Ernährung von Wildtieren:
kurzes Päppeln oder langfristige Konzepte ?

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Deutscher Tierärztetag Leipzig 2022

University of Zurich[UZH]

Clinic of Zoo Animals, Exotic Pets and Wildlife

Was ist das Haltungsziel ?

Die Nutzungsart gibt die Fütterung vor

Nutzung		Rohfaser*	Lebenserwartung
Mastrinder		12 % TS	ca. 2 Jahre
Milchkühe		18 % TS	ca. 4 Jahre
Wildrinder		*30 % TS*	*ca. 20 Jahre*

*historische Empfehlungen für die Rationsgestaltung

Die Nutzungsart gibt die Fütterung vor

Nutzung		Rohfaser*	Lebenserwartung
Mastschweine		3-5 %TS	ca. 0.5 Jahre
Zuchtschweine		10-15 % TS	ca. 3 Jahre
Wildschweine		*15-25 % TS*	*bis zu 15 Jahre*

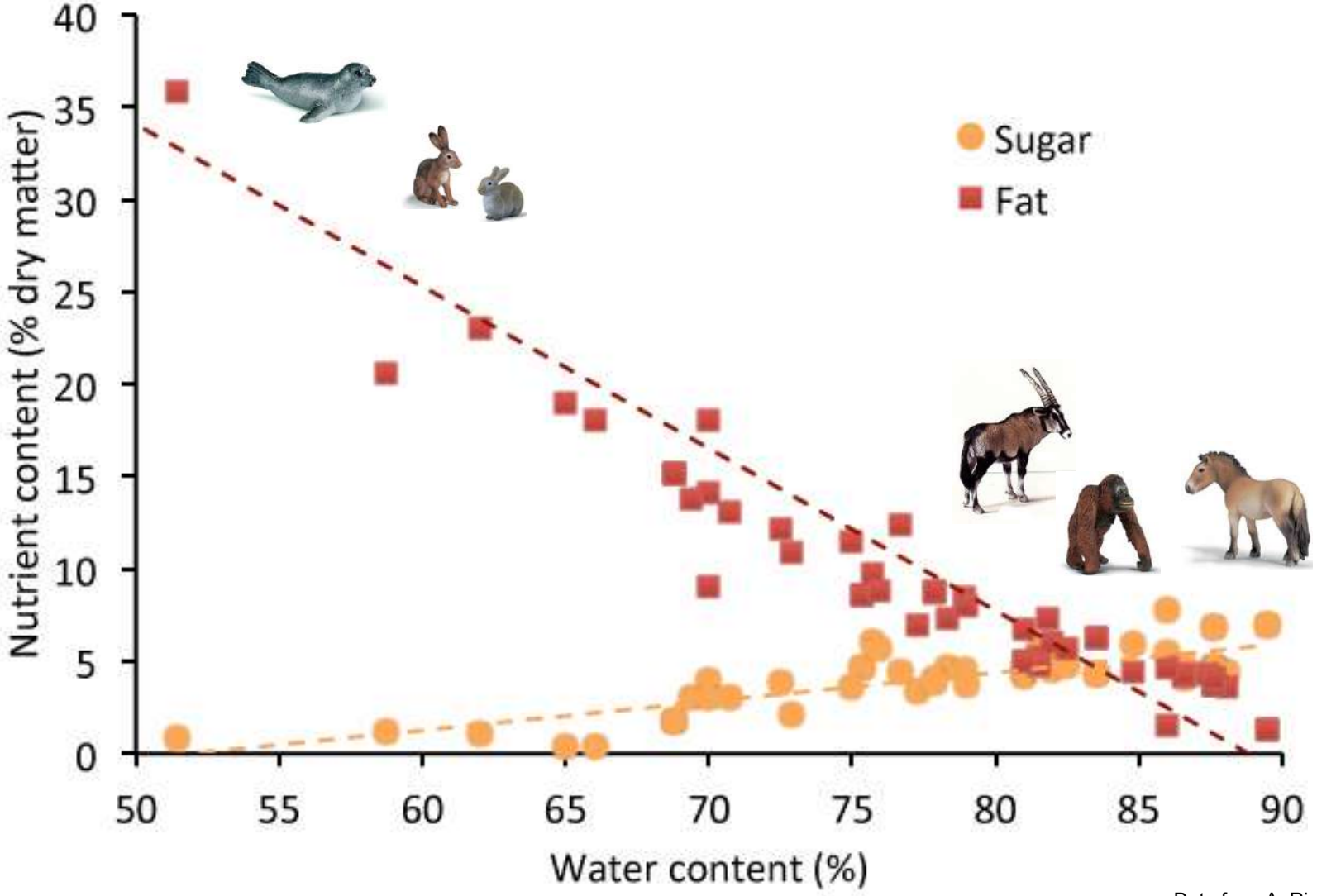
*historische Empfehlungen für die Rationsgestaltung

Was ist das Haltungsziel ?

Was ist das Haltungsziel ?

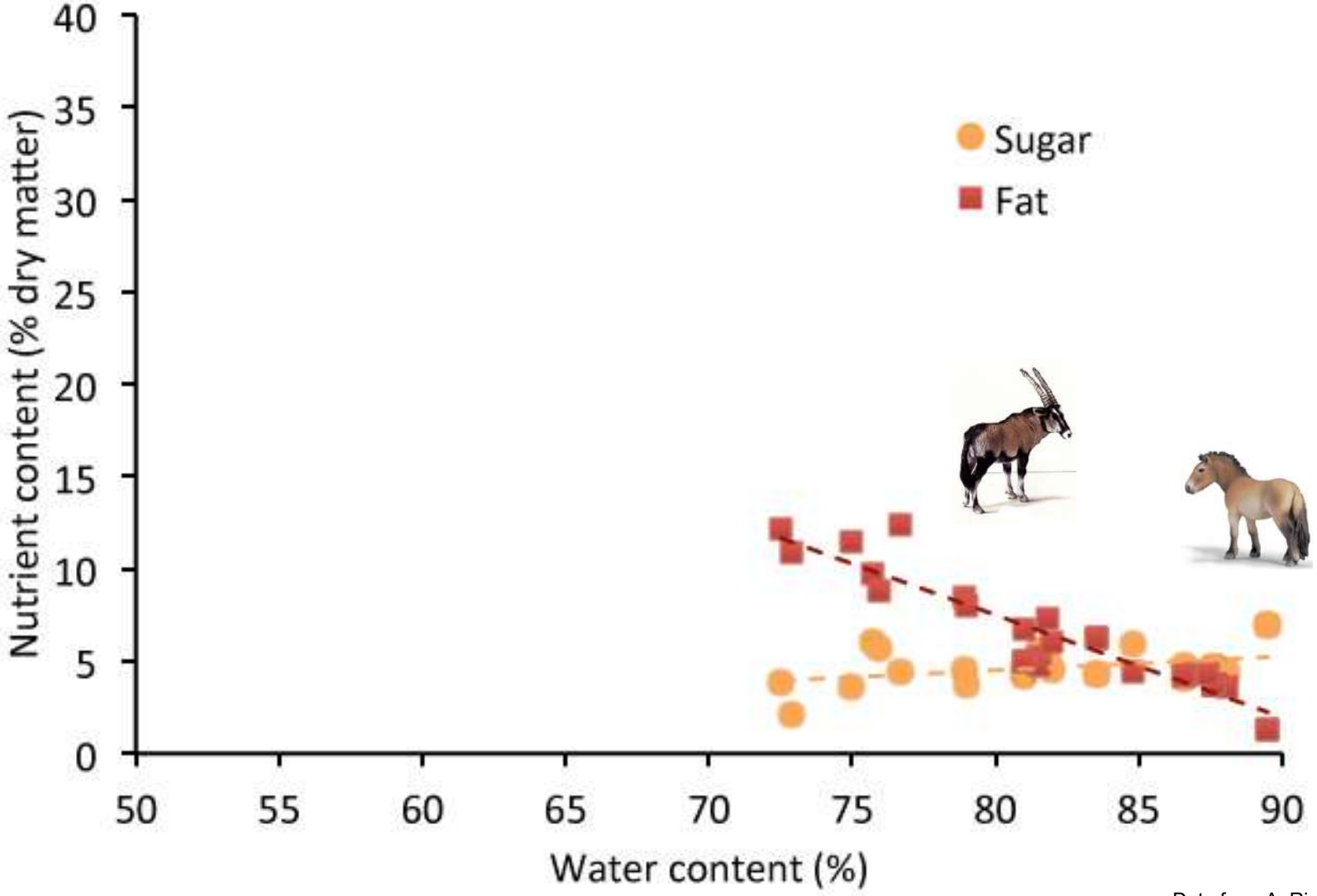
Einzelfall oder Serie ?

Milchzusammensetzung



Data from A. Riek (2008)

Milchzusammensetzung



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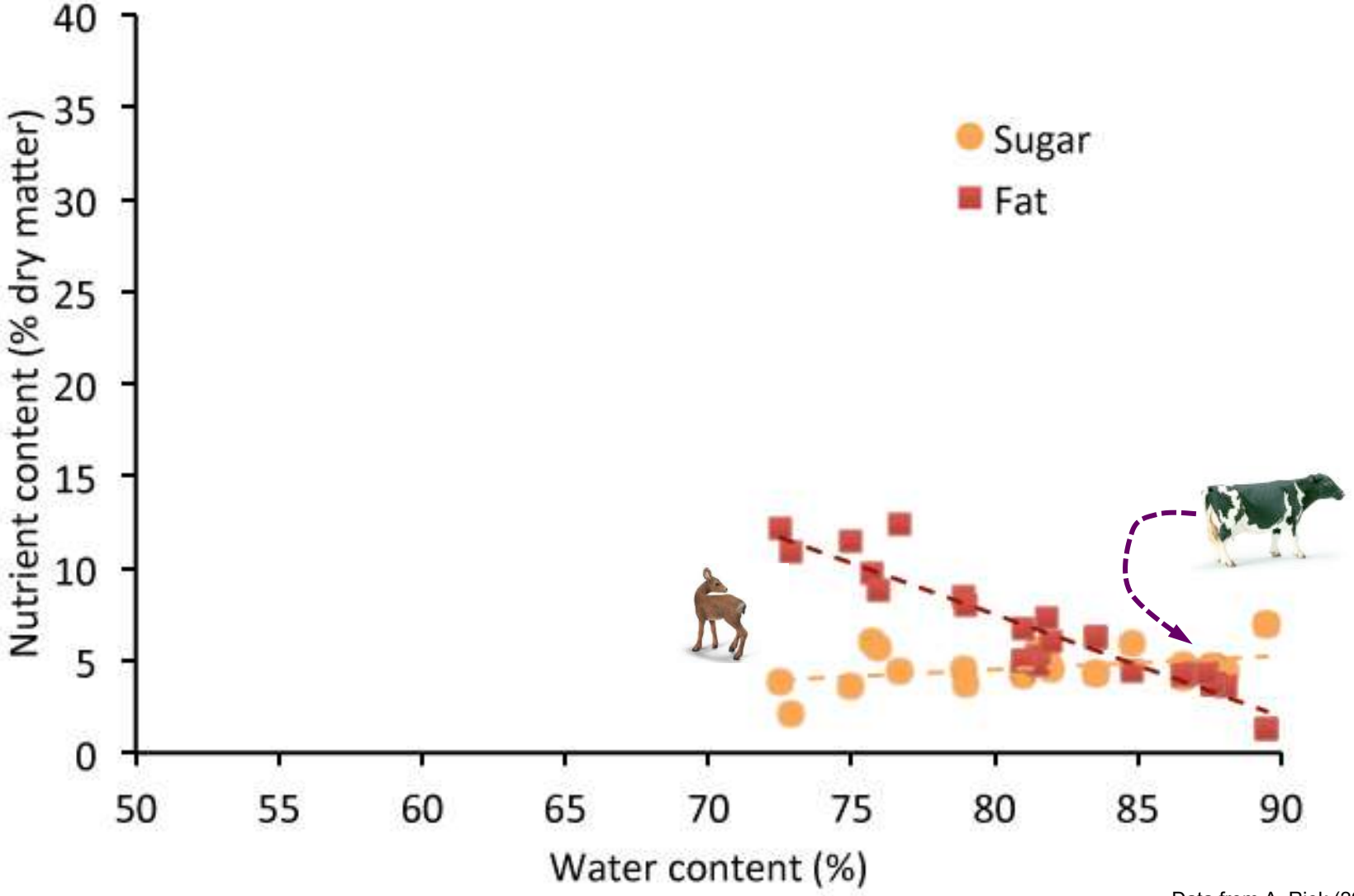


Data from A. Riek (2008)

Ersatzmilch-Rezepte

Tabelle 1: Rezepte für hausgemachte Milchaustauscher für verschiedene Species

Futtermittel / Anteil in %	für Hund	Katze	Katze[1])	Rotwild	Rehkitz	Kaninchen, Hase	Igel	Meerschweinchen	Hamster	Chinchilla	Seehunde
Magerquark	40	15	15	5	36	65	60	38	40	28	7
Rinderhack, fettarm	–	8	–	–	–	–	–	–	–	–	–
Heringsfilet	–	–	–	–	–	–	–	–	–	–	24
Eigelb	10	4	5	–	–	3	12	4	4	5	14
Magermilch	43	68,2	76	66	–	–	–	–	42	33	–
Rahm (30 % Fett)	–	–	–	27	26	25	–	7	11	20	–
Wasser	–	–	–	–	–	–	–	–	–	10	40
Fencheltee	–	–	–	–	–	–	18	–	–	–	–
Vollmilch	–	–	–	–	36,5	–	–	48	–	–	–
Lactose	–	0,8	–	–	–	–	–	–	–	–	–
Speiseöl	6	3	3	–	–	5	8	1	1	2	–
Fischöl[2])	–	–	–	–	–	–	–	–	–	–	14
Mineralfutter[3])	1	1	1	2	1,5	2	2	2	2	2	1

[1]) Diesem Rezept müssen bei langfristiger Verwendung 40 mg Taurin und 300 mg Nachtkerzenöl pro 100 ml zugesetzt werden.
[2]) unbehandelt, sonst geringe Verdaulichkeit des Fetts – > Verschmutzung des Schwimmbeckens (MEYER und WIESE-TWELE, unveröffentl.)
[3]) Mit ca. 20 % Calcium, 5–8 % Phosphor, für Seehunde sind 10 % Calcium günstiger.

Die Rezepte für Hund und Katze sind unter Praxisbedingungen erprobt und bewährt (KIENZLE, 1991).
Das Rezept für die Rehkitze ist der von TREICHLER et al. (1974) in der Praxis erprobten Mischung vergleichbar, lediglich das etwas mühsam zu besorgende Casein wurde gegen Magerquark ausgetauscht, Wasserzusatz ist dann nicht mehr nötig.
Das Rezept für die Seehunde ist in Anlehnung an eine von MEYER und WIESE-TWELE (unveröffentl.) bei der Heuleraufzucht überprüfte Mischung berechnet. Im Originalrezept ist ein milchreiches Alleinfutter für Hunde enthalten, das nicht mehr im Handel ist, daher wurde es durch andere Komponenten ersetzt.
Alle übrigen Rezepte sind entsprechend der Milchzusammensetzung berechnet, jedoch nicht praktisch erprobt.

from Kienzle & Landes (1995)

Ersatzmilch-Rezepte

TAPIR

(Tapiridae tapirus indicus)4

MOTHER'S MILK COMPARISON

Diet	% Protein	%Fat	%Lactose	% Solids
Mother	36.3	21.7	42.0	15.7
Milk 1	33.3	20.3	35.0	

MILK SUBSTITUTE

	Ingredient	Percent	Volume
1	42/25	57.0	1.3
	20/14	43.0	1.0

MIXING DIRECTIONS

The dry powders may be blended together and stored in a closed container following label directions. This allows the blended milk replacer to be reconstituted more quickly when needed. Mix 15.7 grams of powder with 84.3 grams of water or 1.0 volume of powder to 2.5 volumes of water to make a milk of 15.7% solids.

Ersatzmilch-Rezepte

TAPIR

MOTHER'S

Diet
Mother
Milk 1

MILK SUBS

1

MIXING DI

The dry pow
container fo
replacer to
grams of po
powder to 2

BIBLIOGRAPHY

Values numbered are from data published by the following individuals:

1. Olav T. Oftedal. (1984) Milk Composition, Milk Yield and Energy Output at Peak Lactation: A Comparative Review. Symp. Zool. Soc. Lond. No. 51, 33-85

2. Olav T. Oftedal, Daryl Boness, Raymond Tedman. (1987) The Behavior, Physiology and Anatomy of Lactation in the Pennepedia. Current Mammalogy, Vol. 1 Plemum Publishing Company.

3. Olav. T. Oftedal and Robert Jenness. (1988) Interspecies Variation in Milk Composition among horses, zebras and asses (Perissodactyla: Equidae). Journal of Dairy Research, Vol 55, 57-66.

4. R. Jenness and R.E. Sloan. (1970). The Composition of Milks of Various Species: A Review. Dairy Sci. Abstr. 32(10) 599-612 Review Article No. 158.

5. Charles M. Nixon and W.J. Harper (1972) Composition of Gray Squirrel Milk. The Ohio Journal of Science 71(I), 3-6.

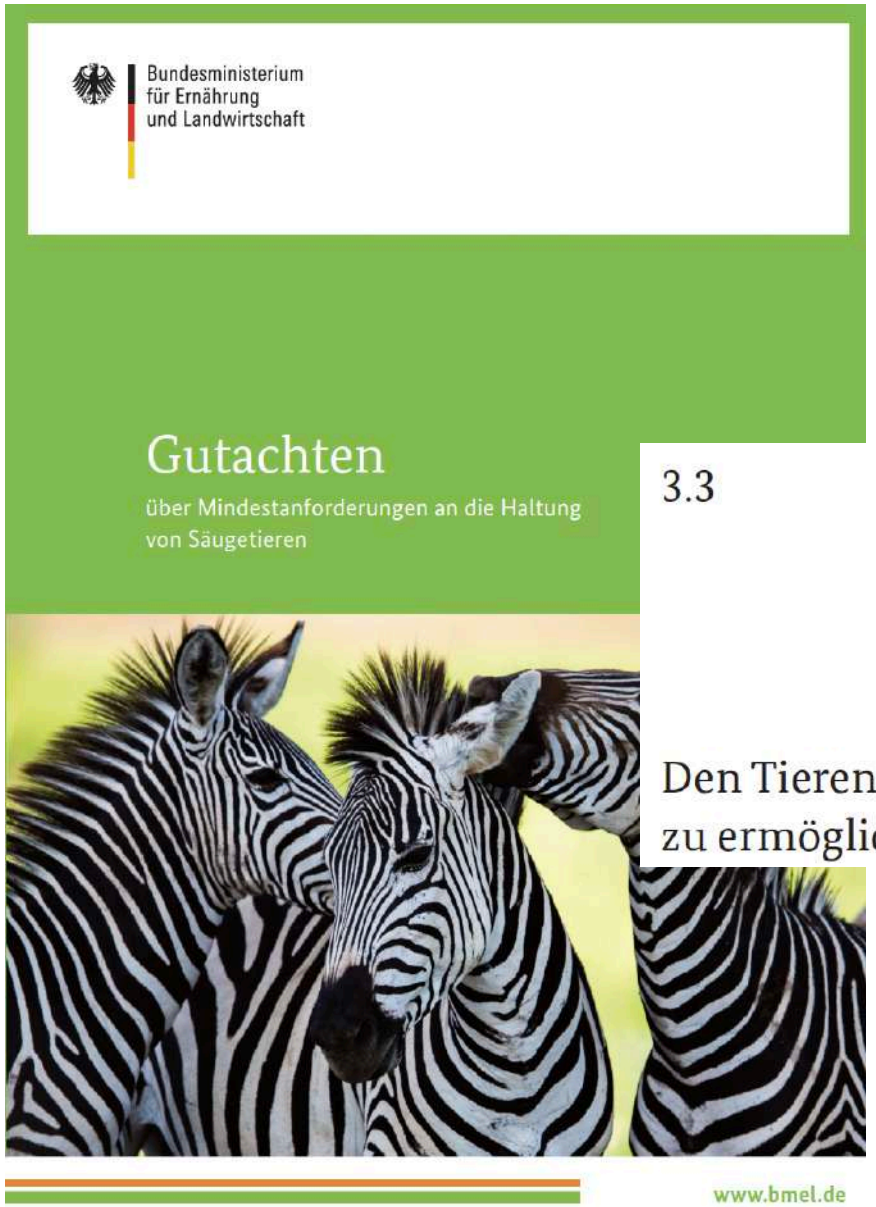
Gesetzliche Vorgaben ?

Tierschutzverordnung

Art. 4 Fütterung

[2] Den Tieren ist die mit der Nahrungsaufnahme verbundene arttypische Beschäftigung zu ermöglichen.

Gesetzliche Vorgaben ?



3 Fütterung/Ernährung

3.3

Den Tieren ist die mit der Nahrungsaufnahme verbundene arttypische Beschäftigung zu ermöglichen.

Gesetzliche Vorgaben ?

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erfüllen ihren Energiebedarf → (**alles** was gefressen wird) (genug) → direktes Überleben

Wir füttern Tiere und …

erfüllen ihren Energiebedarf

erfüllen ihren Nährstoffbedarf/
vermeiden Toxizität

(**alles** was gefressen wird)
(**angemessen supplementiert**)
(genug)

direktes Überleben

direkte Gesundheit

Wir füttern Tiere und …

erfüllen ihren Energiebedarf

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physiologischen Bedarf

(**artgerechtes Futter**)
(**angemessene Menge**)
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langfristige physische
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beeinflussen ihr Verhalten/
erfüllen ihren
psychologischen Bedarf

(**artgerechtes Futter**)
(**angemessene Menge**)
(**angemessen supplementiert**)
(**angemessen präsentiert**)

direktes Überleben

direkte Gesundheit

langfristige physische
Gesundheit

langfristige
psychische
Gesundheit

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erfüllen ihren Energiebedarf → (**alles** was gefressen wird) (genug) → direktes Überleben

Regeneration ~ 1 Woche

erfüllen ihren Nährstoffbedarf/ vermeiden Toxizität → (**alles** was gefressen wird) (**angemessen supplementiert**) (genug) → direkte Gesundheit

Regeneration ~ 1 Monat
kurze Haltung/Nutzung

erfüllen ihren physiologischen Bedarf → (**artgerechtes Futter**) (**angemessene Menge**) (**angemessen supplementiert**) → langfristige physische Gesundheit

langfristige Haltung/Nutzung

beeinflussen ihr Verhalten/ erfüllen ihren psychologischen Bedarf → (**artgerechtes Futter**) (**angemessene Menge**) (**angemessen supplementiert**) (**angemessen präsentiert**) → langfristige psychische Gesundheit

langfristige Haltung incl. Bildungsauftrag / tiergärnterisches Selbstverständnis

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Tierfütterung historisch

Tiergruppe

Rationen aus Landw. / menschl. Gewohnheiten

klassische Mangelkrankheiten

Tierfütterung historisch

Tiergruppe

Rationen aus Landw. / menschl. Gewohnheiten

+ Supplement

~~klassische Mangelkrankheiten~~

‘Zivilisationskrankheiten’

(Adispositas, Malfermentation),

abnormales Verhalten

(Stereotypien, Aggression)

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Rationen, die natürliche Nahrung in Struktur und Nährstoffgehalt imitieren

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+ adequate Präsentation = adäquates Verhalten !!

Tierfütterung historisch

Tiergruppe

Rationen aus Landw. / menschl. Gewohnheiten

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~~klassische Mangelkrankheiten~~

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~~(Adipositas, Malfermentation),~~

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Rationen, die natürliche Nahrung in Struktur und Nährstoffgehalt imitieren

+ adequate Präsentation = adäquates Verhalten !!

'Verhaltensanreicherung' sollte ***nicht*** durch ***Zugabe*** von etwas (wie 'Belohnungsfutter') erreicht warden, sondern durch die ***Präsentation des Futters auf eine herausfordernde und bedeutungsvolle Art*** **!**

Beispiel Kaninchen

Kaninchenversuch

PAPER

Impact of diet on incisor growth and attrition and the development of dental disease in pet rabbits

A. L. Meredith, J. L. Prebble and D. J. Shaw

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Objectives: To assess the impact of four rabbit diets (hay only; extruded diet with hay; muesli with hay; muesli only) on length and curvature of cheek teeth and eruption and attrition rates of incisors.

Materials and Methods: Thirty-two Dutch rabbits, randomly divided into four diet groups, had length and saggital plane curvature of the first cheek teeth measured radiographically at 1, 9 and 17 months. Eruption/attrition of the left upper incisor was directly measured at weeks 30, 32 and 35.

Results: Eruption rates matched attrition rates in all groups, but were higher in the hay only group than in both groups fed muesli. By month 9, a greater degree of tooth curvature was present in rabbits fed muesli only than in those fed hay only and extruded diet with hay. After 17 months, rabbits fed muesli only and muesli with hay had longer lower first cheek teeth and larger interdental spaces between the first two molars than rabbits fed extruded diet and hay and hay only. Three rabbits fed muesli only developed evidence of dental disease.

Clinical Significance: Presence of increased tooth length, curvature and interdental spaces indicated early dental pathology in rabbits fed muesli. Muesli diets cannot be recommended for pet rabbits.

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INTRODUCTION

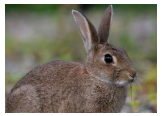
Despite rabbits being the third most popular mammalian pet in the UK (PDSA 2011), their dietary requirements are not fully understood. Diet is frequently implicated in the development of acquired dental disease in pet rabbits (Harcourt-Brown 1996, Crossley 2003, Meredith 2007, Okuda *et al.* 2007); however, its exact role in the aetiology of dental disease remains unclear. The prevalence of dental disease in pet rabbits has been reported to be 29–38·1% (Mullan & Main 2006, Jekl *et al.* 2008), but these reports may underestimate the true prevalence as radiography was not performed and early cases may have been undetected (Jekl *et al.* 2008).

Rabbits have continuously growing elodont teeth (Shadle 1936). The upper incisors erupt at a rate of approximately 2 mm/week and the lower at 2·4 mm/week (Shadle 1936), and incisor eruption rate and length vary widely between individuals (Shadle 1936, Ness 1956). The growth rates of the cheek teeth (premolars and molars) have been reported to be approximately 3 mm a month (Crossley 2005, Meredith 2007, Lord 2012), but more recent studies have reported growth rates of 1·4–3·2 mm/week (Müller *et al.* 2014). Tooth length is maintained by the abrasive nature of the diet, tooth on tooth action during chewing and grinding of the teeth during periods of rest (Shadle 1936, Crossley 2005). The functional differences between incisors and cheek teeth indicate that different diets affect each type of tooth differently (Müller *et al.* 2014). Eruption rates change to match rates of attrition (Wolf *et al.* 1993); taking the incisors out of occlusion by shortening them increases eruption rates (up to 0·7 mm/day) until the tooth returns to occlusion (Ness 1956). Tooth length, wear and growth are also linked to dietary abrasiveness, which is caused by the dietary content of both internal (plant phytolith) and external abrasives such as sand (Müller *et al.* 2014). In addition to diet, age and pregnancy may also influence the rate of eruption of teeth (Shadle 1936, Ness 1956, Wolf *et al.* 1993).

4 x 8 Kaininchen in Paaren gehalten
(kastriert, geimpft)
17 Monate Dauer

		Rohfaser (%TS)
nur Heu *ad lib*	HO	29
Extrudat (+Heu)	EH	19
Müsli (+Heu)	MH	
nur Müsli *ad lib*	MO	14

Kaninchenversuch - Verhalten



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The effect of four different feeding regimes on rabbit behaviour

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Abnormal behaviour
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ABSTRACT

Dietary composition and presentation impacts on the behaviour of animals, and failure to provide a suitable diet can lead to reduced welfare through the development of poor health, the inability to express normal behaviours and the development of abnormal behaviours. This study assessed the effects of two commonly fed pet rabbit diets (extruded nuggets with hay (EH) and muesli with hay (MH)) alongside hay only (HO) and muesli only (MO) on the behaviour of 32 Dutch rabbits observed over 17 months. Increased time spent feeding was observed in the groups fed ad libitum hay (HO, EH, MH) compared to the MO group ($P < 0.05$). A corresponding high level of inactivity was observed in the MO group compared to rabbits receiving hay ($P < 0.05$). In the groups provided with hay a preference to consume hay in a natural grazing posture was observed. The higher activity levels and absence of abnormal behaviours when hay was fed support recommendations that forage should form a significant portion of the diet for domestic rabbits.

1. Introduction

As herbivores, wild rabbits consume relatively large amounts of a high fibre diet of low nutritional quality (Williams and Wells, 1974). This requires them to apportion a large amount of their time budget to grazing. Rabbits spend 30–70% of time outside the burrow grazing, pausing occasionally to groom (Mykytowycz, 1958; Myers and Poole, 1961; Myers and Mykytowycz, 1958; Lockley, 1961). Time spent eating varies with age, sex and social status within the group and has also been shown to increase when food availability falls during drought (Myers and Mykytowycz, 1958; Mykytowycz, 1958). Grazing occurs mainly during late afternoon and throughout the night and daylight hours are spent underground in warrens (Myers and Mykytowycz, 1958; Mykytowycz, 1958; Lockley, 1961, 1962). Caecotrophy is performed while underground (Southern, 1942). Domestic rabbits kept in free range conditions exhibit a similar feeding pattern to their wild counterparts (Vastrade, 1987; Lehmann, 1991). In contrast, many pet rabbits are housed in small hutches with limited exercise opportunities (Mullan and Main, 2006; PDSA, 2011) and a diet consisting largely of concentrates (mono-component nugget or muesli mixes) (PDSA, 2011) which can be consumed rapidly (Lidfors, 1997), with limited or no access to hay or grass (Mullan and Main, 2006; PDSA, 2011).

Stereotypic behaviours are described as behaviours that are relatively invariant, regularly repeated and without an obvious function (Mason, 1991). Stereotypic behaviours reported to occur in laboratory rabbits include excessive grooming, sham chewing (chewing with nothing in mouth), bar biting, licking parts of cage, digging against cage, biting water nipple, sliding nose against bars, head pressing and running repeatedly in a defined pattern (Gunn and Morton, 1995; Lidfors, 1997). An apathetic state of inactivity and boredom has also been reported by Gunn and Morton (1995). Stereotypic behaviours occur most frequently during the night (Gunn and Morton, 1995) when rabbits are naturally at their most active (Mykytowycz, 1958).

Whilst not studied in pet rabbits, the beneficial impact of providing hay to laboratory rabbits has been demonstrated (Lidfors, 1997; Berthelsen and Hansen, 1999). The provision of hay to individually housed laboratory rabbits has proved effective at reducing the expression of abnormal behaviours (Lidfors, 1997; Berthelsen and Hansen, 1999).

Rabbits can consume pelleted feeds rapidly (Lidfors, 1997) and, whilst they may provide adequate nutrition for the maintenance of the rabbit, foraging behaviour is limited. If fed in limited amounts the rapid consumption of the daily ration may leave the rabbit in a state of hunger for a considerable portion of the day (Lidfors, 1997). It has been suggested that stereotypies in pigs and broiler

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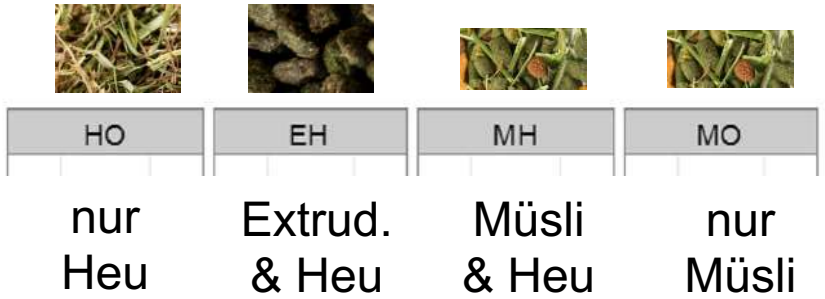
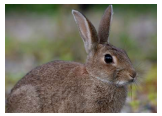


Kaninchenversuch - Verhalten



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Whilst not studied in pet rabbits, the beneficial impact of providing hay to laboratory rabbits has been demonstrated (Lidfors, 1997; Berthelsen and Hansen, 1999). The provision of hay to individually housed laboratory rabbits has proved effective at reducing the expression of abnormal behaviours (Lidfors, 1997; Berthelsen and Hansen, 1999).

Rabbits can consume pelleted feeds rapidly (Lidfors, 1997) and, whilst they may provide adequate nutrition for the maintenance of the rabbit, foraging behaviour is limited. If fed in limited amounts the rapid consumption of the daily ration may leave the rabbit in a state of hunger for a considerable portion of the day (Lidfors, 1997). It has been suggested that stereotypies in pigs and broiler

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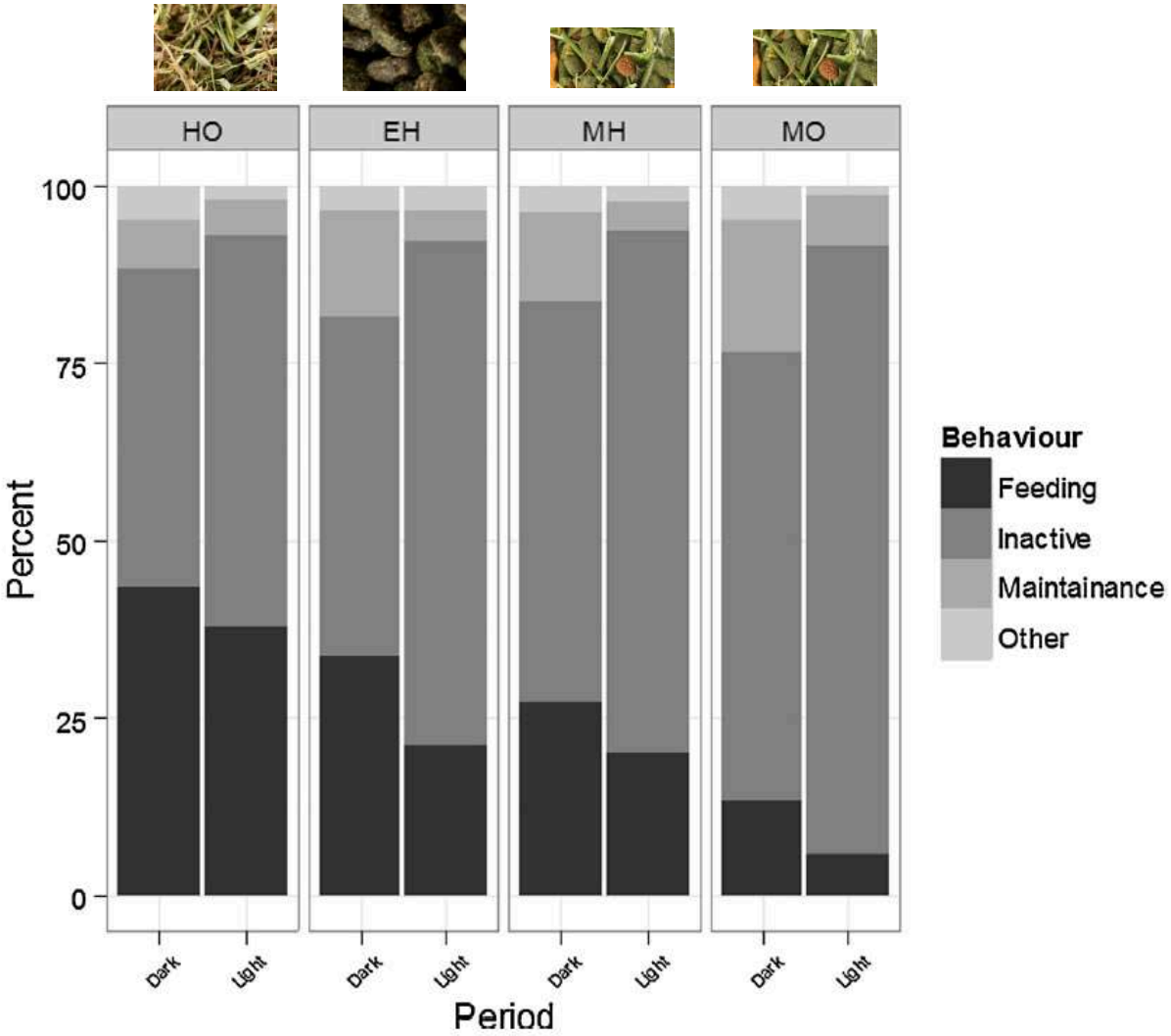
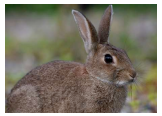
0168-1591/



Kaninchenversuch - Verhalten



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The effect of four different feeding regimes on rabbit behaviour

Jennifer L. Prebble[a,1,2], Fritha M. Langford[b], Darren J. Shaw[a], Anna L. Meredith[a,*]

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ABSTRACT

Dietary composition and presentation impacts on the behaviour of animals, and failure to provide a suitable diet can lead to reduced welfare through the development of poor health, the inability to express normal behaviours and the development of abnormal behaviours. This study assessed the effects of two commonly fed pet rabbit diets (extruded nuggets with hay (EH) and muesli with hay (MH)) alongside hay only (HO) and muesli only (MO) on the behaviour of 32 Dutch rabbits observed over 17 months. Increased time spent feeding was observed in the groups fed ad libitum hay (HO, EH, MH) compared to the MO group ($P < 0.05$). A corresponding high level of inactivity was observed in the MO group compared to rabbits receiving hay ($P < 0.05$). In the groups provided with hay a preference to consume hay in a natural grazing posture was observed. The higher activity levels and absence of abnormal behaviours when hay was fed support recommendations that forage should form a significant portion of the diet for domestic rabbits.

1. Introduction

As herbivores, wild rabbits consume relatively large amounts of a high fibre diet of low nutritional quality (Williams and Wells, 1974). This requires them to apportion a large amount of their time budget to grazing. Rabbits spend 30–70% of time outside the burrow grazing, pausing occasionally to groom (Mykytowycz, 1958; Myers and Poole, 1961; Myers and Mykytowycz, 1958; Lockley, 1961). Time spent eating varies with age, sex and social status within the group and has also been shown to increase when food availability falls during drought (Myers and Mykytowycz, 1958; Mykytowycz, 1958). Grazing occurs mainly during late afternoon and throughout the night and daylight hours are spent underground in warrens (Myers and Mykytowycz, 1958; Mykytowycz, 1958; Lockley, 1961, 1962). Caecotrophy is performed while underground (Southern, 1942). Domestic rabbits kept in free range conditions exhibit a similar feeding pattern to their wild counterparts (Vastrade, 1987; Lehmann, 1991). In contrast, many pet rabbits are housed in small hutches with limited exercise opportunities (Mullan and Main, 2006; PDSA, 2011) and a diet consisting largely of concentrates (mono-component nugget or muesli mixes) (PDSA, 2011) which can be consumed rapidly (Lidfors, 1997), with limited or no access to hay or grass (Mullan and Main, 2006; PDSA, 2011).

Stereotypic behaviours are described as behaviours that are relatively invariant, regularly repeated and without an obvious function (Mason, 1991). Stereotypic behaviours reported to occur in laboratory rabbits include excessive grooming, sham chewing (chewing with nothing in mouth), bar biting, licking parts of cage, digging against cage, biting water nipple, sliding nose against bars, head pressing and running repeatedly in a defined pattern (Gunn and Morton, 1995; Lidfors, 1997). An apathetic state of inactivity and boredom has also been reported by Gunn and Morton (1995). Stereotypic behaviours occur most frequently during the night (Gunn and Morton, 1995) when rabbits are naturally at their most active (Mykytowycz, 1958).

Whilst not studied in pet rabbits, the beneficial impact of providing hay to laboratory rabbits has been demonstrated (Lidfors, 1997; Berthelsen and Hansen, 1999). The provision of hay to individually housed laboratory rabbits has proved effective at reducing the expression of abnormal behaviours (Lidfors, 1997; Berthelsen and Hansen, 1999).

Rabbits can consume pelleted feeds rapidly (Lidfors, 1997) and, whilst they may provide adequate nutrition for the maintenance of the rabbit, foraging behaviour is limited. If fed in limited amounts the rapid consumption of the daily ration may leave the rabbit in a state of hunger for a considerable portion of the day (Lidfors, 1997). It has been suggested that stereotypies in pigs and broiler

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http://dx.doi.org/10.1016/j.applanim.2015.05.003
0168-1591/

8-10 h Fressen
10 h ‘inaktiv’

2 h Fressen
15-18 h ‘inaktiv’

wie für Wild-Kaninchen beschrieben

wie für Labor-Kaninchen beschrieben

Beispiel Igel

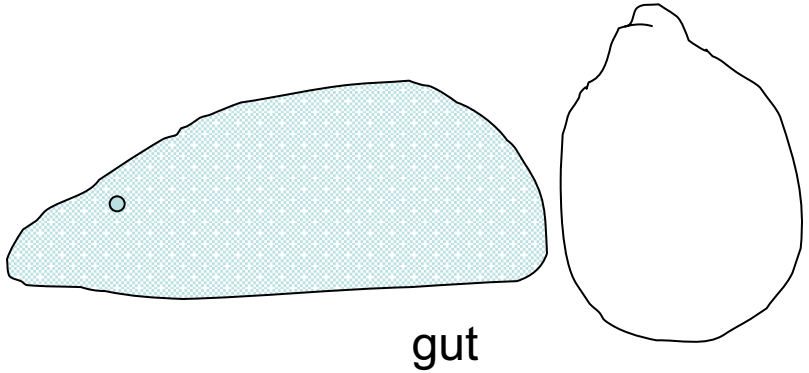
Igel-Stationen

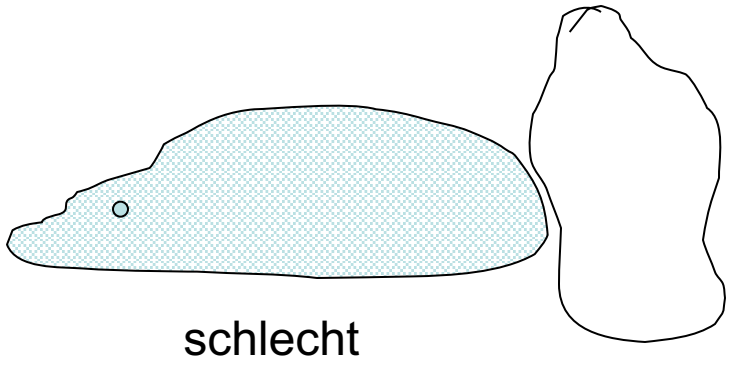
Igel-Stationen

Igel-Stationen

- hoher Erfolg bei Wieder-Auswilderung
- eine gute Körperkondition ist ein Faktor, der zu einem hohen Auswilderungs-Erfolg beiträgt

mind. 500 g für erfolgreiche eigentsändige Überwinterung





Körperkondition Igel

Körperkondition Igel

Igel-Stationen

- hoher Erfolg bei Wieder-Auswilderung
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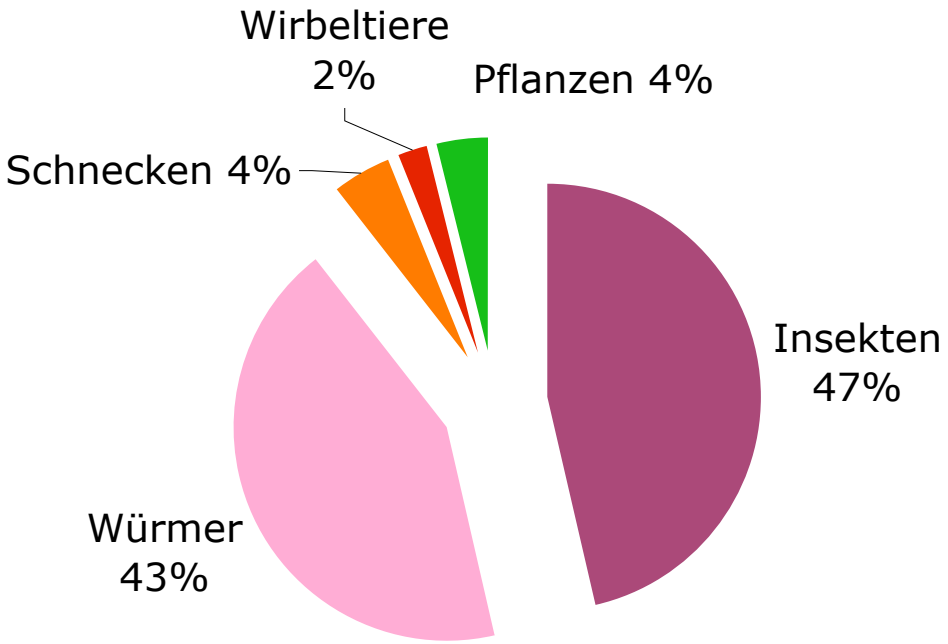
⇒ was auch immer Igel-Stationen machen, vermutlich erfüllen sie ihr Hauptziel: viele Igel einer erfolgreichen Wieder-Auswilderung zuzuführen

Was regt uns auf an der Igel-Haltung ?

Was regt uns auf an der Igel-Haltung ?



Struck & Meyer (1998)

Zusammensetzung
Bäckereierzeugnisse, Getreide, Nüsse (6% Erdnuss), Öle und Fette (3% Lebertran, 3% Sonnenblumenöl, 2% Sojaöl), Weich- und Krebstiere (5% Garnelen, 3% Krebse), Früchte (5% Rosinen), Zucker, Fleisch und tierische Nebenerzeugnisse (3% Trockenfleisch), Mineralstoffe, 1% Bienenhonig, Gemüse, Insekten (0,75% Fliegen), pflanzliche Eiweißextrakte, Fisch- und Nebenerzeugnisse, Hefen, konserviert mit EWG – Zusatzstoffen

Überprüfung kommerzieller Igelfutter auf ihre Eignung (Akzeptanz, Verdaulichkeit, Nährstoffzusammensetzung)

Tierärztl Prax 1997; 25: 178–84

Elisabeth Landes, Susanne Struck, H. Meyer

Die untersuchten Trockenfuttermittel sind als Alleinfuttermittel in der Igelernährung in der vorliegenden Form nicht optimal zusammengesetzt.

Feeding the European hedgehog (*Erinaceus europaeus L.*)—risks of commercial diets for wildlife

J Anim Physiol Anim Nutr. 2021;105(Suppl. 1):91–96.

Angela Gimmel[1] | Ulrike Eulenberger[2] | Annette Liesegang[1]

	Natural diet[a]	Brand 1 dry	Brand 2 dry	Brand 3 dry	Brand 1 wet	Brand 3 wet
CA [%]	8.9	7.7	11.0	8.3	11.1	10.0
CP [%]	58.0	31.1	15.1	33.3	52.8	42.5
CF/Chitin [%]	10.0	3.3	4.7	3.3	2.8	3.0
EE [%]	15.0	21.1	27.9	20.0	30.6	25.0
NfE [%]	8.1	36.8	41.3	35.0	2.7	19.5
ME (kJ/100 g)[b]	1624.3	1819.9	1833.6	1796.3	2015.3	1895.9

[a]Struck & Meyer, 1998, mid-range

Feeding the European hedgehog (*Erinaceus europaeus L.*)—risks of commercial diets for wildlife

J Anim Physiol Anim Nutr. 2021;105(Suppl. 1):91–96.

Angela Gimmel[1] | **Ulrike Eulenberger**[2] | **Annette Liesegang**[1]

In conclusion, the use of commercial dry hedgehog diets should be discouraged as they do not resemble the natural diet of *E. europaeus* and are likely nutritionally inadequate. The commercial wet hedgehog diets should only be used supplementary. The feed labels of commercially available hedgehog diets were not always in compliance with Swiss and European law. The public should be educated about feeding *E. europaeus* and the risks of commercial diets for wildlife.

Industrielles Igelfutter – für Igel geeignet?

Futtermischungen auf dem Prüfstand

Monika Neumeier | Carsten Schiller

IGEL WISSEN kompakt

8

2019

PRO IGEL e.V.

Der angegebene Proteingehalt stammt fast ausschließlich aus dem Erdnussbruch und den Sonnenblumenkernen, tierische Proteine sind nur in homöopathischen Dosen enthalten. Statt Premium-Futter wäre dies als vegetarisches Igelfutter zu deklarieren!

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PRO IGEL e.V.

2019

8

Industriel
für

Futtermisc

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Der sortierbare Anteil an Mehlwürmern, Garnelen und Krabben ergab pro 100 g Futter ein Gesamtgewicht von 760 mg. Unter Berücksichtigung des Abriebs dürften davon höchstens 1–1,5 g enthalten sein. Das ist so wenig, dass es von den Verdauungsorganen des Igels glatt übersehen wird.

IGEL WISSEN kompakt

Industri

f

Futterm

Dass gemäß Internetbewerbung Geflügel Hauptbestandteil der Kroketten sein soll, ist lediglich dem Umstand zu verdanken, dass die tatsächliche Hauptzutat Getreide in seine Einzelbestandteile – Weizen, Futterweizen, Mais und Reis – kleindeklariert wurde.

Die firmenseitige Proklamation – Leidenschaft für Wildtiere, enorme Erfahrung und Liebe, die in diesem Produkt stecken soll – ist innerhalb der optischen Auflösungsgrenzen eines Lichtmikroskops nicht erkennbar.

Die verwendeten Zutaten der Trockenfuttermittel für Igel scheinen uns entgegen dem allgemein anerkannten wissenschaftlichen Kenntnisstand weismachen zu wollen, der Igel sei ein Getreideschädling auf Feldern und in Backstuben.

Igel-Stationen

Für Igel-Stationen wird Katzenfutter (ggf. versetzt mit Weizenkleie oder Chitinpulver) als Basisfutter ergänzt mit versch. Fleischquellen empfohlen …

… und keine kommerziell erhältlichen Igelfutter !

4-5

Ernährung hilfsbedürftiger Igel

Monika Neumeier

www.pro-igel.de

IGEL WISSEN kompakt 4

Alle Merkblätter der Reihe IGELWISSEN kompakt 4:

PRO IGEL e.V.

Igel-Stationen

- hoher Erfolg bei Wieder-Auswilderung
- eine gute Körperkondition ist ein Faktor, der zu einem hohen Auswilderungs-Erfolg beiträgt

⇒ was auch immer Igel-Stationen machen, vermutlich erfüllen sie ihr Hauptziel: viele Igel einer erfolgreichen Wieder-Auswilderung zuzuführen

Was regt uns ***nicht*** auf ?

Angesichts der hohen Dichte an Igel-Stationen in Europa ist der Mangel an Studien zum Verhalten frappierend.

Igel Futtersuche

Acta Theriologica 51 (4): 363–371, 2006.
PL ISSN 0001–7051

Habitat use and behaviour of European hedgehog *Erinaceus europaeus* in a Danish rural area

Anja B. RIBER

Riber A. B. 2006. Habitat use and behaviour of European hedgehog *Erinaceus europaeus* in a Danish rural area. Acta Theriologica 51: 363–371.

Hedgehogs *Erinaceus europaeus* Linnaeus, 1758 were radio-tagged and monitored during the summer of 2001 in a Danish rural area with the objective of quantifying home ranges, nightly distances travelled, habitat use, [illegible] day-nesting habits, and weight [illegible] males and five females being recaptured. Males had larger home range areas and travelled longer nightly distances than females. The two most common habitat types within the home ranges of the hedgehogs were deciduous forest and arable land, whereas the two most frequently used habitat types were deciduous forest and grassland. No differences between the sexes were found in the proportions of different habitat types within the home ranges or in habitat use. Non-random habitat use was found [illegible] and edge habitats seemed preferred [illegible] habitat was deciduous forest. Foraging was by far the most time-consuming nightly activity for both sexes. Males lost weight during the study period (May–July), whereas females gained [illegible] behaviour was found from late-June [illegible] ranging activity and the weight loss of males are interpreted as a consequence of the promiscuous mating system of hedgehogs.

Section of Ethology, Department of Large Animal Sciences, The Royal Veterinary and Agricultural University, DK-1870, Frederiksberg C, Denmark, e-mail: abrj@kvl.dk

Key words: body weight, day-nesting habits, home range, movements, sexual behaviour

Wegstrecke 1-2 km / Nacht

ca. 4 h Fressen / Futtersuche

Introduction

European hedgehogs *Europaeus erinaceus* Linnaeus, 1758 are small secretive nocturnal animals that spend the day in well hidden day-nests. Such characteristics complicate monitoring of the behaviour of free-ranging individuals, contributing to poor understanding of certain aspects of their behavioural ecology. For instance, knowledge of the activity patterns of hedgehog is still limited in spite of the wide distribution of hedgehog in Western Europe and New Zealand. The continuously improving radio-telemetry technology has, however, made comprehensive studies of such animals possible, although the cost of the equipment and the time-consuming form of the method usually still limit the number of study animals involved (eg Morris 1988, Huijser 2000).

FEEDING RHYTHMS OF CAGED HEDGEHOGS (*ERINACEUS EUROPAEUS* L.)

P. A. CAMPBELL

Lincoln College, Canterbury

SUMMARY: The feeding behaviour of four adult caged hedgehogs was studied for a period of 22 weeks. The maximum feeding activity of all four animals occurred between 1900 and 2200 hours, and two of them showed a second, but minor, peak of activity about 0300 hours. Individual feeds were of short duration with the first feed each evening tending to exceed the mean. Variations in behaviour between individuals were considered to be a function of their differing body weights, or to be related to the size of the sample. The feeding behaviour of the caged animals was similar to that reported from comparable field studies.

INTRODUCTION

Herter (1938), Burton (1969) and Campbell (1973) have shown [illegible] have a defi[illegible] rhythm [illegible] caged hedgehogs (Kristoffersson 1964 and Otway 1965) have shown comparable feeding rhythms, but these studies were of only 6 and 14 days duration respectively. The present study was an attempt to determine if hedgehogs retained their natural feeding rhythm when [illegible] for an exte[illegible]

METHODS

Four adult hedgehogs taken from pasturelands near Lincoln were fed under laboratory conditions for 22 weeks. The animals were housed in a temperature controlled room (18 ± 2°C) to pre[illegible] nation and lessen the risk of pne[illegible] mortality factor of caged hedgehogs (Camp[illegible]). To avoid possible effects from the abrupt change in habitat the first 9 weeks were used to condition the animals to captivity, and the remainder for a feeding trial. Each animal was housed in a separate 120 x 30 x 30 cm cage that had a nest box partly filled with shredded paper at one end. The entrance to the nest box was covered by a light-proof curtain. A food tray, which was too narrow for a feeding hedgehog to stand in, was located against the opposite end of the cage, and a pressure pad connected to a four-pen event recorder was placed in front of it (Fig. 1). The pressure pad did not operate unless weight was applied near the contact end. The event recorder operated continually, but movement of the

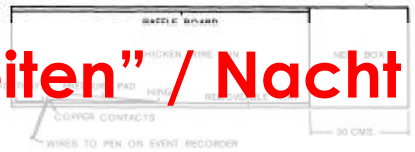

FIGURE 1. *Diagramatic lateral view of a test cage.*

The only lighting in the room throughout the 13 week feeding trial was daylight from an east-facing window shaded by a baffle. A selenium photocell, which could be read from outside the room was used to record light intensities. During the conditioning period only, the animals were observed with the aid of a s[illegible] photographic [illegible] A d[illegible] of cooked mince, bread and milk was provided. Small quantities of mineral salts, cod-liver oil and liver were added regularly.

As the variances were different the modified t-test (Snedecor and Cochran 1967) was used to test data for significance.

RESULTS AND DISCUSSION

The animals did not react to the red light used to assist observations made during the conditioning period. On first emerging from their nests each night the animals normally groomed themselves, then evacuated. Behaviour beyond this point was variable but they would usually complete at least one

7-15 "Mahlzeiten" / Nacht

mit 100-200 sec / Mahlzeit

= 22-27 min / Nacht

Stereotypien ?

THE BEHAVIOUR OF THE HEDGEHOG (*ERINACEUS EUROPAEUS* L.) IN THE ROUTINE OF LIFE IN CAPTIVITY

BY

E. J. DIMELOW

*Department of Zoology, The University, Reading**

[Accepted 9th October, 1962]

An account is given of the grooming and nest building of the hedgehog. In addition its activity while being exercised is described and its behavioural responses to other hedgehogs or to human beings.

CONTENTS

As an alternative to running for a time in fixed circles of different diameter or in concentric circles of diminishing or increasing diameter, D and F might " waltz ". In this case either would spin round once on his axis at one definite point in the process of running round in a circle of about one and a half metres in diameter. D and F also ran backwards and forwards in a straight line along one wall or the side of a box.

can be assessed in some measure and the tests viewed in their proper setting. It is hoped that these limited observations may have some significance in relation to the behaviour of hedgehogs in their natural state.

HEDGEHOGS UNDER OBSERVATION

Nine hedgehogs (A—I below) were kept in captivity at different times over a period of three years. Seven of the hedgehogs (A—G) were caught in the

*Present address: Department of Biology, Mount Allison University, Sackville, N.B., Canada.

Stereotypien ?

Ergänzungen zum Wissen über *Erinaceus e. roumanicus* und kritische Überlegungen zur bisherigen Literatur über europäische Igel

WALTER PODUSCHKA

Z. f. Tierpsychol. Bd. 26, Heft 7 1969

g) *Wegstereotypie*

Der Igel lief unter meinem Arbeitstisch stundenlang an der Wand und an zwei Kisten entlang und beschrieb dabei eine flache 8. Die auf Abb. 10 deutlich sichtbare, etwa 3 cm breite Spur wurde durch zertretene Kotreste und Blut auf den glatten Parkettboden gezeichnet. Das Blut stammte von wundgelaufenen Stellen der Hinterfüße. Zusätzlich war an der Wand eine dunkle Blutspur zu sehen. Sie stammte vom unteren Nasenrücken, der knapp oberhalb des äußeren nackten Nasenknorpels abgescheuert und wund war. Das ♂ schliff im Vorbeilaufen immer wieder mit der empfindlichen Nase über die Wand

Igel-Stationen

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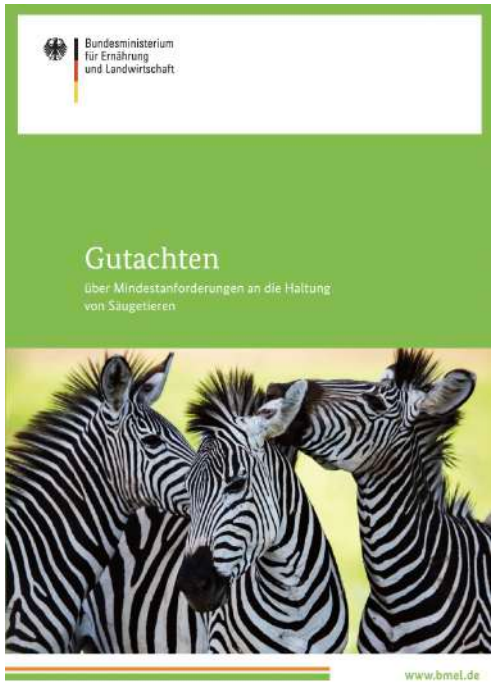
- eine gute Körperkondition ist ein Faktor, der zu einem hohen Auswilderungs-Erfolg beiträgt

⇒ was auch immer Igel-Stationen machen, vermutlich erfüllen sie ihr Hauptziel: viele Igel einer erfolgreichen Wieder-Auswilderung zuzuführen

Haltungsziel

- Aufpäppeln / Wiederauswildern: Aufenthalt in Igel-Station scheint kein Hindernis für den Erfolg zu sein



mind. 2 m^2

"darf unterschritten werden"

mind. 1 m^2

"am besten bewährt hat sich Katzenfutter"

Haltungsziel

- Aufpäppeln / Wiederauswildern: Aufenthalt in Igel-Station scheint kein Hindernis für den Erfolg zu sein

- Langfristige Haltung mit einem Auftrag von Tierwohl und Wissensvermittlung => andere Gehege, Fütterung und Futter-Darreichung notwendig

Int. Zoo Yb. (1989) **28:** 268–271

A mealworm dispenser for the Slender-tailed meerkat *Suricata suricatta* at London Zoo

DAVID SHEPHERDSON[1], TRACY BROWNBACK[1] & ANN JAMES[2]

Haltungsziel

- Aufpäppeln / Wiederauswildern: Aufenthalt in Igel-Station scheint kein Hindernis für den Erfolg zu sein

- Langfristige Haltung mit einem Auftrag von Tierwohl und Wissensvermittlung => andere Gehege, Fütterung und Futter-Darreichung notwendig

Zahlreiche automatisierte Futterspender
im Gehege verteilt
mit kleinen,
unvorhersehbaaren Dosen
(Extrudat)

ANDERE TIERARTEN

granovit

Insectivoren Extrudat

Futternummer: 3762

Geeignet für: Insektenfressende Säugetiere, z.B. Erdmännchen, Erdwölfe, Erdferkel, Gürteltiere, Igel etc.

IHRE VORTEILE

- Hochwertiges Ergänzungsfutter für insektivore Säugetiere
- Ideal zur Ergänzung einer, je nach Tierart, auf Insekten- und Gemüse-basierten Ernährung
- Bei einem Rationsanteil von ca. 50% der Trockensubstanz ergänzt das Futter Mineralstoffe, Spurenelemente und Vitamine ideal
- Weites Ca:P Verhältnis (2.3:1), um calciumarme Rationsbestandteile (unsupplementierte Insekten, Getreideprodukte, Fleisch), auszugleichen Ohne Milchprodukte oder Laktose
- Hoher Anteil an Insektenmehl (20%)
- Enthält Garnelenschalenmehl als natürliche Chitinquelle (4%)
- Taurin-supplementiert (0.35%)
- Mit Präbiotika (0.8%) zur Unterstützung der Verdauung
- Extrudat für hohe Akzeptanz und gute Verdaulichkeit
- Kleine Grösse zur einfachen Dimodierbarkeit, auch anwendbar in Fütterungsautomaten

FUTTERART, FORM, LIEFERMENGEN

- Ergänzungsfuttermittel
- Form: Extrudat
- Liefermengen: 12.5 kg Papiersäcke mit Plastikeinlage Palletten à 375 kg
- Produktnummer: 3762.E5.F12

Grundfutter

Für Ihre Bestellungen

Tel. +41 61 816 96 10
Fax +41 61 816 96 19
info@granovit.com
www.granovit.com

Stand: 01.18

Tiergärtnerisches Selbstverständnis und Lehrauftrag

- Haltungsziel: bedeutungsvolles Tierleben in einer angstreien Umgebung *(meaningful lives in an anxiety-free environment)*

- Fütterung:
  - Gesundheit erhalten
  - Verhalten bestimmen
  - biologisches Wissen vermitteln

- Abweichungen von natürlichen Gegebenheiten bewusst, nicht aufgrund Gewöhnung an Tradition

vielen Dank für Ihre Aufmerksamkeit