ÁCIDOS GRAXOS COMO NUTRACÊUTICOS PARA CÃES E GATOS



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cbna

CONCEITOS

Alimento Funcional: Alimento ou ingrediente alimentar que produza um impacto positivo na saúde e na performance, além de seu valor nutricional.

Nutracêuticos: "suplementos alimentares" que contém a forma concentrada de um composto bioativo de alimento, apresentado separadamente da matriz alimentar e utilizado com a finalidade de melhorar a saúde, em doses que excedem aquelas que poderiam ser obtidas de alimentos."

-





ESTUDOS COM CÃES E GATOS

- ✓ **ÁCIDOS GRAXOS POLINSATURADOS** – (modulação de resposta inflamatória, resposta imunológica e cognição

- ✓ **ÁCIDOS GRAXOS DE CADEIA MEDIA** – (imunidade e respostas cognitivas)







ÁCIDOS GRAXOS POLINSATURADOS – SERIE 6

- **A importância do Araquidônico no processo reprodutivo é bastante conhecida.**

- Maturação dos óvulos,
- Ovulação
- Desenvolvimento embrionário

- **O ácido linoleico é especificamente responsável pela manutenção da permeabilidade cutânea**

- **O ácido araquidônico, como precursor da prostaglandina, é necessário para uma proliferação epidermal normal**

RECOMENDAÇÕES DE LIPÍDEOS E PARA CÃES ADULTOS (mg/KCAL INGERIDA CONSIDERANDO A INGESTÃO DE 110 *PVˆ0,75)

NUTRIENTES	UNID.	NRC	FEDIAF	AAFCO
LIPÍDEOS	mg	13,8	13,75	13,8
ACIDO LINOLÊNICO	mg	0,11	nd	nd
EPA + DHA	mg	0,11	nd	nd
ACIDO LINOLEICO	mg	2,8	3,27	2,80
ACIDO ARAQUIDÔNICO	mg	nd	nd	nd

RECOMENDAÇÕES DE LIPÍDEOS E PARA GATOS (MG/ 1 KCAL INGERIDA, CONSIDERANDO A INGESTÃO DE 100 *PVˆ0,67)

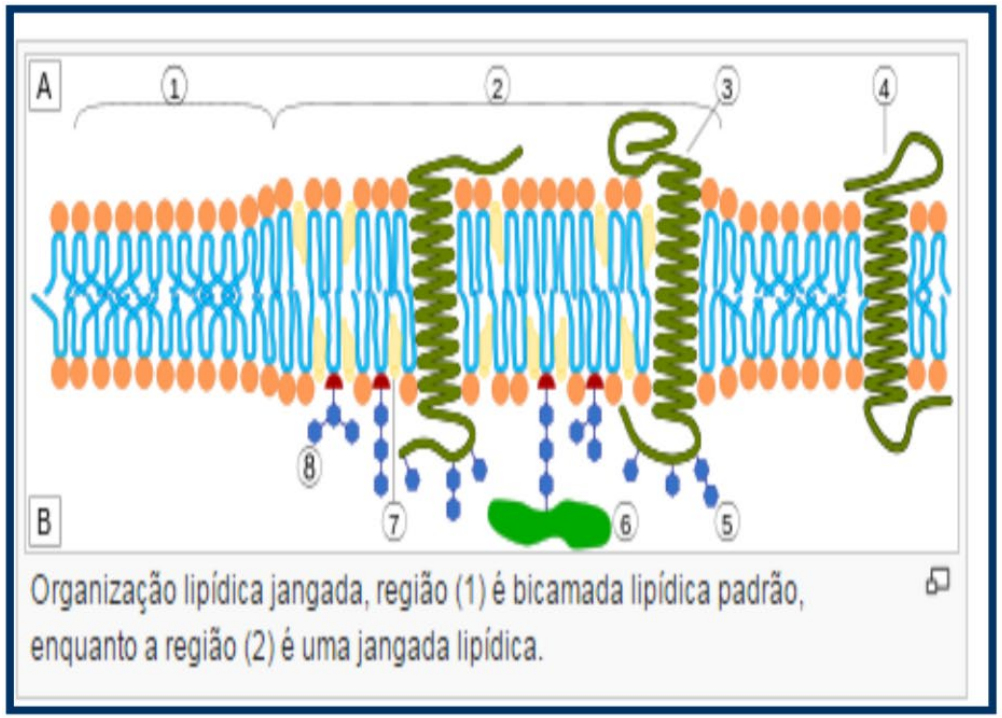
NUTRIENTES	UNID.	NRC	FEDIAF	AAFCO
GORDURA	mg	22,5	22,5	22,5
ACIDO LINOLEICO	mg	1,4	1,25	1,40
ACIDO ARAQUIDONICO	mg	0,0005	0,015	0,05
DHA+EPA	mg	0,025		0,03

ÁCIDOS GRAXOS POLINSATURADOS – SERIE 3

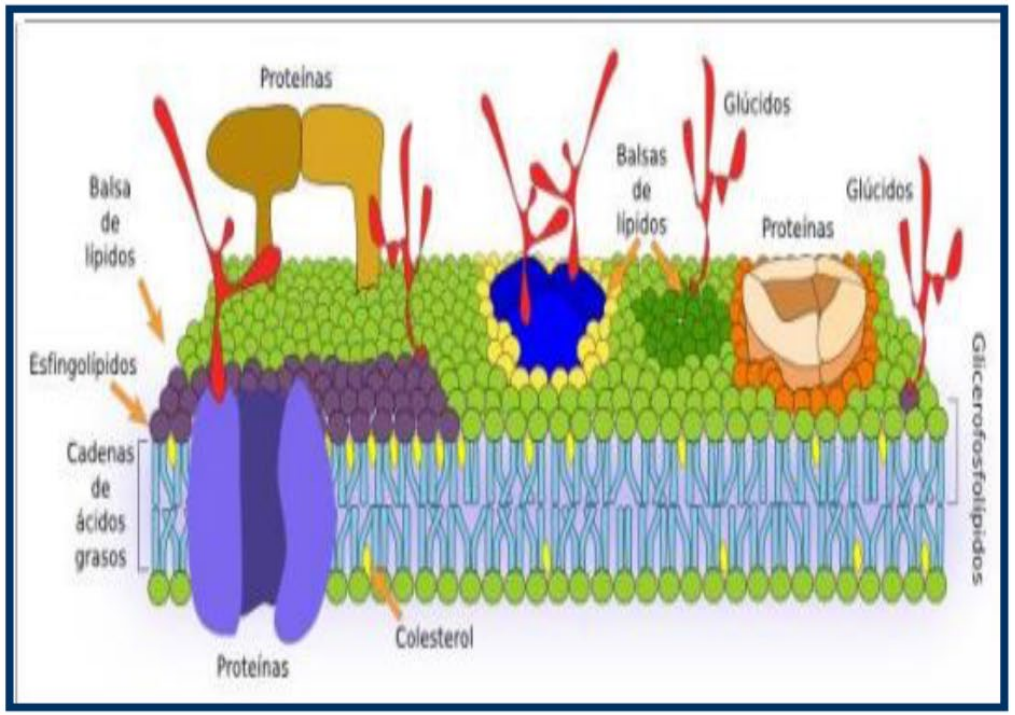
COMO ATUAM?

1. Composição da membrana celular (FOSFOLIPÍDEOS)
2. Modulam os fatores de transcrição gênica (SREBP-1, PPARγ e C/EBPα)
3. Participam da síntese de mediadores lipídicos(EICOSANÓIDES)
4. Modulam as funções dos receptores celulares

1. COMPONENTE DA MEMBRANA CELULAR (ESTRUTURAL)



Organização lipídica jangada, região (1) é bicamada lipídica padrão, enquanto a região (2) é uma jangada lipídica.



- ✓ A assimetria lipídica é importante para os processos de conversão de sinais extracelulares em sinais intracelulares

- ✓ Associada a processos fisiológicos e patológicos, inclui sinalização celular, tráfego molecular , fisiologia vascular, digestiva e reprodutiva.

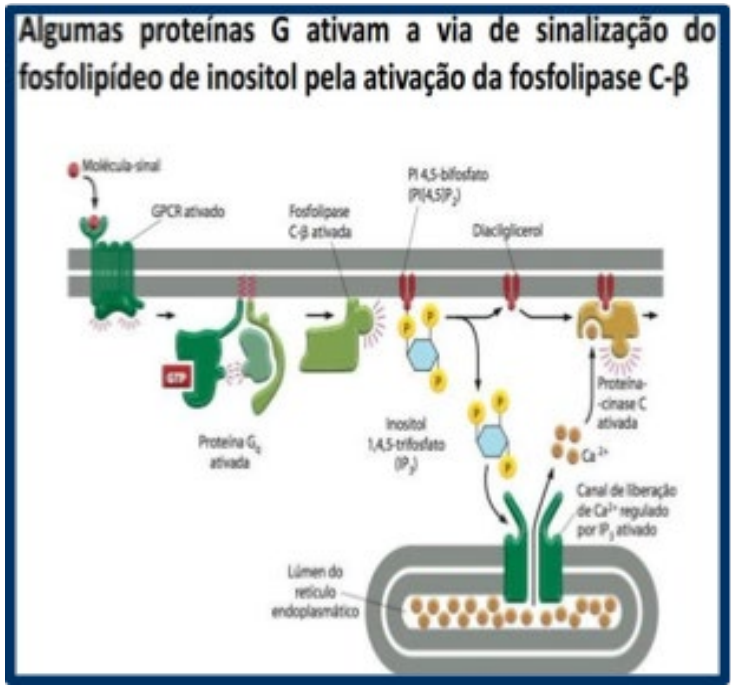
ÁCIDOS GRAXOS E SISTEMA IMUNE

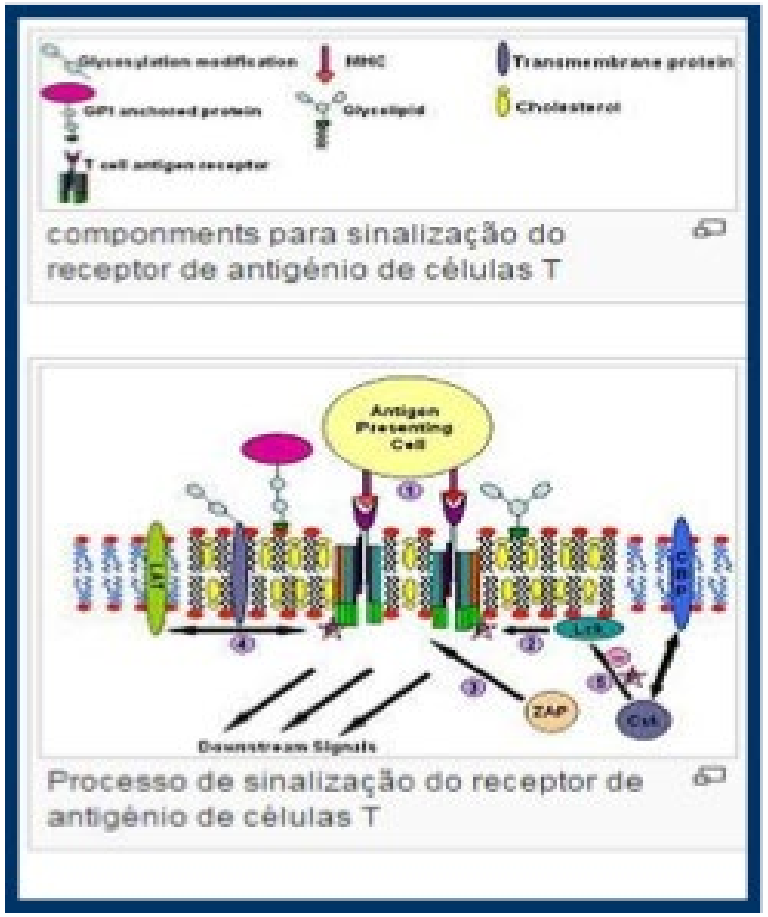
➢Os PUFAS tem papel no desenvolvimento e controle da resposta inflamatória

Mecanismos de ação

Sinalizadores de Membranas
Balsas lipídicas (“Lipid raft”)
Síntese de Eicosanoides

1





ÁCIDO GRAXOS E SÍNTESE DE EICOSANÓIDES:

- **Biopotências dos eicosanóides sintetizados a partir do ARA ou EPA são diferentes**.

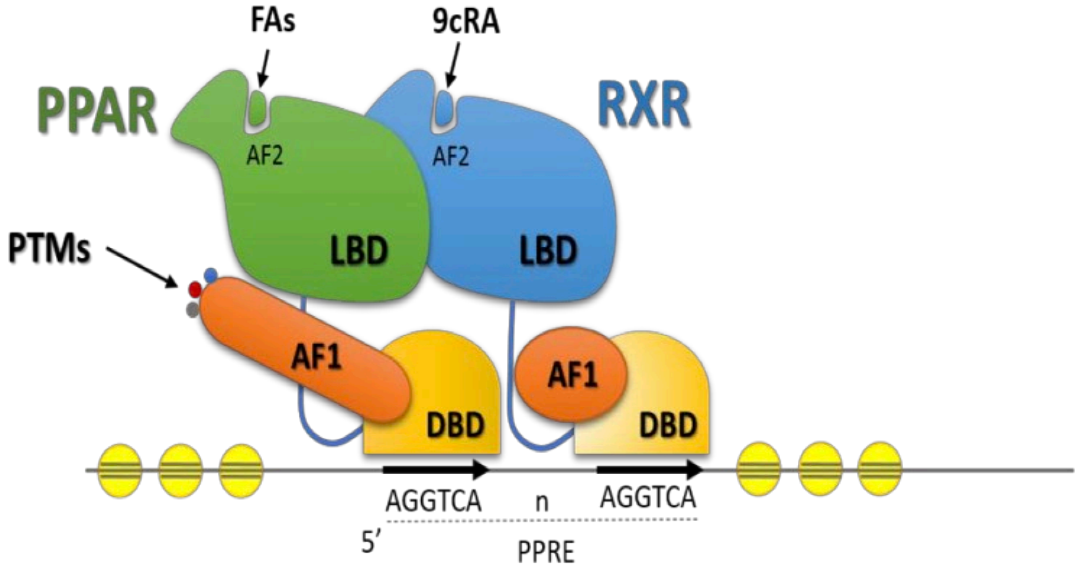
✓ Eicosanóides oriundos do EPA têm efeitos menos potentes sobre as células imunes.

✓ EPA é preferencialmente degradado pela via da lipooxigenase, comparado com o acido araquidônico, levando a maior formação de LT5 e menores níveis de LT4.

✓ Também compete com o acido araquidônico levando a menor produção de PGE2

✓ DHA não é um substrato para as enzimas ciclooxigenase e lipooxigenase, mas inibe a síntese de eicosanóides n-6 diminuindo a liberação do ARA da membrana.

2 - RECEPTORES ATIVADORES DA PROLIFERAÇÃO PEROXISSOMAL (PPARS)



- ✓ AGW3 atuam como sinalizadores intracelulares, induzindo a transcrição de genes envolvidos na oxidação lipídica
- ✓ Reguladores do metabolismo lipídico
- ✓ Metabolismo das lipoproteinas plasmáticas
- ✓ Homeostase da glicose
- ✓ Diferenciação e apoptose celular

ATIVADORES DA PROLIFERAÇÃO PEROXISSOMAL (PPARS)

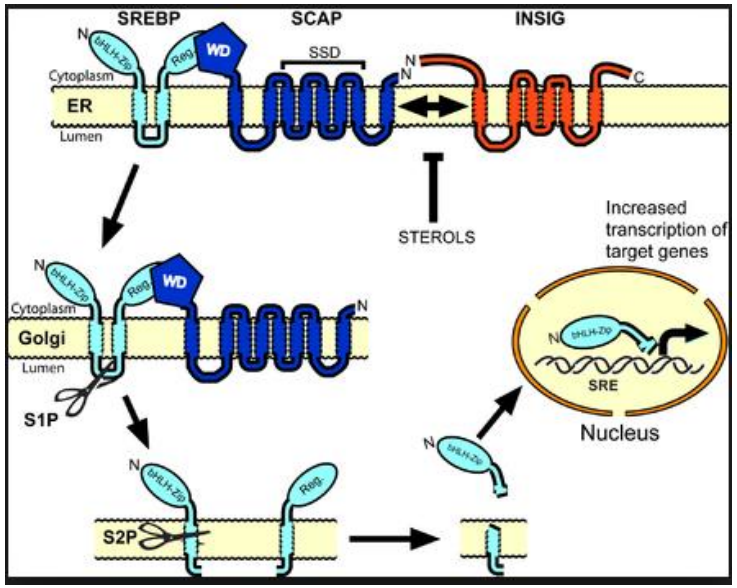
- ✓ PPARα : Ativado pelos leucotrienos B4, identificado em monócitos e altamente presente na diferenciação celular
- ✓ PPARγ: Ativado pelas PGJ2, não identificados em monócitos, mas presente na diferenciação celular
- ✓ PPARα e γ: presentes na região subendotelial e camada lipídica de lesões aterosclerótica
- ✓

INFLUÊNCIA DOS ÁCIDOS GRAXOS SOBRE A ADIPOGENESE



- ✓ Ácidos graxos w6 são potentes ativadores da adipogênese atuando via PPARs e c/EBPα e também pode exercer ação via prostaciclinas aumentando AMPc.
- ✓ Ácidos graxos w3 são menos potentes ativadores da lipogênese atuando via PPARs e também reduz o conteúdo hepático da SREBP1.
- ✓ ▪DHA poder levar a apoptose de adipócito, demonstrando efeito protetor da adipogênese

PROTEINAS DE LIGAÇÃO AOS ELEMENTOS REGULATÓRIOS DE ESTERÓIDES (SREBPs)



AGW3 atuam como sinalizadores intracelulares, inibindo a transcrição de genes envolvidos na lipogênese

Enzimas do metabolismo do colesterol endógeno

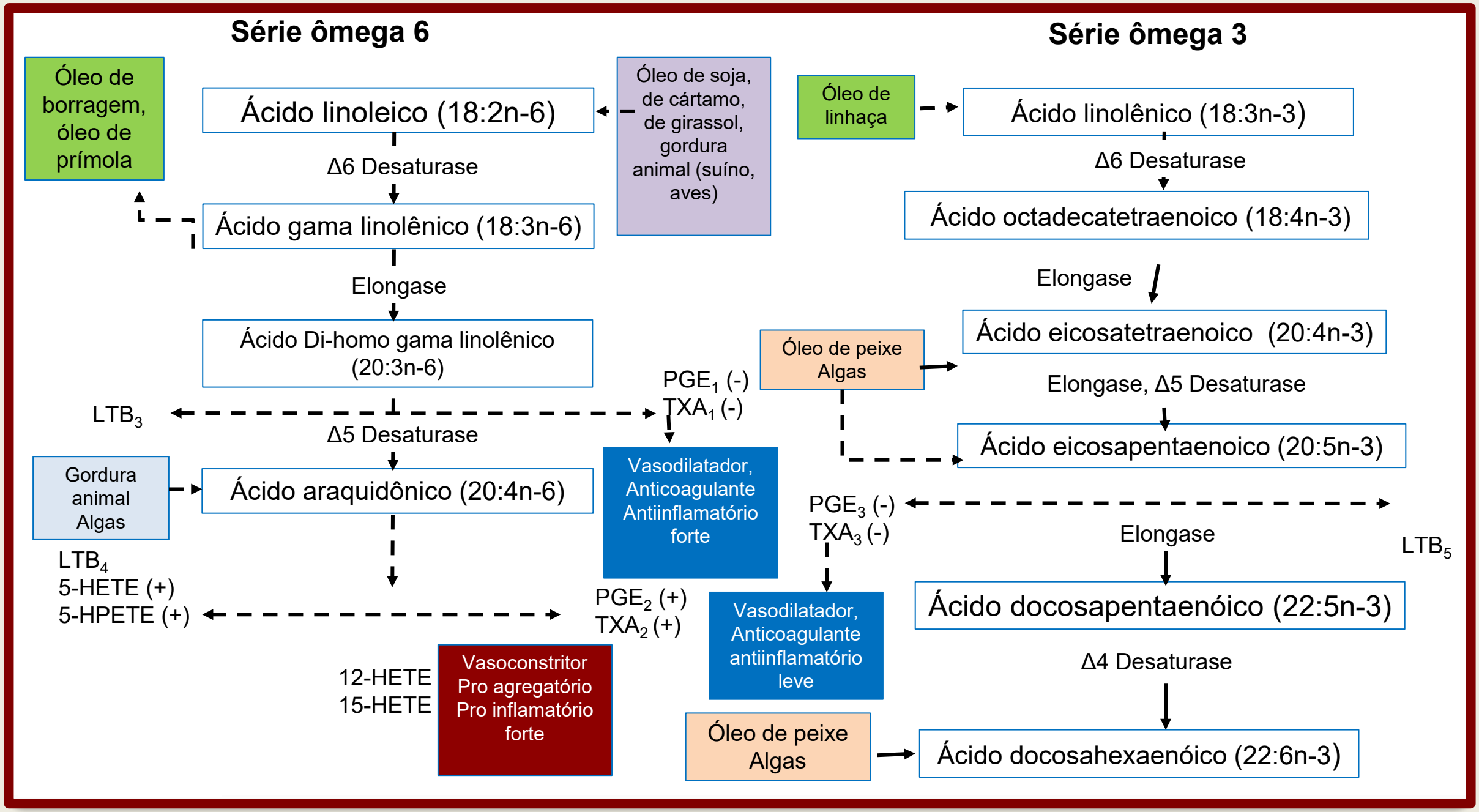
Envolvido na síntese de AG e da insulina

Síntese de fosfolípidos.

- ✓ SREBP-1c está envolvido na síntese de AG e da insulina no metabolismo da glicose induzida (particularmente na lipogênese)
- ✓ SREBP-2 é relativamente específico para a síntese de colesterol
- ✓ SREBP-1a parece estar implicado em ambas as vias

3. MEDIADORES LIPÍDICOS (EICOSANÓIDES)

- ✓ Estimulam lipólise e inibem lipogênese
- ✓ Sistema imune
- ✓ Atenuam a inflamação
- ✓ Prevenir a agregação plaquetária
- ✓ Regulam a pressão arterial
- ✓ Anti-arrítmico
- ✓ Reduzem os níveis de colesterol-LDL (importante em humanos)
- ✓ Ativam a telomerase (função adicionar sequências específicas e repetitivas de DNA à extremidade 3' dos cromossomos, onde se encontra o telômero)
- ✓ Propriedades citoprotectoras


Série ômega 6
Série ômega 3
Óleo de borragem, óleo de prímola
Ácido linoleico (18:2n-6)
Óleo de soja, de cártamo, de girassol, gordura animal (suíno, aves)
Δ6 Desaturase
Ácido gama linolênico (18:3n-6)
Elongase
Ácido Di-homo gama linolênico (20:3n-6)
LTB3
PGE1 (-)
TXA1 (-)
Δ5 Desaturase
Gordura animal Algas
Ácido araquidônico (20:4n-6)
Vasodilatador, Anticoagulante Antiinflamatório forte
LTB4
5-HETE (+)
5-HPETE (+)
PGE2 (+)
TXA2 (+)
12-HETE
15-HETE
Vasoconstritor Pro agregatório Pro inflamatório forte
Óleo de linhaça
Ácido linolênico (18:3n-3)
Δ6 Desaturase
Ácido octadecatetraenoico (18:4n-3)
Elongase
Ácido eicosatetraenoico (20:4n-3)
Óleo de peixe Algas
Elongase, Δ5 Desaturase
Ácido eicosapentaenoico (20:5n-3)
PGE3 (-)
TXA3 (-)
Elongase
LTB5
Ácido docosapentaenóico (22:5n-3)
Vasodilatador, Anticoagulante antiinflamatório leve
Δ4 Desaturase
Óleo de peixe Algas
Ácido docosahexaenóico (22:6n-3)

Clinical Trial > Can J Vet Res. 1997 Apr;61(2):145-53.

Effect of an omega-3/omega-6 fatty acid-containing commercial lamb and rice diet on pruritus in atopic dogs: results of a single-blinded study

D W Scott [1], W H Miller Jr, G A Reinhart, H O Mohammed, M S Bagladi

Affiliations + expand

PMID: 9114966 PMCID: PMC1189391

Free PMC article

Abstract

A commercial, lamb and rice, dog food with an omega-6:omega-3 fatty acid ratio of 5.5:1 was fed in a single-blinded, self-controlled clinical trial to 18 atopic dogs. The pruritus in 8 of these dogs (44.4%) was satisfactorily controlled within 7 to 21 d, returned within 3 to 14 d after the diet was withdrawn, and was again controlled when the diet was reinstated. Plasma and skin levels of examined fatty acids changed in all 18 dogs when their diet was switched to the test diet. Dogs responding to the test diet had a different pattern of fatty acid change as compared to the dogs which failed to respond to the diet, suggesting that there are subsets of atopic dogs with different fatty acid metabolism capabilities.

Clinical Trial > Vet Rec. 1992 Dec 12;131(24):558-60.

A double-blind comparison of olive oil and a combination of evening primrose oil and fish oil in the management of canine atopy

R Bond [1], D H Lloyd

Affiliations + expand

PMID: 1481346

Abstract

A randomised double-blind parallel study lasting eight weeks was used to assess the effects of olive oil in a group of atopic dogs whose clinical signs were well controlled by dietary supplementation with a combination of evening primrose oil and fish oil. Nine of the 11 dogs which continued to receive this combination were considered unchanged at the conclusion of the study, whereas eight of the 10 dogs switched to olive oil had deteriorated. The mean plasma concentration of dihomogammalinolenic acid, a precursor of potentially antiinflammatory mediators, was significantly reduced ($P < 0.05$) in the olive oil-treated group at the end of the study. There were no significant differences between the mean plasma linoleic, eicosapentaenoic and arachidonic acid concentrations in the two groups. These findings suggest that olive oil is not an effective therapeutic agent in the control of canine atopy.

Clinical Trial > Vet Rec. 1995 Aug 12;137(7):169-70. doi: 10.1136/vr.137.7.169.

Canine atopic disease: therapeutic use of an evening primrose oil and fish oil combination

G H Sture [1], D H Lloyd

Affiliations + expand

PMID: 8553525 DOI: 10.1136/vr.137.7.169

Veterinary Dermatology

Essential Fatty Acid Supplementation In The Treatment Of Canine Atopy: A Preliminary Study

David H. Lloyd, Lovell R. Thomsett

First published: March 1990 | https://doi.org/10.1111/j.1365-3164.1990.tb00074.x | Citations: 16

PDF TOOLS SHARE

Abstract

Abstract— In an open, uncontrolled study, 10 dogs with atopy were given evening primrose oil (EPO) (5ml/10kg/day) over a period of 9 weeks. During the first three weeks pruritus, scaling and oedema worsened but erythema and coat condition tended to improve. Subsequently all these parameters tended to improve. The effect on oedema was significant ($p < 0.05$). Eight of these dogs and two others were then given a 4:1 mixture of EPO and marine fish oil for 9 weeks. Although further reductions in scale and improvements in coat condition were marked in some animals, no significant changes occurred. Alterations in the plasma phospholipid essential fatty acid levels reflected the compositions of the two supplements. These findings suggest that EPO can ameliorate of atopy in dogs. This mirrors observations obtained in studies of human atopic eczema.

Journal of Animal Physiology and Animal Nutrition

ORIGINAL ARTICLE

Effects of feeding a high omega-3 fatty acids diet in dogs with naturally occurring osteoarthritis

M. Moreau, E. Troncy, J. R. E. del Castillo, C. Bédard, D. Gauvin, B. Lussier

First published: 14 July 2012 | https://doi.org/10.1111/j.1439-0396.2012.01325.x | Citations: 11

M. Moreau, Department of Veterinary Biomedicine, Faculté de Médecine Vétérinaire, Université de Montréal, PO Box 5000, St. Hyacinthe, Montréal, QC, Canada J2S 7C6. Tel: +450 773 8521 ext. 8516; Fax: +450 778 8102; E-mail: m.moreau@umontreal.ca

ELSEVIER

Journal of Laboratory and Clinical Medicine

Volume 131, Issue 5, May 1998, Pages 447-455



Original article

Beneficial effects of chronic administration of dietary ω-3 polyunsaturated fatty acids in dogs with renal insufficiency ☆

Scott A. Brown [a, b], Cathy A. Brown [a, b], Wayne A. Crowell [a, b], Jeanne A. Barsanti [a, b], Timothy Allen [a, b], Christopher Cowell [a, b], Delmar R. Finco [a, b]

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https://doi.org/10.1016/S0022-2143(98)90146-9

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PERFIL DE ÁCIDOS GRAXOS EM PRODUTOS ANIMAIS

Ácido graxo	Carne* suína	Carne* bovina	Carne* de frango	Banha suína	Sebo bovino	Óleo de frango	Óleo de peixe**
Gordura (%)	26,5	23,5	15,1	100	100	99,8	100
Ácidos graxos (% da gordura)							
16:0	23,10	24,06	20,92	23,8	24,9	21,6	9,84
18:0	12,70	20,71	5,78	13,5	18,9	6,0	4,25
18:1 (n-9)	43,00	32,27	34,33	41,2	36,0	37,3	16,98
18:2 (n-6)	8,06	2,51	19,12	10,2	3,1	19,5	1,54
18:3 (n-3)	0,60	0,72	0,93	1,0	0,6	1,0	1,06
20:4 (n-6)	0,19	0	0,53	0	0	0,1	0,675
20:5 (n-3)	0	0	0,07	0	0	0	13,02
22:6 (n-3)	0	0	0,20	0	0	0	18,23

*Carne mecanicamente separada, **Salmão.
Fonte: USDA (2008).

FORMAS ALTERNATIVAS DE AGW3

1-Óleo vegetal geneticamente modificado:

- ✓ Inserção de gene especifico de microalgas
- ✓ 20% do total dos AG do óleo da semente LC-PUFA, EPA e DHA

2- Produção de microalga:

- ✓ Limitada a produção de algas ricas em DHA (Schizochytrium, Crypthecodinium e Ulkena)

3 - Fontes marinhas alternativas:

- ✓ Inclui o Krill e copépodos calanoides



nutrients

MDPI

Nutrients. 2014 May; 6(5): 2035–2058. PMCID: PMC4042577
Published online 2014 May 22. doi: 10.3390/nu6052035 PMID: 24858407

DHA-Containing Oilseed: A Timely Solution for the Sustainability Issues Surrounding Fish Oil Sources of the Health-Benefitting Long-Chain Omega-3 Oils

Soressa M. Kitessa,[1,*] Mahinda Abeywardena,[1] Chakra Wijesundera,[2] and Peter D. Nichols[3]

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Food and Chemical Toxicology

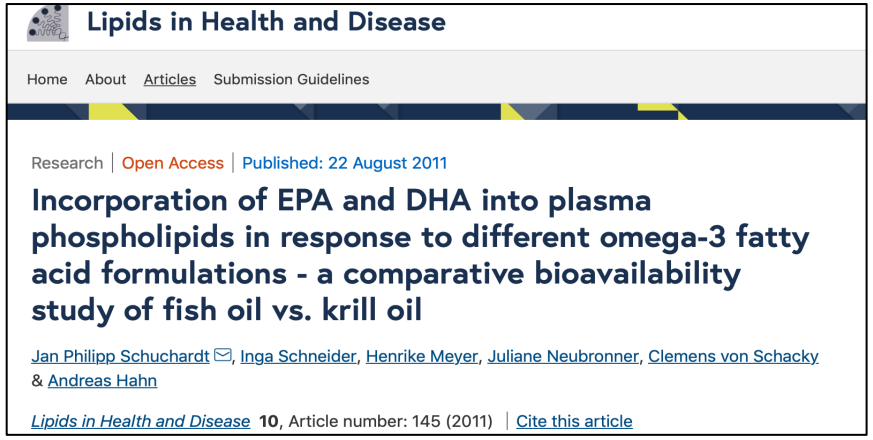
Volume 49, Issue 12, December 2011, Pages 3310-3318

Safety evaluation of DHA-rich Algal Oil from *Schizochytrium* sp.

I. Fedorova-Dahms [a], P.A. Marone [b], M. Bauter [b], A.S. Ryan [a]

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Lipids in Health and Disease

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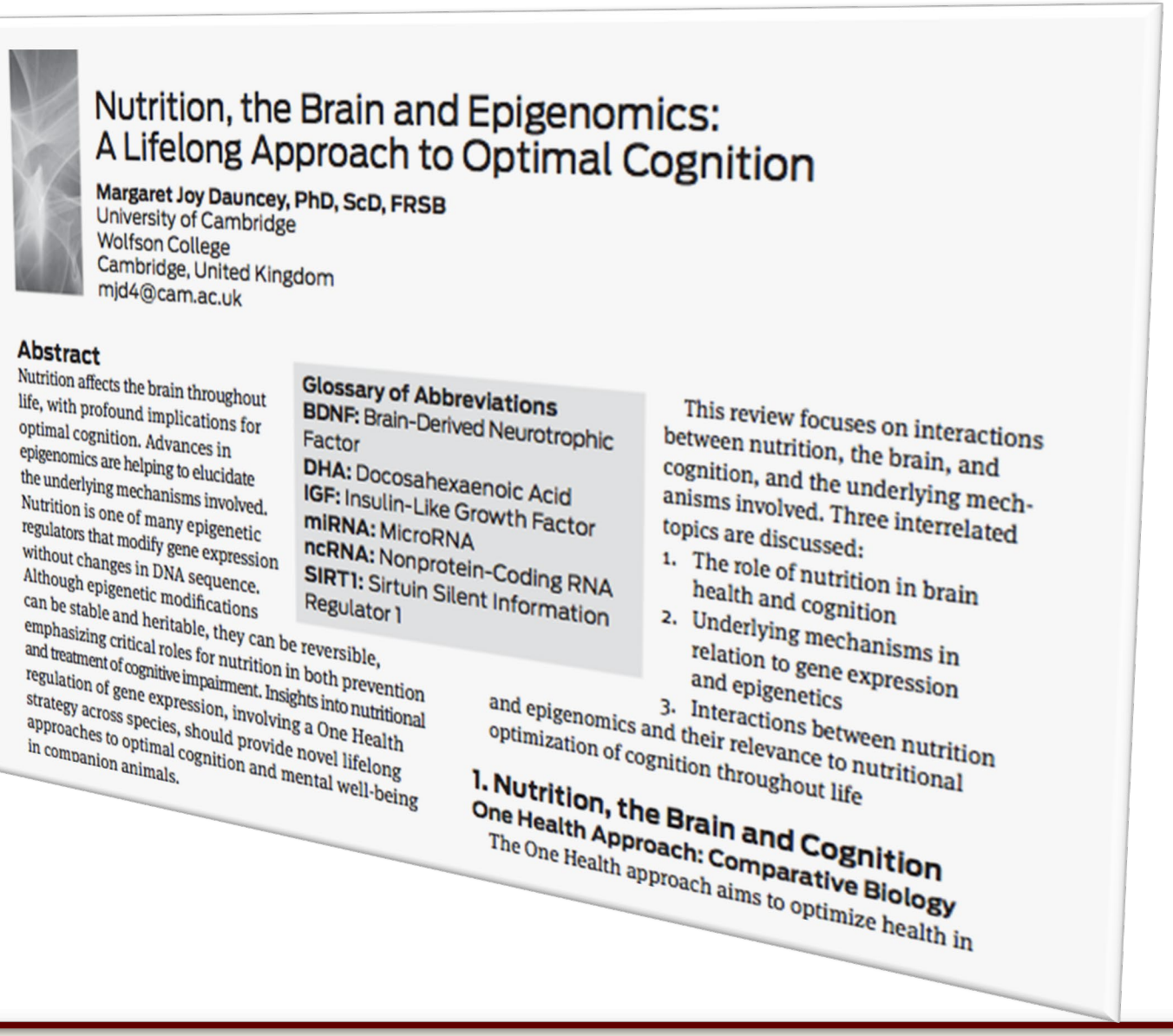
Incorporation of EPA and DHA into plasma phospholipids in response to different omega-3 fatty acid formulations - a comparative bioavailability study of fish oil vs. krill oil

Jan Philipp Schuchardt, Inga Schneider, Henrike Meyer, Juliane Neubronner, Clemens von Schacky & Andreas Hahn

Lipids in Health and Disease **10**, Article number: 145 (2011) | Cite this article

COGNICÃO EM CÃES E GATOS





Nutrition, the Brain and Epigenomics: A Lifelong Approach to Optimal Cognition

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Abstract

Nutrition affects the brain throughout life, with profound implications for optimal cognition. Advances in epigenomics are helping to elucidate the underlying mechanisms involved. Nutrition is one of many epigenetic regulators that modify gene expression without changes in DNA sequence. Although epigenetic modifications can be stable and heritable, they can be reversible, emphasizing critical roles for nutrition in both prevention and treatment of cognitive impairment. Insights into nutritional regulation of gene expression, involving a One Health strategy across species, should provide novel lifelong approaches to optimal cognition and mental well-being in companion animals.

Glossary of Abbreviations

BDNF: Brain-Derived Neurotrophic Factor
DHA: Docosahexaenoic Acid
IGF: Insulin-Like Growth Factor
miRNA: MicroRNA
ncRNA: Nonprotein-Coding RNA
SIRT1: Sirtuin Silent Information Regulator 1

This review focuses on interactions between nutrition, the brain, and cognition, and the underlying mechanisms involved. Three interrelated topics are discussed:

1. The role of nutrition in brain health and cognition
2. Underlying mechanisms in relation to gene expression and epigenetics
3. Interactions between nutrition and epigenomics and their relevance to nutritional optimization of cognition throughout life

1. Nutrition, the Brain and Cognition

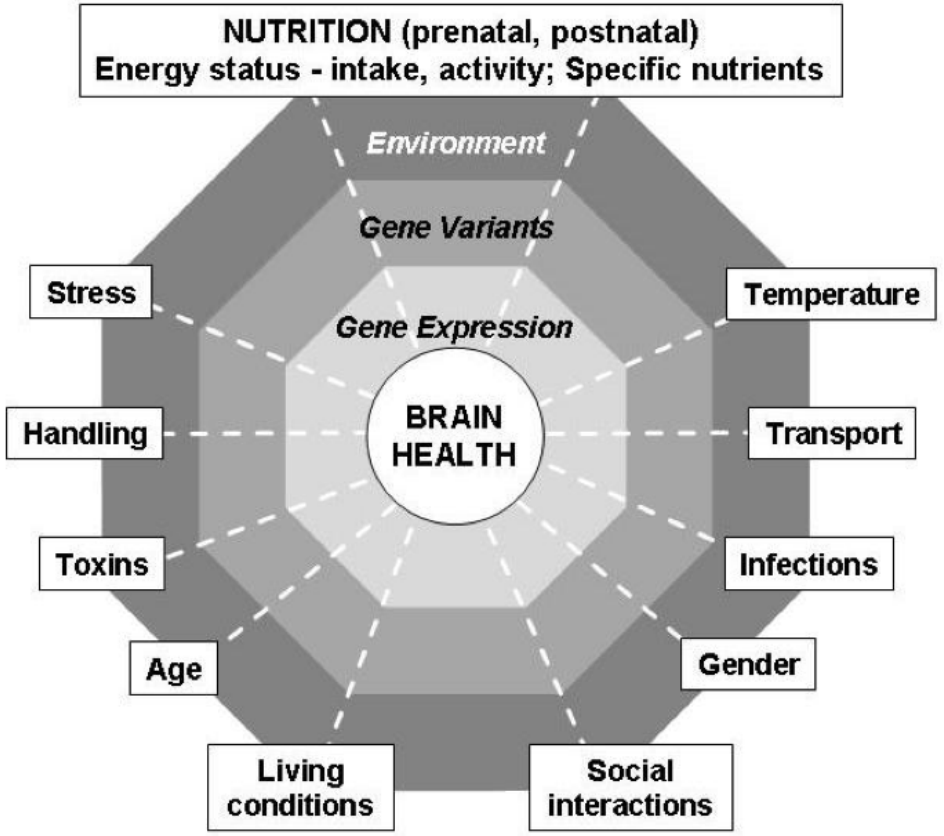
One Health Approach: Comparative Biology

The One Health approach aims to optimize health in



Nutrition, the Brain and Epigenomics: A Lifelong Approach to Optimal Cognition

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Prostaglandins, Leukotrienes and Essential Fatty Acids 118 (2017) 10–18

Contents lists available at ScienceDirect

Prostaglandins, Leukotrienes and Essential Fatty Acids

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

The oil-rich alga *Schizochytrium sp*. as a dietary source of docosahexaenoic acid improves shape discrimination learning associated with visual processing in a canine model of senescence

K.B. Hadley*, J. Bauer, N.W. Milgram

Clinical Research Department, DSM Nutritional Products, Columbia, MD 21045, USA

Fatty acid composition of experimental diets.[a]

Fatty acid	Diet	
	Control	Fortified
∑ of saturated FA (%)	3.76	4.04
∑ of monosaturated FA (%)	3.86	3.93
18:2n−6 (%)	1.64	1.54
[b]20:4n−6 (%)	0.03	0.02
18:3n−3 (%)	0.1	0.24
DHA (%)	[b] **< 0.01**	**0.1**
∑ of n−3 fatty acids (%)	0.11	0.35
∑ of n−6 fatty acids (%)	1.7	1.62

[a] Values represent the mean of the weight % of diet.
[b] Below the limit of detection.

- ✓ **O ácido docosahexaenóico é responsável por executar funções essenciais, como cobrir membranas celulares e auxiliar na formação da retina e dos neurônios**

- ✓ Expressão genética da proteina bdnf (Brain Derived Neurotrophic Factor)
- ✓ Componente da bainha de mielina, que cobre essas estruturas e permite se comunicar entre si.
- ✓ Intimamente relacionado com a proteção do sistema nervoso
- ✓ Ativação do PPAR-A diminui a produção de citocinas inflamatórias, como o IL-2

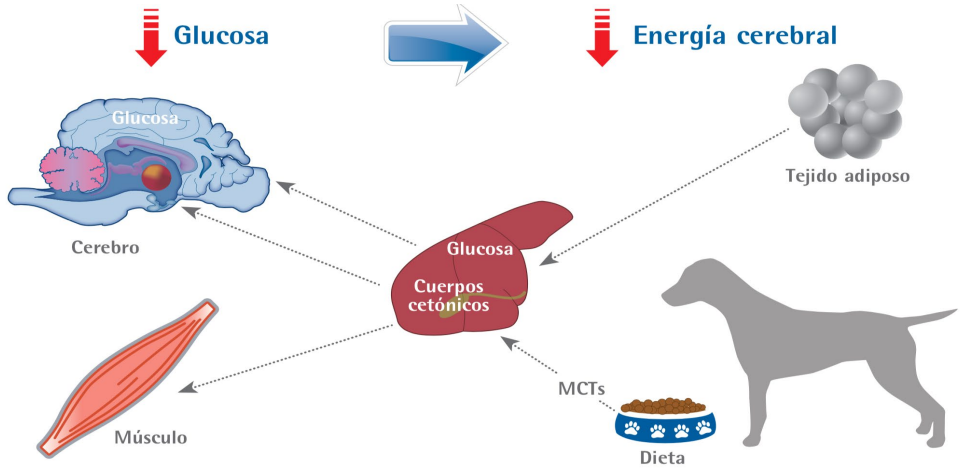
ALIMENTOS NEUROLOGICOS

Corpos cetônicos - fonte alternativa de energia produzida naturalmente pelo corpo que pode ser usada pelo cérebro, coração, rins e músculos.

Triglicérides de cadeia média (MCTs) aumentam os níveis de cetonas no cérebro sendo usados como fonte de energia alternativa para aliviar o déficit no metabolismo da glicose.

Epilepsia idiopática em cães e processos associados a crises epilépticas estão relacionados à redução do metabolismo da glicose cerebral.

Dietas baseadas em triglicerídeos de cadeia média têm se mostrado eficazes no controle da epilepsia humana.



Progress in Neuro-Psychopharmacology and Biological Psychiatry
Volume 29, Issue 3, March 2005, Pages 471-479



Review article

Therapeutic agents for the treatment of cognitive dysfunction syndrome in senior dogs

Gary Landsberg

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https://doi.org/10.1016/j.pnpbp.2004.12.012 Get rights and content

Prostaglandins, Leukotrienes and Essential Fatty Acids
Volume 113, October 2016, Pages 1-8



Kinetics of docosahexaenoic acid ethyl ester accumulation in dog plasma and brain ☆

Irina Dahms, Eileen Bailey-Hall, Norman Salem Jr.

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https://doi.org/10.1016/j.plefa.2016.08.001 Get rights and content

Review article | Published: 02 May 2005

Assessment of nutritional interventions for modification of age-associated cognitive decline using a canine model of human aging

Joseph A. Araujo, Christa M. Studzinski, Elizabeth Head, Carl W. Cotman & Norton W. Milgram

AGE **27**, 27–37(2005) | Cite this article

Original Paper | Published: 20 March 2009

Dietary Enrichment with Medium Chain Triglycerides (AC-1203) Elevates Polyunsaturated Fatty Acids in the Parietal Cortex of Aged Dogs: Implications for Treating Age-Related Cognitive Decline

Ameer Y. Taha, Samuel T. Henderson & W. M. Burnham

Neurochemical Research **34**, Article number: 1619 (2009) | Cite this article

580 Accesses | **18** Citations | **24** Altmetric | Metrics

ORIGINAL RESEARCH ARTICLE
Front. Nutr., 12 December 2018 | https://doi.org/10.3389/fnut.2018.00127

Efficacy of a Therapeutic Diet on Dogs With Signs of Cognitive Dysfunction Syndrome (CDS): A Prospective Double Blinded Placebo Controlled Clinical Study

Yuanlong Pan[1*], Gary Landsberg[2], Isabelle Mougeot[2], Stephanie Kelly[3], Hui Xu[1], Sandeep Bhatnagar[1], Cari L. Gardner[1] and Norton W. Milgram[2]

[1]Nestlé Purina Research, St. Louis, MO, United States
[2]CanCog Technologies, Toronto, ON, Canada
[3]Vivocore Inc., Toronto, ON, Canada

Journal of the American Veterinary Medical Association
December 1, 2019, Vol. 255, No. 11, Pages 1245-1254
https://doi.org/10.2460/javma.255.11.1245

Nutrition and the aging brain of dogs and cats

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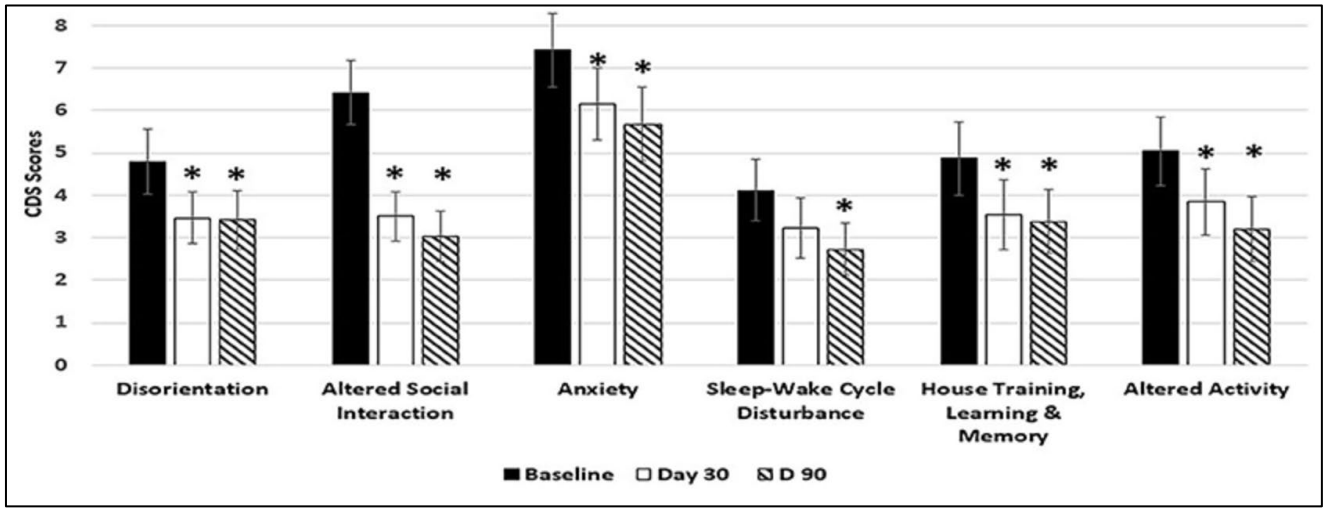
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ORIGINAL RESEARCH ARTICLE
Front. Nutr., 12 December 2018 | https://doi.org/10.3389/fnut.2018.00127

Efficacy of a Therapeutic Diet on Dogs With Signs of Cognitive Dysfunction Syndrome (CDS): A Prospective Double Blinded Placebo Controlled Clinical Study


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	Control	6.5% MCT diet	9% MCT diet
Crude Protein (%)	32.9	32.5	32.9
Crude Fat (%)	17.9	18.2	21.0
Moisture (%)	6.6	6.8	6.9
Crude Fiber (%)	1.70	1.57	1.27
Ash (%)	6.5	6.3	6.5
MCT (%)*	0	6.5	9
BPB INGREDIENTS			
DHA (%)	0	0.23	0.22
EPA (%)	0	0.30	0.29
Arginine (%)	1.78	1.79	1.93
Thiamine (B1, mg/kg)*	8.16	58.68	56.57
Riboflavin (B2, mg/kg)	5.60	26.5	28.3
Niacin (B3, mg/kg)*	86.99	225.76	220.78
Pantothenic acid (B5, mg/kg)	19.20	77.3	83.2
Pyridoxine (B6, mg/kg)	4.39	17.8	18.5
Folic acid (B9, mg/kg)	1.64	8.39	9.32
Cobalamine(B12, mg/kg)	0.076	0.175	0.156
Vitamin E (IU/kg)	52.6	552.08	490.44
Vitamin C (mg/kg)	9.65	151	143
Selenium (mg/kg)	0.704	0.681	0.806
Calculated ME** (KJ/g)	15.67	15.66	16.26
Main ingredients	Chicken, Rice, Corn Gluten Meal, Poultry By-Product Meal, Dried Egg, Wheat Flour. Medium Chain Triglyceride, Fish Meal, Soy Protein Isolate, Tallow Edible w/Vitamin E.		

Abstract

Journal of the American Veterinary Medical Association
September 1, 2012, Vol. 241, No. 5, Pages 583-594
https://doi.org/10.2460/javma.241.5.583

Evaluation of cognitive learning, memory, psychomotor, immunologic, and retinal functions in healthy puppies fed foods fortified with docosahexaenoic acid–rich fish oil from 8 to 52 weeks of age

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The authors thank Dr. Kim Friesen of Elanco Animal Health for assistance with study design.

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Objective—To assess effects of foods fortified with docosahexaenoic acid (DHA)–rich fish oil on cognitive, memory, psychomotor, immunologic, and retinal function and other measures of development in healthy puppies.

Design—Evaluation study.

Animals—48 Beagle puppies.

Procedures—Puppies were assigned to 3 groups after weaning (n = 16/group) and received 1 of 3 foods (low-DHA, moderate-DHA, or high-DHA food) as their sole source of nutrition until 1 year of age. Visual discrimination learning and memory tasks, psychomotor performance tasks, and physiologic tests including blood and serum analysis, electroretinography, and dual-energy x-ray absorptiometry were performed at various time points. Anti-rabies virus antibody titers were evaluated 1, 2, 4, and 8 weeks after vaccination at 16 weeks of age.

Results—Foods had similar proximate analysis results but varied in concentration of DHA from fish oil; the high-DHA food also contained higher concentrations of vitamin E, taurine, choline, and L-carnitine than did other foods. The high-DHA group had significantly better results for reversal task learning, visual contrast discrimination, and early psychomotor performance in side-to-side navigation through an obstacle-containing maze than did the moderate-DHA and low-DHA groups. The high-DHA group had significantly higher anti-rabies antibody titers 1 and 2 weeks after vaccination than did other groups. Peak b-wave amplitudes during scotopic electroretinography were positively correlated with serum DHA concentrations at all evaluated time points.

Conclusions and Clinical Relevance—Dietary fortification with fish oils rich in DHA and possibly other nutrients implicated in neurocognitive development following weaning improved cognitive, memory, psychomotor, immunologic, and retinal functions in growing dogs.

CONCLUSÕES

- ✓ Exercem uma variedade de benefícios para a saúde do cão e do gato através da sua ação molecular, celular e fisiológica
- ✓ Modulações na resposta imune com a relação 6:3 estão bem estabelecidas para a prevenção de enfermidades e para várias enfermidades, variando de 10:1 a 1:1.
- ✓ Papel do gama-linolenico na modulação inflamatória, juntamente com o. EPA também é bem estabelecido
- ✓ Relações entre os ômegas 3 (EPA;DHA) dependem do objetivo proposto e ainda devem ser mais pesquisadas para carnívoros, principalmente com relação à cognição





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