

Degutopia Independent 30-Day Feed Trial: Beaphar XtraVital Degu Diet

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Abstract

Degu colony groups were trialed on the new formulation of a degu-specific diet, 'XtraVital Degu' (Beaphar B.V.), to assess its suitability for maintaining healthy degus. The trial feed was found to meet the needs of the degu appropriately and is recommended as a degu maintenance diet by Degutopia, in addition to hay and fresh vegetable matter. There was no significant difference in weight change between trial and control degus, and the diet performed very well in preference tests.

Introduction

The degu (*Octodon degus*) is a diurnal, semifossorial herbivorous rodent, native to the semi-arid scrublands of central Chile. Degus have become popular as domestic pets over the last few decades, and interest in them has expanded throughout the UK and Europe. Although closely related to other caviomorphs such as the guinea pig and chinchilla, and having a similar digestive system, the degu has a unique dietary requirement making many feed products formulated for these other species somewhat unsuitable and in some cases leading to severe health problems for the degu. The most notable feature of a degu's physiology is that they are extremely intolerant of dietary glucose (e.g. Brown and Donnelly, 2001; Nishi and Steiner, 2003; Opazo *et al.*, 2003). Much research in this area has shown that degus very easily develop diabetes mellitus when regularly fed on a sugar-containing diet (Nishi and Steiner, 2003; Brown and Donnelly, 2001), therefore it is crucial that any degu-specific feed exclude free sugars and have a low carbohydrate content. It is advised the total sugars content be less than 5 % in degu specific formulations (Long, 2009), given that it takes degus over one hour for blood glucose levels to return to normal after ingesting just 0.7 g glucose (Opazo *et al.*, 2003). Research suggests that dietary protein should also be low in degu feeds, since they have only an 85% dietary capacity for protein (Ebensperger, 2001), of which large amounts can lead to a significant increase in water consumption / drinking behaviour (Cortes *et al.*, 1988) due to the excess strain placed upon the kidneys. Long-term, this can lead to permanent kidney damage. Conversely, the fibre content should be maximised as this makes up the most significant proportion of the wild degu diet (Bozinovic *et al.* 2004; Ebensperger and Wallem, 2002), with degus being specially adapted to break down cellulose by alloenzymatic action (Langer, 2002). Bauck (2004) has suggested that caviomorphs need a minimum of 18% dietary fibre in order to maintain healthy digestion, but research by Langer (2002) suggests that it may need to be as high as 21% in the degu. However, any feed produced should take into account that it is advisable to give natural hay *ad lib.* to degus in order to encourage them to forage throughout the day, aid peristalsis and maintain intestinal bacterial health (Bozinovic *et al.*, 2004). It is the popular belief that degus, like their close relative the guinea pig, are not able to produce their own vitamin C, although the lack of research in this area promotes this as hypothesis only. One study by Jenness *et al.* (1980) indicated that degus may in fact be able to produce their own vitamin C, as significant levels of L-gulonolactone oxidase (a precursor to ascorbic acid) were detected in degus maintained on a low vitamin C diet. Until further research can be done, it is important that any degu feed contains added vitamin C in order to avoid potential health problems (Sapra *et al.*, 1987). This is particularly important as many mammals produce their own vitamin C from dietary glucose and galactose (Burri and Jacob, 1997), which are lacking in the degu's natural diet.

In 2009, Beaphar B.V. released a new formulation of their existing degu diet into the market, part of their XtraVital range. This feed is a mixed diet, consisting of three types of rounded extrusions, cylindrical alfalfa pellets, flaked peas, flaked maize, oats and locust

beans (carob). The mix is green, yellow and brown in colour and has a pleasant scent. The ingredients and nutritional breakdown of the product can be found in Table 1.

Ingredients	
Grains in various forms, alfalfa pellets, pea flakes, soy pellets, lupin fibre, locust beans, minerals, manan oligosaccharide, fructo oligosaccharide, echinacea tincture.	
Nutritional Breakdown	
Total sugars*	3.7 %
Fibre	20.1 %
Protein	14 %
Fat	3.1 %
Ash	5.5 %
Vitamin C	600 mg kg ⁻¹
Vitamin A	27000 IU kg ⁻¹
Vitamin D ₃	800 IU kg ⁻¹
Vitamin E	60 mg kg ⁻¹
Copper	15.5 mg kg ⁻¹

Table 1- Ingredients list and nutritional breakdown for Beaphar's XtraVital Degu diet.

*Tested independently for Degutopia by Eclipse Scientific Group's laboratories, total sugars as sucrose.

This feed was considered to be appropriate for degus and was rated as one of Degutopia's 'recommended' degu diets based on the nutrition and ingredients, with all components given a suitability score of 'good' (see <http://www.degutopia.co.uk/degudiet.htm> for further details). As part of the ongoing work by Degutopia to test the suitability of newly formulated degu feeds, we conducted the following independent trial.

Methodology

Animals and Housing

For the trial, a sample of captive degus were monitored, which were kept in a private collection in Leicestershire, UK. All degus included in the study were fully adult (age range 3-7 years) and had been bred for at least one traceable generation. The sample consisted of two groups; one control group (two females) and one trial group (two males). Each respective group was housed in their own colony mesh cage of average dimensions 100 x 60 x 100 cm (length, width, height). All degus had continual access to running wheels, drinking water and meadow hay. In addition, all degus were regularly allowed access to a large enclosure for exercise/play, as usual, throughout the course of the trial.

Diet

Prior to the start of the trial, all degus were maintained on a mixture of 5 g Supreme Petfoods' Gerty Guinea Pig feed mix and 3 g Supreme Petfoods' Science Selective Degu extrusion each per day (see appendix for ingredients lists/nutritional breakdowns). This was slightly less than the recommended 10 g per day portion as the result of previous trial findings (Degutopia, 2009). During the trial, all control degus continued with this feed regime. One week prior to trial onset, all trial degus were gradually introduced to the trial feed (Beaphar's XtraVital Degu) by increasing the daily quantity of trial diet and simultaneously decreasing the original diet until only trial diet was being fed on the day before trial start. This was done to avoid digestive upset by allowing the degus' intestinal microflora time to adapt to the new feed. After this period the trial was started for the period of 30 days, with all trial degus maintained on 10 g of the trial diet (see Figure 1).



Figure 1- Sample daily 10g portion of the Science Selective Degu trial diet. Scales accurate to 1 g, dish zeroed.

Data Collection

Weight data were collected from each control and trial degu on weighing scales accurate to 1 g. In order to facilitate data collection, a small quantity (~1 g) of rolled oats was placed onto the scales to keep the degu in position for the few seconds required to read off the weight. Scales were zeroed prior to the weighing event and calibrated with a 200 g fixed mass weight prior to each weight reading. Data collection was divided into two periods; pre-trial (days -6 – 0) and trial (days 1 – 30). During the pre-trial period, all degus were weighed at the start of the week allowed for introducing the trial diet to trial degus, and again at the end of this pre-trial period (the day prior to the start of the trial). During the trial period, all degus were weighed daily, at the same time of day to avoid any error arising from fluctuations that may occur in body weight over the course of the day. In addition, the quantity of water drunk in each colony cage was noted throughout the trial.

Data Analysis

Weight data were analysed by one-way ANCOVA using the GLM module of Statistica (Statsoft, Inc.). ‘Degu’ / ‘trial status’ (control or trial) was chosen as the independent variable, with ‘weight’ or ‘change in weight’ as dependent variables. ‘Trial day’ was selected as covariate since weight change was likely to be correlated with time as the trial progressed.

Results

Weight Changes

The weights of the trial degus were significantly lower ($F_{[1,117]} = 18.62$; $p < 0.0005$) than the weights of the control degus over the trial period. Figure 2 shows the weights for all degus over the course of the trial, indicating the mean weights for both control and trial degus. There was no significance ($F_{[1,117]} = 0.04$) between the change in weight of the control and trial degus over the trial period. Figure 3 demonstrates the daily change in weight for all degus in both samples. Complete weight tables can be found in the appendix.

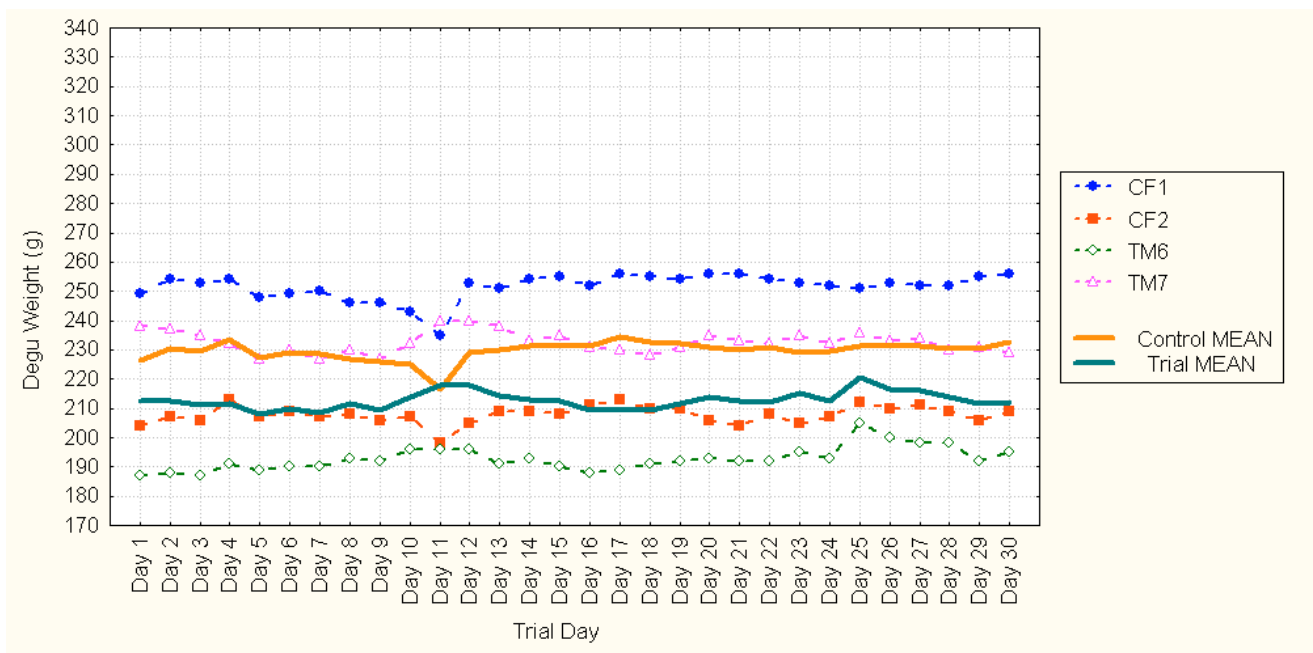


Figure 2- Weights for all degus over the course of the trial.

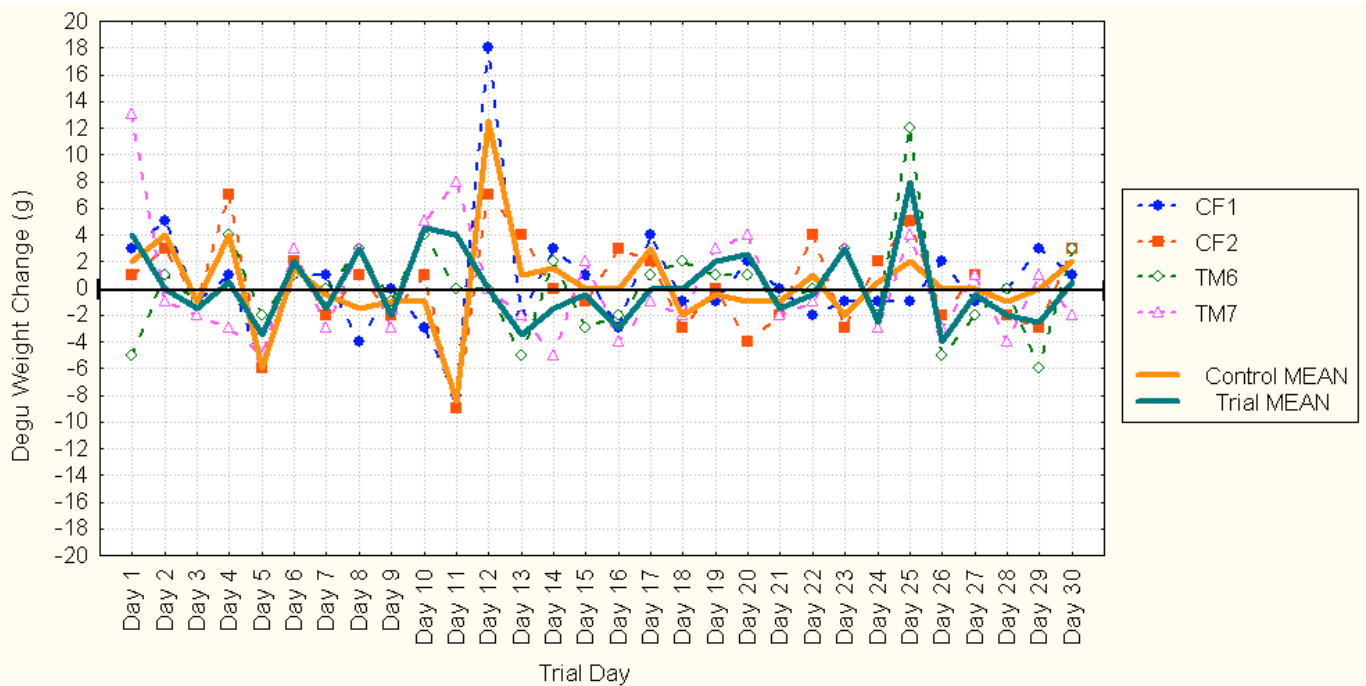


Figure 3- Daily weight changes for all degus over the course of the trial.

Preference tests

After the trial, all degus (trial and control) performed a preference test. Each degu was simultaneously presented with a small (approx. 7 mm) extrusion from either the trial feed, Pets at Home's Degu Nuggets, or Supreme Petfoods' Gerty Guinea Pig or Science Selective Degu. In each case the first piece of diet to be taken was recorded, and the selection was presented to each degu in a randomised way. In this test, all degus selected the trial diet 42 % of the time.

Water Consumption

Table 2 shows the water consumption for each group over the trial period.

Group	Group water consumed (ml)	Number of degus per group	Average individual water consumption (ml)
<i>Control</i>	1920	5*	384
Trial group	1030	2	515

Table 2- Average water consumption per degu over the course of the trial for all groups. * Note that although this group contained 5 degus, only 2 were used as a control as the remaining 3 degus were not fully adult.

Discussion

While the control degus weighed significantly less than the trial degus over the trial period, the fact that there was no significant difference in the weight changes of both groups indicates that the trial diet was formulated as suitably for the degus' metabolic needs as the control diet. As all trial degus readily ate most of their 10 g serving in one sitting and did not demonstrate increased tendency to hoard leftover feed, this was deemed to be an appropriate measure per degu. Water consumption was slightly elevated in the trial group as compared to the

control, although the reason for this was unclear. Possible causes include higher salt or mineral levels in the trial feed although the exact proportions of these are unknown, pending further analysis. Although the trial group was relatively small due to the small quantity of trial diet available, both trial degus were in good health before and after the trial, and in addition were both tested for diabetes at the end of the trial by testing urinary glucose levels (with negative result).

The trial feed was also found to perform very well in the preference tests, with nearly half of the degus choosing the trial diet over the other three. It is possible that the strong, pleasant aroma of the feed contributed to this.

In conclusion, the 30-day trial of XtraVital Degu manufactured by Beaphar showed it to be a suitable candidate for feeding degus as their regular diet, in addition to hay and fresh vegetable matter. Degus did not show significant weight fluctuations as compared to degus maintained on the control diet, and the feed performed extremely well in preference tests.

References

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Appendix

i. Ingredients and nutritional breakdown for Supreme Petfoods Ltd.'s Gerty Guinea Pig feed.

Ingredients	
Alfalfa, flaked peas, flaked maize, wheat and flaked wheat, oats, soya, locust beans, anise and fenugreek liquid, soya oil, orange, banana, vitamins and minerals, sodium chloride, EC colourants, sodium sulphide stabiliser.	
Nutritional Breakdown	
Total Sugars*	4.1 %
Fibre	10 %
Protein	15 %
Fat	3 %
Ash	5 %
Vitamin C	250 mg kg ⁻¹
Vitamin A	23000 IU kg ⁻¹
Vitamin D ₃	1000 IU kg ⁻¹
Vitamin E	50 mg kg ⁻¹
Copper	10 mg kg ⁻¹

*Tested independently for Degutopia by Eclipse Scientific Group's laboratories, total sugars as sucrose.

ii. Ingredients and nutritional breakdown for Supreme Petfoods Ltd.'s Science Selective Degu feed.

Ingredients	
Alfalfa, barley, wheat flour, wheatfeed, peas, soybean meal, broccoli, oats, soy oil, minerals, spinach, basil, salt.	
Nutritional Breakdown	
Total Sugars*	3.9 %
Fibre	10 %
Protein	16 %
Fat	4 %
Ash	8 %
Vitamin C	500 mg kg ⁻¹
Vitamin A	15000 IU kg ⁻¹
Vitamin D ₃	1400 IU kg ⁻¹
Vitamin E	50 mg kg ⁻¹
Copper	10 mg kg ⁻¹

*Tested independently for Degutopia by Eclipse Scientific Group's laboratories, total sugars as sucrose.

iii. Complete weight tables for all degus in the trial.

Degutopia 30-day Feed Trial June 2009; Beaphar Xtra/Mtal Degu (New) and Pets at Home Degu Nuggets Diets.										
Day	Poppy (F) Control Degu 1	Parsley (F) Control Degu 2	Nibble (F) Trial Degu 1	Naughts (F) Trial Degu 2	Chibi Maru (F) Trial Degu 3	Phillip (M) Degu 4	Total	Freya (HF) Trial Degu 5	Dreggen (M) Trial Degu 6	Diego (M) Trial Degu 7
Pre-Intro weight 11-06-09	290	205	237	198	218		198	226	199	235
Post-Intro weight 16-06-09	246	203	234	202	215		200	228	192	225
Trial day 1 17-06-09	249	204	232	204	217		204	227	187	238
Trial day 2 18-06-09	254	207	237	205	219		209	227	188	237
Trial day 3 19-06-09	253	206	239	206	219		209	229	187	235
Trial day 4 20-06-09	254	213	238	207	217		206	231	191	232
Trial day 5 21-06-09	248	207	237	206	215		208	231	189	227
Trial day 6 22-06-09	249	209	242	204	215		210	231	190	230
Trial day 7 23-06-09	290	207	240	205	215		206	231	190	227
Trial day 8 24-06-09	246	208	238	202	214		207	228	193	230
Trial day 9 25-06-09	246	206	236	202	214		210	222	192	227
Trial day 10 26-06-09	243	207	239	207	213		205	231	196	232
Trial day 11 27-06-09	235	198	239	205	220		207	239	196	240
Trial day 12 28-06-09	253	205	237	205	224		215	239	196	240
Trial day 13 29-06-09	251	209	231	202	216		207	235	191	238
Trial day 14 30-06-09	254	209	237	206	219		212	232	193	233
Trial day 15 01-07-09	255	208	238	206	217		209	232	190	235
Trial day 16 02-07-09	252	211	237	205	217		212	231	188	231
Trial day 17 03-07-09	296	213	234	202	218		213	227	189	230
Trial day 18 04-07-09	255	210	233	204	215		214	231	191	228
Trial day 19 05-07-09	254	210	232	208	217		212	232	192	231
Trial day 20 06-07-09	296	206	233	208	218		213	233	193	235
Trial day 21 07-07-09	296	204	230	207	216		212	231	192	233
Trial day 22 08-07-09	254	208	230	204	220		215	232	192	232
Trial day 23 09-07-09	253	205	227	202	219		211	230	195	235
Trial day 24 10-07-09	252	207	232	202	222		215	231	193	232
Trial day 25 11-07-09	251	212	237	206	221		215	233	205	236
Trial day 26 12-07-09	253	210	234	206	219		215	233	200	233
Trial day 27 13-07-09	252	211	234	210	222		212	237	198	234
Trial day 28 14-07-09	252	209	232	206	217		215	232	198	230
Trial day 29 15-07-09	255	206	230	203	215		217	233	192	231
Trial day 30 16-07-09	296	209	226	203	219		215	237	195	229