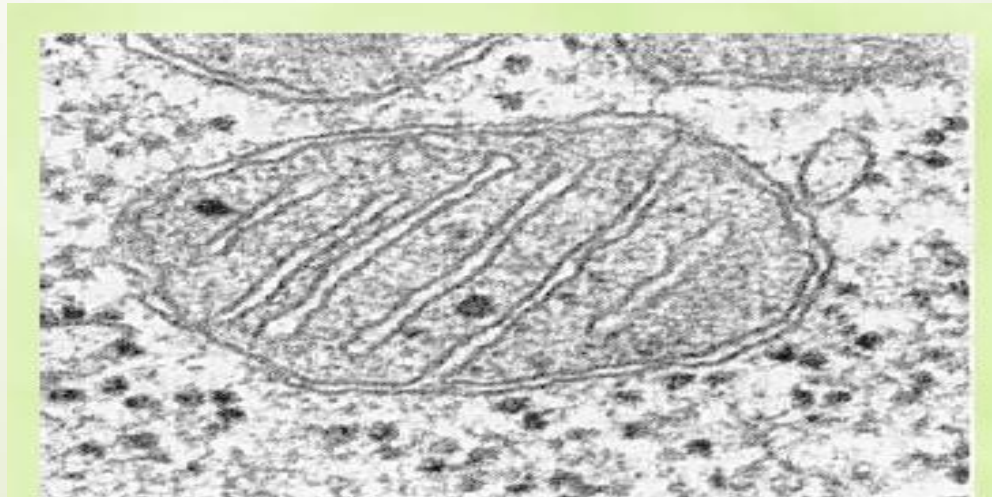


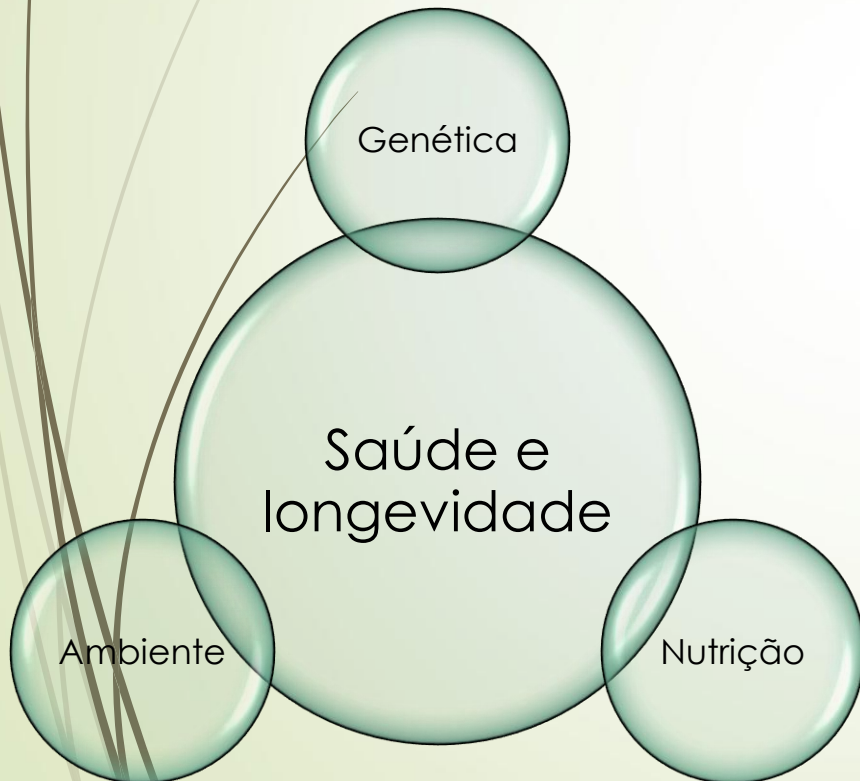
Nutracêuticos que auxiliam na saúde do animal senil

quais realmente funcionam e quando iniciar a
utilização?



ENVELHECIMENTO

O envelhecimento é um processo biológico complexo, pouco compreendido, caracterizado por uma alteração progressiva e irreversível dos tecidos e células, levando à diminuição da vitalidade, das reservas orgânicas e do funcionamento dos órgãos.



DEFINIÇÕES

Os termos "sênior" ou "idoso" referem-se à funcionalidade do animal

Os termos "geriátrico" ou "velho" referem-se apenas à idade cronológica do paciente

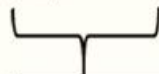
IDADE DE ANIMAIS GERIÁTRICOS

Espécie/Peso	Geriatría
Cães	-
Raças pequenas (2 - 10kg)	11,5 anos
Raças médias (10 - 22kg)	10 anos
Raças grandes (22 - 40kg)	9 anos
Raças gigantes (> 40kg)	7,5 anos
Gatos	12 anos

Adaptado de Goldston (1995) e NRC (2006)

CLASSIFICAÇÃO BASEADA EM ASPECTOS COMPORTAMENTAIS

Years																			
0	0.5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18+
P	J	Y.A.	Mature Adult				Senior					Geriatric							
							Early Senior		Late Senior							Very aged			



Months																								
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Puppy						Juvenile						Young Adult												
						Adolescence (6 - 24 months)																		

Harvey (2021)

QUANDO MUDAR?

- Verificar quando as alterações aparecem com maior frequência (Groves, 2019)

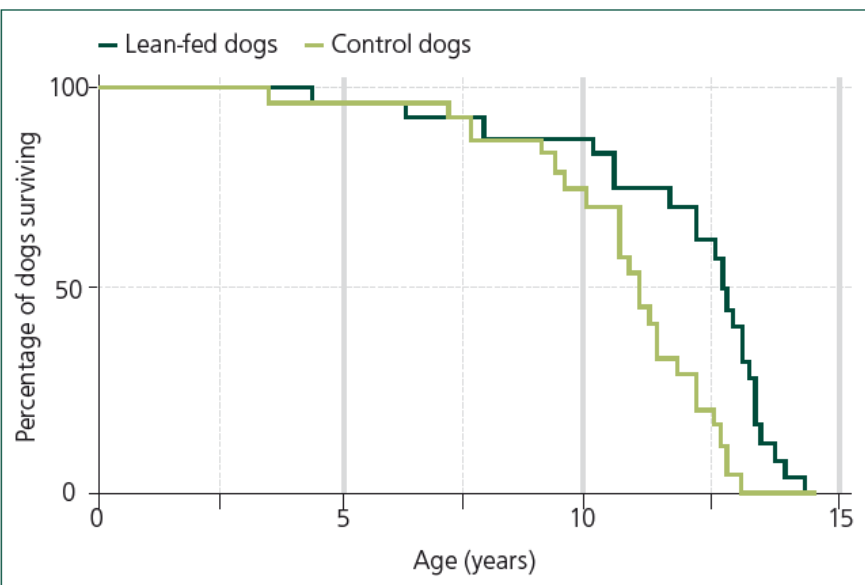


Figure 1. Survival curves for 24 Labradors with average body condition score (BCS) of 4.6 ('restricted feeding') and a second group of 24 Labradors with average BCS 6.7 ('controlled feeding'); BCS was measured from 6–12 years of age. Adapted from Kealy et al (2002), with permission.

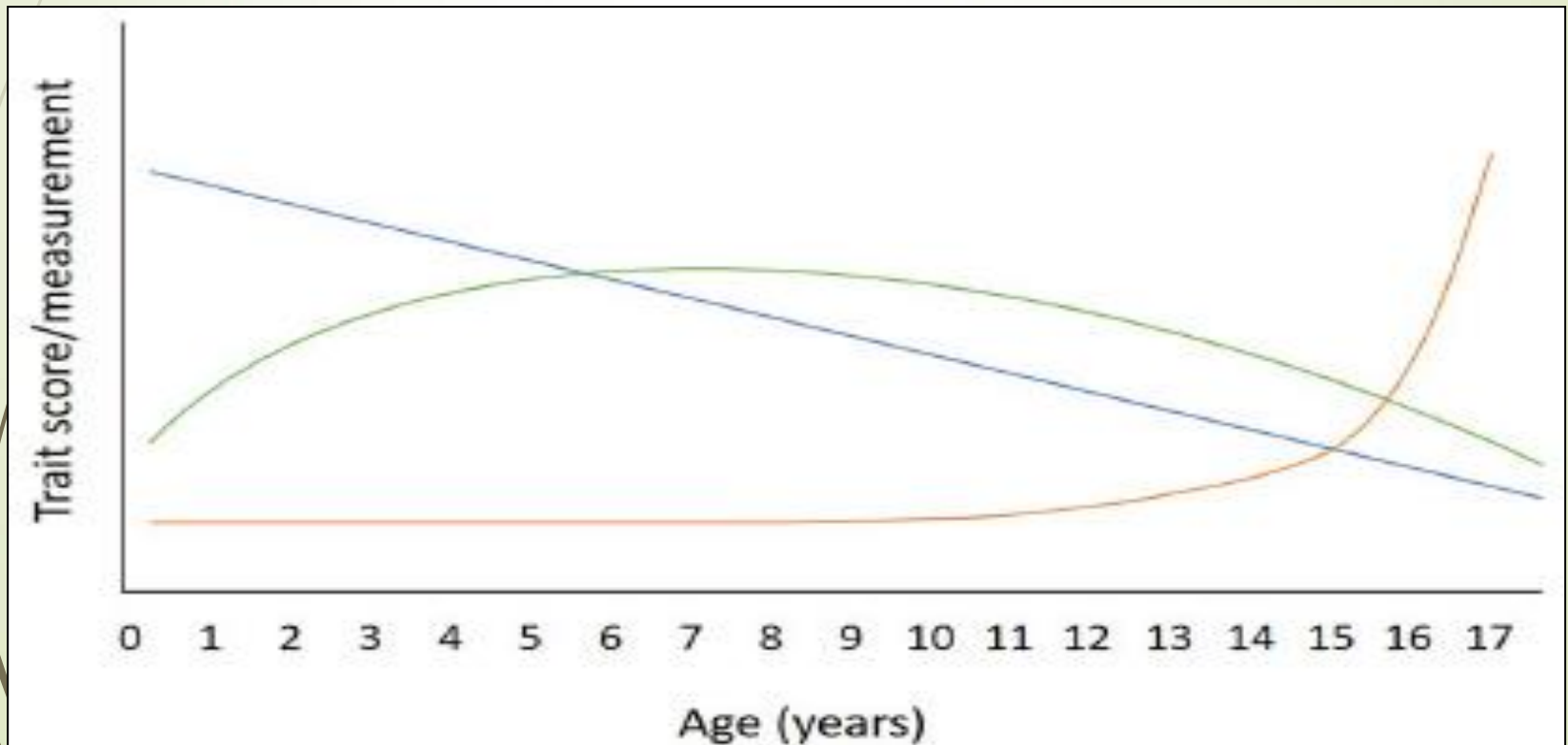
Table 1. Table summarising percentage of obesity and underweight cats by age

Age (years)	Body weight (kg)	Percentage obese	Percentage underweight
1-7	3.7 ± 0.8	<1%	<1%
7-12	4.4 ± 1.7	28%	<1%
Over 12	2.9 ± 1.0	<1%	23%

Adapted from Patil and Cupp (2010), with permission.

QUANDO MUDAR?

- Dificuldade em definir quando em função das diferentes modificações ao longo da vida (Harvey, 2021)

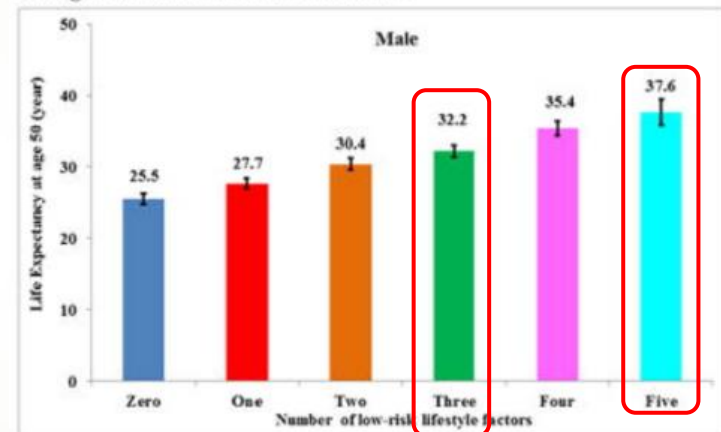


QUANDO MUDAR?

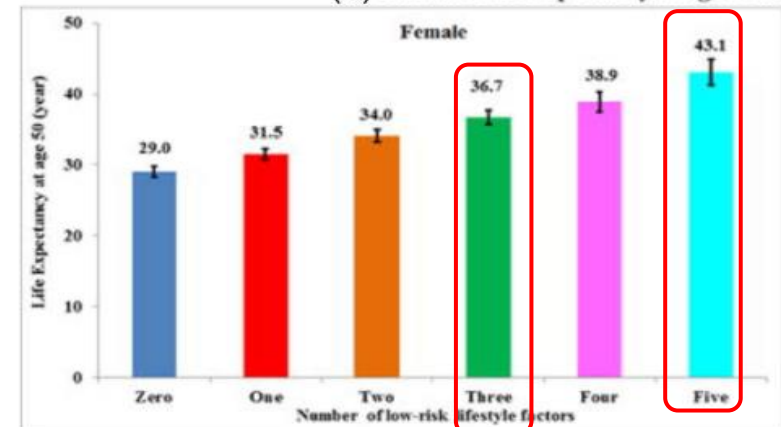
Aditivo de fatores na expectativa de vida em humanos (expectativa de vida acima dos 50 anos)

- Não-fumante
- Atividade física
- Alimentação saudável
- Baixa ingestão de álcool
- Peso ideal

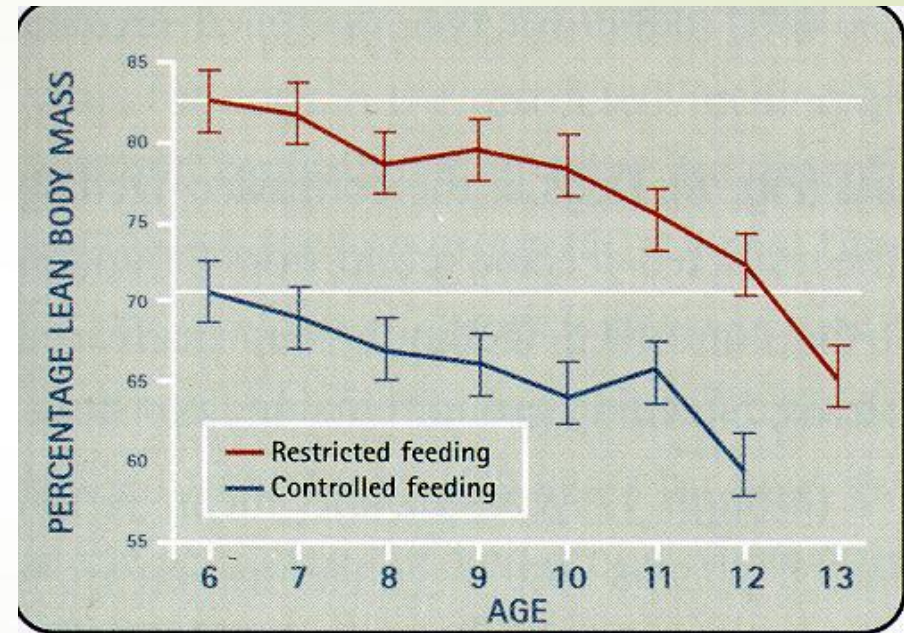
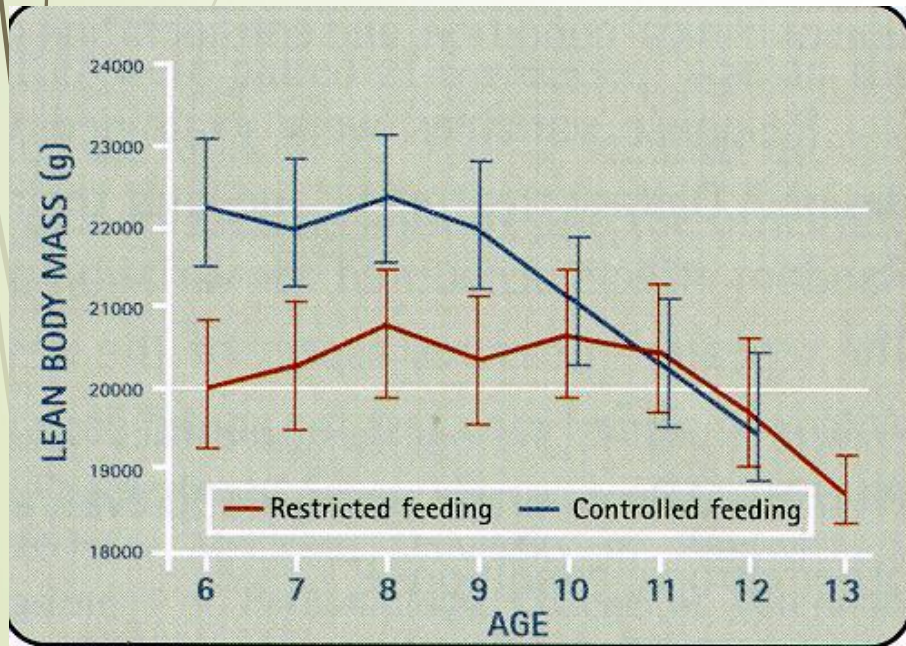
according to the number of low-risk factors



(b) Estimated life expectancy at age 50 ac



SARCOPENIA E MUDANÇAS DIETÉTICAS



Queda da massa corporal magra precede o início de doenças (causa ou consequência?)

PRINCIPAIS ALTERAÇÕES FISIOLÓGICAS

- Perda dos sentidos especiais
- Modificação nas necessidades energéticas
- Perda de massa magra corporal
- Redução na capacidade adaptativa dos sistemas
- Redução na cognição
- Fragilidade imunológica (*imunosenescência*)

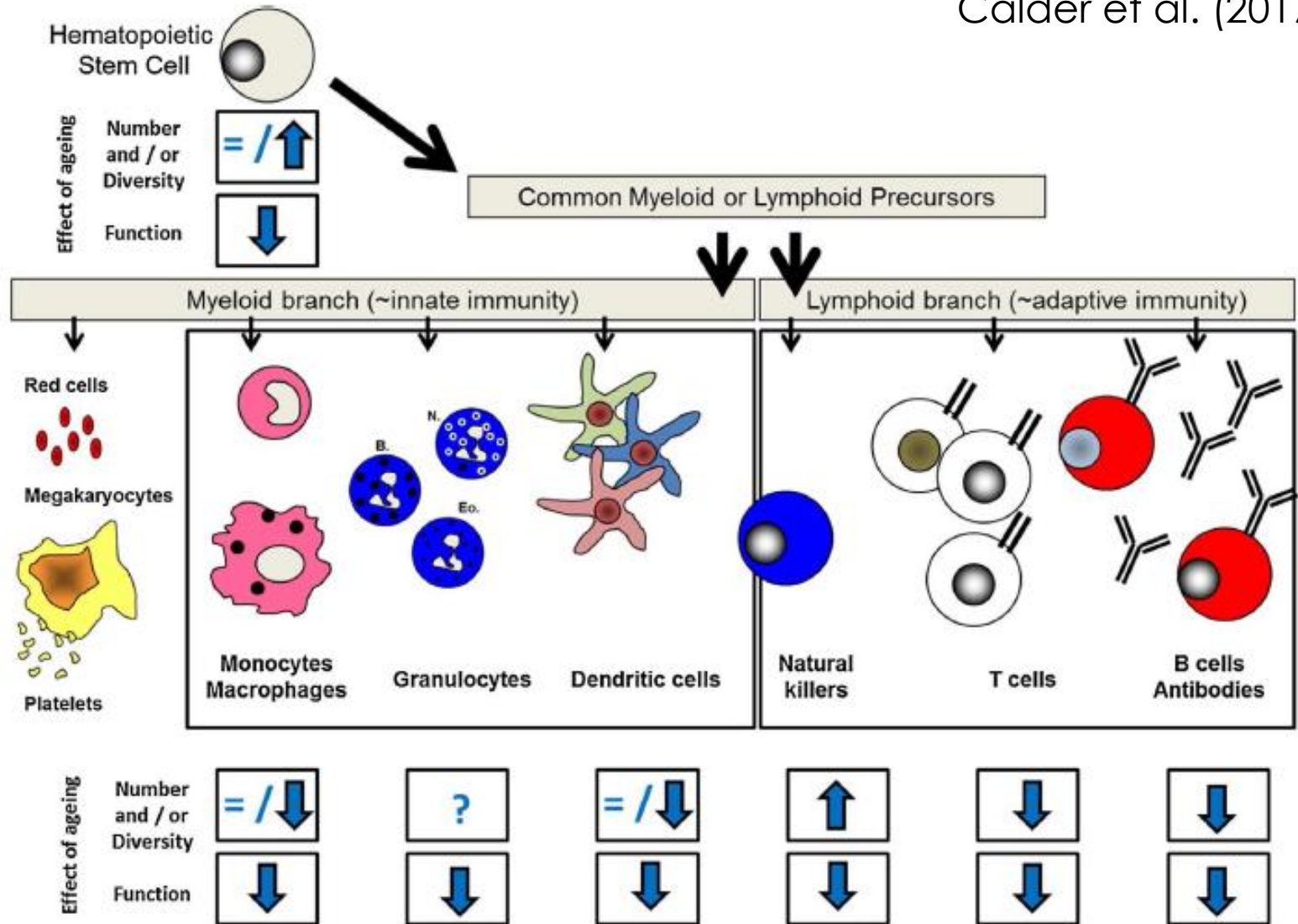
OBJETIVO NA PREVENÇÃO DOS EFEITOS DO ENVELHECIMENTO

- Imunosenescencia
- Inflammageing
- Sarcopenia
- Disfunção cognitiva



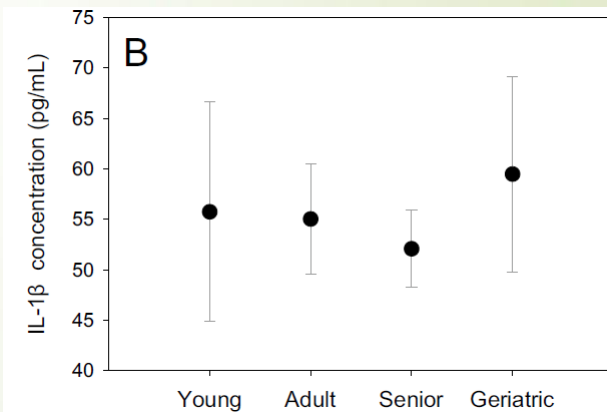
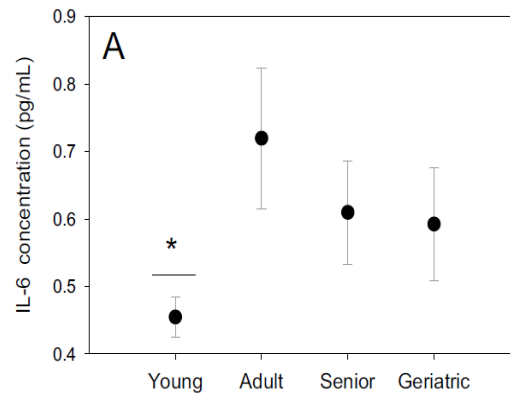
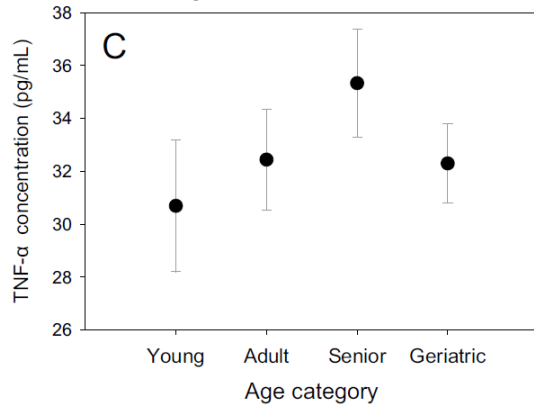
IMUNOSENESCENCIA

Calder et al. (2017)



MARCADORES DO INFLAMMAGEING EM CÃES

- ➔ Jiménez (2023) – 180 cães de diferentes portes e idades



INFLAMMAGEING

Calder et al. (2017)

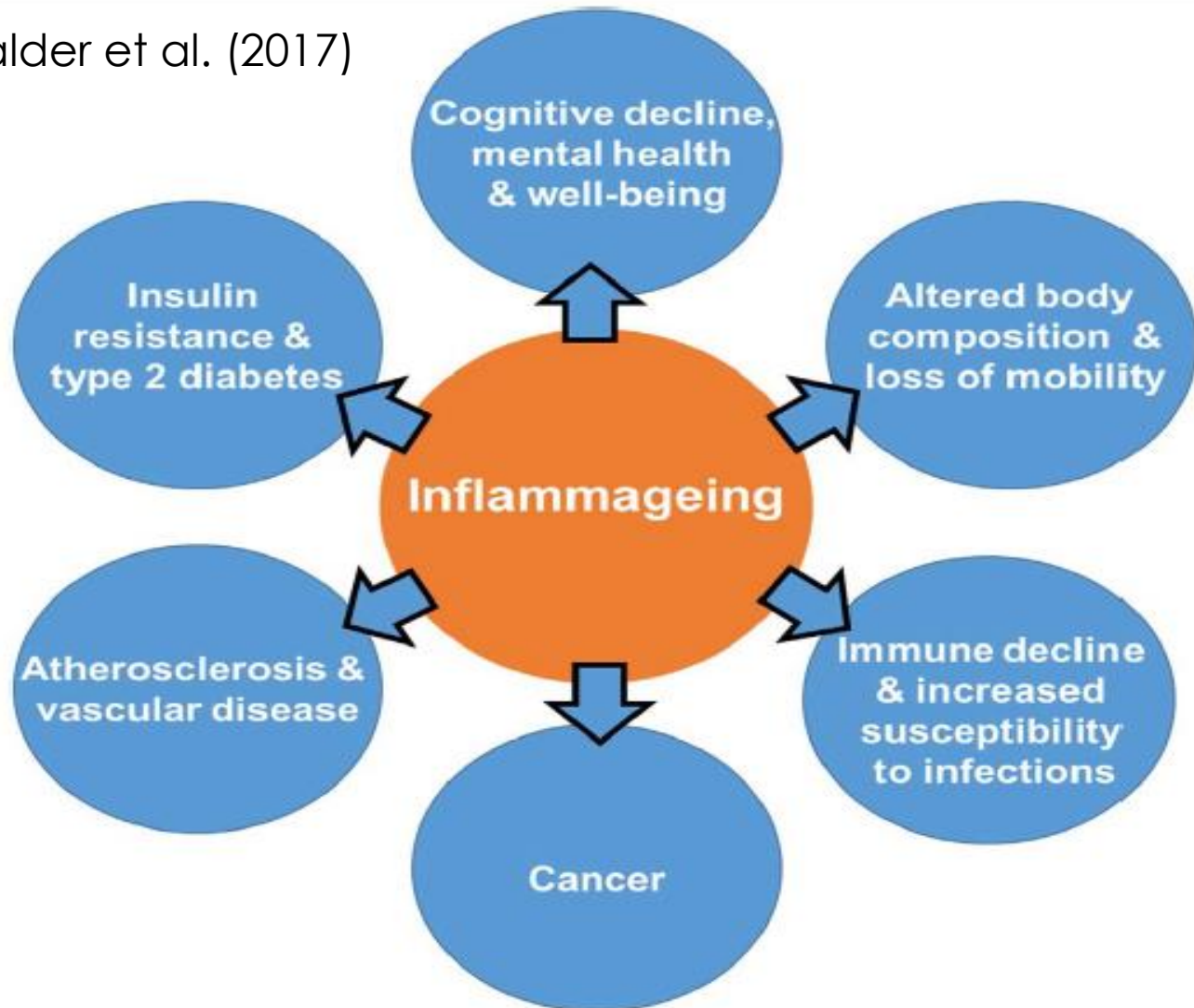
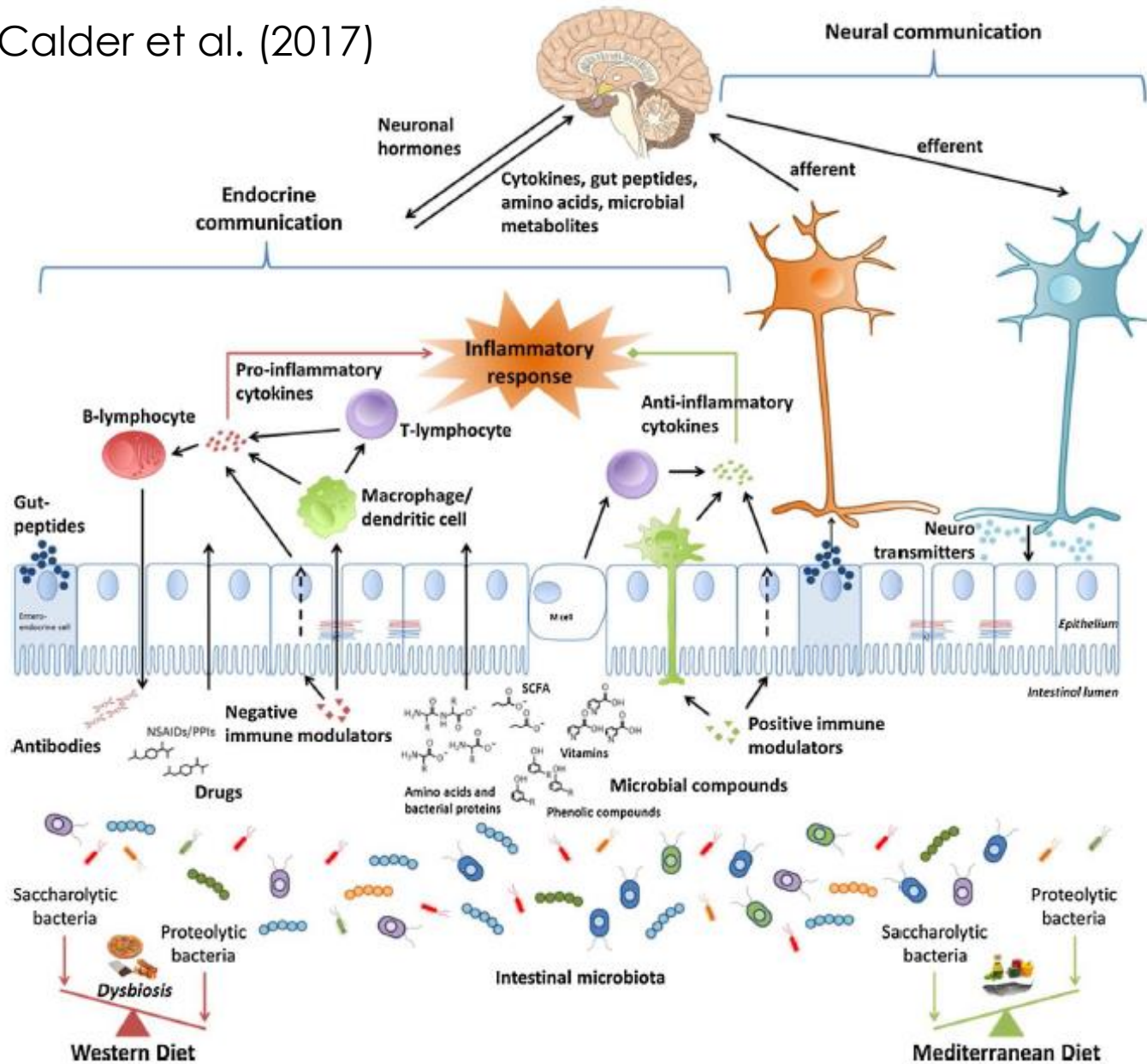


Fig. 2. Central role of inflammaging in chronic conditions of ageing.

INFLAMMAGEING

Calder et al. (2017)



SARCOPENIA

► Interação complexa de:



Distúrbios da
inervação

Diminuição de
hormônios

Aumento de
mediadores
inflamatórios

Alterações da
ingestão
protéico-
energética que
ocorrem durante
o
envelhecimento

SARCOPENIA

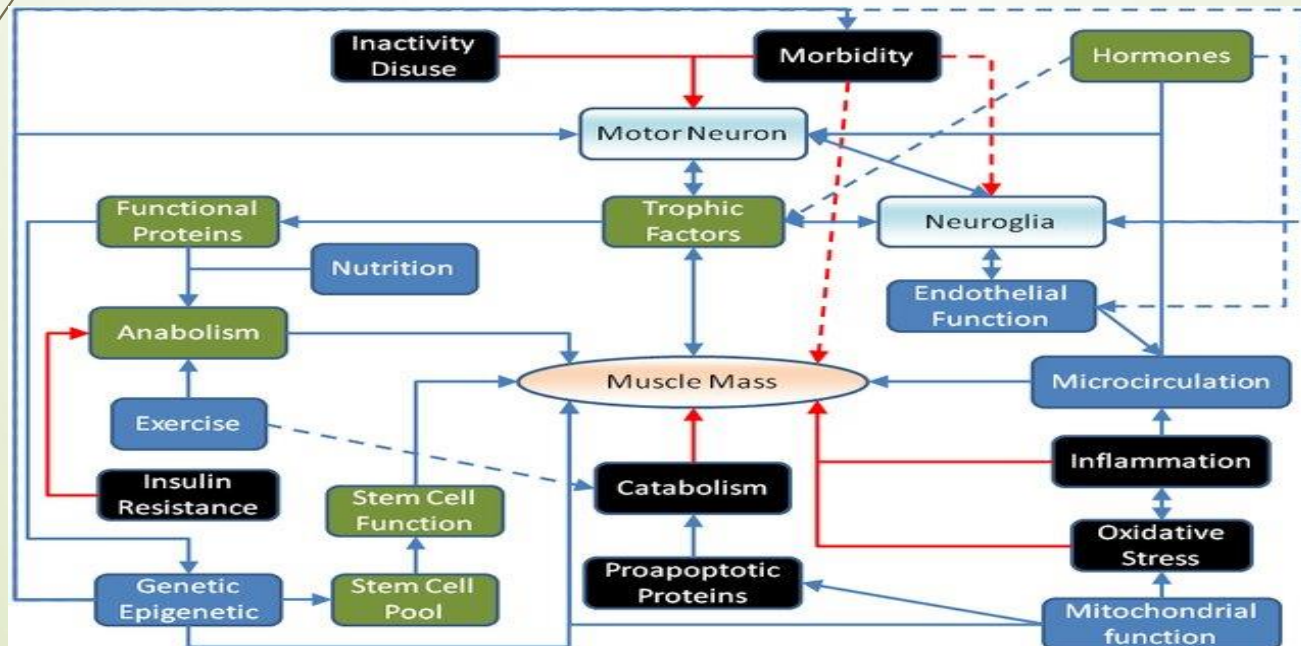
Perda acentuada de Massa Magra corporal



SARCOPENIA

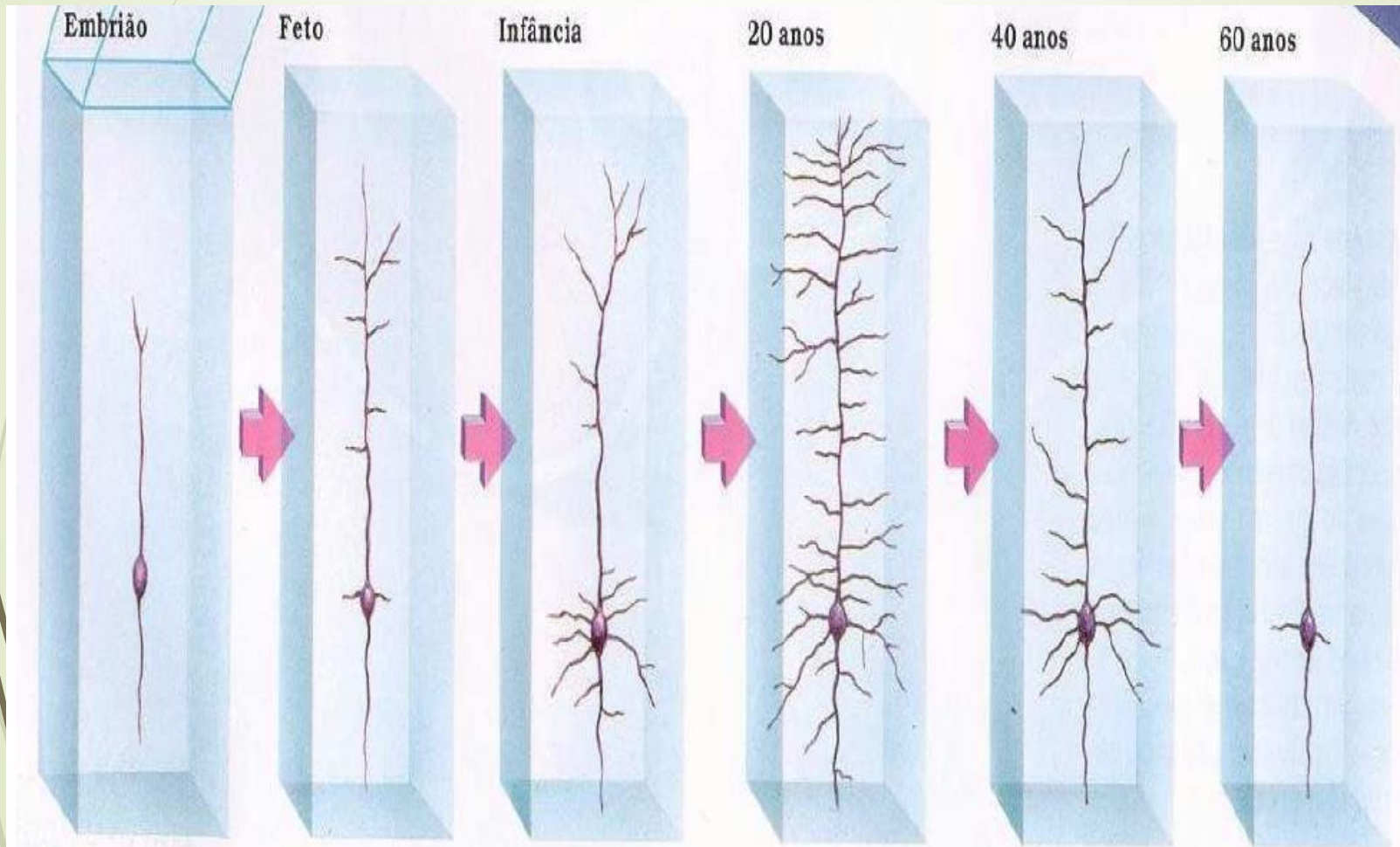
► Características em cães e gatos Laflamme (2018)

- Cerca 30% de perda de massa muscular
- Idade mais observada: 10-15 anos
- Restrição calórica mantém maior MM



COGNIÇÃO

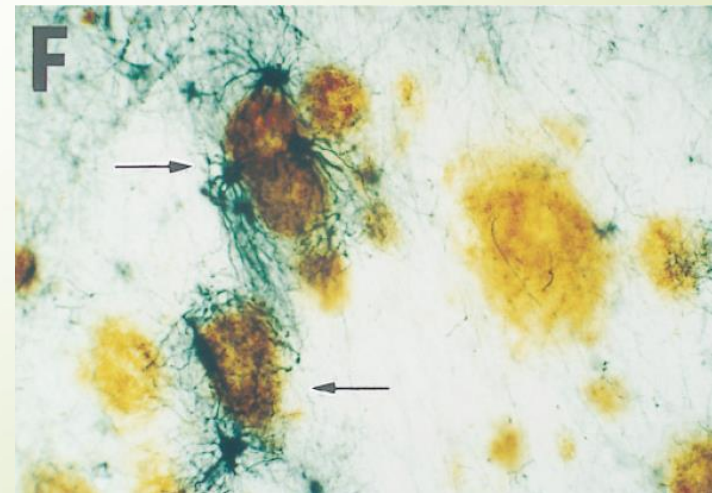
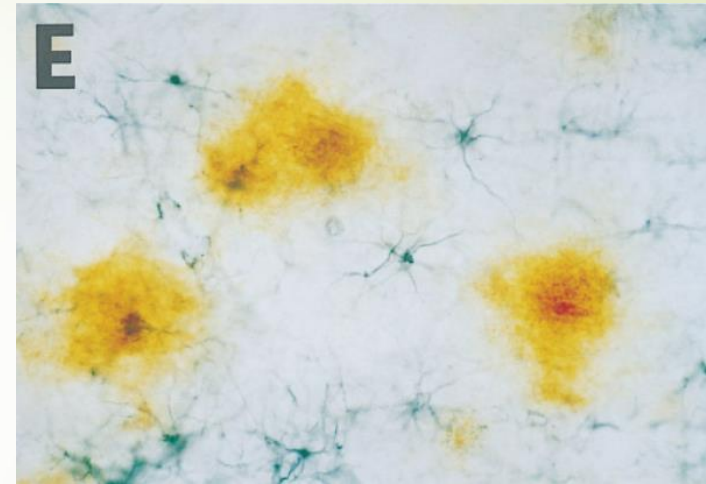
👉 Envelhecimento do SNC



DISFUNÇÃO COGNITIVA

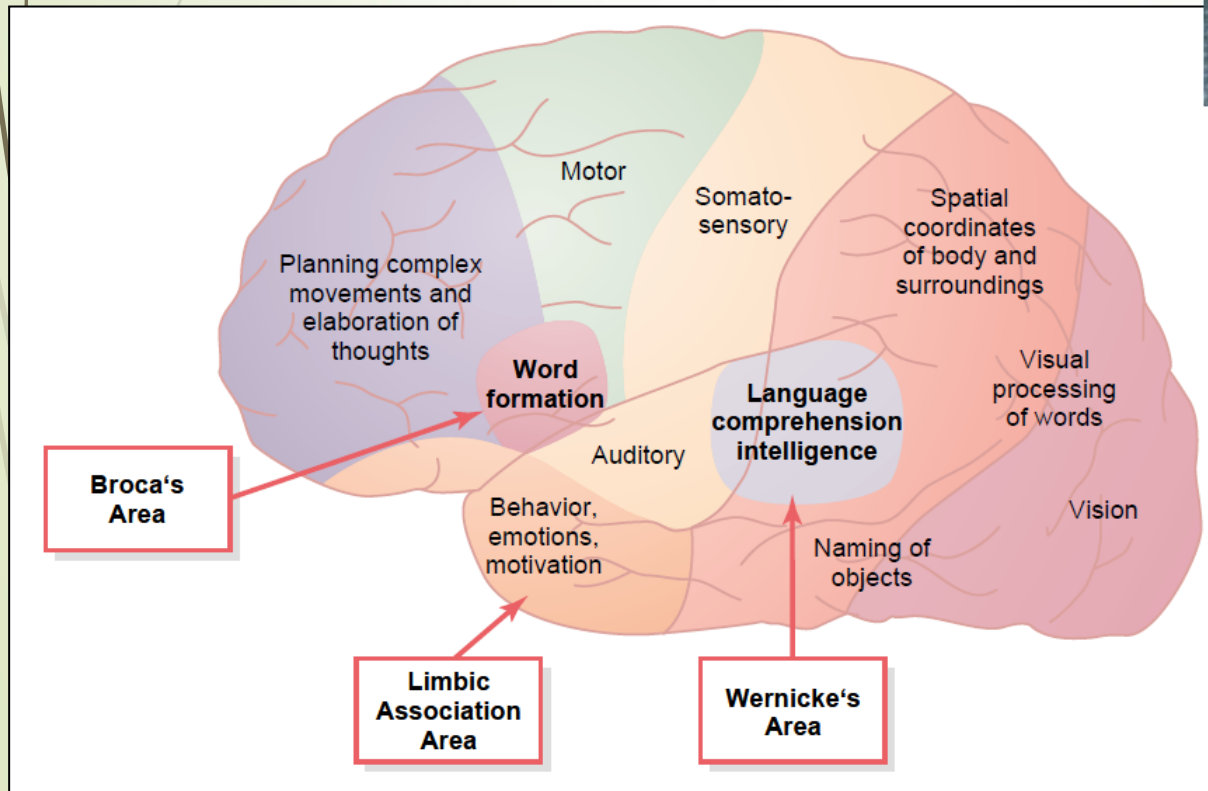
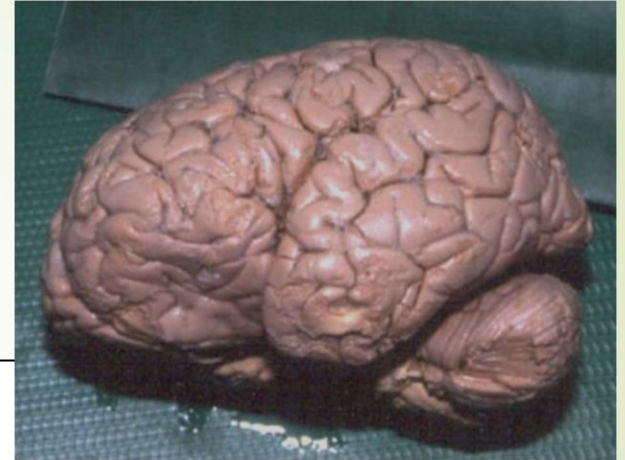
Modificações microscópicas

- *Deposição de β -amilóide*
- *Redução na síntese/degradação de NT*
- *Degeneração da bainha de mielina*
- *Redução do número de mitocôndrias*
- *Redução das defesas antioxidantes*
- *Redução na atividade da melatonina*
- *Aumento no dano do DNA*



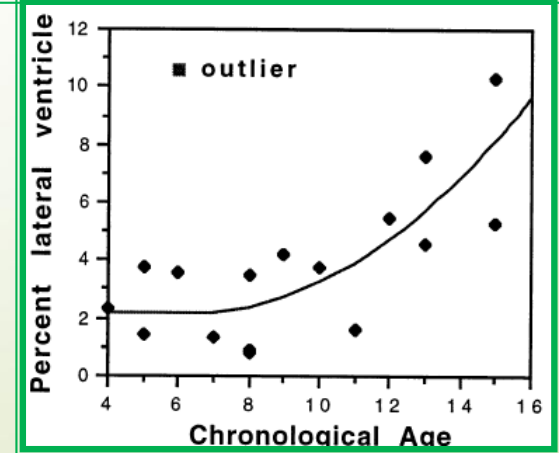
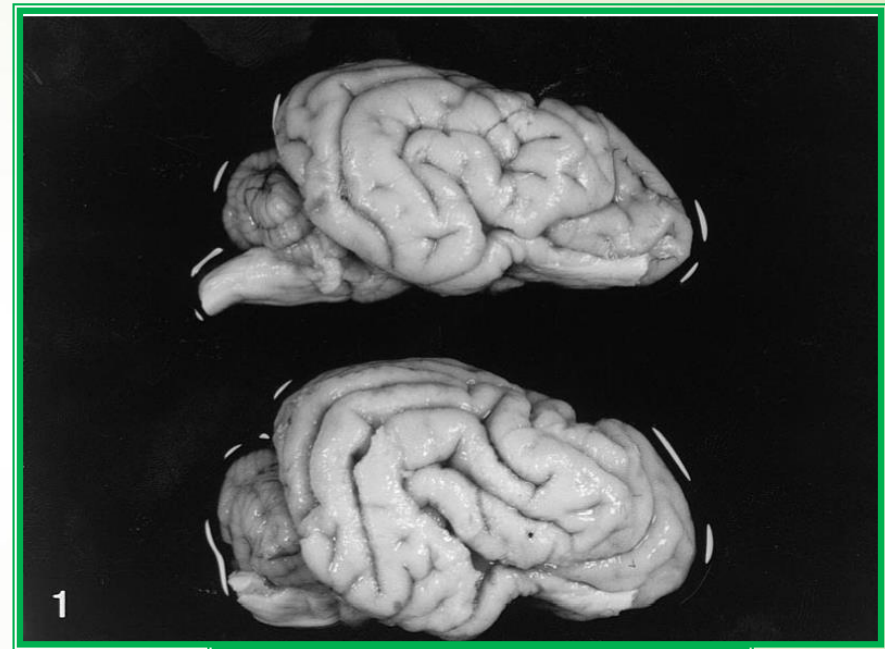
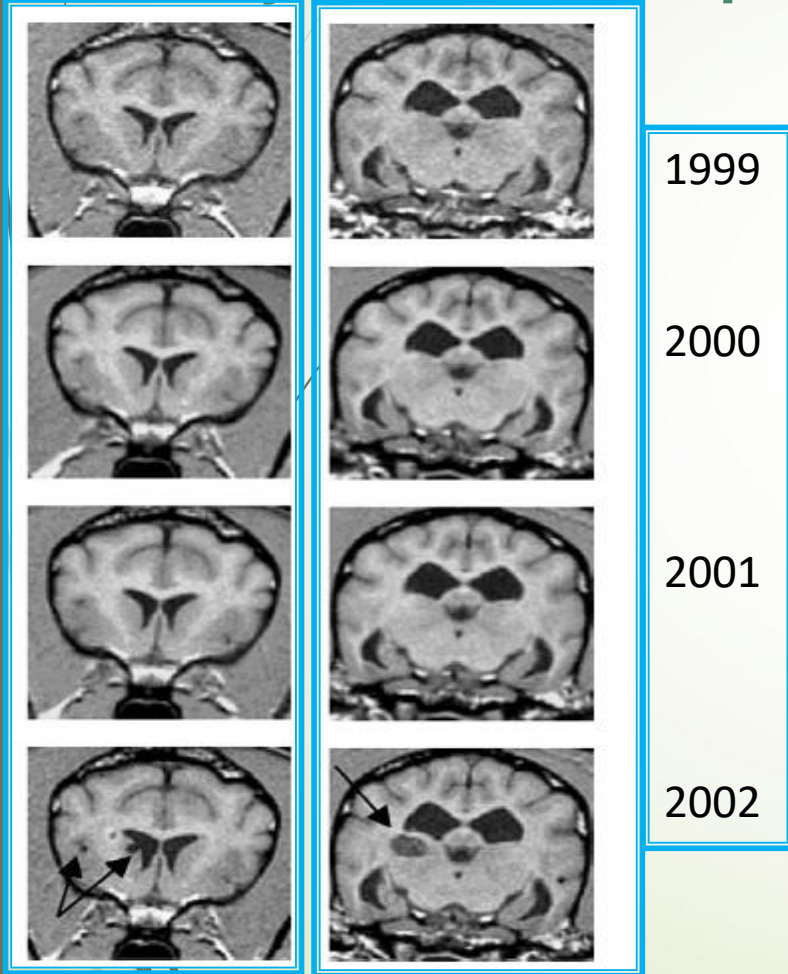
ALTERAÇÕES NO SNC COM A IDADE

👉 Envelhecimento do SNC



ALTERAÇÕES NO SNC

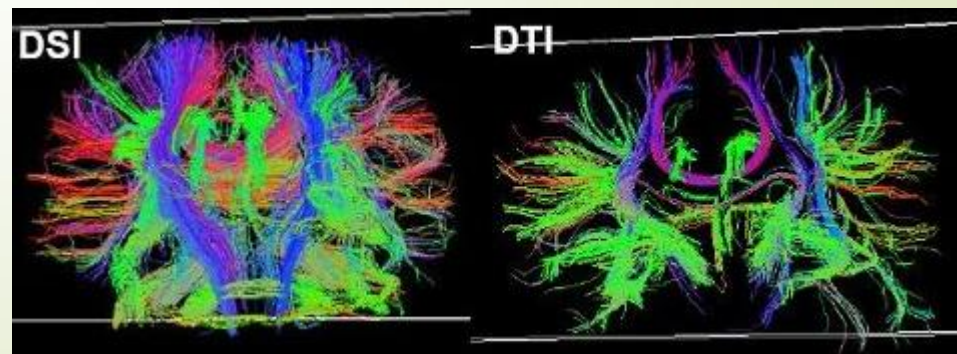
Modificações macroscópicas



Su et al. (1999; 2005)

ALTERAÇÕES NO SNC

- **Atrofia cortical**
- **Degeneração mielínica da substância branca**
- **Acúmulo de proteínas degradadas**
- **Dano ao DNA**
- **Redução dos mecanismos endógenos de proteção Aox**



ESTRATÉGIAS NUTRICIONAIS

- Restrição calórica
- Proteína e aminoácidos
- Ácidos graxos ômega-3
- Ácidos graxos de cadeia média
- Antioxidantes
- Prebióticos

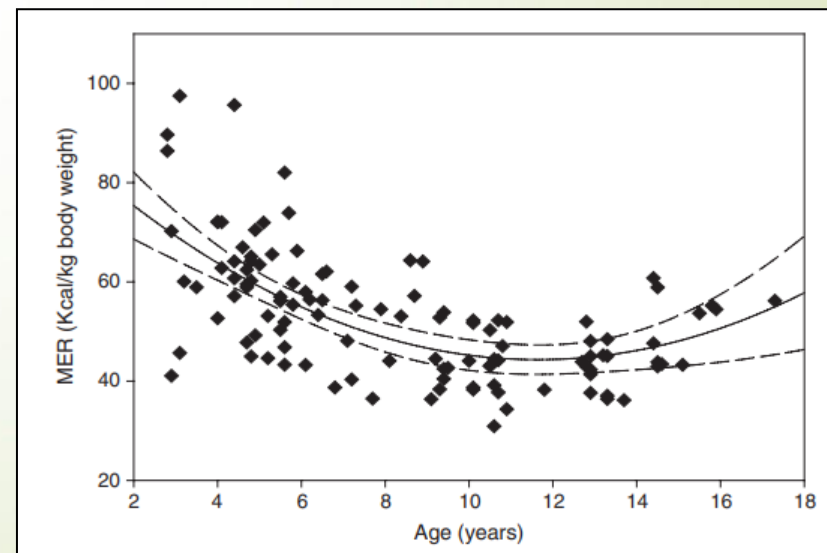


NECESSIDADE ENERGÉTICA

Recomendações práticas para a NEM de cães de idades diferentes"

Idade (anos)	kcal EM/kg ^{0,75/dia}	kJ EM/kg ^{0,75/dia}
1 – 2	130 (125-140)	550 (523-585)
3 – 7	110 (95-130)	460 (398-545)
> 7 (cães senior)	95 (80-120)	398 (335-500)

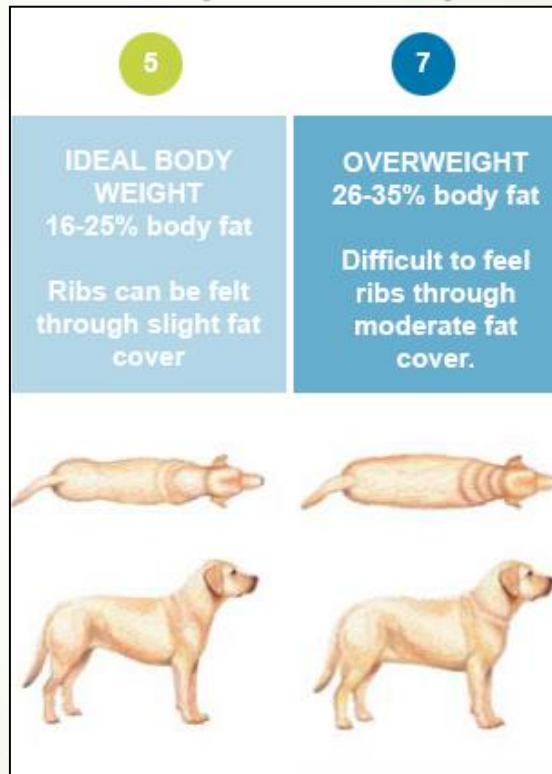
Sexo - Atividade	kcal EM/kg ^{0,67/dia}	kcal EM/kg ^{PC/dia} (gato de 4 kg)
Gatos castrados e/ou que vivem em ambientes internos	52-75	35-45
Gatos ativos	100	60-65



RESTRIÇÃO DIETÉTICA EM CÃES

Estudo de longevidade (Purina)

Expectativa média de vida
Controle 11,2 anos
RD 13 anos ($p < 0,01$)



Escore condição corporal (média dos 6 aos 12 anos)
Controle 6,7
RD 4,6 ($p < 0,05$)

RESTRIÇÃO DIETÉTICA EM CÃES

Imunosenescência

Retardo no declínio imunológico consequente ao envelhecimento

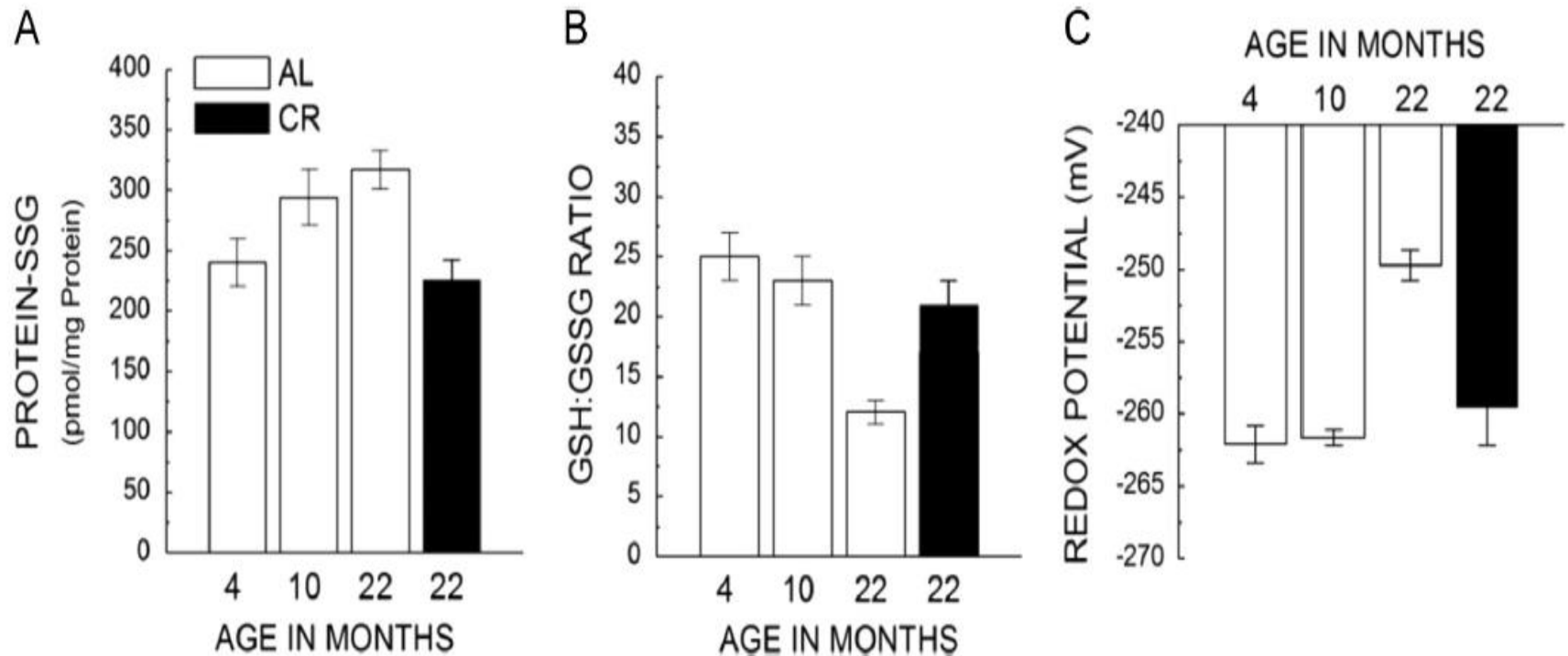
- ↓ Resposta linfoproliferativa
- ↓ CD4
- ↓ %Inf. B
- ↑ % linf. T
- ↑ CD8
- ↓ Poder de fagocitose

Foram aliviados com a restrição dietética

Justifica menor morbidade e maior longevidade verificados

RESTRIÇÃO CALÓRICA E LONGEVIDADE

Efeitos oxidativos em ratos alimentados AL ou CR.



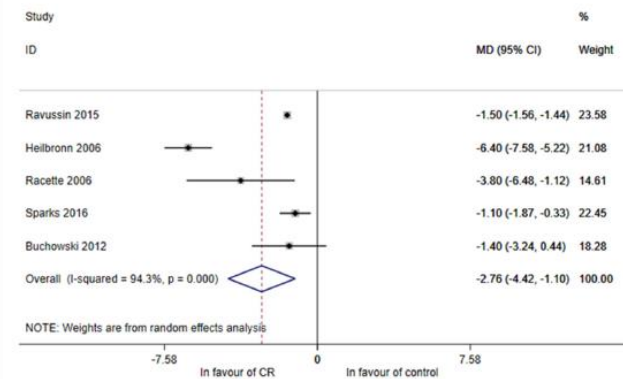
METANÁLISES - HUMANOS

- Restrição calórica (Caristia et al., 2020)

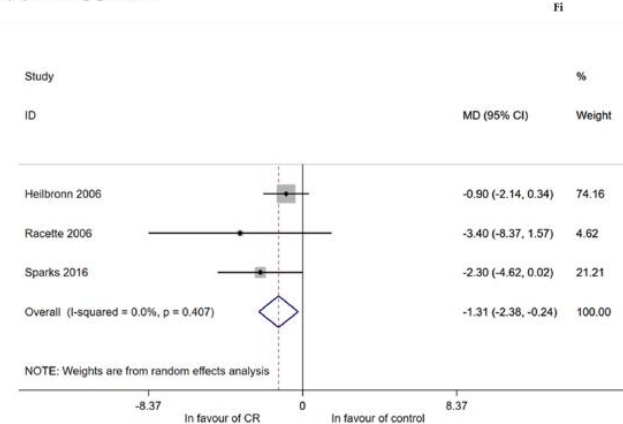
Características

- 29 estudos
- Espécie: humanos
- n = 334 indivíduos
- Tratamento: Restrição calórica
- Conclusão

(a) Fasting insulin



(b) Fasting glucose



METANÁLISES - HUMANOS

SCIENTIFIC REPORTS

OPEN

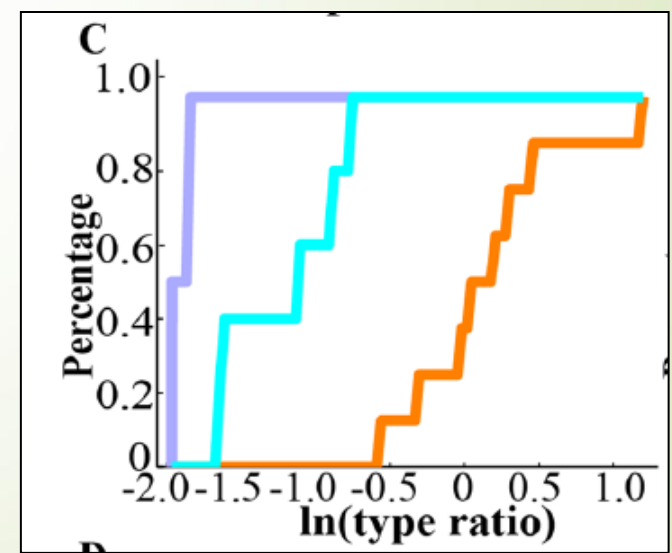
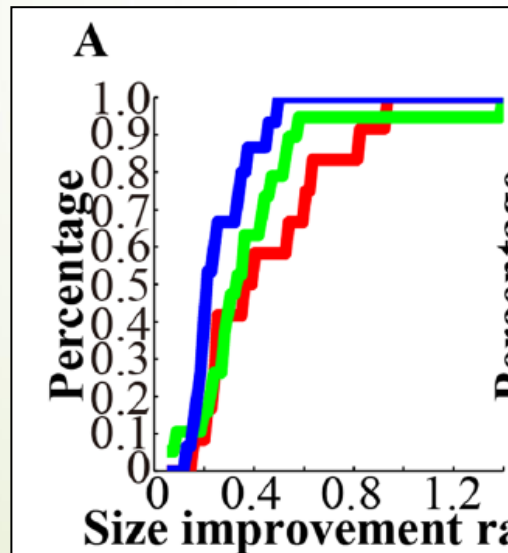
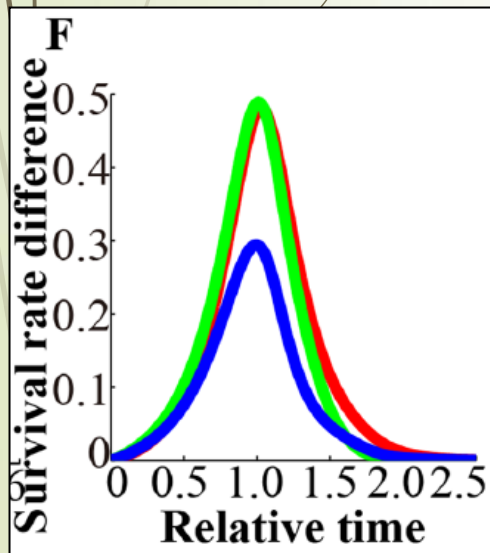
Calorie restriction is the most reasonable anti-ageing intervention: a meta-analysis of survival curves

Received: 5 January 2018
Accepted: 22 March 2018
Published online: 10 April 2018

Yaru Liang¹, Chang Liu², Maoyang Lu¹, Qiongye Dong², Zimu Wang³, Zhuoran Wang¹, Wenxiang Xiong¹, Nannan Zhang¹, Jiawei Zhou¹, Qingfei Liu¹, Xiaowo Wang² & Zhao Wang¹

■ Medications ■ Gene ■ CR

● Antioxidant ● Hypoglycaemic agent
● Gastrointestinal drug ● Antiepileptic ● Others



RESTRIÇÃO DE METIONINA

- ▶ **Kitada et al. (2021)** – benefícios da restrição de MET
 - Indução da autofagia celular
 - Diminuição na formação de ROS
 - Aumento na formação de H₂S



Restrição de **10%** na MET produz efeitos benéficos

nature communications



Article

<https://doi.org/10.1038/s41467-023-43550-2>

Early-adult methionine restriction reduces methionine sulfoxide and extends lifespan in *Drosophila*

Received: 15 April 2022

Accepted: 10 November 2023

Published online: 05 December 2023

Hina Kosakamoto^{1,2,5}, Fumiaki Obata^{1,2,3,5} ✉, Junpei Kuraishi¹, Hide Aikawa¹, Rina Okada², Joshua N. Johnstone^{3,4}, Taro Onuma^{1,2}, Matthew D. W. Piper^{3,4} & Masayuki Miura¹ ✉

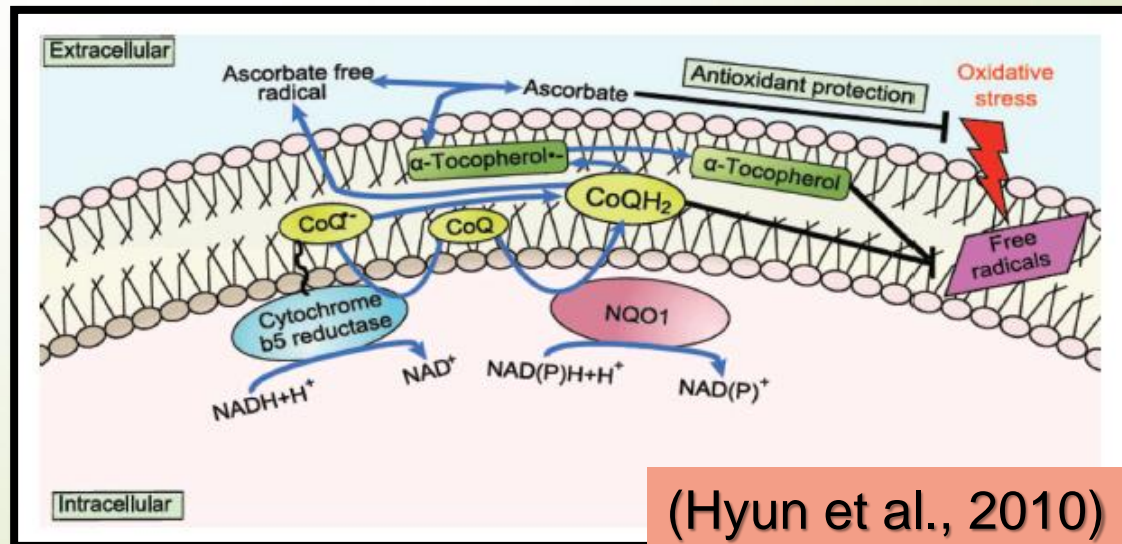
ANTIOXIDANTES

- Moléculas antioxidantes;

- Compartimentalização;

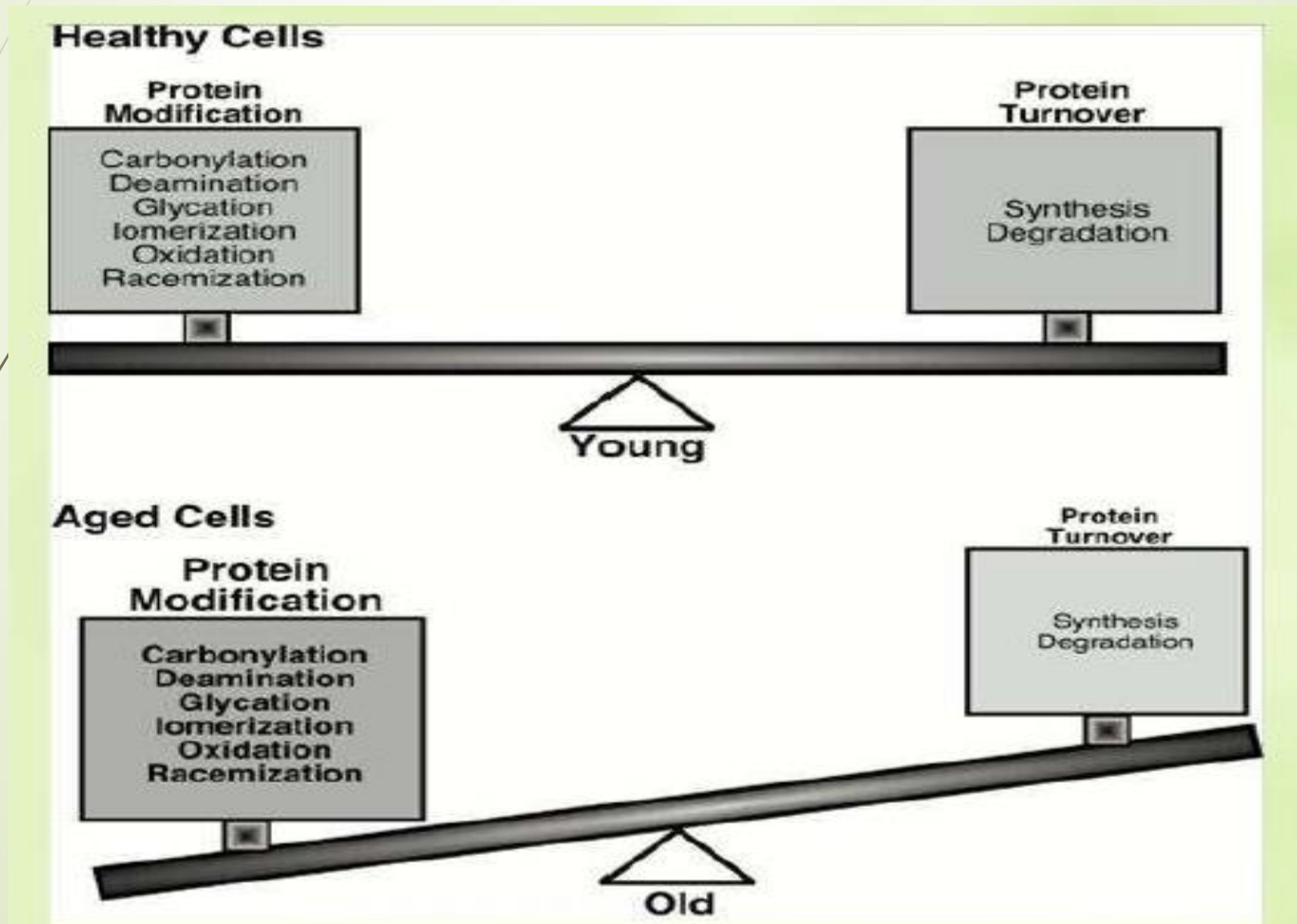
- Sistema enzimático;

- Superóxido dismutase (SOD) – mitocôndria (Mn) e citoplasmática (Cu/Zn)
- Catalase (CAT)
- Glutaciona peroxidase



STRESS OXIDATIVO

Caracterizado por um acúmulo de compostos tóxicos nas células.



The effect of coenzyme Q10 supplementation on oxidative stress: A systematic review and meta-analysis of randomized controlled clinical trials

Zohreh Sadat Sangsefidi^{1,2} | Fatemeh Yaghoobi³ | Salimeh Hajiahmadi^{1,2} | Mahdieh Hosseinzadeh^{1,2}

TAC

GPx

SOD

MDA

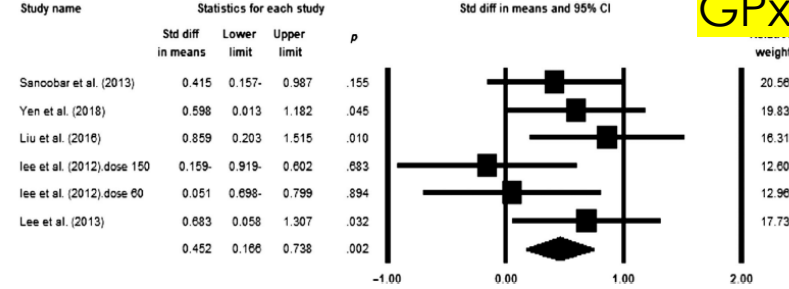
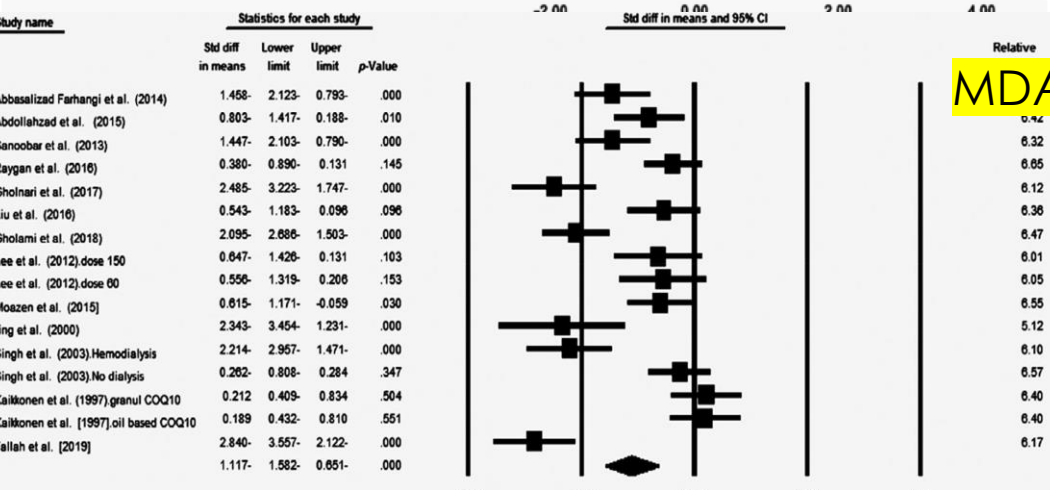
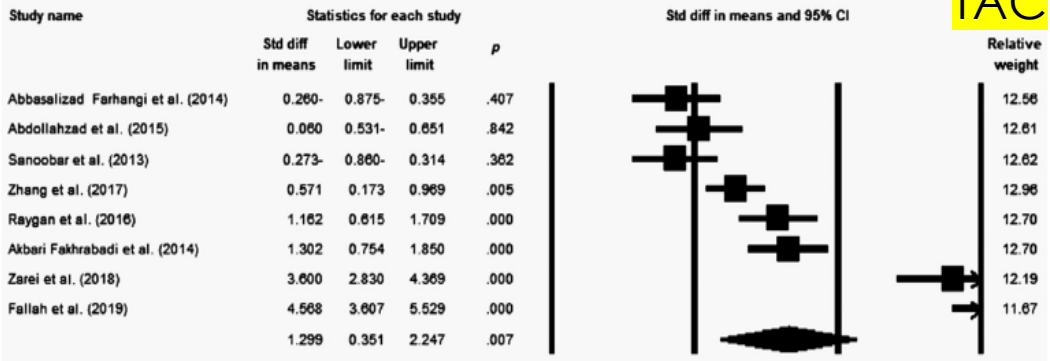
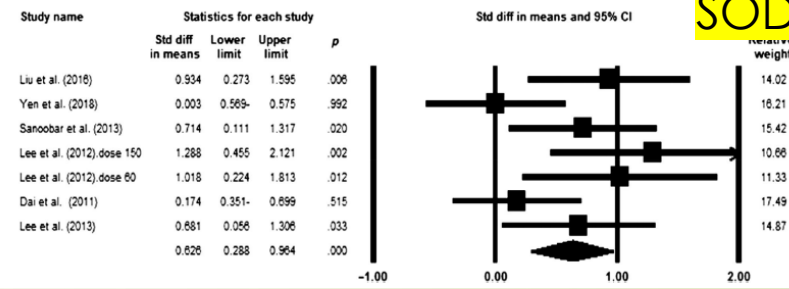
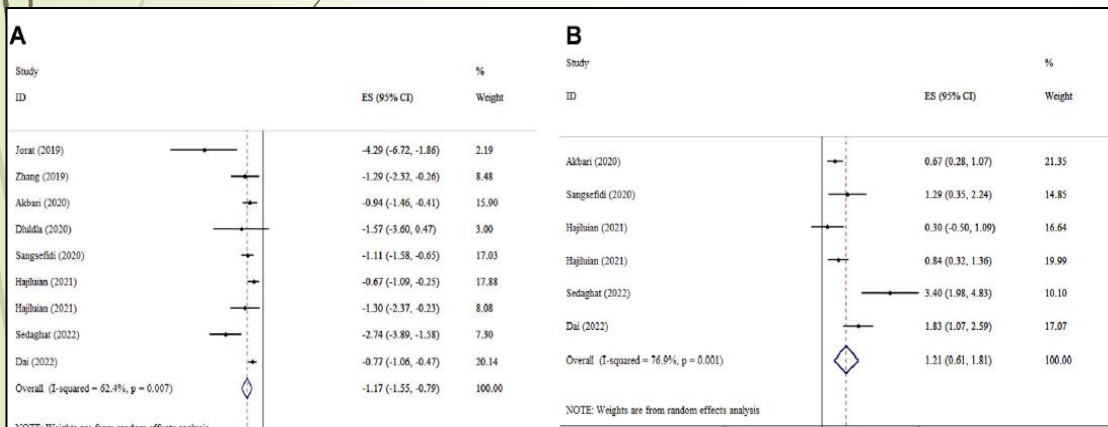


FIGURE 4 Forest plot illustrates standardized mean difference (represented by the black square) and 95% confidence interval (CI) (represented by horizontal line) for concentration of glutathione peroxidase (GPx) and coenzyme Q10 (CoQ10). Weights are from random-effects analysis. The area of the black square is proportional to the specific study weight to the overall meta-analysis. The center of the diamond displays the pool standardized mean differences, and its width shows the pooled 95% CI. Std diff, standard difference



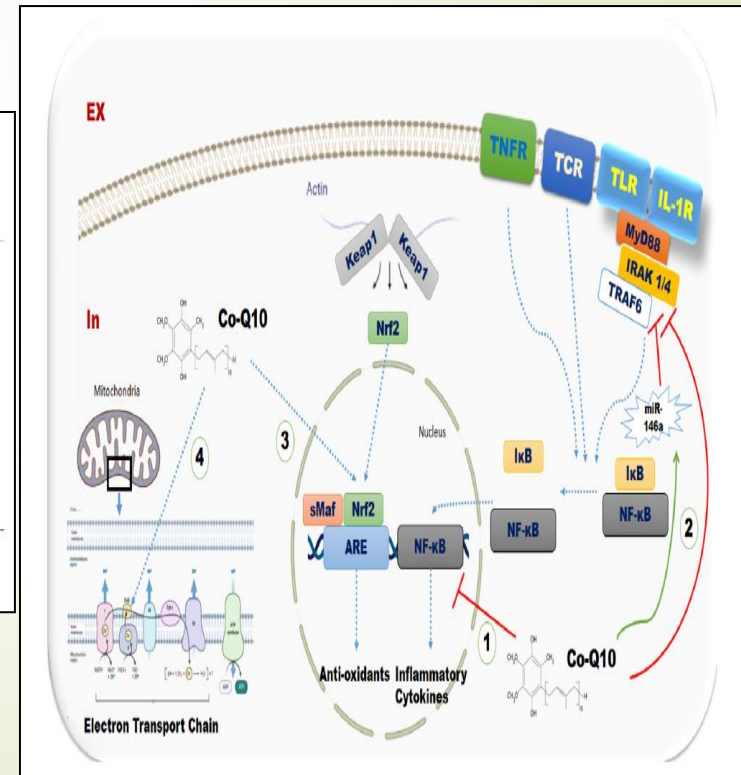
ANTIOXIDANTES

➔ Varnousfaderani et al. (2023) – CoQ-10 e marcadores inflamatórios e oxidativos



Malondialdeído

Capacidade AOX



ANTIOXIDANTES

► Anthoni et al. (2021) – ácido alfa-lipóico

(cães 2.7-4.94 mg/kgPV)

Species	LD ₅₀	Maximum Tolerated Dose (If Known)	NOAEL* (If Known)
Rat	>2000 mg/kg bwt	-	60 mg/kg bwt
Mouse	500 mg/kg bwt	-	-
Dog	400–500 mg/kg bwt	126 mg/kg bwt	-
Cat	30 mg/kg bwt	13 mg/kg bwt	-

Species	Benefits	Reference(s)
Rat	enhances glucose metabolism	[71]
Rat	improves insulin resistance	[72]
Mice	protects retina in disease states	[73–75]
Rat	reduces blood pressure	[76]
Rat	functions as a vasorelaxant	[77]
Rat, Mice	reduces oxidative stress	[78–85]
Rat, Mice	reduces inflammation	[82,83,86–90]
Mice	improves memory	[89]
Rat, Mice	protects against organ damage	[91–108]
Mice, Rat, Dog	improves neuro-cognitive recognition	[82,89,109–112]
Poultry	improves oxidative stability and meat quality	[113–123]
Hainan Goats	enhances meat quality and tenderness	[126]
Horses	reduces oxidative stress	[127,128]
Dog	improves antioxidant capacity	[129,130]

NUTRIENTES NA PREVENÇÃO DAS ALTERAÇÕES COGNITIVAS

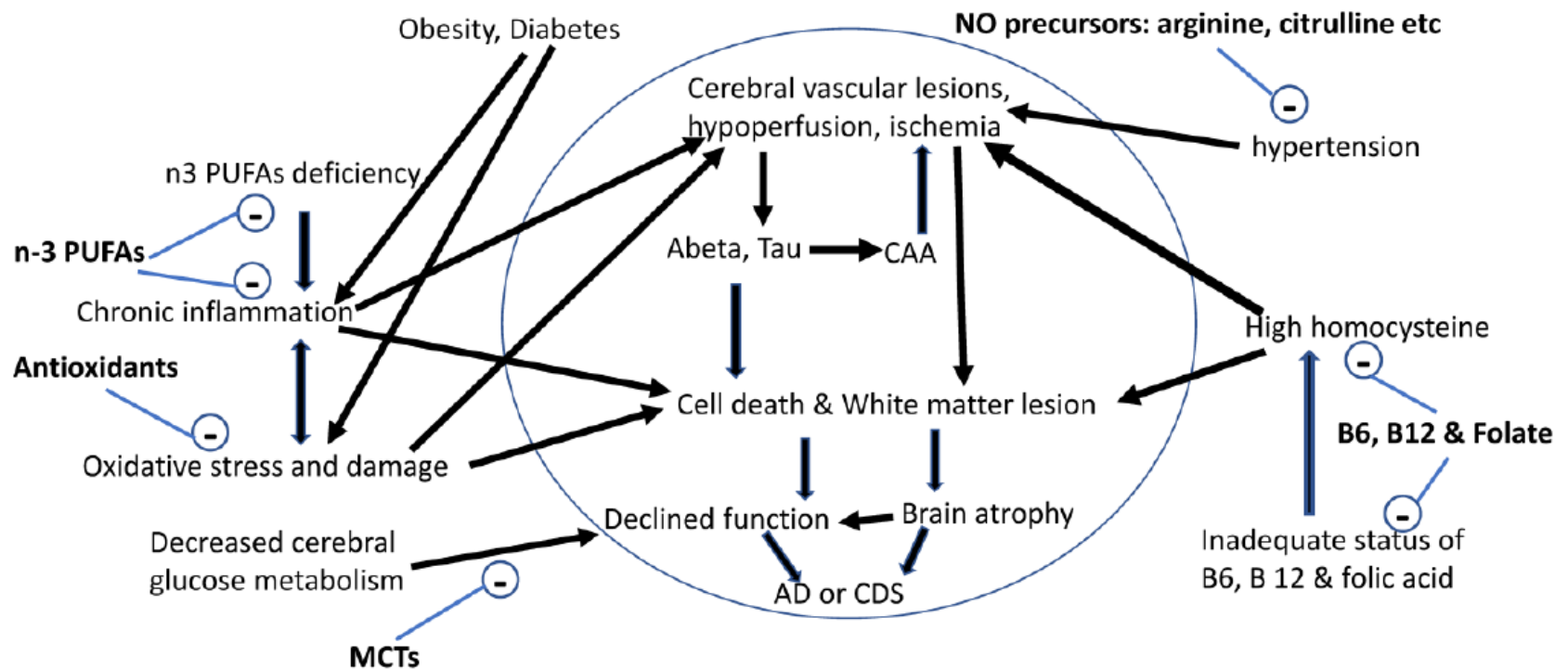


Figure 1. Nutritional management of the risk factors associated with brain aging and AD. Abeta: β -amyloid peptide; AD: Alzheimer's disease; CAA: cerebral amyloid angiopathy; CDS: cognitive dysfunction syndrome; n-3 PUFAs: omega-3 polyunsaturated fatty acids; NO: nitric oxide; Tau: abnormal hyperphosphorylation of tau.

COGNIÇÃO EM CÃES

- Suplementação nutraceuticos (Chapagain et al., 2020)

Características

- 119 cães, 9.1 anos
- Espécie: cães
- Duração 1 ano
- **Conclusão:** sem efeito

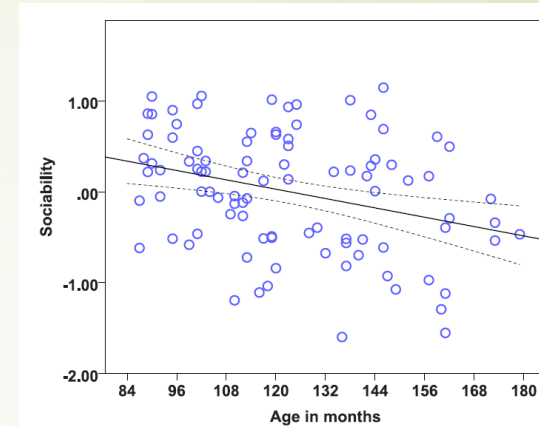
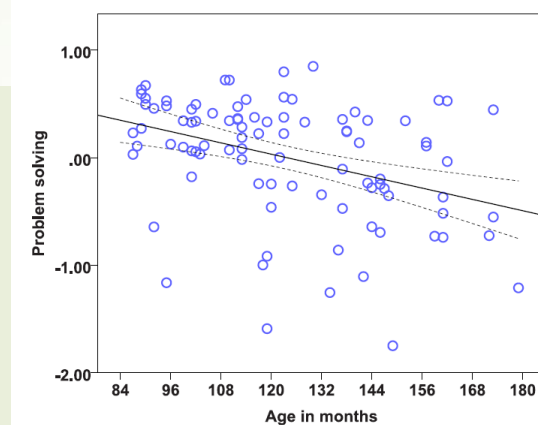


Table 1. Composition of test and control diets.

	Test (enriched diet)	Control
Moisture (%)	9.5	9.5
Crude protein (%)	25.1	25.3
Crude fat (%)	13.4	14.0
Crude fibre (%)	1.6	1.7
Ash (%)	5.1	4.3
Tryptophane (%)	0.45	0.24
TRP/LNAA* ratio	0.067	0.036
DHA (%)	0.17	0
Phosphatidylserine (ppm)	328	0
Vitamin E (ppm)	839	499
Vitamin C (ppm)	559	0
Green tea polyphenols (ppm)	425	0
ME NRC 2006 (kcal/kg)	3826	3884

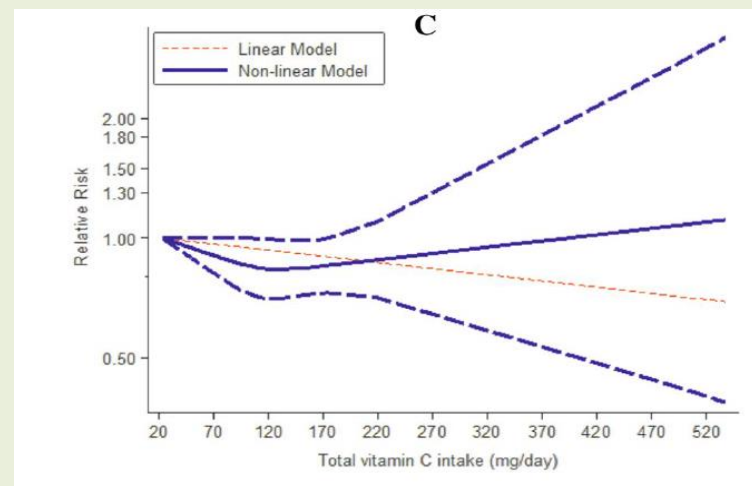
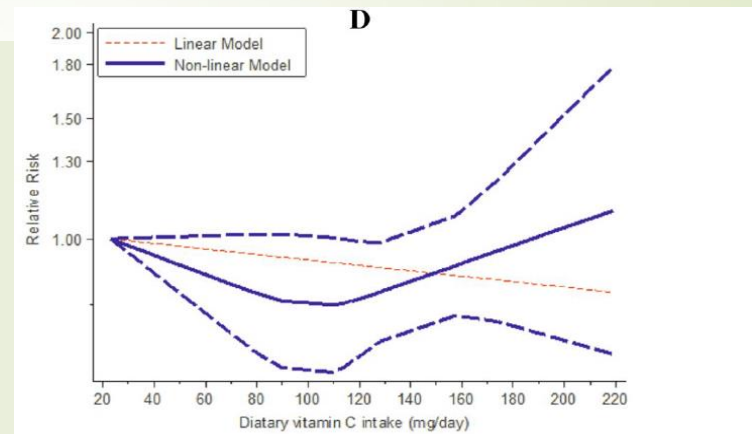
METANÁLISES - HUMANOS

- Antioxidantes e demência (Zhou et al., 2023)

Características

- 73 estudos
- Espécie: humanos
- n = 28.257 indivíduos
- AOX (vit. C e E) e demência ou AD

- **Conclusão:** Supl. Vitamina C a cada 20mg/kg reduz RR em 2% para AD



METANÁLISES - HUMANOS

biology
letters
Evolutionary biology

Biol. Lett. (2012) 8, 790–793
doi:10.1098/rsbl.2012.0316
Published online 20 June 2012

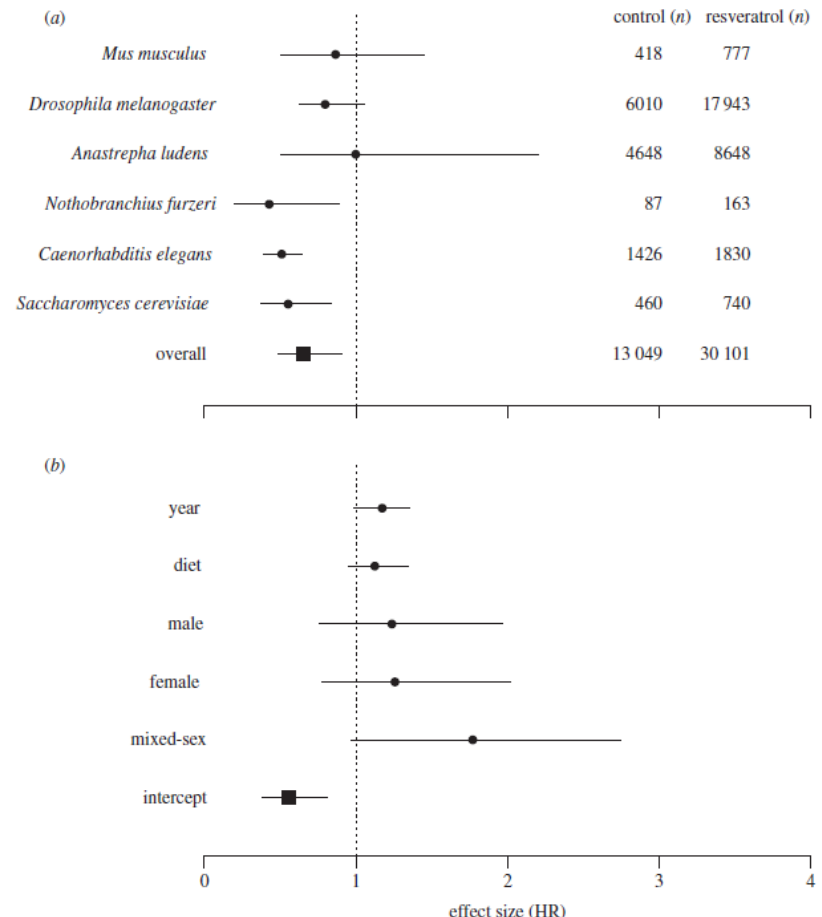
The effect of resveratrol on longevity across species: a meta-analysis



Katie L. Hector*, Malgorzata Lagisz
and Shinichi Nakagawa

Características

- 19 estudos
- Espécie: várias espécies
- n = sem informações
- Resveratrol e longevidade

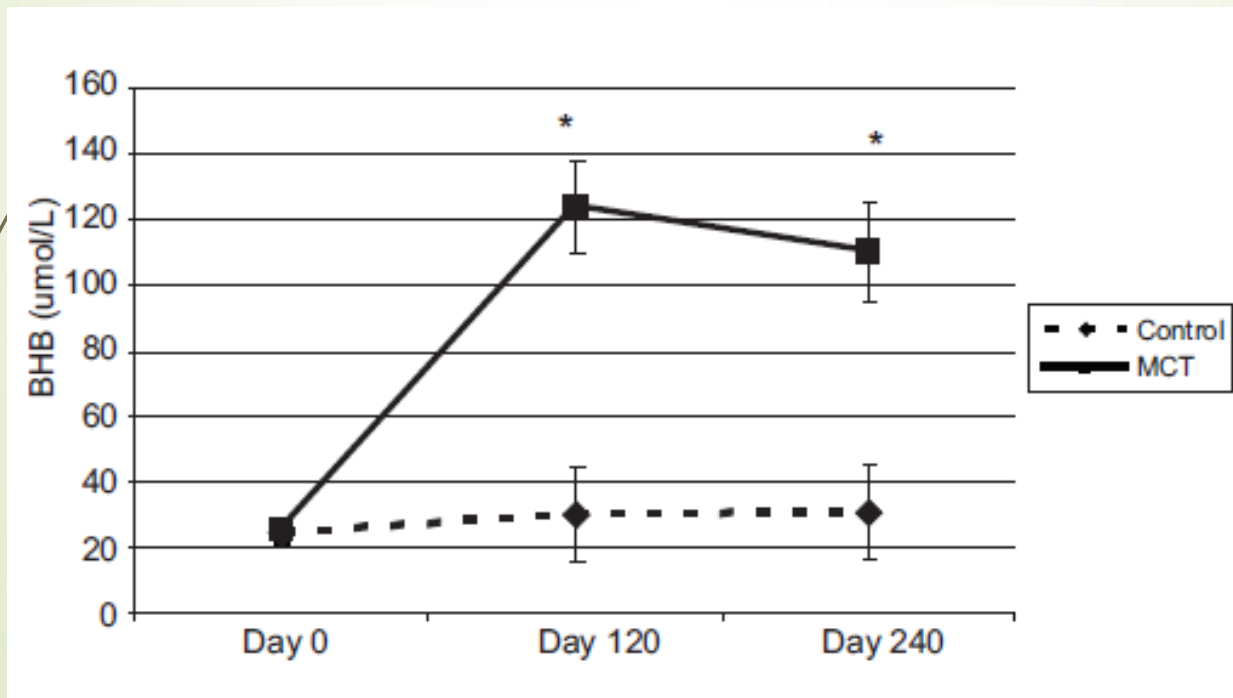


- **Conclusão:** resultados falham em mostrar claim 'life extension'

TRIGLICERÍDEOS DE CADEIA MÉDIA

Suplementação 2g/kg/dia de ácido caprílico

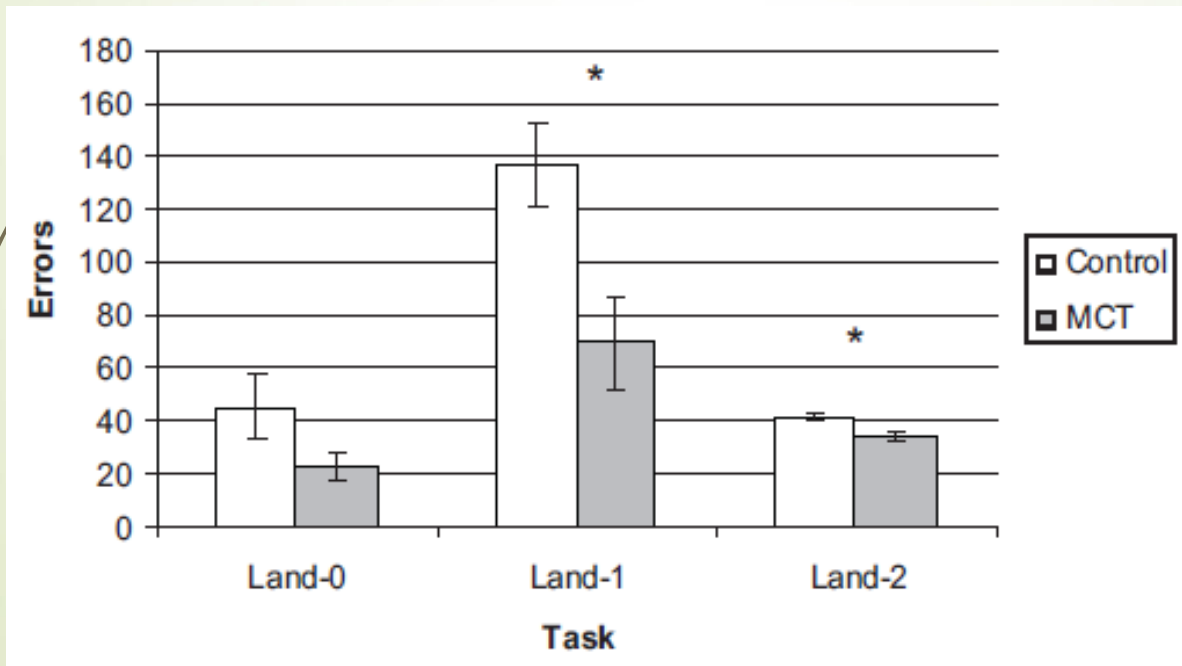
Betahidroxibutirato (β -HB) sérico



TRIGLICERÍDEOS DE CADEIA MÉDIA

Suplementação 2g/kg/dia de ácido caprílico

Número de erros nas diferentes tarefas



DOSAGENS DE ANTIOXIDANTES

Doses de antioxidantes utilizadas experimentalmente (mg/kg na MS)

Antioxidante	Cães	Gatos	Autor
S-adenosil metionina*	20	20	Maureen, 2007
N-acetilcisteína	50	50	Maureen, 2007
Vitamina E	1080	-	Milgram et al., 2002
Vitamina C	80	-	Milgram et al., 2002
Coenzima Q-10*	2	2	Maureen, 2007
Ácido alfa-lipóico	180	-	Milgram et al., 2002
Beta-caroteno*	3-6	-	Chew et al., 2000
Ficocianinas	0,2%	-	Vasconcellos et al., 2011
Luteína*	2	2	Kim et al., 2000

* Dose expressa por kg de peso corporal

SARCOPENIA E INGESTÃO PROTÉICA

1. Diminuição das reservas protéicas

2. WANNEMACHER; McCOY (1966) demonstraram para equilíbrio nitrogenado

→ Jovens | 12,4%

→ Idosos | 18,8%



3. Necessidade aumenta na doença

DIGESTIBILIDADE DA PROTEÍNA

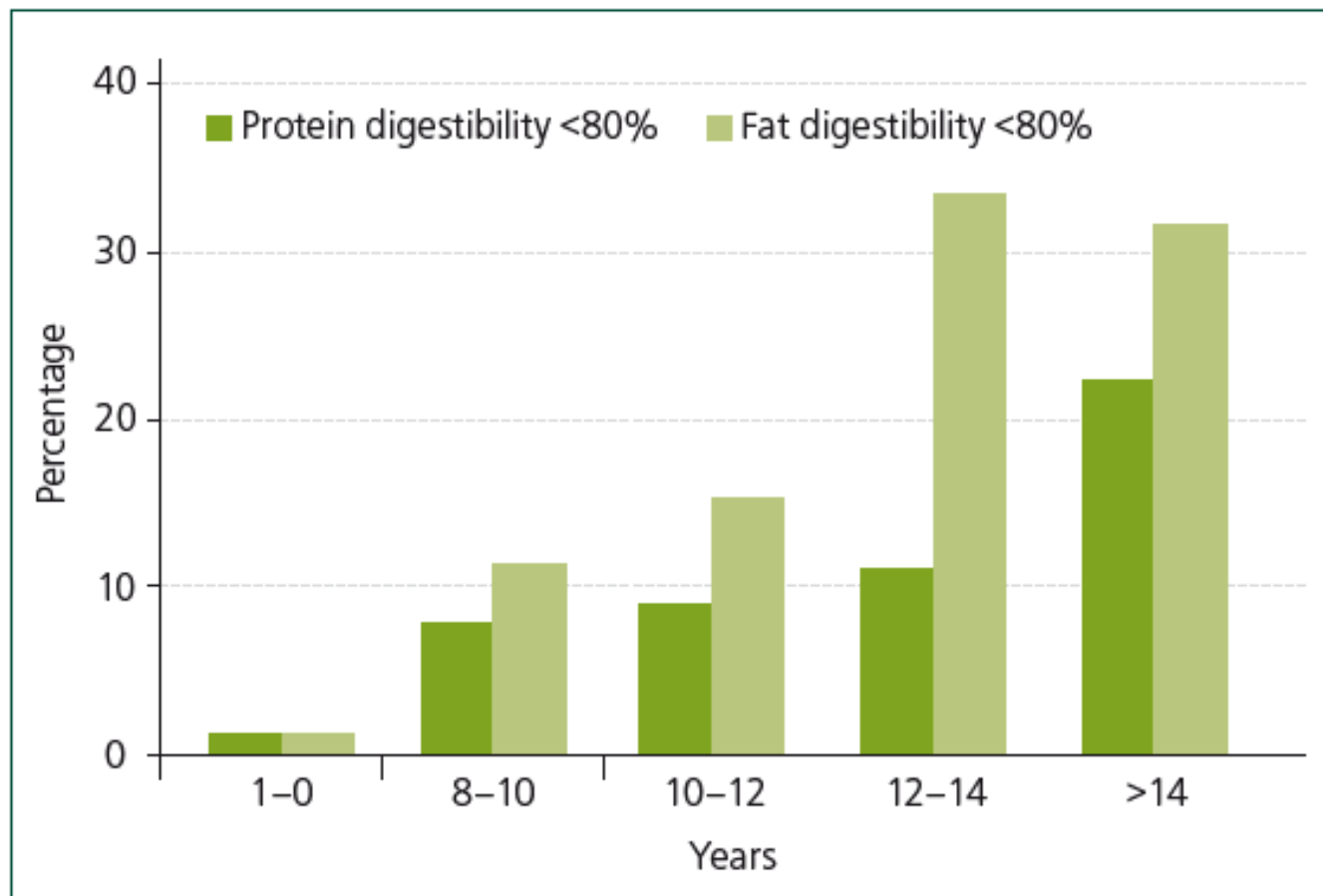


Figure 7. Percentage of cats with low protein and/or digestibility (below 80%), by age. Data from Williams (2018), with permission.

RECOMENDAÇÕES FEDIAF

GATOS

Nutriente	UNID.	Mínimo recomendado		
		Adulto - considerando NEM de		Crescimento e Reprodução)
		75 kcal/kg ^{0,67}	100 kcal/kg ^{0,67}	
Proteína *	g	83,30	62,50	70,00/75,00
Arginina*	g	3,30	2,50	2,68/2,78
Histidina	g	0,87	0,65	0,83
Isoleucina	g	1,44	1,08	1,35
Leucina	g	3,40	2,55	3,20
Lisina *	g	1,13	0,85	2,13
Metionina*	g	0,57	0,43	1,10
Metionina + cistina*	g	1,13	0,85	2,20
Fenilalanina	g	1,33	1	1,25
Fenilalanina + tirosina*	g	5,11	3,83	4,78
Treonina	g	1,73	1,30	1,63
Triptofano	g	0,44	0,33	0,40
Valina	g	1,70	1,28	1,60



Recomendação Prática -

5,0 gPB/kg de peso

7,9 gPB/kg^{0,67}

105 gPB/1000kcal

RECOMENDAÇÕES FEDIAF

CÃES

Nutriente	UNID.	Mínimo recomendado			
		Adulto - considerando NEM de		Crescimento inicial (< 14 Semanas e Reprodução)	Crescimento final (14 ≥ Semanas)
		95 kcal/kg ^{0.75}	110 kcal/kg ^{0.75}		
Proteína *	g	52,10	45,00	62,50	50,00
Arginina*	g	1,51	1,30	2,04	1,84
Histidina	g	0,67	0,58	0,98	0,63
Isoleucina	g	1,33	1,15	1,63	1,25
Leucina	g	2,37	2,05	3,23	2,00
Lisina *	g	1,22	1,05	2,20	1,75
Metionina*	g	1,16	1,00	0,88	0,65
Metionina + cistina*	g	2,21	1,91	1,75	1,33
Fenilalanina	g	1,56	1,35	1,63	1,25
Fenilalanina + tirosina*	g	2,58	2,23	3,25	2,50
Treonina	g	1,51	1,30	2,03	1,60
Triptofano	g	0,49	0,43	0,58	0,53
Valina	g	1,71	1,48	1,70	1,40



Recomendação Prática –

2,5 gPB/kg de peso

5,0 gPB/kg^{0,75}

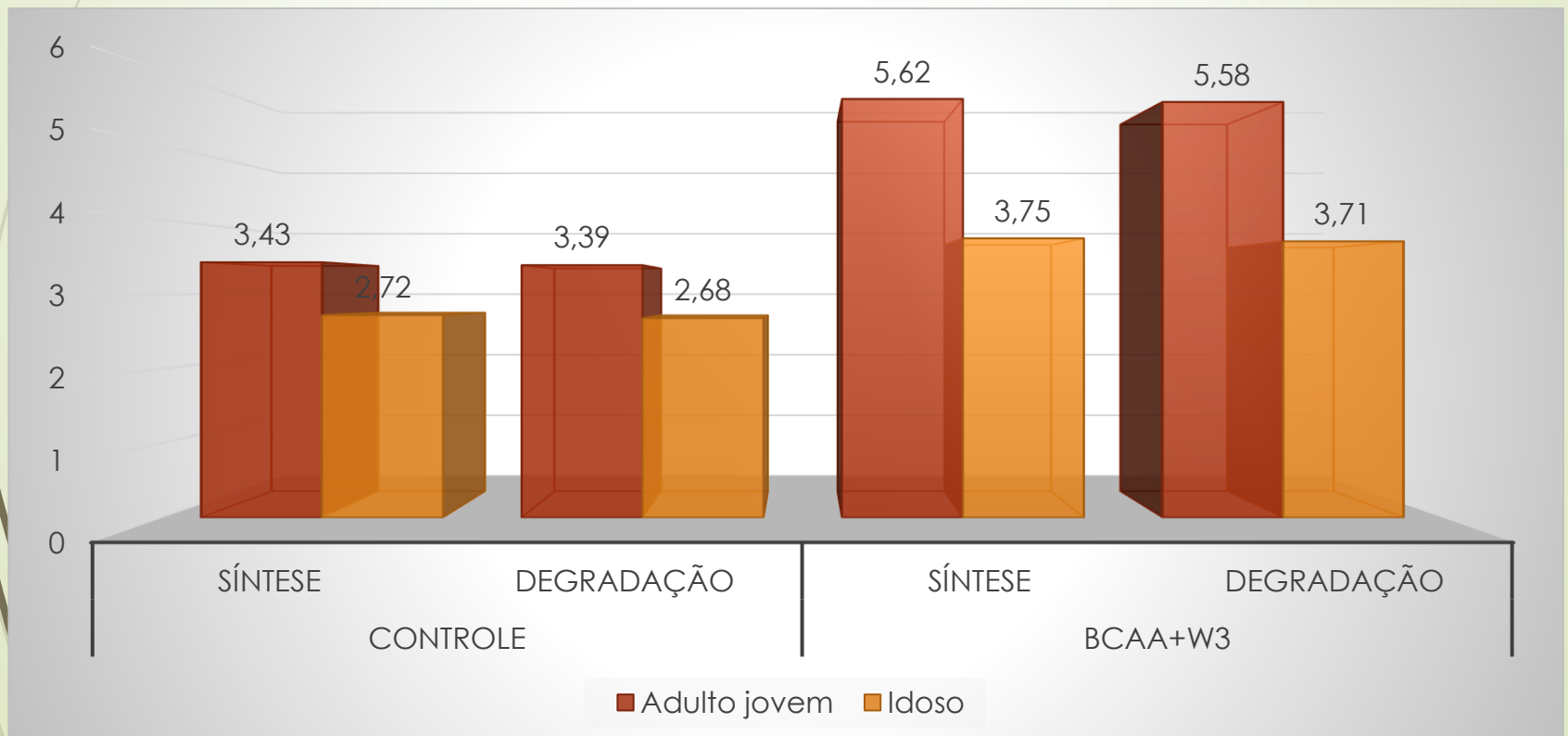
52,5 gPB/1000kcal

SUPLEMENTAÇÃO DE AMINOÁCIDOS E ÔMEGA-3

Pacheco (2022) –

Beagles (2.3±1.2 vs. 12.7±2.6)

Controle (Co) vs Co+BCAA+w-3



METANÁLISES - HUMANOS

- Sarcopenia e ingestão (Santiago et al., 2021)

Características

- 23 estudos
- Espécie: humanos
- n = 17.800 indivíduos
- Sarcopenia vs. normais

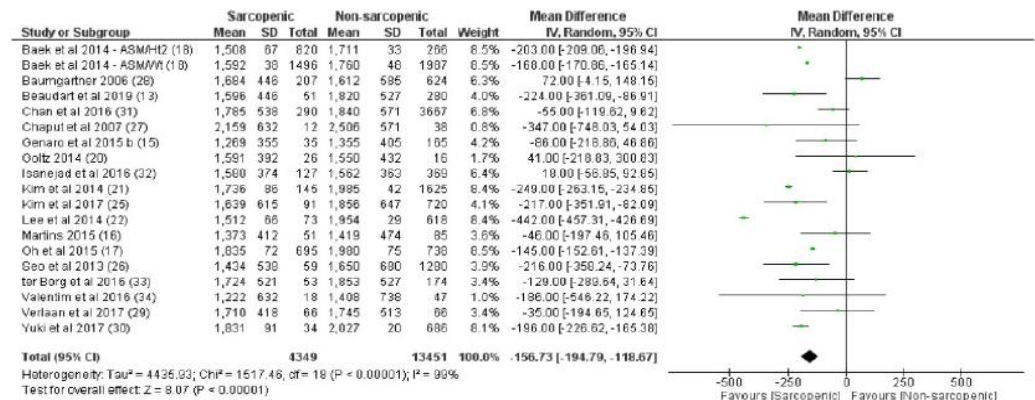


Figure 2 Analysis of energy intake by elderly people with and without sarcopenia.

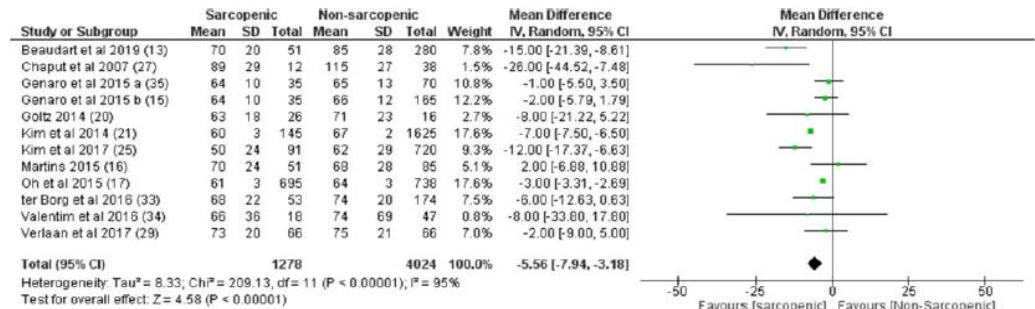


Figure 3 Analysis of protein intake by elderly people with and without sarcopenia.

- Conclusão:** ingestão mais baixa de nutrientes em geral

ÁCIDOS GRAXOS ω -3

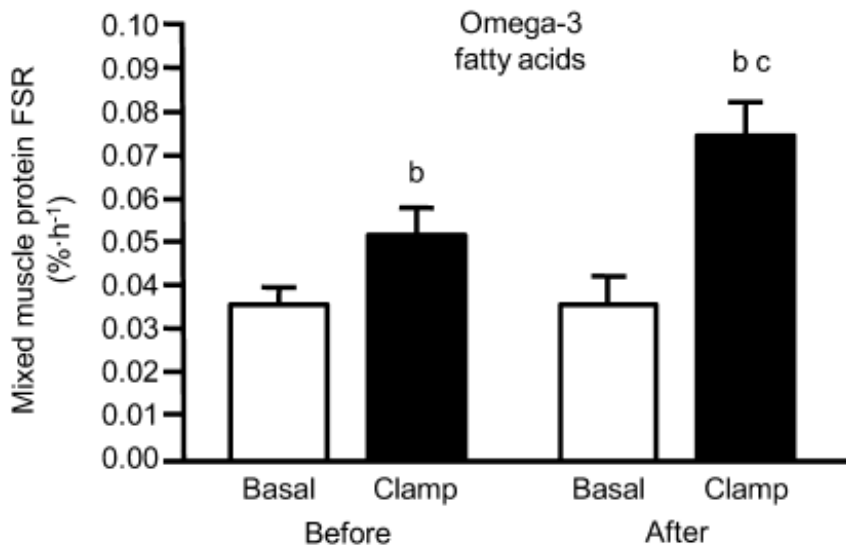
Dietary omega-3 fatty acid supplementation increases the rate of muscle protein synthesis in older adults: a randomized controlled trial¹⁻³

Gordon I Smith, Philip Atherton, Dominic N Reeds, B Selma Mohammed, Debbie Rankin, Michael J Rennie, and Bettina Mittendorfer

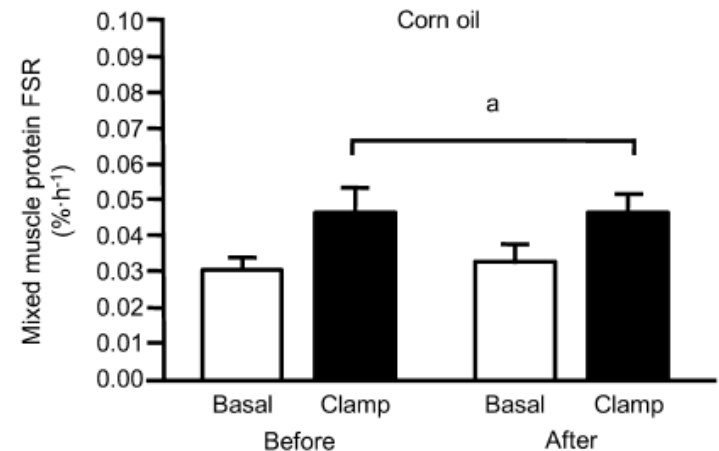
Am. J. Clin. Nutr., 2011

Downloaded from

Sarcopenia



- ✓ 16 humanos idosos
- ✓ Oleo de miho ou ômega-3 por 8 sem.
- ✓ Taxa de síntese ptca muscular



Principais achados: Melhorou a Taxa de Síntese proteica muscular

ESTUDOS COM ÁCIDOS GRAXOS

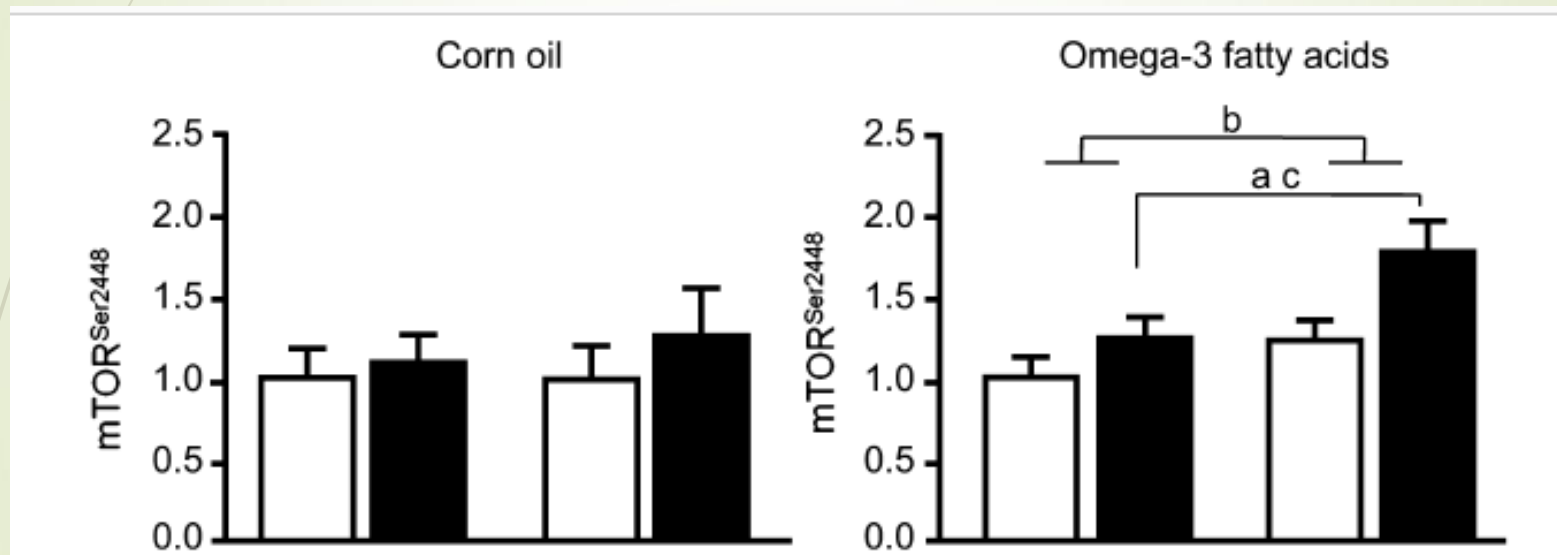
Sarcopenia

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Principais achados: Melhorou a Taxa de Síntese proteica muscular

ÁCIDOS GRAXOS ω -3

Meta-análise sobre inflamação

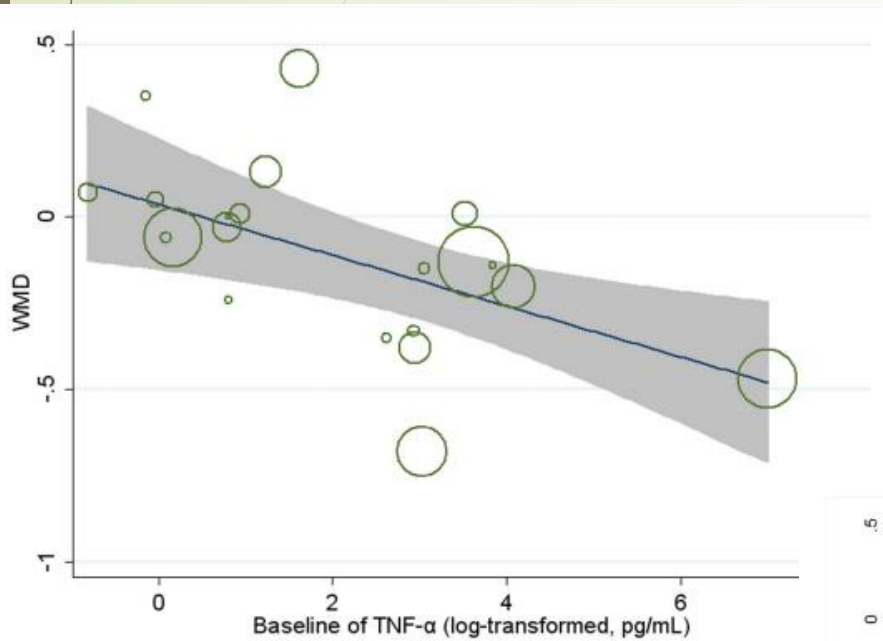


Figure 7. Meta-regression for baseline of TNF- α and effect size (n-3 PUFAs supplementation on TNF- α in chronic non-autoimmune disease). WMD, weighted mean difference. doi:10.1371/journal.pone.0088103.g007

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Effect of Marine-Derived n-3 Polyunsaturated Fatty Acids on C-Reactive Protein, Interleukin 6 and Tumor Necrosis Factor α : A Meta-Analysis

Kelei Li^{1,2}, Tao Huang^{1,2}, Jusheng Zheng^{1,2}, Kejian Wu^{1,2}, Duo Li^{1,2*}

¹Department of Food Science and Nutrition, Zhejiang University, Hangzhou, China, ²DRDCS Centre of Nutrition and Food Safety, Hangzhou, China

- ✓ 68 estudos com 4604 pessoas
- ✓ Estudos com ômega-3 de peixes/algas

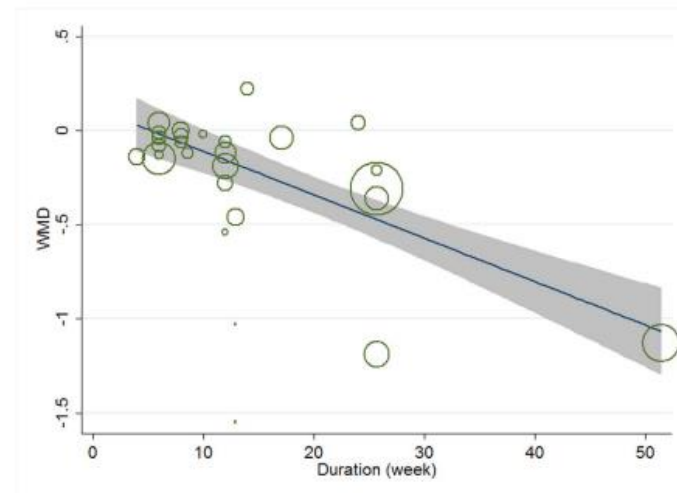


Figure 5. Meta-regression for duration and effect size (n-3 PUFAs supplementation on IL-6 in chronic non-autoimmune disease). WMD, weighted mean difference. doi:10.1371/journal.pone.0088103.g005

ESTUDOS COM ÁCIDOS GRAXOS

Meta-análise sobre inflamação

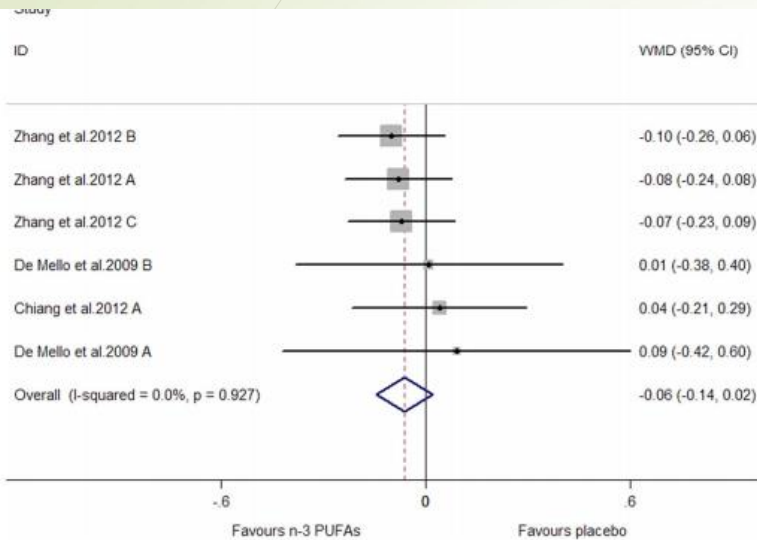


Figure 11. Pooled effect size of n-3 PUFAs from dietary intake on TNF- α in chronic non-autoimmune disease. WMD, weighted mean difference. doi:10.1371/journal.pone.0088103.g011

Estes efeitos também foram verificados em saudáveis

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PLOS ONE

Effect of Marine-Derived n-3 Polyunsaturated Fatty Acids on C-Reactive Protein, Interleukin 6 and Tumor Necrosis Factor α : A Meta-Analysis

Kelei Li^{1,2}, Tao Huang^{1,2}, Jusheng Zheng^{1,2}, Kejian Wu^{1,2}, Duo Li^{1,2*}

¹Department of Food Science and Nutrition, Zhejiang University, Hangzhou, China, ²DFNS Centre of Nutrition and Food Safety, Hangzhou, China

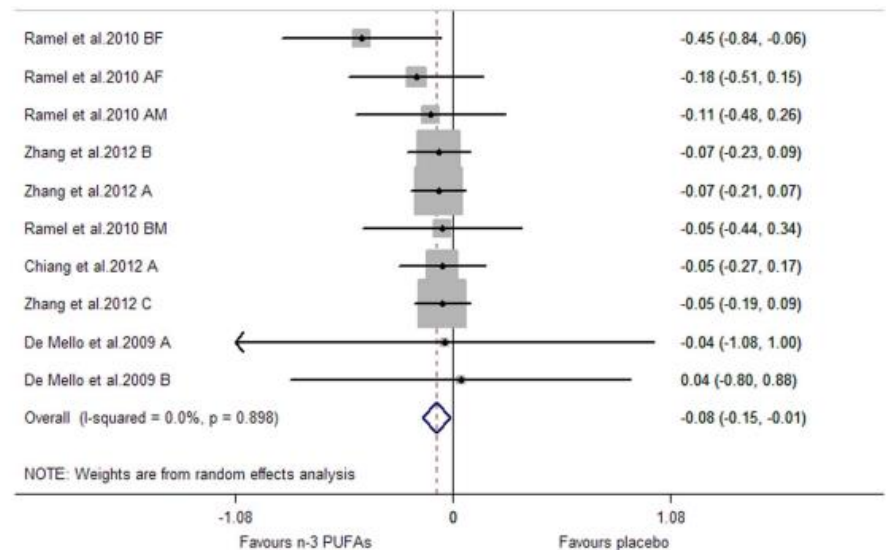


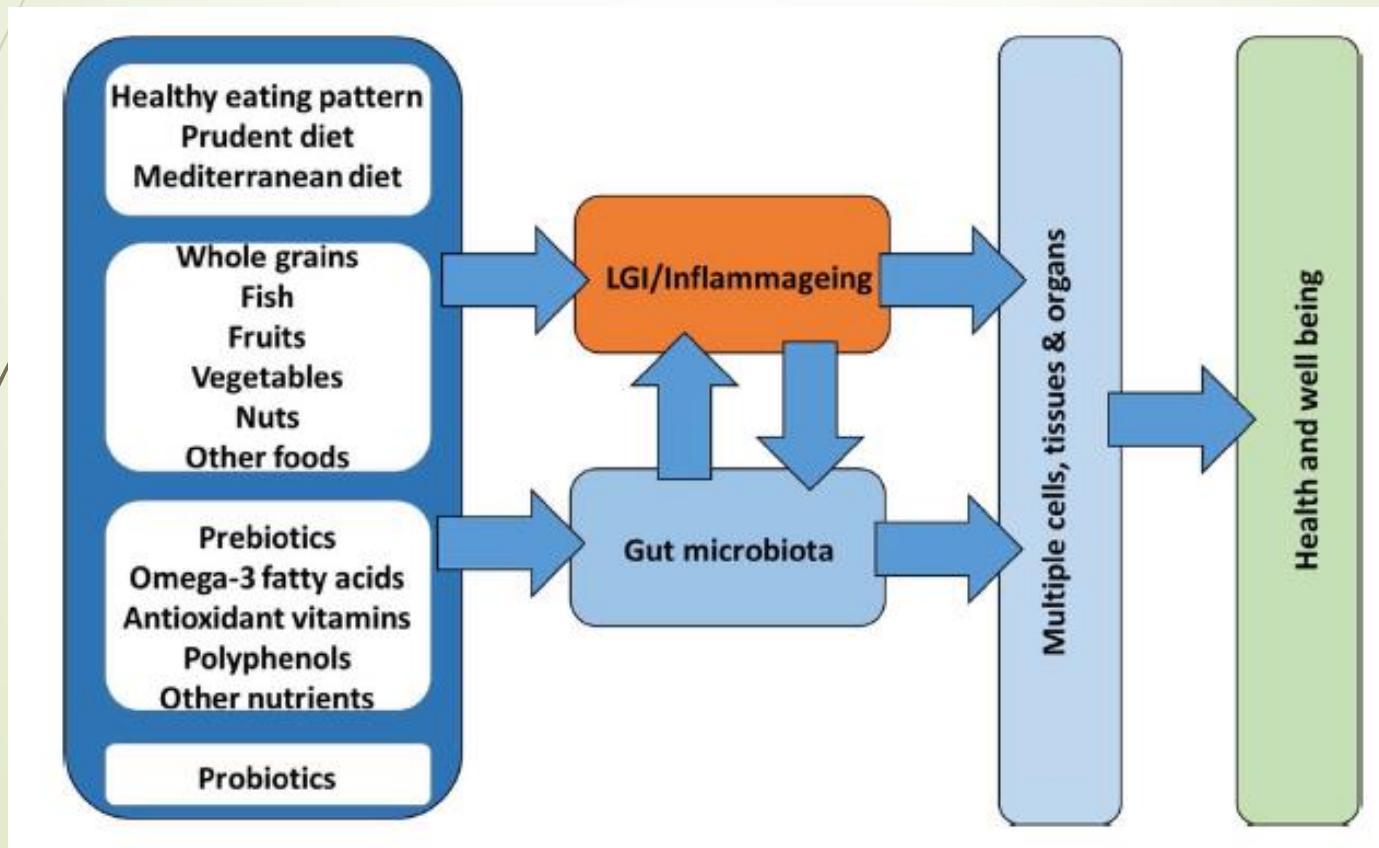
Figure 12. Pooled effect size of n-3 PUFAs from dietary intake on IL-6 in chronic non-autoimmune disease. WMD, weighted mean difference. doi:10.1371/journal.pone.0088103.g012

Study

PREBIÓTICOS E PROBIÓTICOS

•(Calder et al., 2017)

• *Relação entre a microbiota, sistema imune e inflammageing*



PREBIÓTICOS E PROBIÓTICOS

- *Relação entre a microbiota, sistema imune e inflammaging*



animals

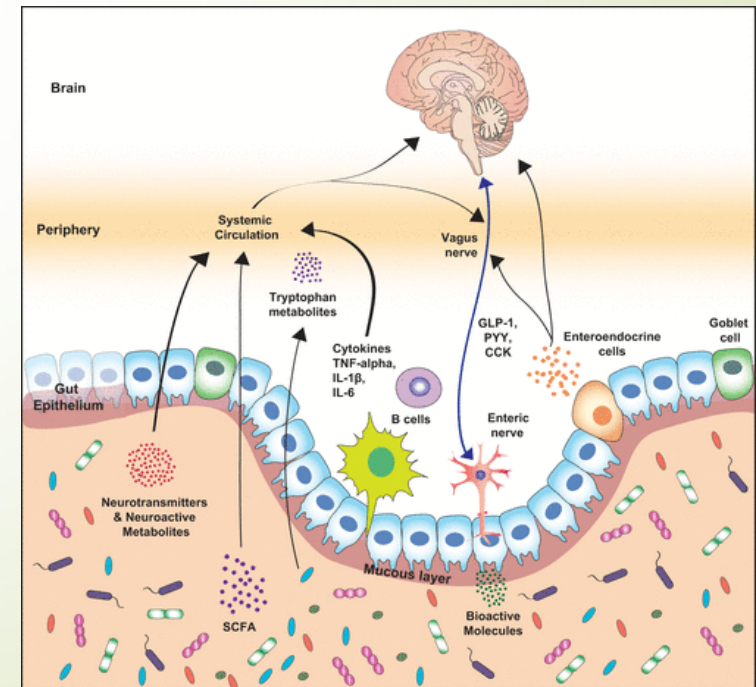
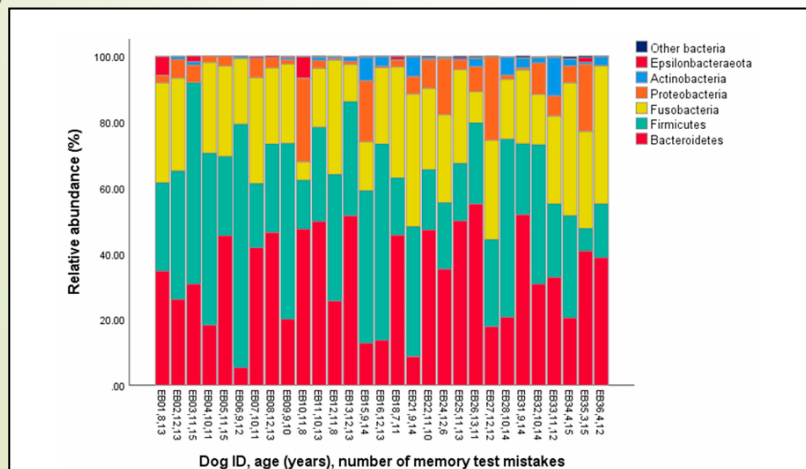


Article

Gut Microbiome Composition is Associated with Age and Memory Performance in Pet Dogs

Eniko Kubinyi ^{1,*}, Soufiane Bel Rhali ^{1,2}, Sára Sándor ¹, Attila Szabó ² and Tamás Felföldi ²

- 29 cães de 3-13 anos

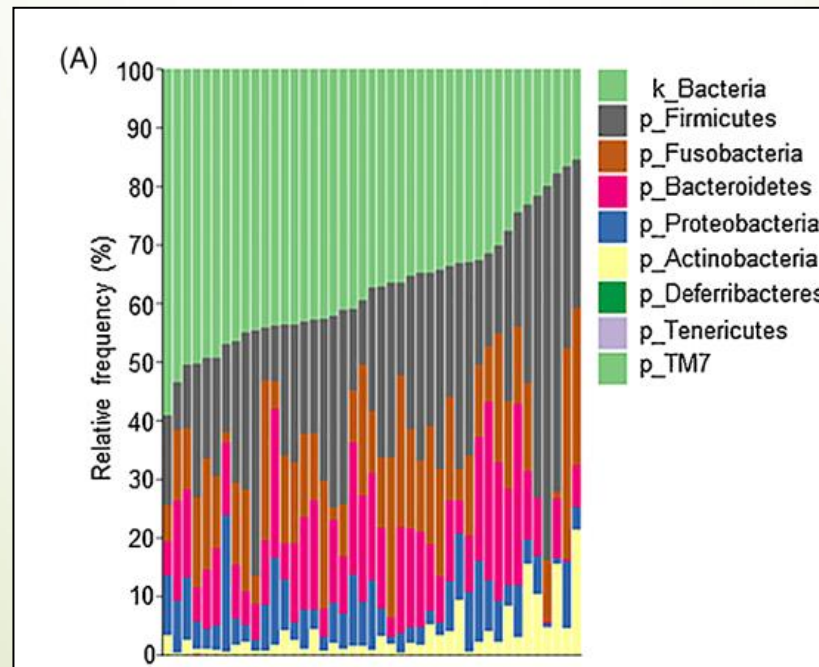


PREBIÓTICOS E PROBIÓTICOS

- 43 cães (Mizukami et al., 2019)

Table 1. Results of the age-related analysis of gut microbiome diversity in Shiba Inu dogs.

	Alpha diversity			Beta diversity	
	Faith-PD	Chao1	Shannon	Unweighted UniFrac	Weighted UniFrac
Correlation coefficient	-0.4156	-0.2822	-0.2919	0.2460	0.1003
P-value	0.0056	0.0668	0.0576	0.0020	0.2320



PREBIÓTICOS E PROBIÓTICOS

JOURNAL ARTICLE

The effect of age and carbohydrate and protein sources on digestibility, fecal microbiota, fermentation products, fecal IgA, and immunological blood parameters in dogs

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A. P. J. Maria, L. Ayane, T. C. Putarov, B. A. Loureiro, B. P. Neto,
M. F. Casagrande, M. O. S. Gomes, M. B. A. Glória, A. C. Carciofi ✉

Journal of Animal Science, Volume 95, Issue 6, June 2017, Pages 2452–2466, <https://doi.org/10.2527/jas.2016.1302>

Effect of Nutritional Interventions on Longevity of Senior Cats

Carolyn J. Cupp, DVM, MS¹
Clementine Jean-Philippe, DVM, PhD²
Wendell W. Kerr, MS¹
Avinash R. Patil, BVSc, PhD¹
Gerardo Perez-Camargo, PhD, MRCVS²

CONSIDERAÇÕES FINAIS

- Envelhecimento apresenta importantes mudanças fisiológicas e nutricionais
- Ainda são pouco conhecidas as necessidades nutricionais em animais idosos
- Apesar das intervenções nutricionais aparentemente auxiliarem na qualidade de vida de animais senis, poucos estudos suportam estas hipóteses.

Obrigado!

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STOP PLAYING
BECAUSE WE GET
OLD.

WE GET OLD
BECAUSE WE
STOP PLAYING.

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