Drinking preferences in rabbits, guinea pigs, chinchillas and degus

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Rabbits and rodents have become common pets in many UK households. The increasing interest towards these species has also led to more research over the past decade, which is helping improve standards of care.

As practising vets, we should look with interest into these studies, as results may be of clinical interest and may be applicable in our everyday job. It may seem an investigation into drinking preferences in rabbits and rodents may be of little interest and relevance.

However, this may be clinically relevant when we consider the following points: open dishes have the advantages of allowing an easy, natural way of drinking, and of rapid cleaning, but can get easily contaminated by bedding, food, urine and faeces, which may increase the risk of disease transmission, and water can be spilled.

Nipple drinkers, in contrast, save space and prevent spilling, but drinking occurs in an unnatural way and their thorough cleaning is difficult (Tschudin et al, 2011a). Furthermore, an adequate water intake may be important for the health and welfare of animals as inappropriate or reduced water intake may lead to reduced food intake, risk of urinary tract infections, urolithiasis, dehydration, hyperthermia, exhaustion and death (Tschudin et al, 2011b).

Several studies have, therefore, been carried out on this topic and this article aims to review some of these.

Water intake in domestic rabbits from dishes and nipple drinkers

In a short communication, Tschudin et al (2011b) had previously used 12 dwarf pet rabbits to evaluate two common methods of water provision: nipple drinkers and open dishes.

This study found rabbits favoured drinking from open dishes, even if they had been used to drinking from nipple drinkers before. They also appeared to be spending less time drinking, but at a higher drinking speed (accounting for the volume of water consumed per unit time) and spent less time drinking. Furthermore, water restriction not only had a negative impact on the amount of water drunk, but also changed the rabbits' circadian drinking pattern.

Tschudin et al (2011a) performed a more comprehensive study investigating the preferences of pet rabbits for water bowls or nipple drinkers, their water intake and faecal excretion, when subjected to different feed and water regimes with practical relevance, such as hay, fresh parsley, a seed mix and two different pelleted feed offered in diverse combinations. They found with ad libitum water access the drinking system did not have an influence on water intake.

However, faecal output was less and dry matter content of faeces was higher with nipple drinkers compared with open dishes, indicating activation of a physiological water-saving mechanism in response. If access to water was restricted for a few hours, there was a reduction in total food and water intake, which ultimately influenced faecal and urinary output, even though water was reintroduced. Total water intake was highest with diet consisting of parsley (chosen as “fresh food” in this study, but may include other food items such as grass), when compared with hay-based or concentrate-based diets, with the majority of water consumed from the diet.

Dry diets stimulated water intake from the drinker, but led to smaller total water intake than diets with a high water content. A high moisture content in the diet seemed to be more important to achieve a high total water intake than only a high water intake from the drinker itself. When foods with a low moisture content were fed, water intake was higher with hay or high-fibre foods in contrast to the low-fibre pellets or seed mixes.

Diets high in fibre seem to enhance water intake in rabbits (Harkness and Wagner, 1995). Furthermore, the longer chewing time spent for diets high in fibre (Wenger, 1997; Zumbrock, 2002) could lead to more salivation, and the higher usage of caecotrophs with diets high in fibre (Fekete and Bokori, 1985) may require more fluid for their formation. The authors concluded rabbits favoured drinking from open dishes.

Drinking systems influenced water intake under conditions of water restriction – which may occur if water freezes in outdoor enclosures, the container is empty and not immediately refilled, or if a less dominant animal is prevented from approaching the drinker – but, with nipple drinkers, faecal output and dry matter content pointed into a direction of water conservation.

Open dishes are often criticised because of their possible contamination and spillage, but the authors found both of these undesirable conditions were only of concern if the open dish was offered on the floor. They suggested the open dish was placed on an elevated area, heavy dishes with high rims were used or open dishes were weighed down with a stone. Furthermore, these authors gave evidence of the fact water should be constantly available and provision of fresh plant material could be beneficial for the health of pet rabbits, reducing certain predisposing factors that may favour diseases, such as urolithiasis, from occurring.

Assessing preferences of chinchillas, degus and guinea pigs

Chinchillas, degus and guinea pigs originate from semi-arid habitats in South America. In

chinchillas and degus, several physiological adaptations to limited water availability have been demonstrated, including highly concentrated urine, low faecal water content and lower evaporative water loss, which seem to be lacking in guinea pigs. Insufficient water intake may lead to health and welfare issues, such as lower urinary output and increased risks of urolithiasis, urinary tract infections, dehydration and reduced nutritional status.

Hagen et al (2014) used six chinchillas, degus and guinea pigs to evaluate their drinking preferences and establish whether, similar to rabbits, they also displayed a preference or even drunk significantly more from either an open dish or a nipple drinker. Food and water intake were measured daily for 13 days. Unsurprisingly, considering the lack of water deprivation adaptation mechanisms, guinea pigs showed a higher water intake per dry matter intake than chinchillas.

Surprisingly, the degus in this study also presented a higher water intake per dry matter intake than chinchillas, although not as high as guinea pigs.

Chinchillas may show a particularly low water intake for various reasons. Differently from other caviomorpha, they have an extremely long colon (Gorgas, 1966), which probably facilitates a particularly high water reabsorption during faeces formation, allowing a particularly low water intake. Possibly, chinchillas can also afford this lower water intake because they are not dependent on calcium elimination via urine, as hindgut fermenting herbivores, such as guinea pigs and rabbits, do, but eliminate 80% of calcium via faeces, and only 1% to 3% via urine (Clauss and Hummel, 2008; Clauss et al, 2009).

A reason for the higher water intake showed by degus may be related to an emergency adaptation mechanism used in cases of scarce water supply. In the present study, chinchillas favoured drinking from open dishes, whereas degus and guinea pigs did not show any clear evidence for any water provision method. The reasons behind these evident differences may be related to body size. The amount of water released by the nipple drinker might be higher as compared to the size of the oral cavity than in rabbits. Therefore, drinking water needs may be met with nipple drinkers in guinea pigs and degus. This does not occur in chinchillas, even if smaller than guinea pigs.

Tschudin et al (2011b) showed rabbits spend less time drinking from open dishes than nipple drinkers, but drink approximately the same amount if the water is available ad libitum. In chinchillas in the present study, the water intake was in or only slightly above the range of previously published observations measured with nipple drinkers only; therefore, the authors concluded in this species, water intake was similarly not constrained by the drinking method under ad libitum provision.

However, under more challenging conditions, such as hot weather, in group situations where access to the drinking water might be more limited for subordinate animals or in animals with urinary tract infections, providing water by open dish may be beneficial.

Providing water to chinchillas via open dishes is controversial, because due to a lack of protective sebaceous excretions into their fur, it becomes matted when wet, which may lead to hypothermia, with deaths anecdotally reported.

Additionally, it has been claimed by several breeders the fur on the chin might become matted when chinchillas drink from open dishes, which may lead to dermatitis. In the study, two small open dishes, instead of one large dish, were used; a solution that may be impractical, especially where more than one animal is kept in an enclosure.

Alternative systems that store larger amounts of water in an upside-down bottle – where water does not exit via a nipple, but in a small open dish – might represent a good solution for chinchillas, complying with the animals' preference for an open dish, yet avoiding the danger of excessive fur wetting.

Do nipple drinkers compensate for behaviourally deficient diets?

Water consumption and feed intake are strictly related, with a ratio of 2ml to 4ml water per ingested gram of dry matter in guinea pigs and rabbits (Wolf et al, 2008). An increased water intake is also seen in rabbits fed on hay (Tschudin et al, 2011b; Prebble and Meredith, 2014) and in guinea pigs fed on roughage (Zentek et al, 1996).

In a study, Balsiger et al (2016) tested the drinking preference of 10 guinea pigs following a preliminary study in which 6 animals – on a diet of lucerne hay and pelleted lucerne – did not show a specific preference to either drinking system, in contrast to chinchillas, which preferred the open dishes (Hagen et al, 2014).

In the present study, 12 adult guinea pigs – 4 intact and 2 castrated males, and 6 intact females – were offered open dishes and nipple drinkers simultaneously, and the water intake for each animal was measured on four different diets (100% grass hay, or as 10% of intake on diets of fresh parsley, seed mix or pelleted complete feed, respectively) on either of the drinking systems.

Animals drank less water on parsley ("fresh food") than on the other diets (as seen, drinking water intake depends on the dry matter content in the feed). Nevertheless, total water intake (from feed and drinker) was typically highest on such diets. Therefore, offering fresh feed can be considered a prophylactic measure against urolithiasis and, in guinea pigs, can also help meeting the requirement for vitamin C. For guinea pigs, a higher drinking water intake on a hay-based diet as seen in rabbits (Tschudin et al, 2011a; Prebble and Meredith, 2014) could not be demonstrated.

In contrast to Hagen et al (2014) – in their study, out of 6 guinea pigs, 2 favoured nipple drinkers, 2 open dishes and the remaining 2 had intermediate values – 9 out of 10 animals clearly preferred nipple drinkers when having a choice, and 8 of these drank more when on this system only.

The difference between the drinking systems was not consistent across all diets: on hay, similar amounts of water were drunk when on open dishes or nipple drinkers only. Differently from rabbits (Tschudin et al, 2011a), guinea pigs preferred the drinking system that required more time being spent drinking, plus they showed a higher water intake from it, suggesting this may be required to fulfil an activity-related oral behavioural motivation linked to a lack of fibre in the diet rather than a thirst-related physiological requirement.

Ultimately, nipple drinkers may offer an “outlet for oral activity that may be related to the feeding mechanism in these animals”. This seems to be confirmed when considering the diet requiring the highest amount of rodent-specific oral processing (whole hay) was the only one where water intake was similar between the drinking systems. Guinea pigs can have a tendency of playing with nipple drinkers, especially on a diet low in roughage and rich in energy-dense food. This has been related to a possible similarity between the oral movements during chewing and drinking from a nipple drinker.

Gerstner and Goldberg (1989) showed guinea pigs drinking from a nipple drinker demonstrated a typical pattern of vertical gnawing motions and tongue protrusion (a sequence not typical for chewing) interrupted by a pattern of a combination of vertical and horizontal jaw movements (a sequence typical for chewing). It appears possible nipple drinkers can serve as a release for a frustrated gnawing and chewing motivation.

Additionally, the body conformation of rabbits and chinchillas may make open dish drinking easier for these species than for guinea pigs. Hence, another possible reason for the lower water intake from open dishes could lie in the physical difficulty for guinea pigs to drink from a dish with an edge of several centimetres.

In conclusion, offering nipple drinkers to pet guinea pigs most likely offers a form of behavioural enrichment that, at the same time, may increase water intake and act as prophylaxis against urolithiasis.

References

- Balsiger A, Clauss M, Liesegang A, Dobenecker B and Hatt JM (2016). Guinea pig (*Cavia porcellus*) drinking preferences: do nipple drinkers compensate for behaviourally deficient diets? *Journal of Animal Physiology and Animal Nutrition*: [Epub ahead of print].
- Clauss M and Hummel J (2008). Getting it out of the (digestive) system: hindgut fermenters and calcium, *Proceedings of the Comparative Nutrition Society*: 30–36.
- Clauss M, Lang-Deuerling S, Kienzle E, Medici EP and Hummel J (2009). Mineral absorption in tapirs (*Tapirus* spp) as compared to the domestic horse, *Journal of Animal Physiology and Animal Nutrition* **93**(6): 768-776.
- Fekete S and Bokori J (1985). The effect of the fiber and protein level of the ration upon the caecotrophy of rabbit, *Journal of Applied Rabbit Research* **8**(2): 68-71.

- Gerstner GE and Goldberg LJ (1989). An analysis of mandibular movement trajectories and masticatory muscle EMG activity during drinking in the guinea pig, *Brain Research* **479**(1): 6-15.
- Gorgas M (1966). Vergleichend-anatomische Untersuchungen am Magen-Darm-Kanal der Sciuromorpha, Hystricomorpha und Caviomorpha (Rodentia), *Zeitschrift für wissenschaftliche Zoologie* **175**: 237-404.
- Hagen K, Clauss M and Hatt JM (2014). Drinking preferences in chinchillas (*Chinchilla laniger*), degus (*Octodon degu*) and guinea pigs (*Cavia porcellus*), *Journal of Animal Physiology and Animal Nutrition* **98**(5): 942-847.
- Harkness JE and Wagner JE (1995). *The Biology and Medicine of Rabbits and Rodents* (4th edn), Williams and Wilkins, Munich.
- Prebble JL and Meredith AL (2014). Food and water intake and selective feeding in rabbits on four feeding regimes, *Journal of Animal Physiology and Animal Nutrition* **98**(5): 991-1,000.
- Tschudin A, Clauss M, Codron D, Liesegang A and Hatt JM (2011a). Water intake in domestic rabbits (*Oryctolagus cuniculus*) from open dishes and nipple drinkers under different water and feeding regimes, *Journal of Animal Physiology and Animal Nutrition* **95**(4): 499-511.
- Tschudin A, Clauss M, Codron D and Hatt JM (2011b). Preference of rabbits for drinking from open dishes versus nipple drinkers, *Veterinary Record* **168**(7): 190.
- Wenger AK (1997). *Vergleichende Untersuchungen zur Aufnahme und Verdaulichkeit verschiedener rohfaserreichen Rationen und Futtermittel bei Zwergkaninchen*, Meerschweinchen und Chinchilla, PhD thesis, Tierärztliche Hochschule, Hannover.
- Wolf P, Bucher L, Zumbrock B and Kamphues J (2008). Daten zur Wasseraufnahme bei Kleinsäugern und deren Bedeutung für die Heimtierhaltung, *Kleintierpraxis* **7**: 217-223.
- Zentek J, Meyer H, Tau A and Adolph P (1996). Untersuchungen zur Ernährung des Meerschweinchens. IV: Wasseraufnahme Harnmenge und Harnzusammensetzung, *Kleintierpraxis* **41**: 347-356.
- Zumbrock B (2002).*Untersuchungen zu möglichen Einflüssen der Rasse auf die Futteraufnahme und –verdaulichkeit, Größe und Füllung des Magen-Darm-Traktes sowie zur Chymusqualität bei Kaninchen (Deutsche Riesen, Neuseeländer und Zwergkaninchen),* PhD thesis, Tierärztliche Hochschule, Hannover.