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# CLINICAL STUDY ON THE EFFECT OF BIOTIN ON SKIN CONDITIONS IN DOGS

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## SUMMARY

In a collaborative study with small-animal veterinary surgeons, dogs with fur and skin conditions were treated with biotin (approximately 5 mg biotin/10 kg body weight/day) for 3 to 5 weeks. In total 119 cases could be treated which were reported to show symptoms such as dull coat, brittle hair, loss of hair, scaly skin, pruritus or dermatitis. Cases requiring other treatments with e. g. glucocorticoids, were excluded from the study. In 60% of the cases all symptoms were reported to be cured after the biotin treatment and in a further 31% an improvement was noted; in only 9% no effect was recorded. All breeds responded but to a variable extent: e. g. in Poodles the response was lower (no response in 6 out of 11 cases) than in Alsations where all improved and 14 out of 29 were completely cured. The results confirm the favourable effect of biotin for treatment of fur and skin conditions in dogs.

**KEY WORDS:** dog – fur – skin – biotin – deficiency

## INTRODUCTION

To biotin, a vitamin of the B-group, much attention has been given to elucidate its role in the nutrition of farm animals, as reviewed by *Tagwerker* (1986). Biotin was found to be important in ensuring optimum reproductive performance in sows (*Bryant et al.*, 1985; *Brooks et al.*, 1977) and a significant contribution of biotin to the maintenance of claw integrity in sows (*Geyer and Tagwerker*, 1986; *Simmins and Brooks*, 1988) was described. Also in growing pigs it is essential for the development of healthy claws (*Schulze et al.*, 1986; *Glättli et al.*, 1975).

## KLINISCHE UNTERSUCHUNG ÜBER DEN EINFLUSS VON BIOTIN AUF HAUTERKRANKUNGEN DES HUNDES

In Zusammenarbeit mit Kleintierpraktikern wurden Hunde mit Erkrankungen von Haut und Haarkleid während 3 bis 5 Wochen mit Biotin behandelt (etwa 5 mg Biotin/10 kg Körpergewicht/Tag). 119 Hunde mit mattem Haarkleid, sprödem Haar, Haarausfall, starken Schuppen, Juckreiz oder Dermatitis wurden therapiert. Patienten, die noch mit andern Medikamenten, z. B. Glucocorticoiden, behandelt worden waren, wurden von dieser Studie ausgeschlossen. In 60% der Fälle verschwanden die Symptome mit der Biotin-Therapie, und bei weiteren 31% war eine Besserung zu verzeichnen. Lediglich in 9% gab es keinen Erfolg. Die Antwort auf die Biotin-Behandlung war rassenabhängig: bei Pudeln war die Antwort schwächer (kein Erfolg in 6 von 11 Fällen) als bei Deutschen Schäferhunden, von denen alle eine Besserung zeigten und 14 von 29 sogar ganz heilten. Die Ergebnisse bestätigen die gute Wirkung von Biotin auf die Gesundheit von Haut und Haarkleid beim Hund.

**SCHLÜSSELWÖRTER:** Hund – Haarkleid – Haut – Biotin – Mangel

In poultry the importance of biotin for growth of broilers as well as for hatchability was established (*Whitehead*, 1984). Biotin was also shown to be effective for the prevention of the fatty liver and kidney syndrome (FLKS) and the requirement for this purpose seems to be higher than that for the prevention of classic signs of deficiency (*Frigg*, 1987). This clearly demonstrates that biotin is essential for normal metabolism and that a lack of deficiency symptoms is not an adequate criterium to establish requirements. Biochemically the role of biotin as a prosthetic group in a number of enzymes in which it functions as a mobile carboxyl carrier is relatively well understood (*Bonjour*, 1984). Aspects of cellu-

lar functions and regulation of enzyme reactions as well as clinical and metabolic aspects were presented at the 1985 biotin conference of the New York Accademy of Science (*Dakshinamurti and Baghavan, 1985*).

Because of the common basic structure of the vertebrate skin with its accessory structures it can be understood that the skin of quite different animals with accessory structures differing markedly in appearance is similarly sensitive to a low biotin supply.

In dogs *Glättli* and others (1973) described deficiency symptoms as being similar to those in experimentally biotin deficient rats. The hair becomes dry and brittle, loses brilliance, breaks and finally falls out (alopecia): the skin becomes scabby, skin and hair start fading and finally dermatitis develops accompanied by the formation of scabs and scars and the animals show pruritus (*Völker, 1980*). Similar deficiency signs have also been observed in mink and foxes where grey or banded underfur, depigmentation, hair loss or rough hair reduces fur quality. Extra biotin supplementation is needed particularly if the mink- or fox-diets contain spray dried egg products (*McArthur-Frye, 1985; Wehr et al., 1980*).

As a result of experimentally feeding dried raw egg white to growing cats similar types of lesions developed, characterized by alopecia, scaly dermatitis and achromatrichia (*Carey and Morris, 1977*). The symptoms increased in severity with progressing state of deficiency. In a study reported by *Völker* (1980) the aim was to test whether domestic dogs showing a variety of fur and skin conditions responded favourably to biotin supplementation. Results of 288 cases representing most of the common breeds were summarized. Due to the complexity of the problem and the individuality of each case a subjective classification of the treatment success according to the categories «cured», «improved» or «unchanged» proved to be useful. *Völker* (1980) reported that 45.0% of all cases treated with biotin alone were «cured» after a mean treatment duration of 3 to 5 weeks. In a further 28.6% of cases an improvement was observed and 26.4% of the cases were characterized as «unchanged». The aim of the present study was to verify and enlarge these findings, using a similar experimental procedure.

#### ANIMALS, MATERIALS AND METHODS

119 domestic dogs were treated with biotin for skin or fur conditions. The cases were observed in collaboration with small-animal veterinary surgeons in Western Germany.

*Biotin dosage:* The biotin was given in the form of whole (5 mg) or half (2.5 mg) tablets Gabiotan® in order to achieve a dosage of about 5 mg biotin/10 kg body weight/day.

*Selection of cases:* Male and female dogs of various breeds with dull coat, brittle hair, loss of hair, scaly skin, pruritus or dermatitis were included in the study. Most of the dogs also showed a combination of these symptoms. Cases needing other treatments with e.g. glucocorticoids were excluded from the study.

*Examination and evaluation procedure:* At first presentation of the patients all relevant details with regard to their general description, the symptoms and the aetiology were recorded in a questionnaire similar to that used by *Völker* (1980). Ideally, the dogs were reexamined at weekly intervals for up to 5 or more weeks. Upon each examination the success of treatment was judged and at the end of the treatment after about five weeks treatment, success was classified either as, «unchanged or worsened», «improved» or «cured». In case of doubt results were classified as negative. For the final evaluation the number of dogs falling into these three categories were summarized and expressed as a percentage of total cases.

#### RESULTS

*Description of patients:* The Alsatian (20), the Dachshund (12), the Poodle (11) and the Boxer (10) were the most frequently treated breeds. Overall about the same number of male (43%) and female (57%) dogs were included in this study and 38% were between 3 and 6 years of age.

*Occurrence of Symptoms:* Most of the dogs showed loss of hair (80%) and in addition dull coat (69%) or brittle hair (24%). In 50% of the cases pruritus and in 24% dermatitis was reported. In only 22% of all cases was a single symptom recorded; in 33% there were two distinct symptoms and in 45% three or more.

*Treatment success:* The results of the treatment are given in Table 1 classified according to breed. A total of 108 (91%) of the 119 dogs were cured or showed improvement. In only 9% no effect of the biotin treatment was seen. With the exception of poodles no clear differences in response among the breeds can be recognized. In 6 of the 11 poodles treated no effect was observed. The percentage of cured cases was not lower when three or more symptoms were diagnosed simultaneously.

Both sexes responded similarly to the biotin treatment. Numerically more males (67%) were cured than females (55%) and the number in the improved category was higher in females. When relating the success of the biotin treatment to the age categories, 66% of the dogs up to 6 years old were cured and 45% of the older animals. No obvious influence of the duration of the treatment was seen. However,

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Table 1: Clinical cases of dogs with skin conditions categorized according to breeds, treatment success and duration of biotin treatment

Breed	Total N	Treatment success						Duration of treatment in weeks		
		cured		improved		unchanged		<3	3-5	>5
		n	%	n	%	n	%			
Alsatian	20	14	70	6	30	-	-	4	13	3
Boxer	10	4	40	6	60	-	-	1	7	2
St-Bernard	4	3	75	-	-	1	25	1	3	-
Great Dane	3	2	67	1	23	-	-	1	2	-
Doberman	3	2	67	1	23	-	-	-	1	2
Dachshund	12	11	92	1	8	-	-	4	6	2
Pointer	7	4	57	3	43	-	-	1	2	4
Spaniel	6	3	50	2	33	1	17	1	4	1
Poodle	11	1	9	4	36	6	55	3	4	4
Pekinese	6	6	100	-	-	-	-	2	3	1
Chow-Chow	3	3	100	-	-	-	-	-	3	-
Yorks. Terrier	3	3	100	-	-	-	-	1	2	-
Other breeds	21	10	48	9	43	2	9	4	12	4
Mongrels	10	5	50	4	40	1	10	3	5	2
Average	119	71	60	37	31	11	9	26	67	25
		91%						22%	56%	21%

it was noted that the severity of the case considerably influenced the compliance of the dog owner, there being a tendency not to return to the veterinary surgeon once the condition had sufficiently improved.

It was difficult to collect relevant information on the actual feeding of the dogs. The evaluation of the available data did not indicate an increased number of cases with a particular feed nor any relation of the success of the biotin treatment to the feeding habits (main feed and supplements).

As examples, two representative cases are briefly described: Case 1: A Boxer showed loss of hair which resulted in a completely hairless area on the left side. After biotin treatment a total recovery was observed.

Case 2: A Doberman showed on both hindlegs areas with almost no hair. After treatment with biotin for four weeks an intensive growth of new hair could be seen.

### DISCUSSION

In the present study, clinical investigations reported earlier (Völker, 1980) were continued. A difference from the previ-

ous study was that biotin injection was omitted since absorption studies indicated that oral treatment in dogs with normal absorption leads quickly enough to an elevated biotin level in the blood. In the present study further data to support the efficacy of biotin for the treatment of skin disorders of domestic dogs are presented, however, the data are biased by the same limitations as the previous study. Each case showed unique aspects and in consideration of all main characteristics such as breed, sex, age, aetiology and combination of symptoms, the collection of even approximately similar cases in sufficient number was practically impossible. This also limited the possibilities of detailed evaluation and the specificity of conclusions for the efficacy of biotin under particular circumstances. The procedure to judge each case on the basis of the initial symptoms and to classify the relative success proved to be a practically acceptable procedure.

In order not to further complicate the study, combination with other therapeutic means was not allowed. However, it cannot be anticipated that biotin would replace a necessary



treatment, e. g. with glucocorticoids in cases of severe pruritus. *Arbeiter* (1977; 1981) reported successful use of biotin in combination with hormonal therapy in the treatment of skin diseases.

In comparison to the previous results (*Völker*, 1980) a slightly increased level of cured dogs (60% vs 45%) is noted in the present study. Similarly, when combining the numbers cured and improved in the present study 91% responded compared to 74% previously. Most probably these differences can be explained by the characteristics of the cases and by some differences between the two studies in the occurrence of symptoms. Most of the dogs in the present study showed some hair conditions compared to 49% in the previous study. Furthermore, in the present study there was only a 24% incidence of dermatitis compared to 42% (eczema) in the trial reported by *Völker* (1980). Nevertheless, the high rate of response to the biotin treatment in both studies is consistent.

The same was true for a study in France (*Zaghroun*, 1988) where out of 23 cases of dogs with fur conditions 16 were cured and 5 were improved solely by biotin treatment lasting two months; 18 of the same dogs additionally had skin problems which were cured in 11 cases and improved in 4 cases with biotin. *Zaghroun* (1988) treated only dogs with squamous or seborrheic skin and hair conditions and eliminated dogs with hormonal or other aetiology. All cases reported by *Zaghroun* (1988) were treated for 2 months but there was the same problem as in the present study that owners did not return to the final examination when the dog was completely cured.

*Zaghroun* (1988), however, could control the supply of biotin by measuring biotin levels in the blood before the start of treatment, after one month and after two months. Levels of 0.6 to 2.5 µg biotin/l of whole blood were measured in the untreated dogs. But it was not possible to relate this value to any symptoms. During treatment responses in blood biotin level were variable; some remained unchanged, while others were elevated to 10 µg/l and some even to 250 µg/l. The very high levels obviously resulted from the administration of the biotin tablet immediately before consulting the veterinary surgeon. In addition the variability can be accounted for by the very rapid elimination of biotin from the blood.

The repeatedly collected evidence that biotin supplementation improved the health of dogs indicates that the uptake of biotin through the diet was insufficient. Recommendations for supplementation range from 500 µg/kg diet (*Völker*, 1980; *Bonjour*, 1984) to 100 µg/kg diet (*Fromageot*

et al., 1982) or are even lower. The present study underlines that it is unlikely to be possible to give a single value for the requirement of dogs.

In calculating biotin intake on the basis of the feed intake the high variability in biotin content (*Frigg*, 1986) as well as the varying bioavailability (*Frigg*, 1984) have to be considered. The presented study indicates that in the nutrition of the dogs as in many species biotin is a micronutrient to which attention should be paid. It further shows that biotin is potent in the improvement of fur and skin conditions and a more extensive use of biotin as an adjuvant to other therapeutic means is indicated.

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### **Examen clinique de l'influence de la biotine sur les maladies dermatologiques du chien**

En coopération avec des praticiens pour petits animaux, des chiens avec des maladies de la peau et du pelage ont été traité pendant 3 à 5 semaines avec de la biotine (à peu près 5 mg de biotine/10 kg de poids vif/jour). 119 chiens avec un pelage pâle, un poil pailleux, alopecie, squames, prurite ou dermatite ont été soignés. Des patients étant traités avec d'autres médicaments par exemple des glucocorticoïdes sont exclus de cette étude. En 60% des cas les symptômes ont disparu avec le traitement à la biotine. Dans 31% il y avait une amélioration. Seulement dans 9% on ne constatait pas de succès. La réponse sur la thérapie avec de la biotine était dépendante de la rasse: chez les caniches elle était plus faible (pas de succès dans 6 de 11 cas) que chez le berger allemand. Ici tous montraient une amélioration et 14 de 29 étaient totalement guéris. Les résultats confirment le bon effet de la biotine sur la santé de la peau et du pelage du chien.

### **Analisi clinica dell'influenza della biotina su malattie dermatologiche del cane**

In collaborazione di veterinari di piccoli animali, cani affetti da malattie dermatologiche vennero curati da 3 a 5 set-

timane con biotina (ca. 5 mg di biotina/10 kg di peso corporeo). 119 cani dal pelo opaco, fragile, affetti da forfora, prurito o dermatite, vennero curati. Pazienti sottoposti a cure di cortisone non furono considerati. In 60% dei casi i sintomi scomparvero in seguito alla terapia con la biotina. In 31% dei casi si riscontrò un miglioramento. Solo 9% dei cani non mostrarono segni di miglioramento. L'effetto terapeutico risultò dipendere dalla razza. Nei barboncini l'effetto fu più debole (6 di 11 casi non mostrarono segni di miglioramento). Il pastore tedesco invece reagì sempre positivamente alla terapia. 14 su 29 guarirono completamente. I risultati confermano l'effetto positivo della biotina sulla salute della pelle e del pelo del cane.

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