O microbioma ao longo do ciclo de vida de cães e gatos:

Uma visão do animal idoso

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PANORAMA

(re)Apresentar aspectos relacionados ao processo de envelhecimento de cães e gatos e embasar discussão sobre seus efeitos no microbioma intestinal

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O ENVELHECIMENTO

"Processo biológico complexo, resultando em redução progressiva da capacidade do indivíduo em manter a homeostase sob estresses ambientais e fisiológicos, diminuindo assim sua viabilidade e aumentando a vulnerabilidade à doença e, eventualmente, causando a morte."
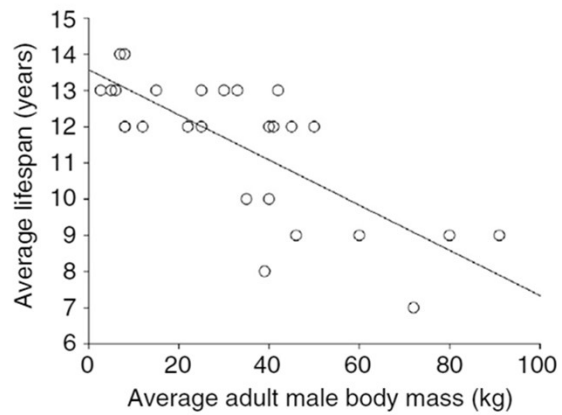
(Fascetti; Delaney, 2024; Goldston 1989)

O envelhecimento é inexorável, progressivo e irreversível

A velhice por si só não é uma doença!

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O CÃO GERIÁTRICO

Figure 1. Body size and lifespan in dogs.

(Kraus; Pavard; Promislow, 2013 ← Selman; Nussey; Monaghan, 2013)

Current Biology   4

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O CÃO GERIÁTRICO

VETERINARY PRACTICE GUIDELINES

2019 AAHA Canine Life Stage Guidelines*

Kate E. Creevy, DVM, MS, DACVIM (SAIM), Jesse Grady, DVM, MS, Susan E. Little, DVM, PhD, DACVM (Parasit.),
George E. Moore, DVM, PhD, DACVPM, DACVIM[†], Beth Groetzinger Strickler, MS, DVM, DACVB, CDBC,
Steve Thompson, DVM, DABVP (C/F), Jinelle A. Webb, DVM, MSc, DVSc, DACVIM (SAIM)[†]

8 months → 15 years

TABLE 1

Proposed Canine Life Stage Definitions

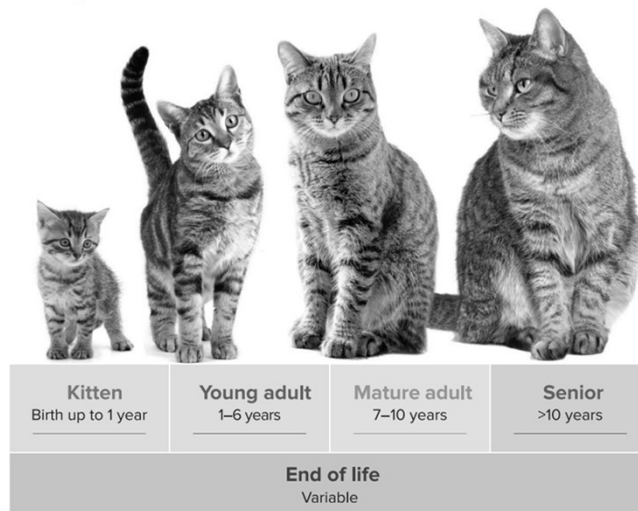| Stage	Definition (Length of Time)
Puppy	Birth to cessation of rapid growth ($\sim$6–9 mo, varying with breed and size)
Young adult	Cessation of rapid growth to completion of physical and social maturation, which occurs in most dogs by 3 to 4 yr of age
Mature adult	Completion of physical and social maturation until the last 25% of estimated lifespan (breed and size dependent)
Senior	The last 25% of estimated lifespan through end of life
End of life	Terminal stage (depends on the specific pathologies)

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O GATO GERIÁTRICO

VETERINARY PRACTICE GUIDELINES

2021 AAHA/AAFP Feline Life Stage Guidelines*

Jessica Quimby, DVM, PhD, DACVIM[†], Shannon Gowland, DVM, DABVP[†], Hazel C. Carney, DVM, MS, DABVP,
Theresa DePorter, DVM, MRCVS, DACVB, DECAWBM, Paula Plummer, LVT, VTS (ECC, SAIM), Jodi Westropp,
DVM, PhD, DACVIM

Feline Life Stages

Kitten	Young adult	Mature adult	Senior
Birth up to 1 year	1–6 years	7–10 years	>10 years

End of life
Variable

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O ENVELHECIMENTO

Além do óbvio...

Desenvolvimento de alterações físicas e comportamentais

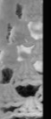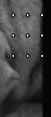Mudanças na composição corporal e sarcopenia

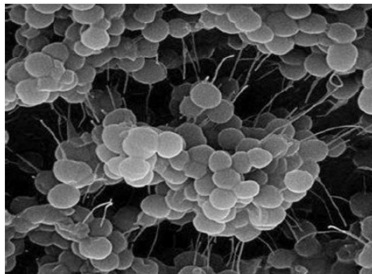Imunossenescência

Inflammaging

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MICROBIOMA INTESTINAL

9

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FATORES QUE INTERFEREM NA EUBIOSE

Composição

Metabolismo

Patológicos

Genéticos

Imunológicos

Ambientais

Fisiológicos

Microbioma

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FATORES QUE INTERFEREM NA EUBIOSE

Neonatal
Essentially sterile

Maternal microflora

Environmental microbes

Gut environment

Colonization

Perinatal/Infant
Temporally unstable
Compositionally simple
Low diversity

Diet

Host genetics

Maturation

Environmental microbes

Host immunity

Healthy Mature
Temporally stable
Compositionally complex
High diversity
Resistant to pathogens

Infection

Malnutrition

Antibiotics

Dysmaturity

Recovery

Chronic Disturbance

Acute Disturbance

Recovery

Persistent Dysbiosis
Temporally stable
Compositionally simple
Low diversity
Permissive to pathogens

Partial Recovery

Transient Dysbiosis
Temporally unstable
Compositionally simple
Low diversity
Permissive to pathogens

(Barko et al., 2017)

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MICROBIOTA FECAL

Figura 1. Animais dos 3 grupos etários. Grupo Filhotes (A), Adultos (B) e Idosos (C)

Filhotes - **GF**
(n=10; **0,83**±0,001 anos)

Adultos - **GA**
(n=10; **5,3**±0,48 anos)

Idosos - **GI**
(n=11; **10,7**±1,25 anos)

(Gomes, 2013)

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MICROBIOTA FECAL

Os animais do grupo idoso apresentaram:

⬆ Concentração de indóis e pH fecal

⬇ Concentração de acetato, propionato e butirato e AGV totais, n°

Bifidobacterium spp e Clostridial cluster IV

Apresentaram alterações histológicas compatíveis com gastrite, enterite e colite

(qPCR)

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Age-associated changes in intestinal health biomarkers in dogs

TYPE Original Research
PUBLISHED 22 August 2023
DOI 10.3389/fvets.2023.1213287

Anna Fernández-Pinteño[1]*, Rachel Pilla[2], Xavier Manteca[3], Jan Suchodolski[2], Celina Torre[1] and Anna Salas-Mani[1]

- 106 cães de raças puras (= M e F)
- 0,2 a 15 anos (média 6,3 anos)
- Canis de 1 a 7 animais (porte)
- Saudáveis (?)
- Alimento igual para 54%
- Sequenciamento Illumina (16S rRNA)

TABLE 1 Descriptive information regarding the age distribution of dogs sorted by age category.

	Junior	Adult	Senior
	n = 16	n = 50	n = 40
Age (in years)	Até 2 anos	2 - 7anos	> 7 anos
Age (in years)	0.92 [0.23; 1.14]	5.00 [4.58; 7.11]	8.25 [8.15; 9.06]

n° de raças: júnior=3; adulto=8; sênior= 17

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Supplementary table 2 (S2). Detailed product composition of the 6 pet food products out of the composition range defined in the manuscript (7-8% moisture, 22-30% protein, 15-21% fat and 2-5% fiber). The animal count for each type of product and its age category are included in the table. The analytical constituent values out of the defined composition range are marked with an asterisk (*).

Product type	Product composition - Analytical constituents (%)				Age Category		
	Moisture	Protein	Fat	Fiber	Junior (n=16)	Adult (n=50)	Senior (n=40)
Adult light	8	27	9,5*	4,8			3
Senior	7,5	27	12,2*	2,5			2
Renal veterinary diet	7,5	14,5*	17,5	3			2
Colitis veterinary diet	8	23	12*	6,5*			1
Gastroenteric veterinary diet	7,5	25,5	12,8*	1,3*	2		
Weight control veterinary diet	7,8	34*	10,5*	11,5*		2	

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Anna Fernández-Pinteño[1]*, Rachel Pilla[2], Xavier Manteca[3], Jan Suchodolski[2], Celina Torre[1] and Anna Salas-Mani[1]

Indicadores avaliados

• Sequenciamento Illumina (16S rRNA) para microbioma fecal

• qPCR para índice de disbiose

• AGCC, calprotectina e IgA nas fezes

Sem diferenças entre os grupos na avaliação do microbioma fecal (valores corrigidos)

TABLE 4 Fecal microbiota composition (% of relative abundance from rarefied data) at the phylum level split by age category.

Phylum	Junior		Adult		Senior		Junior vs. Adult vs. Senior	
	Median	Range	Median	Range	Median	Range	p-value	q-value
Bacteroidota	0.06[a,b]	0–3.67	0.53[a]	0–11.01	1.74[b]	0.21–12.02	0.036	0.087
Bacillota	89.60	77.20–97.52	85.28	71.62–95.08	82.02	64.30–88.92	0.052	0.087
Actinomycetota	6.87	1.47–14.05	5.35	1.66–14.13	8.20	2.60–15.70	0.569	0.569
Fusobacteriota	1.20	0.15–10.52	5.08	0.13–20.34	3.60	0.89–27.9	0.145	0.181
Pseudomonadota	**0.01[a]**	**0–0.60**	**0.27[a,b]**	**0–1.73**	**0.28[b]**	**0.04–2.14**	**0.019**	**0.087**

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Anna Fernández-Pinteño[1]*, Rachel Pilla[2], Xavier Manteca[3], Jan Suchodolski[2], Celina Torre[1] and Anna Salas-Mani[1]

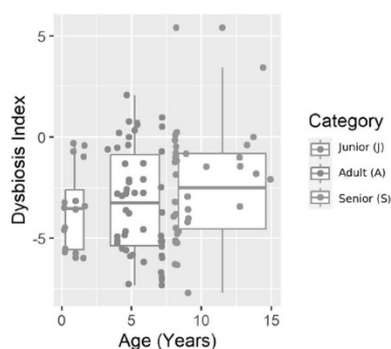**Sem diferenças** calprotectina e IgA nas fezes

FIGURE 1
A representative plot of the dysbiosis index (DI) split by age category.

TABLE 6 Fecal SCFA values expressed as concentration (μmol/g DM) and relative percentages (%) reported by age category.

Fecal SFCA	Junior	Adult	Senior	
	emmeans ± SE	emmeans ± SE	emmeans ± SE	p-value
Concentration (μmol/g DM)				
Acetate	169 ± 26.1	210 ± 15.0	249 ± 21.1	0.061
Propionate	10.2 ± 1.449	12.4 ± 0.837	14.0 ± 1.171	0.149
Butyrate	52.8 ± 8.25	71.4 ± 4.76	61.2 ± 6.66	0.079
Isobutyric acid	6.91 ± 1.109	7.92 ± 0.640	7.27 ± 0.896	0.634
Isovaleric acid	9.72 ± 1.404	8.16 ± 0.811	6.69 ± 1.134	0.249
Valeric acid	4.55 ± 2.06[a,b]	8.59 ± 1.19[a]	4.70 ± 1.66[b]	0.049
SCFA total	254 ± 34.7	319 ± 20.0	343 ± 28.0	0.130
Relative percentages (%)				
Acetate	69.4 ± 1.78[a,b]	66.0 ± 1.02[a]	72.9 ± 1.43[b]	<0.001
Propionate	4.17 ± 0.342	4.18 ± 0.197	4.23 ± 0.276	0.986
Butyrate	18.8 ± 1.552[a,b]	22.0 ± 0.896[a]	17.3 ± 1.253[b]	0.003
Isobutyric acid	2.63 ± 0.304	2.62 ± 0.175	2.22 ± 0.246	0.358
Isovaleric acid	3.43 ± 0.359[a]	2.69 ± 0.207[a,b]	2.01 ± 0.290[b]	0.011
Valeric acid	1.56 ± 0.507[a,b]	2.44 ± 0.293[a]	1.38 ± 0.410[b]	0.043

Significantly different results are indicated in bold (p-value < 0.05). Superscript letters indicate differences between age categories.

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animals

Animals 2021, 11, 2432.

Article

Comparison of Gut Microbiota of 96 Healthy Dogs by Individual Traits: Breed, Age, and Body Condition Score

Inhwan You [1,2] and Min Jung Kim [1,2,*]

- 96 cães de raças puras (36 M e 60 F ; 9 raças)
- Grupos etários: 0,5-1 ; 2-5; 6 a 10 anos
- Raças e ECC (3, 4-5, 6-8)
- Mesmo criador e alimento
- Saudáveis
- Sequenciamento Illumina (16S rRNA)

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animals

Animals 2021, 11, 2432.

Article

Comparison of Gut Microbiota of 96 Healthy Dogs by Individual Traits: Breed, Age, and Body Condition Score
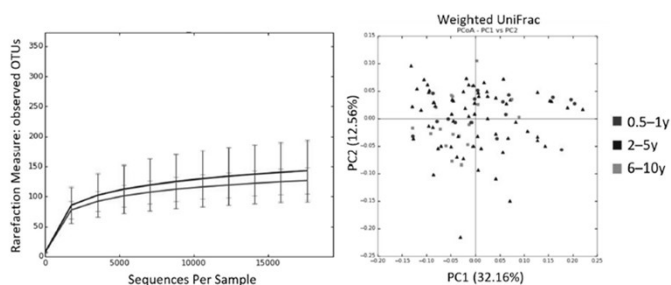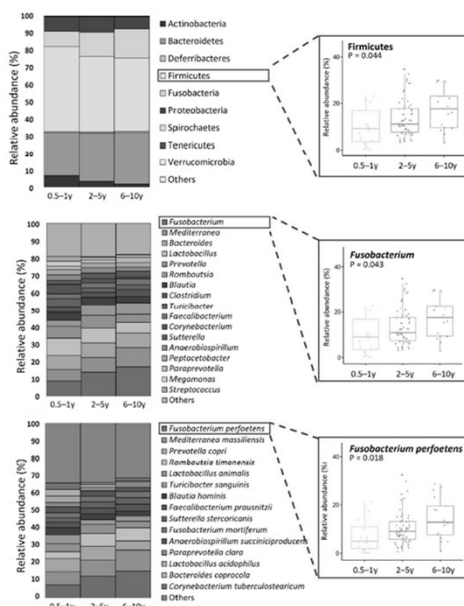
Inhwan You [1,2] and Min Jung Kim [1,2,*]

Figure 3. Alpha and beta diversity according to dog age group. Microbial richness was measured based on observed OTUs (left). PCoA was performed based on weighted UniFrac distances (right).

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MICROBIOTA INTESTINAL E ENVELHECIMENTO

Em resumo, considerar:

- Escassez de avaliações do microbioma focados no envelhecimento (longitudinais)

- Diferentes métodos de avaliação

- Comorbidades e status inflamatório

- Outros fatores

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Envelhecimento saudável

Adotar cuidados ao longo de todo o processo de envelhecimento

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Obrigada!

Kuki – 18 anos

Profa Dra. Márcia de O. S. Gomes
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E NUTROLOGIA DE CÃES E GATOS

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