Gorduras: quanto incluir na fórmula?

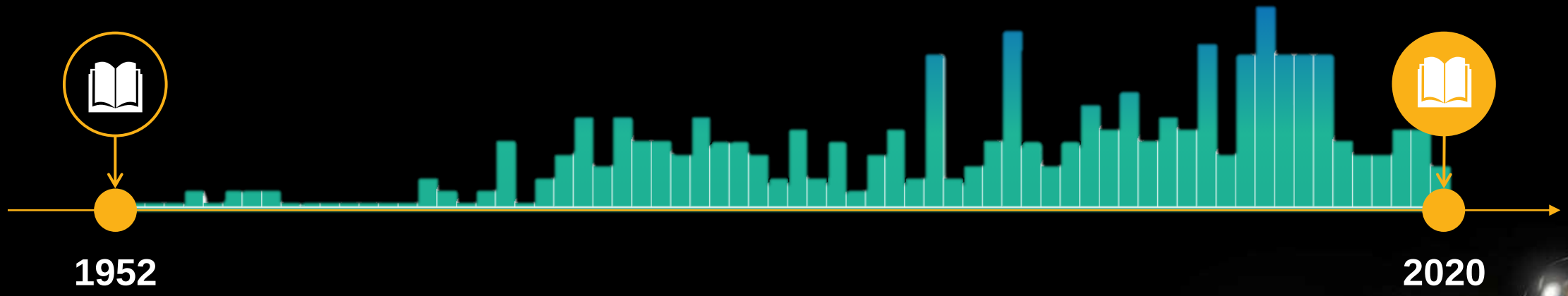


Efeitos fisiológicos em consumo e obesidade

Prof. Dr. Marcio A. Brunetto

Necessidades e recomendações

Gatos





Necessidades e recomendações

Cães





Quanto?



Nem mais, nem menos…depende!

Quanto?

As recomendações de necessidades nutricionais são baseadas em estudos experimentais

Entretanto, os métodos empregados para estimá-las mudaram ao longo do tempo

Muitas das informações que temos são baseadas em sinais de deficiência e resposta à suplementação



SUPPLEMENT ARTICLE

WILEY

Predictive equations of maintenance energy requirement for healthy and chronically ill adult dogs

Vivian Pedrinelli[1] | Mariana Yukari Hayasaki Porsani[1] | Daniel Magalhães Lima[2] | Fabio Alves Teixeira[1] | Caio Nogueira Duarte[1] | Thiago Henrique Annibale Vendramini[2] | Márcio Antonio Brunetto[2]

[1]School of Veterinary Medicine and Animal Science, University of Sao Paulo (USP), São Paulo, Brazil

[2]School of Veterinary Medicine and Animal Science, University of Sao Paulo (USP), Pirassununga, Brazil

Correspondence
Marcio Antonio Brunetto, Department of Animal Nutrition and Production, School

Abstract

Maintenance energy requirement (M
to maintain their weight and body c
such as gender, age, neutering sta
tive study aimed to evaluate MER o
with the MER of healthy adult dog

Cães saudáveis e inativos:

86,09 Kcal/ (Peso corporal)^{0,75}

Nutrition Research Reviews, page 1 of 11
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Neutering in dogs and cats: current scientific evidence and importance of adequate nutritional management

Thiago H. A. Vendramini[1], Andressa R. Amaral[2], Vivian Pedrinelli[2], Rafael V. A. Zafalon[1], Roberta B. A. Rodrigues[1] and Marcio A. Brunetto[1]*

[1]*Department of Animal Nutrition and Production of the School of Veterinary Medicine and Animal Science, University of São Paulo, Ave. Duque de Caxias Norte, 225, Pirassununga, SP, 13635-900, Brazil*

[2]*Department of Veterinary Internal Medicine of the School of Veterinary Medicine and Animal Science, University of São Paulo, Ave. Prof. Dr. Orlando Marques de Paiva, 87, São Paulo, SP, 05508-270, Brazil*

Abstract

Neutering or spaying is a commonly recommended veterinary procedure. However, veterinarians are often confronted with conflicting findings and differences in concepts regarding practice and proper nutritional management after the procedure. The objective of the present review was to bring to light the most recent literature, summarise it and discuss the findings focusing on the risks and benefits of neutering in dogs and cats, and to determine the appropriate nutritional management for these animals.

Key words: **Canine nutrition: Feline nutrition: Diet: Gonadectomy: Obesity**

Quanto? depende....

Qual o objetivo do alimento/produto?

Fase de vida?

Condição/doença?



Ingestão recomendada (**NRC,** 2006) para **CÃES** Alimento com 4000 kcal EM/kg

%	Cães filhotes	Cães adultos	Gestação lactação
Gordura	8,5	5,5	8,5
Ac Linoléico	1,3	1,1	1,3
Ac Araquidônico	0,03	-	-
α linolênico	0,08	0,044	0,08
EPA + DHA	0,05	0,044	0,05

Ingestão recomendada (**NRC,** 2006) para **GATOS** Alimento com 4000 kcal EM/kg

%	Gatos filhotes	Gatos adultos	Gestação lactação
Gordura	9,0	9,0	9,0
Ac Linoléico	0,55	0,55	0,55
Ac Araquidônico	0,02	0,006	0,02
α linolênico	0,02	-	0,02
EPA + DHA	0,01	0,01	0,01

FEDIAF 2020 (cães)

Nutriente	Adulto 95 kcal/kg^{0,75}	Adulto 110 kcal/kg^{0,75}	Crescimento inicial (< 14 semanas) e reprodução	Crescimento tardio (> 14 semanas)
Gordura (g)	5,50	5,50	8,50	8,50
Ácido linoleico (ω-6) (g)	1,53	1,32	1,30	1,30
Ácido araquidônico (ω-6) (mg)	-	-	30,00	30,00
Ácido alfa-linolênico (ω-3) (g)	-	-	0,08	0,08
EPA + DHA (ω-3) (g)	-	-	0,05	0,05

Mínimo de nutrientes recomendados para cães

Unidade por 100g de matéria seca



FEDIAF 2020 (gatos)

Nutriente	Adulto 75 kcal/kg^{0,67}	Adulto 100 kcal/kg^{0,67}	Crescimento e reprodução
Gordura (g)	9,00	9,00	9,00
Ácido linoleico (ω-6) (g)	0,67	0,5	0,55
Ácido araquidônico (ω-6) (mg)	8,00	6,00	0,55
Ácido alfa-linolênico (ω-3) (g)	-	-	0,02
EPA + DHA (ω-3) (g)	-	-	0,01

Mínimo de nutrientes recomendados para gatos

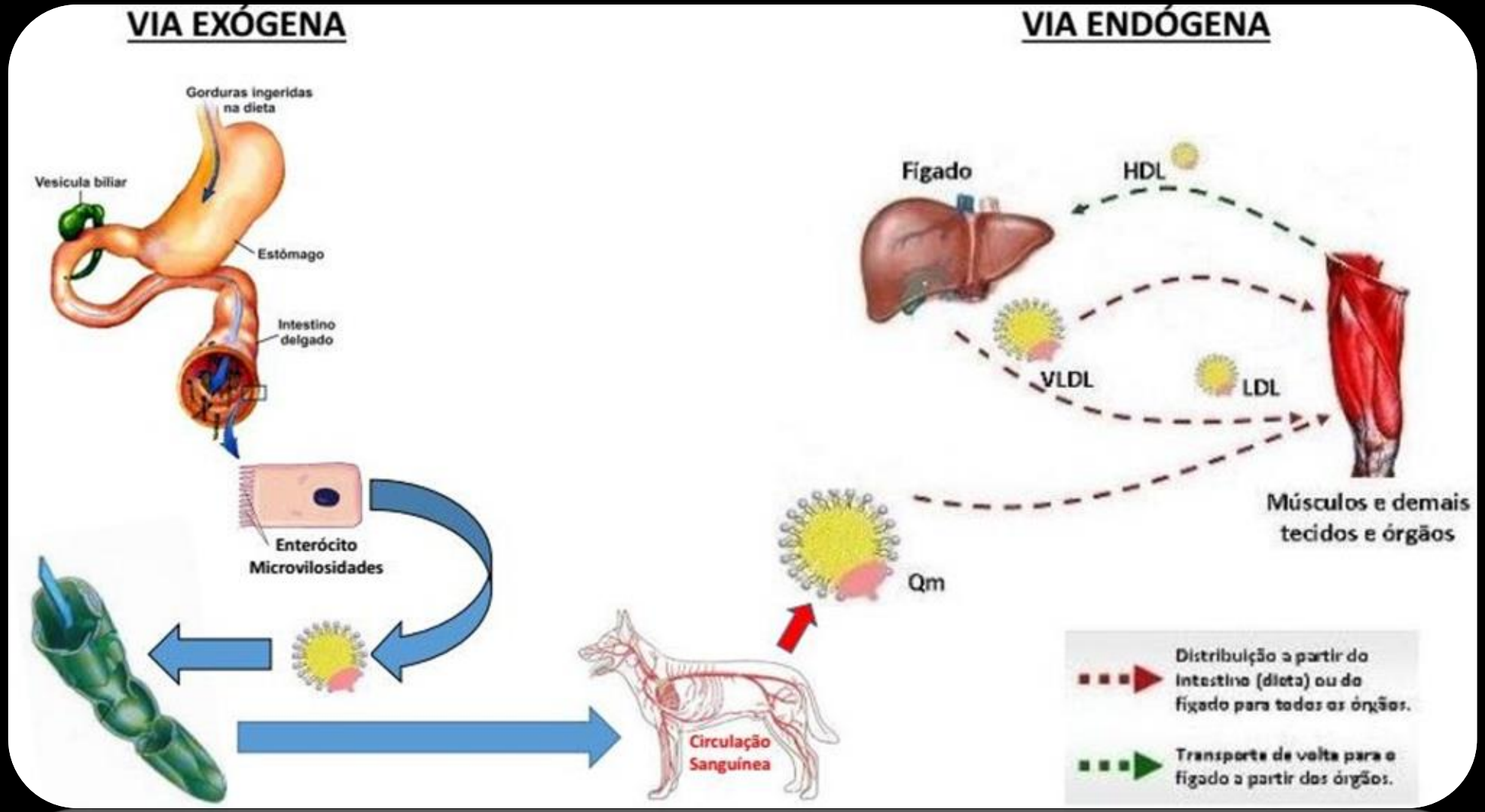
Unidade por 100g de matéria seca



Falamos em mínimo, mas e o excesso???



Vias de metabolismo das gorduras em cães




Do lobo
ao totó
A evolução dos cães

Ingestão energética excessiva crônica

10kcal/ dia

300kcal

Mensais

1ano

450 gramas

10% acima do peso ideal



Restrição energética e longevidade

- A restrição calórica - aumenta a longevidade em roedores e primatas (Weindruch et al., 1996) e cães (Kealy et al., 2002)

- Estudo em longo prazo - Labrador retriever

Ingestão controlada



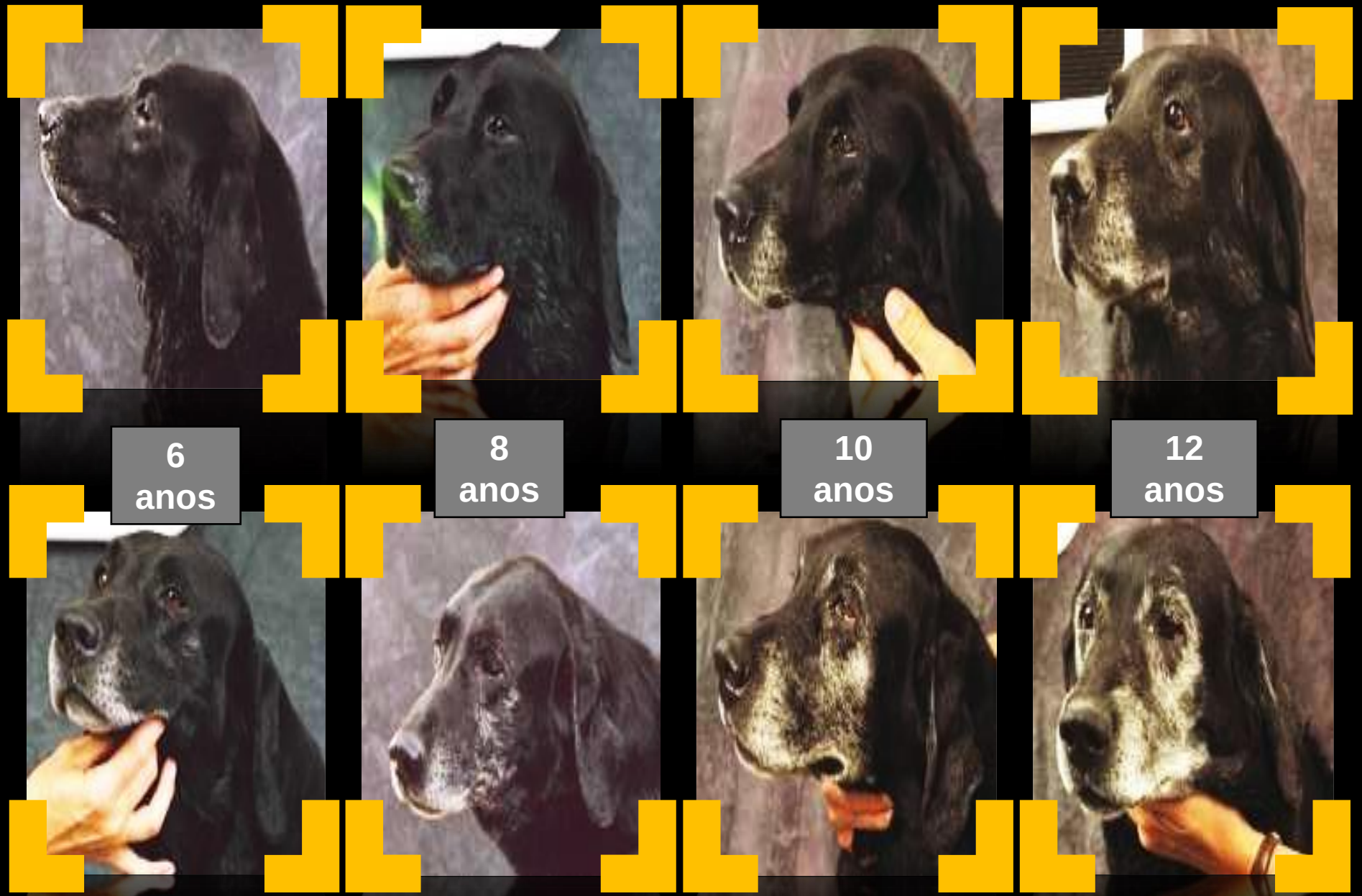
Ad libitum

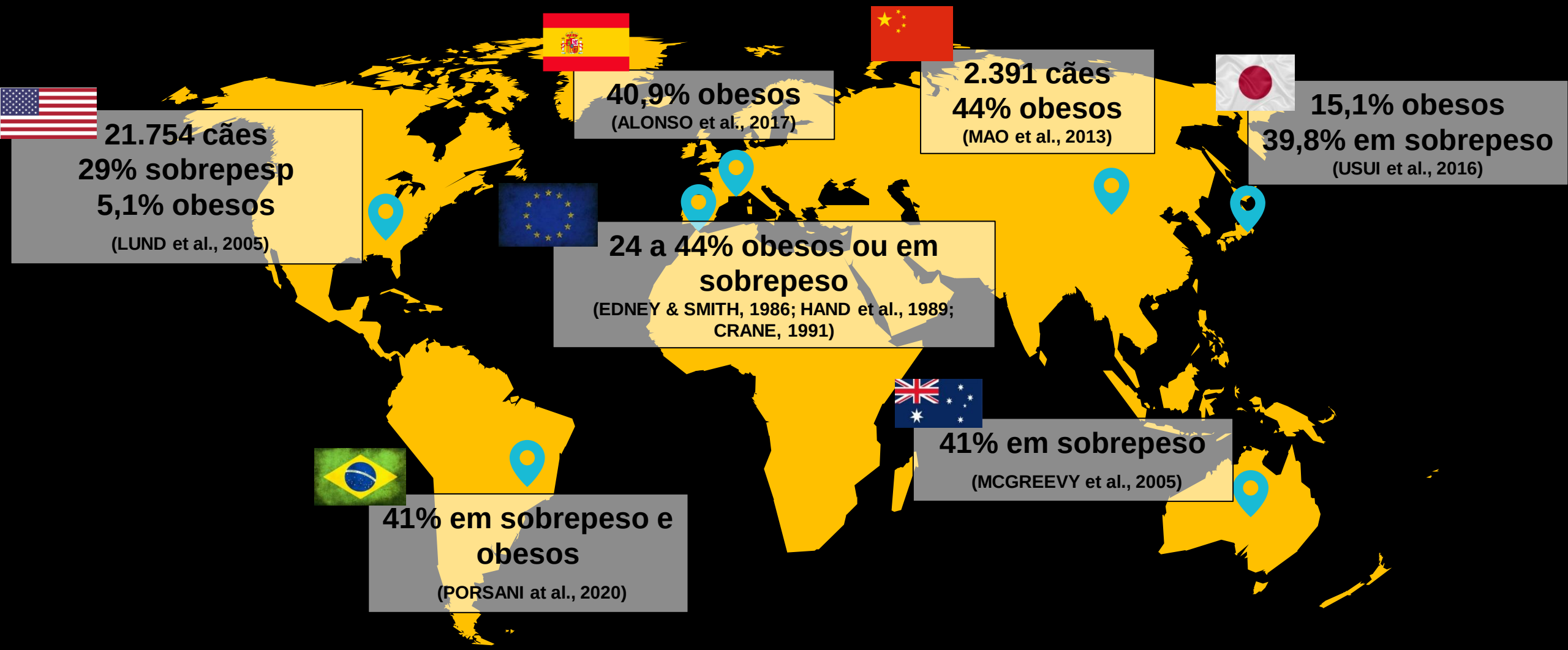
11,2 anos





Viveram cerca de 1,8 anos a mais do que os animais com excesso de peso


6
anos
8
anos
10
anos
12
anos


21.754 cães
29% sobrepesp
5,1% obesos
(LUND et al., 2005)
40,9% obesos
(ALONSO et al., 2017)
2.391 cães
44% obesos
(MAO et al., 2013)
15,1% obesos
39,8% em sobrepeso
(USUI et al., 2016)
24 a 44% obesos ou em sobrepeso
(EDNEY & SMITH, 1986; HAND et al., 1989; CRANE, 1991)
41% em sobrepeso
(MCGREEVY et al., 2005)
41% em sobrepeso e obesos
(PORSANI at al., 2020)

SCIENTIFIC REPORTS

nature research

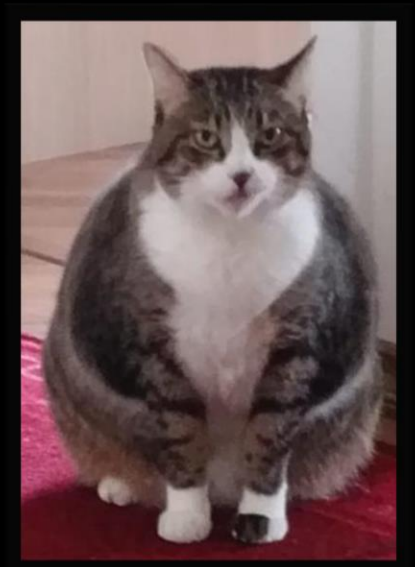
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OPEN

Prevalence of canine obesity in the city of São Paulo, Brazil

Mariana Yukari Hayasaki Porsani[1], Fabio Alves Teixeira[1], Vinicius Vasques Oliveira[1], Vivian Pedrinelli[1], Ricardo Augusto Dias[1], Alexander James German[2] & Marcio Antonio Brunetto[1]

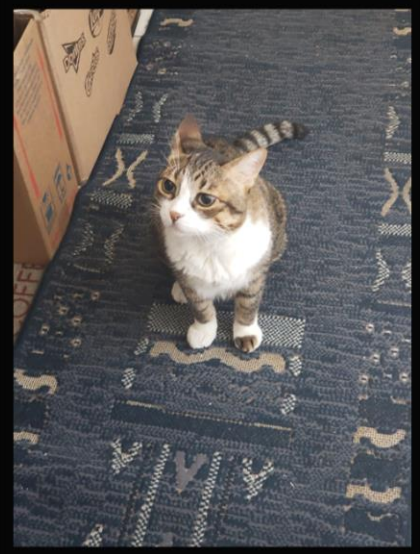
Canine obesity is associated with comorbidities, a shortened lifespan, and a poorer quality of life, but epidemiological studies characterizing canine obesity in Latin America are scarce. Therefore, this study aimed to determine the prevalence of canine obesity in the city of Sao Paulo, Brazil, and the possible associated causal factors. Randomly-selected households from different city regions were visited. Dogs in each household were evaluated and owners completed a questionnaire whilst their anthropometric measures were taken. Total of 285 dogs from 221 owners were included, and the combined prevalence of overweight and obesity was 40.5%. The prevalence of overweight and obesity was greater in female dogs ($P = 0.003$) and in dogs that were neutered ($P = 0.001$). There was also a positive association between BCS and frequency of visits to a veterinarian ($P = 0.026$), feeding frequency ($P = 0.033$), and higher snack intake ($P = 0.011$). Further, the BCS of dogs was greater when their owners reported consuming more snacks themselves ($P = 0.005$) and whose had a presence of elderly people in the household ($P = 0.006$). In conclusion, the prevalence of obesity found in a Brazilian metropolitan region was similar to that if other countries, and neutering and snack intake were associated with the development of this disease.





Antes





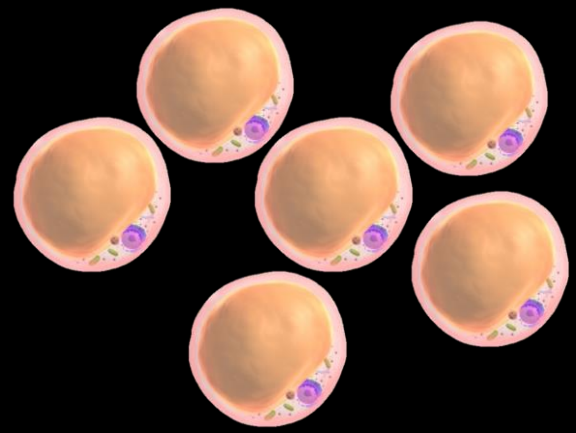
Depois

A gordura em excesso

Calorias que excedem o gasto energético

Ingestão crônica excessiva, mesmo que modesta - ganho de peso significativo em longo prazo

Orgão de armazenamento de energia ?



A gordura em excesso

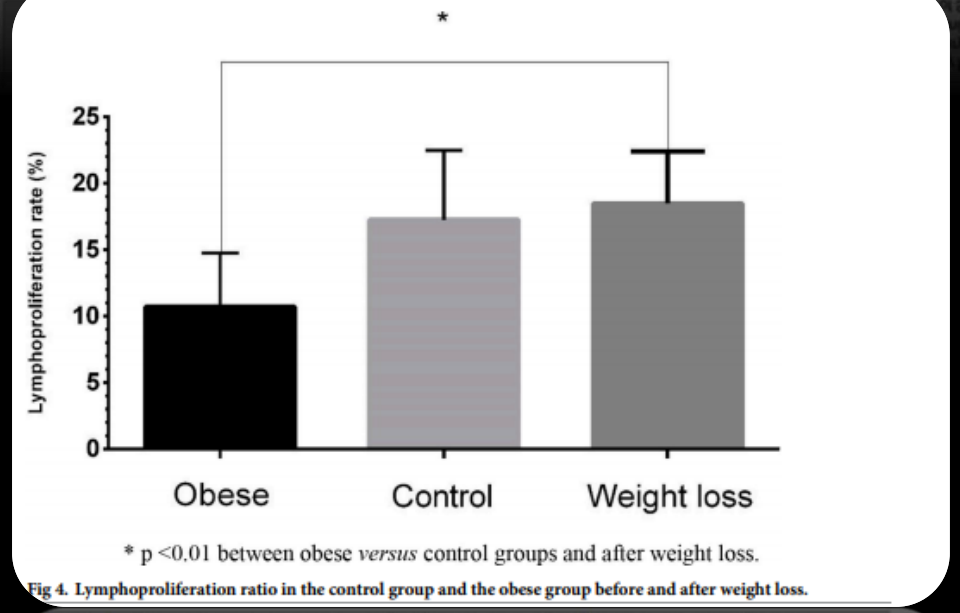
PLOS ONE

RESEARCH ARTICLE

Gene expression of the immunoinflammatory and immunological status of obese dogs before and after weight loss

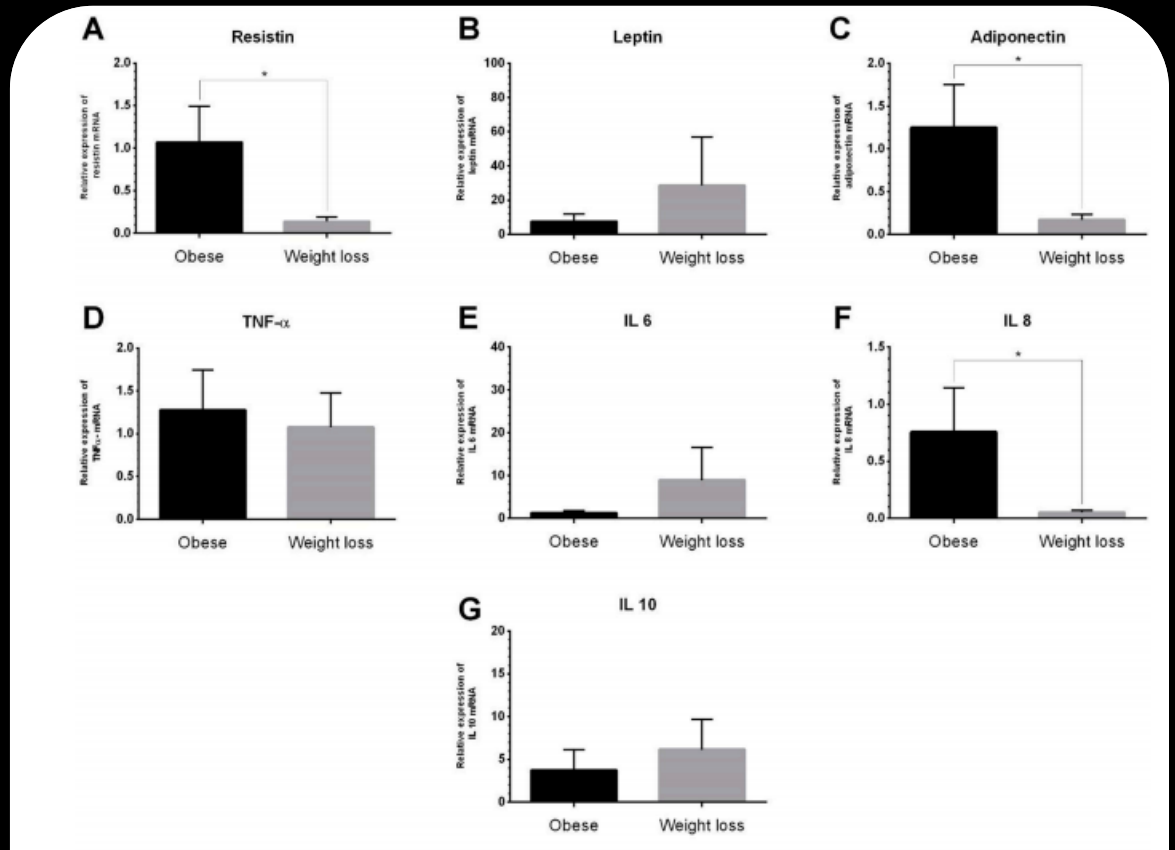
Thiago Henrique Annibale Vendramini[1], Henrique Tobaro Macedo[1], Andressa Rodrigues Amaral[2], Mariana Fragoso Rentas[1], Matheus Vinícius Macegoza[1], Rafael Vessecchi Amorim Zafalon[1], Vivian Pedrinelli[2], Lígia Garcia Mesquita[1], Júlio César de Carvalho Balieiro[1], Karina Pfrimer[3], Raquel Silveira Pedreira[4], Victor Nowosh[5], Cristiana Fonseca Ferreira Pontieri[4], Cristina de Oliveira Massoco[5], Marcio Antonio Brunetto[1,2]*

1 Pet Nutrology Research Center, Nutrition and Production Department, School of Veterinary Medicine and Animal Science, University of Sao Paulo—USP, Pirassununga, São Paulo, Brazil, **2** Veterinary Nutrology Service, Teaching Veterinary Hospital, School of Veterinary Medicine and Animal Science, University of Sao Paulo—USP, São Paulo, São Paulo, Brazil, **3** Medical School of Ribeirão Preto, University of São Paulo—USP, Ribeirão Preto, São Paulo, Brazil, **4** Grandfood Indústria e Comércio, Dourado, São Paulo, Brazil, **5** Department of Pathology, School of Veterinary Medicine and Animal Science, University of São Paulo–USP, São Paulo, São Paulo, Brazil



* p <0.01 between obese *versus* control groups and after weight loss.

Fig 4. Lymphoproliferation ratio in the control group and the obese group before and after weight loss.



* p <0.01 between groups.

Fig 3. Relative expression of mRNA of resistin (A), leptin (B), adiponectin (C), tumoral necrosis factor alfa (D), interleukin 6 (E), interleukin 8 (F), and interleukin 10 (G) in total blood of obese dogs before and after weight loss.

https://doi.org/10.1371/journal.pone.0238638.g003

Obesidade: riscos à saúde conhecidos.....

Riscos à saúde	Espécie	Referências
Alteração da microbiota intestinal	cães e gatos	Im et al., 2012; Handl et al., 2013; Park et al., 2015; Tobaro, 2020; Sanchez et al., 2020
Função renal alterada (alterações histológicas)	cães e gatos	Heneger et al., 2001; Lohmeier et al., 2012; Tvarijonaviciute et al., 2013
Aumento do risco de desenvolver certos tumores	cães	Van den Brandt et al., 2000; Wei et al., 2004; Takeda et al., 2008
Hiperlipidemia	cães e gatos	Hoenig et al., 2003; Jeusette et al., 2005; Brunetto et al., 2010; Bertrand et al., 2012; Park et al., 2014; Mori et al., 2015
Doença hepática	cães e gatos	Nicoll et al., 1998; Tribuddharatana et al., 2011; Sandoe et al., 2014; Xenoulis et al., 2015
Diminuição da qualidade de parâmetros vitais	cães	Wiseman-Orr et al., 2004; Mlacnik et al., 2006; Marshall et al., 2010; German et al., 2012
Redução da longevidade	cães	Kealy et al., 2002; Lawler et al., 2008

Obesidade: riscos à saúde conhecidos.....

Riscos à saúde	Espécie	Referência
Aumento do risco / agravamento de doença ortopédica	cães e gatos	Marshall et al., 1996; Kealy et al., 2002; Mlacnik et al., 2006
Diminuição da atividade geral do cão	cães	Warren et al., 2011; Morrison et al., 2013
Aumento do risco de resistência à insulina, diabetes mellitus (gatos)	gatos	Mattheeuws et al., 1984; Lund et al., 2005; Lund et al., 2006
Disfunção pulmonar	cães e gatos	Garcia-Guasch et al., 2015
Aumento do risco de morte por insolação	cães	Bruchim et al., 2006
Aumento do risco de doença de pele não-alérgica	cães e gatos	Mason 1970; Scarlett et al., 1198; Lund et al., 2005; Lund et al., 2006
Aumento do risco de doença do trato urinário inferior	cães e gatos	Lekcharoensuk et al., 2000; Lund et al., 2005; Lund et al., 2006

Causas de hiperlipidemia

Primárias

- ❑ Hiperlipidemia pós-prandial: aumento leve (duração menor de 15h)
- ❑ Alimentação com alta gordura: >50% de gordura na composição da dieta
- ❑ Raças predispostas: Schnauzer miniatura (prevalência >30% nos EUA. Aumenta com a idade); Rotweiller; Pastor de Shetland

Secundárias

- ❑ Diabetes mellitus: >50% dos casos
- ❑ Hiperadrenocorticismo
- ❑ Hipotireoidismo: >75% dos casos
- ❑ Pancreatite: em aprox. 30% dos casos
- ❑ Obesidade: >25% dos casos
- ❑ Nefropatia com perda de proteína (síndrome nefrótica)
- ❑ Colestase
- ❑ Insuficiência hepática
- ❑ Linfoma
- ❑ Infecção por *Leishmania infantum*
- ❑ Hipernatremia (relato de caso da Medicina Humana)

Fármacos

- ❑ Glicocorticoides
- ❑ Fenobarbital

(Xenoulis et al. Canine hyperlipidaemia. JSAP, 2015)



Alterações de motilidade da VB e fluidez da BILE

- **LAMA BILIAR** = aumento da viscosidade por redução da velocidade de deposição de partículas dispersas no meio líquido da bile
- **MUCOCELE** = aumento da viscosidade por acúmulo anormal de mucinas e hiperplasia da mucosa
- **COLELITÍASE** = Precipitação de compostos (colesterol, cálcio e bilirrubina)
  - Concreções em cristais, micrólitos e litíases

Síndromes emergentes em cães

(CENTER, 2009; COOK et al., 2016; NAGANOBU et al., 2016)

Contents lists available at ScienceDirect

The Veterinary Journal

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

The association between gall bladder mucoceles and hyperlipidaemia in dogs: A retrospective case control study

M. Kutsunai, H. Kanemoto, K. Fukushima, Y. Fujino, K. Ohno *, H. Tsujimoto

Department of Veterinary Internal Medicine, Graduate School of Agricultural and Life Sciences, The University of Tokyo, 1-1-1, Yayoi, Bunkyo-ku, Tokyo 113-8657, Japan

Journal of Veterinary Internal Medicine

ACVIM

Open Access

Standard Article

J Vet Intern Med 2017;31:36–42

Increased Leptin and Leptin Receptor Expression in Dogs With Gallbladder Mucocele

S. Lee, O.-K. Kweon, and W.H. Kim

PLOS ONE

RESEARCH ARTICLE

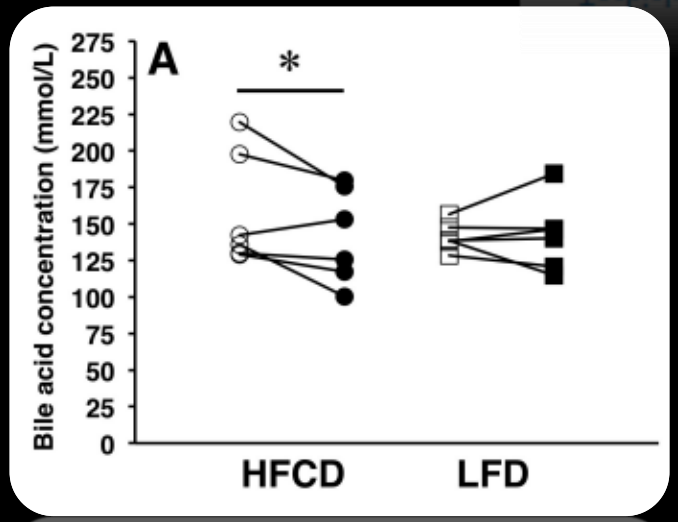
Associations between serum leptin levels, hyperlipidemia, and cholelithiasis in dogs

Sungin Lee, Oh-kyeong Kweon, Wan Hee Kim*

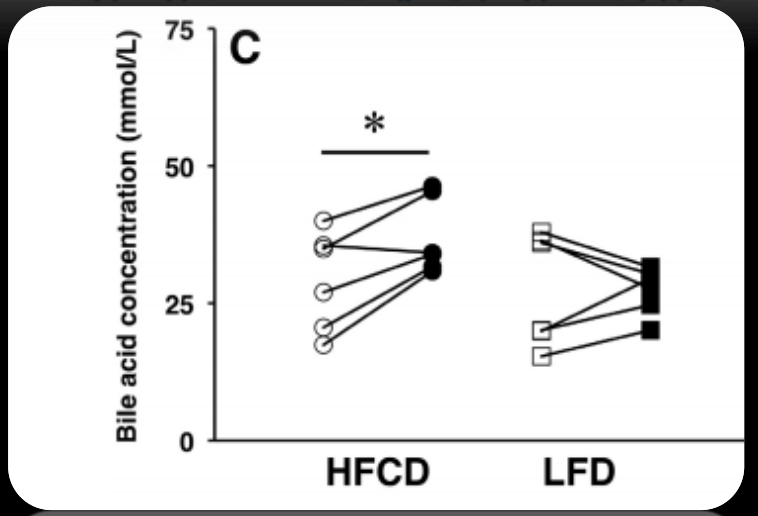
Am J Vet Res. 2017 Dec;78(12):1406-1413. doi: 10.2460/ajvr.78.12.1406.

Effect of a high-fat-high-cholesterol diet on gallbladder bile acid composition and gallbladder motility in dogs

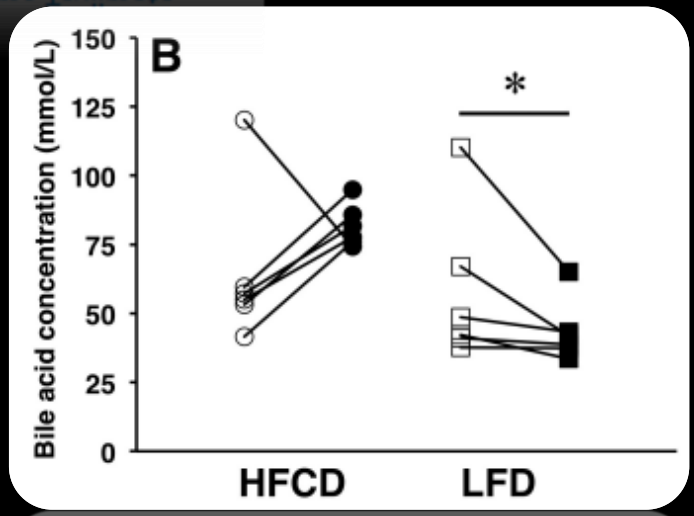
Toshiaki Kakimoto, Hideyuki Kanemoto, Kenjiro Fukushima, Koichi Ohno, Hajime Tsujimoto



Ácido taurocólico

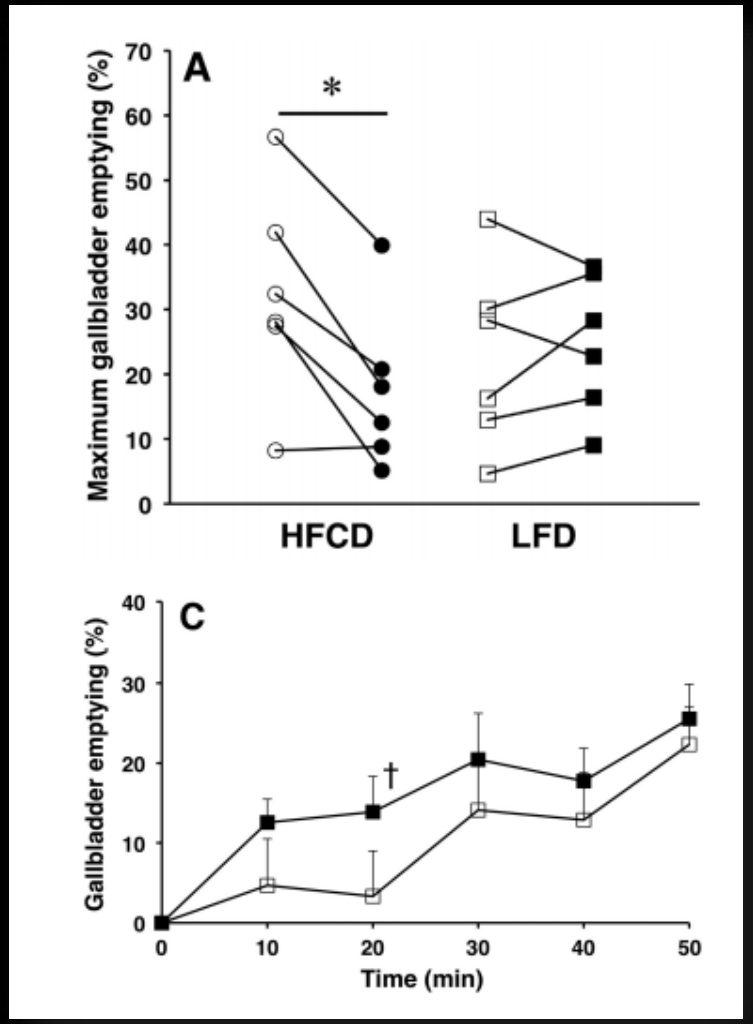


Acido tauroquenodesoxicólico



Ácido taurodesoxicólico

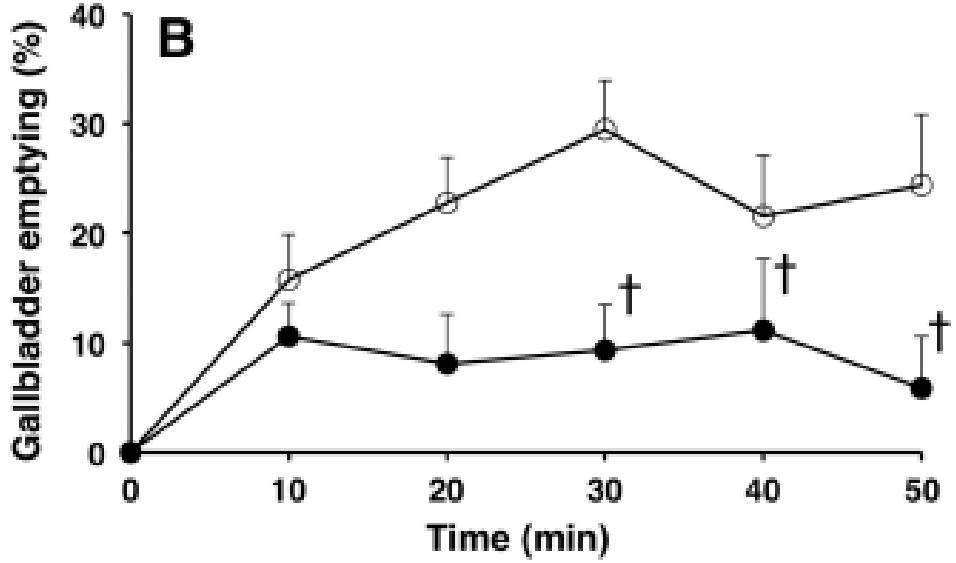
HFCD 20% proteína, 20% gordura, 8% colesterol, 29% amido, 6% fibra
LFD alimento comercial baixa gordura



Am J Vet Res. 2017 Dec;78(12):1406-1413. doi: 10.2460/ajvr.78.12.1406.

Effect of a high-fat-high-cholesterol diet on gallbladder bile acid composition and gallbladder motility in dogs

Toshiaki Kakimoto, Hideyuki Kanemoto, Kenjiro Fukushima, Koichi Ohno, Hajime Tsujimoto



A dieta com alta gordura induziu hipomotilidade de vesícula biliar
Hipomotilidade de vesícula biliar está associada ao desenvolvimento de mucocele biliar

Received: 7 November 2019 | Accepted: 20 January 2020
DOI: 10.1111/jvim.15715

STANDARD ARTICLE

Journal of Veterinary Internal Medicine Open Access
ACVIM American College of Veterinary Internal Medicine

Serum triglyceride and cholesterol concentrations and lipoprotein profiles in dogs with naturally occurring pancreatitis and healthy control dogs

Panagiotis G. Xenoulis[1,2] | Paul J. Cammarata[3] | Rosemary L. Walzem[4] | Jan S. Suchodolski[1] | Jörg M. Steiner[1]

TABLE 1 Characteristics of dogs with pancreatitis and healthy control dogs included into the study

Group characteristics	Pancreatitis	Healthy	*P* value
Total number, n	17	53	-
Patient characteristics			
Age in years, mean (±SD)	7.4 (4.3)	5.4 (2.6)	.07
Sex, male/female	8/9	27/26	1
Neutered	16/17	46/53	.67
BCS, median (range)	5 (4-6)	5 (4-6)	.7
BCS category, n (%)			.67
≤5	16 (94%)	46 (87%)	
>5	1 (6%)	7 (13%)	
Selected clinicopathologic variables (median [range])			
Serum triglyceride (mg/dL)	67 (48-324)	54 (26-257)	**.002**
Serum cholesterol (mg/dL)	209 (142-849)	227 (97-338)	.57
Serum glucose (mg/dL)	108 (87-138)	99 (85-123)	.51
Serum total T4 (μg/d)	2.5 (1.3-4.9)	2.1 (1.2-5.2)	.43
Serum cTSH (ng/mL)	0.28 (0.09-1.21)	0.22 (0.029-0.96)	.74
Serum free T4 (ng/dL)	1.28 (0.6-3.8)	1.4 (0.4-2.3)	.62
Serum Spec cPL (μg/L)	642 (456-1001)	29 (29-186)	**<.0001**

Note: Bold face values indicate statistical significance at $P < .05$.
Abbreviation: BCS, body condition score (range of possible scores: 1-9).

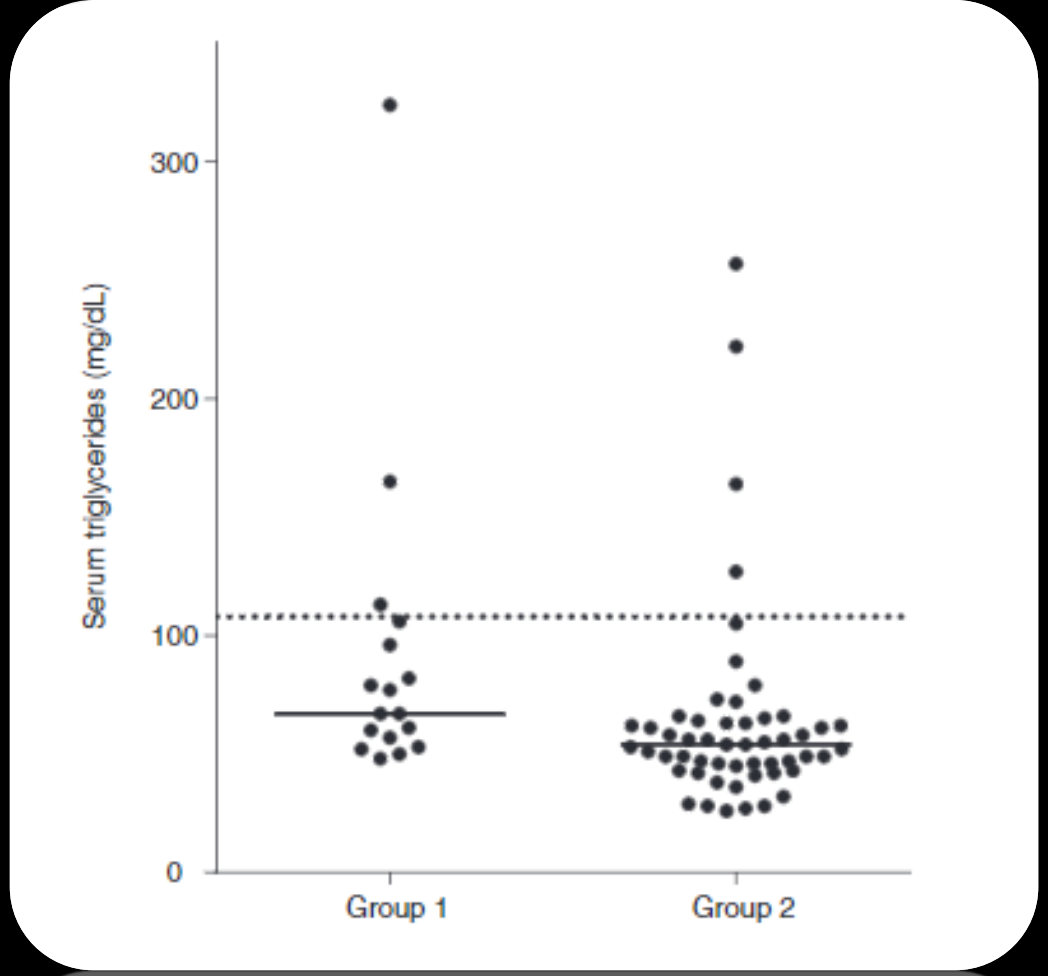


FIGURE 1 Serum triglyceride concentrations in 17 dogs with pancreatitis (Group 1) and 53 healthy control dogs (Group 2). Dogs in Group 1 had significantly higher ($P = .002$) serum triglyceride concentrations than dogs in Group 2. However, the majority of dogs in both groups had serum triglyceride concentrations within the reference interval. Hypertriglyceridemia, when present, was mild. The dashed line represents the upper limit of the reference interval (108 mg/dL) and the solid line represents the median

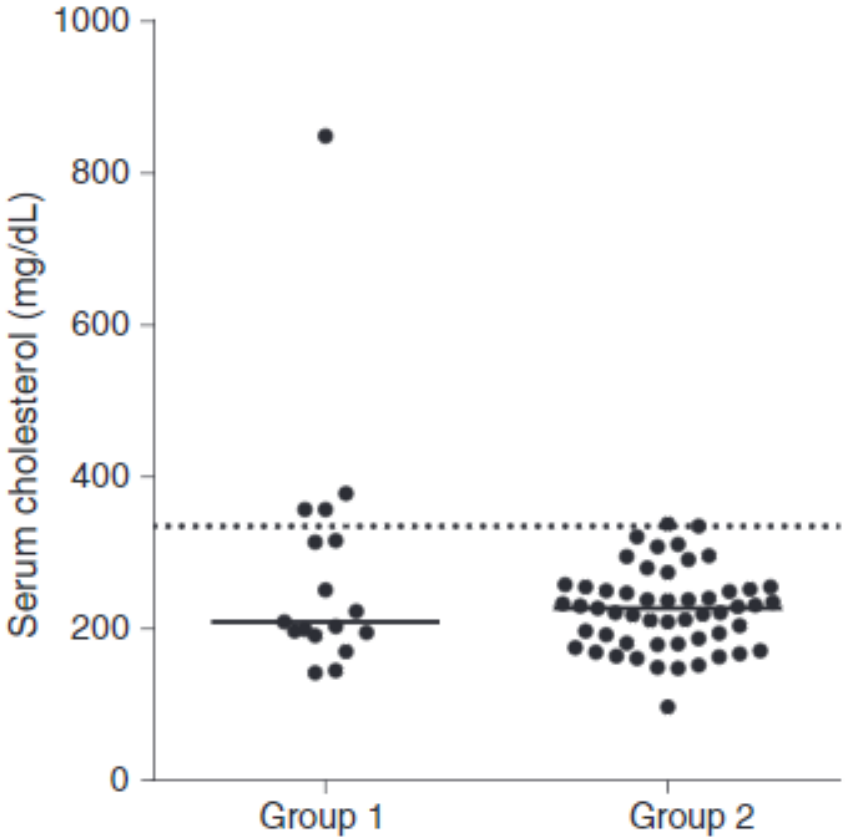


FIGURE 2 Serum cholesterol concentrations in 17 dogs with pancreatitis (Group 1) and 53 healthy control dogs (Group 2). There was no statistically significant difference in serum cholesterol concentration between the two groups ($P = .56$). The majority of dogs in both groups had serum cholesterol concentrations within the reference interval, whereas a small number of dogs had a mildly increased serum cholesterol concentration. The dashed line represents the upper limit of the reference interval (335 mg/dL) and the solid line represents the median

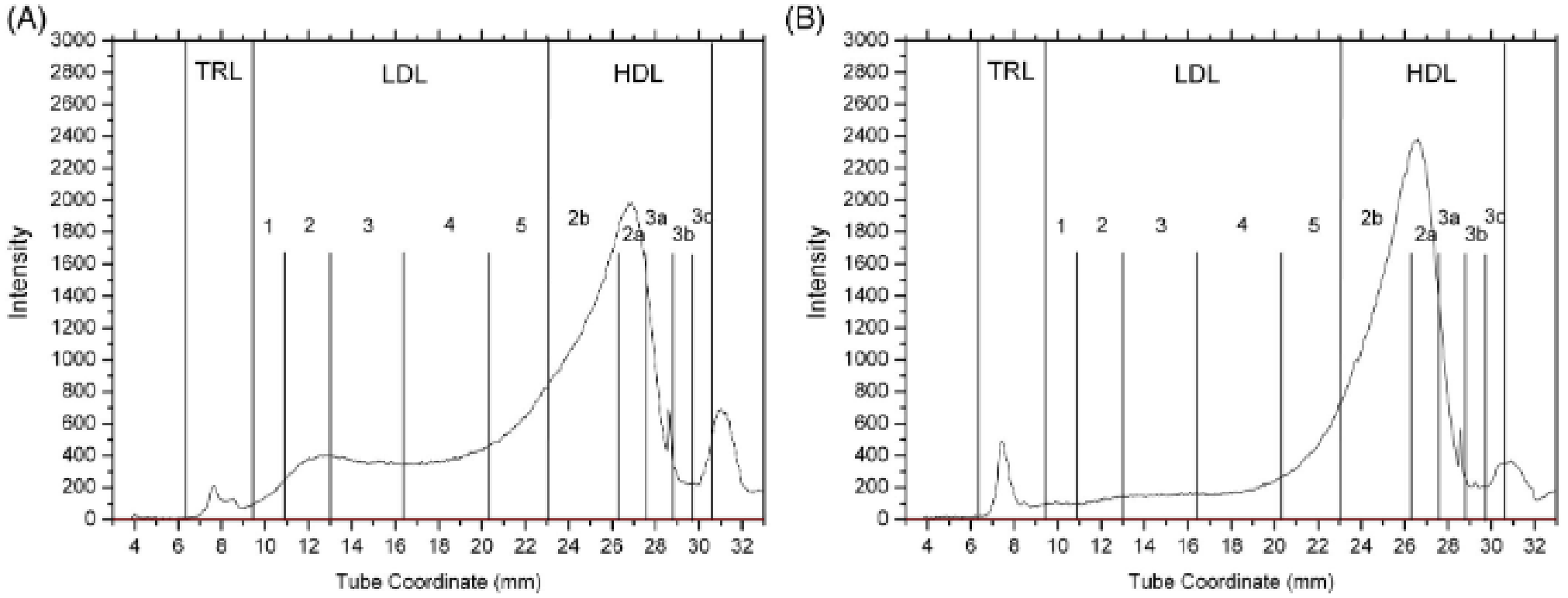


FIGURE 4 Lipoprotein density profiles from a representative dog with pancreatitis (A) and a representative healthy control dog (B). The dog in (A) shows profound increases in the nominal LDL fractions (mainly LDL_2 through LDL_5) compared to the healthy control dog shown in (B). Decreases in the TRL, HDL_{2b}, and HDL_{2a} fractions might also be present in the dog in (A) compared to the dog in (B). Both dogs had serum triglyceride and cholesterol concentrations within their respective reference intervals. HDL, high-density lipoproteins; LDL, low-density lipoproteins; TRL, triglyceride-rich lipoprotein

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DOI: 10.1111/jpn.12696

ORIGINAL ARTICLE

WILEY

Effect of feeding a high-carbohydrate or a high-fat diet on subsequent food intake and blood concentration of satiety-related hormones in dogs

S. Schauf[1] | A. Salas-Mani[2] | C. Torre[2] | E. Jimenez[3] | M. A. Latorre[1] | C. Castrillo[1]

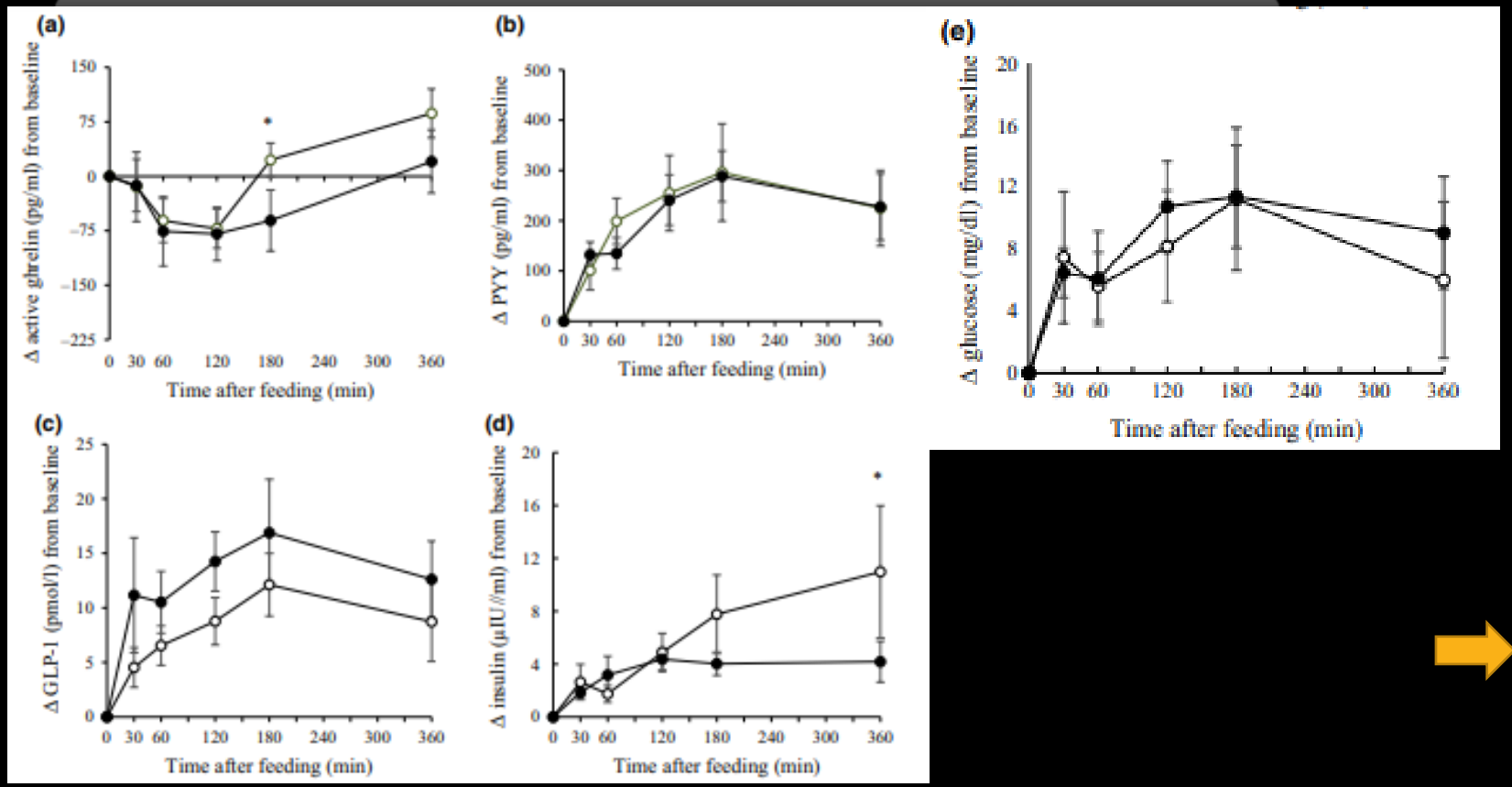


TABLE 3 Blood concentration of satiety-related hormones and glucose in dogs fed a high-carbohydrate (HC) or a high-fat (HF) diet

	Diets		
	HC	HF	*p*-value
Basal concentration			
Active ghrelin (pg/ml)	286 ± 43.9	314 ± 66.4	.331
PYY (pg/ml)	407 ± 29.1	410 ± 33.6	.924
Total GLP-1 (pmol/L)	7.34 ± 0.831	10.3 ± 1.41	.010
Insulin (μIU/ml)	3.28 ± 0.235	2.82 ± 0.275	.170
Glucose (mg/dl)	86.3 ± 2.22	86.0 ± 1.54	.863
$nAUC_{0-180}$			
Active ghrelin (pg/ml)	−38.1 ± 23.19	−57.7 ± 34.06	.310
PYY (pg/ml)	201 ± 51.8	184 ± 31.4	.678
Total GLP-1 (pmol/L)	7.32 ± 1.641	12.0 ± 2.87	.156
Insulin (μIU/ml)	3.79 ± 0.961	3.23 ± 0.558	.499
Glucose (mg/dl)	7.24 ± 2.537	8.09 ± 2.153	.350
$nAUC_{180-360}$			
Active ghrelin (pg/ml)	54.5 ± 26.99	−20.5 ± 41.99	.079
PYY (pg/ml)	260 ± 82.5	258 ± 50.2	.968
Total GLP-1 (pmol/L)	10.4 ± 3.11	14.74 ± 4.105	.422
Insulin (μIU/ml)	9.38 ± 4.668	4.10 ± 1.176	.249
Glucose (mg/dl)	8.63 ± 4.746	10.22 ± 3.113	.642
$tAUC_{0-180}$			
Active ghrelin (pg/ml)	248 ± 35.2	256 ± 40.9	.639
PYY (pg/ml)	576 ± 34.3	572 ± 25.0	.820
Total GLP-1 (pmol/L)	14.7 ± 1.51	22.4 ± 3.07	.031
Insulin (μIU/ml)	7.07 ± 1.033	6.04 ± 0.596	.187
Glucose (mg/dl)	93.5 ± 1.79	94.1 ± 1.76	.548

Considerações finais





Muito obrigado

mabrunetto@usp.br