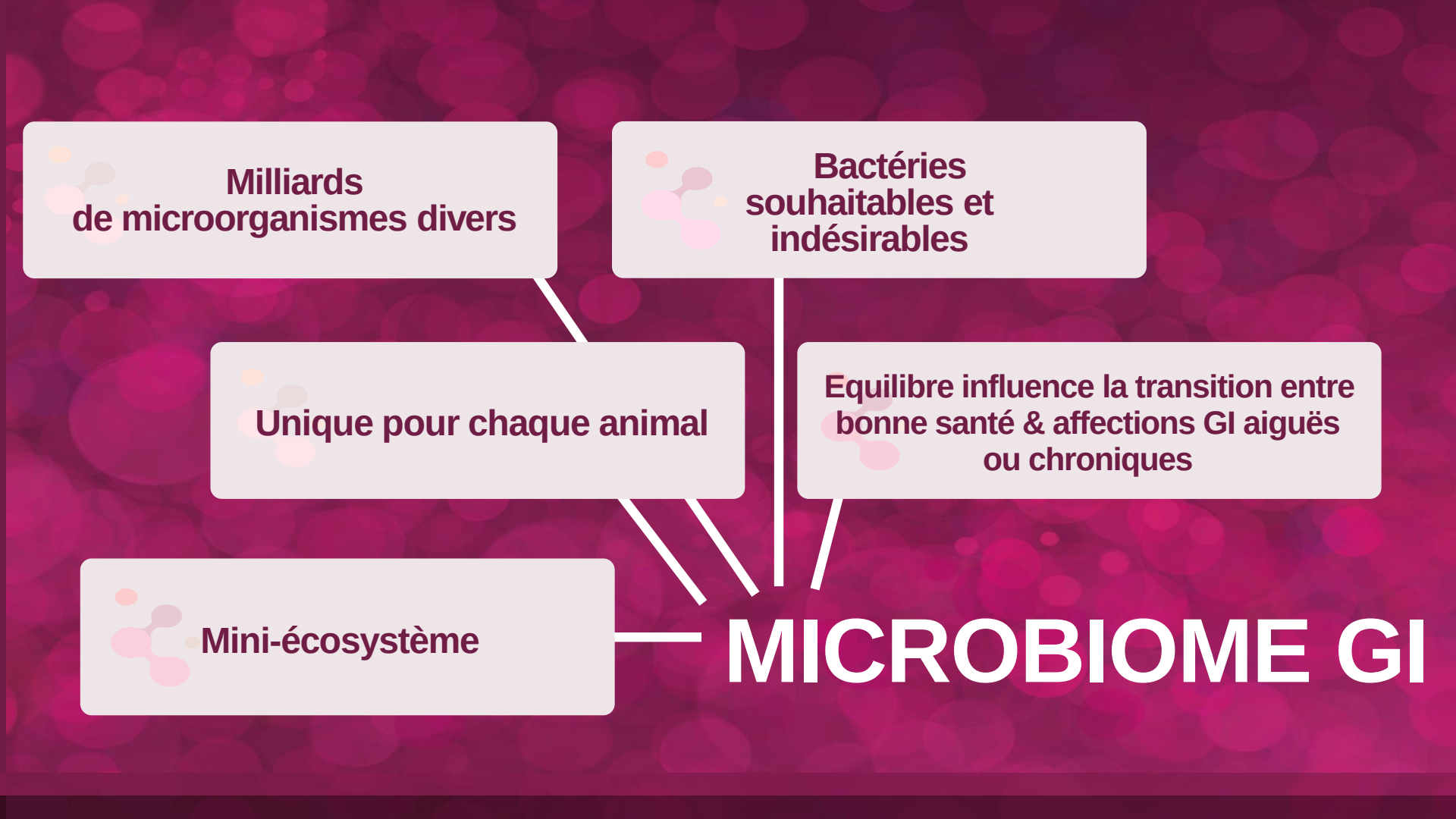
plus de cellules bactériennes que de cellules de l'hôte

---

100 X



plus de gènes bactériens intestinaux que de gènes de l'hôte

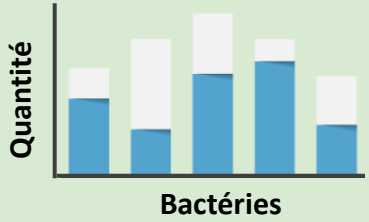

Milliards
de microorganismes divers
Bactéries
souhaitables et
indésirables
Unique pour chaque animal
Equilibre influence la transition entre
bonne santé & affections GI aiguës
ou chroniques
Mini-écosystème
MICROBIOME GI

Extraction d'ADN

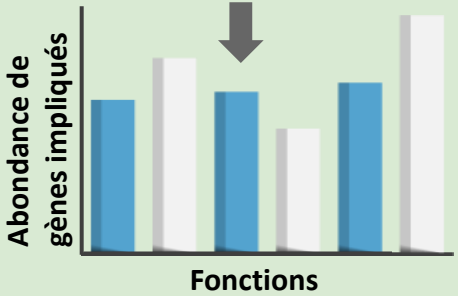
Amplification de l'ADN 16S

Séquençage ADN

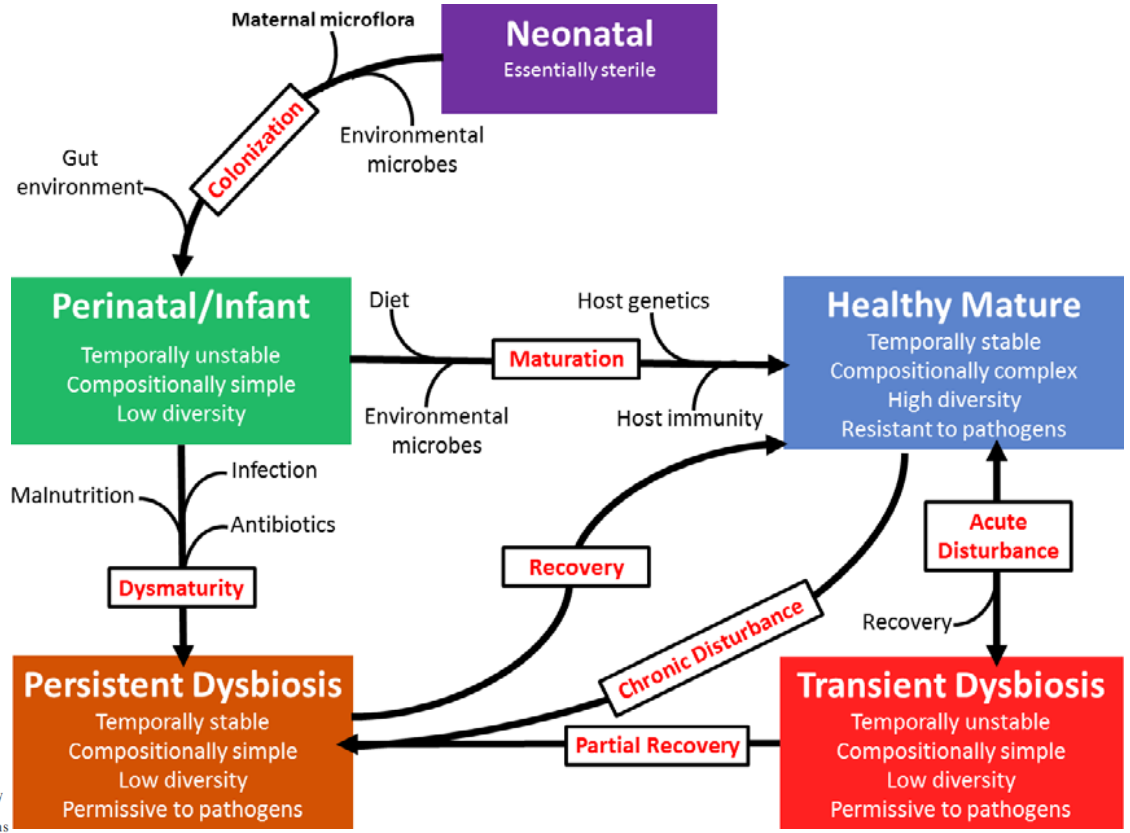
Population/quantité



Analyse fonctionnelle



Microbiome GI : écosystème à l'équilibre, évolutif en fonction de l'âge

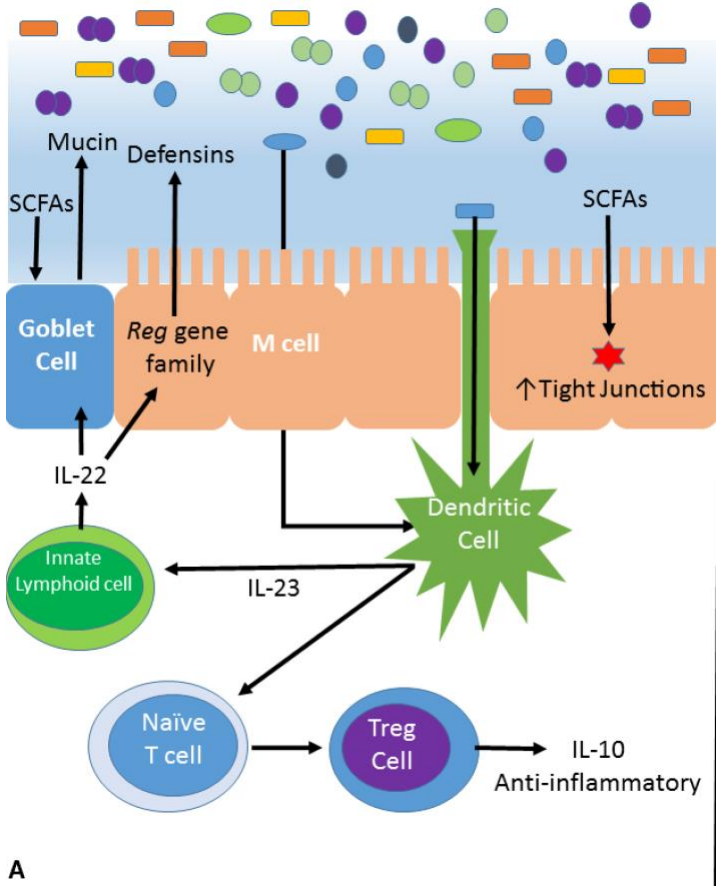


Review
J Vet Intern Med 2017

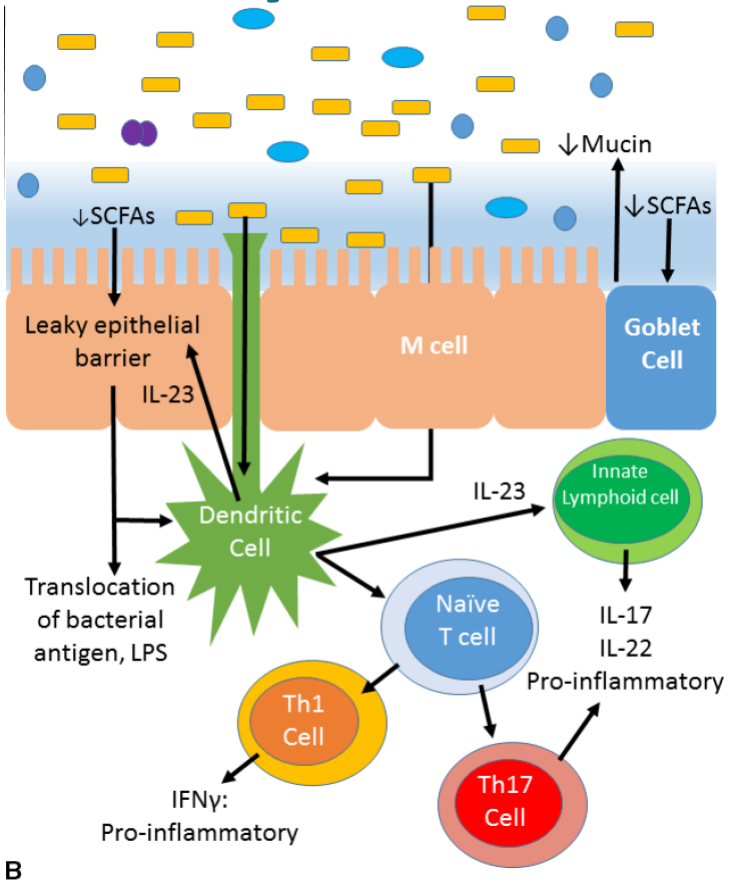
The Gastrointestinal Microbiome: A Review

P.C. Barko, M.A. McMichael, K.S. Swanson, and D.A. Williams

Sain



Dysbiose



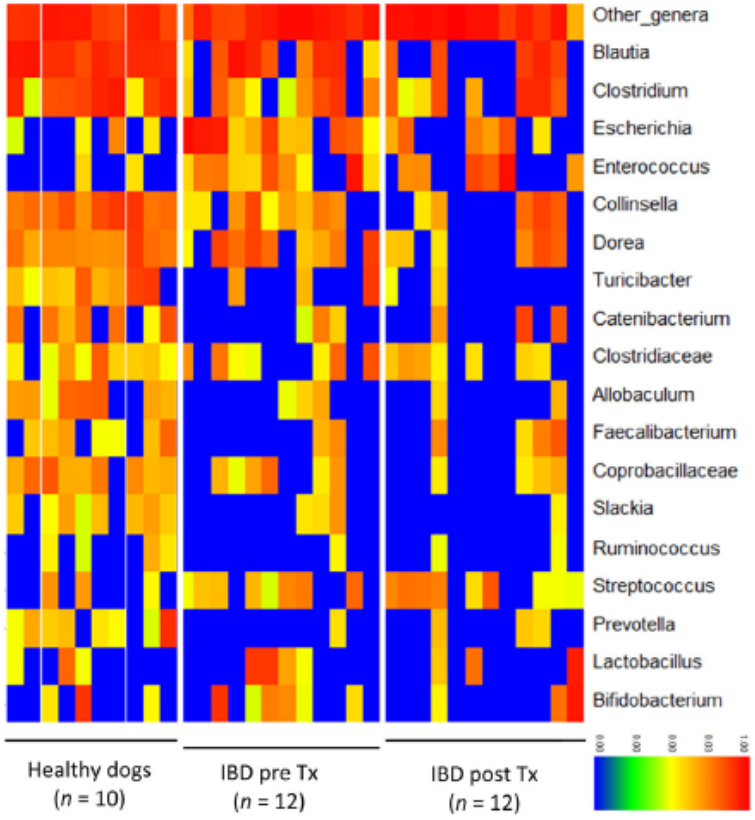
Review
J Vet Intern Med 2017

The Gastrointestinal Microbiome: A Review

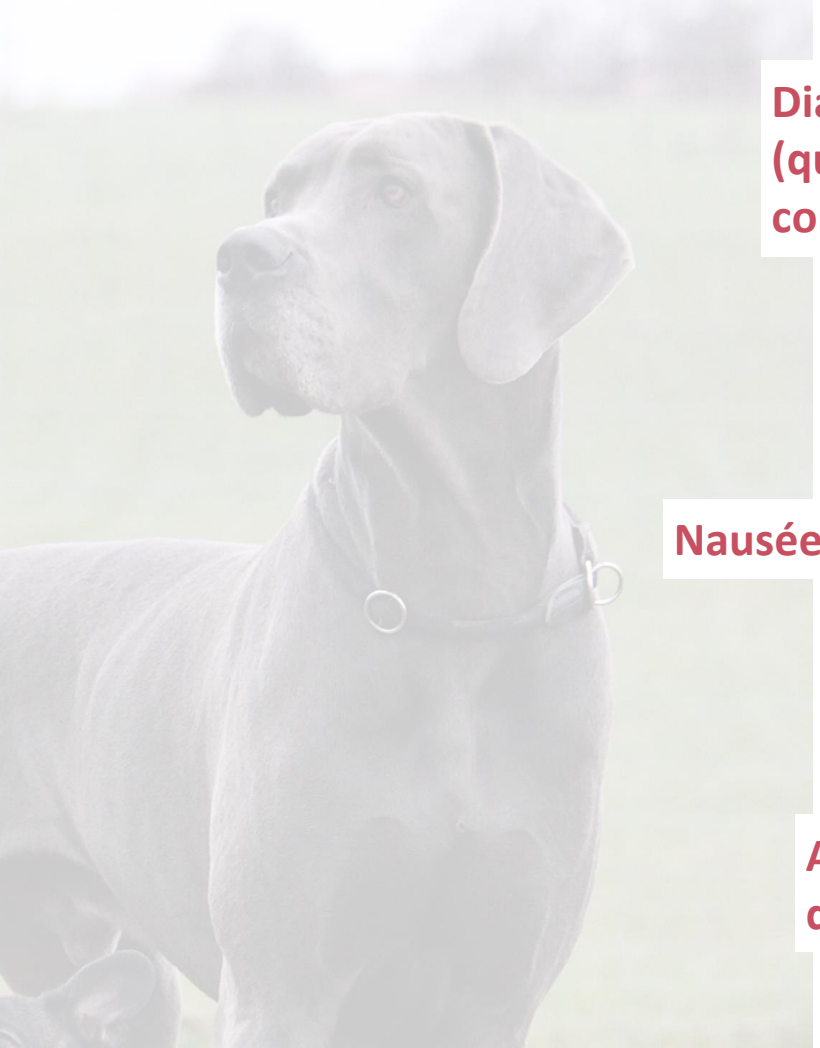
P.C. Barko, M.A. McMichael, K.S. Swanson, and D.A. Williams

MICI

- Déséquilibre de l'écosystème
- Caractérisation des bactéries présentes lors de la maladie
- Retour à la « normale » peut prendre du temps, même après arrêt signes cliniques



Review
Diagnosis and interpretation of intestinal dysbiosis in dogs and cats
Jan S. Suchodolski *
Gastrointestinal Laboratory, College of Veterinary Medicine, College Station, TX 77843-4474, USA
The Veterinary Journal 215 (2016) 30–37

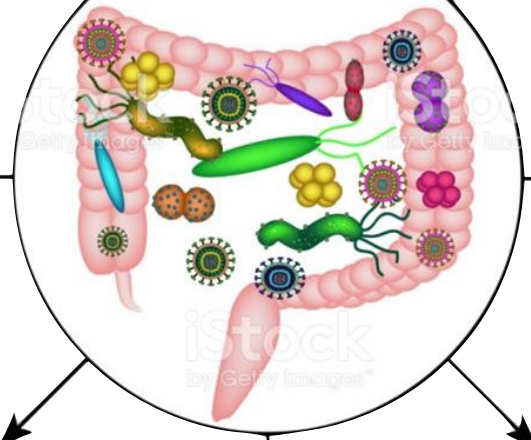


Diarrhée (quelquefois constipation)

Flatulences

Sensation désagréable dans la bouche

Nausées



Eructations

Appétit diminué

Douleur abdominale

Distension abdominale


MICROBIOTE
et DOULEUR ?

Pain. 2019 Jul 2. doi: 10.1097/j.pain.0000000000001640. [Epub ahead of print]

Altered microbiome composition in individuals with fibromyalgia.

Minerbi A[1], Gonzalez E[2,3], Brereton NJB[4], Anjarkouchian A[5], Dewar K[3,6], Fitzcharles MA[1,7], Chevalier S[5,8,9], Shir Y[1].

EBioMedicine. 2019 Aug;46:499-511. doi: 10.1016/j.ebiom.2019.07.031. Epub 2019 Jul 18.

Gut microbiome and serum metabolome analyses identify molecular biomarkers and altered glutamate metabolism in fibromyalgia.

Clos-Garcia M[1], Andrés-Marin N[2], Fernández-Eulate G[3], Abecia L[4], Lavín JL[5], van Liempd S[6], Cabrera D[7], Royo F[8], Valero A[9], Errazquin N[10], Vega MCG[11], Govillard L[12], Tackett MR[13], Tejada G[14], Gónzalez E[15], Anguita J[16], Bujanda L[17], Orcasitas AMC[18], Aransay AM[19], Maíz O[20], López de Munain A[21], Falcón-Pérez JM[22].

Metabolomics. 2019 Mar 27;15(4):54. doi: 10.1007/s11306-019-1513-6.

The GC-MS metabolomics signature in patients with fibromyalgia syndrome directs to dysbiosis as an aspect contributing factor of FMS pathophysiology.

Malatji BG[1], Mason S[2], Mienie LJ[1], Wevers RA[3], Meyer H[4], van Reenen M[1], Reinecke CJ[1].

Acta Med Port. 2018 Sep 28;31(9):516. doi: 10.20344/amp.11073. Epub 2018 Sep 28.

[The Role of Microbiome in Fibromyalgia... A New Therapeutic Target].

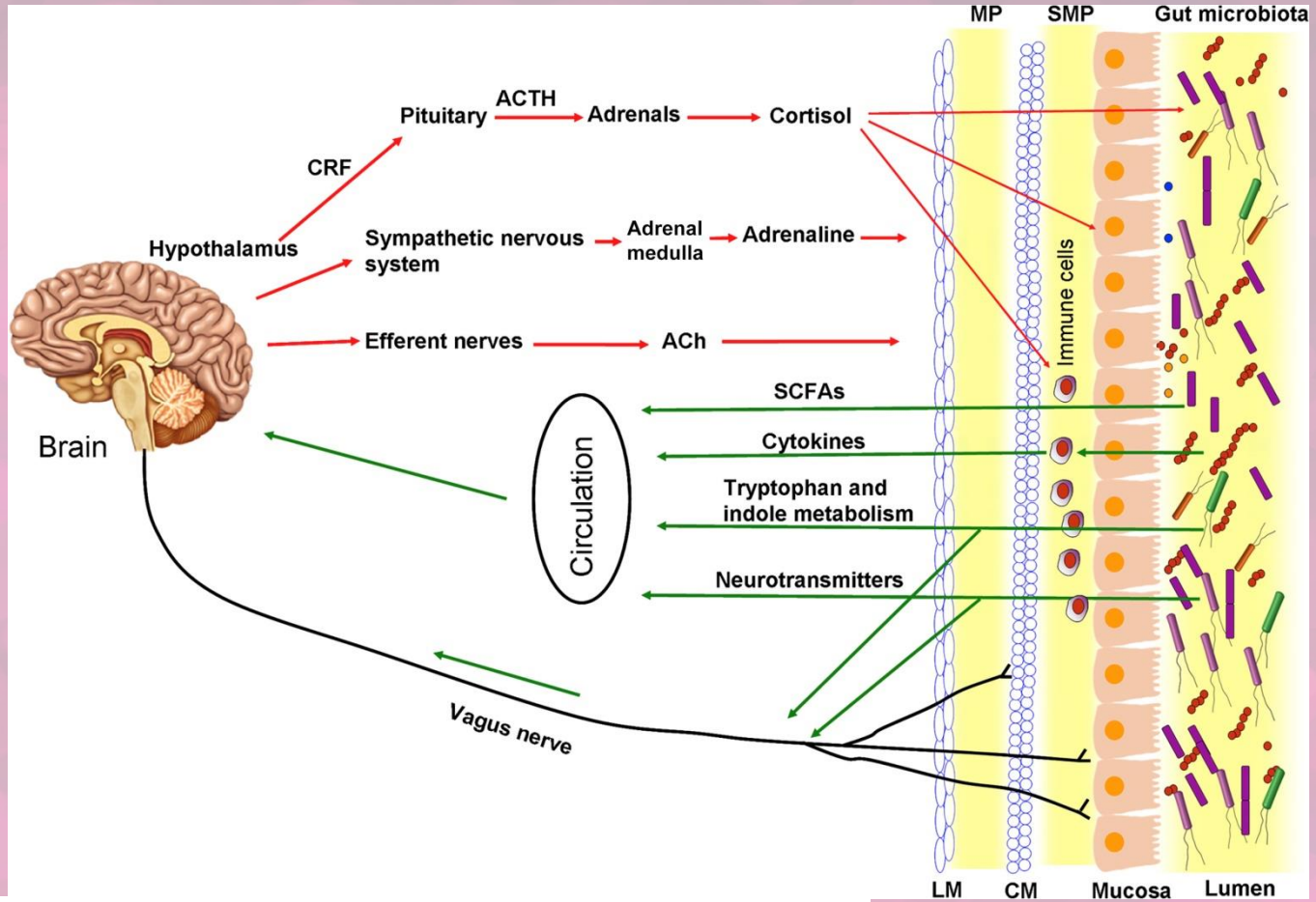
[Article in Portuguese]

Martins A[1], Castro L[1].

Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub. 2018 Sep 11. doi: 10.5507/bp.2018.051. [Epub ahead of print]

Intestinal dysbiosis and hormonal neuroendocrine secretion in the fibromyalgic patient: Relationship and correlations.

Tomasello G[1], Mazzola M[1,2], Bosco V[3], Tomasello G[4], Damiani P[2,5], Sinagra E[2,6], Carini F[1,2,5].



Br J Anaesth. 2019 Sep 21. pii: S0007-0912(19)30638-5. doi: 10.1016/j.bja.2019.07.026.

Pain regulation by gut microbiota: molecular mechanisms and therapeutic potential.

Guo R[1], Chen LH[2], Xing C[3], Liu T[4].

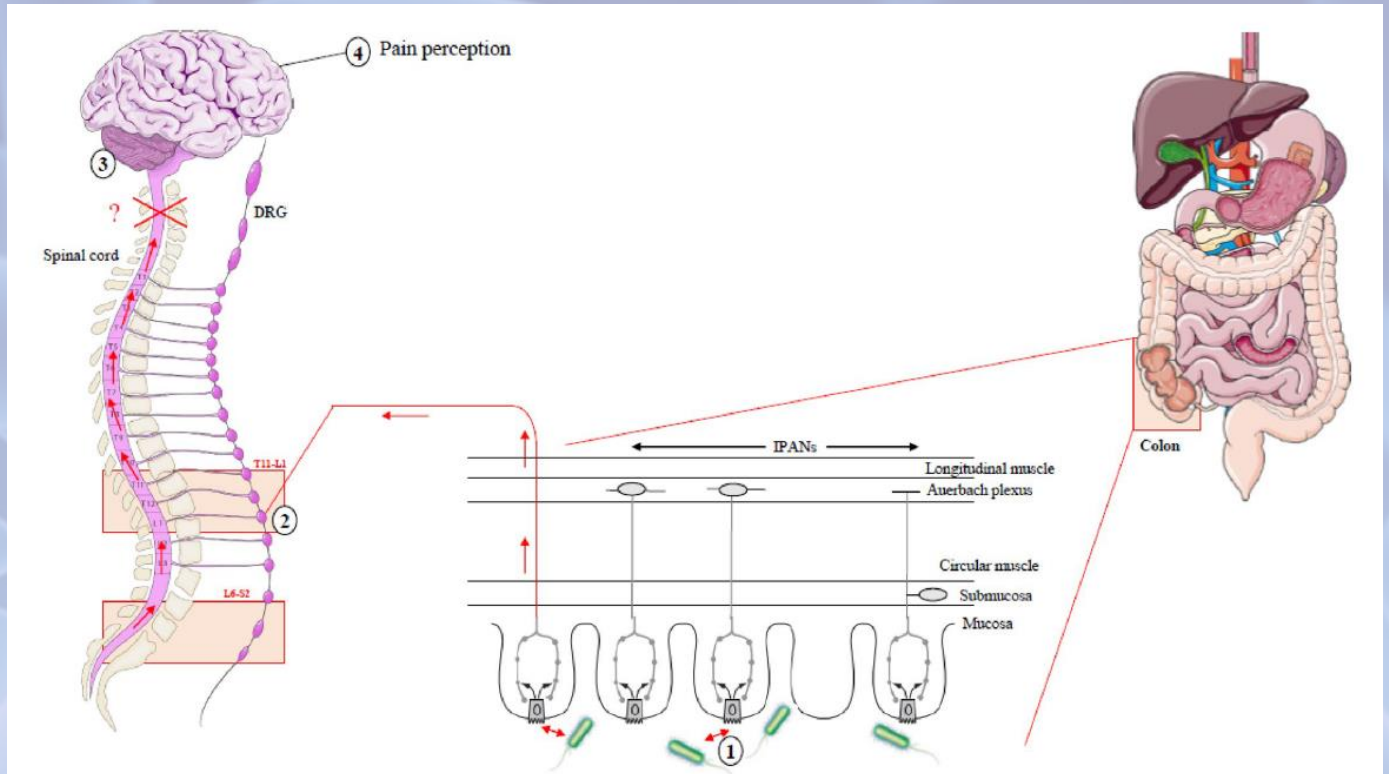


Fig. 1 Implication of gut microbiota in pain perception. (1) Gut microbiota can modulate pain perception via constitutive compounds and metabolites secreted. (2) Peripheral nociceptive signals are relayed by dorsal root ganglion (DRG). Axons of these neurons innervate multiple layers of the intestine and synapse with spinal cord. Message transmission is insured by spinal cord until the brain (3) where pain perception is transduced (4). *IPANs* intrinsic primary afferent neurons

J Neural Transm (Vienna). 2019 Sep 24. doi: 10.1007/s00702-019-02083-z. [Epub ahead of print]

Microbiota: a novel regulator of pain.

Defaye M[1], Gervason S[2,3], Altier C[1], Berthon JY[2], Ardid D[3], Filaire E[2,4], Carvalho FA[5].

Chez l'animal ?

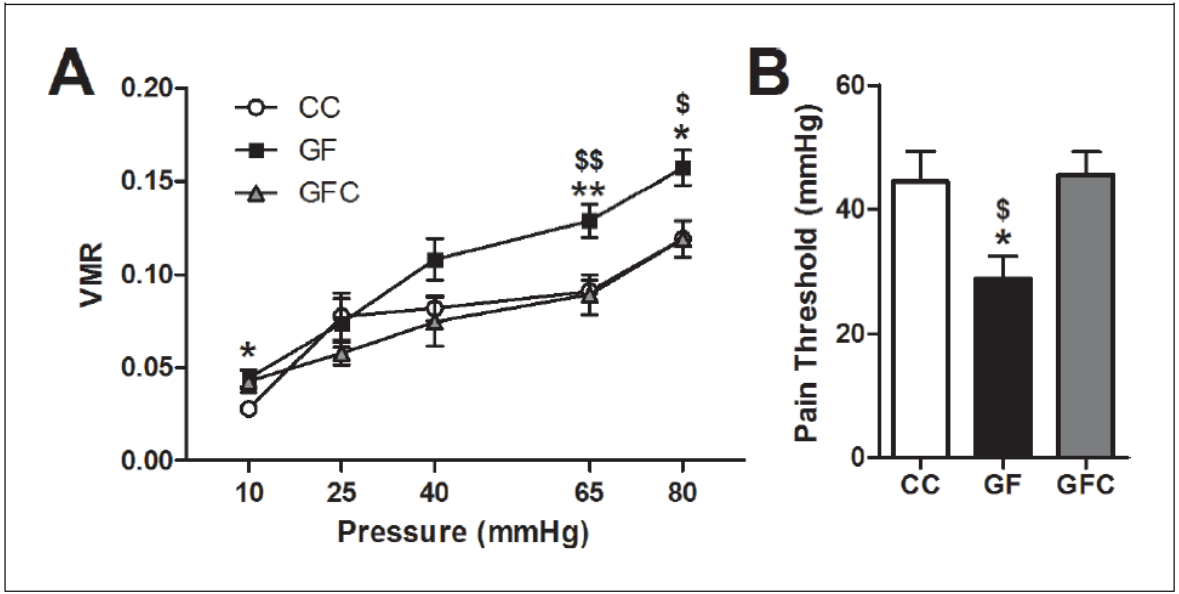


Figure 5. Normalization of visceral hypersensitivity following colonization of GF mice. (A,B) Microbial colonization restored normal visceral pain responsivity (A) and pain threshold (B). For this and subsequent figures, *p<0.05, **p<0.01, and ***p<0.001 versus CC mice; $^{\$}p < 0.05$; $^{\$\$}p < 0.01$ versus GFC mice. CC, n = 10; GF, n = 8; GFC, n = 9.

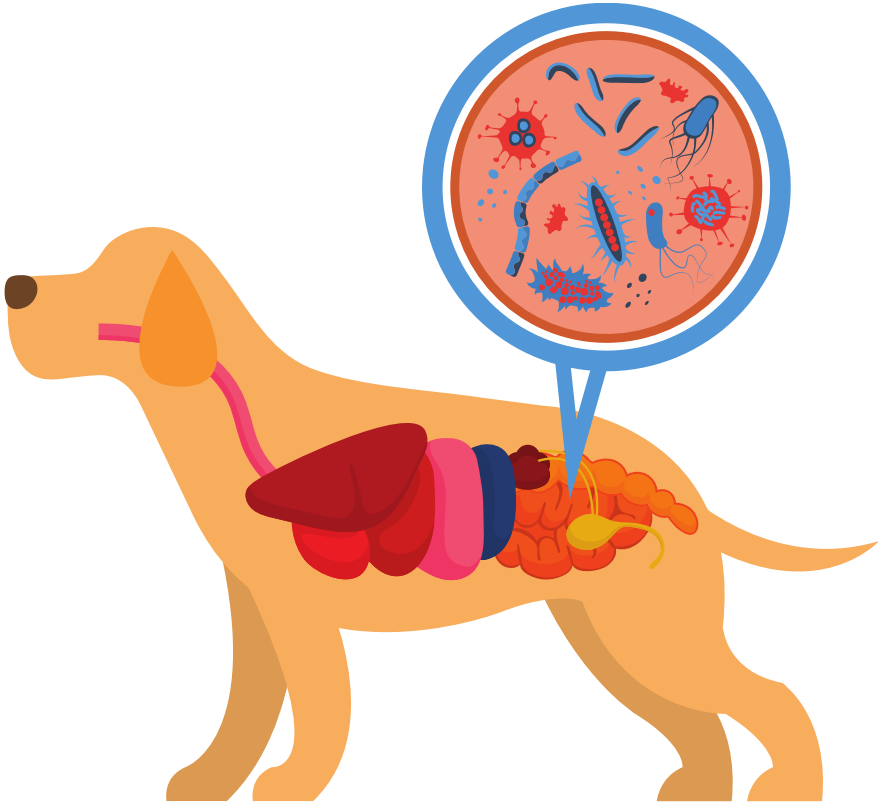
Elife. 2017 Jun 20;6. pii: e25887. doi: 10.7554/eLife.25887.

Microbiota regulates visceral pain in the mouse.

Luczynski P[1], Tramullas M[1], Viola M[1], Shanahan F[1], Clarke G[1,2], O'Mahony S[1,3], Dinan TG[1,2], Cryan JF[1,3].

Le microbiome des chats et des chiens joue un rôle essentiel dans leur

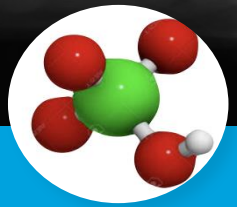
santé générale



Interactions entre la nutrition et le microbiome gastrointestinal

Prébiotiques

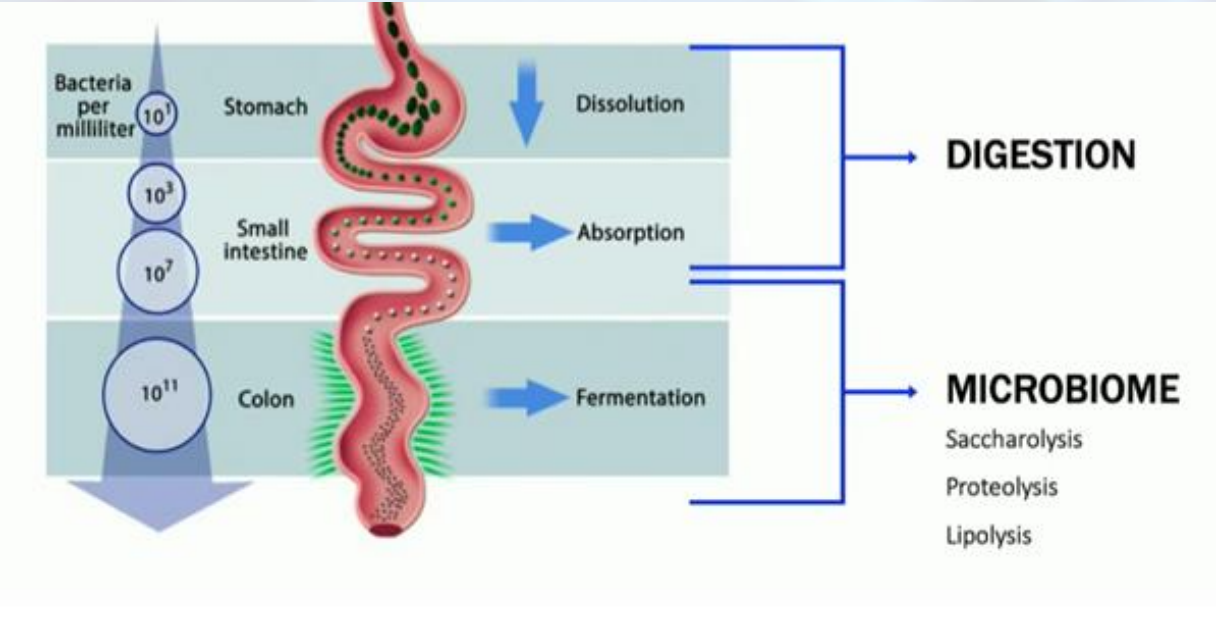
Probiotiques



Postbiotiques

Macronutriments

On nourrit à la fois l'animal et son microbiote



Côlon

Réabsorbés

Protéines non digérées → **Protéolyse** → **Acides aminés ramifiés** → **Putréfaction bactérienne** → **Postbiotiques potentiellement nuisibles**

AGCR, polyamines, indoles, etc

Fibres prébiotiques

Composés végétaux liés aux fibres

→ Saccharolyse & libération de composés végétaux liés aux fibres

→ **Glucides** → Fermentation bactérienne → **Postbiotiques bénéfiques**

AGCC

(butyrate, acétate, propionate)

→ **Composés végétaux** → Metabolisme/ transformation bactérienne → **Polyphénols**

AOX & AI

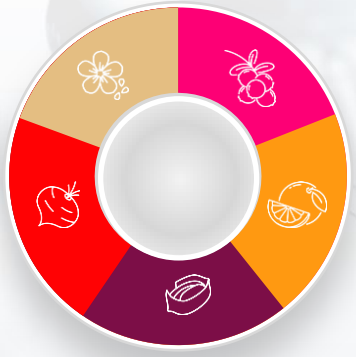
Réabsorbés

Saccharolyse - Décomposition des fibres en sucres simples

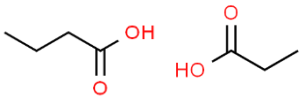
Fermentation - Décomposition des sucres en énergie

Putréfaction - Dégradation anaérobie de protéines non digérées

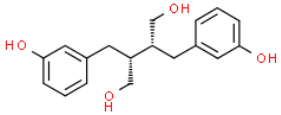
On peut influencer la production de postbiotiques par le choix du **type de fibres**



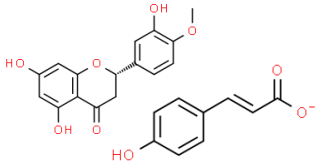
Postbiotiques souhaitables



Butyrate, Propionate



Entérodiol



Hespérétine, 4-hydroxycinnamate

Effets bénéfiques pour l'hôte

Energie pour le côlon et le foie

Anti-inflammatoire

Antioxydant

Intervention alimentaire potentielle

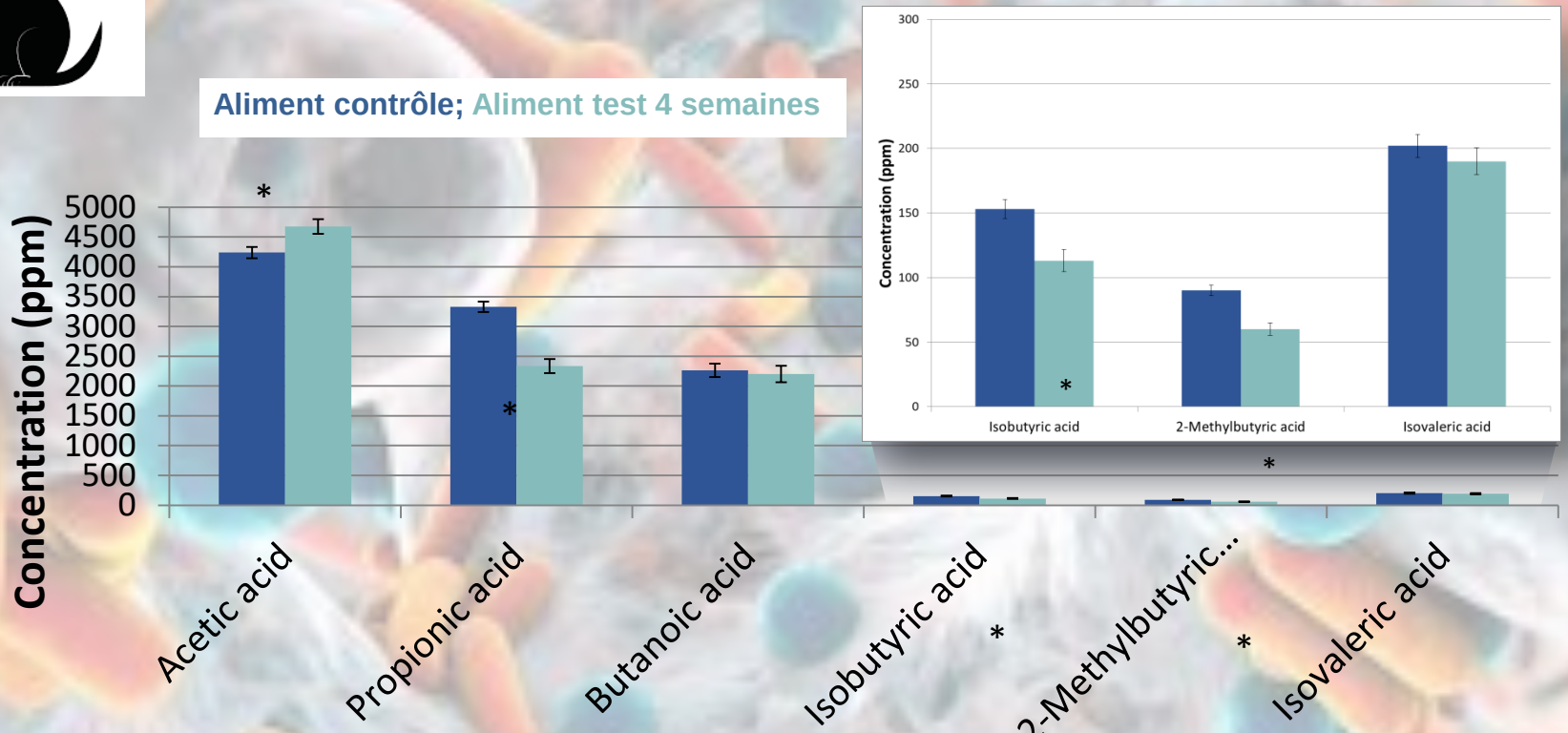
Fibres prébiotiques

Graines de lin

Polyphénols

Augmentation AGCC saccharolytiques fécaux & diminution AGCR de putréfaction en 4 semaines

Aliment contrôle; Aliment test 4 semaines



** Significativement différent vs contrôle*

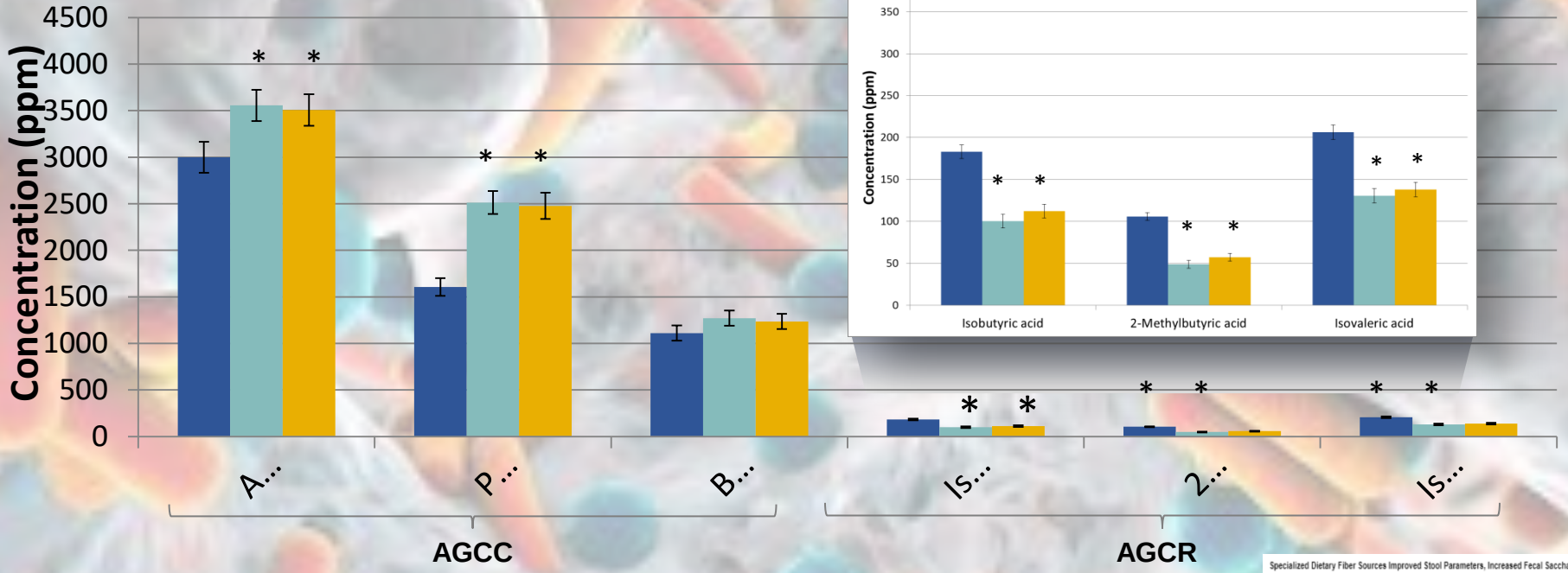
Select Dietary Fiber Sources Improve Stool Parameters, Decrease Fecal Putrefactive Metabolites, and Deliver Antioxidant and Anti-inflammatory Plant Polyphenols to the Lower Gastrointestinal Tract of Adult Dogs

Dale A. Fritsch, Susan M. Wernimont, Matthew I. Jackson, and Kathy L. Gross

The FASEB Journal. Volume 33, Issue 1 (supplement 1), Apr 2019.

Augmentation AGCC saccharolytiques fécaux & diminution AGCR de putréfaction en 4 semaines

Aliment contrôle; Aliment test 4 semaines; Aliment test 8 semaines



** Significativement différent vs contrôle*

Specialized Dietary Fiber Sources Improved Stool Parameters, Increased Fecal Saccharolytic and Fermentative Metabolites, & Delivered Antioxidant & Anti-inflammatory Polyphenols to the Lower Gastrointestinal Tract of Healthy Adult Cats

Susan M. Wernimont, Dale A. Fritsch, Matthew I. Jackson, and Kathy L. Gross

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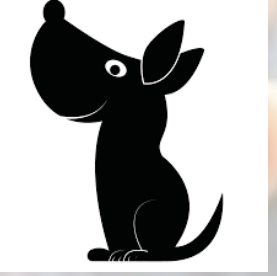
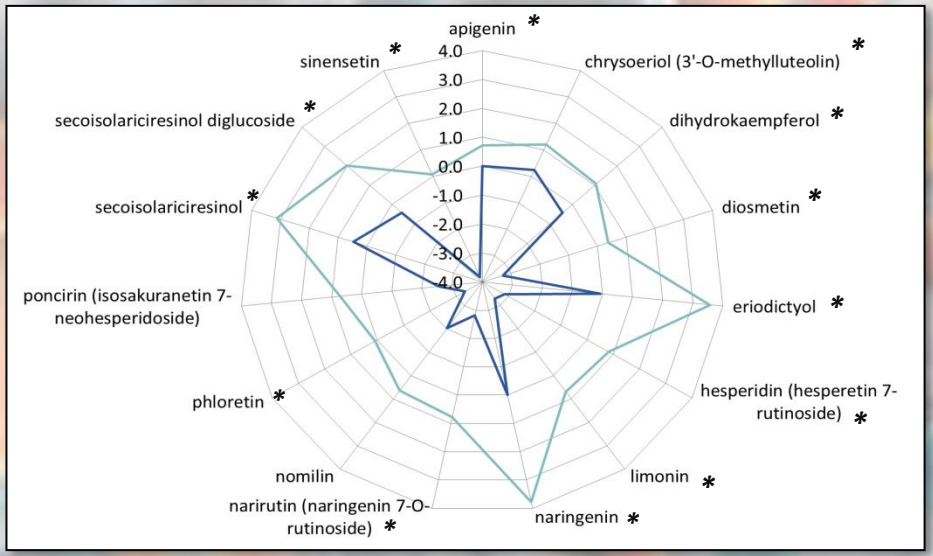
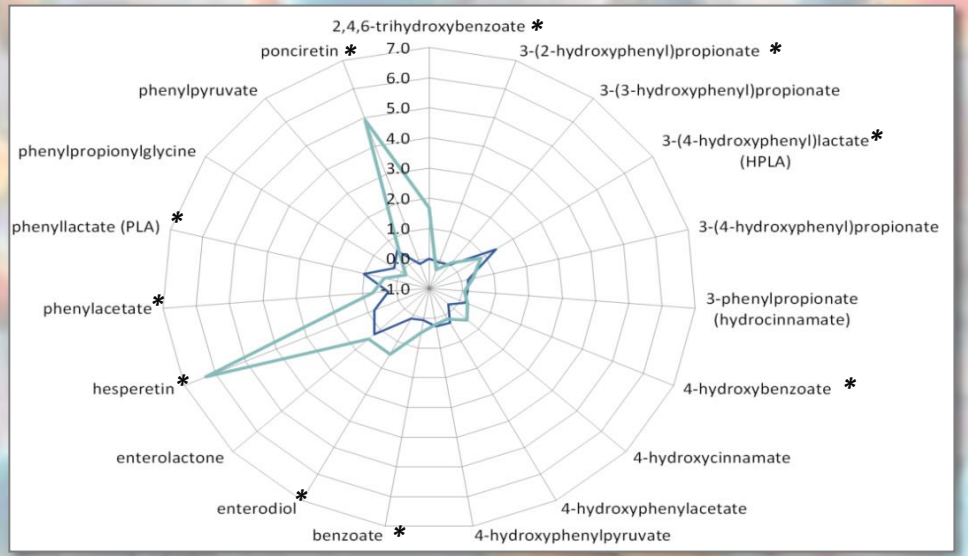


Libération accrue de composés végétaux bénéfiques et de postbiotiques actifs dans le côlon

Composés végétaux





Postbiotiques

Aliment contrôle

Aliment test 4 semaines

** Significativement différent vs contrôle*

Select Dietary Fiber Sources Improve Stool Parameters, Decrease Fecal Putrefactive Metabolites, and Deliver Antioxidant and Anti-inflammatory Plant Polyphenols to the Lower Gastrointestinal Tract of Adult Dogs

Dale A. Fritsch, Susan M. Wernimont, Matthew I. Jackson, and Kathy L. Gross

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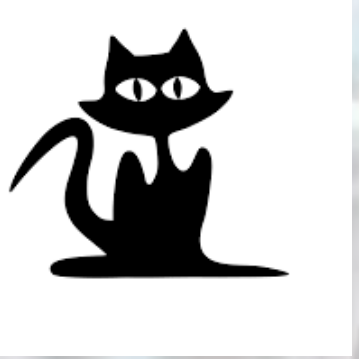
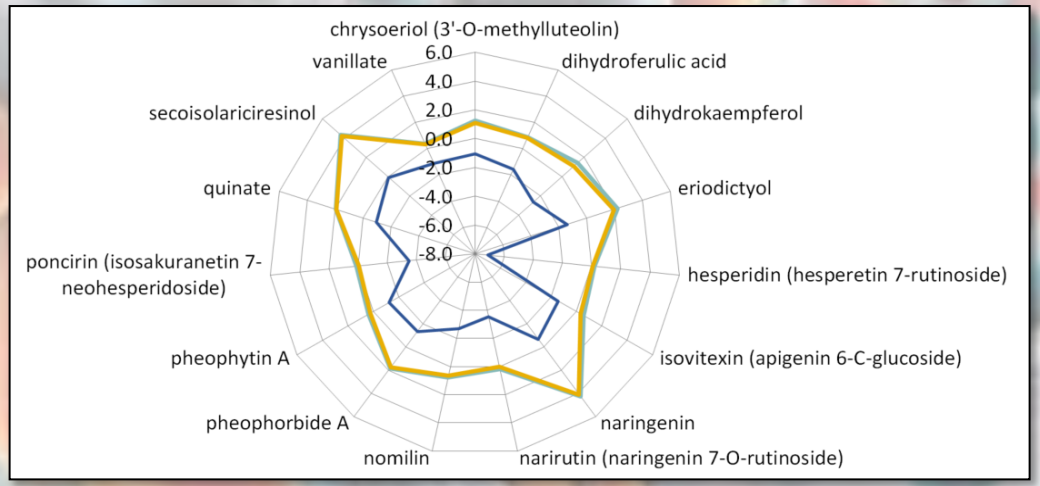
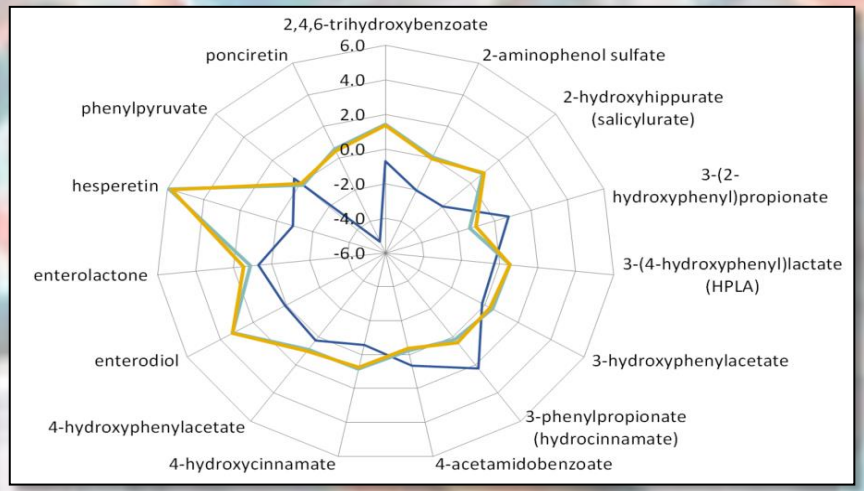


Libération accrue de composés végétaux bénéfiques et de postbiotiques actifs dans le côlon

Composés végétaux





Postbiotiques

- **Aliment contrôle**
- **Aliment test 4 semaines**
- **Aliment test 8 semaines**

**** Significativement différent vs contrôle***

Specialized Dietary Fiber Sources Improved Stool Parameters, Increased Fecal Saccharolytic and Fermentative Metabolites, & Delivered Antioxidant & Anti-inflammatory Polyphenols to the Lower Gastrointestinal Tract of Healthy Adult Cats

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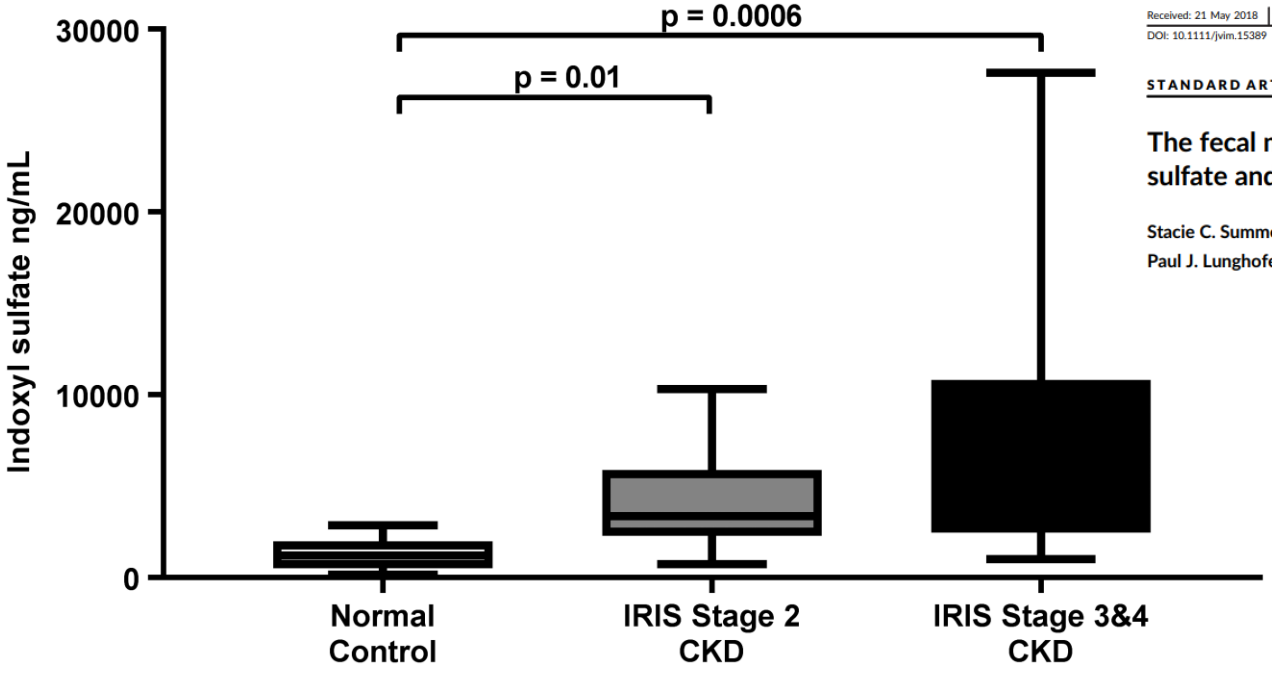
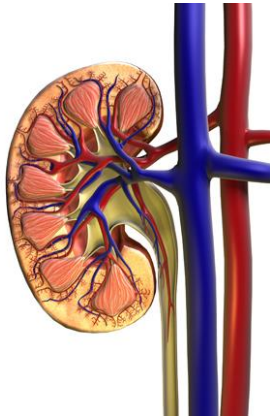
Impact des postbiotiques sur la santé générale : exemple sur la fonction rénale chez le chat



Received: 21 May 2018 | Accepted: 16 November 2018
DOI: 10.1111/jvim.15389
Journal of Veterinary Internal Medicine Open Access ACVIM American College of Veterinary Internal Medicine
STANDARD ARTICLE

The fecal microbiome and serum concentrations of indoxyl sulfate and p-cresol sulfate in cats with chronic kidney disease

Stacie C. Summers[1] | Jessica M. Quimby[1] | Anitha Isaiah[2] | Jan S. Suchodolski[2] | Paul J. Lunghofer[1] | Daniel L. Gustafson[1]

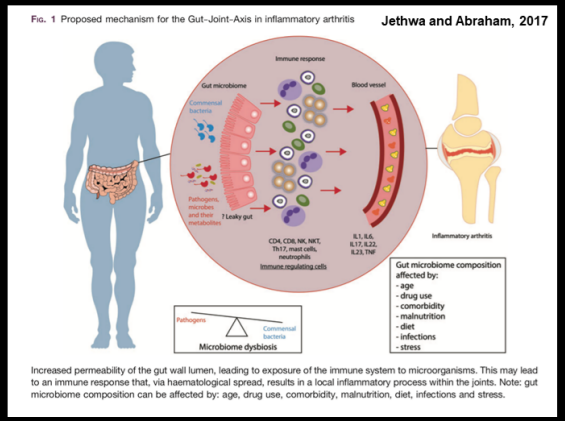


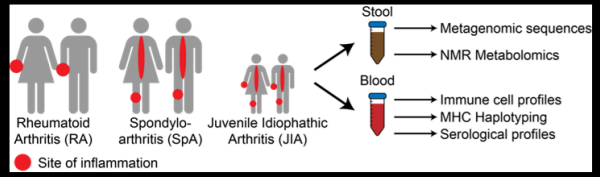
Travaux sur l'inflammation articulaire dans le cadre du Projet du Microbiome Humain

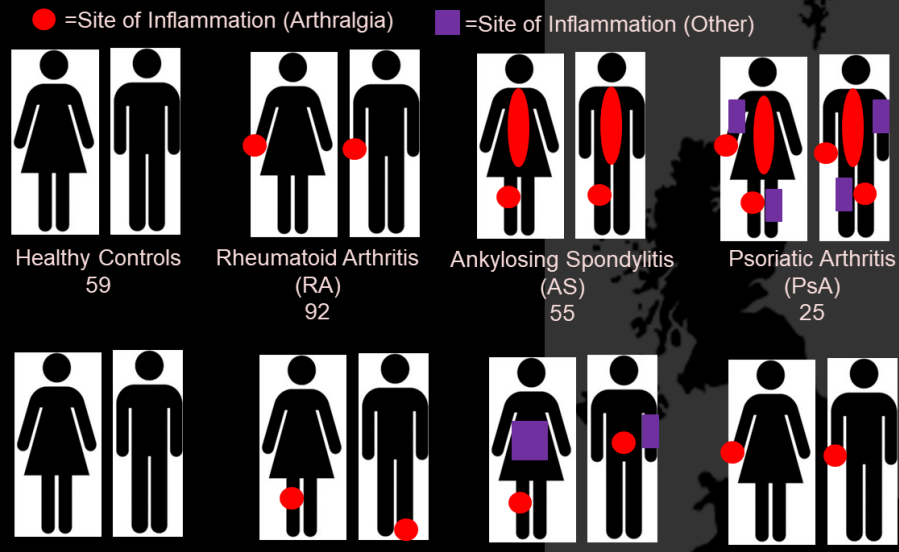
The microbiome in inflammatory arthritis

With Fiona Powrie, Dan Littman, and the Inflammatory Arthritis Microbiome Consortium

ARTHRITIS RESEARCH UK







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Microbiome = Impact sur bonne santé,
douleur et bien-être


Début d’une nouvelle ère…