

Influence of age, sex, body condition score, rectal temperature, anatomical location and hair on skin pH in dogs

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Background – Physiological skin pH levels are well-documented in human medicine, and assessment of variations may be important in assessing the efficacy of wound healing. By contrast, physiological skin pH levels in dogs are sparsely described.

Hypothesis/Objectives – To determine the pH of intact skin in healthy dogs and to study the influence of different physiological factors on the pH level of canine skin.

Animals – Seventy-seven client-owned dogs of various breeds, age and sex.

Methods and materials – A prospective study was designed and the pH of intact skin was measured at the concave surface of both pinnae, and in both axillary and inguinal regions. For each location, the colour and density of the hairs also was recorded. Each dog's rectal body temperature and body condition scores also were determined.

Results – The skin pH in dogs <12 weeks of age was significantly lower (3.97–5.70) than in older dogs (4.40–8.18) ($P < 0.001$). In dogs >12 weeks of age, skin pH was significantly lower in the inguinal regions compared to the pinnae ($P = 0.008$), and female dogs had a significantly lower skin pH in the inguinal regions than male dogs ($P = 0.043$). Pinnae covered with light-coloured hair had a lower skin pH than those with dark-coloured hair ($P = 0.04$). No significant differences were found between dogs with different body condition scores, body temperatures or differences in hair density.

Conclusions and clinical relevance – The pH of intact healthy skin is lower in puppies of <12 weeks of age. Regional differences of body location also were seen which were variably affected by hair colour and sex. A baseline assessment of skin pH in healthy dogs is important for future studies of disease and wound healing.

Introduction

In people, the pH level of the skin and factors influencing it have been the subject of research for many years and several articles on this matter have been published.^{1–7} In the veterinary literature, skin pH in dogs has been described in comparative studies or small case series only.^{8–13} However the influence of factors such as body location and age on the skin pH in a larger group of dogs has not been published to date.

General information on a normal physiological skin pH in dogs might be of great interest, especially when considering pathological conditions, which could potentially influence the pH.^{14–16} Because there might be a variety of factors that can have influence on physiological variation, it is important to evaluate these in order to determine a physiological baseline for skin pH before assessing the effects of an underlying disease process.

The pH of the intact skin of humans varies between pH 3 and pH 7, with most values between pH 4 and pH 4.9.^{2,11} The large range in skin pH can be explained by many influential factors: anatomical location, exogenous factors, such as water, detergents and cosmetic products, and also endogenous factors, such as age, skin colour, humidity and sweat.^{1,5} In dogs, the pH of normal intact skin is reported to vary between 4.84 and 9.95,^{7,9,12,13,17} which is substantially higher than the skin pH of humans. In healthy German shepherd dogs, it has been suggested that the skin pH is influenced by factors such as the anatomical location, humidity and environmental temperature.^{12,13} The objective of the current study was to determine the skin pH in healthy dogs of different breeds, sex and ages, and further assess the influence of factors such as body condition score, rectal temperature, body location, hair colour and hair density.

Methods and materials

Animals

The study was approved by the local ethical committee (EC 2019-27) and client-owned dogs presented for routine surgeries or puppies

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visited at the breeder were enrolled after signing an informed consent. Exclusion criteria were dogs that were hospitalised, had wounds on locations where pH measurements were planned (pinnae, axillary and inguinal regions), had a history of skin disease or were treated with topical medications.

Data collection

The signalment of dogs and body weight were recorded, and a body condition score (BCS) was determined on the Purina nine point scale.¹⁸

pH measurements

All pH measurements were performed by the same person using a Seven2Go measurement device S2 combined with a pH electrode InLab Surface (Mettler Toledo; Columbus, OH, USA). Before performing the first pH measurement of the day, the pH device was calibrated using three buffer solutions of pH 7.00, 4.01 and 9.21. Whenever the pH device was restarted during the same day, it was re-calibrated in the pH 7.00 buffer solution. The study dogs' skin was neither cleaned nor disinfected before the pH measurement. The electrode was held gently against the skin until a stable pH value was obtained (Figure 1). In between each dog, the electrode was rinsed using distilled water.

In order to reduce stress, skin pH was measured in a calm environment while the owner was gently restraining the dog. The skin pH measurement of unweaned puppies was performed in the presence of their mother and littermates at the place where they were raised.

In all dogs, the pH of intact skin was measured at six locations: the concave surface of both pinnae, and both axillary and both inguinal regions. For each location, the colour of the hair (light- versus dark-coloured) and the density of the hair (low versus high density) was recorded. After all skin pH measurements were performed, the rectal body temperature was measured, except in dogs <12 weeks of age and their mothers, to minimize stress.

Statistical methods

Statistical analyses were performed using SPSS Statistics 26 (IBM; Armonk, NY, USA). Shapiro–Wilk tests were performed to explore if data were distributed normally. Wilcoxon paired rank tests were used to determine if a difference was present between the left and right side at the different anatomical locations (concave surface pinnae, axillary and inguinal regions). The skin pH values of the different anatomical locations were compared within dogs using Friedman tests. In case statistical differences were found, multiple comparisons were performed and a Bonferroni correction was applied.

Dogs were divided into four different age categories; <12 weeks, 12 weeks to two years, >2 to eight years, and >eight years. Based



Figure 1. Example of pH measurement at the concave side of the canine pinna.

on BCS, dogs were divided into three categories: underweight (BCS 1–3), normal (BCS 4–5), and overweight (BCS 6–9); and based on body temperature, they also were divided into three categories: <38°C, 38–39°C and >39°C.

Wilcoxon–Mann–Whitney U-tests were used to determine if there was a difference at the different anatomical locations separately in dogs >12 weeks of age and in dogs <12 weeks of age. In dogs >12 weeks of age, Wilcoxon–Mann–Whitney U-tests were used to determine if there was a difference between male and female dogs, between light- and dark-coloured hair, and between places with low and high density of hairs. Furthermore, in dogs >12 weeks of age, differences in body temperature and in BCS were determined at the different anatomical locations using Kruskal–Wallis tests. Statistical differences at the different anatomical locations were determined for the different age categories excluding dogs <12 weeks of age, using Kruskal–Wallis tests. Subsequently, this was repeated adding dogs <12 weeks of age. In case of statistically significant differences, multiple comparisons were performed and Bonferroni correction was applied. Finally, correlations at the different anatomical locations were performed between the skin pH value, on the one hand, and age, body temperature and BCS, on the other, using Spearman rho tests. All correlations were performed with skin pH values of dogs >12 weeks of age, except for the correlations between skin pH value and age, which also was performed including dogs <12 weeks of age.

Results

Demographic data

In total, 77 dogs of 24 different breeds (Table 1) were included. Twenty-seven dogs were <12 weeks of age and they belonged to six different litters of two different breeders. Most common breeds of dogs <12 weeks of age were standard poodles ($n = 11$) and golden retrievers ($n = 9$). Sixteen dogs were between 12 weeks and two years old, 18 dogs between two and eight years old, and 13 dogs older than eight years. The most common breed in dogs >12 weeks of age were cross-breed dogs ($n = 13$). The median age of all dogs was 14.5 months (1–156 months, $n = 74$), the median age of dogs <12 weeks and >12 weeks of age was five weeks (4–11 weeks) and 48.0 months (4–156 months, $n = 47$), respectively. In total, 35 dogs were male (16 neutered), of which 22 were >12 weeks of age, and 42 dogs were female (17 neutered), of which 28 were >12 weeks of age.

The body weight varied from 1.96 to 37.0 kg. The median body weight of dogs >12 weeks of age was 12.5 kg (2.5–37.0 kg, $n = 46$) and the median BCS was 5 (3–5; $n = 50$). Of dogs >12 weeks of age, five had a BCS ≤ 3 , 30 had a BCS of 4 or 5, and 15 had a BCS ≥ 6 . The median body temperature was 38.8°C (37.6–39.4°C, $n = 36$), with four dogs having a body temperature <38°C and 10 dogs >39°C.

One dog had alopecia at both the axillary and inguinal regions; the hair quality was judged to be normal in all other dogs. In seven dogs, the density of the hair was not recorded on the concave surface on the pinnae and in the inguinal region, and in 10 dogs density was not determined in the axillary region. A mix of light and dark hair was present bilaterally at the concave surface of the pinnae of two dogs, and bilaterally in the axillary and inguinal regions of five dogs. Of the five dogs, four had mixed hair colours at all axillary and inguinal regions. These skin pH values were omitted in the statistical analyses when looking at the hair colour. In one dog, skin pH values of both

Table 1. Breed and age distribution of the study dogs

Age	Concave pinnae	Axillary region	Inguinal region
Dogs <12 w	4.94 (4.34–5.70) (n = 54)	4.94 (4.31–5.43) (n = 54)	4.94 (3.97–5.36) (n = 54)
Dogs >12 w	6.22 (4.93–8.18) (n = 98)	6.14 (4.95–8.06) (n = 97)	6.12 (4.40–8.18) (n = 99)
Overall population	5.79 (4.34–8.18) (n = 152)	5.42 (4.31–8.06) (n = 151)	5.36 (3.97–8.18) (n = 153)

w, weeks.

axillary regions could not be obtained because the hair was too dense. In another dog, skin pH values of both pinnae could not be obtained because the dog did not allow it. Finally, despite several attempts and for unclear reasons, no stable skin pH value was reached in one dog in the right inguinal region and in another dog in the left axillary region.

In dogs >12 weeks of age, 60 concave surfaces of pinnae had light-coloured hairs while 20 had dark-coloured hairs, for the axillary and inguinal regions, 66 and 75 regions had light-coloured hair, respectively, and 21 and 16 had dark-coloured hair, respectively. Low density of hairs was present on 64, 18 and 48 concave surfaces of the pinnae, axillary and inguinal regions, respectively, whereas 20, 59 and 37 of the respective regions had a high density of hairs.

Median skin pH values

The median skin pH on the concave surface of the pinnae was 5.79 (4.34–8.18, n = 152), in the axillary region 5.42 (4.31–8.06, n = 151) and in the inguinal region 5.36 (3.97–8.18, n = 153). The age distribution of these measurements is illustrated in Table 2.

Influence of different anatomical locations on skin pH

In dogs >12 weeks of age, no statistical significance was found between the left and right concave surface of the pinnae ($P = 0.955$), axillary region ($P = 0.458$) or inguinal region ($P = 0.353$). In these dogs, a statistically significant difference was found between the pH values of the pinnae and inguinal regions ($P = 0.008$). No statistically significant difference was found between the pinnae and axillary regions, and between the inguinal and axillary regions ($P = 0.053$ and $P = 1.000$, respectively).

Also in dogs <12 weeks of age, no statistical significant differences were found between the left and right concave surface of the pinnae ($P = 0.541$), axillary region ($P = 0.52$) and inguinal region ($P = 0.321$). No statistical difference was found between the different anatomical regions ($P = 0.875$).

Influence of age on skin pH.

A statistically significant difference was found between dogs <12 weeks of age and all other age categories for all anatomical locations ($P < 0.001$ for all comparisons) (Figure 2). When dogs <12 weeks of age were excluded, no significant differences between age categories remained (Table 3).

Table 2. pH value measurements (range and number of measurements) per age group and in total

Breed	Total	Dogs <12 w	>12 w–2 y	2–8 y	>8 y
Standard poodle	14	11			1
Golden Retriever	13	9	2	1	2
Cross-breed	13		7	4	2
Pomeranian	6	5			
Cavalier King Charles spaniel	3			2	1
Chihuahua	3		1		2
Dachshund	3		1	1	
Shiba inu	3	2		1	
Border collie	2			1	1
Labrador retriever	2			1	1
Pug	2		1	1	
Australian cattle dog	1		1		
Beagle dog	1				1
Husky	1			1	
Jack Russell terrier	1				1
Maltese	1			1	
Miniature pinscher	1			1	
Mini Australian shepherd dog	1		1		
Old English bulldog	1			1	
Parson Jack Russell terrier	1		1		
Samoyed	1			1	
Shetland sheepdog	1			1	
Shi tzu	1				1
Tamaskan	1		1		
Total	77	27	16	18	13

w, weeks; y, years.

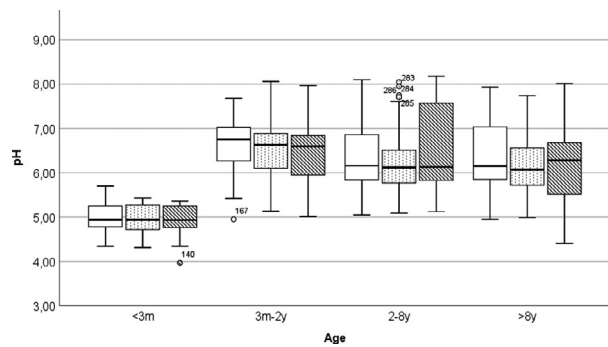


Figure 2. Skin pH values per age category of dog at the concave surface of the pinnae (white box plots), the axillary regions (dotted box plots) and the inguinal regions (striped box plots).

For all anatomical locations, the pH in dogs under three months of age was significantly lower than for all other age categories ($P < 0.001$ for all comparisons); m, month, w, week; y, year.

Influence of sex, BCS and body temperature on skin pH

For dogs >12 weeks of age, no statistically significant difference was found between male and female dogs at the level of the concave surface of the pinnae and the axillary regions. At the level of the inguinal regions, however, female dogs had a significant lower skin pH compared to male dogs ($P = 0.043$). No statistical differences were found either for dogs with different BCS, or for dogs with different body temperatures (Table 3).

Influence of hair colour and density on skin pH

A significant lower pH was found at the concave surface of the pinnae with light-coloured hair ($P = 0.04$), and no statistical differences in hair colour were found at the axillary and inguinal regions. Finally, no statistically significant differences were found between areas with low versus high density in hairs (Table 3).

Correlations of skin pH

In dogs >12 weeks of age, no correlations were found between skin pH values and age ($P = 0.302$ concave surface of pinnae, $P = 0.172$ axillary regions and $P = 0.388$

inguinal regions), body temperature ($P = 0.466$ concave surface of pinnae, $P = 0.633$ axillary regions and $P = 0.566$ inguinal regions) and BCS ($P = 0.165$ concave surface of pinnae, $P = 0.297$ axillary regions and $P = 0.246$ inguinal regions). If, however, all dogs were included, a significant moderate positive correlation was found between the pH value and age at the concave surface of the pinnae (0.599, $P < 0.001$), axillary region (0.575, $P < 0.001$) and the inguinal region (0.603, $P < 0.001$) (Figure 3a and b).

Discussion

Skin pH values found in the current study are similar to those described in dogs previously,^{7,9,12,17} and ranged between 4.40 and 8.18 in dogs >12 weeks of age. Most skin pH values in humans vary between 4 and 4.9,¹¹ which is at the lower end of the skin pH range reported here and in previous studies. This difference may be explained by a variety of factors. In comparison to humans, the stratum corneum of dogs is thinner and contains less intracellular lipid.¹⁹ However, in areas with less dense hair, the stratum corneum is thicker.²⁰ Dogs have epitrichial glands dispersed over the entire body; these are apocrine glands associated with primary hair follicles.²⁰ In humans, these glands are found only in specific locations such as the axillary and anogenital region.²¹ Atrichial glands, however, are present only on the foot pads of dogs, whereas these glands can be found over the entire human body.^{20,21} The secretion of atrichial glands in humans has a lower pH than the secretion of apocrine glands, which may contribute to the lower skin pH in people as compared to dogs. It also would explain why skin pH values in the axillary and inguinal regions in humans are higher than in the remainder of the body.^{11,22} In dogs <12 weeks of age, less variation in skin pH values was seen, and skin pH was significantly lower than in older dogs. This finding contrasts with the situation in humans, where a study showed that neonates have a higher skin pH than adults.⁴ In humans, it has been shown that the properties of the epidermal barrier change during the first

Table 3. *P*-values for all tested characteristics in the three different anatomical locations in healthy dogs >12 weeks of age (significant values are in bold)

Characteristics	<i>P</i> -values		
	Pinnae	Axillary regions	Inguinal regions
Age			
>12 w-2 y versus 2-8 y	1.000	1.000	1.000
>12 w-2 y versus >8 y	1.000	0.917	1.000
2-8 y versus >8 y	1.000	1.000	1.000
Sex			
Male versus female	0.252	0.110	0.043
Body condition score (BCS, nine point scale)			
1-3 versus 4-5 versus 6-9	0.054	0.135	0.174
Body temperature			
<38°C versus 38-39°C versus >39°C	0.091	0.160	0.282
Hair colour			
Light versus dark	0.040	0.733	0.853
Hair density			
Low versus high	0.941	0.723	0.853

w, weeks; y, years

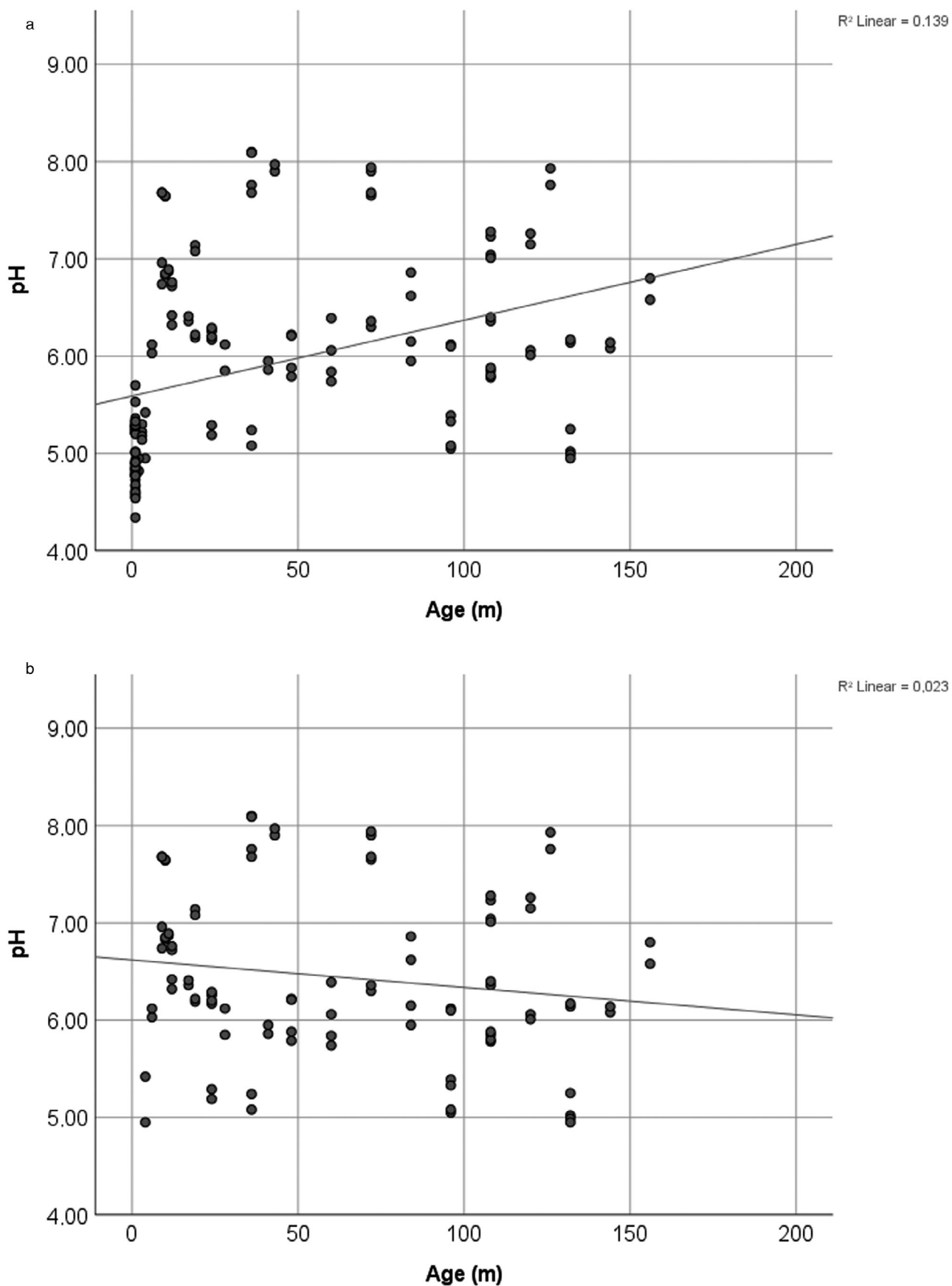


Figure 3. Correlation between age (in months, m) and pH values measured at the concave surface of the pinnae in dogs.

(a) A significant moderate positive correlation was found between the pH value and age at the concave surface of the pinnae (0.599, $P < 0.001$) when dogs <12 weeks of age were included. (b) No correlation was found between the pH value and age at the concave surface of the pinnae in dogs >12 weeks of age.

four weeks of life and thus influence changes in skin pH in neonates.^{3,4} Once dogs were older than 12 weeks, skin pH seemed no longer to be correlated with age. It was interesting to note that the three lactating bitches were at the low end of the PH range. Also in humans, on the one hand, the skin pH is reported to remain constant between 18 and 60 years of age.¹ On the other, in humans >60 years of age, the skin pH increases again¹; this trend was, however, not observed in dogs over eight years of age included in the current study and would need to be verified in a larger cohort of elderly dogs.

The skin pH on the concave surface of the pinna in the current study is similar to the pH values reported in previous studies.^{10,12} However, we found lower median skin pH values at the level of the axillary and inguinal regions (6.14 and 6.12, respectively, for dogs >12 weeks of age) than reported previously (7.5 and 7.4, respectively).¹⁰ The previously published study, however, included only five dogs (all beagle), while our study population was much larger and contained a greater diversity of breeds which might have accounted for this difference.¹³ When compared with another study in which skin pH was measured in 61 German shepherd dogs, the range of skin pH values in our study was lower.¹²

In the inguinal regions, male dogs had significantly higher pH values compared to female dogs. In human medicine, controversy exists whether sex does have an influence on skin pH or not, with some studies showing that females have a higher skin pH than males and others showing the opposite.¹ We did not find the density of hair to have a significant influence on the skin pH. By contrast, beagle dogs were demonstrated to have a lower skin pH in regions that were relatively hairless such as the ears, interdigital skin and footpads.¹⁰ Besides the hair distribution, differences in gland distribution also could have contributed to this finding as the secretion of atrichial glands, which are present on the foot pads of dogs, typically has a relatively low pH.^{20,22} In the current study, dogs with dark-coloured hair on the pinnae had a higher skin pH compared to those with light-coloured hair; however, a similar association with coat colour was not found in the axillary and inguinal region. Most dogs in our study population had a low density of hairs on the pinnae and a high density of hair in the axillary regions, and dark-coloured hair was much less common in our dogs, especially in the inguinal region, both factors that might have influenced the results.

We decided to determine skin pH at three locations that are typically less haired, to ensure that a good contact was achieved between the pH electrode and the skin. Nevertheless, in one dog, skin pH could not be measured because of the high density of hairs and in two other dogs a stable skin pH value also could not be reached, although the reasons for this were unclear. A large variety of dogs were included, yet certain variables may have been present in insufficient numbers to find statistical significance within this population, particularly BCS, body temperature, hair colour and density, and breed.

In conclusion, this study provides baseline physiological skin pH for three different body locations in a large popu-

lation of dogs that could be used in future studies. We confirmed previous study findings that the skin pH in dogs is lower than in humans. Additionally we demonstrated that skin pH is significantly lower in dogs <12 weeks of age compared to dogs >12 weeks of age. The skin pH was lower in axillary and inguinal skin yet hair density did not appear to be a factor affecting this measurement. Knowledge of the baseline skin pH in healthy dogs is important when considering changes associated with disease or wound healing.

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Author contribution

Alexander Schlake: Conceptualization, Data curation, Formal analysis, Investigation, Validation, Writing-original draft, Writing-review & editing; **Nausikaa Devriendt:** Conceptualization, Data curation, Formal analysis, Investigation, Supervision, Validation, Writing-original draft, Writing-review & editing; **Louise Talloen:** Conceptualization, Data curation, Formal analysis, Investigation, Validation, Writing-original draft, Writing-review & editing; **Tri Dadi:** Data curation, Formal analysis, Investigation, Validation, Writing-original draft, Writing-review & editing; **Hilde de Rooster:** Conceptualization, Data curation, Formal analysis, Investigation, Supervision, Validation, Writing-original draft, Writing-review & editing.

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Résumé

Contexte – Les niveaux de pH cutané physiologiques sont bien documentés en médecine humaine et déterminer les variations peut être important pour estimer l'efficacité de la cicatrisation. Au contraire, les niveaux de pH cutané physiologiques chez le chien sont peu décrits.

Hypothèses/Objectifs – Déterminer le pH de la peau intacte de chiens sains et étudier l'influence de différents facteurs physiologiques sur les valeurs de pH de la peau canine.

Sujets – Soixante dix sept chiens de propriétaires de race, âge et genre variés.

Matériels et méthodes – Une étude prospective a été réalisée et le pH de la peau intacte a été mesuré à la surface concave des deux pavillons et dans les deux régions inguinales et axillaires. Pour chaque zone, la couleur et la densité des poils ont également été enregistrées. La température rectale et les scores corporels ont aussi été déterminés pour chaque chien.

Résultats – Le pH cutané des chiens de moins de 12 semaines était significativement plus bas (3,97–5,70) que les chiens plus âgés (4,40–8,18) ($P < 0.001$). Chez les chiens de plus de 12 semaines, le pH cutané était significativement plus faible dans les régions inguinales que sur les pavillons ($P = 0.008$), et les femelles avaient un pH cutané significativement plus faible dans les régions inguinales que les mâles ($P = 0.043$). Les pavillons recouverts de poils clairs avaient un pH cutané plus faible que ceux avec poils sombres ($P = 0.04$). Aucune différence significative n'a été trouvée entre les chiens en fonction de leurs scores corporels, des températures corporelles ou de la densité pileuse.

Conclusions et importance clinique – Le pH de la peau cutanée intacte est plus faible chez les chiots de moins de 12 semaines. Les variations entre zones corporelles différentes ont aussi été observées, ce qui est affecté par la couleur des poils ou par le genre. Une détermination du pH cutané de base chez le chien sains est importante pour de futures études de pathologie ou de cicatrisation cutanée.

Resumen

Introducción – los niveles fisiológicos de pH de la piel están bien documentados en medicina humana y la evaluación de las variaciones puede ser importante para valorar la eficacia de la cicatrización de heridas. Por el contrario, los niveles de pH fisiológico de la piel en perros se han descrito raramente.

Hipótesis/Objetivos – Determinar el pH de la piel intacta en perros sanos y estudiar la influencia de diferentes factores fisiológicos en el nivel de pH de la piel canina.

Animales – setenta y siete perros de propietarios particulares de diversas razas, edades y sexos

Métodos y materiales – se diseñó un estudio prospectivo y se midió el pH de la piel intacta en la superficie cóncava de ambos pabellones auditivos y en las regiones axilar e inguinal. Para cada ubicación también se anotó el color y la densidad de los pelos. Igualmente se determinaron los valores de la temperatura corporal rectal y la condición corporal de cada perro.

Resultados – El pH de la piel en perros <12 semanas de edad fue significativamente más bajo (3,97–5,70) que en perros mayores (4,40–8,18) ($P < 0,001$). En perros > 12 semanas de edad, el pH de la piel fue significativamente más bajo en las regiones inguinales en comparación con el pabellón auricular ($P = 0,008$), y las hembras tenían un pH cutáneo significativamente más bajo en las regiones inguinales que los perros machos ($P = 0,043$). Las orejas cubiertas con cabello de color claro tenían un pH cutáneo más bajo que aquellas con cabello de color oscuro ($P = 0,04$). No se encontraron diferencias significativas entre perros con diferentes valores de condición corporal, temperaturas corporales o diferencias en la densidad del pelo.

Conclusiones y relevancia clínica – El pH de la piel sana intacta es más bajo en cachorros de <12 semanas de edad. También se observaron diferencias regionales de ubicación corporal que se vieron afectadas de manera variable por el color del cabello y el sexo. Una evaluación de referencia del pH de la piel en perros sanos es importante para futuros estudios de enfermedades y cicatrización de heridas.

Zusammenfassung

Hintergrund – Physiologische pH Werte der Haut sind in der Humanmedizin gut dokumentiert und eine Erhebung von Variationen könnte bei der Erhebung ihrer Wirksamkeit bei der Wundheilung von Bedeutung sein. Im Gegensatz dazu sind physiologische pH Werte der Haut beim Hund nur selten beschrieben.

Hypothese/Ziele – Eine Bestimmung des pH Wertes intakter Haut bei gesunden Hunden und eine Untersuchung der Einflussnahme unterschiedlicher physiologischer Faktoren auf die pH Werte von Hundehaut.

Tiere – Siebenundsiebzig Hunde verschiedener Rasse, Alters und Geschlechts, die sich in Privatbesitz befanden.

Methoden und Materialien – Eine prospektive Studie wurde designed und der pH Wert intakter Haut an der konkaven Oberfläche beider Pinnae, sowie beider Achseln und der Inguinalregion gemessen. Für jede Lokalisation wurde die Farbe und Dichtheit der Haare ebenfalls bestimmt. Die Rektaltemperatur eines jeden Hundes und die Werte des Allgemeinzustandes des Körpers wurden erhoben.

Ergebnisse – Der pH Wert der Haut bei Hunden < 12 Wochen Lebensalter war signifikant niedriger (3,97-5,70) als bei älteren Hunden (4,40-8,18) ($P < 0,001$). Bei Hunden < 12 Wochen Lebensalter war der pH Wert der Haut in der Inguinalregion signifikant niedriger im Vergleich zu den Pinnae ($P = 0,008$), und weibliche Hunde hatte einen signifikant niedrigeren pH der Haut in der Inguinalregion als männliche Hunde ($P = 0,043$). Pinnae, die mit hellen Haaren bedeckt waren, zeigten einen niedrigeren pH Wert als solche, die mit dunkelgefärbten Haaren bedeckt waren ($P = 0,04$). Es wurden keine signifikanten Unterschiede zwischen den verschiedenen Allgemeinbefunden, der Körpertemperatur oder der Haardichte gefunden.

Schlussfolgerungen und klinische Bedeutung – Der pH Wert intakter gesunder Haut ist bei Welpen < 12 Wochen niedriger. Regionale Unterschiede in Bezug auf die Körperlokalisierung konnten ebenfalls festgestellt werden, diese waren in unterschiedlichem Ausmaß von Haarfarbe und Geschlecht beeinflusst. Ein Basiswert für den pH Wert der Haut ist bei gesunden Hunden für weitere Studien von Erkrankungen und Wundheilung wichtig.

要約

背景 – 人の皮膚の生理的pH値はよく知られており、その変動を評価することは創傷治癒の効果を評価する上で重要である。対照的に、犬の生理的皮膚のpHレベルはほとんど記述されていない。

仮説/目的 – 本研究の目的は、健康犬の無傷の皮膚pHを測定し、犬の皮膚pHレベルに対するさまざまな生理学的因子の影響を研究することであった。

供試動物 – 様々な品種、年齢、性別のオーナー所有の犬77頭。

材料と方法 – 前向き研究がデザインされ、無傷の皮膚pHは、両耳介の凹面、および両腋窩および鼠径部で測定された。それぞれの部位で、毛の色および密度も記録した。また、各犬の直腸体温およびボディコンディションスコアを測定した。

結果 – 12週齢未満の犬の皮膚pHは、高齢の犬 (4.40-8.18) よりも有意に低かった (3.97-5.70) ($P < 0.001$)。12週齢以上の犬では、鼠径部の皮膚pHは耳介部に比べて有意に低く ($P = 0.008$)、雌犬は雄犬に比べて鼠径部の皮膚pHが有意に低かった ($P = 0.043$)。明るい色の毛で覆われた耳介部は、暗い色の毛で覆われた耳介よりも皮膚pHが低かった ($P = 0.04$)。ボディコンディションスコア、体温、毛の密度が異なる犬の間では、有意な差は見られなかった。

結論と臨床的関連性 – 無傷の健康皮膚pHは、12週齢未満の子犬では低いことがわかった。また、体の部位による領域差が見られ、これは毛色や性別によっても影響を受ける。健康犬の皮膚pHをベースラインで評価することは、今後の疾患や創傷治癒の研究に重要である。

摘要

背景 – 生理皮膚pH水平在人类医学中有充分记录,评估变化可能对评估伤口愈合的有效性很重要。相比之下,犬的生理性皮肤pH水平描述很少。

假设/目的 – 测定健康犬完整皮肤的pH值,并研究不同生理因素对犬皮肤pH水平的影响。

动物 – 77只不同品种、年龄和性别的客户拥有的犬。

方法和材料 – 设计前瞻性研究,测量双侧耳廓凹面、腋窝和腹股沟区域完整皮肤的pH值。对于每个位置,还记录了毛发的颜色和密度。还测定了每只犬的直肠体温和身体状况评分。

结果 – < 12周龄犬的皮肤pH值(3.97-5.70)显著低于老年犬(4.40-8.18) ($P < 0.001$)。在 > 12周龄的犬中,与耳廓相比,腹股沟区域的皮肤pH值显著降低 ($P = 0.008$),雌性犬腹股沟区域的皮肤pH值显著低于雄性犬 ($P = 0.043$)。被浅色毛发覆盖的耳廓皮肤pH值低于被深色毛发覆盖的耳廓 ($P = 0.04$)。不同身体状况评分、体温或毛发密度差异的犬之间未发现显著差异。

结论和临床相关性 – < 12周龄幼犬的完整健康皮肤pH值较低。还观察到身体位置的区域差异,其受毛发颜色和性别的影响。健康犬皮肤pH值的基线评估对于未来疾病和伤口愈合研究非常重要。

Resumo

Contexto – Os níveis fisiológicos de pH da pele são bem documentados na medicina humana e a avaliação das variações pode ser importante para avaliar a eficácia da cicatrização de feridas. Em contraste, os níveis

fisiológicos de pH da pele em cães são pouco descritos.

Hipótese/Objetivos – Determinar o pH da pele intacta em cães saudáveis e estudar a influência de diferentes fatores fisiológicos no nível de pH da pele canina.

Animais – Setenta e sete cães de propriedade privada de várias raças, idade e sexo.

Métodos e materiais – Um estudo prospectivo foi delineado e o pH da pele íntegra foi mensurado na superfície côncava de ambas as orelhas e nas regiões axilar e inguinal. Para cada local, a cor e a densidade dos pelos também foram registradas. A temperatura retal de cada cão e os escores de condição corporal também foram determinados.

Resultados – O pH da pele em cães com <12 semanas de idade foi significativamente menor (3,97–5,70) do que em cães mais velhos (4,40–8,18) ($P < 0,001$). Em cães com > 12 semanas de idade, o pH da pele foi significativamente menor na região inguinal em comparação com os pavilhões auriculares ($P = 0,008$), e as cadelas tiveram um pH de pele significativamente mais baixo na região inguinal do que os cães machos ($P = 0,043$). Os pavilhões auriculares recobertos por pelos claros apresentaram pH cutâneo inferior aos daqueles com pelos escuros ($P = 0,04$). Não foram encontradas diferenças significativas entre cães com diferentes escores de condição corporal, temperatura corporal ou diferenças na densidade do pelo.

Conclusões e relevância clínica – O pH da pele saudável intacta é mais baixo em cães com <12 semanas de idade. Diferenças regionais de localização corporal também foram observadas, as quais foram afetadas de forma variável pela cor do pelo e gênero. É importante que seja realizada uma avaliação inicial do pH da pele em cães saudáveis em estudos futuros sobre doenças e cicatrização de feridas.